A retrospective evaluation of elements of the EU VAT system

Final report

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CPB Netherlands Bureau for Economic Policy Analysis (Consortium leader)

CAPP CASE

CEPII ETLA

IFO IHS

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Contributors to this report

CONSORTIUM MEMBERS

Institute for Fiscal Studies (project leader)
Stuart Adam, David Phillips and Stephen Smith

CPB Netherlands Bureau for Economic Policy Analysis (consortium leader)
Leon Bettendorf, Stefan Boeters, Henk Kox, Bas Straathof and Kasper Stuut

CAPP
Massimo Baldini, Monica Ferrari, Silvia Giannini, Paolo Onofri, Stefania Tomasini and Lorena Vincenzi

CASE
Luca Barbone, Richard Bird and Luis Jaime Vázquez Caro

ETLA
Tarmo Valkonen and Niku Määttänen

IFO
Christian Breuer, Alexander Ebertz and Chang Woon Nam

IHS
Johannes Berger and Ludwig Strohner

ADDITIONAL CONTRIBUTORS

CenEA
Michal Myck

DIW Berlin
Stefan Bach, Martin Beznoska and Richard Ochmann

IEF
Nuria Badenes, Olga Cantó and José María Labeaga

Independent economic consultants
Alain Trannoy, Nicolas Ruiz and Vanessa Denis

KU Leuven
André Decoster and Dirk Verwerft

This report is dedicated to the memory of Luis Jaime Vázquez Caro, who died unexpectedly on 28 September 2011, during the final stages of this project, on which he worked as part of the CASE team. Jaime, a 1973 graduate of the International Tax Program at Harvard University, was a well-known professional in the area of tax policy and administration, having been the deputy tax commissioner of Colombia, and having spent over fifteen year of his career working on tax administration reform issues first at the IMF, and then at the World Bank. In the mid-1990s he was involved in several projects to help in the implementation of tax and tax administration reforms in central Europe, and was particularly concerned with the emergence of different types of VAT-based frauds, discussed in this report. At the time of his passing, he was also working on a project on tax administration reform in Armenia. Our condolences go to his wife Maria Teresa and his son José Camilo, who live in Bogotá, Colombia.

Contents

Preface

This is the final report of a project on "The retrospective evaluation of elements of the VAT system."[1] This project has been led by researchers at the Institute for Fiscal Studies, in co-operation with other members of a consortium of organisations (led by CPB Netherlands Bureau for Economic Policy Analysis) carrying out a programme of economic analysis of taxation for the European Commission, and with additional contributions to this project from researchers outside the consortium.

We gratefully acknowledge the support, guidance and comments we have received from European Commission staff throughout this project, as well as helpful suggestions from Ingvil Gaarder and Jonathan Kesselman and detailed comments on an earlier draft from David Holmes and Michael Keen. None of these are responsible for the views expressed or remaining deficiencies, however.

The terms of reference for this project asked us to address the following 12 evaluation questions:

(1) To what extent do the ***current VAT arrangements for cross border supplies of goods and services*** maximise the potential of a genuine EU single market for businesses and customers (for both businesses and private individuals)? What is the range of GDP loss that could be attributed to the special rules, obligations and risks associated to EU trade? What are the related administrative burdens and collection costs? What are the main reasons for any infringements and/or fraudulent activity and their extent at EU level?
(2) To what extent is the ***current method of collecting VAT*** efficient, effective and robust, e.g. in terms of minimising the compliance cost for the enterprises and maximising the tax revenue for national administrations whilst preventing fraud?
(3) What are the cost and impacts[2] (positive, negative, intended, unintended) of the current restrictions applied to the ***right to deduct VAT*** including through the determination of the deductible proportion (businesses carrying on exempt and taxed activities, linked to question 4) for tax revenue (estimates of the additional tax revenue for member states), businesses (estimates of the VAT actually borne) and

[1] Specific Contract no. TAXUD/2010/DE/328 implementing Framework Service Contract no. TAXUD/2010/CC/104 for the provision of economic analysis in the area of taxation.
[2] For example, impacts on (distortion of) competition, consumption patterns (distortion and/or deflection of trade), etc.

the customers? Is non-deductible VAT on business inputs the most appropriate/efficient way of taxing such businesses?

(4) What are the cost and impacts of the current ***exemptions*** for tax revenue, businesses and final consumers? What percentage of the member states' total consumption is VAT-exempted?

(5) What are the cost and impacts of the current ***diversification of the VAT rates***, including ***reduced VAT rates***, on compliance for businesses in particular for cross border transactions and on collection/control costs? What percentage of the member states' total consumption is subject to reduced VAT rates/ standard VAT rate?

(6) To what extent and how do the different ***cost factors of the VAT*** impact the ***medium/large and pan-European businesses***?

(7) To what extent does the current ***VAT framework for small businesses***[3] help to create the right conditions for them to grow and prosper in the single market? To what extent and how do the different ***cost factors of the VAT*** impact them?

(8) To what extent does the current VAT acquis applied on ***services provided internationally***[4] guarantee adequate taxation (no double taxation or tax avoidance)?

(9) What are the cost and impacts of the current national VAT arrangements applied in the member states on ***the bona fide traders*** in the context of the VAT fraud?

(10) To what extent do the current ***derogations, exemptions*** and ***options***[5] continue to be relevant as compared with the needs they aim to satisfy? Do the benefits they bring validate the cost?

(11) To what extent does the current ***diversification of the VAT rates***, including the ***reduced VAT rates***, continue to be relevant as compared with the needs they aimed to satisfy? Do the original motives[6] for their introduction still justify their application?

(12) To what extent and how does the current VAT system impact the ***price-setting mechanism*** in the short and long run?

[3] Different scopes and thresholds applied in member states, exemptions, simplified procedures, special schemes for farmers, etc.

[4] Including services provided by branches/ head-offices situated in third countries to EU branches or head-offices.

[5] Exemptions for certain activities in the public interest (i.e. for social, educational and cultural reasons), exemptions for other activities subject to technical concerns about applying VAT to the underlying transactions or interference with other taxes (i.e. postal and financial services, gambling activities, immovable property, etc.) and exemptions applied before the introduction of the VAT or at the time of the countries' accession to the EU (i.e. passenger transportation, etc).

[6] For example, social justice, historical motives, environmental motives, technological difficulties, etc.

In doing so, we were asked to focus specifically (though not exclusively) on the following seven elements:

(A) The evaluation should provide estimates of the total volume and value of domestic and cross-border (intra-EU and extra-EU) transactions carried out by pan-European enterprises and estimates of the administrative burden and compliance cost as a percentage of the total administrative burden and in euros. It should also enlighten estimates of differences in price-setting mechanisms between pan-European (linked) companies and businesses that are independent from each other, with a view of potential differences in VAT revenues collected.

(B) Analysis of the aspects of non-distortion of competition in the EU, including in cross-border relations. In particular, the evaluation should analyse in detail the impact of the VAT system and of the unequal treatment of intra-EU supplies as compared to domestic supplies on the internal market, e.g. if and to what extent it leads to a change in consumer choice, higher or lower prices, the creation of barriers for new suppliers and service providers, the facilitation of anti-competitive behaviour or emergence of monopolies, market segmentation, etc. It should also look at the impact it has on trade barriers and if it provokes relocation of economic activities.

(C) The analysis set out in point (B) above should cover both B2B and B2C transactions, and notably the specific regimes (distance selling, supplies of new means of transport, intra-Community acquisitions by non-taxable legal persons or taxable persons without a right of deduction) which have been introduced in 1993 in order to avoid distortions of competition resulting from the differences in VAT rates.

(D) Analysis of the impact of the VAT system on competitiveness of EU firms as opposed to firms established outside the EU, e.g. what impact it has on the global competitive position of EU firms, if it influences and to what extent the withdrawal of certain products or services from the market, if it leads to new or the closing down of business and if some products/ businesses are treated differently from others in a comparable situation.

(E) Quantitative evidence of the impact of the diversity of rates, exemptions and schemes applied to goods and services in the EU under the current VAT system on the job creation, value added, economic growth, welfare gain, consumption, labour market, national revenues, and the proper functioning of the internal market.

(F) Analysis in the more general context of the welfare and equity impacts of the VAT system. In particular, a number of derogations applied by the member states have been introduced for reasons of social justice (i.e. redistribution of income) or for historical reasons (grandfathering clauses). A question to be answered in this context is whether the redistribution effect has been achieved, if any, by applying

specific elements of the VAT system. Also, the share of the exempt, zero, reduced and standard rate in the total theoretical tax revenue should be estimated.

(G) Evaluation of the welfare impact of the multiple-rate VAT system. In particular, the evaluation should examine the economic effect of the adjustments in the VAT rates on real relative price changes.

The chapters of this report are broadly (though not precisely) organised in line with these seven elements. At the start of each chapter we note which element(s) the chapter addresses; we also note which of the 12 evaluation questions the chapter helps to address, though individual chapters are not structured as head-on our answers to individual questions: answers to several of the questions are spread across chapters. Chapter 1 summarises the findings of the report as a whole.

1 Executive Summary (IFS)

In the 1960s, the member states of the EU pioneered the use of VAT in place of the variety of turnover tax systems then in operation. Over the years, VAT has become a major source of revenue for all member states and by 2009 it raised €784bn annually – 6.6% of the EU's GDP and 17.3% of all taxes raised.

Clearly, how well VAT works is a question that matters, especially as VAT is considered as a tool for the fiscal consolidation taking place (or due to take place) across much of Europe. The bigger VAT is, the more important it is to design it well. And conversely, whether VAT works well has an important bearing on the question of whether it is the right tax to use to raise further revenue.

VAT has many desirable properties in principle. It should not distort saving and investment decisions, production patterns, trade and competitiveness – though it is unlikely to raise the long-run growth rate. Although VAT taxes final consumption in a rather roundabout way (it is levied on all transactions, with registered businesses able to reclaim VAT paid on inputs), this has advantages: sellers do not have to distinguish between businesses and final consumers, and it reduces the potential and incentive to evade tax. These desirable properties are mostly displayed by the EU VAT regime in practice as well: there is much to be said in its favour.

However, the EU VAT system also has a number of weaknesses. This is, in part, because the economic environment in which VAT operates has changed a great deal since the main features of the regime were put in place. The nature of business activities has evolved. International trade has expanded dramatically – particularly in difficult-to-tax services – and internal frontiers within the single European market were abolished in January 1993. Technology has changed both how taxes can be operated and the nature of what is to be taxed. Over the last two decades, piecemeal policy responses have sought to improve the functioning of the VAT system in the face of these developments but have left many fundamental problems unaddressed. A more radical remodelling of the VAT system could address the significant limitations of the current regime and allow VAT to fulfil its potential as the economically efficient tax it can, in principle, be. Moreover, experience in New Zealand and other countries demonstrates that such reform is possible. With its December 2010 Green Paper, the European Commission has initiated a debate on more comprehensive reforms aimed at making the EU VAT system simpler, more robust and more efficient.

To facilitate this process, this report is directed at a *retrospective* evaluation of the consequences, in economic terms, of the functioning of the most pertinent elements of the current EU VAT system. To make policy decisions, it is necessary to compare alternatives: both different possible designs of the VAT, and VAT as compared with other taxes. We leave the design and analysis of alternative policies to future studies.

But what are the main weaknesses and problems with the current EU VAT regime?

Exemptions are the most obvious and probably the most economically damaging. Where they exist, VAT is no longer a tax on final consumption, as intended. This results in significant distortions to decisions by firms of whether to self-supply or purchase goods and services from the market, and to competition between exempt and non-exempt firms and between different EU countries, and, last but not least, in an increase in compliance and administrative costs for those firms that have to allocate input tax between exempt and taxed transactions. Through these mechanisms, exemptions reduce productivity and output, impede the Single Market and reduce the international competitiveness of important European industries. For instance, if financial services firms could reclaim VAT on their inputs, the cost of financial services to businesses would be reduced by around 3–5% in the four biggest euro-area countries (France, Germany, Italy and Spain), leading to an increase in their international price competitiveness of 0.16%, on average. Reducing the extent of exemptions would also have a double dividend for governments: extra revenues that could be used to reduce the rate of VAT or other taxes, reduce borrowing or increase spending.

Albeit to a lesser degree, the extensive use of reduced rates also causes problems. Zero and reduced rates can be progressive and can be used to encourage use of socially desirable goods and services. But because of the structure of VAT, they are rarely well-targeted tools to use for either of those aims. Furthermore, they increase the complexity of the system – thereby increasing administrative costs, litigation costs and compliance costs – and distort households' spending patterns, reducing welfare. Indeed, our estimates show that it would be possible, in principle, to abolish zero and reduced rates of VAT and compensate all households and still have revenue left over. In practice, it would not be possible to compensate all households exactly, but changes in direct tax and transfers can be used to ensure poor households and other vulnerable groups are compensated, on average.

In part because there are multiple rates, the complexity of the VAT regime, along with variations across the EU in how it operates, continues to create substantial compliance

costs. This is particularly the case for small businesses, which is why substantial VAT registration thresholds are one form of VAT exemption we do think is justified – they reduce burdens on the smallest businesses. Considerable complexity is also created for those wishing to trade across borders, although we welcome moves to simplify the VAT treatment of trade in services. Particularly worrisome are the many differences across member states in VAT-related administrative procedures: on average, a firm trading in two EU15 members would have to deal with 11 such differences. Such intra-EU differences form a source of trade costs that hamper the development of the internal market and discourage cross-border trade. Our estimates suggest that a 10% reduction in differences in VAT procedures could boost intra-EU trade by up to 3.7% and GDP by up to 0.4%, although we consider these estimates very much upper bounds of the true effects. Harmonising procedures and limiting differences in VAT rates, and more generally reducing compliance costs, look like worthwhile goals.

Finally, the level of evasion remains a concern. The 'VAT gap' – the gap between actual VAT revenues and what they would have been with full compliance – is big, estimated at an average of 12% of liabilities in 2006. Clearly, most VAT is evaded through transactions in the shadow economy that are not reported, followed by frauds based on reducing the reported level of taxable sales or on exaggerating claims for refunds of VAT paid on business inputs. Contrived insolvency fraud is also a problem, although recent measures have reduced its extent. It is unlikely that shadow economy fraud will be reduced by applying lower rates to the transactions that are not reported, because it remains attractive to evade the associated income tax.

While most VAT fraud is domestic, cross-border trade is associated with particular forms of fraud, notably missing trader intra-Community (MTIC) fraud. This arises because of the break in the VAT 'audit trail' that occurs at the border, and the zero-rating of exports. Possible strategies for tackling such problems range from making more use of 'reverse charging' (whereby buyers rather than sellers are responsible for reporting the tax due) to, more radically, moving away from the zero-rating of exports towards a system such as the 'VIVAT' in which a uniform rate is applied to all business-to-business transactions. Because compliance costs are already high for cross-border trade, distorting trade and reducing GDP as we saw above, efforts should be made to ensure that moves to increase compliance do not increase these further; this makes increased cooperation, data-sharing and joint anti-fraud operations between revenue authorities in different member states a first priority.

One good measure of the extent of departures from a simple uniform VAT is the VAT revenue ratio, which tells us that actual VAT revenues in 2008 were only 58.1% of what they would have been if all consumption had been successfully taxed at the standard VAT rate, or 85.4% of what they would have been if all consumption by households had been successfully taxed and no government consumption had been taxed. This shows that, taken together, exemptions, reduced rates and various forms of non-compliance significantly reduce the amount of VAT that is raised.

We now go on to look at each of these features and problems, and several others.

Taxation of trade and the internal market (Chapter 3)

Broadly speaking, a destination-based VAT – one in which the VAT levied on goods and services depends on the country in which they are consumed – should not distort trade patterns within the European single market, since items are taxed at the same rate regardless of their origin. But applying the destination principle can be problematic, leading to distortions to trade and potentially higher compliance costs.

Developments in product markets (such as digital downloads), the abolition of intra-EU border controls in 1993, and the fact that the VAT treatment of services has been brought more into line with the VAT treatment of goods, have reduced the significance of differences between goods and services for tax policy. Increasingly, the central distinction is instead between business-to-business (B2B) and business-to-consumer (B2C) trade.

For most B2B trade, a zero rate of VAT is applied to exports, with imports subject to the VAT applicable in the importing country. In principle, this application of the destination principle avoids distorting trade patterns.

Trade in services has traditionally been more problematic for the VAT system. Complex and varied 'place of supply' rules designed to ensure the proper levying of taxes acted as a significant discouragement to trade by increasing compliance costs. They also made it more likely that they will be interpreted and applied differently in different countries, giving rise to the potential for double or zero taxation where both or neither country claims taxing rights over the supply; rules intended to prevent this exist, but there is evidence in the legal literature that these have not always worked in a satisfactory way. Fortunately, these problems have been significantly reduced by

reforms in the last two years that mean a large majority of B2B services are now taxed in the customer's location at the VAT rate applicable at that location.

The major downside of zero-rating exports and taxing imports – the approach now applied to most B2B services as well as goods – is that it breaks the VAT 'chain' (the collection of VAT in parts from traders throughout the supply chain), opening up enforcement risks. Measures taken to mitigate this enforcement risk have helped limit the tax fraud that would otherwise take place, but are one of many causes of higher compliance costs of doing business across borders, creating a barrier to trade. Given this, it is unlikely to be the case that the present set-up represents best policy: whilst it is beyond the scope of this report to suggest alternative policies, we note that many proposals exist, including improved cross-border audits and radical ones such as the 'VIVAT' (which would establish a common EU VAT rate for B2B trade).

B2C trade falls into two broad categories, each of which has its own difficulties.

Cross-border shopping, small-scale distance-selling and some B2C services are taxed in the supplier's location. In these cases, consumers' ability to choose between suppliers charging different VAT rates can potentially give rise to economically inefficient outcomes, with resources wasted as consumers' choices – and therefore competition between firms and firms' location decisions – are driven by tax rather than commercial considerations. However, because of the relatively small flows of trade involved, the economic cost is likely to be fairly small. Furthermore, it is not clear to us that existing arrangements could be improved: charging customers the VAT applicable in their country of residence would greatly increase compliance costs and be impractical to enforce, particularly in the case of cross-border shopping.

Distance sales above the destination country's distance-selling threshold (either €35,000 or €100,000), and some B2C services, are taxed according to the customer's location. This is useful and prevents the biggest revenue losses and distortions that could result if all B2C sales were taxed in the supplier's location. However, the need for sellers to register for VAT in all member states to which they make substantial sales does add to the compliance burden for businesses selling across borders. The distance-selling regime can also be difficult for governments to enforce, since the tax authorities in the destination country (to whom the VAT is due) have no jurisdictional power over suppliers in other member states.

VAT exemptions and the taxation of small businesses (Chapters 3 and 11)

Exemptions, by which VAT is not charged on sales but also cannot be reclaimed on input purchases, run wholly counter to the logic of VAT as a consumption tax and are highly economically inefficient in a number of respects:

- They result in B2C sales being undertaxed and B2B sales being overtaxed.
- They give firms an incentive to supply their own inputs (or vertically integrate) rather than buy them, so as to reduce the amount of irrecoverable input VAT they face.
- They create distortions in competition when exempt firms compete with non-exempt firms, or when competing exempt firms in different EU countries face different costs as a consequence of being charged different VAT rates on their inputs.
- 'Partial exemption' – a widespread situation whereby some of a firm's activities are exempt and some are not, leading to a need to allocate inputs between the exempt and the non-exempt activities – causes particular problems, adding to firms' compliance costs in determining correct allocations and creating tax avoidance opportunities (and corresponding anti-avoidance work for governments). The variation across countries in methods for allocating inputs can also have trade-impeding effects by increasing the costs of cross-border sales.

Despite these problems, large areas of economic activity are exempt or (equivalently) outside the scope of VAT. The effective exemption of much of the public sector and of services in the public interest is a clear weakness of the EU VAT regime, with little justification (if such services are seen as socially desirable, they can be supported in less economically damaging ways).

The exemption of financial services is similarly damaging, and financially costly (estimated at around €11bn of forgone VAT revenues for the UK alone). VAT increases their production costs, putting EU financial firms at a competitive disadvantage compared with the financial services sector outside the EU, and has a cascading effect, increasing other domestic and export prices. Input–output calculations for the four biggest EMU countries (France, Germany, Italy and Spain) show that non-recoverable VAT increases the costs of intermediate inputs to the financial services sector by 6.9% on average. Allowing financial services firms to recover the VAT on their inputs would therefore make EU firms more competitive: by cutting the cost of producing financial services, we estimate that it would reduce the price of financial services by 3–5% in the four biggest euro-area countries with consequential price reductions for other sectors

using financial services as inputs. Overall, these four countries would see their terms of international price competitiveness improve by 0.16%. It is beyond the scope of this study to suggest specific reforms, but we note that there are a number of serious and credible proposals for bringing financial services into VAT (or an equivalent tax).

Of the major areas where VAT exemption is applied, the most defensible is the VAT registration threshold applied to small businesses. Despite the disadvantages of exemption, substantial registration thresholds are probably a price worth paying for avoiding disproportionate administrative and compliance costs for small businesses. There may also be a case for applying simplified flat-rate schemes to small businesses; however, the case for some other small business regimes currently in operation seems less compelling. Optional schemes invite traders to see which option is better for them by calculating their liabilities under both scenarios, potentially combining maximum effort (and hence compliance costs) by the trader as they make the calculations and maximum revenue loss for government. Graduated thresholds can easily complicate rather than simplify the system and such a scheme in Finland does not appear to have significantly reduced the barrier to growth caused by VAT registration.

Costs of administration and compliance (Chapter 4)

Evidence on the cost to government of administering VAT is very limited: the only figure we have been able to find is for the UK, at 0.7% of VAT revenue. However, there is broad agreement in the literature that more complex legislation (e.g. many exemptions, rate differences and special schemes) increases costs, as does having onerous procedural requirements (e.g. more frequent returns). Having many small clients also raises costs in relative terms, which is one reason why significant VAT thresholds are a good idea (see above).

The cost to business of complying with VAT obligations has been more extensively studied and documented. Compliance costs are substantial according to most studies, but the range of estimates is wide. Early studies for the UK, Australia and New Zealand reported compliance costs between 2% and 9% of VAT collected; more recent estimates range from a low of 0.3% reported in a study of Denmark, to as high as 8% or even 25% of VAT collected, as shown in studies of Croatia and Slovenia. One problem in drawing broad conclusions is that part of this variation reflects different methodologies used in the studies. However, some cross-country studies do exist and these show that compliance costs vary substantially, with them being particularly high

in the EU's newer members. Compliance with consumption taxes (mainly VAT) takes less time – and is presumably less costly – in countries where:

- VAT is administered by the same tax authority as the corporate income tax;
- online filing and payment are in place;
- VAT returns are required less frequently and require less information and accompanying documentation;
- rule changes are less frequent.

There is a strong consensus in the literature that, because much of the cost of complying with VAT is fixed (i.e. incurred regardless of the level of sales), compliance costs are relatively more burdensome for small businesses. Quantification of this is scarce, but one study of Croatia (admittedly not yet an EU member) found that compliance costs represented 3.9% of turnover for unincorporated businesses but only 1.5% of turnover for firms with more than six employees.

Compliance costs are also particularly high for cross-border trade – though some of the reporting requirements associated with trade would be needed even in the absence of VAT itself. To date, there is little convincing quantification of the compliance costs of doing business across borders, but indirect estimates of their effects on trade are discussed further below (see *The effects of VAT and VAT compliance costs on trade*).

Existing estimates do not give any indication that the compliance costs of VAT are falling over time, though it may be that the effects of e-filing and other initiatives are not yet visible in the data.

VAT fraud and evasion (Chapter 4)

The 'VAT gap' – the gap between actual VAT revenues and what they would have been with full compliance – is big, estimated at an average of 12% of liabilities in 2006. It should be stressed, however, that not all of the VAT gap is due to outright fraud: it also includes non-payment arising from innocent error, legitimate tax avoidance measures or business failure.

The literature suggests that levels of compliance are associated with a number of 'behavioural' or 'institutional' factors that bear on a tax based on voluntary compliance: compliance is higher where the public have greater trust in institutions, corruption is lower, and the courts and legal process work efficiently. There is also evidence that

compliance rates are associated with 'policy' factors, with some evidence that compliance is higher where there are fewer VAT rates and where VAT rates are lower.

While most VAT fraud is domestic, cross-border trade is associated with particular forms of fraud, notably missing trader intra-Community (MTIC) fraud. This arises because of the zero-rating of exports and the break in the VAT audit 'trail' that occurs when the taxing jurisdiction cannot verify transactions before import or after export. Possible strategies for tackling non-compliance in the cross-border context range from increasing cooperation between revenue authorities in enforcement and audit procedures to making more use of 'reverse charging' (whereby buyers rather than sellers are responsible for reporting the tax due) or, more radically, moving away from the zero-rating of exports towards a system such as the 'VIVAT' in which a uniform rate is applied to all B2B transactions.

There is a natural link between tackling non-compliance on the one hand and compliance burdens and administrative costs on the other: governments adopt onerous reporting requirements and enforcement activities largely in order to ensure compliance. We find that countries that impose higher compliance burdens actually tend to have *more* non-compliance. This most likely reflects the fact that countries with large VAT gaps feel the need to take more stringent and burdensome anti-fraud action. We believe more detailed research on the working of particular anti-fraud policies is required.

The extent of differences in VAT rates and administration (Chapter 5)

The extent of diversity in VAT policy and procedures across member states, one driver of compliance costs, can be characterised by calculating 'VAT regime dissimilarity indices'. These are summary indicators that capture, for each pair of EU countries, the bilateral differences across many different aspects of national VAT regimes, including VAT rate structure, implementation regulations and the efficiency of the VAT regime.

One important conclusion from this work is that differences in the rates of VAT applied to different goods and services are a relatively small component of the overall differences in the VAT systems of member states. In one way, this is reassuring: the limits on how rates can vary that are part of the EU VAT Directives may be leading to a degree of harmonisation and simplification. But, market pressures from cross-border shopping may also limit how much VAT rates can differ across countries.

There are, however, many differences across member states in VAT-related administrative procedures. Such intra-EU differences could form a source of trade costs that hamper the development of the internal market and discourage cross-border trade. Out of 30 different administrative and procedural VAT rules included in the index, an average of 11 differ between each EU15 country pair. By contrast, the countries that joined the EU in the major enlargement in 2004 have fewer administrative differences in their VAT regimes than the EU15 countries. A possible reason is that these countries were able to start a VAT system from scratch and have chosen to adapt best-practice procedures from the EU15 countries. A similar assessment and adoption of best practice by older EU members would lead to a significant simplification of rules, reducing cross-border compliance costs and potentially boosting intra-Community trade.

The effects of VAT and VAT compliance costs on trade (Chapters 6 and 7)

National differences in VAT regimes can affect trade in the Single Market by increasing the costs of border-crossing trade flows relative to domestic sales, e.g. through the need to familiarise and comply with different procedures by country. Such costs are likely to bear relatively heavily on small and medium-sized businesses which may only be trading small volumes, creating a real market-entry barrier and anti-SME bias in intra-European trade. They may also distort and complicate firms' decisions of whether to export or set up local subsidiaries, which is likely to be a particular problem for firms that organise complex trade networks in intermediate goods. Finally, VAT regime differences can affect consumers' decisions. Cross-border shopping and distance-selling mean that consumers can take advantage of lower rates of VAT in other countries, especially in border regions. And, more generally, exemptions and variation in VAT rates can affect what consumers buy by changing relative prices differently in different countries.

Whilst we are unable to distinguish between these separate effects in our quantitative analysis, we can and do investigate how trade flows are related both to the dissimilarity indices described above and to VAT compliance costs. Allowing for other factors such as proximity and shared language, we find that higher trade volumes are associated with:

- similarity in administrative procedures and in the VAT rates applied to specific goods and services;
- the destination country imposing fewer VAT regulations beyond those required by EU law;
- the destination country imposing larger compliance burdens in other respects;

- the origin country imposing larger compliance burdens.

We do not find all these results plausible. Remember that we are assessing statistical relationships which need not imply causal relationships. It may be that some characteristic, which we cannot control for, helps to determine both VAT policy and trade patterns independently: e.g. that certain kinds of country are disposed both to adopt certain kinds of policy and to trade with each other.

Using some of the more plausible results of this estimation, we can simulate the effects of changes in VAT policy on trade, GDP and consumption, assuming that the relationships we observe are causal. We find that:

- removing all VAT obligations beyond EU requirements would increase intra-EU trade by 2.6%, GDP by 0.2% and consumption by 0.2%;
- a 10% reduction in the dissimilarity of general VAT obligations would increase intra-EU trade by 3.7%, GDP by 0.4% and consumption by 0.3%;
- a 50% reduction in the dissimilarity of rates for specified goods and services would increase intra-EU trade by 9.8%, GDP by 1.1% and consumption by 0.7%;
- moving to identical VAT rates across countries on specified internationally-traded services would increase intra-EU trade by 6.5%, GDP by 0.7% and consumption by 0.5%.

We believe these are likely to be overestimates since they assume causality is all one way (from VAT to trade patterns). To help give a sense of plausible magnitudes of the effect of VAT compliance costs on trade, we consider two further simulations that do not suffer this problem and that show the effects of eliminating all VAT compliance costs under illustrative assumptions as to their size. These show that:

- if the VAT compliance costs associated with intra-EU trade were equivalent to 1% of firms' sales, eliminating them would increase intra-EU trade by 4.3%, GDP by 0.4% and consumption by 0.3%;
- if VAT compliance costs were 3% of turnover, eliminating them would increase intra-EU trade by 13.3%, GDP by 1.4% and consumption by 1.0%.

It is also possible to assess the impact of compliance costs on the international price competitiveness using a different model. Our analysis is confined to the four largest EMU countries, and finds that complete elimination of compliance costs would reduce the price of tradable goods by 0.9% in France, 0.7% in Germany, 1.3% in Italy and 1.7% in Spain, although this effect may reduce in the long run as exchange rates adjust.

Clearly, VAT policy could potentially have quite significant effects on trade patterns and the wider economy. In principle, harmonising procedures and limiting differences in VAT rates, and more generally reducing compliance costs, therefore look like worthwhile goals.

VAT, external competitiveness and macroeconomic performance (Chapters 7 and 11)

Shifting from personal or corporate income taxes towards greater use of consumption taxes such as VAT can affect competitiveness. Since standard income taxes reduce incentives to save and invest and therefore reduce capital accumulation in the economy, moving to VAT leads to a rise in overall productivity and an improvement in competitiveness even after prices and exchange rates have adjusted. But there is no compelling reason to believe that shifting the tax mix towards VAT should increase the economy's long-run growth rate.

However, in the short run – before prices have time to adjust fully – a shift between different tax bases can have larger and somewhat different effects on trade and economic performance. In this report, we use the *Prometeia* international macroeconomic model to examine the short-run macroeconomic effects of a shift of 1% of GDP towards VAT instead of personal income tax, corporate income tax or employer social security contributions (SSCs). We find that such a shift could have significant short-run effects not only on the EU's terms of trade and trade balance, but also on GDP, consumer prices, employment and the public sector budget balance. Shifts from income tax and SSCs have the most beneficial impacts on GDP and employment, whilst shifts from corporate income tax improve public finances the most. However, over time as prices and exchange rates adjust, we would still expect the predictions of theory – essentially, that greater use of VAT will encourage investment and boost output slightly, but have no *direct* effect on competitiveness – to hold.

Existing simulations based on 'general equilibrium' modelling – including studies undertaken for the European Commission using the QUEST model – support these theoretical predictions. Cross-country studies also provide some evidence that a greater reliance on VAT acts to increase the level of GDP. However, the results of general equilibrium models are sensitive to the particular assumptions made (e.g. how wages are determined). In our own analysis, we are able to replicate the findings of the cross-country studies, but there is good reason to believe that these estimates are biased. Using more robust methodologies, we do not detect an effect of more reliance upon

VAT on the level of GDP, but that may be because our models are too demanding of the limited data available. So while we are unable to find clear evidence that shifting the tax mix towards VAT does increase GDP, nor can we rule it out. The impact of VAT on unemployment is also unclear, and we can find no evidence of an impact on aggregate consumption.

As far as aggregate tax revenues are concerned, in line with similar studies, we find no robust evidence that adopting a VAT is associated with an increase in overall tax revenues. Nor do we find robust evidence that increasing use of VAT leads to an increase in overall tax revenues. Finally, we estimate that a 1 percentage point increase in the standard rate of VAT is typically associated with an increase of only 0.4 percentage points in the amount of VAT actually collected as a proportion of consumption. This is a reminder of the importance of reduced rates, exemptions and non-compliance; but more than that, since 0.4 is somewhat below the average VAT revenue ratio in the EU, it implies that increases in standard rates of VAT tend to be accompanied by falls in the VAT revenue ratio.

How does VAT affect prices? (Chapter 8)

Economic theory predicts that a number of factors should affect the extent to which firms pass on VAT into consumer prices, including the competitiveness of markets and the responsiveness of demand and supply to prices. Pass-through of a VAT change for a specific good is likely to be less than that for a broad-based VAT change, since a change that applies only to a narrow category of goods opens up more possibilities of substitution towards other goods.

All this implies that it should be possible to observe a wide range of price responses to VAT rate changes. Existing empirical work and new case studies included in this report broadly bear this out and find support for the predictions of theory. Estimates of pass-through vary widely (from 0% to 163%), as expected. Pass-through tends to be nearer 100% in more competitive markets and for more broad-based VAT changes. The long-run extent of pass-through seems to be achieved rather quickly – after the first few months there is little sign that prices adjust any further, and in some cases prices may adjust even before a reform is implemented. There is some evidence that short-run pass-through may be higher for tax rises than for tax cuts.

VAT rates and structure (Chapters 9 and 10)

Reduced rates of VAT and, in certain countries, zero rates are pervasive features of the European system of VAT – though the extent to which they are used varies widely between countries. The principal motives for using reduced (and zero) rates are to help poorer households and to change behaviour in ways perceived to be desirable. In both cases, we find that VAT rate differentiation can help to achieve these objectives, but it is usually an inefficient means of doing so.

While VAT rate differentiation can be progressive, other taxes and transfers can target the rich and the poor more directly, achieving more redistribution for a lower cost. Hence, the case for reduced (and zero) rates of VAT on items such as food and domestic energy for redistributive purposes is weak. Similarly, the particular features of VAT mean that it is rarely well targeted for encouraging the use of 'socially beneficial' goods and services. Reduced rates of VAT can only encourage purchases by final consumers, when often business use of the goods in question can be equally beneficial (such as for environmental products); and the encouragement provided is proportional to price, when often the benefit from consumption is no greater for more expensive varieties of the good in question. Specific subsidies may be better targeted.

We find reduced rates of VAT for 'labour-intensive services' more justifiable. Many of these services are substitutes for do-it-yourself (DIY) home production. Taxation in general creates distortions that encourage households to rely more than they otherwise would on such DIY and to buy less from, and work less in, the market economy. Reduced rates of VAT can be used to offset these distortions and can therefore boost productivity and formal economic output. They may also reduce the incentive to evade VAT (by reducing the gain from doing so) in activities that are generally seen as particularly liable to evasion (e.g. paying a painter or plumber in cash with no receipt), although the concurrent evasion of the income tax may be a more important factor.

However, having different VAT rates for different products adds to the complexity of the system. Firms face extra compliance costs (and governments extra administration costs) to ensure that products are correctly categorised; particular problems occur at boundaries between products, where uncertainty and litigation are common results. More zero- and reduced-rated outputs mean a higher chance that deductible VAT on firms' input purchases exceeds the VAT due on their sales, with the resulting refunds a notoriously difficult administrative area. And greater rate differentiation within

countries means greater disparities between countries as well, with implications for distorting trade patterns of the kind already discussed.

Furthermore, reduced rates of VAT distort households' spending patterns and tend to reduce welfare. We estimate the effect of reduced and zero VAT rates on welfare for Belgium, Germany and the UK, putting to one side the issue of the effects of VAT on work and DIY. We find that while removing all zero and reduced rates and using the revenue to reduce the main rate would, on its own, be regressive, the fact that consumption decisions would be less distorted means that governments could, in principle, redistribute the gains of the winners to the losers and still have revenue left over. That is a measure of the economic efficiency loss associated with VAT rate differentiation. We estimate this 'surplus' revenue – the welfare gain – at €0.17bn (or €0.74 per week per household) in Belgium, €5.8bn (or €3.10 per week per household) in Germany and €1.3bn (or €1.07 per week per household) in the UK. While the modelling is not robust enough to justify putting too much emphasis on these exact numbers, the results demonstrate that reduced rates of VAT, taken together, do reduce overall welfare. There are better and less damaging ways to redistribute and to encourage use of socially desirable goods and services, although reduced rates for labour-intensive services and others that can encourage work (e.g. for childcare) do look justifiable despite the costs.

Final thoughts

This summary provides the key findings and assessments of a major evaluation of the existing EU VAT system. Reading it, one may be struck by the number of faults and issues we highlight. We do not want to be relentlessly negative: virtually all taxes have problems, distort firm and consumer behaviour to some extent, and entail costly compliance burdens. The idea of a consumption tax that underlies and is largely embodied in the EU VAT system is a good one: such a tax is efficient, and avoids distorting business decisions and the internal market. However, there are significant shortcomings with the existing system. Exemptions, a proliferation of reduced rates, and significant variation in rules and procedures across countries increase compliance costs for businesses, distort trade and business and consumer choices, and reduce productivity and GDP. Assessing how to address these problems and choosing the most efficient and cost-effective solutions lie beyond the scope of this retrospective evaluation. But it is our view that there is considerable scope for beneficial policy development, and we hope that by providing evidence of the main problems with the existing system, this study can help that process.

2 Introduction: VAT in the European Union (IFS)

This chapter contributes towards answers to the following evaluation questions in the project Terms of Reference:

(4) What are the cost and impacts of the current exemptions for the tax revenue, the businesses and final consumers? What percentage of the member states' total consumption is VAT-exempted?

(5) What are the cost and impacts of the current diversification of the VAT rates, including the reduced VAT rates, on compliance for businesses in particular for cross border transactions and on collection/control costs? What percentage of the member states' total consumption is subject to reduced VAT rates/ standard VAT rate?

Summary

- VAT is a significant source of revenue in all EU member states, accounting for 6.6% of the EU's GDP and 17.3% of all taxes raised across the EU as a whole. It is a central plank of policy at both EU and national levels.
- As a consumption tax, VAT has important economic advantages: in broad terms, it avoids discouraging saving and investment, and it avoids the economic inefficiency associated with taxing inputs to the production process.
- The fractional collection mechanism by which VAT is collected – collecting the tax from traders throughout the supply chain in proportion to the value added at each stage of production – also has significant practical advantages.
- Member states' choice of standard VAT rate and use of zero and reduced rates is somewhat restricted by EU rules. Nevertheless, national governments retain – and use – considerable discretion over their VAT rate structures. Exemptions are very different from zero and reduced rates since (contrary to the basic thrust of VAT) tax paid on inputs to production cannot be reclaimed.
- Owing to the combination of varying use of reduced rates and exemptions and varying degrees of non-compliance, the relationship between the standard rate of VAT and the revenue yield varies widely across countries.

- Taxing goods and services in the country where they are consumed (rather than where they are produced) helps to avoid distorting competition between firms in different countries. However, a number of complications mean that the impact of VAT on the functioning of the internal market might not be as benign as this broad description suggests.

2.1 Introduction

VAT is a central plank of policy at both EU and national levels. All EU member states must operate a VAT as a requirement for membership, and it raises large amounts of revenue in all of them. Uniquely among the major taxes, many of the rules for how VAT works are set out in common at the EU level, now predominantly in Council Directive 2006/112/EC of 28 November 2006 on the Common System of Value Added Tax – sometimes abbreviated to CVSD[7] or RVD[8] and often known simply as 'the VAT Directive'– although some derogations from the common rules are in place for individual member states, and many aspects of policy are left to member states' discretion.

This chapter provides an overview of VAT in the EU. We begin by describing the significance of VAT in revenue terms. The rest of the chapter then describes the basic properties of VAT, moving from the general to the specific. Section 2.3 describes the key economic properties of consumption taxes in general; section 2.4 explains how VAT implements a consumption tax, while section 2.5 discusses rate structures and exemptions before touching briefly on non-compliance. Finally, section 2.6 lays the ground-work for understanding cross-border aspects of VAT. In the course of the chapter, we highlight issues that are examined in depth in the remainder of this report.

2.2 VAT as a source of revenue

VAT is one of the main sources of government revenue in all EU member states. Across the EU as a whole, VAT brought in €783.7 billion of revenue in 2009, 6.6% of the EU's GDP and 17.3% of all taxes raised.

But while VAT exists in all 27 EU member states, it plays a far bigger role in some than in others (see Table 2.1). In 2009, VAT accounted for over 30% of Bulgaria's tax

[7] For 'Common VAT System Directive' (see eg de la Feria, 2009).
[8] For 'Recast VAT Directive' (see eg Terra and Kajus, 2011) – 'recast' because the 2006 directive largely recast material previously contained in the old First and Sixth VAT Directives.

revenue, but less than half that proportion in Italy and Spain; it accounted for more than 10% of GDP in Denmark, with that measure of importance again lowest in Italy and Spain at 5.7% and 4.1% of GDP respectively.

Table 2.1. VAT revenue across the EU, 2009

Country	€ billions	% of total tax revenue	% of GDP
BE	23.6	16.0	7.0
BG	3.2	31.2	9.0
CZ	9.8	20.7	7.1
DK	22.5	21.0	10.1
DE	177.7	18.7	7.4
EE	1.3	25.2	9.1
IE	10.2	22.7	6.4
EL	14.9	21.1	6.4
ES	43.4	13.5	4.1
FR	129.4	16.3	6.8
IT	86.5	13.2	5.7
CY	1.5	26.0	9.1
LV	1.1	22.5	6.0
LT	2.0	25.2	7.4
LU	2.4	16.7	6.2
HU	7.8	21.3	8.4
MT	0.5	22.9	7.8
NL	40.1	18.4	7.0
AT	22.2	18.9	8.1
PL	23.1	23.4	7.4
PT	12.0	23.0	7.1
RO	7.9	24.8	6.7
SI	3.0	22.4	8.4
SK	4.2	23.3	6.7
FI	15.0	20.3	8.8
SE	28.2	20.7	9.7
UK	90.4	16.6	5.8
EU-27 (weighted)	783.7[a]	17.3	6.6
EU-27 (unweighted)		21.0	7.4

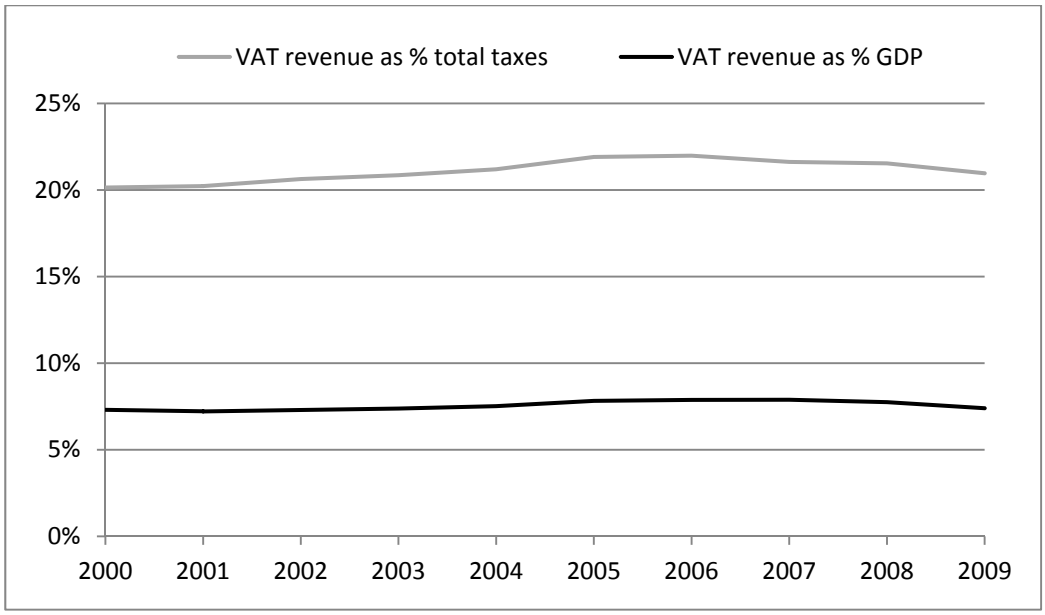
[a] Total VAT revenue across the EU, corresponding to an average of €29.0 billion per country.

Source: European Commission (2011a)

The fact that the arithmetic (unweighted) averages of these figures across the 27 member states are significantly higher than the GDP-weighted averages (equivalent to the percentages for the EU as a whole) indicates that VAT typically plays a greater role in the smaller countries of the EU than in the larger countries.

In absolute (cash) terms, of course, the reverse is true: much more revenue is raised in the larger countries. 62% of the €784 billion of VAT revenue collected across the EU in 2009 was raised in the four largest economies – Germany, France, the UK and Italy – with Germany alone bringing in nearly a quarter of EU-wide VAT receipts.

Figure 2.2. Average VAT revenues across the EU-27 since 2000

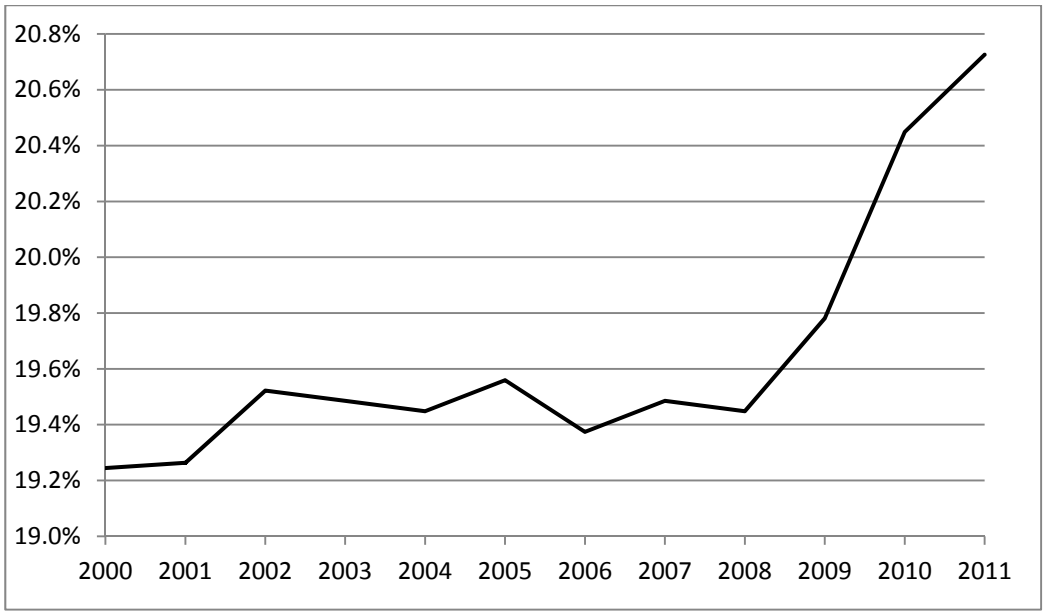


Note: Arithmetic (unweighted) averages.
Source: European Commission (2011a)

Figure 2.2 shows that the average revenue yield of VAT was broadly stable over the course of the 2000s, with only a slight rise in the mid-2000s before falling back again. However, EU-wide revenue data are only available up to 2009. Standard VAT rates – which were also stable up to 2008 – have risen since then in the wake of the recent financial crisis, increasing from an average of 19.4% in 2008 to 20.7% in 2011 (Figure 2.3). 16 of the 27 EU member states now have higher standard VAT rates than they did in 2008. Governments across Europe seem to be looking to VAT to contribute to the fiscal consolidations that have suddenly become a high priority. We hope that this report helps policy-makers and others to understand better the advantages and disadvantages of VAT as a source of revenue. We also hope that it can contribute to

reforms that improve the design of VAT – and the higher rates of VAT become, the more important it is that it be designed well.

Figure 2.3. Average standard VAT rate across the EU-27 since 2000



Source: European Commission (2011a)

2.3 Taxing consumption

VAT is essentially a tax on consumption expenditure. A pure consumption tax has important economic advantages. In particular, while (like other taxes) it discourages work, it avoids two distortions created by other taxes.

First, taxing only final consumption means that no net tax is levied on intermediate inputs (purchases made by firms for their business). This is crucial for preserving *production efficiency*: in other words, for ensuring that there is no unutilised scope for the economy to produce more of one good without having to produce less of others, which would clearly be wasteful.

People's welfare depends on the goods and services they consume. Governments might have reasons for wanting to influence how much of different goods and services people consume; but those goods and services should still be produced as efficiently as

possible. Since the prices of final consumption goods can be influenced directly by adjusting tax rates on the final product, taxes on intermediate inputs cannot be helpful: they may affect the prices of the final consumption goods they are used to produce; but since the prices of consumption goods can be influenced more directly by setting tax rates on different goods and services, using taxes on intermediate inputs is an inefficient tool to use. If, left to themselves, firms would produce goods and services in the cheapest, most efficient way possible, all that taxes on intermediate inputs can achieve is to distort firms' choices of how to produce goods and services away from the most efficient way.[9]

In cases of market failure, firms' private choices of how to produce things might not be efficient, and therefore taxing intermediate inputs might be desirable: for example, environmentally harmful carbon dioxide emissions ought to be discouraged by taxation (or equivalent) whether generated by final consumption or in the production process. Notwithstanding such exceptions (which are often dealt with by separate measures outside the VAT system), the general case for avoiding taxation of intermediate inputs remains a powerful one. The fact that VAT generally does avoid taxation of intermediate inputs – in marked contrast to the 'multi-stage' (or 'cascade') taxes which it replaced in many countries – is therefore a strength. Later in this chapter we will encounter the one area where VAT does tax intermediate inputs: exemptions, considered in depth in the next chapter.

The second major advantage of consumption taxes is that they avoid discouraging *saving and investment*. Only money that I spend is taxed; earnings that I save and invest are not taxed until I come to spend them (and any returns earned in the meantime) later. Most economists regard avoiding discouragement to saving and investment as desirable, though there is considerable debate around this.[10] The fact that VAT does not discourage saving and investment stands in stark contrast to personal and corporate income taxes (and capital gains taxes). Though often with major exceptions, standard income taxes are typically charged on the full income from savings and investments.[11]

[9] Diamond and Mirrlees (1971).

[10] Major recent contributions to this debate include Mirrlees et al (2011), Banks and Diamond (2010) and the associated commentaries by Hall (2010), Kay (2010) and Pestieau (2010), and Auerbach (2009)

[11] Corporate income taxes typically give some allowance for the depreciation of capital assets, but not a full deduction for the cost of capital, which would be the equivalent of what VAT does and is what would be needed to avoid discouraging investment.

Note too that, unlike systems which tax labour earnings but simply exempt investment income (or tax it at a reduced rate), VAT does not provide scope for avoiding tax by converting labour income into capital income – the source of major practical difficulties in direct tax systems across Europe and the world. This is because income from whatever source is taxed equally when it is spent. Thus people who earn exceptional returns to their savings (whether through luck, skill or devices to convert labour income into capital income) do pay more tax on those returns. Disincentives to save are instead avoided by declining to levy tax up-front on earnings that are saved rather than spent, targeting those whose decision whether to save or spend is marginal (and so whose incentives matter) rather than those whose prospect of earning exceptional returns means that they would save in any case.[12]

So far we have discussed the properties of an idealised 'pure' consumption tax from the point of view of economic efficiency. In practice VAT does exhibit these properties to a large degree, but not entirely. And to assess other aspects such as the distributional impact of VAT we must consider its rate structure. To identify more specific properties of VAT we must look at how VAT actually works.

2.4 How VAT works[13]

VAT taxes all sales, whether wholesale or retail, but allows registered traders to deduct the tax charged on their inputs. It is therefore a tax on the *value added* at each stage of the production process. Since the value of the final product is the total of the value added at each stage of production, the tax base—total value added—equals the value of final sales. Consequently, the tax is in effect imposed on the value of the final product but is collected in small chunks from each link in the supply chain. VAT charged on sales to registered traders who sell on an item or use it in production can be reclaimed by the purchaser; only VAT on retail sales cannot be reclaimed. VAT therefore taxes only final consumption and leaves production decisions undistorted.

It is worth illustrating how the system works with a very simple example.[14] Suppose firm A makes a sale to firm B for €100 plus 20% VAT—€120 in total—remitting the

[12] The importance of combining the non-taxation of amounts saved with this taxation of 'excess' returns is emphasised by Mirrlees et al (2011).

[13] Parts of the descriptions in this and the following section draw heavily on work done previously by one of the present authors and published in Mirrlees et al (2011).

[14] The example illustrates the 'invoice-credit' method of implementing a VAT. This is universally used in the EU (and in most of the rest of the world), though there are other ways in which a VAT can be implemented.

VAT to the tax authorities.[15] Firm B uses what it has bought to make products worth €300; €60 VAT is due when these products are sold to firm C, but B can also reclaim the €20 VAT charged on its inputs. And, similarly, C can in turn reclaim the €60 VAT on its input purchases. Firm C, a retailer, sells its products to final consumers—households—for €500 plus €100 VAT.

Table 2.2 illustrates the VAT payments in this simple supply chain from two perspectives which bring out the two key features of VAT. The top panel shows the VAT payments associated with each transaction. When firm A makes a €100 sale to firm B, A charges €20 VAT on the sale, but B can reclaim the same €20, so there is no net revenue raised from the transaction. Similarly, the €60 VAT due on B's sale to C is reclaimed by C. Only sales to final consumers generate a net VAT liability, and the total revenue raised is 20% of the value of this final consumption. No net tax is levied on intermediate inputs; the pattern of activity in the supply chain generating the final product is irrelevant to the tax burden, and so is not distorted.

Table 2.2. A simple supply chain with 20% VAT

	VAT charged on sales	VAT reclaimed on input purchases	Net VAT liability
Analysis of transactions			
Sale from firm A to firm B for €100[a]	€20	€20	€0
Sale from firm B to firm C for €300[a]	€60	€60	€0
Sale from firm C to consumer for €500[a]	€100	€0	€100
Analysis of firms			
Firm A	€20	€0	€20
Firm B	€60	€20	€40
Firm C	€100	€60	€40

[a] Price excluding VAT, which is shown separately in the next column.

The bottom panel of Table 2.2 shows the VAT remitted by each firm. Firm A makes sales of €100 plus VAT with no purchased inputs in our example, so it simply remits

15 VAT is usually expressed in *tax-exclusive* terms: a 20% VAT rate means that liability is 20% of the price excluding VAT (20% of €100 = €20). This is unlike income tax, for example, which is expressed in *tax-inclusive* terms: as a percentage of income including (i.e. without deducting) the tax itself. A 20% tax-exclusive rate is equivalent to a 16.7% tax-inclusive rate (16.7% of €120 = €20).

the €20 VAT on the sale. Firms B and C each add €200 to the value of the goods, and so each has a net liability of 20% of that (€40). B transforms €100-worth of inputs into €300-worth of outputs, so deducts €20 input VAT (20% of €100) from its €60 output VAT (20% of €300), remitting a total of €40. C is liable for €100 output VAT on its €500 sales, less €60 input VAT on its €300 purchases, also remitting €40 in total. Each firm pays 20% tax on the value it adds; in other words, responsibility for remitting the €100 tax on the total value of the final product is divided across the supply chain in proportion to the value added at each stage.

An alternative, which achieves the objective of taxing only final consumption but without dividing liability across the supply chain in this way, would be to make a legal distinction between wholesale and retail sales and tax only the latter. This is the approach of the retail sales tax (RST) which currently operates in most states of the US. This would appear more straightforward, and means that only firms selling to retail customers (firm C in our example) need face the cost of complying with the tax.

The fact that VAT is collected 'fractionally' rather than as an RST is an important administrative feature, but it should not affect the ultimate economic incidence of the tax. It is a basic tenet of the economics of taxation that changing the legal identity of the taxpayer should not change who ultimately bears the burden of a tax, at least in the long run. Prices are determined by supply and demand; if the identity of the taxpayer changes, prices will adjust so that the price paid by the buyer and the price received by the seller remain unchanged. In the example above, if Firm A and Firm B know that the government is going to take €20 of VAT from A and redistribute it to B, the sale will simply take place at a (tax-inclusive) price €20 higher to reflect that. In other words, Firm A charges €100 + VAT regardless of whether the VAT is zero or 20%, thus undoing the redistribution – B pays A the VAT that must be remitted, safe in the knowledge that he can reclaim the VAT from the government. The result will be no different from the case where no VAT is levied until final sale; only the net VAT levied on the final product has any economic (as opposed to administrative) effect.

That does not mean that VAT will necessarily always be passed on in full to consumers: it is possible that firms will hold down consumer prices and that the burden of VAT will therefore be passed on to workers (in lower wages) or shareholders (in lower profits) at some earlier stage in the supply chain. The degree to which VAT is passed through to consumers is the subject of Chapter 8 of this report. But in the long-run the degree of pass-through should be the same for a VAT as for an RST.

While the economic effects of a VAT and an RST are the same, VAT has significant administrative advantages.

First, drawing the distinction between wholesale and retail sales is difficult in practice. An RST requires sellers to establish whether their customers will use their products for business or consumption. But there is little incentive for sellers to draw the distinction correctly, making misclassification and significant loss of revenue possible. In contrast, VAT requires buyers to establish whether they have used their *purchases* for business rather than consumption. Since only registered traders deduct VAT on their purchases, misclassification of purchases as inputs rather than consumption would normally require people to register for VAT and commit outright fraud. Despite taking a less direct approach than the RST to taxing only final consumption, VAT is more likely to be successful in achieving this goal.[16]

More importantly, dividing VAT liability across all links of the supply chain means that any one trader evading VAT escapes with only the tax due on the value added in that part of the supply chain, not the VAT due on the whole value of the product. This lessens the incentive for traders to attempt evasion. Traders' claims for deduction of input VAT also require an output VAT invoice from their supplier, so traders buying inputs have an incentive to ensure that their supplier invoices the VAT in full (if not necessarily remitting it to the authorities). If the supplier does not do so, the input buyer ends up paying both parties' VAT liabilities—which is undesirable for the input buyer, but at least means that the government gets the revenue it is due. The symmetric invoices—each claim for input VAT can be checked against the supplier's recorded output VAT—also provide a useful audit trail for the government.

Only traders making sales above a threshold determined by each member state are obliged to register for VAT.[17] Unregistered traders are for the most part treated like final consumers. This means they are largely ignored for VAT, and spared the hassle of

[16] Distinguishing between business expenditure and consumption expenditure is not always straightforward under a VAT, as for example when a firm buys gym memberships for its employees or when a self-employed person buys a computer for personal as well as business use. These blurred borderlines—unlike the more mundane monitoring problem discussed in the text—create difficulties for VAT and RST equally, and indeed for other taxes too: there are close parallels between these boundary issues and the difficulties in identifying work-related expenses for income tax purposes.

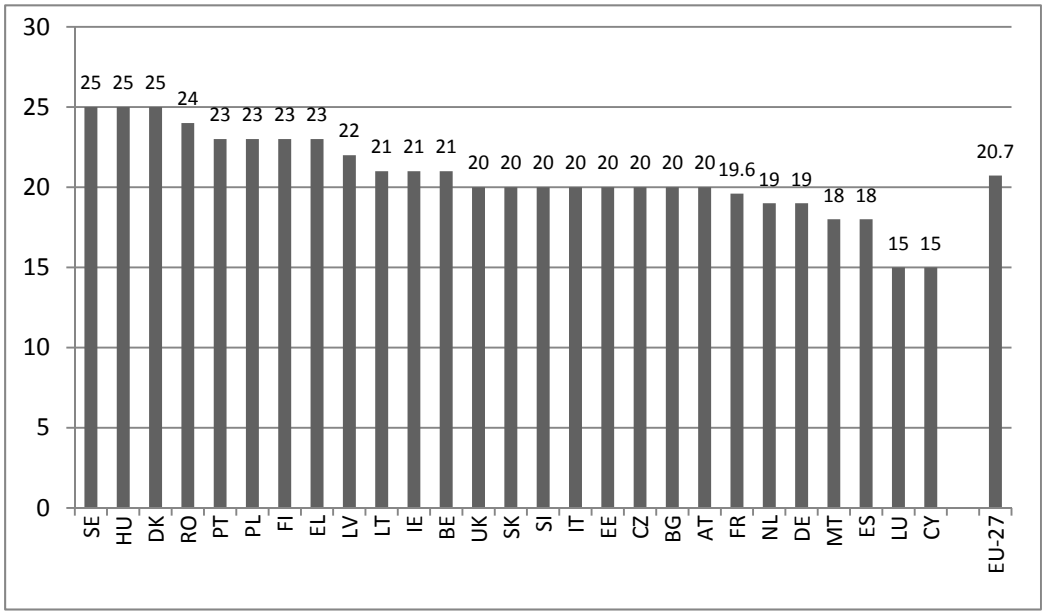
[17] Firms making acquisitions from other countries in excess of the registration threshold must also register; and firms making distance sales to a member state in excess of that country's distance selling threshold (different from the main registration threshold) must also register there. The precise rules about registration, as well as the thresholds themselves, vary between member states.

complying with VAT obligations: no VAT is due on their sales, and they cannot reclaim VAT on their input purchases. This is in effect a form of VAT exemption, and it is to such features of VAT systems that we now turn.

2.5 Standard rates, reduced rates, zero rates and exemptions

EU law requires all EU member states to apply a standard rate of at least 15%.[18] In fact, only two member states – Luxembourg and Cyprus – currently have a standard rate that low. The average standard rate is currently 20.7%, with three countries – Denmark, Hungary and Slovenia – applying a standard rate of 25% (see Figure 2.4).

Figure 2.4. Standard VAT rates across the EU, 1 July 2011 (%)



Source:
http://ec.europa.eu/taxation_customs/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.pdf.

In practice, many goods and services are not subject to VAT at the standard rate. Some are subject to reduced rates, some are zero-rated, and some are exempt.

[18] This 15% minimum is currently due to expire on 31 December 2015. The VAT Directive mandated a 15% minimum standard rate up to 31 December 2010; Article 97 of the Directive was amended by Council Directive 2010/88/EU of 7 December 2010 to extend this provision to 31 December 2015.

Member states may apply one or two reduced rates of not less than 5% to goods and services listed in Annex III of the VAT Directive.[19] The list of goods and services to which reduced rates may be applied has in fact become longer over time as certain labour-intensive services (and other similar locally supplied services) have been included.[20] Member states may also apply reduced rates to electricity and natural gas, to imports of works of art, collectors' items and antiques, and to plants and similar items.[21] Under the provisions of the VAT Directive, services supplied electronically may not, however, be taxed at reduced rates.

In addition to these provisions for all member states, a number of provisions allow a subset of member states to maintain reduced rates on a 'transitional' basis pending the adoption (which shows no sign of happening) of a 'definitive' VAT regime. Member states may apply a reduced rate to items not listed in Annex III of the VAT Directive if they were doing so at 1 January 1991, though this reduced rate must be at least 12% (a 'parking rate') unless the rate that applied at 1 January 1991 was below 5% (a 'super-reduced' rate) or zero.[22] Where member states were applying a super-reduced or zero rate to certain goods (whether or not listed in Annex III) on 1 January 1991, they may continue to do so provided that these concessions were legal and "adopted for clearly defined social reasons and for the benefit of the final consumer".[23] Member states may also apply super-reduced (though not zero) rates to items listed in Annex III if they had to increase their standard rate of VAT by more than 2 percentage points (from its 1 January 1991 level) on 1 January 1993, when the 15% minimum standard rate was introduced.[24] Finally, a number of very specific provisions apply to particular goods and

[19] Articles 98 and 99 of the VAT Directive. The goods and services covered by Annex III are set out in section 10.2 of this report.

[20] Permission to apply reduced rates to labour-intensive services was originally introduced in 1999 (Directive 1999/85/EC) on an experimental basis for a maximum of three years from 1 January 2000 to 31 December 2002, then extended to 2010 (Directive 2006/18/EC). Finally, in 2009 Directive 2009/45/EC made the provision permanent and integrated the list of relevant services into the Annex III list.

[21] Articles 102, 103 and 122 of the VAT Directive.

[22] Articles 113 and 118 of the VAT Directive.

[23] Article 110 of the VAT Directive.

[24] Article 114 of the VAT Directive. Those member states may also apply super-reduced (though not zero) rates to children's clothing and footwear and to housing (Article 114); and member states that applied reduced rates to those goods at 1 January 1991 may continue to do so (Article 115).

services and/or particular places, ranging from bridge tolls in the Lisbon area to food and pharmaceuticals in Malta.[25]

Taken together, these provisions do represent real restrictions on member states' ability to apply zero and reduced rates, and particularly to introduce new ones. Nevertheless, the boundaries they provide leave considerable scope for using reduced rates, and some more limited scope for the retention of zero rates in certain member states. And within the set boundaries, national governments can choose which of the permitted items to apply reduced rates to and at what rates, and have discretion in interpreting which specific goods and services are deemed to fall into the categories listed in Annex III. As a result, the use of zero and reduced rates varies greatly across the EU. Table 2.3 shows the rates used in each member state, though this is of limited value without also knowing which rates apply to which goods and services, which cannot be summarised so briefly.[26]

Figure 2.5 shows what shares of the total tax base were subject to different rates in 2000 (sadly, the most recent internationally comparable data we could find). Overall, two-thirds of the then EU-15 countries' tax base was standard-rated; one quarter was subject to reduced rates, 9% to super-reduced rates and 6% to zero rates. Denmark's standard rate covered, and still covers, almost all taxable (including zero-rated) expenditure – indeed, it is the only EU country to have no reduced rate at all, though even there a zero rate applies to newspapers. At the other extreme, the standard rate covered less than half of the tax base in Spain and Luxembourg. Only in the UK and Ireland were significant proportions (19% and 12% respectively) of the tax base subject to zero rates.[27]

Consequences of the use of zero and reduced rates are discussed in several parts of this report. Chapter 6 estimates their effect on trade patterns – and hence GDP and consumption – particularly via their implications for the compliance costs of doing business in different member states. Chapter 9 estimates their distributional effects and

[25] Articles 105 and 111(c) respectively of the VAT Directive. However, some other very specific provisions were temporary arrangements for the new accession countries and have now expired.

[26] A summary of which rates currently apply to different goods and services across the EU is available at http://ec.europa.eu/taxation_customs/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.pdf.

[27] Note that VAT-exempt spending does not count as part of the tax base and is therefore not included in Figure 2.5.

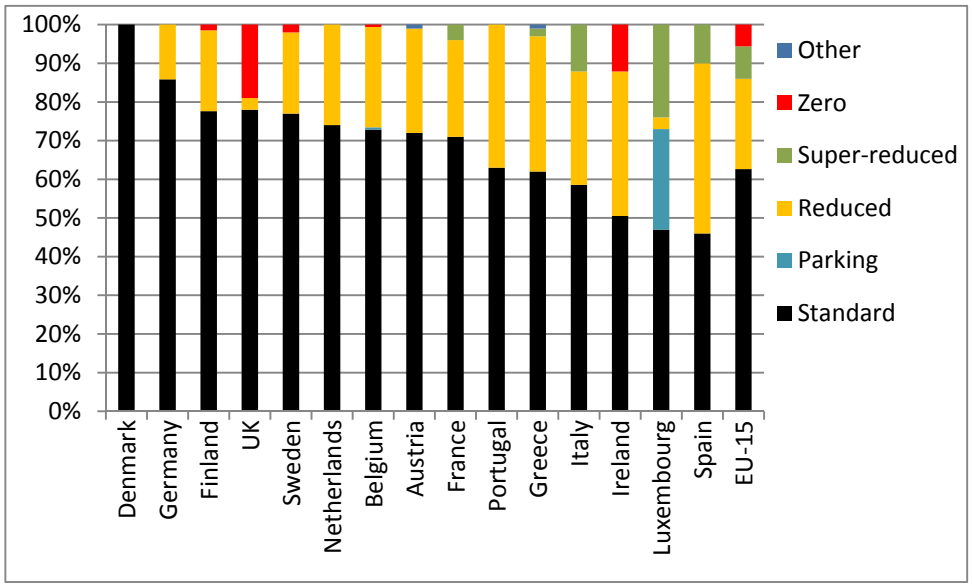
their impact on households' spending patterns and welfare. Chapter 10 assesses their advantages and disadvantages as tools for achieving different objectives.

Table 2.3. VAT rates in place across the EU, 1 July 2011

Country	Zero rate in place?	Super-reduced rate	Reduced rate	Parking rate	Standard rate
BE	Yes	-	6/12	12	21
BG	No	-	9	-	20
CZ	No	-	10	-	20
DK	Yes	-	-	-	25
DE	No	-	7	-	19
EE	No	-	9	-	20
EL	No	-	6.5/13	-	23
ES	No	4	8	-	18
FR	No	2.1	5.5	-	19.6
IE	Yes	4.8	9/13.5	13.5	21
IT	Yes	4	10	-	20
CY	No	-	5/8	-	15
LV	No	-	12	-	22
LT	No	-	5/9	-	21
LU	No	3	6/12	12	15
HU	No	-	5/18	-	25
MT	Yes	-	5/7	-	18
NL	No	-	6	-	19
AT	No	-	10	12	20
PL	No	-	5/8	-	23
PT	No	-	6/13	13	23
RO	No	5	5/9	-	24
SI	No	-	8.5	-	20
SK	No	-	10	-	20
FI	Yes	-	9/13	-	23
SE	Yes	-	6/12	-	25
UK	Yes	-	5	-	20

Source:
http://ec.europa.eu/taxation_customs/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.pdf.

Figure 2.5. Shares of tax base subject to different rates, 2000



Notes: 'Other' category is mainly flat rate schemes for farmers. Reduced and parking rates in Ireland (both 12.5%) not identified separately. Zero-rated share for the UK likely underestimated because traders only engaged in zero-rated activities in the UK are not obliged to register for VAT.
Source: Mathis (2004).

VAT exemption is rather different from zero- and reduced-rating. The distinction between zero-rating and exemption is that zero-rating allows registered traders to reclaim the VAT on any inputs used in the production process.[28] As a consequence, there is no component of taxation in the final price of a product that is zero-rated. In contrast, goods and services that are exempt are not subject to VAT when sold, but the producer of an exempt product cannot reclaim the VAT paid on purchases of inputs. The VAT on inputs means that the sale price does include a component of taxation, so is higher than it would be with zero-rating. If a good or service is zero-rated, then it is subject to VAT, but the VAT rate is 0%. If it is exempt, then its production is in effect ignored completely for VAT, with no VAT charged on sales or credited on inputs.

[28] Indeed, zero-rating is formally referred to as "exemption with deductibility of VAT paid at the preceding stage", though zero-rating is the term in common parlance.

To illustrate the distinction, let us return to the example in Table 2.2. If we now suppose that firm C's output is zero rated, it need not add €100 VAT to the €500 price of its sales, but it can still reclaim the €60 VAT charged on its purchase from firm B. Thus C in effect reclaims the VAT remitted further up the supply chain (€20 by A and €40 by B) and charges no VAT on its own sales. Production in this case is entirely VAT free and the consumer pays a price unaffected by VAT.

Exemption is different. It means that sales are not subject to VAT but, in contrast to zero-rating, the firm cannot reclaim the VAT paid on its inputs. If firm C is selling VAT-exempt goods, it would charge no VAT on its sales but would not be able to reclaim the €60 VAT paid on the inputs it purchased from firm B. Although C's outputs no longer bear VAT, its production costs are now €60 higher, perhaps passed on in a higher price to the consumer. With a final product worth €500, this €60 irrecoverable input VAT represents an effective tax rate of 12%. It should be clear, then, that the effective rate of VAT on the final product depends on the proportion of total value that is added before the exempt link in the supply chain.[29] The effective VAT rate will normally be below the standard rate, but by differing amounts depending on the structure of the supply chain.

Although exempt goods and services bear less than the full rate of VAT, exemption is very different from a reduced rate of VAT. For one thing, exemption is not always more generous than taxation. Where exempt goods and services are sold directly to final consumers, this lower effective rate of VAT is payable *instead of* the standard VAT rate on those sales. But where exempt products are sold to other VAT-registered businesses, the irrecoverable input VAT comes *on top of* the VAT that will be charged on sales to final consumers by businesses further down the supply chain.

If, in our example, it were firm B's output that was exempt from VAT, the €20 VAT on A's sale to B would now be irrecoverable. Crucially, the fact that €60 VAT would no longer be levied on B's sale to C is irrelevant since C could have recovered it anyway; and C's sale to final consumers would be subject to VAT. So the overall VAT payable on this chain of production would be increased by the €20 irrecoverable input VAT;

[29] Specifically, the effective rate of VAT as a fraction of the full rate is equal to the share of value added before the exempt link. In our example, the goods are worth €300 by the time C acquires them, and the final product is worth €500, so the effective VAT rate is 60% (300 ÷ 500) of the full 20% rate, or 12%.

coming on top of the €100 already due on C's sale to final consumers, this means that the final product bears *more than* the full VAT rate.[30]

Whether exemption is more or less generous than applying the standard rate thus depends on whether the exempt products are sold to final consumers—in which case the lack of output VAT outweighs the irrecoverable input VAT—or to other businesses—in which case any output VAT would have been recoverable anyway, so the irrecoverable input VAT is a pure extra cost.

Articles 131 to 137 of the VAT Directive provide for exemption from VAT for a number of activities in the public interest (such as medical care and education) and for other reasons (such as the technical difficulty of taxing financial services). In addition to this, exemption applies *de facto* to activities which fall outside the scope of VAT, of which two examples are particularly noteworthy. First, much of the public sector is outside the scope of VAT because its activities are not considered to be 'business'. And second, member states may choose to allow (or compel) traders whose turnover is below some threshold not to register for VAT; unregistered traders are not considered to be 'taxable persons' and neither charge VAT on their sales nor reclaim it on their inputs: in effect, they are exempt. Exemptions are widely considered to be one of the most problematic features of VAT in the EU. We consider them in depth in the next chapter, and they recur in our analysis of intra-EU trade in Chapter 6 and EU firms' external competitiveness in Chapter 7.

We have been unable to find estimates of what proportion of total consumption is VAT-exempt (or equivalent) – indeed, given the nature of some of the major categories of exemption (e.g. unregistered traders), the data requirements for producing such estimates would be daunting.

One measure of the overall extent of deviations from uniformity is the VAT Revenue Ratio (VRR), the ratio of actual VAT revenues to the VAT that would have been raised if either (a) all consumption or (b) all consumption by households (as opposed to government) were successfully taxed at the standard VAT rate. Table 2.4 shows

[30] In this case, the share of value that is added before the exempt link in the supply chain is 20% (the €100 value of B's inputs is 20% of the €500 value of the final product), so the effective tax rate generated by the irrecoverable input VAT is 20% of the standard 20% rate, 4%. Coming on top of the standard 20% VAT charged on the sale to final consumers, this makes a total effective VAT rate of 24% on the €500 pre-tax price of the final product: €100 output VAT and €20 irrecoverable input VAT making €120 in total.

estimates of the VRR on both these measures in 2008. [31] The (unweighted) average VRR is 58.1% as a fraction of total consumption or 85.4% as a fraction of household-sector consumption. This implies that a 1 point increase in the standard rate is associated with an increase in the share of VAT revenues in total consumption and household sector consumption of 0.58 and 0.85 percentage points, respectively. However, it is the degree of variation across countries that is striking, with the lowest VRRs in the EU (found in Italy and Greece, on both measures) being less than half of the highest (Cyprus and Luxembourg). The VRRs are slightly smaller in countries that apply a higher standard rate (see the small correlations in Table 11.3, later in the report).

[31] The VRR is defined as $RV/[(C - RV)t]$, where RV denotes the actual VAT revenue collected. In the tax base of the first measure, C denotes total final consumption expenditures. In the second measure, C is restricted to final consumption expenditures by households. The standard VAT rate is denoted by t. Data on RV and C are taken from OECD Revenue Statistics and National Accounts. Data for non-OECD members are supplemented from Eurostat. Standard VAT rates t come from European Commission (2011b) and OECD (2011). The EU figure is an unweighted average among countries.

Table 2.4. VAT revenue ratios and VAT gaps across the EU

Country[a]	VRR for total consumption, 2008	VRR for household consumption, 2008	VAT gap, 2006
Austria	61.2%	89.4%	14%
Belgium	48.7%	75.7%	11%
Bulgaria	76.9%	100.6%	—[b]
Cyprus	100.2%	133.8%	—[a]
Czech Republic	58.9%	88.8%	18%
Denmark	61.9%	107.3%	4%
Estonia	—[a]	—[a]	8%
Finland	58.0%	93.1%	5%
France	48.8%	73.4%	7%
Germany	55.0%	77.3%	10%
Greece	44.4%	58.0%	30%
Hungary	56.8%	86.0%	23%
Ireland	54.3%	81.8%	2%
Italy	40.7%	56.5%	22%
Latvia	48.9%	66.9%	22%
Lithuania	57.9%	77.6%	22%
Luxembourg	93.0%	153.9%	1%
Malta	57.3%	81.1%	11%
Netherlands	59.9%	102.2%	3%
Poland	49.5%	67.6%	7%
Portugal	52.1%	72.6%	4%
Romania	56.3%	74.5%	—[b]
Slovak Republic	53.5%	73.7%	28%
Slovenia	67.6%	96.7%	4%
Spain	45.2%	63.2%	2%
Sweden	58.3%	102.6%	3%
United Kingdom	46.3%	66.5%	17%
EU average	58.1%[c]	85.4%[c]	12%[d]

[a] Data not available.
[b] Not EU members at the time.
[c] Unweighted average among countries for which data available
[d] Weighted average among countries for which data available
Sources: VRRs: calculations by CPB Netherlands – see section 11.6 for original data sources. VAT gaps: Reckon LLP (2009).

Importantly, though, the VRR not only reflects the effects of zero rates, reduced rates and exemptions; it also captures the extent to which VAT revenues fall short of their theoretical ideal because of non-compliance: outright fraud, greyer areas such as failure

to take due care, or innocent error.[32] While most evasion is domestic and consists of simple expedients such as underreporting sales on one's VAT return, it has risen up the agenda at an EU level because of the growth in the phenomenon of missing trader intra-Community (MTIC) fraud following the abolition of the EU's internal frontiers. To focus in on non-compliance, Table 2.4 also shows estimates of the 'VAT gap' – the gap between actual VAT revenues and what they would have been with full compliance – for 2006. Again the degree of variation is striking – estimated VAT gaps range from 1% in Luxembourg and 2% in Ireland to 28% in the Slovak Republic and 30% in Greece – and there is a strong correlation between those countries with a high VAT gap and those countries with a low VRR.[33]

While the average VAT gap showed little trend between 2000 and 2006, the average VRR increased slightly during the same period, suggesting that VAT bases were broadened somewhat.[34] VAT fraud and VAT gaps are discussed further in Chapter 4, while VRRs feature in the analysis of Chapter 11.

2.6 International trade and compliance costs

VAT is generally levied on a 'destination basis' – that is, goods traded across borders are taxed in the country where they are consumed (the destination country) rather than where they are produced (the origin country), and at the destination country's tax rate. This is consistent with VAT being conceived of as a tax on consumption, rather than on production. It also helps to ensure that households and firms face the same tax rate on their purchases regardless of where they buy the goods, and therefore avoids inefficiently distorting competition between producers in different countries and resulting production patterns (although it can lead to an inefficient pattern of *consumption* across countries).

In practice, things do not work quite so smoothly, for several reasons.

- First, not all goods and services are taxed on a destination basis, especially those sold directly to final consumers.

[32] Bad debts can also reduce the VRR. Note that the irrecoverable input VAT entailed by exemption acts to increase the VRR.

[33] Among those countries for which estimates of both VRRs and the VAT gap are available, the correlation coefficient between the VAT gap and the VRR for total consumption is -0.40, and that between the VAT gap and the VRR for household consumption is -0.51.

[34] Data not shown, but sources as for Table 2.4. The comparison of trends over time is somewhat complicated by the fact we are comparing a weighted average with an unweighted average.

- Second, where the items traded are VAT-exempt, the amount of irrecoverable input VAT embedded in the price will depend on the country of origin.
  Third, even where neutrality is theoretically achieved, in practice the burden of complying with VAT obligations is higher when trading across borders than when trading domestically, so firms are not quite competing on a level playing field and trade is impeded. This is a particular issue for small firms, which face much bigger compliance costs relative to their size.
- Fourth, the main mechanism for implementing destination-based taxation – zero-rating exports and taxing imports – involves breaking the 'VAT chain': the fractional collection of VAT through the supply chain, the advantages of which were described above.

These issues are analysed in Chapter 3. Chapter 4 then discusses the issues of compliance costs and of breaking the VAT chain in more detail; Chapters 5 to 7 undertake new quantitative analysis of how features of the VAT system affect intra-EU trade and EU firms' competitiveness vis à vis the rest of the world.

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3 VAT, production efficiency and the internal market (IFS[35])

This chapter contributes towards answers to the following evaluation questions in the project Terms of Reference:

(1) To what extent does the current VAT arrangements for cross border supplies of goods and services maximise the potential of a genuine EU single market for businesses and customers (for both businesses and private individuals)? What is the range of GDP loss that could be attributed to the special rules, obligations and risks associated to EU trade? What are the related administrative burdens and collection costs? What are the main reasons for any infringements and/or fraudulent activity and their extent at EU level?

(3) What are the cost and impacts[36] (positive, negative, intended, unintended) of the current restrictions applied to the right to deduct VAT including through the determination of the deductible proportion (businesses carrying on exempt and taxed activities, linked to question 4) for the tax revenue (estimates of the additional tax revenue for member states), the businesses (estimates of the VAT actually borne) and the customers? Is non-deductible VAT on business inputs the most appropriate/efficient way of taxing such businesses?

(4) What are the cost and impacts of the current exemptions for the tax revenue, the businesses and final consumers?

(7) To what extent does the current VAT framework for small businesses help to create the right conditions for them to grow and prosper in the single market? To what extent and how do the different cost factors of the VAT (i.e. compliance costs and other effects of the VAT regime) impact them?

[35] With additional contributions – particularly the Finnish case study at the end of Section 3.4 – from ETLA. Parts of this chapter draw heavily on material previously written by two of the present authors and published elsewhere: specifically, in Crawford, Keen and Smith (2010), Mirrlees et al. (2011) and Smith (1996).

[36] For example, impacts on (distortion of) competition, consumption patterns (distortion and/or deflection of trade), etc;

(8) To what extent does the current VAT acquis applied on services provided internationally guarantee adequate taxation (no double taxation or tax avoidance)?

(10) To what extent do the current derogations, exemptions and options continue to be relevant as compared with the needs they aim to satisfy? Do the benefits they bring validate the cost?

It addresses the following specific elements mentioned:

(A) The evaluation should provide estimates of the total volume and value of domestic and cross-border (intra-EU and extra-EU) transactions carried out by pan-European enterprises and estimates of the administrative burden and compliance cost as a percentage of the total administrative burden and in euros. It should also enlighten estimates of differences in price-setting mechanisms between pan-European (linked) companies and businesses that are independent from each other, with a view of potential differences in VAT revenues collected.

(B) Analysis of the aspects of non-distortion of competition in the EU, including in cross-border relations. In particular, the evaluation should analyse in detail the impact of the VAT system and of the unequal treatment of intra-EU supplies as compared to domestic supplies on the internal market, e.g. if and to what extent it leads to a change in consumer choice, higher or lower prices, the creation of barriers for new suppliers and service providers, the facilitation of anti-competitive behaviour or emergence of monopolies, market segmentation, etc. It should also look at the impact it has on trade barriers and if it provokes relocation of economic activities.

(C) The analysis set out in point (B) above should cover both B2B and B2C transactions, and notably the specific regimes (distance selling, supplies of new means of transport, intra-Community acquisitions by non-taxable legal persons or taxable persons without a right of deduction) which have been introduced in 1993 in order to avoid distortions of competition

resulting from the differences in VAT rates.

Summary

- There is a tension between the fundamental principles of *neutrality* – that similar activities should be taxed similarly so as to minimise inefficient distortions to behaviour – and *subsidiarity* – that decisions should be decentralised to the lowest possible administrative level. Given that different countries choose to apply different VAT rates, achieving neutrality in cross-border trade can be difficult.

- The tax regime for business-to-business (B2B) trade in goods – and since 1 January 2010 for most services as well – achieves neutrality towards production decisions by application of the *destination principle*, under which tax is levied at the rate applicable in the customer's country, regardless of the origin of the goods. However, in the absence of physical border controls, the implementation of the destination principle by zero-rating cross-border sales and requiring purchasers to account for VAT on their acquisitions instead breaks the VAT 'chain' (by which VAT is collected in fractions from traders in proportion to the value added at each stage in the supply chain), increasing the risk of non-compliance as discussed in the next chapter.

- Business-to-consumer (B2C) trade is smaller in magnitude, but poses greater challenges for achieving neutrality because the destination principle is more difficult to implement. In some cases – notably cross-border shopping and those B2C services which are taxed according to the seller's location – consumers' ability to choose between suppliers charging different VAT rates can potentially give rise to economically inefficient outcomes, though it is not clear that this problem is severe in practice. In other cases – notably distance selling – the principal problem is the need for sellers to register for VAT in all member states to which they make sales above the distance-selling threshold (either EUR 35 000 or EUR 100 000) of the member state concerned, which creates a burden for those selling across borders which is not shared by those trading purely domestically.

- VAT exemptions violate neutrality in a fundamental way, creating numerous distortions – including distortions to competition between exempt firms in different member states – and are anathema to the logic of VAT as a consumption tax. The

wholesale exemption (or equivalent) of financial services and of large swathes of public services and the public sector seem likely to be extremely damaging, though quantifying the harm done is difficult.

- Substantial VAT registration thresholds, despite entailing the disadvantages of exemption for unregistered firms, are probably a price worth paying for avoiding disproportionate administrative and compliance costs for small businesses. However, the case for some other small business regimes in operation, such as graduated thresholds and optional flat-rate schemes, seems less compelling. The high compliance costs of trading across borders relative to trading domestically – particularly acute for small firms – is another impediment to the efficient functioning of the internal market, the effects of which we attempt to quantify in later chapters.

3.1 Introduction

Consumption taxes in principle have many desirable economic properties, as discussed in Chapter 2. VAT as currently applied in EU member states exhibits these properties to a large degree, yet it has features which affect business decisions in a way that distorts the pattern of production and inefficiently hampers the effective functioning of the internal market.

Some distortions to patterns of economic activity arise specifically from the tax treatment of cross-border transactions: from the destination principle as applied in practice with exceptions and special regimes. That is the subject of section 3.2.

Imperfections in the operation of the internal market do not only arise from the treatment of trade specifically, however. Some features of existing VAT regimes that apply more generally can nevertheless cause particular problems in the context of transactions between member states. Of particular concern in this are exemptions, limitations to the scope of VAT and other limitations on the right to deduct input VAT. In section 3.2 we discuss the problems that irrecoverable input VAT cause even in a purely domestic context; but the same problems also impede the effective functioning of the internal market.

VAT registration thresholds are, of course, one form of exemption. But the regimes applied to small firms raise other concerns as well. We will consider how effective VAT thresholds and other special regimes applied to small businesses (eg flat rate

schemes and graduated thresholds) are likely to be at limiting VAT compliance costs. We will also consider the disincentive for firms to grow above the threshold. For small businesses in particular, unequal costs of making intra-EU supplies as compared to domestic supplies are an important barrier to the effective operation of the internal market created. These unequal costs can arise from the operation of mechanisms for taxing trade specifically – through zero-rating exports and taxing imports[37] or through reverse charging, for example – or they can arise simply from having to comply with more than one member state's VAT regime when operating in more than one country. All those issues which apply only, or especially, to small businesses are addressed in Section 3.3.

Quantitative evidence on the importance of these barriers to the functioning of the internal market is scarce. The literature review in Chapter 4 confirms that most existing studies are not focussed on the questions we are addressing here (differentiating compliance costs between domestic and intra-EU transactions, for example): the kind of detailed data that would be required simply do not exist. However, the new quantitative analysis by CPB in Chapter 5 is explicitly tailored towards providing indicators that can assist in an assessment of how far compliance costs are an obstacle to the functioning of the single market, and Chapter 6 explores what can be learned from this.

3.2 Taxation of intra-EU trade

The openness of member states' national markets within the EU single market means that the VAT systems of EU member states have to cope with a high proportion of transactions which cross internal frontiers, as well as imports and exports beyond the EU area (Table 3.1).

This is particularly true of sales of manufactured goods, where almost 40% of output is exported[38]. As Table 3.1 shows, about 70% of these exports are to other member states (intra-EU25 trade, as it was in the data at that time), and the remainder outside the EU. By contrast, a relatively small proportion of services output is exported – less than 6%.

[37] Throughout this report we follow common parlance in using 'exports' and 'imports' to refer to any cross-border supply, although in EU law these terms strictly refer only to transactions with parties outside the EU, while intra-EU transactions are referred to as 'dispatches' (or 'removals') and 'acquisitions' respectively.

[38] Data on industrial output and on trade transactions are normally derived from different sources, which are not directly comparable. This comparison of trade volumes with output for both goods and services is drawn from page 9 of the special Eurostat report, published in 2007: *European Union international trade in services, Analytical Aspects, data 1997-2005*.

As Table 3.1 shows, intra-EU trade constitutes a smaller proportion of total services exports (57%) than of exports of manufactured goods.

Table 3.1 Cross-border transactions in the EU single market, 2005

bn EUR

	Intra-EU25 trade	**Extra-EU25 trade**
All goods (SITC 0-9)		
Exports	2164	1072
Imports	2092	1184
Manufactured goods (SITC 5-8)		
Exports	1751	921
Imports	1674	774
Services		
Exports (credits)	536	406
Imports (debits)	521	349

Note: Export and import figures for intra-EU25 trade differ due to factors relating to definition, reporting, timing and statistical coverage.
Source: Eurostat trade statistics

Significant changes to the economic environment in recent years have brought international tax issues ever more to the fore. For EU member states, the most important of these was the completion of the single European market in January 1993, which directly affected the operation of the VAT system. The completion of the single market also contributed to the wider impact of globalisation in increasing trade. Particularly marked have been the very large increase in cross-border trade in services and the birth and rapid expansion of e-commerce, both more difficult to tax than traditional trade in physical goods.

While there were frontier controls, the VAT policies of member states were, to a very large extent, their own concern. Differences in VAT rates had no impact on the competitive position of national firms, since national VAT was refunded when goods were exported, and they had little impact on individual purchasing in other member states, since the travellers' allowances for tax-paid goods were small. Within the constraints governing the coherence of the overall system provided at the time by the VAT Sixth Directive and other EU law, member states could set VAT rates, and administer and enforce the tax, largely independently of what was happening elsewhere in the EU.

With the abolition of frontier controls, the insulation of domestic VAT policy ended, and member states' VAT policies affect the interests of other member states in two respects. First, with free movement of goods by individuals, there is now more scope for individual cross-border shopping, to take advantage of rate differences between member states. Second, without border controls, member states have lost one control instrument. Effective enforcement requires more cooperation than when border controls were available as a control option.

There is a tradeoff of some considerable importance between the objectives of ‘subsidiarity’ and ‘neutrality’ in the design of the EU's VAT system.

Subsidiarity is the principle that decisions should be decentralised to the lowest possible administrative level (member states or even sub-national administrations rather than the EU). Other things being equal, it would be desirable not to constrain more than necessary member states' powers to choose VAT rates. In the case of the harmonisation of indirect taxes, however, considerations relating to the internal market provide an important qualification to the general principle of subsidiarity governing the division of powers between the EU and lower levels of government. Article 113 of the Treaty on the Functioning of the European Union provides that indirect tax legislation is to be harmonised where this is needed to ensure the establishment and functioning of the internal market and to avoid distortion of competition.

It is, in general, a good objective for taxation that it should not induce changes in taxpayer behaviour solely for tax reasons. This objective has been reflected in the concept of ‘neutrality’ – taxing similar activities similarly – which has proved a powerful organising concept in the economic assessment of tax reform (Kay and King, 1990; Leape, 1990; OECD, 2011; Mirrlees et al., 2011). It clearly relates closely to the more fundamental notion of economic efficiency: where differentials in tax treatment induce large changes in private sector behaviour, this is likely to be an indication that the system involves correspondingly large ‘distortionary’ or ‘deadweight’ costs of raising revenues. Other things (such as considerations of equity and administrative cost) being equal, a good tax system will tend to be one which raises the required revenues whilst imposing the least disturbance on private sector decisions and behaviour. And in general neutral systems will also tend to fare well in terms of equity (since, almost by definition, it avoids arbitrary differentials in the treatment of similar activities) and administrative costs (since defining and policing indistinct boundaries is one of the most costly aspects of tax administration).

One area in which neutrality is important is in relation to location decisions and the pattern of competition between businesses in different member states. It has been a fundamental principle of the EU's internal market policies that competition between businesses in different member states should reflect their underlying efficiency and natural advantages; it should not be influenced by government policies, whether in the form of tariffs, non-tariff barriers, subsidy, or discriminatory taxation. The concept of the "level playing field", which has been a regular theme in discussion of internal market policy, has its economic justification not as a matter of sporting fairness, but a statement of the conditions required for neutral taxation, and neutral, non-distortionary, policies more generally.

So what impact do differences in VAT rates between member states – characteristic of the principle of subsidiarity – have on the neutrality of the VAT system in terms of its impact on the market for goods and services? It is worth considering goods and services separately, and also the effect on purchases by registered businesses and by consumers separately. Although border controls within the EU were abolished to facilitate free movement of goods and services and create a level playing field between firms operating across member states, their abolition nevertheless created new challenges both for B2B and B2C trade.

Trade in goods

B2B trade in goods

As far as business purchasing decisions are concerned, neutrality has, to date, been assured by the operation of a VAT system consistent with the destination principle.[39]

[39]The terms "destination" and "origin" principle are being defined here in terms of the conventional usage in the economics literature on sales taxation. As Messere (1994) pointed out, three aspects of the tax treatment of an international transaction are potentially of interest: (i) Which country's tax rates determine the final tax burden and the total revenue raised from production and sale of a good? (ii) Which country benefits from the revenues? (iii) Which country collects the tax? In the current EU VAT system, all three coincide. The tax rate of the importing country determines the final tax burden levied on a good traded between member states, and the total revenue raised; this revenue accrues to the importing country; and the importing country levies the tax. In some of the alternatives to the current system, the three criteria diverge. Where this happens, the destination principle is defined here by the first criterion: in other words, it holds if the final burden of tax on an international transaction, and consequently the aggregate revenue, is governed solely by the tax rates ruling in the importing country. This corresponds to long-standing usage in the economics literature. It will be noted, however, that in recent years there has been an increasing tendency outside the economics literature, and particularly in EU policy discussions, to use the terms "destination" and "origin" to reflect the country collecting the tax; this has led to some confusion about the economic attributes of different systems.

Under the destination principle the tax burden on a particular sale reflects the country where the goods are being sold, rather than the country or countries where the goods were produced. Danish bacon sold in British supermarkets bears a VAT rate of zero, the British rate of VAT on food, rather than the Danish rate of 25 per cent. This has been achieved up until now by, in effect, zero-rating exported goods, so that no trace of the VAT rate of their country of production remains when they are exported, and the burden of tax then reflects only the VAT rate of the country of final sale. As a result, the VAT system exerts a neutral effect on intra-EU transactions between VAT-registered traders.[40] The British supermarket buying bacon can choose between Danish and British suppliers on the basis of their prices excluding VAT, and the VAT rates in Britain and Denmark do not distort the supermarket's decision.[41] The main features of VAT systems that breach this neutrality for B2B transactions are exemptions and other limitations on the right to deduct, discussed in the next subsection.

However, while neutrality might in principle be maintained by the destination basis, implementing destination-based taxation in the absence of border controls is problematic. At present, the VAT system ensures that goods are taxed only in the country of consumption by zero-rating exports (thus freeing them of all VAT levied on the supply chain up to that point) and subjecting all imports to tax. In the EU prior to 1993, this involved the use of border controls to monitor exports and imports. But the abolition of physical checks at frontiers means that it is no longer possible to apply at borders the tax adjustments that are fundamental to the operation of the destination principle. Instead, firms acquiring goods from another country account for VAT on these purchases in their VAT return, usually reclaiming it as input VAT at the same time (assuming they have the right of deduct their input VAT – see the discussion of exemptions in the next section): a system sometimes called ‘deferred payment’ (Cnossen, 1983). With VAT on the acquisition ‘cancelling out’ their deductible input VAT, these firms are left responsible for remitting net VAT on the full value of their output sales (less any domestic inputs), rather than merely for the value they have added themselves. Thus the ‘VAT chain’ – the usual fractional collection mechanism

[40] There can be some cash-flow advantage to importing rather than buying inputs domestically, depending on the timing of VAT payments and recovery, but this advantage is likely to be small.

[41] It should be noted that, although the destination principle secures this outcome, there are also circumstances in which taxes levied on the origin principle would also be neutral in this sense, even if tax rates differ between member states. These circumstances are, however, limited: the conditions are set out by Lockwood, De Meza and Myles (1994).

described in the previous chapter – is broken. The enforcement problems this creates, and possible ways to deal with them, are discussed in Chapter 4.

B2C trade in goods

Purchasing by private individuals and by entities that are not registered for VAT is treated differently from purchasing by VAT-registered businesses. There are essentially two ways such purchases can happen: an individual can buy goods in one country and transport them home to another country themselves (cross-border shopping); or an individual can buy goods from a supplier in another country – usually by mail-order or on the internet – who transports the goods to them (distance selling).

As far as individual cross-border shopping is concerned, if two countries set different tax rates on a product, then, when there are no borders (and so no way to enforce limits on what individuals can bring home from abroad having paid tax only at the foreign-country rate), consumers can purchase the product in the country with the lower rate of tax and ship it home. The freedom to purchase abroad gives individuals an opportunity not open to businesses - to gain genuine benefit from purchasing in lower-tax member states. This form of cross-border shopping is clearly an inefficient outcome, for several related reasons. First, journeys undertaken by individual consumers simply in order to save tax are wasteful in terms of time and transport resources. Second, competition between firms selling similar products in different places (particularly either side of a border) is distorted, and mobile firms' location decisions may be correspondingly distorted. And third, cross-border shopping undermines attempts by countries to maintain independent tax policies. There is pressure on each country to reduce the rate of tax – a form of 'race to the bottom'.

A notable exception to this is the special regime applied to purchases of new motor vehicles, which are always taxed in the customer's country of residence. This creates slightly different problems – it is one of the rare occasions where an individual can face the compliance cost of accounting for VAT, in this case when she brings the car back into her home country, and there is additional paperwork for the seller to complete as well – but it succeeds in removing the incentive to buy vehicles from low-tax regime.

New motor vehicles aside, cross-border shopping is clearly an area where the current VAT regime creates problems. However, how important this problem is depends on the extent to which cross-border shopping is actually a viable option for consumers. Clearly the sheer inconvenience of travelling to another country to make small-scale purchases

for personal use limits the relevance of concerns over cross-border shopping. There are some borders where VAT differentials may give rise to an appreciable level of cross-border shopping, particularly for small but valuable products and when the difference between VAT rates in the two countries is large.[42] But it is generally an issue of lesser importance than the VAT treatment of transactions between businesses.

A special regime applies to distance selling which avoids many of the problems associated with cross-border shopping. If a trader's distance sales to a particular member state exceed that member state's distance selling threshold (generally either €35 000 or €100 000),[43] the trader must register for VAT in the destination country and account for VAT (at the destination country rate) there. Thus such sales are destination-based and there is no tax reason for customers to prefer suppliers in one country to another: in principle neutrality is achieved. The main disadvantage of this regime is that firms making substantial sales to several countries must register and account for VAT in each of them. The compliance cost of doing so, especially given the differences in VAT regimes between countries with which the trader must become familiar, can be a significant barrier faced by firms making distance sales from another country relative to purely domestic firms supplying the same market. The distance selling regime can also be difficult for governments to enforce, since the tax authorities in the destination country (to whom the VAT is due) have no jurisdictional power over suppliers in other member states.

There are exceptions to this distance-selling regime – notably for goods which the supplier is contracted to assemble or install (which are taxed where the assembly or installation takes place), and for second-hand goods, artworks and antiques (which are taxed in the country of origin). But for the most part the distance-selling regime avoids the problems associated with cross-border shopping – where sales are above the distance-selling threshold.

Firms making distance sales below the distance selling threshold can choose whether to register and account for VAT voluntarily in the destination country or whether to

[42] For studies of cross-border shopping and examples of where it is significant, see Bygrå et al, 1987; Fitzgerald et al, 1988; Bode et al, 1994; Fitzgerald et al, 1995; Ratzinger, 1996; European Commission, 1997; and Copenhagen Economics, 2007.

[43] A full list of current distance sales thresholds is available at http://ec.europa.eu/taxation_customs/resources/documents/taxation/vat/traders/vat_community/vat_in_ec_annexi.pdf. Distance sales of goods subject to excise duties require the seller to register for VAT in the destination country regardless of the value of sales.

charge and account for VAT in the origin country – in effect treating them like domestic sales. This is clearly an attractive position for the trader, who can take into account both the additional compliance cost of registering in the destination country and any difference in VAT rates between the two countries in deciding which option is more beneficial. But it can also re-introduce distortions, depending particularly on the tax rate in the destination country. Abstracting (for simplicity) from the compliance costs aspect, it is clear that:

- Firms selling to the EU member state that applies the lowest VAT rate on their product (Luxembourg, say) will prefer to account for VAT in Luxembourg, regardless of which country they are selling from. Thus sellers from all countries will charge the same VAT rate (that applied in Luxembourg) and consumers face an undistorted choice.
- Firms selling to the EU member state that applies the highest VAT rate on their product (Denmark, say), on the other hand, will prefer to account for VAT in their 'home' country, where the VAT rate is lower. Firms making low-value distance sales to Denmark from low-tax countries then have a competitive advantage over other firms (those making low-value distance sales to Denmark from low-tax countries, those making distance sales to Denmark above the Danish distance-selling threshold, and domestic Danish firms) which must charge a higher rate of VAT. Thus distortions similar to those associated with cross-border shopping are re-introduced – indeed, the problems are potentially greater since the customer does not face the cost of transporting the goods themselves.

Thus the optional regime creates greater problems for distance selling to high-tax countries than for distance selling to low-tax countries. However, the presence of distance-selling thresholds necessarily limits the potential scale of this distortion.

Trade in services

The EU VAT regime was originally set up to deal with a traditional model of trade in physical goods, for which the notion of a trade transaction can generally be defined clearly in terms of the physical movement of the taxed commodities, and the discussion so far in this chapter reflects that. Yet international trade in services has grown much more rapidly than trade in goods in recent decades, placing increasing strain on some aspects of current consumption tax legislation and procedures in the EU and elsewhere. Services involve no physical movement of products, making it much less straightforward to define transactions to which the tax provisions relating to international trade should apply. Many of the problems that arose in the VAT treatment of traded services can be traced to the lack of a fully systematic and uniformly applied

definition of the 'place of supply' – clear principles for where taxation should take place. Some services were taxed on the basis of the place of the supplier, others on the basis of the place of consumption; further complexity arose through the use of proxies (such as the place of establishment, or the place of performance) to define the place of either production or consumption of certain services. The main concerns were that some transactions might end up untaxed or taxed twice, and that loopholes might be extensively exploited in the organisation of international services businesses. Similar anxieties have arisen about the continuing viability of consumption tax systems in the face of the rapid growth of e-commerce. This has undermined national regulation and taxation in certain areas (such as gambling services), and turned some readily taxed goods (records and video-tapes, for instance) into hard-to-tax quasi-services (digital downloads).

Data on the main categories of services exports, and their scale, are summarised in Table 3.2.

Table 3.2 Intra-EU and Extra-EU trade in services, 2005

	Intra-EU exports of services	**Extra-EU exports of services**
	bn EUR	***bn EUR***
Transport services	**104**	**103**
Shipping and sea transport	36	56
Passenger shipping	*2*	*1*
Freight shipping	*28*	*49*
Other shipping	*7*	*6*
Air transport	33	36
Passenger air transport	*21*	*21*
Freight air transport	*3*	*6*
Other air transport	*10*	*9*
Other transport services	35	11
Travel	**162**	**71**
Other services	**266**	**230**
Communications services	17	7
Construction services	9	11
Insurance services	13	6

Financial services	41	35
Computer and information services	31	17
Royalties and licence fees	15	23
Other business services	125	117
Personal, cultural & recreational.	6	5
Misc government services	9	8
Total Services Exports	**536**	**406**

Source: Eurostat "European Union International Trade in Services"

B2B trade in services

The choice of regime for taxing intra-EU supplies of services matters less for B2B transactions than for B2C transactions, since for transactions between registered traders, any tax paid is recovered later through the natural mechanism of the VAT (assuming, as current EU rules seek to ensure, that recovery operates effectively across any borders that the transaction spans), and there is no advantage (apart from second-order cash flow considerations) to purchasing from a lower-taxed source.

However, the sheer complexity of the rules has itself been an impediment to the functioning of the internal market. The cost of establishing the appropriate treatment adds to the other compliance costs faced by businesses considering selling to other countries over and above the costs for conducting purely domestic transactions. As de la Feria (2009) puts it:

> companies engaging in intra-community trade experience serious difficulties in determining whether they are the entity liable to pay tax, and if so, in which member state...Determining the applicable place of supply rule can be time-consuming, separating between supplies subject to different rules even more so.

Furthermore, the complexity of the rules has created scope for different applications and interpretations in different countries – notably, but not exclusively, in determining which category of service a particular supply falls into (especially when services are 'bundled' together), and therefore which place of supply rule applies. Such differences in interpretation not only add further to the compliance costs facing would-be traders; they can also result in double (or zero) taxation of the sale in question. Provisions exist to try to avoid cases of double or zero taxation: the 'use and enjoyment' clause of the

VAT Directive allows member states to treat the place of supply as being wherever the 'effective use and enjoyment of the service' takes place, rather than following the usual rules, in order to avoid double or zero taxation (or other distortions to competition). Yet this is far from a fully satisfactory solution, not least because the concept of 'use and enjoyment' is itself ill-defined, giving rise to fresh interpretive uncertainty.[44]

These problems, however, have been significantly reduced by changes to the place of supply rules for B2B services which came into effect in January 2010 and January 2011. The key change is that, from January 2010, the default place-of-supply rule (i.e. the place of supply for all services not covered by other specific rules) has changed from being the supplier's place of establishment to being the customer's place of establishment. Some B2B services (notably telecoms and broadcasting) had already been taxed according to the customer's place of establishment, and a number of rules for specific categories of services which had previously been taxed on a different basis were also changed to bring them into line with the new default rule.[45] The result is that the large majority of B2B services are now taxed on the same basis, namely the customer's place of establishment. This is a significant simplification and provides a somewhat more consistent and coherent approach to taxing services.

There remain significant exceptions to this standard treatment, generally for services closely associated with a particular location. The most important such exceptions are:

- Services related to land and immovable property (a broader category than it sounds, encompassing not only repairs, plumbing, etc but also hotel accommodation and services provided by estate agents, architects, surveyors, property managers, etc), which are taxed where the property is located;
- Restaurants and catering, which are taxed where the service is carried out;[46]
- Admission fees for cultural, artistic, sporting, scientific, educational and entertainment events, which are taxed where the event takes place;
- Passenger transport, which is taxed according to the location of the transport (i.e. proportionally to distance travelled in each country);
- Short-term vehicle hire, which is taxed where the vehicle is provided.[47]

[44] De la Feria (2009) discusses these problems in depth.

[45] These include ancillary transport services (such as loading and unloading) and cultural, artistic, sporting, scientific, educational and entertainment services, which until January 2011 had been taxed where the activities took place; and valuation and work on moveable property, which until January 2010 had been taxed where the activities were physically carried out.

[46] This is in itself a change: before January 2010 these were taxed in the supplier's place of establishment.

[47] Again, these were taxed in the supplier's place of establishment before January 2010.

Such exceptions contribute towards significant complexity that remains, but the problem is somewhat reduced.

While the new rules achieve somewhat greater consistency in the treatment of different services, the choice of the customer's place of establishment as the standard basis of taxation has some administrative disadvantages. Where the place of supply is the customer's place of establishment and the supplier has no establishment in that country, the system is implemented by 'reverse charging'. The sale is zero-rated, with the seller remitting no VAT; instead, the customer accounts for VAT on the acquisition in the destination country (at the destination-country rate), usually reclaiming it as input VAT at the same time (assuming they are entitled to full deduction of VAT). This is essentially the same system as already applied to cross-border B2B supplies of goods, as described above, and has the same downside of breaking the VAT chain.

However, this must be set against the considerable advantages of basing the place of supply on the customer's location. It ensures that revenue accrues to the 'right' government – that in the country of consumption – with no need for revenue reallocation between countries to achieve that. It reduces the number of occasions on which traders must apply for refunds from countries in which they are not established – an especially onerous compliance burden and one where the refunding government has little incentive to be co-operative.[48]

B2C trade in services

For B2C sales, distortions arise if some final consumers face different tax rates for similar products. For services, distortions would arise through the equivalent of cross-border shopping or distance selling: in other words, the possibility that a consumer might be able to obtain equivalent services from suppliers located in different member states, and these might, under some definitions of the place of supply, be taxed differently. Unlike for sales to registered traders, this is a fundamental neutrality issue because the VAT charged on cross-border sales cannot be reclaimed as input VAT.

[48] On the difficulties associated with claiming refunds from foreign revenue authorities, see Harrison and Krelove (2005) and OECD (2010). A new 'one stop shop' system for dealing with refunds of this type within the EU was introduced on 1 January 2010, replacing paper applications made direct to each refunding government with an electronic system through which applicants can make all refund applications through their home-country government's portal. This was partly intended to reduce the burden on applicants, although any such potential gains have so far been overshadowed by major practical problems associated with the introduction of the new IT systems in the member states.

As with cross-border shopping for goods, the practical significance of the problem, in terms of the risk of significant economic distortion, varies considerably between products. At one extreme there are services which are effectively different if they are performed in different locations. Examples include passenger transport (a tram journey in Brussels is no use to the Madrid commuter trying to get to work), service performed on fixed property (by a plumber, for example), and various entertainment services (a cinema ticket in Stockholm is not a close substitute for a ticket for the identical film in Rome). At the other extreme there are services (including most e-services) where the location of the supplier is irrelevant to the performance of the service, and where a private customer could, in principle, purchase the service from a supplier in another member state without any penalty in terms of cost, inconvenience, or quality as compared with the equivalent domestic supply.

For the first group of services, the location of the customer coincides with the location of the supplier when the service is performed, and defining the place of supply as either would have an equivalent effect on economic efficiency. Problems of distortion in purchasers' decisions arise only if the place of supply is defined in terms of the location of the supplier, and if this can differ from the location of the customer. For this second group of services the definition of the place of supply is an issue of much greater significance for economic efficiency. For these services, distortion in sales to final consumers (and B2B sales to exempt traders) can be avoided only by taxing where the customer is located. Yet reverse charging the customer is clearly not an option for B2C trade, and requiring sellers potentially to deal with all 27 member states' tax authorities seems undesirable even if sellers are in a position to identify their customers' location (a serious problem for digital services, for example, although the development of geo-location software is making it easier for suppliers to know where their customers are located). As the European Commission note, these problematic cases have become more prevalent over time:

> the realities of the Internal Market, globalisation, deregulation and technology change have all combined to create enormous changes in the volume and pattern of trade in services. It is increasingly possible for a number of services to be supplied at a distance.[49]

Under current EU rules, the default place of supply for B2C services is the supplier's place of establishment (and there are no proposals for this to change as it has for B2B

[49] European Commission (2003), p.2.

services). However, there are numerous exceptions to this, which collectively cover quite a large proportion of B2C service provision. All the special rules listed above for particular B2B services apply to similar B2C services too (services related to immovable property, restaurants and catering, cultural admissions, passenger transport and short-term vehicle hire). In addition, a number of other services are specified as being taxed where the activities take place, including valuation or work on moveable property, ancillary transport services, and cultural, artistic, sporting, scientific, educational and entertainment services (i.e. the services themselves and their organisation etc, not just admissions). These exceptions to the default rule mostly – though not always – serve to ensure that the tax rate that applies is that of the country where the consumer enjoys the service: so if the consumer wants the service there, she has no choice between suppliers charging different VAT rates. A supplier who is not based there – a firm supplying entertainment or architecture services to customers in several countries, for example – bears the burden of registering and accounting for VAT in each destination country.

What of the more troublesome cases where services are supplied at a distance? Some of these fall under the default rule, and can lead to distortions equivalent to cross-border shopping: thus while taxing hairdressing in the supplier's place of establishment is unlikely to cause problems, taxing services such as bookkeeping or legal advice in the supplier's place of establishment opens up scope for customers to shop around between countries for a supplier able to offer a lower price because they charge less VAT – and consequently for suppliers to establish themselves in low-tax member states, and for firms established in more than one member state to issue invoices from a low-tax country. This is in fact not an issue for supplies to customers outside the EU, because special provisions define the place of supply for many such services to non-EU customers to be the destination country so that suppliers charge no EU VAT (this includes advertising, consultancy, transfers of intellectual property, engineering, law, accountancy, financial services, hire of movable property other than vehicles, gas and electricity distribution, electronically supplied services, telecoms and broadcasting).

However, for certain increasingly important types of service that are supplied at a distance – telecoms, broadcasting and electronically supplied services – the place of supply rules are due to change. Currently taxed in the supplier's location (creating potential distortions which should by now be familiar), from 1 January 2015 intra-EU B2C supplies of these services will be taxed in the customer's location. The problem of suppliers having to register separately in multiple destination countries is to be

mitigated by the introduction of a 'one stop shop',[50] whereby suppliers will register for VAT in a single member state and remit all the VAT due to that country's government (but at the destination country's VAT rate); the revenue will then be redistributed to the revenue authorities in the countries of consumption on a formula basis.

As with trade in goods, it is clear that the treatment of B2C sales creates greater difficulties than B2B sales; yet as with trade in goods, the preponderance of trade is B2B, and the relevance of problems with B2C trade remains, for now, somewhat limited by their relatively small scale.

3.3 Exemptions and the scope of VAT

VAT exemption means that sales are not subject to VAT but the firm cannot reclaim the VAT paid on its inputs. The effective rate of VAT on the final product depends on the proportion of total value that is added before the exempt link of the supply chain.[51] The effective VAT rate will normally be below the standard rate, but by differing amounts depending on the structure of the supply chain.

Although exempt goods and services bear less than the full rate of VAT, exemption is very different from a reduced rate of VAT. For one thing, exemption is not always more generous than taxation. Where exempt goods and services are sold directly to final consumers, this lower effective rate of VAT is payable *instead of* the standard VAT rate on those sales. But where exempt products are sold to other VAT-registered businesses, the irrecoverable input VAT comes *on top of* the VAT that will be charged on sales to final consumers by businesses further down the supply chain, so that the final product bears, in effect, a tax burden that is *more than* the VAT rate applicable to the final sale.

Whether exemption is more or less generous than applying the standard rate thus depends on whether the exempt products are sold to final consumers—in which case the lack of output VAT outweighs the irrecoverable input VAT—or to other businesses—in which case any output VAT would have been recoverable anyway so the irrecoverable input VAT is a pure extra cost.

[50] In fact this is an extension of the existing one stop shop arrangement for non-EU suppliers making B2C sales of electronic services to EU customers, which has been in place since July 2003.

[51] Specifically, the effective rate of VAT as a fraction of the full rate is equal to the share of value added before the exempt link.

Exemption is anathema to the logic of the VAT. It breaks the chain of tax and offsetting credit, leading to distortions of production patterns since taxes on produced inputs cannot be reclaimed. Production efficiency is of paramount importance in tax design (Diamond and Mirrlees, 1971); it is therefore one of the cardinal principles of tax design that intermediate inputs to production should not be taxed. The Australian description of exempt activities as 'input-taxed' is a good one and immediately draws attention to the inefficiencies that can be created.

We noted above that the effective tax rate entailed by exemption is related to the share of total value that is added before the exempt link in a supply chain. But this share is not fixed, so there is an incentive to minimise it. Exemption creates an incentive to 'self-supply' or 'vertically integrate'—that is, it encourages firms producing VAT-exempt outputs to undertake as many links of the supply chain as they can themselves to ensure that value added at intermediate stages is not taxed. So, for example, firms whose outputs are VAT-exempt have a strong incentive to supply their own security services, technical support, cleaning services etc rather than contract them out and face irrecoverable VAT bills. Exemption can create distortions in competition when exempt firms compete with non-exempt firms – favouring exempt over non-exempt firms when selling to final consumers, and favouring non-exempt over exempt firms when selling to other traders – or when competing exempt firms in different EU countries face different costs as a consequence of being charged different VAT rates on their inputs.[52]

Finally, exemption can create additional administration and compliance burdens (and opportunities for tax avoidance) through the need to allocate input VAT between taxable and exempt outputs (credit being available for the former but not the latter) for producers selling both. Such instances of 'partial exemption' are widespread – financial institutions, for example, typically engage in a mixture of exempt and non-exempt activities – and are particularly problematic because there is significant diversity in the methods chosen by different member states to calculate how much input VAT should be deductible. This adds to the aforementioned problem of high compliance costs for firms trading in multiple countries

While the total cost of these complexities and distortions is hard to ascertain, they are likely to be substantial. Indeed Maurice Lauré, nicknamed 'father of the VAT' for

[52] Dietl et al (2011) provide a formal analysis of the effect of VAT exemptions on competition – especially where exempt and non-exempt traders compete – and of how the effects depend on factors such as firms' cost structures and the share of their sales which are made to registered traders.

developing the first fully fledged VAT system (introduced in France in 1954), went so far as to describe exemption as 'the cancer of the VAT system'.[53] Given this, the natural question to ask is: why is it used? Here we consider the arguments in the most important areas, beginning with public services and the public sector, and then turning to look at financial services. The following section considers the other major category of (de facto) exemption: businesses below the VAT registration threshold.

The public sector and services in the public interest

The exemption for services in the public interest such as health, education, postal and cultural services seems to stem from a view that is somehow obviously inappropriate to tax them. If this view reflects distributional concerns, then the arguments set out later in this report (Chapter 10) that it is the distributional effect of the overall tax and transfer system that matters and that using other parts of the tax and transfer system to achieve redistribution may be more efficient, apply with even more force to exemptions than they do to the zero-rating and reduced-rating discussed in that chapter given the additional distortions created by exemption. And even if there is some other compelling reason why public services should be treated preferentially, it is far from clear why this preferential treatment should take the form of exemption, which, as we have argued, is far more damaging than, say, applying a zero or reduced rate because of the problems of cascading that arise.

The exemption for services in the public interest is closely related to the effective exemption applied to many public sector bodies. But the two are not the same, and the relationship between them is becoming more important and more complicated as various forms of privatisation, liberalisation, outsourcing and public-private partnerships increase private sector involvement in the provision of public services and blur the boundaries between the two sectors. To some extent what we have is a VAT system which has just not adapted with the economy. Blurred boundaries between public and private sectors lead to arbitrary differences in the tax treatment of similar organisations doing similar things. If public and private sector bodies are competing, they might not do so on a level playing field: public sector bodies may have an advantage in providing services to final consumers or to other exempt bodies because of the lack of output tax, whereas private firms' ability to recover input VAT may give them an advantage in providing services to taxable firms.

[53] Cited in European Commission (2010b).

When public-sector bodies are selling something—whether or not in competition with private firms—it might be thought that charging VAT is equivalent to simply adjusting the price: after all, passing the VAT on to the tax authorities is merely a transfer from one government agency to another, which could (at least in principle) be offset by adjusting the funding of the agency concerned. However, this is not always true: if a public-sector body is selling something (e.g. parking spaces) that is used both for consumption and as a business input, then charging VAT is not equivalent to a price adjustment as businesses could reclaim the VAT whereas households (and indeed exempt bodies paying for the parking space) could not. Since only final consumption should be taxed, prices ought to be higher for households than for businesses. The VAT mechanism achieves this, whereas a price adjustment cannot.

Finally, regardless of whether their outputs are sold or provided free to users, exempt public sector bodies have an incentive to self-supply rather than purchase taxed goods and services from private-sector suppliers.

Such distortions suggest that the effective exemption applied to the public sector is a significant weakness of the EU VAT regime.[54] The question is therefore whether VAT could be extended to the public sector in a way which eliminates or at least reduces these distortions. Close examination of options for reform is beyond the scope of this evaluation, but we note that several studies have suggested how this could be done and the benefits it would have,[55] and Australia and New Zealand provide practical examples.

Financial services

When I open a current account at the bank, I do so in part because the bank will store my money more safely than leaving it under the mattress. They will also give me a cheque book and a debit card which enable me to withdraw and spend my money at will without needing to carry the cash around with me; and they will save me the trouble of finding someone who can put my money to productive use until I need it.

[54] Rules are in place at the EU level and in some member states to mitigate some of the distortions, in effect by moving away from exemption. For example, some activities of public sector bodies are classed as 'business activities' and taxed; and exemption does not apply where it is deemed that it would lead to a significant distortion of competition. The UK has a special scheme which refunds input VAT to some public sector bodies (notably local authorities). However, the scope of these provisions is far from complete and in practice many distortions remain.

[55] Aujean, Jenkins and Poddar (1999); Genser (2005); Copenhagen Economics and KPMG (2011).

Often they will give me car breakdown cover or discounts on rail tickets as well. These are all services I consume.

If the bank charged me explicitly for these services, this would be straightforward: they would be selling me a money storage facility, a debit card, a borrower-finding service, and car breakdown cover, and VAT could be charged on the sale. But they do not. Instead they give me a low interest rate on my account. If I open a savings account which does not provide instant access to my funds and all the other perks, the bank will pay me a somewhat higher rate of interest.

Meanwhile, if I wish to borrow money, the bank will charge me interest at a much higher rate, reflecting the fact that, rather than doing me the service of storing and using funds I have but don't immediately need, the bank is now doing me the service of finding and providing funds I need but don't immediately have. It is through such interest rate 'spreads'—the interest rate charged to borrowers in excess of that given to savers—that the bank covers the cost of providing its services and makes profits.

Standard VATs cannot cope with this. Borrowers and savers are not explicitly buying financial services from the bank, so there is no sale on which VAT must be charged. To date, most governments around the world, including the whole of the EU, have resigned themselves to this, and have exempted financial services from VAT. Exemption is seen as taxing what can be taxed: anything the bank purchases from registered traders to enable it to provide its services bears VAT that the bank cannot reclaim, so the government gets some revenue, paid for by customers if the bank passes on this VAT in its interest rates.

But exemption taxes only the value of the inputs the bank purchases; it does not tax the additional value added by the bank through the labour and ingenuity of bankers in transforming those inputs into the services I enjoy. And we have already discussed the other problems caused by banks' inability to reclaim VAT on their inputs:

- over-pricing of financial services provided to other businesses, which ought not to bear any tax;

- a bias towards sourcing financial services (and anything produced using them) from countries which have lower VAT rates or which have a narrower (i.e. more generous) interpretation of what are non-creditable inputs;[56]
- difficulty identifying which inputs are attributable to exempt activities, where firms undertake a combination of taxable and exempt activities (as financial institutions typically do);
- a bias towards minimizing the use of taxed inputs—specifically, towards the use of zero-rated inputs and towards vertical integration as banks do as much as possible in-house (provide their own cleaning and security services, for example) to avoid paying VAT on purchased inputs.

These are serious problems, though their significance is difficult to quantify.

In revenue terms, it is theoretically ambiguous whether VAT exemption yields more or less revenue than full taxation: it depends whether the VAT forgone by not taxing B2C financial services is more or less than the VAT collected on non-creditable inputs to both B2B and B2C financial services (in other words, whether the 'over-taxation' of B2B financial services outweighs the 'under-taxation' of B2C services). Empirical estimates of the revenue impact of VAT exemption are scarce, but available studies seem to agree in finding that exemption costs money relative to a position of full taxation. Genser and Winker (1997) estimated a cost of DM 10 billion (€5 billion) for Germany; for the EU as a whole, Huizinga (2002) estimated that the cost was €12 billion. More recently, tentative estimates by the UK government imply that exempting financial services costs about £10 billion (€11 billion) in the UK alone (with a 20% VAT rate),[57] although around a third of this is recouped through insurance premium tax, a tax currently levied on insurance premiums as a proxy for VAT which could be abolished if insurance were subject to a cash-flow VAT (or equivalent) along with other financial services.

Note, however, that these revenue figures are not a good guide to the scale of the problem caused by the current exemption: it is the net revenue effect of under-taxing financial services to households and over-taxing financial services to businesses. The

[56] There is also a bias towards sourcing financial services from countries which in effect zero-rate exports of financial services. Services provided across borders within the EU are not zero-rated in this way, however.

[57] Source: authors' calculations using HMRC Statistics table 15.1 (http://www.hmrc.gov.uk/stats/tax_expenditures/table1-5.pdf), adjusting the 2010–11 estimate to reflect the fact that the VAT rate was 17.5% for part of that fiscal year and 20% for the rest.

revenue effects of these offset each other, but both are distortions in their own right. Two common complaints are that it has been too cheap and easy for households to borrow, but too expensive and difficult for businesses to obtain finance. VAT exemption contributes to both of these. More relevant than the net revenue consequences of exemption is the extent of taxation of inputs, since it is that which creates the distortions associated with exemption. Chapter 7 of this report includes estimates of the extent of irrecoverable input VAT in the financial sector in the four biggest EMU countries, finding it ranging between 2.1% of the value of the financial sector's output in Spain and 4.3% in France. None of this, however, quite captures the harm caused by distortions such as the bias towards vertical integration, the problems of partial exemption, and so on.

Financial services are VAT-exempt not because of doubts over the problems it causes but largely because, for the reasons explained above, they have been perceived as technically difficult or even impossible to subject to VAT. This argument already sits somewhat uneasily with actual policy developments. Exemption of financial services is not, in fact, mandatory: member states can choose to allow financial firms an 'option to tax' (i.e. the firms can opt to be subject to taxation rather than exempt), which a few countries have chosen to implement in various ways; moreover, the European Commission has proposed that it should be mandatory to make this option available to financial firms in all member states. An option to tax financial services suggests a belief that taxation is possible in some way, although it is not clear quite what method is envisaged and practice in those countries which offer an option to tax is diverse.[58] As with public services and the public sector, detailed examination of alternatives to exemption is beyond the scope of this study. Yet despite the difficulty of applying the usual invoice-credit mechanism of VAT to financial services, we note that proposals have been made for systems that are economically equivalent to applying VAT, including cash-flow taxation, Tax Calculation Accounts and some variants of the Financial Activities Tax.[59] In light of the recent (and ongoing) financial crisis, the Commission began to explore a number of options for taxing the financial sector, including the possibility of a Financial Activities Tax (European Commission, 2010c); as this report was being finalised, the Commission brought forward proposals for a Financial Transactions Tax (European Commission, 2011), which (unlike a Financial Activities Tax) bears little relationship to a VAT.

[58] De la Feria and Lockwood (2010) survey practice on the existing option to tax and analyse the European Commission's proposals for reform.

[59] See Chapter 8 of Mirrlees et al (2011) and references therein for a description and discussion of these alternative proposals.

3.4 Compliance costs and small businesses

The VAT registration threshold is, of course, a form of exemption. Registration for VAT is optional for traders with sales below this threshold (except in the Netherlands, where voluntary registration by firms below the threshold is not permitted). Firms choosing not to register do not remit VAT on their sales, nor can they reclaim VAT on their input purchases, so they are in effect VAT-exempt. However, many firms with turnover below the threshold choose to register, because if they don't they cannot reclaim VAT paid on inputs. For firms selling mostly to registered traders, any output VAT charged is unimportant because their customers can reclaim it anyway, whereas irrecoverable input VAT could be a significant extra cost. So voluntary registration can often make sense for such firms—although they must also take account of the compliance costs entailed by being registered for VAT.

It is these compliance costs, and the corresponding administrative costs to government, that provide the rationale for a threshold of this kind. This rationale is much stronger than that for the other exemptions discussed above. The costs of ascertaining VAT liabilities, record-keeping, and so on are substantial, and particularly important for small businesses since many of these costs are fixed rather than proportional to turnover while the revenue at stake is small. Below we discuss how these considerations should be weighed against the disadvantages of exempting small firms in order to ascertain the optimal threshold, but it seems almost indisputable that there must be some level below which it is simply not worth the hassle of collecting tiny amounts of revenue. Various member states also use other schemes to minimise administration and compliance costs for small businesses, and we discuss the two main ones – simplified flat-rate schemes and (more unusually) graduated thresholds – below.

Before considering these detailed design issues, however, it is worth emphasising the importance of compliance costs for small businesses in the context of the EU's internal market.

A crucial barrier to the effective operation of the internal market created by VAT is the cost to firms of complying with VAT obligations, and specifically unequal costs of making intra-EU supplies as compared to domestic supplies. These can arise from the operation of mechanisms for taxing trade specifically – through zero-rating exports and taxing imports or through reverse charging, for example – or they can arise simply from having to having to comply with more than one member state's VAT regime when operating in more than one country.

Indeed, it is sometimes easier to trade with firms in non-EU countries than with firms in other EM member states. An exporter of goods to a non-EU country merely needs to be able to prove the goods were exported, which can be based on straightforward Customs certification and paperwork. However, selling goods to another member state requires that the firm be responsible for ensuring that the customer is a valid registered taxable person in that state. This can bring its own risks, especially for smaller firms that do not trade much outside their own country.

All else equal, compliance burdens are likely to be felt more keenly by small firms than by large firms. Compliance costs can have both transaction-related ('variable') and 'fixed' components. It is the fixed element that makes compliance costs a particular barrier to trade for small firms, but both elements may, potentially, distort the patterns of activity and trade.

Transaction-related compliance costs could operate as an impediment to trade if the tax compliance costs on trade transactions are greater than the compliance costs on purely domestic transactions. Much of the '1992 programme' of measures to complete the internal market of the Community was motivated by a concern that border formalities could increase the costs to a firm of doing business in other member states in the European market; indeed, there was a concern that on occasions member states may have employed frontier bureaucracy as a form of trade protection against products from other member states. In order to remove the opportunities for such non-tariff barriers to arise, the 1992 programme abolished internal frontier formalities. In its original proposals for the VAT mechanism to operate after 1992, the Commission would have gone further than this, and would have also put in place a VAT mechanism for cross-frontier transactions which was as close as possible to that applying to domestic sales, in order to minimise the possibilities that any significant difference in compliance costs could arise between the two types of transaction. In practice, however, the measures adopted for the post-1992 VAT regime apply very different procedures to trade within, and trade between, member states. To the extent that the procedures applying to trade between member states involve higher compliance costs on each transaction than on corresponding transactions within a single member state, the tax system may discourage complete integration of the European market.

'Fixed' compliance cost differences may also arise, and could also segment the European market by discouraging entry by firms into export markets in other member states. The notion of fixed compliance costs covers those aspects of the administrative

burden which firms bear which are not related to the volume of taxed transactions, but which are incurred in making any taxed transactions of a particular sort. In this way, tax compliance costs could function as an "entry fee" to exporting, which must be paid in order to export at all, or to export at all to a particular market. They may include the initial costs of training and tax advice which an exporter must bear before being able to enter a new market, and the ongoing annual burden of dealing with tax authorities in more than one member state. Such costs could inhibit the entry of new firms into exporting, and may be particularly damaging in the case of smaller firms seeking to make the transition from a business orientated purely to the domestic market to one trading throughout Europe. They could thus distort both the pattern of trade, and the size structure of industry, by favouring larger firms, for whom the fixed compliance cost burden is a smaller proportion of total costs.

It is important to note that the origin of fixed costs – and the problems they create – stem as much from uncertainty and the costs of ascertaining obligations as from actually filling in paperwork. To appreciate the nature of the problem, consider a small business in a provincial town, which one day receives a phone call from a firm in another EU member state who wishes to place an order. The trader is delighted to receive the call, but is immediately apprehensive about accepting the order. First of all, she does not know which tax regime would apply to the supply. Would it be taxed in her country or in her customer's country? Would she have to register for VAT in the destination country, and would that depend on whether sales to customers in that country alone exceeded that country's registration threshold? If the destination country's VAT regime is relevant at all, what VAT rate applies to her products in that country? What paperwork would she have to complete, and would her record-keeping have to change from what she already did for domestic VAT purposes?

Not only does our would-be exporter not know the answers to these questions (and many more); her regular tax advisor – a high street accountant accustomed to dealing only with domestic tax – does not know either. Moreover, neither of them knows quite where to find out. Their domestic tax authority does not consider it their concern; the tax authority in the foreign country may have a website, but they do not know where to find the relevant information, and indeed the website or paper literature may be in a language they do not understand (even a different alphabet). The best way to find out the VAT implications of accepting this order may well be to approach a firm of tax advisors with greater specialist knowledge, but this is likely to be expensive.

All of this is before the would-be exporter has even found out what the VAT implications of accepting this order would be, let alone actually incurred any actual additional costs of selling her products abroad. Even before considering the costs of actually complying, the costs of merely ascertaining her obligations must be considered. And at the time she receives the phone call, she may have little idea what the costs (in time and money) of finding out the VAT implications of this sale would be. The sheer uncertainty might be enough to dissuade her from accepting the order, to choose to 'play safe'.

These problems stem from several sources acting in combination.

- The costs will be greater, the more complex the tax regimes (extensive rate differentiation, complex place of supply rules, special schemes, etc)
- The costs will be greater, the more different the regimes in different member states (in terms of compliance obligations, rate structures, difference in application and interpretation of EU provisions, etc).
- The costs will also depend on the actual tax treatment of international trade, since that will affect, for example, whether she does indeed need to deal with the tax authorities in the destination country.

The costs of ascertaining obligations are largely fixed costs - indeed, to a considerable extent one-off costs, incurred the first time a firm trades with a partner in another member state - and they are therefore overwhelmingly more important for small businesses. Such costs would then tend to discourage intra-EU trade by smaller firms.

Data on trading activity by firm size is not collected systematically by all EU member states. But some member states do compile statistics, in some cases based on data derived from the operation of the VAT system. Data from this source for Germany are presented in Table 3.3. These statistics do not separately distinguish trade flows by trading partner, so concern total trade, rather than just intra-EU trade, but they are nonetheless of interest in the current context.

It is worth noting, initially, the very large number of small firms, and their relatively small overall turnover. Firms in the two lowest size classes (with annual turnover below €100,000) account for half of all the firms (49.3%), but a total turnover of only €75bn, 1.5% of the total turnover of all firms shown.

The proportion of firms which are exporters is very much lower among small firms than among larger firms. Fewer than 5% of firms in the two smallest size classes are

engaged in any exporting at all, compared with 11 per cent of firms overall, and more than 40% of firms with an annual turnover in excess of €1 million. The export turnover of the 1.5 million firms in the two smallest size classes is of almost trivial economic significance, less than €650m (less than one tenth of one per cent of all firms' exports). Nevertheless, those small firms that do participate in exporting have quite substantial levels of exports in relation to their turnover - more than 20% of turnover in the lowest two size classes, a higher percentage than in medium-sized firms, and broadly equal to the export share for exporting firms as a whole. Although by no means a conclusive demonstration, the pattern of exporting behaviour observed in this table strongly suggests that small firms encounter 'fixed entry cost' barriers to exporting that are proportionately more significant than for larger firms. These fixed entry costs may arise from a range of sources, including unfamiliarity with markets, legal requirements, the fixed cost of a local presence, and also possibly the additional tax compliance costs involved when the firm embarks on exporting.

Table 3.3 Firm size and exporting, Germany, 2009

Size class (in 1000 EURs)	Number of firms (1000s)	Turnover (bn EUR)	% of firms which export	Exports as % of turnover	Exports as % of turnover, exporters only
17.5 - 50	912	29	2.7	0.7	24.5
50 - 100	635	46	4.7	1.0	20.0
100 - 250	685	109	8.2	1.4	16.6
250 - 500	351	124	14.3	2.2	14.6
500 - 1000	232	163	21.9	3.2	14.2
1000 - 2000	143	201	30.9	4.7	15.0
2000 - 5000	99	305	43.3	7.6	17.0
5000 - 10000	37	255	56.2	11.3	19.8
10000 - 25000	24	365	65.3	14.2	21.5
25000 - 50000	9	307	73.2	17.4	23.7
50000+	10	2994	78.8	21.6	25.1
All firms	3135	4898	11.1	16.8	23.9

Source: IfM Bonn, based on Statistisches Bundesamt, *Umsatzsteuerstatistik 2009*

The UK's Office of Tax Simplification recently investigated the scope for simplifying the taxation of small businesses, and concluded that international trade is a major source of complexity facing them: "it has traditionally been assumed that only large

businesses carry out international trade and so find themselves liable to register for VAT in other countries; this is clearly not the case from our research" (Office of Tax Simplification, 2011). In any case, international trade being dominated by large firms does not indicate that the small business problem is unimportant: most trade could be conducted by large firms precisely *because* small firms are deterred, which (if true) would indicate that the problem was severe.

Quantifying the differential compliance costs and their effects is hard. The 1996 Commission 'definitive regime' proposals stated that "according to some estimates, the average costs [of transactions between member states] can be five or six times greater than those of a domestic transaction".[60] These estimates are now somewhat dated (developments in IT and the accession of new member states must surely make a substantial difference), but do give a feel for possible orders of magnitude, and again it is worth emphasising that the differential is likely to be much higher for small firms than for large ones. VAT compliance costs undoubtedly account for a significant part – though far from all – of the differential costs of trading with other member states rather than domestically. Chapter 5 of this report constructs indicators of the complexity and dissimilarity of VAT regimes, and Chapter 6 assesses their effects on trade patterns and other economic outcomes.

The choice of registration threshold

The level of VAT registration threshold varies widely between member states. In some countries firms must register almost as soon as they have any turnover at all. At the other extreme, the UK's registration threshold of £70,000 per year (in 2010–11) is so high that most businesses are outside the VAT net: the UK government estimates that 2.9 million small businesses are not registered, compared to a total of 1.95 million businesses registered for VAT[61]—although since they are by definition small, the unregistered businesses account for only a small minority of sales and revenue. Some member states – France, Germany and Ireland – apply lower rates to firms supplying services than to firms supplying goods, because those supplying services typically require far fewer inputs to production, so a given level of turnover is typically associated with much higher value added for them than for firms supplying goods.[62]

[60] European Commission (1996), p.12. We have been unable to establish the original sources of these estimates.
[61] HM Treasury (2010), paragraph 4.9.
[62] For rather different reasons, Slovenia applies a lower registration threshold to non-profit and charitable organisations.

The benefits of exempting small firms from any sales tax system are the saving in costs of tax administration for the authorities, and of compliance costs borne by the private sector. These costs are likely to include a significant fixed element for each firm taxed, and for the smallest firms this fixed cost is likely to be large relative to the tax that would be collected from the firm. Exempting small firms from the VAT system reduces the number of firms that have to be taxed very sharply - and hence makes a significant saving in the costs of tax administration and compliance - while forgoing little in terms of tax revenue. Because of the residual effective tax burden on these firms, arising from unrecovered VAT on purchased inputs, the net revenue loss is even smaller.

Exempting small firms from the VAT system may forgo little revenue, while making a large saving in the costs of operation. However, the balance between cost savings and revenue loss shifts when larger firms are considered; the revenue forgone would exceed the costs of taxing the firm. At some intermediate point an optimal VAT threshold can be identified, at which the cost savings and revenue losses just balance out.

The optimal turnover threshold for VAT registration has been discussed by a relatively small research literature. Keen and Mintz (2004) present a straightforward assessment of the optimal threshold following the above logic, which defines and calculates the optimal registration threshold in the following way:

At optimal threshold, the costs and benefits of a marginal change in the threshold will be exactly balanced. A marginal reduction in threshold would gain additional revenue, but would add an equivalent amount to the costs of administration (for the revenue authorities) and compliance (for firms). The benefits and costs of a marginal reduction in the threshold can be written as:

$$(D - 1)\, tVZ = DA + C$$

Where D is the marginal cost of public funds, A and C are administrative costs borne by the revenue authorities and compliance costs borne by firms respectively, t is the VAT rate, Z the turnover threshold, and V the share of value-added in turnover. The role of V should be noted. It reflects the fact that firms below the registration threshold cannot claim back the VAT paid on purchased inputs. Value added by the firm is the difference between its gross turnover and its purchased inputs. The higher is the level of taxed input purchases relative to the firm's sales, the lower is V and the lower is the next revenue loss from exempting the firm's sales from VAT.

The expression above can then be rewritten to give the formula for the optimal threshold Z*

$$Z^* = [\, DA + C \,] \;/\; [\, (D - 1)\, tV \,]$$

Table 3.4. Calculation of the optimal VAT threshold for EU member states.

		Rate of VAT	Optimal VAT threshold - base case (annual turnover in Euros)
Belgium	BE	21	66,000
Bulgaria	BG	20	70,000
Czech Republic	CZ	20	70,000
Denmark	DK	25	56,000
Germany	DE	19	73,000
Estonia	EE	20	70,000
Greece	EL	23	61,000
Spain	ES	18	78,000
France	FR	19.6	71,000
Ireland	IE	21	66,000
Italy	IT	20	70,000
Cyprus	CY	15	93,000
Latvia	LV	22	63,000
Lithuania	LT	21	66,000
Luxembourg	LU	15	93,000
Hungary	HU	25	56,000
Malta	MT	18	78,000
Netherlands	NL	19	73,000
Austria	AT	20	70,000
Poland	PL	23	61,000
Portugal	PT	23	61,000
Romania	RO	24	58,000
Slovenia	SI	20	70,000
Slovakia	SK	20	70,000
Finland	FI	23	61,000
Sweden	SE	25	56,000
United Kingdom	UK	20	70,000
EU-27 average		20.7	67,000

Table 3.4 illustrates the application of this formula by calculating optimal VAT thresholds for each member state, on the basis of some simple representative assumptions about key parameter values. Updating the estimates of administrative and compliance costs from Cnossen (1994), we assume that the administrative costs per firm are €135 per annum and compliance costs per firm are €675. The tax rate is assumed to be the standard VAT rate applicable in each country, and the estimates in Table 3.4 assume that V is 0.3, a figure that might reasonably reflect the position of a manufacturing firm (with a relatively high ratio of purchased inputs to turnover). D, the marginal cost of public funds, is assumed to take the relatively low value of 1.2, meaning that the distortionary cost imposed on the economy if an additional Euro is raised in taxation adds a further 20 cents to the cost of the Euro. Studies giving evidence on the value of D are rather rare, but few would indicate a value lower than this, and some analysts would argue that the distortionary cost of taxation is substantially higher. On the basis of these assumptions, the optimal VAT threshold would range from €56,000 to €93,000 across EU member states, with an average of €67,000.

Table 3.5 then shows how this calculation is affected by changes in the assumed parameter values, summarised in terms of the effect on the EU average optimal threshold. A substantially more pessimistic assessment of the distortionary costs of taxation would imply a much reduced VAT threshold (since the forgone VAT revenue is much more valuable when raising taxes from alternative sources would impose high distortions). Higher administrative and compliance costs would increase the optimal threshold (since this would reduce the number of firms incurring these costs). A higher value of V, such as would be appropriate, for example, for firms producing labour intensive services, would substantially reduce the optimal threshold, since the lower level of purchased inputs to their production activities will reduce the effective rate of tax that would be borne by the sales of firms below the VAT threshold. The powerful impression conveyed by the Table 3.5 is of the sensitivity of the 'optimal' threshold to these uncertain parameters, which suggests that such calculations should be treated with caution.

Table 3.5. Sensitivity of the optimal VAT threshold for EU member states to parameter values.

	EU average optimal threshold values (annual turnover in Euros)
Base case	67,000
As base, but with more distortionary tax system (MCPF=2)	15,000
As base, but for labour intensive services	29,000
As base, but with 50% higher VAT costs	101,000
As base, but with 33% lower VAT costs	45,000
As base, but with national VAT rates two points lower	76,000

Over and above the factors included in the Keen and Mintz formula, exempting small firms has all the downsides of exemption generally discussed above, and the threshold itself brings additional distortions, including:

- creating an incentive for traders to remain below the turnover threshold. Firms can influence their turnover in several ways, and the distortions implied vary consequently. Some of the methods can be classified as fraud, e.g., underreporting the sales, failure to register and misclassification of commodities (Keen and Smith, 2007). Fraud reduces VAT revenues and distorts competition. Another type of reaction is just to limit the growth of the taxed sales, for example, by redirecting production to less taxed goods or by scaling down investment and marketing expenditure. The firms could also be artificially split, when the turnover seems to exceed the threshold. This last phenomenon has been detected in Japan (Onji, 2008).
- giving retailers below the threshold an unfair competitive advantage over taxed retailers. The extent of this will depend on the share of labour input into production, which differs in various industries.

These additional effects are difficult to quantify. There are not many studies that look for optimal registration thresholds. Keen and Mintz note that small firms are likely to bunch just below the VAT threshold due to the fixed elements in the compliance costs and the high marginal costs involved when crossing the line. These costs are high because the whole turnover becomes liable to taxation when the firm is registered. Bunching reveals that the turnover shown by these firms is likely to be lower than optimal. However, their formula discussed above does not include these distortionary

effects. Both Keen and Mintz (2004) and Zee (2005) consider how allowing for such distortions might change the optimal threshold. Unfortunately this discussion leads to no clear practical guidance as to how the calculation of the optimal threshold should be adjusted to reflect these effects, as their numerical simulations show ambiguous effects.

Simplified flat-rate schemes

Another route, used in many countries, to minimising administration and compliance costs is to apply a simplified scheme to small businesses.[63] These simplified schemes often involve levying tax as a flat-rate percentage of turnover rather than on value added calculated transaction-by-transaction.

For example, such a scheme has existed in the UK since 2002 for small firms (those with non-exempt sales below £150,000, excluding VAT, in 2010–11), which have had the option of using a simplified flat-rate VAT scheme. Under the flat-rate scheme firms pay VAT at a single rate on their total sales and give up the right to reclaim VAT on inputs. The flat rate, which varies between 4% and 14.5% depending on the industry,[64] is intended to reflect the average VAT rate in that industry after taking into account recovery of VAT on inputs, zero- or reduced-rating of some outputs, and so on. This scheme has problems. By disallowing the recovery of VAT on inputs, it distorts production decisions in the same way as exemption. The differentiation of rates between 55 categories of industry creates distortions and policing problems at the boundaries between them. Insofar as such schemes achieve genuine simplification for affected small businesses, there is clearly a trade-off to be made, like with the registration threshold, between simplicity and neutrality.

However, the UK scheme has a second feature which is similarly instructive: it is optional. The schemes in place across EU member states vary in that regard. Where such schemes are optional, they naturally encourage firms to estimate (at least roughly) their liability under both regimes to see which is lower—indeed tax advisors often insist on doing both sets of calculations for fear of being found negligent if clients choose the wrong option. This therefore increases compliance costs—ironic when the scheme exists precisely to reduce them—as well as ensuring the maximum revenue loss for the government.

[63] In some countries such schemes apply to certain sectors, such as agriculture, irrespective of size.
[64] This is the range of rates from January 2011, when the main VAT rate rises to 20%.

Whether the benefits of simplified flat-rate schemes outweigh the costs is difficult to say. But although firms are likely to prefer optional schemes (since, unlike compulsory schemes, they cannot lose), it does seem clear that from society's point of view optional schemes are less likely to be a welcome feature of member states' VAT regimes.

A graduated threshold: a case study of Finland (ETLA)

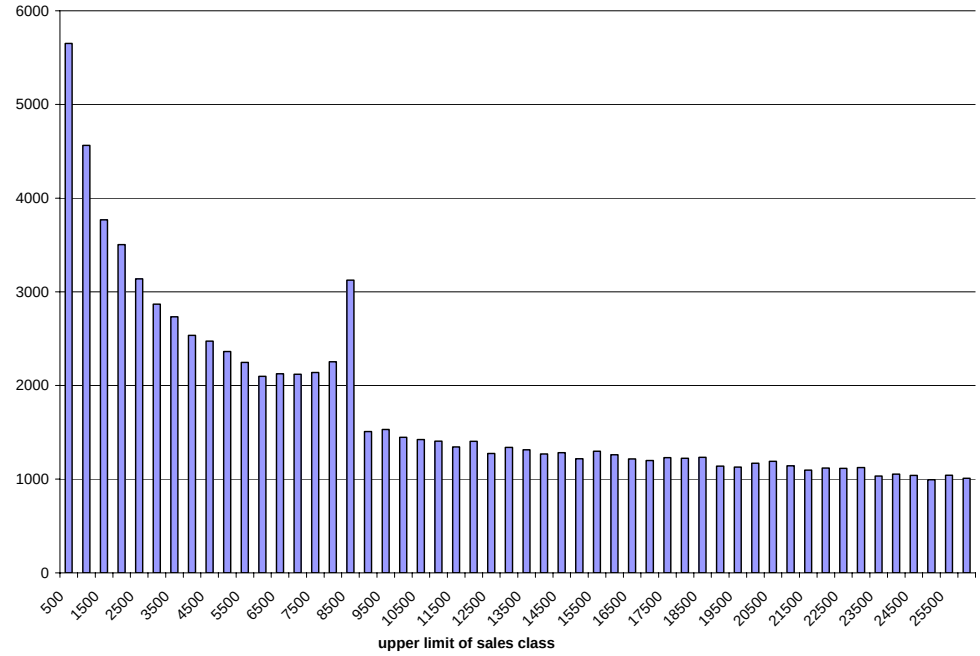
The Finnish VAT regime was reformed at the beginning of 2004. Before that, the VAT registration threshold was annual turnover of 8500 euros. If turnover exceeded this amount, all sales of the firm became liable for taxation. The reformed scheme introduced a sliding scale of tax rates when turnover exceeded 8500 euros but was less than 20 000 euros. The upper limit was raised to 22 500 euros from the beginning of 2005.

Tax relief = VAT paid – [(turnover – lower limit) × VAT paid]/(higher limit – lower limit)

When turnover exceeds 22 500 euros, the formula produces a negative tax relief, but then it is not applied. Another case where the VAT relief is not applied is when VAT paid is negative, i.e. when the taxpayer is entitled to a VAT rebate. If the yearly turnover of a registered firm is less than 8500 euros, the tax relief granted is the total VAT paid. The idea of introducing a sliding threshold was originally presented by the Federation of Finnish Enterprises and supported by the Tax Working Group appointed by the Prime Minister's Office (Prime Minister's Office (2003)).

In the Bill presented to Parliament (Government of Finland (2003)), the Finnish Government justified the reform by arguing that a fixed threshold hinders the growth of firms and increases the size of the informal economy. Figure 3.1 shows that before the reform the firms' turnover did, indeed, bunch strongly under and near the threshold of 8500 euros. The data includes both registered and unregistered firms.

Figure 3.1. Frequency distribution of firms by turnover class of 500 euros in 2003 in Finland.



Source: Rauhanen and Ventoklis (2011).

Evaluation of the reform

The Government Bill included an impact assessment of the reform. According to this assessment the reform increases entrepreneurship and especially the number of self-employed persons. The estimated number of tax-payers affected was nearly 80000 and the aggregate annual tax foregone was expected to be about 36 million euros (Government of Finland (2003)). The loss of VAT revenue turned out to be substantially overestimated, since the actual tax foregone in 2006 was 16 million euros (Rauhanen and Ventoklis (2008)).

Rauhanen and Ventoklis (2011) evaluated the economic impact of the reform. The econometric study asked how the turnover of micro firms responded to the reform. For registered firms below the 8500 euro threshold, the relief was (perhaps surprisingly) associated with an increase in sales. But there was also (and more importantly) a disappointing result, since it seems that the relief has not encouraged the non-registered

firms to register and grow. The method used was to compare the pre-reform and post-reform behaviour of firms affected by the policy to the behaviour of the unaffected control group of firms (the 'difference-in-differences' estimator).

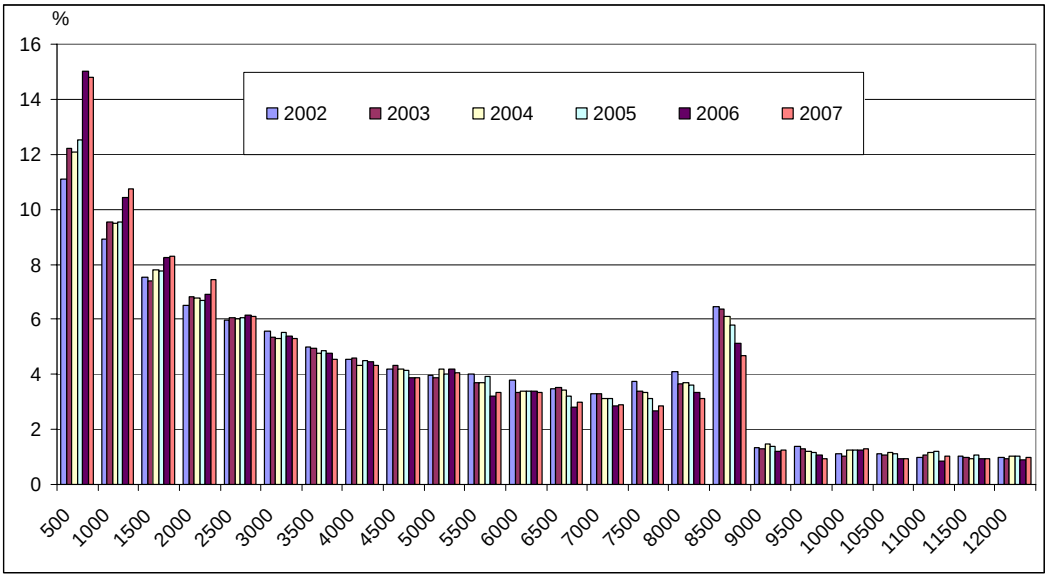
The data available was comprehensive including (1) income tax declarations and financial statements of all firms, (2) surveillance declarations (including paid tax by tax rate) of all VAT registered firms for the period 2002 to 2007; and (3) information on VAT relief decisions for the period 2004 to 2007 (firms have to apply for VAT relief at the end of the year and the decisions made on these applications are registered). To avoid selection bias the data was divided to 2-year panels, which were estimated separately. For longer time series a bias is possible, since only some of the firms continued to operate in the following year and the survival is positively correlated to the growth of sales.

In the first analysis carried out the treatment group was the firms who had a turnover between 100 - 8500 euros and were voluntarily registered. The control group was the firms with turnover higher than 8500 euros, but lower than 20 000 euros (therefore obliged to register). The dependent variable was log of sales and the explanatory variables were time and treatment dummies and their interaction term and sales, legal type, industrial sector and geographical location of the firm at the start year.

The estimation results show that the treatment group already had higher growth rate before the reform, but the difference increased markedly after the reform. This is not straightforward to interpret. Some of these firms were voluntarily registered because their inputs include more VAT than sales. These firms did not benefit from the reform. Part of the firms sold to other registered companies. In that case the reform reduced the current effective VAT rate to zero. It also created an incentive to increase sales above the threshold by providing a lower average VAT rate until the higher limit was reached.

A second analysis concentrated on firms closer to the registration threshold (turnover of 7000-8500 euros vs. turnover of 8500-10 000 euros). It produced lower coefficients and less statistical significance. The third and fourth estimation sets were otherwise similar to the first and second, but now the data also covered non-registered firms. Including these firms lowered even more the estimated coefficients and reduced the statistical significance. This was interpreted to show that the growth of the non-registered firms, which was slower before the reform, stayed so after the reform.

Figure 3.2. Unregistered firms in 2002-2007, frequency distribution of firms with turnover between euro 500 and euro 12 000, by turnover class of euro 500.



Source: Rauhala and Ventoklis (2011).

Figure 3.2 shows what happened to the bunching of the firms. It seems that the share of the non-registered firms just below the threshold is lower after the reform, but the cluster is still high. A closer look shows that the bunch is caused by entrepreneurs and self-employed persons (Rauhanen 2002), who can adjust their sales, or venture into tax fraud.

One striking anomaly is that many of the firms eligible for the VAT relief did not apply for it. Only 31 percent of the firms that were eligible 2004 applied and received the VAT relief. One explanation may be the small size of the relief. It was 617 euros on average for those firms that did not tap it and 10 per cent of the reliefs would have been less than 100 euros.

Rauhanen and Ventoklis (2011) discuss the possible reasons for the firms staying unregistered. One is the compliance costs involved. The study of Niinikoski et al. (2007) finds that the average yearly cost for a registered firm was 389 euros in 2007. The compliance costs for small firms were reduced from the beginning of 2010. The firms with turnover less than 25 000 euros can now report and account for their VAT yearly instead of monthly.

Conclusions from the case study

This case study analysed the reactions of firms to a recent change in the design of the VAT registration threshold in Finland. There are many kinds of actions firms are likely to take when turnover approaches the VAT registration threshold in order to avoid the compliance cost involved in crossing the threshold. The consequent behavioural distortions may have economic costs both in terms of a loss in VAT revenue and in terms of the decisions as to how much the firms produce, what they produce and whether the products are exported. Also the choices of consumers are distorted.

Tax data reveals that bunching has decreased each year after the reform, but there is still a large number of non-registered firms who seem to restrict their turnover just below the registration threshold of 8500 euros. One reason behind this is the compliance costs involved in paying VAT and in applying the tax relief. Especially in the Finnish case, where the threshold is fairly low, the importance of the fixed costs is likely to be large. The reform itself increased compliance costs, since the relief has to be applied. The studied group consists of micro firms and therefore such explanations as insufficient information about the reform may also play a role.

Is it possible to draw more general conclusions from this case study? It seems that compliance costs are important for small firms, as expected. There are also indications that the registered and non-registered firms have different initial ambitions towards growth. The effectiveness of tax incentives remain limited for those firms which are not growth-oriented.

On the basis of the Finnish experience, the introduction of a sliding VAT rate schedule is not the right solution for micro firmsthat are trying to avoid the compliance costs by not registering their businesses. The measure is likely to help some of the voluntarily registered firms to grow, but in the Finnish case, where the upper limit of the schedule is low, the real growth effects are not likely to be large.

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4 The costs of VAT: a review of the literature (CASE)

This chapter contributes towards answers to the following evaluation questions in the project Terms of Reference:

(1) To what extent do the current VAT arrangements for cross border supplies of goods and services maximise the potential of a genuine EU single market for businesses and customers (for both businesses and private individuals)? What is the range of GDP loss that could be attributed to the special rules, obligations and risks associated with EU trade? What are the related administrative burdens and collection costs? What are the main reasons for any infringements and/or fraudulent activity and their extent at EU level?

(2) To what extent is the current method of collecting VAT efficient, effective and robust, e.g. in terms of minimising the compliance cost for the enterprises and maximising the tax revenue for national administrations whilst preventing fraud?

(5) What are the cost and impacts of the current diversification of the VAT rates, including the reduced VAT rates, on compliance for businesses, in particular for cross border transactions, and on collection/control costs? What percentage of the member states' total consumption is subject to reduced VAT rates/ standard VAT rate?

(6) To what extent and how do the different cost factors of the VAT (i.e. compliance costs and other effects of the VAT regime) impact the medium/large and pan-European businesses?

(7) To what extent does the current VAT framework for small businesses help to create the right conditions for them to grow and prosper in the single market? To what extent and how do the different cost factors of the VAT (i.e. compliance costs and other effects of the VAT regime) impact them?

(9) What are the cost and impacts of the current national VAT arrangements applied in the member states on the bona fide traders in the context of VAT fraud?

It also contributes towards the following specific element:

(A) The evaluation should provide estimates of the total volume and value of domestic and cross-border (intra-EU and extra-EU) transactions carried out by pan-European enterprises and estimates of the administrative burden and compliance cost as a percentage of the total administrative burden and in euros. It should also enlighten estimates of differences in price-setting mechanisms between pan-European (linked) companies and businesses that are independent from each other, with a view of potential differences in VAT revenues collected.

Summary

This chapter provides a review of published economic literature on the definition and measurement of compliance costs for taxation and regulation in general (with emphasis on VAT and on the European Union), as well as of VAT evasion and fraud.

- The first section focuses on the administrative and compliance costs of VAT and related taxes, and discusses existing estimates of the level and structure of such costs. It begins by clarifying the sometimes confusing terminology found in the literature (e.g., compliance vs. administrative costs), and proceeds to review older and more recent estimates of costs borne by the public and private sectors. The main conclusions are as follows:

    1. With regard to ***administrative costs*** (those costs that are borne directly by the public sector, and indirectly by all taxpayers), the review shows considerable variation of overall tax administration costs among EU countries, suggesting the potential for efficiency improvements in at least several of them. However, little specific information is currently available to single out VAT costs, as most administrations are not organised by single tax, but rather by functions that cover a multiplicity of taxes. While the complexities of the tax systems undoubtedly add to the administrative

costs (including VAT), most likely other country-specific factors contribute to country differences.

2. With regard to ***compliance costs*** (those that are directly borne by VAT registered traders), over the past ten years or so the Standard Cost Model (SCM) has quickly become the standard-bearer among practitioners and policymakers to assess such costs and to set policy goals. While the SCM is not immune from criticism (having been criticised, for instance, for concentrating only on a subset of costs, for lack of consideration of market failures and imperfections, or for its assumptions of a "normally efficient" firm, etc), it has helped produce several country and global studies that allow comparisons over time and across countries. The general conclusions are that, in the EU as well as in the many other countries that have adopted VATs, (i) compliance costs are high and significant for individual businesses (but with estimates of the overall burden at the country level varying considerably in different studies depending on country circumstances and methodologies. Early studies for the UK, Australia and New Zealand reported compliance costs between 2 and 9 percent of VAT collected; more recent ones, applying the SCM methodology, ranged from the low of 0.3 percent reported in a study of Denmark, to as high as 8 or even 25 percent of VAT collected, as shown in studies of Croatia and Slovenia); (ii) compliance costs are regressive, in the sense that small businesses are more than proportionally burdened by compliance requirement (three times higher, for instance, in the case of Croatia); and (iii) compliance costs are not falling over time in the absence of policy action. Time and further research will tell what effects will be of the increasing adoption of e-filing procedures, and of the aggressive programmes of burden reduction initiated in a number of countries.

- The chapter also reviews compliance burdens linked to intra-EU trade and related reporting requirements, and concludes that these requirements present specific challenges, which are not borne by taxpayers which do not engage in cross-border trade. Specific burdens have been addressed over time with the extension of e-filing systems and other simplifications. It should be borne in mind that the burdens are also the results of the EU policy objective to monitor intra-EU trade through Intrastat, which now piggy-back on the VAT reporting requirements, but would obviously continue to exist even in the absence of a VAT. Further research is however warranted in this respect, given the most recent technological advances in data reporting that could be captured by up-to-date surveys.

- In the second section, the chapter takes stock of the existing quantitative and theoretical literature with regard to VAT evasion and fraud, with specific focus on EU countries. VAT evasion is a well-recognised phenomenon, with the most recent estimates of non-compliance putting the revenue loss for different EU countries in a (wide) range of some 2 to 30 percent of potential revenues, with an overall average of about 12 percent.

- Several reasons help explain VAT fraudulent practices. VAT specific and EU general policies have been recognised as major determinants of the compliance and enforcement environments that facilitate the emergence of fraud. Institutional factors include (i) the choices of base, rates, exemptions, zero rating, registration and return filing thresholds, rules on VAT refunds and the existence of parallel small taxpayers regimes; and (ii) two broadly recognised general EU policy principles that affect VAT fraud: the intra-European single market in force since 1993, and the application of the subsidiarity principle to tax administration which generates a second layer of differentiation in the actual application of the laws. Behavioral econometric studies point to variables such as the VAT burden, the trust in institutions and the prevalence of corruption, which can be construed to proxy the attitude of the taxpayer community vis-á-vis the state.

- Overall, this literature review points to several avenues for further research that might help policymaking, for instance in the better understanding of administrative costs for VAT (e.g., by applying the SCM model to tax administrations and related services); the effect of the increasing prevalence of e-reporting on compliance costs, particularly for intra-EU trade; and the trade-offs between the added compliance costs of (more) enforcement efforts and the revenue losses associated with laxer attitudes, just to cite three important examples.

4.1 Introduction

In the province of Germany it is quite clear that goodness and respect for religion are still to be found in its peoples … When these republics have need to spend any sum of money on the public account … each person presents himself to the tax collectors in accordance with the constitutional practice of the town. He then takes an oath to pay the appropriate sum, and throws into a chest provided for the purpose the amount which he conscientiously thinks that he should pay; but of this payment there is no witness save the man who pays.

> Machiavelli N, *The Discourses*, ed. Bernard Crick (Penguin Books, 1983), pp. 244–45.

Curiously, this rather imaginative description of Germany in the 16th century has a 20th century parallel in the vision of the libertarian thinker Ayn Rand (*The Virtue of Selfishness*, New York, Signet, 1964, p. 117):

> *In a fully free society, taxation –or, to be exact, payment for government services – would be voluntary. Since the proper services of a government – the police, the armed forces, the law courts – are demonstrably needed by individual citizens and affect their interests directly, the citizens would (and should) be willing to pay for such services, as they pay for insurance.*

In both these visions of an ideal, law-abiding society – one of a (probably imaginary) past and one of a (probably unrealisable) future – people would voluntarily pay the taxes they owe, and the task of the revenue administration would be little more than to provide the facilities for citizens to discharge this responsibility. Alas, no such country exists, nor—despite what Machiavelli may have thought—has it ever existed.

Compliance with tax laws does not occur without effort: it must be created, cultivated, monitored, and enforced in all countries. In economic terms, of course, effort is just another word for cost, and tax compliance costs have been a concern for centuries. One of Adam Smith's famous 'canons' of taxation, for instance, was that "(e)very tax ought to be levied at the time, or in the manner in which it is most likely to be convenient for the contributor to pay it."[65]

Although a few early attempts were made to measure the cost of tax compliance (e.g. Haig (1935)), the "father" of modern compliance cost studies was undoubtedly Cedric Sandford, who amongst many other works on the subject (e.g., Sandford 1973, 1994) produced the first detailed study of the costs of VAT (Sandford et al. 1981). In this report, we review much of the modern literature on compliance costs with particular attention to the costs associated with VATs, with particular reference to the existing VATs in the EU. We also consider some aspects of VAT fraud and non-compliance, as set out in the terms of reference.

[65] Smith, *Wealth of Nations*, quoted in http://www.progress.org/banneker/adam.html

This chapter is organised as follows. Section 4.2 provides a review of concepts with regard to different aspects of administrative and compliance costs; Section 4.3 reviews quantitative estimates of such costs; and Section 4.4 provides a discussion of non-compliance and fraud in the European VAT context, including available quantitative estimates, proposals for reform to reduce fraud, and some suggestive evidence on the trade-off between compliance costs and fraud.

4.2 Definition and Measurement of Compliance Costs

In recent years, a substantial body of literature has been devoted to the definition and, in many cases, the quantification of the costs of complying with taxation and with regulation in general. In the last decade or so, particularly but not exclusively in the European Union, an increasing proportion of this literature has taken the form of cost estimates based on the Standard Cost Model (SCM). As discussed below, the SCM is in effect a representation of a subset of the broader concept(s) used earlier in the broader Tax Compliance Cost (TCC) literature. This section provides a brief overview of the different concepts of burdens, drivers and methodologies found in both the SCM and the broader TCC literature. While these concepts are generally applicable to all taxes, we highlight VAT-specific issues when appropriate.

The Costs of Tax Compliance

A number of important definitional issues need clarification when approaching taxation compliance costs, particularly in view of not only the shifting debates within the EU but also the increasing use of the Standard Cost Model and related approaches recently popularised through such other influential publications as the World Bank's *Paying Taxes 2011*.

In a recent thorough review of the compliance cost literature, Evans (2008) provides a clear and broad definition of terms with respect to the costs of taxation:

> "Modern taxation systems have the capacity to impose a heavy burden on taxpayers, and particularly on small business taxpayers. That burden typically consists of three elements. In the first place there are the taxes themselves (…) Secondly, there are the efficiency costs (variously referred to as deadweight losses or excess burden), involving tax-induced market distortions. And finally there are the operating costs of the tax system: the costs to the government (ultimately borne by taxpayers) of administering and collecting the taxes (usually referred to as "administrative costs"), and the costs expended by

> taxpayers in complying (or sometimes not complying) with their tax obligations (usually referred to as "compliance costs")."

Evans (2008) goes on to note that "in addition to this generally accepted hard core of compliance costs, there are a number of other costs that need to be considered. For example, there is little doubt that there will always be a measure of psychological cost that is induced by the operation of the tax system. Taxpayers suffer stress, anxiety and frustration as a result of attempting to comply with their tax obligations. Unfortunately, no studies have yet managed to successfully quantify these psychological costs, although research in this area is now taking place." For this reason, we will not pursue this strand of the literature further in the present review, although James and Edwards (2010) list several interesting examples of behavioural and experimental research which appear to offer some promise of future practical relevance (e.g. Coleman et al. 2003). In particular, it is perhaps worth noting that at least one such study (Hasseldine and Hansford, 2002) suggests that psychic costs are positively associated with financial costs of compliance.

In most of the tax compliance cost (TCC) literature surveyed by Evans (2008) (and catalogued extensively by James and Edwards, 2010) the term *administrative costs* refers to the public budgetary costs associated with collecting taxes (including, of course, VAT). Confusingly, however, in such SCM-based studies as SCM Network (2005), this term has the very different meaning of the direct resource costs imposed on taxpayers, assuming full compliance with the law.

Equally confusingly to those familiar with the TCC literature, the SCM studies introduce the term *administrative burden* (AB) to mean those costs that are directly attributable to the various "information obligations" imposed on taxpayers by such regulations as VAT law and procedures, as distinguished from the costs – e.g. of registering a business -- necessary for simple "business as usual" (BAU) operation. Thus defined, "administrative burden" is of course a major component, but not the whole, of the "compliance costs" imposed by VAT on the private sector as discussed and measured in the broader TCC literature. That literature often considers not only the compliance costs imposed on the private sector by taxation but also the public sector's administrative costs. While in some instances administrative and compliance costs may be substitutes and in other instances complements, both constitute real resource costs -- the "operating costs" -- of a given tax system, and should be properly accounted for. Table 4.1—drawn largely from Sandford, Godwin and Hardwick (1989)—may help the reader disentangle the overlapping but distinct measurement approaches found in the

compliance literature. Most of the concepts listed in the table are discussed further in the next section.

Table 4.1
Compliance and Administrative Costs

Operating costs = Administrative + Compliance costs

A. Administrative (or 'enforcement') public sector costs

1. Budgetary costs of revenue department(s)
2. Costs incurred by other departments in providing information
3. Judiciary and other costs related to dispute resolution
4. Interest costs (of 'loans' extended by legal lags in collection)

B. Compliance costs incurred by private sector

1. Direct costs incurred by taxpayers or 'taxpayer costs'(time, labour cost, expert advice, other)
   (a) in complying with legal obligations ("involuntary" or unavoidable costs)
   (b) in tax planning and attempting to evade ("voluntary" or avoidable costs)
   (c) psychic costs (stress, anxiety, frustration)
2. Costs incurred by third parties (information providers, voluntary helpers)

C. Possibly offsetting compliance 'benefits' to private sector

1. Management benefits (from improved accounting required for tax purposes)
2. Cash flow benefits (the private sector side of A.4)

D. Net compliance costs = B-C (in addition, some costs may be reduced to the extent they are tax deductible)

Comments:

[1] The SCM model essentially attempts to measure B1(a) – which it calls "administrative burden" – distinguishing it from what is rather confusingly called "administrative cost", by which is meant the ordinary costs of running a business as opposed to the narrower concept of the costs of complying with the specific 'information obligations' imposed by a particular law.

[2] Since there may be substantial 'start-up' costs for both the public and private sectors when tax laws and procedures are changed and even the initial operating costs may be reduced ('learning effect') over time, it is sometimes important to distinguish initial from ongoing costs.

Cost Drivers: Administrative and Compliance Costs

Taking as given the standard (OECD 2011) definition of administrative costs as the resources devoted by governments to administer and enforce taxes and regulations (including VAT),[66] a number of studies over time have looked at what makes countries more or less efficient and effective in these tasks. OECD (2011) provides a detailed, and often quantitative, comparison of tax administration practices in EU member states, among others. Unfortunately for our purposes, though understandably, since modern tax administrations are organised not by tax but by function, increasingly with some segmentation of key taxpayer groups (such as large businesses), none of this information is provided on a 'tax' (e.g. VAT) basis. In any case, valuable as they are, the OECD data can only be used for comparative purposes with great care owing to the many comparability problems that remain to be sorted out.

For a first attempt to incorporate some of this information in a more systematic cross-country study, see Slemrod and Robinson (2010). In recent years, a number of attempts have been made to compare such costs, mainly in developing countries, as discussed by Gallagher (2005). In addition, careful studies have been made of the operational efficiency of tax offices in a number of countries such as Belgium (Moesen and Persoon 2002).[67]

Although conceptually quite distinct, administrative costs and compliance costs share certain "drivers": for example, more complex regulations increase the burden on taxpayers and generally also require higher managerial resources on the part of enforcement agencies. However, the burden on the two sides of the process—the taxer and the taxed—is likely to be quite uneven, may differ sharply in different sectors, and at different times and, in the case of VAT, may depend to a considerable extent on such features as rate structure, thresholds, integration with other business taxes, etc. (Cnossen 1994, Evans 2003). Among the 'drivers' of administrative costs – and to a considerable extent of compliance costs also – identified in the literature are:

1. The complexity of legislation (the number of 'lines' to be drawn – exclusions, exemptions, deductions; rate differences; goods/services distinctions, etc.;

[66] The most useful general discussion of defining administrative costs probably remains that of Sandford, Goodwin and Harwick. (1989).

[67] Other relevant country studies of aspects of this issue, with varying degrees of sophistication, include Hunter and Nelson (1995) on the United States, Klun (2003) on Slovenia, Serra (2005) on Chile, Forsund et al. (2006) on Norway, and von Soest (2007) on Zambia.

frequency and nature of changes; costs involved in explaining legislation, making rulings and determinations, etc.). Distinguishing set-up (initial, implementation) costs of changes in these factors from on-going recurrent costs is not always easy.

2. Procedural requirements—the number of returns[68]; requirements for supplementary documentation; treatment of cross-border transactions; and, of course, registration. The latter is an especially key factor in VAT because possession of a VAT number carries with it the potential to, in effect, write a payment order on the Treasury without the Treasury approving it or even being aware of it.

3. The size and nature of clientele (number of taxpayers; structure of economy and of business sector; the importance of B2B (transactions between VAT registrants) relative to B2C (transactions with non-registrants); cross-border transactions; size of threshold). In this connection, note that there are 'marginal costs' associated with the growth of the taxpayer population as well as with policy and procedural changes, and that these categories should in principle be distinguished.

4. The difficulty of verifying 'self-assessed' information, which varies with such factors as the size of the informal sector; the extent and nature of links between formal and informal sectors; 'border effects' on information flows; the extent to which efforts are made with respect to verification and chasing down suspect cases[69]; extent of e-invoicing; and the role played by tax professionals – accountants in particular.

Compliance Costs and the Standard Cost Model (SCM)

There is also debate about what should be included in the measurement of tax compliance costs. Tax compliance costs are those costs "incurred by taxpayers, or third parties such as businesses, in meeting the requirements laid upon them in complying with a given structure and level of tax" (Sandford, Godwin and Hardwick, 1989, p. 10). Paraphrasing Evans (2008), while this is an area in which there will always be debate, it is possible to identify a "hard core" of costs that are indisputably part of the costs of complying with tax requirements. Typically these will include:

[68] For example, the "barriers to business" studies of the World Bank place considerable weight on the number of returns.

[69] To illustrate, business surveys (such as KPMG 2010)) often find that the highest and most troublesome operating costs are those associated with audit. Interestingly, OECD (2011) shows that such costs are equally prominent on the other side of the taxing equation.

- the costs of labour/time consumed in completion of tax activities. For example, the time taken by a business person to acquire appropriate knowledge to deal with tax obligations such as VAT; or the time taken in compiling receipts and recording data in order to be able to complete a tax return;
- the costs of expertise purchased to assist with completion of tax activities (typically, the fees paid to professional tax advisers); and
- incidental expenses incurred in completion of tax activities, including computer software, postage, travel, etc.

Involuntary vs. voluntary costs

Evans (2008) also notes that there is contention over other aspects of the precise boundaries of compliance costs. For example, compliance costs are sometimes divided into computational (unavoidable or involuntary) and tax planning (avoidable or voluntary) costs (a distinction first made by Johnston (1963)). Many tax lawyers and policy-makers continue to insist that only computational costs constitute legitimate measures of tax compliance costs, and some attempts have been made to disentangle the two (Pope, Fayle and Chen, 1991).

However most major modern studies (for example, Sandford, 1973; Sandford, Godwin and Hardwick, 1989; Allers, 1994; Evans, Ritchie Tran-Nam and Walpole, 1997) have not distinguished computational and tax planning costs in their estimates of compliance costs – if only for the obvious reason that it is often almost impossible to disentangle the one from the other. Moreover, as noted by Slemrod and Sorum, "both kinds of costs are real resource costs of collecting the taxes" (1984, p. 461). Despite these sound comments, the SCM approach does attempt to distinguish these costs essentially, as discussed further below, by assumption.

Social vs. private (taxpayer) costs

Evans (2008) also points to the distinction between what have variously been termed total, gross or social compliance costs and net or taxpayer compliance costs (Allers, 1994; Evans, Ritchie, Tran-Nam and Walpole, 1997), i.e. the costs to the economy vs. the costs directly borne by taxpayers. Social compliance costs tend to be less than taxpayer compliance costs for two reasons:

- In the first place there are various offsetting benefits that may be generated for taxpayers as a result of compliance with their tax obligations. These include, fairly obviously, certain cash flow benefits that may arise as a result of the timing difference between receipt of funds and payment of tax relating to those funds. Most modern empirical studies quantify the value of these benefits with some certainty. Less obviously, managerial benefits may also occur as a result of tax compliance. For example, better accounts and record keeping may lead to improved business decision-making and reduce the costs of audit for small businesses, resulting in lower accounting fees. Two major studies in the UK attempted, somewhat imprecisely, to quantify the managerial benefits generated for business taxpayers, and concluded that the value of these managerial benefits can be quite significant (Sandford, Godwin, Hardwick and Butterworth, 1981, p. 96; National Audit Office, 1994, pp. 19–20).

- Secondly, net taxpayer costs – though not social costs – may be reduced to the extent that they are deductible in computing income tax liability. The tax deductibility of business taxpayer compliance costs has also been taken into account in a few of the major studies but not in most. The three major studies that appear to have factored in a value for the tax deductibility of certain compliance costs are those conducted by Johnston (1963), Allers (1994), and Evans, Ritchie, Tran-Nam and Walpole (1997).

The Standard Cost Model

The Standard Cost Model (SCM), developed in the 1990s in the Netherlands and quickly became the standard bearer of the definition of compliance costs for practitioners, particularly in Europe. The spread of the reach of the SCM is little short of phenomenal. Its features are discussed in a "manual" now widely in use among practitioners (see International Working Group on Administrative Burdens (2004)). Other useful references include Wegrich (2009), from which Box 4.1 is adapted, as well as a very vibrant on-line debate, best represented perhaps by the network Standard Cost Model, which maintains a growing website community of practice at http://www.administrative-burdens.com/.

As Box 4.1 discusses, the SCM per se did not introduce particularly innovative concepts or techniques to estimate compliance costs by taxpayers. Its strength, which makes it so appealing to spontaneous replication across many administrations and professional circles, lies in its accounting-like methodology, which promises to quantify

costs based on an assumed real-life simulation of what it takes to comply with legal and administrative whims. In some countries, as discussed in the next section, this approach has produced apparently precise estimates of costs of regulation and taxation (among which VAT features prominently), which have then been used to set the stage for a public debate on creating better business environments. The SCM is also at the root of the World Bank's *Paying Taxes* (2011) methodology, as we discuss later, and this methodology may, over time, produce even more powerful effects on public policy debate, as have the more general indicators and rankings included in the Bank's broader *Doing Business* (2011) studies.

In addition to being restricted to a subset of compliance costs, the SCM is not immune from other criticism. In particular, Weigel (2008) has argued that the model is deficient for a number of reasons:

i) the lack of explicit consideration of the market failures which gave rise to information obligations, which may lead to economically flawed results because the simulation assumes that the costs attributable to the IOs may be eliminated with no detriment to the efficiency or coverage of the tax;

ii) the disregard of other market imperfections that permit strategic actions that may lead to errors in the assessment of tax obligations;

iii) The disregard of the variation in costs of compliance by assuming a "normally efficient" firm—a methodology that to some extent makes the overall result of the exercise almost arbitrary, and certainly far from statistically representative;

iv) Finally, other reasons may lead different firms to perform differently (such as those suggested by the theory of X-inefficiency), so that the reactions of firms to changes in the reduction of compliance burdens may be quite different from those suggested by the SCM numbers (and presumably desired by policy makers).

Box 4.1. The Standard Cost Model: Rapid Deployment of a Simple Technique

The SCM policy template was developed starting in the early 1990s in the Netherlands (cf. WIFO-CEPS 2006; OECD 2007). The perception of increasing regulatory burdens was a recurring theme on the public sector reform agenda in the Netherlands (Larsen 2006; Toonen and van den Ham 2007). The idea of measuring and quantifying regulatory burdens was part of this debate. However, earlier attempts to measure overall costs of regulation were frustrated by the perceived complexity of such an approach, and also by difficulties in accounting for benefits of regulations.

Rather than developing increasingly complex solutions to these problems, policy development was guided by the idea of reducing complexity by focusing the measurement on a specific component of regulatory costs, namely what came to be defined as administrative costs (see text discussion for semantic differences with earlier literature). Administrative costs in the SCM are defined as those parts of the regulatory (or compliance) costs that are imposed on firms by specific information obligations (IOs) included in laws or secondary legislation. Administrative costs thus defined are then distinguished from so-called *substantial* compliance costs, i.e costs attributable to compliance with regulatory standards (such as emission standards). While the boundary between administrative and substantial costs is difficult to draw and those two types of regulatory costs are clearly related, the key idea is to quantify those costs that are easy to measure in order to permit the setting of quantitative targets for reducing administrative burdens.

The method for measuring administrative costs was developed by research organisations and consultancies over a decade and tested in various pilots. Unlike approaches assessing administrative costs accumulating in companies by focusing on single regulations, the main idea of the SCM is to start from information obligations included in legislation, calculate the time (hence: costs) of work needed in a company to comply with this obligation, and then sum up the number of 'cases' (frequency of occurrence and number of companies affected by the information obligation). The total cost calculated for all the individual information obligation of a regulation is regarded as the quantification of the administrative cost of this regulation. While the calculation of the costs of complying with information obligations is based on information gathering activities, such as interviews or, in some cases, actual time measurement (stopwatch approach), the tool is not meant to present either an exact measurement or a representative sample of the actual costs of compliance for companies. Rather, the idea is systematically to assess what the costs would be in a 'standard' process of compliance with the information obligation. Experiences with the measurement exercise, the development of databases etc. and comparative 'benchmarking' are said to enhance the precision of the assessment. Nevertheless, the quantification remains a proxy of a cost measurement that is supposed to allow tracking change (as well as benchmarking across jurisdictions) over time and hence evaluate the effectiveness of reduction measures. The method does not account for different administrative implementation styles of regulations in terms of over- or under-enforcement by agencies, and of course takes no account of any possible benefits from the regulations, e.g., by improving management's information on operations.

Diffusion of the SCM policy template in Europe

From its very inception, the SCM has enjoyed almost unparalleled popularity among both practitioners and policymakers, and consequently it has rapidly spread as the standard tool for quantification of costs of taxation and regulation, particularly in the EU. Taking for instance the starting point as 2003 when the Netherlands carried out the SCM baseline measurement (accounting for all regulations as by end of 2002), by 2004, only two other countries were engaged in any activity of administrative costs measurement and reduction. However, by the end of 2007, 15 out of 29 EU-25/EFTA member states had developed such programmes (with two further countries having expressed the general plan to engage in SCM measurement exercises). Almost all EU-15 member states have adopted this approach. Moreover, so have two larger EFTA countries (Norway and Switzerland). As yet, however, smaller EU-15 member states, most of the new member states of the 2004 enlargement and the two small EFTA countries have done relatively little along these lines. Still, the scope of diffusion in western Europe is striking – all larger western European countries are involved in some kind of emulation of the SCM policy template. Interestingly (but beyond the scope here), South Africa was the first non-European country to adopt the SCM approach, and other non-European countries (Australia, Canada, US, Australia, New Zealand) are involved in the OECD's project related to the SCM method (Red Tape Scoreboard, OECD 2007).

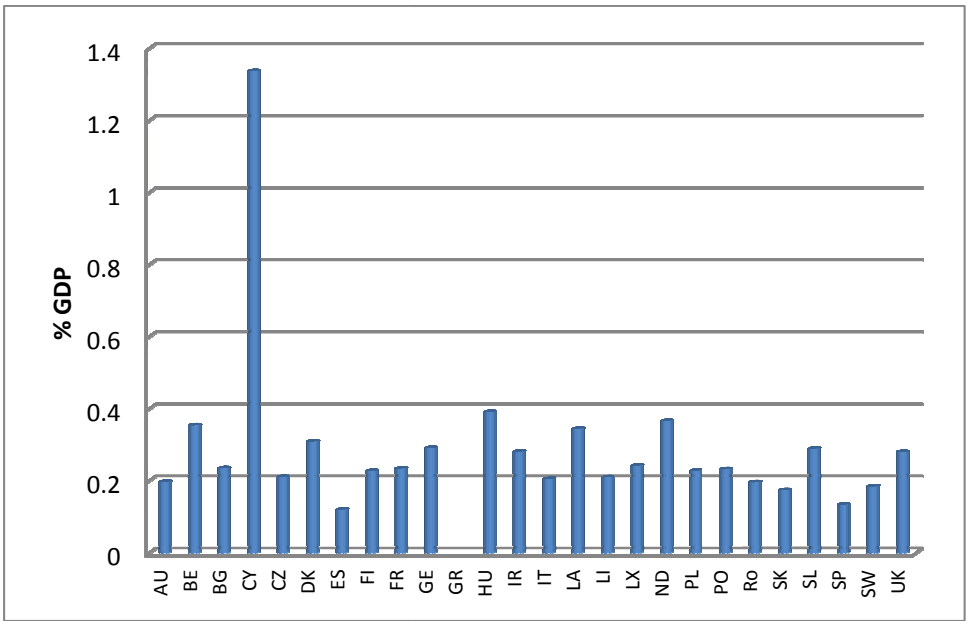
4.3 Estimates of Compliance and Administrative Costs

With the observations just discussed on concepts and definitions, we now review in turn evidence on administrative and compliance costs.

Administrative Costs

Administrative costs imposed on the public sector by VAT are largely captured in the budgetary allocation of the revenue department(s). The OECD (2011), in its biannual publication on comparison of tax administration performances, provides detailed country-by country data on budgetary allocations for different tax administration (though not divided by tax, something which is obviously very difficult to quantify with precision). Figure 4.1 provides a snapshot for 2009, the latest comparable data period (note that Greece does not report such data).

Figure 4.1. Tax administration budgetary allocations



Thus defined, tax administration costs in the EU averaged 0.29 percent of GDP, ranging from a minimum of 0.12 percent in Estonia to 1.3 percent of GDP in Cyprus (an outlier, with the second-highest country being Hungary with 0.34 percent of GDP). Although the OECD study warns of the pitfalls of international comparisons of such ratios, it also

provides data on other measures of administrative efficiency of such expenditures, such as the ratio of expenditures to tax collections.

Of course, not all administrative costs are attributable to VAT. On the other hand there are additional administrative costs that can and should also be taken into account e.g., other government departments, judiciary, etc.[70] It should also be mentioned that budgetary numbers often do not convey the economically relevant facts: for example, many countries do not charge appropriate 'rents' for the office facilities used by tax agencies to the budgets of those agencies and capital outlays (e.g. not simply buildings and computers but also such outlays as training costs and 'taxpayer services') are seldom depreciated appropriately from an economic perspective. In sum, it appears that as yet no attempt has been made to develop as detailed an approach as the SCM to allocating the costs of tax departments to the various ways and amounts in which real resources are devoted to either on-going VAT activities or the impact of changes in legislation or procedures.

Partly because of the increasing extent to which tax administration is organised by function rather than by tax, little information on administrative costs by tax is available In the UK, however, a recent report shows that the cost of administering VAT in that country is 0.7 percent of VAT revenues.[71] Occasionally other countries' budgets, annual reports, etc. provide information on the estimated costs of changes in various aspects of VAT administration.[72] As an example, the recent incorporation of the provincial sales tax into the national VAT system was reported in the budget of the province of Ontario to reduce the province's administrative costs by $500 million in 2010-11: although no details were reported, it is likely that this outcome reflects the fact that the new tax, unlike the previous provincial sales tax, would be administered at no cost to the province by the Canada Revenue Agency.[73]

Overall, in this area what has been done in terms of understanding of and estimating administrative costs appears to have been governed far more by the availability of data than by any rigorous consideration of what should be done to obtain the most useful or

[70] See for one such wider approach Vaillancourt, Clemens and Palacios (2008), for Canada.
[71] See p. 13 of http://www.hmrc.gov.uk/about/annual-report-accounts-1011.pdf
[72] For a detailed consideration of comparative information on the costs and requirements of administering a tax system, including a VAT, see Australian Government (2007), a research guide which compares approaches to information management, risk management and internal organisations among several large administrations (Australia, Canada, United States, the "OECD model", etc.).
[73] See http://www.fin.gov.on.ca/en/budget/ontariobudgets/2010

relevant measures for the purpose at hand. Of course, this is both understandable and acceptable; but perhaps more thought should be given to how we might obtain the 'correct' economic information or at least to thinking about the possible extent and direction in which the numbers we do have might be altered if we were able to take such information—even if it proves unattainable in practice—into account.

Estimates of Compliance Costs

The SCM approach

The spread of the SCM discussed above has produced a flurry of estimates of compliance costs by countries, some of which are based on very detailed analyses of business processes and obligations resulting from tax legislations and other regulations.

KPMG (2006) reports a detailed study of the "administrative burden" (compliance burden in our terminology) for a number of tax and other obligations for the UK for the year 2005. According to the study, the total compliance burden can be quantified at £5.1 billion (or about 0.42 percent of GDP), of which costs attributable to VAT would amount to about £1 billion, or 0.08 percent of GDP. The report also provides estimates of costs based on types of obligations, as well as on the size of the business units. As is typical in such studies, smaller businesses (if subject to VAT obligations) are reported to bear a disproportionately large share of the total burden.

SCM Network (2005) reports estimates of what it labels the "administrative burden of VAT" calculated using the SCM methodology for four countries (Denmark, Netherlands, Norway and Sweden) and based on the structure of VAT as of 2003 for each country. As shown in Table 4.1, this SCM concept is roughly equivalent to what other studies term compliance costs (i.e. those costs incurred directly by taxpayers) and we therefore use the term "compliance costs" for consistency and simplicity. According to this study, compliance costs on businesses (per average business unit) range from a low of Euro 180 in Denmark (which, multiplied by the number of businesses reported by the study, yields a "total cost" amounting to 0.3 percent of VAT collections, or 0.03 percent of GDP), to a high of Euro 807 for the Netherlands (for a total of 2.17 percent of VAT collections and 0.17 percent of GDP), with Norway at Euro 430 (0.64 percent of VAT collections and 0.06 percent of GDP) and Sweden at Euro 344 (0.75 percent of VAT collections and 0.07 percent of GDP). The authors advance a number of explanations for this wide range. Inspection of the rate structure, filings, thresholds, registration requirements etc. reveals a number of differences across countries that

without pointing to a single culprit, give food for thought. For instance, it is notable that Denmark is the country of the group with the least differentiation in rates, so that the other countries' businesses are burdened with somewhere between 2 and 48 extra hours per year for the administration of multiple rates. Similarly, Denmark's filing procedures are more lenient than in Norway or Sweden, again resulting in cost advantages for Danish businesses. For example, a business with limited liability and a turnover of 200 000 euro must file four times per year in Denmark, six times per year in Norway and 12 times per year in Sweden. The differences between the countries can also be seen by looking at the proportion of businesses in each respective country that file different number of times per year. 44 percent of the businesses obliged to pay VAT in Sweden file 12 times per year, in Denmark the same proportion is only 10 percent.

For SCM studies of the new EU members and candidate countries, see Klun (2003) for Slovenia, and Blažić (2004) on Croatia. The latter specifically addresses the issue of regressivity of taxation (and of VAT in particular). It finds that VAT compliance costs amount to 3.9 percent of turnover for individual entrepreneurs, while falling to 1.5 percent for firms with more than 6 employees. The study comes to the conclusion that "The regressive effect of tax compliance costs is proven in the case of Croatian small business (businesses that pay personal income tax), even with respect to micro businesses. In the cost structure the time cost, predominantly the owner's time, is predominant" (Blažić 2004, p. 15). The study produces an overall estimate of the VAT burden in the range of 16-25 percent of VAT collections, an astoundingly high figure attributed to the still-recent introduction of VAT when the study was conducted.

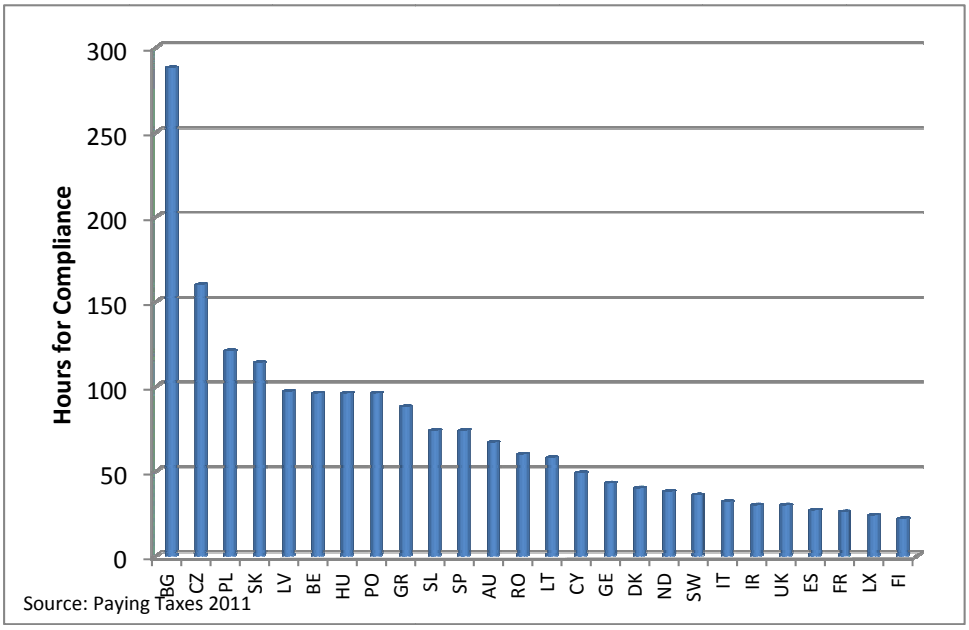
Another approach to the use of the SCM (again, not limited to VAT taxation) concerns the performance of public institutions in reducing the cost of doing business through streamlined/reduced/abolished regulation. As an example, see Agence pour la Simplification Administrative (2009), which reports on detailed cost reductions by government departments in Belgium, in the context of a multi-year programme for simplification (no such studies seem to have concentrated on VAT). [74]

The World Bank/International Finance Corporation (IFC) (in collaboration with PriceWaterhouse Coopers/PWC) has developed and publicised an ambitious and wide-

[74] For a discussion of the potentials for application of the SCM to the case of Italy, see Cavallo et. al. (2007).

ranging effort to quantify compliance costs using the SCM methodology.[75] The main value added from this work comes from the comparability of results across countries, and over time. The methodology employed produces cost estimates in the form of man-hours required to fulfil different types of tax obligations. It thus shares with other SCM studies the shortcoming of not estimating actual as opposed to theoretical costs. Nor does it yield cost estimates that can be related to tax avoidance or tax evasion activities. *Paying Taxes* is not concerned at all with administrative costs as discussed in the preceding section. It does, however produce figures on consumption tax compliance burdens (of which VAT is the overwhelming component) that are, by design, comparable, as shown in Figure 4.2.

Figure 4.2. Consumption tax compliance burdens



As one can see, the *Paying Taxes* methodology results in a tremendous range of "potential" burden to taxpayers (and by extension to the national economy) from compliance with taxation requirements, with some of the more recent members

[75]For the latest Paying Taxes 2011 Report, see http://www.doingbusiness.org/~/media/fpdkm/doing%20business/documents/special-reports/paying-taxes-2011.pdf. Also available on the website are a number of more detailed country studies, e.g. Ukraine, Armenia, South Africa.

imposing very high hourly requirements (Bulgaria being a stupendous outlier), and the more advanced/older member economies being at the low end of the spectrum.[76]

The *Paying Taxes 2011* study also offers six general lessons and one interesting observation on the relative importance of the drivers for compliance costs (in terms of time requirements), based on the universe of all the 145 countries where VAT (or a VAT-equivalent tax) is present. These lessons are:

i) It takes less time on average when VAT is administered by the same tax authority as corporate income taxes (a similar lesson on the benefits of different taxes being administered by the same authority is drawn by a recent World Bank study on costs and benefits of integrating tax administration (World Bank 2010));

ii) It takes less time on average in countries where business uses online filing and payment (see on this OECD (2010), esp. Tables A8 and A12);

iii) The frequency at which VAT returns are required impacts the time to comply;

iv) The more information is required in the VAT return, the more time is needed[77];

v) The requirement to submit invoices or other documents with the return adds to compliance time;

vi) Changes to the rules and regulations can increase compliance time.

An interesting observation is that there is a positive correlation between the VAT compliance burden and the time delay in receiving a VAT refund.

[76] Note also that the data for the Netherlands in Figure 2 is sharply lower than the one reported by the just-quoted SCM study: this is a reflection of the simplification programme embarked upon in 2005 by the Dutch authorities, which has resulted in steadily declining hours for complying with taxes as documents by the various *Paying Taxes* reports.

[77] To cite a rather old example (Bird 1999), in the early 1990s at around the same time the VAT return in the UK, a country with perhaps the most complex VAT in the EU in some respects, was simplified to one page, Poland, then a relatively new VAT adopter, increased the number of items required on VAT forms from 61 to 105 on a form that called for 12 separate arithmetical manipulations. The design of tax forms – the direct interface (whether in paper or web form) between taxpayers and the administration – and in particular not asking for information that is not directly relevant and is seldom used, remains an important and too often inadequately considered driver of compliance costs.

Comparison between SCM measures and the TCC literature

The definition of compliance costs by Evans (2008) cited earlier in many ways approximates more or less what the SCM *administrative cost* measure attempts to measure through its survey-cost allocation procedure. In addition, however, as mentioned above taxes may occasion both psychic and social costs that are obviously not included in such measures. Such costs, however, seem sufficiently politically relevant to be recognised in some EU-related work in general terms as *costs of irritation* or *perceptual* aspects of taxation that should be taken into account in developing ways of redressing problems with the present VAT system. Obviously, such "soft" notions are difficult to quantify and even harder to interpret meaningfully.
A more important difference between most compliance cost studies and the SCM work mentioned earlier is that the latter explicitly excludes three components of compliance cost included in most other studies in the TCC literature:

- costs (and benefits) not directly reflected in outlays or attributable to simply being in business rather than being taxed,
- costs incurred by others than direct taxpayers,
- and costs related to activities facilitating not tax payment but tax non-payment through (legal) tax avoidance or (illegal) tax evasion.

The first of these exclusions is presumably in accordance with the mandate of the EU studies to measure the direct *administrative burden*—as defined earlier—on taxpayers. While the EU studies do clearly try to disentangle *tax* compliance costs from *business-as usual* or *core* accounting costs they inevitably do so, as did earlier studies (like Plamondon 1993) on the basis of expert judgments that are inherently rather arbitrary. On the other hand, this approach deliberately omits some relevant resource costs (and benefits) of VAT compliance. Again, most of these factors were set out fairly clearly in the pioneering book by Sandford et. al. (1981) such as the opportunity cost of cash-flow benefits (and costs) and the possible *managerial benefits* accompanying the requirement for better accounting in a VAT system. Evans (2008) refers to estimates including such factors as estimates of 'social' rather than 'taxpayer' costs.

One reason such omissions matter is because they may affect the significance of the results emerging from the SCM approach. As an illustration, note that the cash-flow aspects of public and private costs do not cancel out because the two sectors can borrow at different rates. Moreover, within the private sector any gains from such interest-free

loans are presumably much more valuable to smaller businesses facing higher borrowing rates. Smaller firms are also of course those most likely to gain from having 'better accounting' practices forced upon them for tax compliance purposes. Both these factors may to some extent mitigate the market regressivity of the "gross" VAT compliance costs reported in most studies.

A point that is not often mentioned in the literature is also related to the nature and size of businesses. Consider two businesses, both of equal size but one engaged in manufacturing and one in services. Both have the option (common in many countries) of paying a 'presumptive' (flat-rate output tax) or being in the VAT system. The service business, which purchases little from other firms, has little to gain by recouping input VAT and, if it is mainly B2C, much to gain by being subjected to a lower output tax (and of course even more if it is completely outside the system, e.g. in the informal sector). The manufacturing business by definition is more dependent on purchased inputs and is also more likely to sell to e.g. distributors rather than final consumers directly. Hence it has much more B2B on both sides of the sales-purchase journal. Its calculations in choosing to opt out of VAT are thus more difficult than those of the service firm and depend in part on how its payment terms to its suppliers and its customers are related to each other and to the payment (and grace) periods of the VAT system as well as on the relative compliance costs of the full VAT vs. the simplified systems provided in most EU countries for small businesses. In principle, if small manufacturers sell mainly to VAT registered firms, they would presumably choose to register voluntarily even if their level of operation is below the VAT threshold. However, in countries with large and persistent 'informal' sectors, in which considerable trade takes place among non-registered firms, the choice may be much less clear.

Cross-Border Transactions in the EU and Compliance-Administrative Burdens

As discussed, the theoretical literature and some empirical evidence point to the multiplicity of requirements of VAT (as for other taxes and administrative rules) as a direct driver of the compliance costs firms have to bear (and, to some extent, also of the costs borne by tax administrations). Multiple VAT rates and exemptions oblige firms to keep more complex accounting codes and records. Furthermore, EU-based taxpayers face additional burdens when they engage in international trade, both intra-EU and outside the EU. In addition to having to comply with domestic regulations, exporters to other EU members have to accommodate importing countries' specific sets of rules affecting their cross-border. Differential requirements for dealing with different tax

administrations are the determinants of the intra-European-generated additional transaction costs: to take an extreme example, even a small number of transactions with a country can impose a large cost, if it obliges a firm to set up and maintain a separate accounting code and recording system. So long as the application of the VAT rules across the 27 member States varies, small businesses will undoubtedly continue to have considerable difficulty in understanding, let alone complying with, intra-EU trade. For such firms, intra-EU trade may thus be at least as burdensome, and perhaps even more so, than trading with countries outside the EU. Unfortunately, there appears to be little empirical evidence bearing on this issue

The introduction of the Single Market, as discussed in Section 3.2, was meant to result in a reduction in compliance costs from intra-EU trade, chiefly through the abolition of customs declarations.[78] Verwaal and Cnossen (2002) have however argued that the statistical requirements that were put in place to allow identification of VAT-taxable transactions and to help record trade among member states (the Intrastat system) have resulted in a substantial burden for exporters, which they estimate at 5 percent of the value of trade, with wide variation according to size (and country). Interestingly but not surprisingly, the availability of e-filing systems is a major reducer of compliance costs.[79] These findings (based on a survey conducted in 1996) are quite sobering compared to previously-published studies, such as the 1997 assessment by the European Commission (Commission of the European Communities (1997)) which argued that compliance costs for firms engaging in intra-EU transactions had been reduced by approximately two-thirds. Unfortunately, again there seems to hve been little subsequent empirical examination of these questions. A partial exception is the European Tax Survey of 2004 (Commission of the European Communities, 2004a). This work consisted of a survey of roughly 700 European enterprises subject to VAT taxation, and some of which engaging in intra-European trade. It found that "VAT compliance costs appear particularly high for companies that undertake activities in

[78] We can also surmise that, following the adoption of the Single Market, administrative costs for national tax agencies may have increased as tax administrations had to quickly provide access to the new ex-post filing and IT systems to deal with the new procedural dimensions of the tax. But again, no cost accounting of tax administrations was found in the literature to substantiate or refute this hypothesis.

[79] Firms engaging in EU trade beyond certain thresholds are expected to file EC Sales lists for VAT purposes. These lists include details on individual transactions and VAT identifiers of corresponding traders, and are to be used by tax authorities of the trading countries to verify the legitimacy of the VAT claims that may arise (see the following discussion on the problem of Carousel Trade). These Sales Lists can be filed, depending on the individual countries, manually, electronically or via the internet. See for an example of the UK system:
http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageImport_InfoGuides&propertyType=document&id=HMCE_PROD_009770

other EU member states without having a permanent establishment there and companies that incur VAT on inputs in other EU member states"—this being a subset of all companies engaging in intra-EU trade. However, due to the nature of the survey instrument, it was difficult to point to specific factors, other than "administrative complexity" that could be addressed by policy.

Verwaal and Cnossen indeed offered policy suggestions (including the abolition of the Intrastat System for VAT-liable persons with intra-EU transactions, and a system of compensation for firms with small amount of intra-EU transactions). The EU, in turn, modified the Intrastat system in 2004, with a view to making it more transparent (but not, apparently, less onerous for firms), see European Parliament (2004). In the absence of follow-up surveys, it is difficult to gauge the extent to which the Verwaal and Cnossen findings have been superceded by the subsequent reforms in administrative requirements.

It should also be noted that at least some of the compliance costs identified by Verwaal and Cnossen are not directly related to the existence of the VAT *per se*, but rather to statistical requirements which presumably might exist even in the absence of a VAT (though linked to VAT reporting in the present institutional context). There is an interesting perspective on the issue of the statistical burden coming from Intrastat itself: "For all trade operators involved, Intrastat meant a lighter workload compared with the previous system before 1993 where any intra-Community trade transaction had to be declared and presented to Customs. But in these times the respondents were often not aware of the fact that their reporting obligations for foreign trade statistics were fulfilled when lodging a Customs declaration. With the introduction of the Intrastat system the statistical reporting burden became apparent." (European Commission –Eurostat (2007))

Overall, there is surprisingly little recent empirical evidence on the actual compliance costs borne by firms in EU countries attributable to cross-border trade within the EU or with non-EU countries. As an example, the SCM (and Paying Taxes) studies typically do not consider firms engaged in exporting activities. Although extending coverage to such firms would raise no new conceptual problems, it could be potentially costly to implement, since cross-border costs may vary from country to country (both within the EU and outside).

Private sector contribution to compliance, compliance costs and VAT fraud analysis

It is appropriate in our review to touch even briefly on an important (and growing) element in compliance (and fraud analysis) practice--the presence of private-sector advisors. Casual web searches reveal substantial offerings by practitioners. Indeed, judging from the great amount of possibly good advice found on the Web, the "compliance market" is probably larger than the "fraud market"[80].

The compliance market offers complete and partial solutions to compliance and compliance costs by making available compliance alternatives claimed to be both legal and more efficient. For example, SAP's well known Integrated Management Information System (IMIS) offers a VAT add-on to SAP[81], fusing VAT compliance with accounting compliance. Others--such as IBM--have developed VAT country-specific software and made it part of their IMIS[82]. Still others have developed parallel systems like central banking transactions that may in the end be useful for VAT tracing[83]. Finally, the private sector offers ethical perspectives on compliance and fraud[84]. This work complements and broadens some of the perspectives of the studies commissioned by the EC from other private tax advisory firms.

What do the Studies Show?

Table 4.2 (based largely on Evans 2003, supplemented with additional studies from Vaillancourt, Clemens and Palacios (2008) and augmented with the SCM VAT studies discussed above) gives a bird's eye picture of existing quantative studies of VAT-related compliance costs for various classes of taxpayers in a number of countries. All these studies (along with those earlier reviewed by Cnossen (1994)), agree to varying

[80] An alternative interpretation might perhaps be that the prevalence of private providers of tax advice on how to comply may reflect to some extent the inadequacy of – or lack of trust in – official advice: to the extent there is any truth in this argument, increased private compliance costs are clearly to some extent at least substituting for public administrative costs, although no one seems to have considered seriously the costs and benefits of such a substitution (though see the general considerations in Shaw, Slemrod and Whiting (2010)).

[81] ***A turn-key solution to overcome the pitfalls and shortcomings within SAP's VAT determination and reporting logic.*** http://www.meridianglobalservices.com/vat-add-on-for-sap/

[82] ***IBM - Sterling Commerce*** June 24, 2010 http://eeiplatform.com/2350/survey-companies-risk-fines-for-non-compliance-with-cross-border-invoicing-regulation/

[83] http://www.europa-nu.nl/id/vil6ib65lmzi/nieuws/nadere_toelichting_op_enkele_europese?ctx=vg9pk7ho53zu

[84] *Clients: Increased emphasis on corporate compliance. Calling time on international bribery*. Clifford Chance. Available at: http://www.cliffordchance.com/about_us/annual_reviews/annual_review_2010/clients/calling_time_on_international_bribery.html

extents with three 'big lessons' put forth by Evans (2008), which apply to all compliance costs and certainly to those associated with VAT:

1. Compliance costs are high and significant
2. Compliance costs are regressive
3. Compliance costs are not falling over time

Regarding the first conclusion, Evans (2008), referring to overall taxation, sums up by saying that "the studies suggest that compliance costs of such taxes are typically anywhere between two percent and ten percent of the revenue yield from those taxes; up to 2.5 percent of GDP; and usually a multiple (of between two and six) of administrative costs." Thus, as shown in Table 4.2, Sanford et. al. (1981) and Sanford et. al. (1989) estimated costs equivalent to 9 and 3.7 percent of VAT collections for the UK, Pope, Fayle and Chen (1993) showed compliance costs of over 2 percent of collections for the Australian WST, and Hasseldine (1995) estimated VAT compliance costs of 7.3 percent of revenues in New Zealand. The picture is more mixed for more recent studies, particularly those using the SCM methodology. As discussed above and also shown in Table 4.2, we find studies at the lower end of the spectrum indicated, and some that are much higher. Witness for instance the notably low estimates, as a percentage of GDP and of VAT revenue, for Denmark (SCM 2005) at 0.3 percent, but also the considerably higher estimates for Slovenia (Blazic 2004) and Croatia (Klun 2003) (respectively 25 percent and 8 percent of VAT collections), and presumably for Bulgaria and other new member states, based on the "hourly burden" data of the *Paying Taxes* study discussed above. This wide spectrum of estimates most likely reflects different country circumstances and, as discussed, the different methodologies applied by authors at different points in time.

On the whole, as one might expect, the extant studies also suggest that administrative costs are absolutely and relatively less burdensome than compliance costs. Those studies that do address administrative costs suggest that they rarely exceed one percent of revenue yield, and more usually come in well below one percent. As noted, few reliable estimates can be obtained for VAT administrative costs only.

The regressivity of the compliance burden of taxation, and VAT in particular, which can be taken as definitively established in the literature, in particular stems from the large diseconomies of scale involved in complying with tax requirements, together with the learning curve effect that militates strongly against small firms (Evans 2008, see also DeLuca et. al. (2007) for the USA, etc.). To quote Cnossen (1994), "…all studies

emphasise that the compliance costs of the VAT, as a percentage of sales, fall with exceptional severity on small businesses." Of course, as has also been shown in the literature, much the same can be said with respect to most if not all taxes since most involve some fixed costs, and such costs invariably decrease as the size of a business expands.

And finally, Evans (2008) makes the strong point that compliance costs are perceived to be an on-going cause for concern, and a problem not improving over time. It is interesting to note, however, that several of the studies surveyed here in the spirit of the SCM, and applied to specific strategies of burden reduction by national governments and EU member states perhaps give hope of the possibility of seeing a reduction in such burdens (witness the Belgian case cited above, as well as the indications for the UK, Denmark, the Netherlands). Given that many such programmes of burden reduction have only recently been put into operation, time will tell whether they can be successful and successfully sustained.

Table 4.2: Summary of major published studies of VAT taxation operating costs since 1980

(An extended and updated table from Evans, 2003)

European Studies

Year of publication (Year(s) under review)	Author(s)	Country (population studied)	Taxes studied	1. Methodology 2. Sample frame 3. Respondents 4. Response rate	Major outcomes	
					Compliance costs	Administrative costs
1981 (1978-1980)	Sandford, Godwin, Hardwick & Butterworth	UK (UK VAT registered traders and their advisers)	Value added tax	1.Documentary analysis for administrative costs; for compliance costs (a) postal survey, followed by (b) telephone and personal interviews and (c) interviews with advisers (sample and responses not published for this element) 2. (a) 9,094 (b) 445 3. (a) 2,799 (b) 263 4. (a) 31% (b) 59%	Gross compliance costs for VAT estimated as £392m in 1977-78, and administrative costs £85m. Total operating costs of c. £480m represented 11% of VAT revenue; VAT compliance costs "exceptionally regressive in their incidence" (and administrative costs also likely to be regressive); cash flow benefits (£73m) and managerial benefits (difficult to quantify) exacerbate the regressiveness; net compliance costs affected by size of firm, sector (relatively lower compliance costs in primary production and higher in financial and services sector), payment or repayment situation	
1989 (1986-87)	Sandford, Godwin & Hardwick	UK (UK VAT registered traders)	Value added tax	1. Postal survey 2. 3,000 3. 680 4. 24%	Aggregate compliance costs were £791m (3.69% of revenue yield) and cash flow benefits (disproportionately enjoyed by larger firms) were £580m; net compliance costs were 1% of revenue yield; compliance costs very regressive; compliance costs fallen since 1977-78	Administrative costs of £220m in 1986-87 were 1.03% of revenue yield
1989 (1987)	Bannock & Albach	UK & Germany (UK and German businesses)	Value added tax	1. Postal survey (a) UK and (b)Germany, with very limited telephone follow up (15 calls in each country) 2. (a) 600 (b) 800 3. (a) 262 (b) 197 4. (a) 44% (b) 25%	Dissatisfaction with VAT system was much greater among smaller firms in the UK than in Germany, and compliance costs for smaller traders were significantly higher in the UK than in Germany	Not addressed

1994 (1992-93)	National Audit Office	UK (UK VAT traders)	Value added tax	1.Update of earlier VAT surveys conducted by Sandford et al (1981 & 1989) 2. Not relevant 3. Not relevant 4. Not relevant	Compliance costs of VAT were £1.6b offset by compliance benefits (cash & management) of £750m; compliance costs regressive	Administrative costs were £399m
2002 (2000)	Hasseldine & Hansford	UK (business taxpayers)	Value added tax	1. Postal survey 2. 6,232 3. 1,449 4. 23%	Increased compliance costs are associated with increased turnover, newly registered businesses, increased complexity and perceived psychological costs; no significant differences in patterns of core compliance costs and planning costs; businesses with computerised systems faced relatively higher compliance costs than businesses with manual procedures	Not addressed
2002	Verwaal and Cnossen	Netherlands	VAT, Trade statistical requirements	1. Postal Survey of firms 2. 2998 3. 642 4. 21.5%	Statistical requirements for intra-EU trade linked to VAT reporting system impose on average a 5 percent cost on firms with wide variation. E-filing contributes to reduce costs.	Not addressed
2003	Klun	Slovenia	Value Added tax		Compliance costs between 1.7 and 2.5 percent of GDP.	Not addressed
2004	Blazic	Croatia	Taxation for small businesses (including VAT)	1. Interviews	Total compliance cost 0.8 percent of GDP. Total compliance cost for VAT 0.2 percent of GDP.	Not addressed
2004	Commission of the European Communities	EU	VAT and other taxes	1. Survey of 700 enterprises	VAT compliance costs appear particularly high for companies that undertake activities in other EU member states without having a permanent establishment there and companies that incur VAT on inputs in other EU member states.	Not addressed

2005	SCM Network	Denmark, Netherlands, Norway, Sweden	Value Added Tax	SCM methodology	CC (percent of GDP): Denmark 0.03% Netherlands 0.17% Norway 0.06% Sweden 0.07%	Not addressed
2006	KPMG	UK	Value Added Tax (together with assessment of overall administrative burden)	SCM Methodology	The "administrative" (compliance) burden of UK tax regulation is £5.1 billion. VAT accounts for £1 billion, or 20 percent of total. (respectively 0.3 and 0.1 percent of GDP).	Not addressed

North American Studies

Year of publication (Year(s) under review)	Author(s)	Country (population studied)	Taxes studied	1. Methodology 2. Sample frame 3. Respondents 4. Response rate	Major outcomes	
					Compliance costs	Administrative costs
1993 (1993)	Plamondon	Canada (Canadian small businesses)	Goods and services tax	1. Interviews (face to face) conducted by accountants with questionnaire 2. 200 3. 200	Compliance costs were not as high as previous studies had shown, but were regressive; businesses using computers for accounting routines had compliance costs 20% to 40% lower than those operating manually	Not addressed
1993 (1995)	General Accounting Office (US)	USA (Federal administration)	Value added tax	1. Estimate of administrative costs of a value added tax 2. Not relevant 3. Not relevant 4. Not relevant	Not addressed	Recurrent administrative costs of a value added tax would be between US$1.22b and US$1.83b, with 70% of those costs related to audit work; transitional costs of introducing a value added tax would be US$800m; costs would vary with key design features of the tax, and a simple single rate, broad-based VAT would minimise administrative costs
1995 (1995)	Plamondon	Canada (Canadian small businesses)	Goods and services tax (Quick method of accounting for GST)	1. Interviews (face to face) conducted by accountants with questionnaire 2. 200 3. 200	Small businesses were not using the Quick method of accounting for GST due to a lack of awareness; those who knew of it but did not use it were not overly concerned about compliance costs; savings in tax were more important than savings in compliance costs	Not addressed
2008	Government Accountability Office (US)	Australia, New Zealand, Canada, France, United Kingdom	VAT	Mixed methodology		Some available data indicate a VAT may be less expensive to administer than an income tax.

Australasian and South East Asian Studies

Year of publication (Year(s) under review)	Author(s)	Country (population studied)	Taxes studied	1. Methodology 2. Sample frame 3. Respondents 4. Response rate	Major outcomes	
					Compliance costs	Administrative costs
1993 (1990-91)	Pope, Fayle & Chen	Australia (Australian businesses)	Wholesale sales tax	1. Postal survey 2. 2,467 3. 593 4. 24%	Net compliance costs of WST were $201m, or 2.1% of revenue yield; compliance costs were highly regressive; WST generated a cash flow cost overall rather than a benefit	Not addressed
1995	Hasseldine	New Zealand	Goods and Services Tax (GST)	1. Postal survey	Compliance costs amount to 7.3 percent of VAT collecations	Not addressed
2002 (1998-2000)	Rametse & Pope	Australia (Western Australian business taxpayers)	Start-up costs of the Goods and Services Tax (GST)	1. Postal survey 2. 3,199 3. 868 4. 27%	Estimated GST start-up compliance costs for small businesses were AUD$7,600; this included owner/manager time of 131 hours; start-up costs were considerably higher than official government estimates	Not addressed
2002 (Jun 1999 - Jun 2001)	Tran-Nam & Glover	Australia (small business taxpayers)	Transitional costs of the Goods and Services Tax (GST), Australian Business Number (ABN), Pay As You Go (PAYG) and Business Activity Statement (BAS)	1. Case study 2. 31 3. 31 4. Not relevant	Small businesses incurred net transitional compliance costs of AUD$4,853 (mean) or AUD$2,393 (median); (median was preferred); in addition to monetary costs, small business taxpayers appeared to suffer substantial psychological costs during the transitional period	Not addressed

Concluding remark

While it is difficult to summarise the lessons of the vast literature just briefly reviewed, perhaps one quote from the recent Mirrlees Review is appropriate to end this section:

"Administrative and compliance costs depend on a wide range of factors, including the complexity of the tax, characteristics of the tax base, structure of tax rates, frequency of reform, and organisation and efficiency of the tax authority. Taxes should therefore be kept as simple and stable as possible. In other areas, there is a trade-off between administrative and compliance costs: for example, whether it is the tax authority or taxpayers who have responsibility for calculating tax liability. Providing help and guidance increases administration costs, but reduces compliance costs." (Shaw et. al., 2010).

4.4 Compliance Costs and Non-Compliance

> "Missing Trader Intra-Community (MTIC) VAT fraud is a large-scale organised criminal attack on the EU VAT system. The most serious form of the fraud – known as carousel fraud – involves a series of contrived transactions within and beyond the EU, with the aim of creating large unpaid VAT liabilities and fraudulent VAT repayment claims."[85]

Overview

A large and growing literature has focused in recent years on the increasing evidence of VAT-associated fraudulent practices in the EU. This is a major concern for businesses that see themselves at a competitive disadvantage, as well as national and EU policy makers, as evidenced in recent communications on the matter (Commission of the European Communities (2007)). This section reviews several contributions to the debate on evasion and fraud, and places them in the context of the discussion on compliance and administrative costs reviewed in the previous sections.

VAT fraud was recognised by the EC as an objective problem and made part of the EC strategy in 2003. In 2007 the fight against VAT fraud became a major concern of EC strategic thinking. The recognition of VAT fraud as "large-scale organised criminal

[85] Measuring Indirect Tax Losses–2007 HM Revenue and Customs, available at http://s3.amazonaws.com/zanran_storage/www.hmrc.gov.uk/ContentPages/13568349.pdf

attack on the EU VAT system" as defined in the British report cited above signals both awareness and a notion of magnitude.

The literature points to several institutional reasons to explain VAT fraudulent practices (in addition to the behavioural variables which we will review below in the econometric studies of the VAT gap). VAT specific and EU general policies have been recognised as major determinants of the compliance and enforcement environments that facilitate the emergence of fraud[86]. These include (i) parametric issues on base, rates, exemptions, zero rating, registration and return filing thresholds, refunding of VAT specific rules and the existence of parallel small taxpayers regimes; and (ii) two broadly recognised general EU policy principles that affect VAT fraud: the intra-European single market in force since 1993, and the application of the subsidiarity principle to tax administration which generates a second layer of differentiation in the actual application of the laws (See Keen and Smith (2007) and Cnossen (2009)).

VAT parametric issues

The parameters of individual countries' VAT systems can create a number of fiscal complexities and risks to VAT compliance attitudes. This can result from either the way in which bases, taxpayers and rates are defined or the way in which the compliance process is structured. Purchases and refund entitlements, for instance, are a most important matter in the case of intra-EU trade fraud.

This type of VAT fraud emphasised in the recent EU literature occurs when registered sellers charge VAT and buyers request a refund or simply include the input VAT in their declarations and the seller does not declare and pay the tax. Bogus traders, in fact, issue what are in effect deferred "cheques" or payment orders in the form of invoices that may be used as input credits in a future VAT return and may even generate refunds from countries' treasuries; then they simply disappear (see Cnossen (2009) and Harrison and Krelove (2005)). See Table 4.3 for information on VAT refund practices from the latter paper).

[86] The claim of VAT advocates about "self-enforcing" in the early stages of VAT implementation around the world (1960s through 1980s) was questioned by Hemming and Kay (1981) in the early 80s. Michael Keen and Stephen Smith (2007) rejected it because of the implicit assumption that both buyer and seller were compliant taxpayers. These authors questioned the claimed "self-enforcing" feature of VAT because of another possible outcome: both seller and buyer gain the tax by cheating in a context of poor targeting and control. For this reason the argument is illusory.

Table 4.3. Harrison and Krelove VAT Refunds: A Review of Country Experience Based on a survey of tax-administrations in 36 countries around the world	
Refund Levels	• In many countries, levels exceed 40% of gross VAT collections. • 40% of survey respondents repay a third or more of gross VAT collections. • Countries with refund levels under 20% are mostly in Africa, Asia and Latin America. • Within regions, refund levels are similar among countries with similar VAT systems and economic conditions.
Time frame for refunding tax credits	• In most developed countries, refunds are paid within four weeks of a refund claim being made. • In developing and transitional countries, it often takes several months and sometimes more than a year to process refund claims. This can seriously undermine the competitiveness of the export sector. • Notwithstanding that most countries have statutory deadlines for making refunds, these are often not met by tax authorities.
Reasons for delaying payment of refunds	• Prevalence of fraudulent claims and differences in strategies to cope with them: o In less advanced tax administrations: Pursuance of time-consuming and labor-intensive processes to verify claims before approving refunds. o Effective and efficient tax administrations: Refund related fraud is tackled as part of a broader VAT-compliance strategy based on risk management principles and limit pre-refunding verifications to high-risk claims. • When state budgets are under pressure and tax collection targets are not being made. This happens when administrations lack suitable forecasting and monitoring systems to anticipate refund levels and do not set aside sufficient funds. • Although these delays are more likely in transitional or developing countries, it is not confined to them.
VAT refund abuse and fraud	• All countries report VAT refund abuse, but most have difficulty estimating the scale of associated revenue losses. • While the nature of VAT refund abuse is similar across countries, the environment in which it occurs and the approaches to counteract it vary between countries. • VAT refund abuse is only a component of VAT fraud; in many countries audit resources focus mainly on VAT refunds and do not pay adequate attention to other related risks.
Strategies for controlling late payment of refunds	• 90% of the countries reported that their tax authorities are bound by law to making refunds within a prescribed timeframe, generally 30 days. • 40% go further, providing by law for interest to be paid on late refunds. These measures also demand safeguards from fraudsters, which range from providing tax officials with statutory powers to conduct audits and verification checks to requiring security or bank guarantees from traders who seek refund. In 60% of surveyed countries there is a mandatory carry-forward period to limit the number of refund claims.
List of countries that responded to the survey: Algeria, Azerbajan, Bolivia, Bulgaria, Cambodia, Cameroon, Canada, Chile, Colombia, El Salvador, France, Hungary, Indonesia, Ireland, Italy, Kazakhstan, Kenya, Latvia, Mexico, Mongolia, Morocco, Mozambique, Netherlands, New Zealand, Pakistan, Peru, Poland, Romania, Russia, Singapore, Slovak Republic, South Africa, Sweden, Tanzania, Ukraine, United Kingdom	

Similar frauds may also happen *within* a country, particularly in the presence of a large

informal sector in which difficult-to-track sellers issue invoices and disappear (see Ainsworth (2008) for some Canadian examples) In a recent careful micro-econometric study in Brazil, de Paula and Scheinkman (2009) have shown that there are 'networks' of evaders who deal with each other so that when 'holes' appear in the VAT chain, whether as a result of legislation (exempt sectors like transport in Mexico) or administrative problems--whether arising from 'informality' domestically or cross-border trade as discussed below—they may spread and eat away more and more of the potential tax base over time unless corrected.

Cross-border transactions in a free movement environment

Intra-European free-trade free-movement rules break the domestic VAT chain on exported goods to other member countries. This generates a VAT collection loss in exporting countries (through the rebate mechanism) but leaves destination countries completely open to the behaviour of the taxpayer importing the goods (Cnossen 2009). Cnossen and other authors point to lack of proper tax administration, enforcement and audit practices and/or capacities (see for instance the thorough review reported in GAO (2008).)

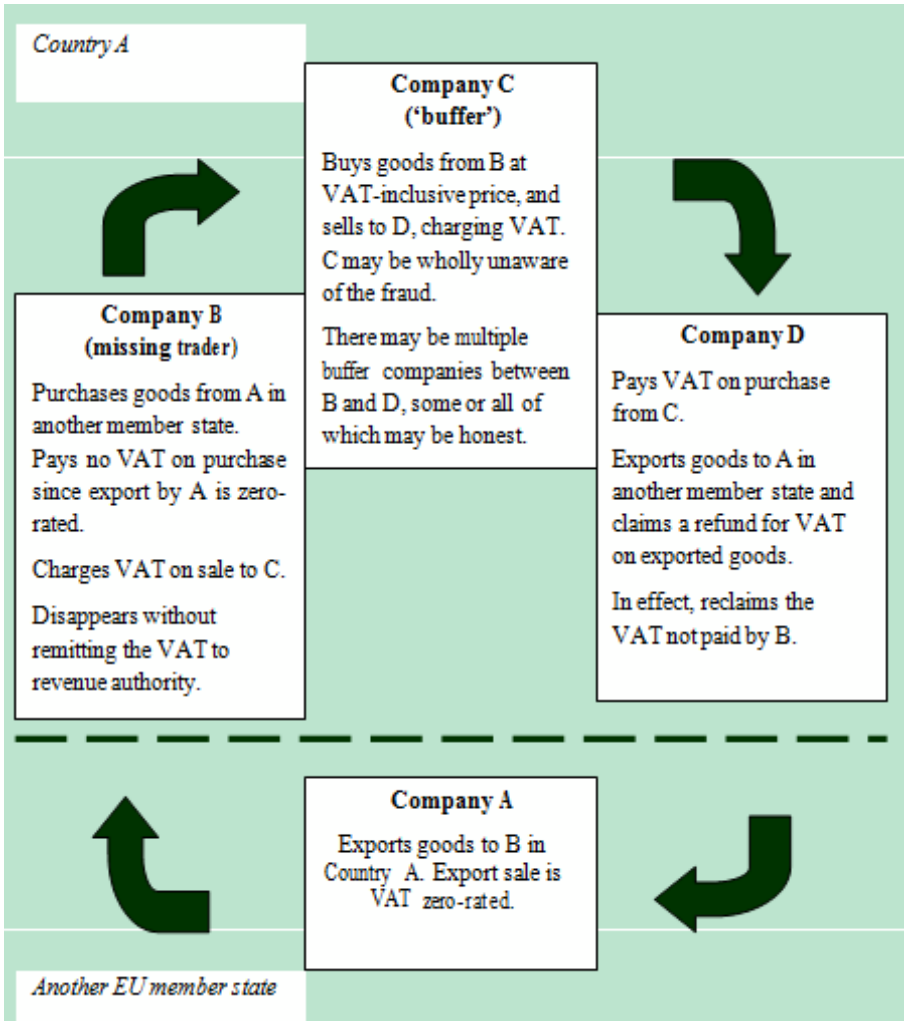
In intra-EU transactions a common type of fraud involves the trading of VAT rebate rights in the so-called *Carousel* (see box 4.2, reproduced from Smith (2007)). The *Carousel*, the most distinctive fraud for VAT, is a false claim for creditable VAT paid on inputs or, most dramatically, for a refund based on the zero-rated of exports, which breaks the VAT collection chain at a vulnerable point, the border between domestic and foreign tax administrations. Carousel fraud exploits the combination of the zero-rating of exports and the deferred payment situation of VAT periodic return procedures (See Keen and Smith 2007, p. 13).

An operational challenge these authors identify relates to VAT refunds: enforcement has to find an appropriate balance between lax and stringent attitudes toward refunds, because erring either way creates problems. If too lax, there is too much incentive for fraud, but an excessively stringent attitude creates high costs and may end up turning the VAT into a tax on production and exports, defeating its economic purpose[87]. Harrison and Krelove (2005) provide estimates on percentage of refunds over gross

[87] This conundrum is well recognised by the European Commission, see for instance the 2007 document: "It should be kept in mind that all measures that are discussed in the context of the fight against VAT fraud have to respect other EU policies, and in particular the general target of the European Council to achieve, by 2012, a reduction by 25% of the existing administrative burden (…)" p. 6.)

VAT collections. A strategy to help lessen this problem is called the "gold card scheme" which promises businesses with good compliance records prompt refund payment.

Box 4.2. The basic carousel fraud: an illustration



Application of the subsidiarity principle in a world with different capacities of tax administrations

Albeit in a different context, Casanegra (1990) once stated that "tax administration is tax policy". This point seems particularly relevant for the multi-country membership of the European Union. Given the subsidiarity principle, the administration of taxes differs among member countries in many respects. Each manages different control systems, there is diversity (and lack of connectivity) of IT systems and, in general, different levels of awareness, institutional and political capacities. This creates opportunities for skilled would-be evaders[88].

The EU approach to solve this problem has been to establish institutional capacities on two levels to address limitations selectively. First, member country tax administrations were supported by the EC *Fiscalis* programme during 2003-2007, which funded seminars, exchange and study visits for different tax officials. "One of its major objectives is to make possible for the Acceding Countries to adopt as soon as possible the same level of cooperation and to reach the same level of control efficiency as the current member states"[89]. In addition, the EC has also provided centralised information availability for the normal functioning of tax administration.

Quantitative evidence of evasion and fraud[90]

Quantitative evidence of VAT fraud critically depends on availability of data pertinent and such data are lacking for both the core issues identified by Keen and Smith above and the Reckon Report discussed below.

[88] This results in mistrust among administrations. In 2004, for example, European Commission (2004) finds worrying that legislation on secrecy regarding certain tax information still existed, which posted a major obstacle to effective administrative cooperation against fraud. Three years later, the European Commission (2007) still talks of the necessity of further cooperation between member states. "Allowing tax authorities of other member states automated access to non-sensitive data would eliminate the costs of human intervention in the member state holding this information in cases of routine requests for information." (European Commission 2007, p. 8)

[89] European Commission 2004, p. 9

[90] Note that the present discussion does not in any way imply that such problems are greater with VAT than with other taxes, direct or indirect. Indeed, although we do not attempt to review here the extensive theoretical and empirical literature of tax fraud and evasion in general, our impression from experience in a number of countries at different degrees of development is that on the whole fraud and evasion are generally relatively more important problems with respect to income taxes.

A sense of aggregate numbers

The following quote provides a sense of the scale and dynamics of the VAT fraud phenomenon:

> "Tax fraud is a major economic challenge for the EU. In a 2006 memorandum, the European Commission estimated the level of overall tax fraud at 2 to 2.5% of GDP, amounting to as much as €200-250 billion at the EU level. However, there are no firm figures on the scale of tax fraud, given the illicit nature of the activity and that few member states release data on the subject.
>
> The International VAT Association, a leading body on international VAT issues, voiced concern in a 2007 report that "European VAT fraud is growing at an alarming rate." In the same report, it further comments that "suppression of fiscal borders in the EU has allowed businesses to purchase goods and services cross-border without being charged VAT."
>
> The British Institute for Fiscal Studies reported in 2007 that UK VAT revenue losses for 2005-2006 topped £12.4 billion (€15 billion), or 14.5 percent of potential VAT revenues. Her Majesty's Revenue and Customs estimated that so-called missing trader inter-community (MTIC) or 'carousel' VAT fraud represented "less than a quarter of these losses" but that these had increased "rapidly despite its best efforts." The Commission published an estimate which put carousel fraud in the UK in 2006 at "between €1.5bn and €3bn a year…represent[ing] about 1.5 to 2.5 percent of the total UK VAT receipts."
>
> The new Commission initiative follows proposals made last year to speed up information exchanges between EU countries to fight cross border fraud (EurActiv 19/03/08)". [91]

Measurement

The most comprehensive recent report attempting to quantify fraud and evasion in the EU is the so-called "Reckon Report" (Reckon LLP 2009). This report was commissioned by the European Commission Directorate-General for Taxation and

[91] http://www.euractiv.com/en/enterprise-jobs/commission-fight-vat-fraud-schemes/article-184681

Customs Union and produced by Reckon LLP. The study quantifies and analyses the VAT gap in each EU member state over the period 2000–2006, comparing the accrued VAT receipts with a theoretical net VAT liability. This net liability is calculated by identifying the categories of expenditure that give rise to irrecoverable VAT and combining them with appropriate VAT rates.

The document stresses the distinction between VAT gap and VAT fraud; though related they are not interchangeable or equivalent measures. Discrepancies between these two measures can arise because the VAT gap might include non-payment arising from innocent error or grey areas such as failure to take due care as well as from deliberate fraud. Moreover, in some instances it might include VAT not paid as a result of legitimate tax avoidance measures. Since the VAT gap is estimated on the basis of national accounts data, it depends on the quality of such data. Finally, the VAT gap measure does not make any allowance for VAT that would not be collected in any case, e.g., due to insolvencies. The report also cautions that a short-coming of the top-down approach used to obtain the VAT gap (i.e. comparing the total accrued tax receipts with a theoretical tax liability derived from general economic data), is that it does not help much in identifying what sectors and types of business are more suitable/prone to VAT fraud. On the other hand, note that no member state appears to have objected to the findings of the Reckon report, which provides some indirect evidence that the figures shown in the report are not implausible.

The aggregate behaviour of the VAT gap and the VAT gap as a share of theoretical liability was found to be as follows (Tables 4.4 and 4.5):

Table 4.4. Aggregate estimates of the VAT gap, 2000-2006 (EUR billion)[92]

	2000	2001	2002	2003	2004	2005	2006
EU-10	6.5	8.3	8.3	7.6	8.6	8.1	7.9
EU-15	84.4	96.2	98.9	101.1	103.6	105.2	98.8
EU-25	90.9	104.5	107.1	108.7	112.3	113.3	106.7

Note: EU-10 and EU-25 exclude Cyprus. Non-Euro currencies converted to EUR using the average exchange rate in each year..

Table 4.5. Aggregate estimates of the VAT gap as a share of theoretical liability, 2000-2006 (EUR billion)[93]

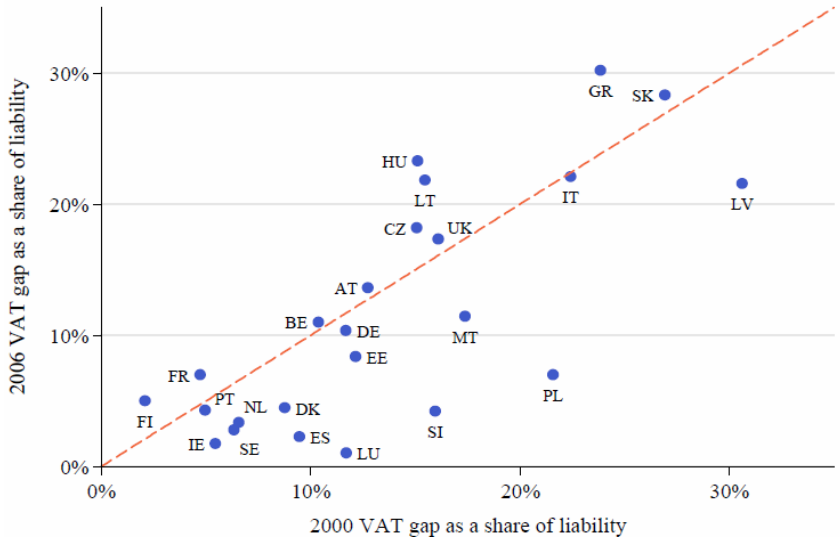
	2000	2001	2002	2003	2004	2005	2006
EU-10	20%	22%	20%	19%	19%	16%	14%
EU-15	12%	13%	13%	14%	13%	13%	12%
EU-25	13%	14%	14%	14%	14%	13%	12%

Note: EU-10 and EU-25 exclude Cyprus.

These "top-down" estimates of the VAT gap for individual countries show few common trends across the 24 member states studied. However, several member states joining the EU in 2004 show a greater decline in the estimated VAT gap between 2004 and 2006. Although not all these numbers may be fully comparable over either time or space, all the estimates come from a single study using a single methodology, so the broad thrust of these declines appears to be genuine—perhaps reflecting to some extent the effort to gain fiscal efficiency and the VAT legislation reforms that this new affiliation implied (see Figure 4.3).

[92] Reckon LLP (2009), p. 8.The definition of EU-10, EU-15 and EU-25 is as follows: EU-25: member states in the analysis, although data from Cyprus was not included. (Austria, Belgium, Cyprus, Czech Republic, Germany, Denmark, Estonia, Greece, Spain, Finland, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, The Netherlands, Poland, Portugal, Sweden, Slovenia, Slovakia, and the United Kingdom.)
EU-10: member states that joined the EU in 2004, although data from Cyprus was not included. (Thus the Czech Republic, Hungary, Poland, Slovakia, Slovenia, Latvia, Lithuania, Estonia, Cyprus, and Malta)
EU-15: member states in 1995. (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.)
[93] Reckon LLP (2009), p. 9.

Figure 4.3. Comparison of estimated VAT gap in 2000 and 2006[94]



The report also provides a useful overview of the existing econometric literature on VAT fraud for the EU, whose findings can be summarised as follows.

Christie and Holzner (2006) and Keen and Smith (2007) note the shortage of empirical work on the determinants of the VAT gap, reflecting the difficulty of measuring such VAT non-compliance. On the basis of their own estimation of non-compliance, (based on a top-down methodology as adopted by Reckon LLP) Christie and Holzner (2006) proceed to identify its determinants, through an elaborate econometric analysis on a panel data set of compliance rates (for VAT and for other taxes as well). In their preferred estimation, they identify the following effects on VAT compliance: "(a) a higher weighted average VAT rate reduces VAT compliance (more specifically, a one percent increase in VAT rates leads to a 0.2 percent decrease in the compliance rate); (b) greater judicial and legal effectiveness increases VAT compliance; (c) countries where citizens want more power for local authorities (which is, according to the authors, a proxy for tax morale) tend to have lower levels of VAT compliance; and (d) countries with a large proportion of GDP from travel revenues tend to have higher levels of observed VAT compliance."

[94] Reckon LLP (2009), p. 13.

In an earlier study, Agha and Houghton (1996), making use of a cross–section of VAT compliance rates for 17 OECD member countries in 1987 built from national accounts data, undertook an econometric analysis of these determinants. They concluded that: "(a) a higher VAT rate is associated with lower VAT compliance; (b) the number of VAT rates negatively affect the level of VAT compliance; (c) VAT compliance increases the longer VAT has been in operation; and (d) smaller countries (in terms of population) tend to have higher levels of compliance."[95]

Otranto, Pisani and Polidoro (2003) study the determinants of VAT fraud in Italy, showing a positive relationship between VAT evasion and GDP, a measure of fiscal burden, and the ratio of value added and gross profits to GDP.

Keen and Smith (2007) report on different measures of non-compliance and fraud numbers in different countries, attempting to ascertain whether noncompliance under VAT is notably more or less than under other taxes. For this they use data from HMRC in the United Kingdom, both top-down (VAT gap estimate around 13 percent, its highest point in the years after abolition of border controls which gave more opportunities for fraud) and bottom-up approaches (in this approach, the MTIC fraud appears from trade data to have grown significantly in the last years, through trade data). Comparing these figures with those found in the Gebauer and Parshe (2003) study, they find the latter are much lower than the official ones for the same years.

The Reckon (2009) report itself conducts a series of econometric tests of "determinants" of VAT gaps, utilizing a number of structural indicators of EU economies and policies. The variable found to have the strongest relationship with the size of the VAT gap is connected with the perceived level of corruption in the country: lower perceived corruption is associated with a lower VAT gap. Surprisingly, the report also claims that once measurement errors in the estimation of the theoretical liability are taken into account by using an instrumental variable regression, no statistically significant relationship between the VAT gap and the VAT burden can be found—in marked contrast to the results reported quite consistently by the other studies cited here. Presumably such factors as the different macroeconomic conditions prevailing in in different countries at different times may account for some of these differences, but considerable work clearly remains to be done on this subject.

[95] Reckon LLP (2009), pp. 48.

Studies that have concentrated on the estimation of the compliance gap include Agha and Haughton (1996) and Silvani and Brondolo (1993). Others have studied determinants of revenue productivity (Ebrill et. al. (2001), Aizenman and Jinjirak (2005). The measure is the VAT Revenue Ratio (VRR), defined as the ratio of VAT revenue to aggregate consumption, divided by the standard rate of VAT: under a uniform single rate VAT, perfectly enforced, the VRR would be unity. However, since the 'gap' thus measured reflects both the aggregate compliance level and the coverage of the VAT base, it is difficult to use for comparative purposes in this paper.

Summing up, the econometric evidence cited in the studies above is subject to considerable uncertainty in view of the non-observable nature of non-compliance itself (despite the ingenuity of different authors in coming up with plausible estimates). Most early studies pointed to a positive relationship between the tax burden and VAT evasion—the Reckon study being the outlier in this respect. More recently, institutional variables—capturing culture and attitudes towards the state—have begun to appear in such studies, with results suggesting that countries with better citizen-state relations tend to have higher tax ratios than those in which unhappy citizens are less prone to fulfil their obligations[96]. But again, it is hard to tell how robust these results are in view of the non-observable nature also of such institutional variables (or for that matter, to gauge the direct tax policy implications of their messages). To our knowledge, to date no such studies have focused on the implications, if any, of such cultural factors with respect to VAT compliance specifically.

Searching for Solutions: Anti-fraud strategies

There is an extensive bibliography identifying and looking for solutions to the problems caused by VAT fraud both at the EU and the individual country levels. Again, different stakeholders bring to the discussion a substantial amount of ideas and improvement proposals. The process has become quite open because the EC, in the context of shaping the antifraud strategy, established participatory mechanisms to identify and/or clarify issues before entering into the definition of the problem and formulation of a possible solution.[97]

[96] For an exampple, see Bird, Martinez-Vazquez and Torgler (2008).

[97] Communication From The Commision To The Council, concerning some key elements contributing to the establishment of the VAT anti-fraud strategy within the EU 2007

Systemic Changes

Four basic strategic ideas of change are on the table and discussed in academic and policy circles: VIVAT, Reverse Charges, Origin-not-destination VAT and maintain and improve current system. We review these approaches briefly here. First, however, we note a number of variations that have been proposed but have not been part of the intense ongoing debate: a "Compensating VAT" or C-VAT[98] and Dual VAT.[99]

In parallel, there is also a private-public dialogue that promotes Web-based IT strengthening in a broader way to practically eliminate the time lags (deferred declaration and payment) with measures and private-public shared systems coordination and cooperation. These types of activities—of which e-filing and e-invoicing are crucial components—would include stand-alone information flows on key matters defined in such a way as to disallow cheating occasions. This type of automation would improve the general security of refund transactions and simultaneously reduce compliance costs.

There is also a set of notions to be incorporated as operating principles in the laws, such as the principle of joint liability suggested by Pashev [100]:

> Despite its bad reputation, the principle of joint liability appears an important element of the overall strategy to combat network fraud. Of course it needs to be optimised in the direction of more impartial implementation, so that it targets better the fraudsters rather than compliant traders that have been caught unwittingly in the fraudsters' network. The principle of joint liability is a serious test of the professionalism and integrity of the revenue administration and law enforcement as the market links in one chain compliant traders and fraudsters. Therefore it may be applied only through a state-of-the-art system of risk management. It needs to identify the risk sectors and goods and equip the audit and law enforcing units with the relevant databases on technology processes, production capacities, and price calculations…

[98] C-VAT—proposed by McLure (2000) elaborating on an earlier Varsano proposal for coordinating VAT of the Brazilian states. Note, however, that the recent discussion about the possibility of imposing a common rate on intra-EU sales is similar to an important element of the CVAT proposal.

[99] 'Dual VAT' comes in two varities in Canada, one in the Province of Quebec and the other in five other provinces, while four provinces do not impose any VAT (Bird and Gendron 2010)

[100] Pashev, Konstantin V. (2007): *Countering Cross-Border VAT Fraud: The Bulgarian Experience*, Journal of Financial Crime, Vol. 14, No. 4

In simple terms, a joint liability law would make sellers liable for what may happen to the tax they credited to their intra-Community purchasers. While this proposal may seem rather bold, it can be likened to the treatment of innocent parties entering in business with fraudsters. Given the existence of web-based support to establish the registration of intra-EU traders, the risk involved with missing traders is substantially reduced. Nonetheless, as recommended by the author, care should be taken in the implementation of the policy.

VIVAT (Viable Integrated VAT)

> "The easiest way to think of the VIVAT proposal is as a common VAT rate for the whole EU, plus member-specific sales taxes charged at the point of final sales. The choice of the common rate (and exceptions) needs to be discussed, but for the moment just suppose that it is set at the minimum VAT rate that EU members are allowed to charge, namely 15%.
>
> Under VIVAT, the de-tax-and-re-tax procedure is eliminated for business-to-business transactions since the de-taxing rate and the re-taxing rate are identical. This simultaneously reduces the incentive for, and the cost of, missing trade frauds (i.e. it attacks element (C) of the ABCs of VAT fraud). For the crooks, this goes a long way towards spoiling the fruit of fiscal fraud since they would have already paid 15% VAT on the imported goods. For the governments, the same fact caps the maximum loss. That's the good part as far as fraud prevention is concerned."[101]

VIVAT would eliminate zero-rating and would establish a uniform EU rate for all goods traded among registered merchants. Member countries remain with the power to set the final rate to the consumer through a Retails Sales Tax, which in the end would establish the effective product/service rate. See details as explained by Cnossen in Box 4.3.

Box 4.3 VIVAT[102]

In the belief that the alleged break-in-the-VAT-collection chain threatens VAT's integrity, Keen and Smith (1996) have made an imaginative, high-profile proposal for a viable integrated VAT (VIVAT), which would consist of the following elements.

- An EU-wide uniform (dual) VAT rate, administered by member states, on all intermediate (non-retail) transactions between VAT registered traders, within and between member states. Accordingly, interstate exporters would be taxed and interstate importers would be allowed a credit at the same uniform rate.

[101] Baldwin (2007) http://www.voxeu.org/index.php?q=node/275
[102] Cnossen (2009)

- A clearing mechanism for payments from net exporting states to net importing states, based on export and import statistics (derived from VAT returns!) and allocated to member states on the basis of consumption statistics. This would ensure the maintenance of the destination principle, except for cross-border consumer purchases.
- A surtax on retail sales to consumers (in essence, a retail sales tax) for member states wishing to collect more revenue than accruing to them under the EU-rate.
- Retention of the special schemes for distance sales and means of transport, but perhaps not for exempt entities since their inputs would be taxed at the uniform rate, standard or reduced, applicable to cross-border purchases.
- Sellers to separate sales into three categories: (a) sales to registered persons within the EU subject to the EU-rate, (b) sales to unregistered persons within the EU (in- as well as out-of-state) subject to the higher member state rate, and (c) sales for export outside the EU, subject to the zero rate.
- A single agency to handle interstate trade, which would reduce administrative and compliance costs.

Reverse Charges

Germany and Austria proposed to the EU the use of reverse charges as a way to control and limit VAT fraud. As Baer and Ter-Minassian (2006) put it:

> "Given the difficulties that the German and Austrian authorities have been facing in controlling businesses engaging in carousel fraud, in 2006 they asked the European Commission for permission to deviate from the "transitional" VAT system; as part of their requests they provided estimates of their VAT revenue losses.[103] Austrian officials gauged their overall losses at 4.4% of annual VAT revenue, but did not provide an estimate of the proportion attributable to carousel fraud. The German authorities estimated that the missing-trader type fraud accounted for two percent of annual VAT receipts.[104]"

The introduction of reverse charges is equivalent to shifting VAT liability from suppliers to purchasers. It is the equivalent to a single-stage RST. "The main difference with a conventional RST would be that the proposal envisages the retention (and

[103] The German and Austrian authorities proposed adopting the "reverse charge" mechanism for the VAT. This is discussed in greater detail in section 4.7 of this paper.

[104] Communication from the Commission to the Council, Commission of the European Communities, COM (2006) 404 final, Brussels, July 19, 2006.

intensification) of the cross-checking properties of a non-tax-invoice-based VAT" (Cnossen 2009, p. 25).

Origin Principle VAT

The establishment of an origin principle VAT "under which the value added up to the export stage would be taxed in the member state of production and imports" (Cnossen 2008, p. 6), instead of the destination principle, also emerged as a possibility which is mentioned but does not seem to have general appeal.

Tax Administration Improvement and International Cooperation

The reverse charge approach in effect displaces the legal VAT payer to the country of destination. In contrast, the VIVAT approach, apparently anticipating inadequate operational capacity in (some) such countries, proposes a substitutive approach, imposing the major (EU standard) tax in the origin country but leaving the imposition of the 'destination' (retail) portion of the tax up to the destination country. In both cases, neither any (non-existent) EU tax administration nor any individual country administration really has to attempt to track and control borderless transactions started in a different member country.

This is why Cnossen contends that:

> "… exporter rating and reverse charging do not obviate the need for auditing domestic and cross-border transactions. Proper domestic and multi-jurisdictional audit, on the other hand, would obviate the need for costly design changes whose reporting requirements might be just as or more burdensome than the requirements under deferred payment. The legal and administrative-cooperation arrangements appear sufficient for the time being to tackle cross-border VAT evasion. The problem is that member states should make better use of them and be more willing to assist other member states in their endeavour to catch VAT evaders. Of course, even if this would be done – and it should be – fraud should still be listed along with death and taxes as events that are certain." Cnossen (2008, p. 36).

> "Secondly, under VAT, invoices establish a country-specific audit trail throughout the entire production-distribution chain.[5] In the case of

> cross-border trade, however, this trail does not start before import and ends with export. (Cnossen 2008 It's the Audit Trail, Stupid.)"

Proponents of maintaining and deepening tax administration improvements are concerned with actual delivery of improvements. While VIVAT would take away part of the current country tax administration from each and every country, implementing the ongoing strategy would complement (rather than substitute) member countries' tax administrations through training, sharing of experience and information that addresses critical gaps of individual administrations.

Inasmuch as the perception is that the proposal is perceived as redistributing bureaucratic powers, there will be a fiscal federalism problem. In Baer's and Ter-Minassian's words:

> "Tensions between the application of national vs. EC tax rules has implications for the tax administration's ability to enforce compliance with the tax laws"

Summary

The literature shows that VAT fraud is neither new in Europe nor in the other 150-some countries where it exists. Although MTIC/Carousel fraud is not unique to Europe, [105], it has almost certainly been facilitated by the current situation in the EU with the free intra-European market being combined with separate VAT administration at the country level and no overriding EU mechanism to back up those administrations. These conditions facilitate the MTIC/Carousel, which is evidently a EU specific form of carousel. Other countries – notably Canada (Bird and Gendron 2010) but also to a limited extent Brazil and India (Bird 2010) – administer, with varying degrees of success, subnational VATs in an essentially borderless environment. However, in all these federal cases, the subnational VATs are backed up to a greater or lesser extent by an overriding federal VAT. Lack of data does not allow us to gauge whether the phenomenon is growing, but this is perhaps the major risk to be assessed in a country and a Community perspective.

The diversity of compliance cultures can be tackled by introducing throughout the EU modern managerial and IT concepts to all tax administrations. Culture-related concepts

[105] Actually, as Bird and Gendron (2007) emphasise, similar frauds can and do exist, though admittedly less visibly, with any sales tax in the (inevitable) absence of perfect tax administration.

like corruption and the informal sector start to appear in papers referring to newcomers like Bulgaria where clearly the compliance culture is new but inherits patterns of conduct of the previous system.

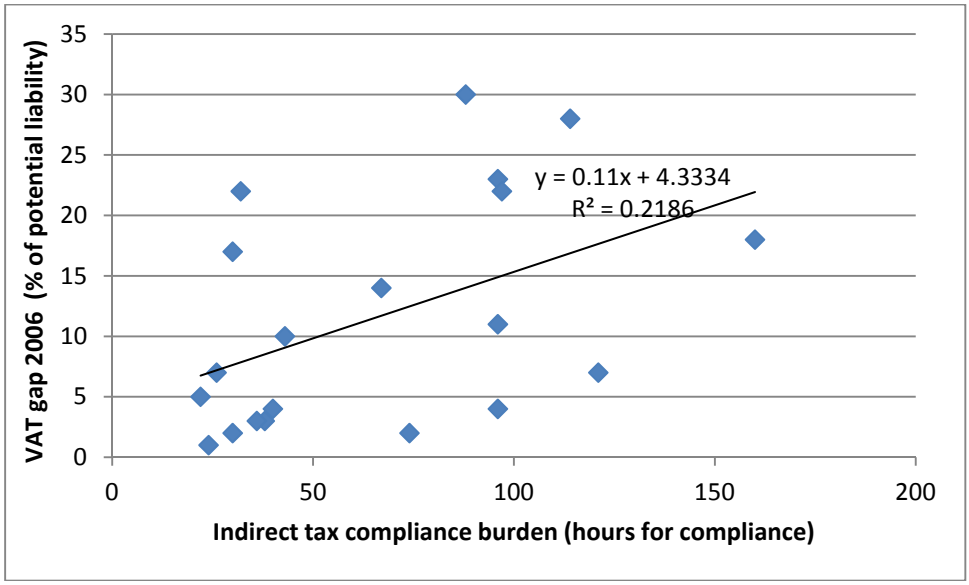
In Closing - VAT Compliance Costs and Fraud: Is There a Link?

As was pointed out in the previous discussion, examination of proposals to reduce VAT evasion suggests that there might be a trade-off between the desire to minimise fraud and evasion (for VAT as well as for any other tax) and the desire to avoid imposing excessive burdens on taxpayers, either via increasing administrative/control regulations, or (in the case of VAT) by changing features of the tax that deny its theoretical economic advantages over other forms of taxation. Many in fact fear that increasing administrative and compliance burden might be subject to a "Laffer Curve" effect, namely that excessive burdens may lead taxpayers to *increase* tax evasion, for example by escaping from the formal sector altogether, or by increasing the resources devoted to "defeating the system"[106]

This literature review has not uncovered rigorous testing of the hypothesis that increasing compliance burdens affects VAT fraud in either direction. However, a compilation of data discussed in this report (namely, the Reckon estimates of the VAT gap and the World Bank's/PWC's *Paying Taxes* estimates of compliance burden does show an intriguing correlation (see fig. 4.4): fraud appears to be ***directly*** related to the compliance burden. While fig. 4.4 is merely suggestive, and on close inspection it is dominated by the high administrative burdens in new member states, which also suffer from large VAT gaps (and where the causality is hard to ascertain without further investigation), it certainly points to the fact that it might be productive to pursue this line of research, most probably through a variety of survey instruments, and with appropriate country specificity.

[106] See however the interesting discussion on the use of professional services to reduce tax liabilities in Eichfelder, Sebastian and Michael Schorn (2009).

Figure 4.4. Compliance burden vs. VAT gaps



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5 Compliance costs and dissimilarity of VAT regimes (CPB)

This chapter contributes towards answers to the following evaluation questions in the project Terms of Reference:

(1) To what extent do the current VAT arrangements for cross border supplies of goods and services maximise the potential of a genuine EU single market for businesses and customers (for both businesses and private individuals)? What is the range of GDP loss that could be attributed to the special rules, obligations and risks associated to EU trade? What are the related administrative burdens and collection costs? What are the main reasons for any infringements and/or fraudulent activity and their extent at EU level?

(6) To what extent and how do the different cost factors of the VAT (i.e. compliance costs and other effects of the VAT regime) impact the medium/large and pan-European businesses?

(9) What are the cost and impacts of the current national VAT arrangements applied in the member states on the bona fide traders in the context of the VAT fraud?

Summary

This chapter presents the indicators that will be used (in the next chapter) to assess the impact of the current VAT systems in the European Union on intra-EU trade in goods and services. These indicators are also informative in their own right, quantifying the extent of differences in VAT regimes across the European Union.

- The current VAT system in the European Union leaves considerable operational and administrative freedom to national governments. This means that, despite European co-ordination on the basic structure of the VAT system, the situation is still such that firms operating in the internal market have to deal with a complex and heterogeneous patchwork of different national VAT rules.

- This could negatively affect the level of cross-border trade and direct investment in the internal market. Dealing with different national VAT systems may create a fixed-cost trade barrier, because of the costs involved for the trading firms in adapting to other countries' VAT regimes. Such fixed-cost trade barriers could have a negative impact on participation in trade, particularly for small and medium-sized enterprises. In order to detect whether these effects are important, we need indicators that capture the degree of heterogeneity in national VAT regimes.
- This chapter develops quantitative indicators that are comprehensive enough to pick up all the aforementioned types of impacts, yet are flexible enough to allow a fine-grained decomposition that allows us to identify key VAT areas with a large internal market impact. Two types of indicators are proposed: VAT-regime dissimilarity indices, and national level indices for specific VAT elements.
- The main indicators are the VAT-regime dissimilarity indicators. National VAT regimes have various aspects and functional domains that can be numerically compared across countries. The VAT regime aspects that we subject to inter-country comparison include rate structures, the heterogeneity of administrative procedures, and the compliance cost burdens created by national VAT regimes. Each of these aspects is split into a number of functional domains.
- The VAT dissimilarity indicators are calculated for all 676 (=26x26) bilateral country pairs in the EU. The VAT dissimilarity indicators are calculated *per country pair* in order to allow maximum accuracy in detecting the VAT influences on bilateral trade between member states.
- The VAT dissimilarity indicators are comprehensive, covering 116 comparison elements per member state. The indicators can be decomposed for finer-grained regulatory VAT domains, thus allowing us to detect which elements of the intra-EU VAT heterogeneity have the largest trade impact.
- Over the past 20-30 years the older EU member states (EU15) have not achieved convergence in their administrative VAT procedures. It is noteworthy that the accession countries that joined the EU after 2004 have less administrative differences in their VAT regimes than exist between the EU15 countries.
- This chapter complements the VAT dissimilarity indicators with a set of indicators that proxy *per member state* (as opposed to *per country pair*) the level of VAT-related compliance costs, VAT complexity, and the impact of VAT on small and medium-sized firms.
- If there were a clear ranking of countries on the basis of the VAT-related burden for individual firms then we would expect a high correlation between the individual country indicators. However, we find that the country rankings for the individual-country items differ considerably. It means that there is no uniform, unequivocal

ranking possible for the VAT-related burden for individual firms. It further means that no single indicator can be considered as a *pars pro toto* for the remaining country indicators.

5.1 Introduction

As described in Chapter 2, VAT in the European Union is the result of a combination of EU-wide rules and the policies of individual member states. Within the constraints of the VAT Directive, national governments retain considerable discretion over VAT rate structures and administrative procedures. The VAT Directive identifies a number of VAT implementation options, from which member states have made their choices. Some EU member states have however added elements to their domestic VAT regimes that go beyond the implementation options stated in the EU Acts on VAT.[107] The result is that the EU as a whole operates with a complex and heterogeneous patchwork of different national VAT rules.

A core element of the European Union is its single market programme for trade in goods and services. The question asked here is: to what extent does the heterogeneity in national VAT regimes affect the operation and development of intra-EU trade flows. This is to be tested by gravity analysis of bilateral trade flows in the union. For this purpose we need quantitative indicators that document the differences between the VAT regimes of the EU member states. Chapters 5 and 6 of the study set out to quantify whether and how the national difference in VAT regimes influences the operation and development of the Single Market in goods and services.

VAT-related obligations have been identified as an important source of compliance cost burden for European firms, because of their pervasive role in everyday transactions.[108] Table 5.1 indicates 25 priority areas in the VAT legislation by their contribution to the compliance cost burden of European companies. Eight of these priority areas specifically pertain to border-crossing activities. However, in the imaginary case that the EU would have one unified VAT regime, there would also be an compliance cost burden impact on the behaviour of individual firms.[109] The fact that

[107] cf. Annacondia and Van der Corput (2010).

[108] cf. High Level Group of Independent Stakeholders on Administrative Burdens (2009), and http://ec.europa.eu/enterprise/policies/better-regulation/administrative-burdens/priority-areas/tax/index_en.htm; Ministry of Finance, et al. (2005); Diemer (2010); Skatteverket (2006), Verwaal and Cnossen (2002).

[109] Chapter 3 discusses the distortionary impacts that arise from the tax treatment of cross-border transactions.

VAT-related administrative obligations result in real administrative costs for firms, says nothing about the impact of the national differences in VAT regimes on intra-EU trade.

The European Commission (2003) in its Internal Market Scoreboard reports: *"In November 2000 a Commission survey showed that 26% of businesses considered difficulties related to the VAT system and VAT procedures to be an obstacle to doing business in the Internal Market. In September 2001 a further survey showed that VAT payments and refunds were rated third among regulatory burdens that are the most costly for companies. The multiplicity and complexity of the VAT requirements in the 15 member states, combined with difficulties in obtaining foreign refunds leads to substantial costs and represents a real barrier to cross border activities*."

Table 5.1 Top 25 administrative burdens for firms associated with the VAT Directive, prioritised according to their level of cost, their complexity, and their burden potential

Rank	Type of information obligation	Prioritisation
1	VAT bookkeeping in sufficient detail for inspection by tax authorities	***
2	Issuing of an invoice	***
3	Taxable persons providing intra-community supplies	***
4	Storage of invoices for inspection	***
5	Notification of the start of working activity as a taxable person	***
6	Application for a VAT refund	***
7	Submission of a periodical VAT return	***
8	Provision of proofs of exemption on exports	**
9	Submission of an intra-community acquisitions listing	**
10	Submission of a summary annual VAT return	**
11	Guaranteeing authenticity of origin and integrity of content of e-invoices	*
12	Formalities relating to the exportation of goods	*
13	Submission of VAT returns for the intra-community acquisition of goods other than means of transport and excise goods	*
14	Notifications relating to storage	*
15	Storage data guaranteeing authenticity, integrity and legibility of invoices	*
16	Obtaining an import certificate for the purpose of import VAT deductions	*
17	Notification of change or cessation of working activity as a taxable person	*
18	Notification of cessation of conditions of exemption for EC acquisitions	*

19	Keeping separate accounts for special margins and other transactions	*
20	Obtaining certificates of VAT taxable status in order to qualify for refunds	*
21	Delivery of certificates attesting that no transactions have been performed for which a business can be held liable for VAT	*
22	Keeping a register of shipments without transfer of ownership	*
23	Keeping accounts of intra-EU transfers of movable tangible property	*
24	Submission of a VAT return in case of intra-community acquisitions of new means of transport	*
25	Obligations related to intra-community supplies of new means of transport	*

Source:http://ec.europa.eu/enterprise/policies/better-regulation/administrative-burdens/priority-areas/tax/index_en.htm

We distinguish four channels through which national differences in VAT regimes can have an impact on trade flows in the internal market:

a) *Border-cost effects*. Different VAT regimes in EU member states may create additional trade costs for border-crossing trade flows. Exporting firms selling their products in another member state incur additional costs for having to deal with different administrative procedures by country, country-specific VAT rates that must be incorporated in sales promotion activities, cost in relation to familiarising themselves and adapting to country-specific VAT refund rules and administrative practices. These requirements may form the source of real business costs. We therefore expect that the

degree of differences in the VAT regimes of two member states has a negative impact on their bilateral trade.

b) *Impact on the choice of foreign supply modes (*exports versus setting up a local subsidiary).[110] Differences in VAT rates, in administrative thresholds, refunding practices, and in the efficiency of national VAT authorities could affect a firm's choice between serving a foreign market through exports or through FDI. The fixed or variable costs of dealing with a foreign country's VAT regime could tip the balance in such strategic firm decisions. This seems of particular importance for firms that organise complex trade networks in intermediary goods.

c) *Impact on structure of demand*. VAT rates, VAT exemptions and the compliance cost burden associated with a national VAT regime may have domestic price and volume effects that also affect the structure of a country's foreign trade. The application

[110] Specifically for services trade we must consider a wider trade concept than standard cross-border trade. The WTO definition of services trade includes trade through 'commercial presence' (services sales in another country through a local subsidiary of a services multinational firm) and services provision through temporary stay of employees abroad.

of multiple VAT rates and exemptions affect the structure of relative prices in a country. This may push up the demand for low-rated or exempted goods and services, while putting a brake on the demand for other items. Trade-distorting effects could easily arise when neighbouring or distance-trading member states apply different VAT rates for similar goods:

(i) Border regions in the member states with the higher VAT rates may experience stronger effects, as consumers in border regions buy in the country that has the lowest VAT rates;

(ii) Industries that provide services or goods that are easily traded over large distances (books, software, electronic products, online music services and other media carriers, some services) may find themselves put in disadvantaged positions when other member states provide these goods against reduced VAT tariffs.[111]

d) *Impact on the export participation decision of firms due to VAT-related costs that are not scale-neutral*. Some of the administrative procedures associated with VAT rules create one-off, fixed setup costs. It means that such costs are more or less independent of firm size, and hence, press relatively more heavy on small and medium-sized enterprises (SME).[112] The VAT regulations are quite complex in some countries. SME companies may lack the knowledge required to use the correct policies, time schedules and rates for all their transactions. The onus rests on firms to conduct their VAT affairs properly, certainly because countries apply financial and even criminal sanctions for failing to do so. Dealing with foreign VAT authorities and different VAT rules thus tends to be a real market-entry barrier for SME companies. Often this barrier can only be surpassed by using expensive tax advice.[113] Compared with a system of uniform European VAT rules, the persistence of national VAT regimes might create an anti-SME bias in intra-EU trade participation.

This chapter develops quantitative indicators that are comprehensive enough to pick up the effects of all the aforementioned types of impacts, yet are flexible enough to allow a finer-grained decomposition that allows identification of key VAT-regulation areas with a large internal market impact. We found that both purposes can be served

[111] cf. Copenhagen Economics (2007, Chapter 4).
[112] cf. Skatteverket (2006: 43, 55-57). Most likely, the very small companies just above the VAT threshold bear the heaviest burden in tems of administrative burden costs (e.g. Ministry of Finance *et al.*, 2005; CapGemini, Deloitte & Ramboll Management, 2009).
[113] "*A complicated VAT system is good for lawyers and other advisers, but it is bad for business*" (De Witt, 1995: 49).

with two types of indicators: VAT-regime dissimilarity indices, and national level indices for specific VAT elements. Both approach routes are explained below.

5.2 VAT regime dissimilarity indices

National VAT regimes have various aspects, functional domains and sub-domains that can be numerically compared across countries. The VAT regime aspects that we put to inter-country comparison include: the complexity of VAT rates structure, administrative procedures, and the compliance cost burden created by the national VAT regime. Each of these aspects is split in a number of functional domains. For instance, the comparison of administrative procedures is based on the following functional domains: registration thresholds, refunding thresholds, Intrastat reporting threshold, border-crossing aspects, requirements for storage of invoices, filing and payment deadlines, timing of invoicing, structure of penalties and Intrastat statistical reporting obligations. For each of these functional domains, a number of specific VAT items are used. The structure of the comparison is shown in Table 5.2. The comparison is quite comprehensive and includes no less than 116 different VAT elements per country.

The bilateral differences by VAT regime aspect are summarised in six VAT dissimilarity indices (shown by their abbreviation) and one umbrella indicator, named HV_ALL. The later includes the information of all 116 regulatory VAT elements. These indicators are used in the next chapter to test for their trade impact.

How national VAT regimes affect individual firms is not only determined by the structure of formal regulations, but also by the efficiency of the national tax apparatus. We have therefore complemented the comparison with a number of items that may proxy the national differences in administrative and regulatory efficiency. For these items we derive a specific VAT dissimilarity index (HVADREG), as shown at the bottom of Table 5.2.

Table 5.2 also shows that the dissimilarity indices are decomposable, i.e. when we would find a significant trade affect for a particular VAT aspect, we may dig deeper to find out which VAT domain drives the trade results.[114]

Calculating of the bilateral VAT dissimilarity indices per country pair

[114] Because the VAT dissimilarity indices are averages over a number of specific VAT elements, we can only dig deeper through more detailed indicators if enough comparison items are available, over which the average is calculated, otherwise the representativeness of the index drops.

VAT regime dissimilarity indices are summary indicators that capture the degree to which two EU member states differ in their policies (or practices) for a specific domain of their VAT regimes. The full procedure for calculating the indices and their properties is explained in Annex A. This section presents only the main elements.

The VAT dissimilarity indices are specific for each country pair. So, for instance for Estonia, we calculate a specific dissimilarity index Estonia-Poland, Estonia-France, Estonia-Italy, etc. The underlying idea is that VAT-related trade barriers for firms in a country differ by trade origin and by trade destination. As a consequence of the bilateral nature we get per country 26 different bilateral indices. In total that yields 676 country-pair-specific dissimilarity indicators.

The CPB-developed VAT dissimilarity indices aggregate the information of both numerical and qualitative comparison items.115 Per VAT comparison item we assess whether a country pair had an identical regulation or not. If the two countries are not identical, the item gets a dissimilarity score of 1, and a 0 otherwise.116 Afterwards we sum the scores over all comparison elements per VAT domain and divide by the number of non-blank scores, to arrive at the bilateral dissimilarity index for the relevant VAT domain. The score is always between 0 and 1. The closer it is to 1, the more the two countries differ. When the score is 0, the two countries have identical policies in place with regard to the VAT domain that is being compared.

[115] Similar indices have been developed by CPB in order to analyse the potential impact of the EU Services Directive (cf. De Bruijn et al. 2008; Kox et al. 2004, 2006;) and have more recently been adopted by the OECD Trade Division (cf Nordås et al. 2009, Kox et al 2007) to study the impact of heterogeneous regulation on OECD services trade..

[116] For comparison items that allow us to distinguish a yes-no answer, the application of the dissimilarity score is straightforward. For items of numerical nature we do not want very small differences to result in a score of 1. We therefore follow a coarse-graining procedure for numerical comparison items by reducing the possible scores into 3-6 numeric intervals. The standard is 3 numeric intervals, but this is widened to a maximum of 6 if the distribution of country scores is very skewed. The procedure is explained further in Annex A.

Table 5.2 Composition of VAT dissimilarity indices by VAT aspects and functional domains

VAT regime aspects	functional VAT domains	abbre-viation for index	No. of separate VAT elements used for calcu-lating index per domain
Overall structure and complexity of VAT regime	* General structure of VAT rates		9
	* VAT exemptions applied		10
	* Domestic VAT rate variability		3
	* Distinctive national VAT legislation		4
	Total	HVGEN	26
General administrative procedures VAT	* VAT registration thresholds		4
	* Border-crossing aspects		4
	* VAT Refunding thresholds		2
	* Optimal reverse charge, contracting party liability, postponed accounting imported goods		11
	* Excess input tax		2
	* Requirements on storage invoices		2
	* Filing and Payment deadline, penalties		5
	* Intrastat reporting thresholds, penalties		3
	* Timing invoicing		2
	Total	HVADM	39
Administrative burden measures related to VAT	* Aggregate AB measures for VAT		3
	* AB measures for specific VAT items		7
	Total	HVAB_	10
VAT rates applied for specified goods and services	* Specified goods, partly tradable a)		8
	* Specified services, mostly non-tradable		11
	Total	HVSRAT	19
VAT rates on specified internationally traded goods		HVTG_	18
VAT rates on specified services subject to international trade b)		HVTS_	7
All VAT domains, all aforementioned items of VAT regimes		HVALL	116
PM: General administrative and regulatory efficiency		HVADREG	11

Note: Annex B of the report provides more detailed information on the individual comparison items and the data sources from which the relevant information has been derived.

The dissimilarity indices are built up in a hierarchical way. The HVALL_ dissimilarity index is a comprehensive 'umbrella' index. It covers all bilateral comparison items for the EU VAT regimes. As a consequence it is strongly correlated with all other dissimilarity indices, as Table 5.3 shows. Each of the other indices measures bilateral heterogeneity in a different VAT domain. The pair-wise correlation of these other indices is rather low, so that they can be applied simultaneously in the regression analysis. This does not hold for the two indices that measure the dissimilarity with respect to the VAT rate structure of internationally traded goods (HVTG_) and services (HVTS_). The fact that these indices have a high mutual correlation follows from the fact that the VAT rates for traded goods and services generally do not diverge much.

Table 5.3 Correlation analysis VAT dissimilarity indices, EU27, 2008

	HVALL_	HVTGEN	HVTG_	HVTS_	HVADM	HVSRAT
HVALL_	1.00					
HVTGEN	0.56	1.00				
HVTG_	0.60	0.03	1.00			
HVTS_	0.60	0.23	0.47	1.00		
HVADM	0.47	0.23	0.05	0.37	1.00	
HVSRAT	0.34	0.36	-0.19	0.15	0.07	1.00

Note: Variables and their names are defined in Table 5.2. Source: own calculations CPB.

The VAT dissimilarity indices are symmetric between both compared countries. If the index has a high value (close to 1), this says that VAT-related adaptation costs could play a role as trade barrier between two countries. But because of its symmetry, it does not tell us in which trade direction (imports or exports) the trade barrier is largest. Normally this is not a problem in empirical trade analysis, because we have to choose beforehand whether we consider trade from the import side or from the export side. If the VAT dissimilarity index turns out to be statistically significant and negative in import regressions then we know that VAT-related adaptation costs hamper import trade.

As can be read in the technical annex (Annex A), we have deliberately assigned equal weights for all numerical and qualitative comparison items, because this gives maximal transparency. Though an equal-weights scheme is in itself also a subjective choice, we think that at this stage it is better to avoid making hidden political judgements. Our

method is however very flexible and it would be quite easy to add an 'expert weights' vector with which we weigh all bilateral differences.[117] However, the achievement of an undisputed expert-weights vector is a process that would require much more effort than is possible in the context of the present study.

Summing up, the VAT dissimilarity indices are comprehensive proxies for fixed or variable VAT-related adaptation costs for firms trading with other EU member states. The index summarises the degree of bilateral disparity in national VAT regimes. And as such, this may help to explain why we find strong or, conversely, limited trade between different country pairs.

5.3 Complementary indicators of VAT-related trade costs

Each cross-border transaction requires firms (or establishments of firms) on both sides of the border, importing firms and exporting firms.[118] For policy reasons it is important to know whether exporters or importers are most affected by the adaptation costs. Complementary indicators may help to answer that question. VAT dissimilarity indices do not say which of both countries has the most strict, complex and inefficient VAT regime. It is useful therefore to complement the VAT dissimilarity indices with indicators that quantify the level of VAT-related costs and/or compliance cost burden *per country* rather than per *country pair*.

Table 5.4 includes factors that, according to the literature, may be a nuisance for trading firms or that may proxy VAT-related administrative burden costs for firms: variation in national VAT rates (variation coefficient); national VAT requirements that go beyond EU requirements; VAT items that increase the within-country compliance cost burden; and specific VAT-related administrative burden for small- and medium-sized enterprises (SME).

[117] Cf. for example the procedure chosen by the OECD to add expert weights in the construction of their comparative indicators for national product-market regulation (Nicoletti, Scarpetta and Boylaud, 2000).
[118] And, of course, vice versa for trade regressions using the export side.

Table 5.4 Indicators for VAT-related costs and administrative burden per country

Comparison item	Measurement	Expected trade impact	Variable
Complexity of VAT structure in a country	Coefficient of variation of VAT rates across 25 goods/services	Higher trade costs	cov_rate
Non-EU elements in national VAT legislation	No. of national VAT obligations going beyond EU requirement	Higher trade costs	nonEUobl
Non-EU elements in national VAT legislation	% of estimated VAT admin. burden due to national obligations beyond EU VAT requirements	Higher trade costs	nonEU_ab
VAT-related entry costs for SME companies	Primary VAT registration threshold (in 1000 E);	If low : more burden for SME	regcutoff
VAT-related burden for SME companies	Threshold for annual VAT refund (in 1000 E)	If high: more waiting costs for SME	anrefund
VAT-related burden for SME companies	Threshold for quarterly VAT refund (in 1000 E)	If high: more waiting costs for SME	qtrefund
Compliance cost burden	Obligatory storage of invoices (in years)	If high: more adm. burden	inv_yrs
Compliance cost burden	VAT filing deadline (in days)	If low: more frequent adm. burden	filedays
Compliance cost burden	Adm. burden costs VAT as % of national VAT revenue	Measure of tax inefficiency	abvat_rev
Compliance cost burden	Adm. burden costs of VAT as % of GDP	If high: more adm. burden	abvat_gdp
Compliance cost burden	Estimated avg. adm burden costs per firm (total of 5 categories, expressed in log)	If high: more adm. burden	logabfirm
Compliance cost burden	Number of export documents needed for standard export event (WB)	If high: more adm. burden for exporters	no_expdoc
Compliance cost burden	Number of import documents needed for standard import event (WB)	If high: more adm. burden for importers	no_expdoc
Compliance cost burden	No. of separate tax payments; includes corp. & inc. tax (WB)	If high: more frequent adm. burden	antaxpmt
Compliance cost burden	firm time needed for tax payments (hours) (WB)	If high: more adm. burden	antaxtime

If there were a clear ranking of countries on the basis of the VAT-related burden for individual firms then we would expect a high correlation between the individual (complementary) indicators. Apparently, there is not such a clear country ranking. Table 5.5 shows the correlation between the country scores for the complementary indicators.

The correlations are highest for items that represent administrative burden indicators of VAT. However, most correlation coefficients are quite low, meaning that the country rankings for these items are very different. So, the complementary indicators do not tell one story: the country ranking differs strongly by comparison item.[119] Due to this finding, it is not allowed to pinpoint a single country indicator that can reliably serve as as a *pars pro toto* for the remaining country indicators.[120]

Table 5.5 Correlation analyis of complementary indicators for VAT-related costs and administrative burden per country , 2006-2008, 27 EU member states

	cov_ rate	non-EU obl	non-EU_ ab	reg cut-off	an_ re fund	qt_ re fund	inv_ yrs	file days	abvat _ rev	abvat _ gdp	log ab firm	antax pmt	antax time	no_ exp doc
nonEUobl	0.13													
nonEU_ab	-0.01	0.15												
regcutoff	0.11	-0.02	-0.03											
anrefund	-0.10	-0.15	0.04	-0.02										
qtrefund	-0.16	-0.14	0.01	-0.12	0.77									
inv_yrs	0.01	0.18	0.22	0.07	-0.18	-0.16								
filedays	-0.28	-0.58	-0.25	-0.10	0.36	0.36	-0.29							
abvat_rev	-0.31	-0.12	0.14	-0.16	-0.19	-0.29	-0.17	0.16						
abvat_gdp	-0.18	-0.18	-0.08	-0.30	-0.28	-0.21	-0.12	0.33	0.82					
logabfirm	-0.07	0.09	0.62	-0.21	0.05	0.00	0.35	0.04	0.51	0.52				
antaxpmt	-0.28	0.10	-0.09	0.09	0.04	0.00	-0.02	0.03	0.04	-0.23	-0.21			
antaxtime	-0.07	-0.07	-0.04	-0.09	0.43	-0.03	0.03	0.25	0.40	0.08	0.13	0.04		
no_expdoc	-0.34	0.16	0.42	0.07	0.13	-0.05	-0.11	-0.07	0.39	-0.02	0.18	0.30	0.26	
no_impdoc	-0.46	0.08	0.14	0.05	0.24	-0.07	-0.01	0.06	0.38	-0.03	0.07	0.22	0.54	0.82

[119] Section 2.3 presents similar results by country.

[120] On the positive side, we may infer that different level indicators can be jointly used in the gravity trade regressions without the estimation results and thir interpretation being hampered by multicollinearity issues.

5.4 Some descriptive results for both types of indicators

In this section we show some descriptive results for the VAT-regime dissimilarity indicators and for the complementary country indicators. Table 5.6 describes the results for the dissimilarity indicator HVADM, which deals with VAT-related administrative procedures. The indicator is calculated on the basis of some 30 different comparison items for most country pairs. The dissimilarity index equals on average 0.38 for the EU15 countries, which means that on average more than 11 out of the 30 administrative and procedural VAT regime elements differ between each EU15 country pair.

Most of the older EU member states introduced their VAT system in the 1970s. Table 5.6 implies that over the past 20-30 years these older EU member states, apparently, have not been able to converge their administrative VAT procedures.[121] The ten member states that joined the EU in 2004 (EU16_24) have less mutual administrative differences in their VAT regimes than the EU15 countries have among each other. A possible reason is that these countries were able to start a VAT tax system from scratch and have chosen to adapt best-practice procedures from the EU15 countries.[122]

The first column of Table 5.6 indicates the mean dissimilarity that each member state had with the 26 other EU countries. Ireland had on average the most differences (0.44) with the rest of the EU, while Poland (0.28) had the lowest mean difference. These are averages, however. The second data column provides for each country the standard deviation around this mean. The UK for instance has a dissimilarity mean of 0.43 and a standard deviation of 0.11, which indicates that the UK's bilateral dissimilarities with most other countries range between 0.54 (=0.43+0.11) and 0.32 (=0.43-0.11). The two last columns show, per member state, the countries with which their administrative VAT procedures differ, respectively, the least and the most. The UK has the smallest differences with Malta and the largest differences with Bulgaria.

Table 5.7 shows that the 'old' EU15 countries are much more dissimilar in their VAT rates than the 10 accession countries. Finally, Table 5.8 shows the main results for the other dissimilarity indices, including the umbrella index HVALL_. The latter displays a relatively small variation between the countries. Tables 5.9 and 5.10 are different. They present the national level indices that may proxy elements of trade costs and administrative burdens for firms.

[121] Cf. Vos et al. (1994); Somers (1995); De Witt (1995).
[122] Cf. Van der Corput (2004).

Table 5.6 HVADM: Dissimilarity index for administrative VAT procedures, 2008

Reference country	mean HVADM dissimilarity with EU27	standard deviation bilateral HVADM	avg. no. of bilateral data points	smallest HVADM dissimilarity with:	largest HVADM dissimilarity with:
AT	0.42	0.07	32	FR (0.29)	IT (0.52)
BE	0.35	0.09	31	EE (0.21)	SI (0.56)
BG	0.42	0.10	30	LU (0.24)	UK (0.71)
CY	0.31	0.11	30	EE (0.14)	AT (0.48)
CZ	0.35	0.09	28	RO (0.15)	EL (0.53)
DE	0.38	0.09	29	SK (0.24)	BG (0.59)
DK	0.41	0.08	29	LT (0.21)	FR (0.53)
EE	0.31	0.11	29	IT (0.11)	AT (0.52)
EL	0.39	0.09	32	LU (0.17)	UK (0.55)
ES	0.36	0.10	29	IT (0.19)	BG (0.50)
FI	0.33	0.07	30	CY (0.20)	UK (0.45)
FR	0.37	0.06	31	SK (0.24)	DK (0.53)
HU	0.30	0.09	30	PL (0.10)	SI (0.47)
IE	0.44	0.07	28	LT (0.31)	SI (0.63)
IT	0.33	0.11	29	EE (0.11)	AT (0.52)
LT	0.31	0.07	29	HU (0.17)	AT (0.43)
LU	0.37	0.09	32	EL (0.17)	UK (0.60)
LV	0.36	0.09	31	HU (0.16)	DE (0.53)
MT	0.32	0.10	29	EE (0.15)	BG (0.52)
NL	0.39	0.07	30	RO (0.28)	SI (0.50)
PL	0.28	0.06	31	HU (0.10)	SI (0.40)
PT	0.35	0.10	31	CY (0.16)	UK (0.50)
RO	0.31	0.10	28	CZ (0.15)	IE (0.52)
SE	0.41	0.07	30	PL (0.29)	IE (0.61)
SI	0.43	0.10	30	LU (0.25)	IE (0.63)
SK	0.30	0.07	31	PL (0.19)	IE (0.45)
UK	0.43	0.11	29	MT (0.24)	BG (0.71)
EU15	0.38	0.08	30	IT (0.11)	UK (0.71)
EU16_24	0.33	0.09	30	PL (0.10)	SI (0.63)

Variables and their names are declared in Table 5.2. Country codes are standard EU abbreviations for member states. Source: own calculations. Detailed tables available on request.

Table 5.7 HVSRAT: Dissimilarity index of domestic VAT rates, EU25, 2008

Reference country	mean HVSRAT dissimilarity with EU27	standard deviation bilateral HVSRAT	avg. no. of bilateral data points	smallest HVSRAT dissimilarity with:	largest HVSRAT dissimilarity with:
AT	0.43	0.13	18	CZ (0.26)	BE (0.74)
BE	0.75	0.08	17	ES (0.58)	IE (0.84)
CY	0.37	0.15	18	LT (0.16)	BE (0.74)
CZ	0.44	0.38	18	HU (0.00)	PL (1.00)
DE	0.41	0.12	18	SK (0.26)	IT (0.74)
DK	0.36	0.14	18	MT (0.16)	BE (0.74)
EE	0.33	0.17	18	MT (0.11)	BE (0.84)
EL	0.33	0.15	18	SI (0.11)	BE (0.79)
ES	0.44	0.11	18	PL (0.21)	LU (0.63)
FI	0.42	0.13	18	DK (0.21)	BE (0.74)
FR	0.53	0.11	18	PL (0.32)	BE (0.79)
HU	0.33	0.19	18	SI (0.05)	BE (0.79)
IE	0.41	0.17	18	EE (0.16)	BE (0.84)
IT	0.59	0.13	18	SE (0.32)	IE (0.79)
LT	0.33	0.17	18	LV (0.11)	BE (0.84)
LU	0.49	0.09	18	EL (0.32)	BE (0.68)
LV	0.36	0.17	18	LT (0.16)	BE (0.84)
MT	0.30	0.18	18	HU (0.05)	BE (0.84)
NL	0.47	0.10	18	UK (0.32)	IT (0.68)
PL	0.39	0.15	18	ES (0.21)	BE (0.79)
PT	0.47	0.12	18	IE (0.26)	BE (0.79)
SE	0.46	0.10	18	UK (0.32)	BE (0.68)
SI	0.35	0.18	18	HU (0.05)	BE (0.79)
SK	0.41	0.14	18	SI (0.21)	IT (0.74)
UK	0.40	0.13	18	EL (0.26)	BE (0.84)
EU15, avg.	0.46	0.12	18	EL (0.11)	BE (0.84)
EU1624, avg	0.36	0.19	18	CZ (0.00)	PL (1.00)

Variables and their names are declared in Table 5.2. Country codes are standard EU abbreviations for member states Source: own calculations. Detailed tables available on request.

Table 5.8 Other bilateral dissimilarity indices for EU VAT regimes, EU27, 2008

reference country	mean dissimilarity with EU27				variation coefficient of dissimilarity (standard deviation / mean)			
	HVTGEN	HVALL	HVTG_	HVTS_	HVTGEN	HVALL	HVTG_	HVTS_
AT	0.56	0.49	0.55	0.67	0.22	0.17	0.58	0.34
BE	0.58	0.51	0.53	0.59	0.17	0.13	0.59	0.40
BG	0.56	0.51	0.55	0.49	0.28	0.19	0.62	0.65
CY	0.49	0.50	0.87	0.79	0.26	0.14	0.19	0.27
CZ	0.45	0.46	0.58	0.55	0.28	0.15	0.49	0.35
DE	0.51	0.46	0.53	0.66	0.26	0.18	0.52	0.36
DK	0.51	0.54	0.96	0.76	0.26	0.14	0.19	0.28
EE	0.53	0.44	0.64	0.47	0.22	0.20	0.48	0.55
EL	0.50	0.50	0.57	0.57	0.24	0.14	0.47	0.39
ES	0.54	0.54	0.80	0.83	0.19	0.11	0.23	0.21
FI	0.48	0.47	0.76	0.46	0.23	0.12	0.25	0.47
FR	0.49	0.47	0.54	0.53	0.21	0.14	0.52	0.30
HU	0.41	0.42	0.54	0.50	0.24	0.18	0.59	0.45
IE	0.59	0.51	0.58	0.67	0.17	0.09	0.44	0.29
IT	0.50	0.51	0.58	0.57	0.22	0.12	0.50	0.41
LT	0.52	0.50	0.67	0.44	0.23	0.16	0.44	0.55
LU	0.50	0.53	0.88	0.68	0.18	0.09	0.19	0.32
LV	0.42	0.45	0.67	0.50	0.28	0.19	0.44	0.37
MT	0.50	0.46	0.67	0.47	0.24	0.21	0.44	0.77
NL	0.47	0.47	0.55	0.68	0.27	0.15	0.50	0.33
PL	0.54	0.50	0.78	0.55	0.17	0.11	0.23	0.36
PT	0.50	0.50	0.61	0.51	0.18	0.12	0.38	0.38
RO	0.41	0.42	0.53	0.47	0.30	0.21	0.57	0.77
SE	0.50	0.55	0.96	0.77	0.22	0.12	0.19	0.26
SI	0.42	0.48	0.59	0.64	0.25	0.16	0.50	0.37
SK	0.53	0.46	0.53	0.63	0.23	0.18	0.56	0.50
UK	0.50	0.50	0.74	0.51	0.22	0.18	0.31	0.37
EU15	0.52	0.50	0.68	0.63	0.21	0.13	0.36	0.33
EU16_24	0.48	0.47	0.65	0.55	0.24	0.17	0.42	0.44

Variables and their names are declared in Table 5.2. Country codes are standard EU abbreviations.
Source: own calculations. Detailed tables available on request.

Table 5.9 Selected complementary indicators for VAT-related firm costs by country, 2006-2008

country code	cov_rate 2006	nonEU obl 2007	filedays 2008	regcutoff 2008	anrefund 2008	qtrefund 2008	antaxpmt 2008	no_impdoc, 2008	no_expdoc, 2008
AT	0.25	5	45	30	36	360	22	5	4
BE	0.34	16	20	6	25	200	11	5	4
BG	..	3	45	26	256	511	17	7	5
CY	0.38	4	40	16	26	205	..	..	..
CZ	0.44	5	25	40	31	61	12	7	4
DE	0.28	8	10	18	25	200	15	5	4
DK	0.45	5	25	7	25	189	9	3	4
EE	0.34	1	20	16	26	192	7	4	3
EL	0.41	7	20	10	25	200	21	6	5
ES	0.36	6	20	0	25	201	8	8	6
FI	0.34	0	45	9	25	200	20	5	4
FR	0.48	7	15	76	25	200	19	5	4
HU	0.30	6	20	20	28	203	14	7	5
IE	0.72	7	19	70	25	200	9	4	4
IT	0.46	7	16	0	25	200	15	4	4
LT	0.34	7	15	29	29	204	15	6	6
LU	0.62	6	15	10	25	200	..	..	..
LV	0.34	3	25	14	31	207	7	6	5
MT	0.00	0	45	37	23	188	..	..	..
NL	0.48	2	30	1	25	200	9	5	4
PL	0.53	6	25	14	25	200	40	5	5
PT	0.56	4	40	10	20	160	8	5	4
RO	..	6	25	35	..	..	108	6	5
SE	0.37	3	26	3	51	406	2	3	3
SI	0.39	4	30	25	50	210	22	8	6
SK	0.00	6	25	45	25	198	31	8	6
UK	0.54	2	30	86	24	198	8	4	4

The variables themselves have been described in Table 5.4 . Country codes are standard EU abbreviations for member states. Sources. *cov_rate* : own calculations based on data from European Commission (2006); *nonEUobl*: data from CapGemini, Deloitte & Ramboll Management (2009); *filedays, regcutoff, anrefund, qtrefund*: data from van der Corput and Annacondia (2008); *antaxpmt* : data from Djankov et al. (2008); *no_expdoc, no_impdo*: data from World Bank Cost of Doing Business database.

Table 5.10 Selected national level variables for VAT-related administrative burden for firms, 2007-2008

country code	abvat_rev 2007	abvat_gdp 2007	nonEU_ab 2007	logabfirm 2007	inv_yrs 2008	antaxtime 2007	antaxpmt 2007
AT	7.3	0.52	2.1	7.88	7	170	22
BE	7.9	0.57	1.3	7.86	7	156	11
BG	6.4	0.27	7.2	8.17	5	616	17
CY	12.0	1.00	0.2	8.13	7	..	..
CZ	13.4	0.48	0.4	7.88	10	808	12
DE	6.3	0.42	4.4	7.98	10	196	15
DK	3.4	0.44	0.0	7.44	5	135	9
EE	10.7	0.53	0.0	7.64	7	81	7
EL	17.5	0.98	3.3	8.47	6	264	21
ES	17.6	0.93	6.1	8.03	4	298	8
FI	8.7	0.77	0.0	8.02	6	269	20
FR	6.2	0.49	1.2	7.71	10	132	19
HU	16.6	0.72	0.4	7.57	5	340	14
IE	5.3	0.44	2.2	7.73	6	76	9
IT	11.0	0.68	6.1	8.41	10	340	15
LT	15.2	0.53	54.5	9.75	10	166	15
LU	8.2	0.50	8.3	8.38	10	..	..
LV	8.0	0.33	14.2	6.91	5	279	7
MT	28.7	1.50	0.0	8.69	6	..	..
NL	7.0	0.54	0.2	7.68	7	180	9
PL	21.4	0.91	1.7	7.77	5	418	40
PT	17.6	1.22	7.1	8.81	10	328	8
RO	7.8	0.24	0.5	7.15	7	202	108
SE	6.2	0.68	0.0	7.85	10	122	2
SI	8.5	0.53	0.1	7.70	10	260	22
SK	8.8	0.29	1.9	7.58	10	325	31
UK	4.4	0.28	0.1	7.06	6	105	8

The variables themselves have been described in Table 5.4 . Country codes are standard EU abbreviations for member states. Sources. *abvat_rev, abvat_gdp, nonEU_ab* and *logabfirm*: data and calculations based on data from CapGemini, Deloitte & Ramboll Management (2009); *inv_yrs*: data from van der Corput and Annacondia (2008); *antaxpmt* and *antaxtime* : data from Djankov et al. (2008).

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Annex A. Methodology for constructing dissimilarity indicators

An indicator of the dissimilarity of different countries' VAT regimes has to address the multi-dimension problem that is inherently present in comparing different institutional VAT settings. There are several dimensions in which the relevant national VAT regulations may differ between countries. The bilateral VAT dissimilarity index may grasp how much national VAT policy differences between to trading countries differ.

A.1. Desired properties of the VAT dissimilarity indicator

The indicator should preferably be a decomposable, bilateral quantitative index. Moreover, since we cannot – and do not want to – judge the appropriateness of individual VAT policies in individual countries, the VAT dissimilarity index and the way it is aggregated should therefore be independent of judgements on specific policy items. The indicator should have the following seven properties: (a) increase in the degree of VAT regime differences, regarding regulation contents and implementation form; (b) allow aggregation over multiple dimensions with respect to which regulation items may differ; (c) yield a single numerical indicator; (d) be specific for each country pair; (e) allow aggregation independent of a set of subjective weights; (f) be independent of judgements on a priori criteria about specific VAT policies in countries, no matter whether these criteria are subjective or based on specified objective; and (g) be decomposable with respect to specified VAT regulation aspects.

A.2. VAT dissimilarity analysis based on qualitative policy data

The basic principle of the VAT dissimilarity indicator is that multiple-dimension qualitative policy information is reduced to dimensionless binary information. The latter can be aggregated to heterogeneity indicators that satisfy the seven criteria specified in the preceding section.

Specific for each country pair

Let there be some regulation attribute R for which it can unequivocally be assessed whether or not it applies in a country. This gives logical information: $R \in \{1,0\}$, so that regulation attribute R can also be used to compare two countries. For any two countries

(i and j) dissimilarity indicator h_{ij}^{R} has the value of *1* when both countries are dissimilar with respect to R, and *0* in the opposite case. The dissimilarity indicator h_{ij}^{R} is specific for each possible country pair. For n countries we have:

$$h_{ij}^{R} \in \{1,0\} \quad for \ \forall i,j \subset (1,..,n) \tag{1}$$

From a perspective of informational content, not all dissimilarity indices are interesting. Trivial are the cases of self-similarity (h_{ii}^{R}, h_{jj}^{R}) and the cases of bi-directional similarity, i.e. $h_{ij}^{R} \equiv h_{ji}^{R}$. The pair-wise comparisons can be gathered in a $n \times n$ dissimilarity matrix H^R. Weeding out the cases of self-similarity (matrix diagonal) and bi-directional similarity (below diagonal) we get a dissimilarity matrix with many blank elements. For a case of four countries (*a,b,c,d*) the dissimilarity matrix for regulation attribute R looks like:

$$H^{R} = \begin{bmatrix} h_{aa}^{R} & h_{ba}^{R} & h_{ca}^{R} & h_{da}^{R} \\ h_{ab}^{R} & h_{bb}^{R} & h_{cb}^{R} & h_{db}^{R} \\ h_{ac}^{R} & h_{bc}^{R} & h_{cc}^{R} & h_{dc}^{R} \\ h_{ad}^{R} & h_{bd}^{R} & h_{cd}^{R} & h_{dd}^{R} \end{bmatrix} = \begin{bmatrix} . & h_{ba}^{R} & h_{ca}^{R} & h_{da}^{R} \\ . & . & h_{cb}^{R} & h_{db}^{R} \\ . & . & . & h_{dc}^{R} \\ . & . & . & . \end{bmatrix} \tag{2}$$

The system can easily be expanded from single-attribute indicators to a system dealing with multiple regulation attributes. Suppose countries are compared over a set of R_s ($s=1,2,..,m$) different regulation attributes, resulting in m dissimilarity indicators for each country pair. This produces a $n^2 \times m$ dissimilarity matrix H^{Rs}. After again weeding out the informational redundancies the matrix in the four-country case reads as:

$$H^{Rs} = \begin{bmatrix} . & h_{ba}^{R1} & h_{ca}^{R1} & h_{da}^{R1} & . & h_{ba}^{R2} & h_{ca}^{R2} & h_{da}^{R2} & ..... & . & h_{ba}^{Rm} & h_{ca}^{Rm} & h_{da}^{Rm} \\ . & . & h_{cb}^{R1} & h_{db}^{R1} & . & . & h_{cb}^{R2} & h_{db}^{R2} & ..... & . & . & h_{cb}^{Rm} & h_{db}^{Rm} \\ . & . & . & h_{dc}^{R1} & . & . & . & h_{dc}^{R2} & ..... & . & . & . & h_{dc}^{Rm} \\ . & . & . & . & . & . & . & . & ..... & . & . & . & . \end{bmatrix} \tag{3}$$

How large should m be? A single policy attribute for which we compare two countries is just a sample for policy heterogeneity. We are not interested in this particular policy item as such. Rather, we consider it as a specimen from which we can derive that the

two countries could have structural or pervasive policy differences in place. With *m* close to unity it is more likely that the policy-difference picture blurred by incidental sampling errors. One then may easily find average heterogeneity values that are either close to zero or close to unity. Using a larger number of observations diminishes the probability of sampling errors with respect to structural policy differences between countries. Structural (dis)similarities in policy are asymptotically approximated by a larger number of regulation attributes. In practical terms, by considering more than -say- hundred different policy attributes, it is very unlikely that we only get an incidental or atypical picture of bilateral policy differences.

Aggregation possible over multiple dimensions

Matrix H^{Rs} reduces the dimensions of regulation attributes R_s to *m* dimensionless numbers that can be aggregated in several directions: per country pair, across countries, across subsets of regulation attributes.

Yield a single numerical indicator

Average bilateral VAT dissimilarity per country pair over the *m*-dimension set R_s regulation attributes is:

$$HG_{ij}^{Rs} = \frac{1}{m}\sum_{r}^{m} h_{ij}^{Rs} \qquad \forall\, i, j\ ;\ s = 1,...,m \tag{4}$$

The elements of the set h_{ij}^{Rs} are either zero or one, so that: $0 \le HG_{ij}^{Rs} \le 1$. If the indicator is close to unity, both countries have very dissimilar policies. Matrix H^{Rs} may also be used to identify countries with strongly diverging policies vis-à-vis all other countries. This is measured by the country deviancy indicator. For country *i* it can be defined as:

$$DV_i^{Rs} = \frac{1}{n\,.\,m}\sum_{j}^{n}\sum_{s}^{m} h_{ij}^{Rs} \tag{5}$$

The country deviancy indicator can if necessary be expressed in relative terms by normalising it with the average for all countries. Note that two countries with a low score on the deviancy indicator do not necessarily have similar policies, since the indicator just registers the existence of regulation differences, not the actual content of regulations.

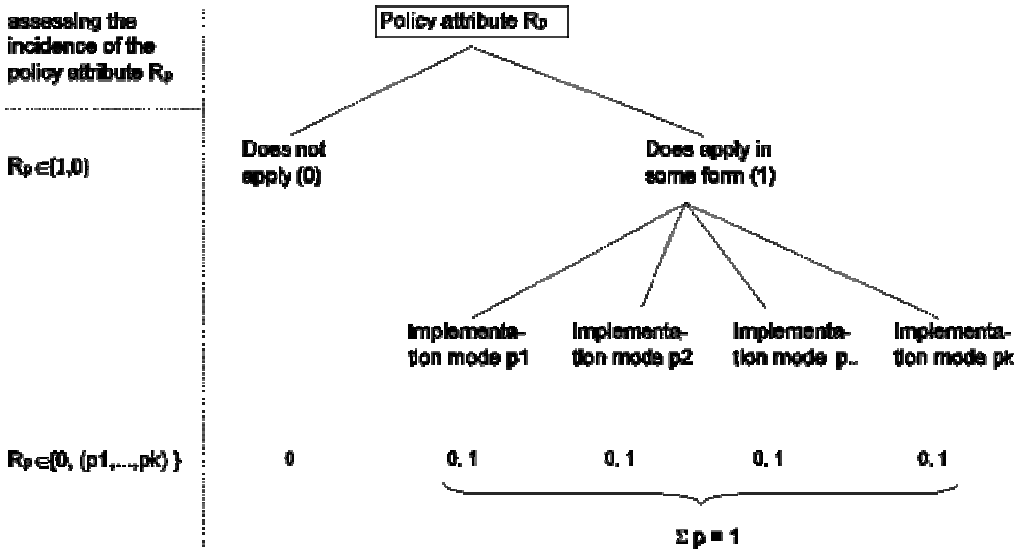
Decomposable with respect to specified VAT regulation areas

Finally, matrix H^{Rs} can be used to calculate average heterogeneity across any preferred subset of the R_s regulation vector, or for any sub-set of countries.

Increase in the degree of regulation differences

So far we dealt with *binary* regulation attributes that either apply or do not apply in a country: $R_i \in \{1,0\}$. In principle any regulation could be described in binary terms, but this may either be too unpractical due to the required amount of detailed taxonomic work, or simply because the necessary regulation data are not available for international comparison. Many comparison items are of a more complex nature than simple yes-no questions, meaning that difference between countries can only be described in terms of distinct implementation modes. This can be labelled *categorical* regulation information. The actual implementation of a regulation is grouped into a limited number of discrete and mutually exclusive implementation modes. Consider regulation attribute *Rp* that can be implemented in *k* different modes ($p_1,p_2,..,p_k$), so that for any country *i* we may find *k+1* different values for *Rp*: $R_{pi} \in \{0,p_1,p_2,...,p_k\}$ as Figure 1 shows. The case of binary policy attributes is a special case, with k=1.

Figure A1. Dealing with categorical VAT regulation attributes (discrete categories)



The introduction of multiple implementation modes increases the number of possible regulation differences. The likelihood that two countries have different policies in place increases. Assume that countries are independent and that the presence of a certain regulation attribute in one country has no impact on its presence in the other county (random draw). For any country *i* we may find *k+1* different policies[123] in place (*0,*R_{p1} *,*R_{p2}*,...R,*$_{pk}$). Hence, for any pair of countries *2(k+1)* different VAT regulation combinations are possible. The probability of each combination is $[2(k+1)]^{-1}$. Since there are *k+1* different policies, the probability that we find identical policies in both countries is: $(k+1)^{-1}$. The probability that we find different (heterogeneous) VAT regimes is:

$$\Pr\left(h_{ij}^{Rp} = 1 \right) = \frac{k}{k+1} \qquad (6)$$

The heterogeneity indicator increases in *k,* the number of allowed VAT regulation modes. E.g. for *k=1, k=5* and *k=9* the probabilities are *0.5*, *0.8* and *0.9*. Especially for continuous numerical variables *k* goes to infinity. It is useful therefore to apply a coarse-graining procedure that reduces the numerical variety by distinguishing a discrete number of numerical intervals. At the end of this annex, we describe the decision rules for the coarse-graining procedure that was applied applied in the construction of the VAT disimilarity indicators.

Multiple implementation modes magnify the VAT-regime dissimilarity matrix H^{Rs} to dimensions $n^2 \times m \times g$, where *g* is the maximum number of implementation modes that holds for any of the regulation attributes. Regulation attributes for which it holds that $g>k$ will effectively be represented in the matrix by blank elements for the implementation modes $\{k,..,g\}$. In the summary indicators we can correct for the number of blanks in the relevant rows or columns.

After adding the implementation modes as comparison dimensions, the country deviancy indicator becomes:

$$DV_i^{Rps} = \frac{1}{n \,.\, m \,.\, k} \sum_{j}^{n} \sum_{s}^{m} \sum_{p}^{k} h_{ij}^{Rps} \qquad (7)$$

[123] Including the possibility that a particular country has no VAT regulation in place for a particular policy item.

Aggregation independent of subjective weights

The heterogeneity indicator HG_{ij}^{Rs} is based on an unweighted average over all relevant regulation attributes. This has the advantage that the composite heterogeneity indicator is not based on subjective information elements. In the paper to be produced we will illustrates through an example how the bilateral VAT dissimilarity indicator is calculated and aggregated.

Independent of pre-defined judgements on specific policies

VAT dissimilarity indices and country deviancy indicators are dimensionless numbers. They give no information about the nature of the dissimilarity itself, nor on the question whether a player is high/low, strict/lenient or intensive/extensive with regard to a particular VAT regime characteristic. The indicator is primarily a frequency count for bilateral policy differences. It can be decomposed for policy differences in specific VAT domains. If one is interested in these aspects, the indicators will have to be used in combination with a dimensioned level indicator. The main text proposes a number of level indicators of VAT-related trade costs and administrative burden for firms that may help to identify - for each country pair - which of both is the one where trade costs and VAT-related administrative burdens are probably lowest. It should be realised however that even for a given country pair this hierarchy may differ by VAT comparison item.

A.3. Coarse-graining procedure applied for numerical variables

Some variables used for calculating the VAT dissimilarity indices have a continuous numerical value, e.g. the sales threshold for being eligible for quarterly VAT refund, with sales measured in thousand euros. Continuous numerical variables, by their nature, can have lots of different values. It would make no sense that all different values of a numerical variable, irrespective of their size magnitude, are regarded as a VAT-regime heterogeneity element. To avoid that we may classify, per numerical comparison item, all numerical values into a limited number of intervals. E.g. for a variable that across member states differs between 0 and 20, we might choose for four intervals (less than 1, 1-8, 9 to 15, above 15). This reduces the potential heterogeneity scope for this variables to just four differnet country scores. This variety-reducing method for continuous numerical variables redistributes all numerical differences to minimally three and maximally six different intervals, depending on the distribution characteristics of the

actual country scores. The same decision rule decides for the choice between either 3, 4, 5 or 6 intervals for a particular numerical item:

- Per variable we first determine the maximum range that contains all numerical values in the sample.
- The range is divided by the standard deviation, yielding a value *K*.
- The next step takes care of the higher moments of the distribution by a correction factor *E* that corrects for the relation between the mean and the standard deviation. The correction factor is calculated as: $E = 1 - \frac{M - \sigma}{(\sigma - M)^2}$ in which *M* is the mean value and σ is the standard deviation. The denominator is squared so that it is always positive for values $\sigma \neq M$.

Now it is possible to determine the potential number of different value intervals for that numerical variable, using a lower threshold of three categories and a ceiling of maximum six categories:

$$\begin{cases} Z = 6 & if \ \left|\text{int}\left(K.E\right)\right| > 6 \\ Z = \left|\text{int}\left(K.E\right)\right| > 6 & if \ \ 3 \le \left|\text{int}\left(K.E\right)\right| \le 6 \\ Z = 3 & if \ \ \left|\text{int}\left(K.E\right)\right| < 3 \end{cases}$$

This coarse-graining procedure is applied individually for each continuous numerical variable. Subsequently, for all countries the continuous variable is re-coded according to the number of intervals Z.

Annex B. Items used for construction of dissimilarity indices

Used for indicator:	Comparison item no.	Description	Nature	Source no.(at bottom)	endnote no.
HVGEN	1	Standard VAT rate	level	7	
HVGEN	2	Using reduced rates?	Y/N	7	
HVGEN	3	Reduced VAT rate 1	level	7	
HVGEN	4	Multiple reduced rates?	Y/N	7	
HVGEN	5	Reduced VAT rate 2	level	7	
HVGEN	6	Does super reduced rate exist?	Y/N	7	
HVGEN	7	Super-reduced VAT rate	level	7	
HVGEN	8	Does Parking VAT rate exist?	Y/N	7	
HVGEN	9	Parking VAT rate	level	7	
HVGEN	10	Regional exemptions within country?	Y/N	1	a
HVGEN	11	No. of goods to which parking rates apply	level	1	
HVGEN	12	No. of services to which parking rates apply	level	1	
HVGEN	13	No. of goods & serv. categories to which super reduced rates apply	level	1	b
HVGEN	14	No. of categories goods & services to which zero rate applies	level	1	
HVGEN	15	Exemptions on Leasing & letting of immovable property?	Y/N	7	
HVGEN	16	Exemptions on financial services?	Y/N	7	
HVGEN	17	Exemptions on supply of other buildings than new buildings?	Y/N	7	
HVGEN	18	Exemptions on land other than building land?	Y/N	7	
HVGEN	19	Full zero rate on provisions of supplies and fuel to sea vessels, recue vessels and war vessels?	Y/N	7	
HVGEN	20	Variability of standard VAT rates across 7 tradable services (CoV)	level	own_calc	c
HVGEN	21	Variability of standard VAT rates across 18 tradable goods (CoV)	level	own_calc	d

Used for indicator:	Comparison item no.	Description	Nature	Source no.(at bottom)	endnote no.
HVGEN	22	Variability of standard VAT rates across 25 tradable goods/services (CoV)	level	own_calc	e
HVGEN	23	Number of national VAT obligations going beyond EU VAT requirements (options identified in EU Act)	level	16	f
HVGEN	24	Number of national VAT obligations going beyond EU requirement (NOT identified in EU Act)	level	16	f
HVGEN	25	Number of EU VAT requirements NOT transposed in national tax law	level	16	
HVGEN	26	Country's legal origin	categ	17, 18	g
HVADM	27	VAT registration threshold?	Y/N	2	
HVADM	28	Multiple VAT regist. thresholds?	Y/N	2	
HVADM	29	VAT registration threshold 1 (in 1000 euros 2006)	level	2	
HVADM	30	VAT registration threshold 2 (euros 2006)	level	2	
HVADM	31	Distance-selling threshold (in 1000 euros)	level	7	
HVADM	32	Intra-Commun. Acquisition threshold (in 1000 euros)	level	7	
HVADM	33	Does threshold retail export scheme exist (Y/N)	Y/N	7	
HVADM	34	Threshold retail export scheme (in 1000 euros)	level	7	
HVADM	35	Threshold for annual refund of VAT (in 1000 euros)	level	7	h
HVADM	36	Threshold for quarterly refund of VAT (in 1000 euros)	level	7	h
HVADM	37	Optional reverse charge: assembly and installation supplies	Y/N	7	i
HVADM	38	Optional reverse charge: services connected to immovable property	Y/N	7	i
HVADM	39	Optional reverse charge: hiring-out of means of transport	Y/N	7	i
HVADM	40	Optional reverse charge: work on movable goods	Y/N	7	j
HVADM	41	Optional reverse charge: All other supplies	Y/N	7	i

Used for indicator:	Comparison item no.	Description	Nature	Source no.(at bottom)	endnote no.
HVADM	42	Are suppliers in EU member states obliged to appoint a VAT representative? (Y/N)	Y/N	7	k
HVADM	43	Is voluntary appointment of VAT representative for EU suppliers unconditio-nal? (Y/N)	Y/N	7	k
HVADM	44	Voluntary appointment of VAT representative for EU suppliers? (Y/N)	Y/N	7	k
HVADM	45	Contracting partner's joint and several liability? (Y/N)	Y/N	7	l
HVADM	46	Is contracting partner's joint and several liability conditional? (Y/N)	Y/N	7	l
HVADM	47	Can excess input tax be carried forward unconditio-nally?	Y/N	7	m
HVADM	48	Conditional carry forward of excess input tax?	Y/N	7	m
HVADM	49	Immediate refund of excess input tax?	Y/N	7	m
HVADM	50	Conditional refund possible of excess input tax?	Y/N	7	m
HVADM	51	Postponed accounting VAT imported goods possible?	Y/N	7	n
HVADM	52	Postponed accounting VAT imported goods only conditionally possible	Y/N	7	n
HVADM	53	Storage of invoices: general storage period (in years)	Y/N	7	
HVADM	54	Storage of invoices: do exceptions exist for firms?	Y/N	7	
HVADM	55	Filing deadline (in days)	level	7	
HVADM	56	Do interim payment deadlines exist?	Y/N	7	
HVADM	57	Penalty for late submission of VAT return by VAT-due firms?	Y/N	7	o
HVADM	58	Maximum penalty for late or incorrect submission of VAT return as percentage of VAT amount due	level	8	
HVADM	59	Maximum penalty for late or incorrect submission of VAT return in euros	level	8	

Used for indicator:	Comparison item no.	Description	Nature	Source no.(at bottom)	endnote no.
HVADM	60	Intrastat reporting thresholds for arrivals (in 1000 euros)	level	8	
HVADM	61	Intrastat reporting thresholds for dispatches (in 1000 euros)	level	8	
HVADM	62	Maximum penalty for late or missing Intrastat declaration (in 1000 euros)	level	8	
HVADM	63	Time limit for the issue of VAT invoices ?	Y/N	7	p
HVADM	64	Time limit for the issue of VAT invoices, goods (in weeks)	Y/N	7	p
HVAB_	65	Administrative burden costs of VAT as % of national VAT income (measure of VAT tax efficiency)	level	16, own calc	q
HVAB_	66	Administrative burden costs of VAT as % of GDP	level	16, own calc	q
HVAB_	67	Share (%) of administrat. burden due to national obligations beyond EU VAT requirements	level	16, own calc	f
HVAB_	68	Average per firm of total administrative burden of VAT-related software (in euros)	level	16, own calc	r
HVAB_	69	Avg. tot. admin. burden p.firm for inspectable VAT bookkeeping (in euros)	level	16, own calc	r, s
HVAB_	70	Avg. tot. admin. burden p.firm for submission of a periodical VAT return (in euros)	level	16, own calc	r, t
HVAB_	71	Avg. tot. admin. burden p.firm for submission of an intra-Community sales listing (in euros)	level	16, own calc	r, u
HVAB_	72	Avg. tot. admin. burden p.firm for the issuance of a VAT invoice (in euros)	level	16, own calc	r
HVAB_	73	No. of separate tax payments (number)	level	17, 19	v
HVAB_	74	Time required for complying with tax payments (hours)	level	17, 19	w
HVSRAT	75	Foodstuffs	level	1	
HVSRAT	76	Water supplies	level	1	
HVSRAT	77	Pharmac	level	1	
HVSRAT	78	Medical equipm. disabled persons	level	1	

Used for indicator:	Comparison item no.	Description	Nature	Source no.(at bottom)	endnote no.
HVSRAT	79	Books	level	1	
HVSRAT	80	Newspapers	level	1	
HVSRAT	81	Periodicals	level	1	
HVSRAT	82	Agricult. inputs	level	1	
HVSRAT	81	Passeng. transport	level	7	
HVSRAT	82	Admission to cult. services	level	1	
HVSRAT	83	Pay / cable TV	level	1	
HVSRAT	84	Writers / composers	level	1	
HVSRAT	85	social housing	level	1	
HVSRAT	86	hotel accomod.	level	1	
HVSRAT	87	Admiss. sporting events	level	1	
HVSRAT	88	use of sport facilities	level	1	
HVSRAT	89	social services	level	1	
HVSRAT	90	medic. & dental care	level	1	
HVSRAT	91	Waste collecttion	level	1	
HVTG_	92	Spirits	level	1	
HVTG_	93	Wine	level	1	
HVTG_	94	Beer	level	1	
HVTG_	95	Mineral water	level	1	
HVTG_	96	Electricity	level	1	
HVTG_	97	Cut flowers	level	1	
HVTG_	98	Plants for food production	level	1	
HVTG_	99	Children clothing and footwear	level	1	x
HVTG_	100	Adult clothing	level	1	
HVTG_	101	Adult footwear	level	1	
HVTG_	102	Tobacco	level	1	
HVTG_	103	HiFi- video appliances	level	1	
HVTG_	104	CD/ CDRoms	level	1	
HVTG_	105	Household electrical appliances	level	1	
HVTG_	106	Pesticides, plant protection materials	level	1	

Used for indicator:	Comparison item no.	Description	Nature	Source no.(at bottom)	endnote no.
HVTG_	107	Fertlizers	level	1	
HVTG_	108	Petrol (unleaded)	level	1	
HVTG_	109	Motor vehicles	level	1	
HVTS_	110	Intra-EU and internat. rail transport	level	1	
HVTS_	111	Intra-EU and internat. road transport	level	1	
HVTS_	112	Phone/fax /telex, etc	level	1	
HVTS_	113	Passenger domest. rail transport	level	1	
HVTS_	114	Construction work on new buildings	level	1	
HVTS_	115	Travel agencies	level	1	
HVTS_	116	Treatment of waste and waste water	level	1	y
HVADREG	117	Procedures for starting a business (number)	level	17	
HVADREG	118	Time procedures for starting a business (days)	level	17	
HVADREG	119	Cost of regulation-related procedures for starting a business (% of inc. p. capita)	level	17	
HVADREG	120	Min. capital for starting a business (% of inc.p. capita)	level	17	
HVADREG	121	No. of documents required for export (number)	level	17	
HVADREG	122	Time for approval of export (days)	level	17	
HVADREG	123	No. of documents required for import (number)	level	17	
HVADREG	124	Time for approval of import (days)	level	17	
HVADREG	125	No. of procedures for enforcing of contracts	level	17	
HVADREG	126	Time required for enforcing of contracts (days)	level	17	
HVADREG	127	Cost of enforcing of debt contract (% of debt)	level	17	

Data sources 2008 (or closest available year) for the comparison items

Source no.	Reference
1	EU,ECFIN-TAXUD, VAT rates applied in the member states of the European Union, DOC/1829/2006, European Commission 2006.
2	Annacondia, F. & W. van der Corput, 2008, VAT registration threshold in Europe, Internat. VAT Monitor, Nov/Dec 2008, 453-457
3	Int. VAT Monitor, Sixth VAT Directive text 1 Jan 2006, IBFD, Amsterdam
4	W.v.d.Corput and F Annacondia, 2007, VAT Compass 2007, IBFD, Amsterdam 2007
5	Practical information on European VAT, International VAT Monitor, IBFD , Jan/Febr 2006.
6	Annacondia, F. & W. van der Corput, 2005, VAT registration threshold in Europe, Internat. VAT Monitor, Nov/Dec 2005, 434-436
7	W.v.d.Corput and F Annacondia, 2008, VAT Compass 2008, IBFD, Amsterdam 2008
8	Ernst & Young, 2008, The 2008 worldwide VAT and GST guide, Ernst & Young UK
9	W. v.d. Corput, 2004, VAT Options exercised by the New member states, International VAT Monitor , Sept/Oct. 2004, 318-332.
10	Eurostat/ European Commission, 2010, Taxation trends in the European Union - data for the EU member states, Iceland and Norway, 2010 edition, Eurostat/ European Commission
11	F. Annacondia & W. v.d. Corput, 2005, Overview of general turnover taxes and tax rates, VAT Monitor, Marc/April 2005, 1-11
12	Practical information on European VAT, International VAT Monitor, IBFD , Jan/Febr 2004.
13	R.Vos, N. Lawrence & D. Jordorson (eds.), 1994, Tolley's VAT in Europe, Nexia International, Tolley: Croydon.
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16	CapGemini, Deloitte & Ramboll Management, 2009, Final report: Measurement data and analysis, Report on Tax Law (VAT) Priority Area, EU Project on baseline measurement and reduction of administrative costs (ENTR/06/061), March 2009, Brussels.
17	World Bank, Cost of Doing Business Database, World Bank.
18	Djankov, S. , R. La Porta, F. Silanes, and A. Schleifer, 2003, Courts, The Quarterly Journal of Economics, May 2003.
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End notes to the comparison items

a	For parts of the country that also form part of the EU and where the country has the jusrisdiction.
b	List is non-exhaustive according to data source.
c	Calculated as Coefficient of Variation of VAT rates for all 7 listed traded services categories.
d	Calculated as Coefficient of Variation of VAT rates for all 18 listed traded good categories.
e	Calculated as Coefficient of Variation of VAT rates for all 25 listed traded good and services categories.
f	Refers to national VAT requirements that are not stated in the EU Acts on VAT.
g	Similarity of a country pair's legal origins can influence a firm's costs of dealing with legal conflicts with foreign government related to VAT issues.
h	Minimim numbers, applies to non-resident traders.
i	Optional reverse charge mechanism applicable to supplies made by non-resident suppliers.
j	Optional reverse charge mechanism applicable to supplies made by non-resident suppliers. Does not include services rendered to customers identified for VAT purposes in another member state.
k	Where non-resident suppliers are liable to pay the tax, member states may allow them to appoint a tax representative as the person liable for payment of the tax ("voluntary representation") .
l	Where non-resident suppliers are liable to pay the tax, Memer States may provide that, in addition to the supplier's tax representative, some other person, usually the customer, may be held jointly and severally liable for the payment of the tax (Art.21.3 of the Sixth Directive; art 205 of Directive 2006/112).
m	When for a given tax period, deductible input taxes exceed output tax, member states may require that the excess is carried forward to following tax period(s).
n	Regarding imported goods, member states may provide that (in designated circumstances) VAT on importation does not need to be paid to the customs officials at the time the goods are released from customs control or periodically ("on deferred terms") but instead by the person for whom the goods are destined, through the latter persons'periodic VAT return ("postponed accounting").
o	This indicator refers to a specific fine or penalty. Apart from that, most countries charge a penalty interest rate on the amount due.
p	member states may impose time limits for the issue of invoices, counting from the date on which the taxable event occurs.
q	Administrative Costs can be split in 'businesss-as-usual' costs (arising from information costs that firms would collect even in the absence of a specific legislation) and 'administrative burden' (information costs arising from a specific legal or regulatory obligation).

r	Average administrative burden per firm (across all firm size classes) for "VAT bookkeeping in sufficient detail for inspection by tax authorities" (in euros). For the countries for which the detailed adm. burden indicators were not measured in the source document (16), we take the value for France as the starting point for extrapolation to the orher EU countries. We used the actually measured countries in source(16) to calculate the optimal weight algorithm, with France as point of departure. The optimal weights, showing the smallest average deviations from the actual values were obtained by the use of the following weights: (1.5 / 2) times the difference with France with respect to subindicator 66; (0.1 / 2) times the difference with France with respect to subindicator 65; (0.1 / 2) times the difference with France with respect to subindicator 74; and (0.3 / 3) the difference with France with respect to subindicator 67.
s	Average administrative burden per firm (across all firm size classes) for for "VAT bookkeeping in sufficient detail for inspection by tax authorities" (in euros).
t	Each member state has its own unique process for submission of VAT return. "Every taxable person shall submit a VAT return setting out all the information needed to calculate the VAT amount taxable, the VAT amount deductible, as well as, [..] the total amount on which VAT is chargeable and deductible, as well as the value of any VAT exempt transaction".
u	"Every taxable person identified for VAT purposes shall submit a recapitulative statement of the acquirers identified for VAT purposes to whom he has supplied goods [..], and of the persons identified for VAT purposes to whom he has supplied goods which were supplied to him by way of intra-Community acquisitions [..]".
v	World Bank/ Price Waterhouse, " Paying Taxes", World Bank Cost of Doing Business 2007: The tax payments indicator reflects the total number of taxes and contributions paid, the method of payment, the frequency of payment and the number of agencies involved for this standardised case during the second year of operation. It includes payments made by the company on consumption taxes, such as sales tax or value added tax. The number of payments takes into account electronic filing. Where full electronic filing is allowed and it is used by the majority of medium-sized businesses, the tax is counted as paid once a year even if the payment is more frequent.
w	World Bank & PriceWaterhouse, "Paying Taxes", World Bank Cost of Doing Business 2008: Time is recorded in hours per year. The indicator measures the time to prepare, file and pay (or withhold) three major types of taxes and contributions: • corporate income tax, • value added or sales tax, and • labour taxes including payroll taxes and social contributions. Preparation time includes the time to collect all information necessary to compute the tax payable. If separate accounting books must be kept for tax purposes – or separate calculations made – the time associated with these processes is included. This extra time is included only if the regular accounting work is not enough to fulfil the tax accounting requirements. The time estimated also does not include the time spent developing the entries on tax for inclusion in

	the statutory accounts. Filing time includes the time taken to complete all necessary tax forms and to make all necessary calculations and submissions. Payment time is the hours needed to make the payment online, or at the tax office. Where taxes and contributions are paid in person, the time includes delays while waiting. This payment time can also include analysis of forecast data and associated calculations if advance payments are required.
x	In case of Poland: baby clothing.
y	In case of DE and IE : two tariffs (only lowest mentioned.

6 VAT compliance costs and trade (CPB)

This chapter contributes towards answers to the following evaluation questions in the project Terms of Reference:

(1) To what extent does the current VAT arrangements for cross border supplies of goods and services maximise the potential of a genuine EU single market for businesses and customers (for both businesses and private individuals)? What is the range of GDP loss that could be attributed to the special rules, obligations and risks associated to EU trade? What are the related administrative burdens and collection costs? What are the main reasons for any infringements and/or fraudulent activity and their extent at EU level?

(4) What are the cost and impacts of the current exemptions for the tax revenue, the businesses and final consumers? What percentage of the member states' total consumption is VAT-exempted?

(5) What are the cost and impacts of the current diversification of the VAT rates, including the reduced VAT rates, on compliance for businesses in particular for cross border transactions and on collection/control costs? What percentage of the member states' total consumption is subject to reduced VAT rates/ standard VAT rate?

(6) To what extent and how do the different cost factors of the VAT (i.e. compliance costs and other effects of the VAT regime) impact the medium/large and pan-European businesses?

(9) What are the cost and impacts of the current national VAT arrangements applied in the member states on the bona fide traders in the context of the VAT fraud?

It addresses the following specific elements:

(B) Analysis of the aspects of non-distortion of competition in the EU, including in cross-border relations. In particular, the evaluation should analyse in detail the impact of the VAT system and of the unequal treatment of intra-EU supplies as compared to domestic supplies on the internal market, e.g. if and to what extent it leads to a change in consumer choice, higher or lower prices, the creation of barriers for new suppliers and service providers, the facilitation of anti-competitive behaviour or emergence of monopolies, market segmentation, etc. It should also look at the impact it has on trade barriers and if it provokes relocation of economic activities.

(B) The analysis set out in point (B) above should cover both B2B and B2C transactions, and notably the specific regimes (distance selling, supplies of new means of transport, intra-Community acquisitions by non-taxable legal persons or taxable persons without a right of deduction) which have been introduced in 1993 in order to avoid distortions of competition resulting from the differences in VAT rates.

Summary

This chapter presents an analysis of the impact of VAT policies in EU member states on trade in goods and services and how the resulting changes in trade affect GDP and consumption. We use the indicators described in Chapter 5 to estimate the impact of VAT compliance costs and dissimilarity in VAT regimes on aggregate trade between pairs of countries. For trade in services we distinguish three types of trade flows: *Total services*, *Travel*, and *Other business services*.

The regression results only capture the direct (partial equilibrium) effects of VAT policy on trade and do not take into account trade diversion and other indirect effects. For this reason, we have used the estimated direct effects in simulations with the computable general equilibrium model WorldScan.

We performed four simulations with WorldScan based on these regression results:

1. Removal of national obligations that go beyond EU VAT requirements. Simulation results indicate an increase of 2.6% in intra-EU trade and a rise in real GDP and consumption of 0.2% for the members of the EU.
2. Reduction of 10 percent in the dissimilarity of the general VAT administrative procedures between countries. This scenario yields a rise of 3.7% in intra-EU trade, while real GDP and consumption increase by 0.4% and 0.3%, respectively.
3. Reduction of 50 percent in the dissimilarity between countries in terms of the VAT rates they apply to specified goods and services (not simply the standard VAT rate).[124] Here, intra-EU trade gains 9.8%, real GDP rises by 1.1%, and consumption by 0.7%.
4. Removal of differences in VAT rates on specified services that are subject to international trade.[125] In this scenario, we find increases of 6.5% in intra-EU trade, 0.7% in real GDP, and 0.5% in consumption for the EU27.

We thus find indications that harmonisation of VAT rates and procedures might bring gains in trade, GDP, and consumption. For trade in services, our regression results indicate that differences in VAT rates and procedures have a positive effect on trade, especially in the category *Other business services*. Possible explanations for this result are that a part of services trade is due to tax avoidance and that dissimilarity in VAT regimes makes it attractive for firms to open a foreign subsidiary to be more cost-effective. Services traded between subsididaries of multinationals can be used to implicitly allocate profits to the country with the most favourable tax regime (see also the discussions in Chapter 3 and Chapter 11 of this report). Results for trade in *Travel services* are similar to the results for trade in goods.

The results reported above are likely to overstate the true effects of VAT harmonisation due to methodological limitations, however: the estimated effects of VAT reforms described above assume that it is the features of the VAT system that are *causing* the associated trade patterns. There are two other strong possibilities. One is reverse causation: it may be that countries choose to adopt VAT rates and rules that are similar to those of their main trading partners, for example. The other is common causation: it

[124] These goods and services are a group that are often subject to reduced rates: foodstuffs, water supplies, pharmaceuticals, medical equipment for disabled persons, books, newspapers, periodicals, agricultural inputs, passenger transport, admission to cultural. services, pay / cable TV, writers / composers, social housing, hotel accomodation, admission to sporting events, use of sports facilities, social services, medical and dental care, and waste collection.

[125] These services are: Intra-EU and international rail transport, Intra-EU and international road transport, phone/fax/telex etc, passenger domestic rail transport, construction work on new buildings, travel agencies, and treatment of waste and waste water.

may be that other characteristics, not allowed for in the estimation, help to determine both VAT policy and trade patterns independently: for example, that certain kinds of country are disposed both to adopt certain kinds of policy and to trade with each other. As robustness checks, we therefore conduct two additional simulations with WorldScan based on assumed levels of compliance costs.

We also find that:

5. Removal of all VAT compliance costs on intra-EU trade assuming that compliance costs are 1 percent of a firm's sales. This scenario shows increases of 4.3% in intra-EU trade and 0.4% in GDP.
6. Removal of all VAT compliance costs on intra-EU trade assuming that compliance costs are 3 percent of a firm's sales. Intra-EU trade is expected to rise by 13% in this scenario, while GDP increases by 1.4%. These outcomes can be considered to be plausible upper-bound estimates of the impact of removal of VAT compliance costs as they do not rely on potentially biased regression results.

6.1 Introduction

Gravity analysis is the standard econometric technique that is used for identifying the determinants of bilateral trade flows (Anderson and Van Wincoop 2004). The core empirical contribution of gravity analysis is that the size of a trade flow is related to the sizes of both the importing economy and the exporting economy. Many other indicators have been included successfully in later studies, making the gravity equation the workhorse of empirical international economics.

We focus on compliance costs of VAT regulation. For trade in goods, the destination principle ensures that foreign firms face the same VAT rate as domestic firms in the internal market. As such, differences in VAT rates will not affect the destination countries chosen by the exporter. Even though the destination principle ensures that differences in VAT rates do not distort the choices of exporters, this does not hold true for differences in VAT compliance costs. Differences in VAT compliance costs across countries might affect the behaviour of exporting firms in a similar way as differences in transport cost do: Firms have an incentive to export to countries that have similar VAT procedures because exporting to these countries requires less administrative expenditure.

For trade in services the destination principle does not always apply. In particular, the destination principle does not apply to most services traded in category *Travel* as this

category primarily contains goods and services bought abroad by travellers. For this reason we include the differences in tax rates between the exporting and the importing country in the regressions for services trade.

A limitation of the regression analysis is that we only have data on VAT compliance costs indicators for a single year. Consequently, our results might pick up the effects of variables that are correlated with VAT compliance costs, but that are not included in the analysis. Another estimation problem is that countries have an incentive to harmonise VAT regulation with their largest trading partners, such that it might appear that VAT harmonisation leads to large trade flows, while the causation might run in the other way.

The regression results are used as the starting point of four simulations by the computable general equilibrium model WorldScan. These simulations show, among other things, how GDP is affected by VAT harmonisation. Given the estimation problems mentioned above, these WorldScan simulations are likely to be based on biased estimation results. In order to illustrate how more plausible magnitudes of the effect of VAT compliance costs on trade would affect GDP, we conduct two further simulations. The additional simulations have been performed based on assumed *levels of compliance costs of 1 and 3 percent of sales.* The European Tax Survey (European Commission 2004, Table 2-3) has shown that compliance costs of more than 3 percent of sales are reported by just 13 percent of firms. Hence these two scenarios provide reference results that can be considered upper bounds on the effects of compliance costs on trade and GDP.

The next section discusses the estimation strategy. Section 6.3 contains a description of the data that have been used in addition to the indicators introduced in Chapter 5. The estimation results for trade in goods are presented in Section 6.4, the results for trade in services are presented in Section 6.5. WorldScan simulations are presented in Section 6.6. A synthesis of the main findings from the regression analysis and the WorldScan simulations, can be found in Section 6.7. Annex C provides details of the countries used in our pair-wise analysis of trade flows, Annex D provides information on the robustness checks used in this analysis and Annex E provides information on the calibration of our Worldscan model.

6.2 Estimation strategy

We only have data on compliance costs for a single year, such that the nature of the analysis is cross-sectional. In order not to reduce the dependency on a single year for other variables (notably trade and *GDP*), we also present results based on panel regressions. The empirical equations that we have estimated have the following form:

$$\ln TRADE_{ijt} = a_0 + a_1 \ln GDP_{it} + a_2 \ln GDP_{jt} + \sum_k b_k x_{kijt} + \sum_l c_l z_{lijt} + \sum_l c_l^{mi} z_{lijt}^{mi} + \eta_t + \varepsilon_{ijt} \quad (1)$$

Here, $TRADE_{ijt}$ is the total value of exported goods from country i to country j in year t, GDP_{it} and GDP_{jt} are the GDP of the exporting country and the GDP of the importing country, the variables x_k are the controls log distance between exporting country and importing country, whether these countries have a common border, a common language, whether they had a colonial relationship, and whether they were part of the same country in the past.

The regressors z_l are variables related to the VAT compliance costs and VAT dissimilarity (see next section). These variables are available for a single year only, which is 2008. We only have these indicators for EU countries, such that we need a strategy on how to treat the trade flows for which the data are missing. A simple approach would be to drop the observations with missing values, which amounts to reducing the sample to intra-EU trade. The results presented below show that this does yields very few statistically significant coefficient estimates for VAT related indicators – possibly because the number of observations gets quite small in this subsample.

Another approach is to set all missing values to zero and add a 'dummy' variable that equals one for all observations with a missing value (the z_k^{mi}). We have followed this approach for the full data sample. If we do not include this set of dummies, then we underestimate the effect of VAT dissimilarity. Trade flows with missing VAT dissimilarity probably have a high degree of dissimilarity. Imputing a dissimilarity of zero would bias the estimated effect of dissimilarity toward zero. By including dummies for missing observations, we estimate the average effect of dissimilarity for extra-EU and non-EU trade flows. We do not report the coefficients for these variables. The error term captures variation over the years and is implemented with year dummies. The coefficient estimates for the year dummies are also not reported. ε_{ijt} is the residual.

It is well-known that estimating a gravity equation on cross-sectional data tends to generate unstable coefficient estimates. Results can differ wildly from one year to another. The usual way of improving the robustness of estimation results is to perform a panel regression with fixed effects for country pairs. Fixed effects regression has the additional advantage of being less vulnerable to omitted variable bias, including bias due to endogeneity of trade policy (Baier and Bergstrand 2007).

This approach is not feasible here as using a fixed effects regression means basing econometric identification on differences over time rather than across countries. By construction, the compliance cost and dissimilarity indicators do not vary over time. Instead, we have estimated each specification in three different ways:

1. Cross-section for 2008
2. Pooled regression for the period 2004 to 2008 for trade in goods and 2002 to 2009 for trade in services
3. Random effects panel regression for the period 2004 to 2008 for trade in goods and 2002 to 2009 for trade in services

Each estimator has its drawbacks. Cross-sectional analysis can yield very different estimates from year to year, pooled regression can yield biased estimates because of unobserved country characteristics, and random effects panel regression can produce biased estimates if the random country effects are correlated with the regressors. For this reason, we report results for all three estimators, correcting clustering of standard errors in various ways.

We consider pooled regression to be the preferred, albeit not perfect, estimation technique. In particular, coefficient estimates are not very reliable for two reasons. 1) Omitted variable bias: VAT-related regressors might be correlated with unobserved variables for example unobserved non-tariff barriers. 2) Endogeneity bias: governments are likely to have harmonised their VAT policies with their main trading partners in the past. VAT harmonisation might have led to larger trade flows, but larger trade flows might also have led to VAT harmonisation.

6.3 Data

The compliance cost indicators are collected for EU countries only for the year 2008 and are described in Chapter 5, with the exception of the difference in VAT rates (vatratedif) which is computed using the VAT rates described in Chapter 11. Table 6.1 contains short descriptions of the compliance cost related variables used in the

regressions, while Table 6.2 shows short descriptions of dissimilarity indicators related to VAT policies.

Table 6.1. Compliance cost indicators at the country level (exporter and/or importer)

Indicator	Description
cov_rate	Variability of standard VAT rates across 25 goods/services (CoV)
nonEUobl	Number of national VAT obligations beyond EU requirements
nonEU_ab	Percentage of national VAT obligations beyond EU requirements
regcutoff	Primary VAT registration threshold (in EUR 1000)
anrefund	Threshold for annual VAT refund (in EUR1000)
qtrefund	Threshold for quarterly VAT refund (in EUR 1000)
inv_yrs	Storage of invoices: general storage period (in years)
filedays	VAT filing deadline (in days)
abvat_rev	Adm. burden costs VAT as % of national VAT revenue
abvat_gdp	Adm. burden costs of VAT as % of GDP
logabfirm	Estimated avg. costs administrative burden per firm
antaxpmt	No. of separate tax payments; includes corp. & inc. tax
antaxtime	firm time needed for tax payments (hours); includes corp. & inc. tax
no_expdoc	No. of documents required for export (non-VAT regul. trade costs)
no_impdocs	No. of documents required for import (non-VAT regul. trade costs)

Data on the value of bilateral trade in goods were obtained from the International Trade in Commodity Statistics (ITCS) database using the OECD's website. The ITCS database is maintained by the OECD and the UNSD. The most recent year currently available is 2009, but the analysis has been limited to 2008 as the 2009 data suffer from underreporting. The first year used in the analysis is 2004, the year of the enlargement of the EU to 25 member states.

Table 6.2. VAT dissimilarity indicators

Indicator	Description
hvall	Overall characteristics of VAT regime
hvgen	Overall structure and complexity of VAT regime
hvadm	General VAT administrative procedures
hvab_	Administrative burden measures related to VAT
hvsrat*	VAT rates applied for specified goods and services
hvtg_*	VAT rates on specified internationally traded goods
hvts_*	VAT rates on specified services that are subject to international trade
hvadreg	General administrative and regulatory efficiency
vatratedif	Log (exporting country main VAT rate / importing country main VAT rate)

* This indicator captures dissimilarity in rates between countries for specific categories of goods and services, rather than differences in the standard rates between countries. The goods and services that have been used for constructing hvsrat, hvtg, and hvts are listed in the table provided in Annex B of Chapter 5 under the name of the corresponding variable in the first column of the table.

Data on all countries was retrieved and most developing countries were aggregated by (sub-)continent in order to reduce the number of zero trade flows and to focus on the OECD. A list of countries and country-aggregates used in the analysis is provided in Annex C. Results for the subsample of intra-EU25 trade are also reported. As a rule reported imports were used as the primary source. When a country did not report any imports for a specific partner, the exports reported by the partner were used instead.

An important exception to this rule has been made for all intra-EU trade flows. The establishment of the Single Market in 1992 had the side effect that data on intra-EU trade no longer could be collected from customs forms. Instead, trade statistics are gathered from data on value-added tax, the so-called INTRASTAT methodology. Due to sensitivity to fraud and other factors, intra-EU trade statistics suffered (and still suffer) from under-reporting. Because reported imports turn out to be more affected by under-reporting than reported exports, the latter kind of data were used as a primary source for intra-EU trade from 1992 onwards. (In many cases, under-reporting was so large that reported exports even exceeded reported imports despite the cif/fob difference.) The median cif/fob ratios in the years immediately prior to 1992 were used to correct for this exceptional treatment of INTRASTAT data.

Data on the value of bilateral trade in services were taken from the OECD's "Trade in services by partner country" database. Services are categorised according to the Extended Balance of Payments Services Classification (EBOPS2). We have used three

different categories of services trade: *Total services* (code 200), *Travel* (code 236), and *Other Business Services* (code 268). *Travel* mainly comprises the goods and services acquired from an economy by travellers during visits of less than one year in that economy. Data on services trade are available for all OECD countries and selected non-OECD countries. The analysis is based on data reported by the exporting country. These data seem to be more reliable than data reported by importers as 1) there are fewer missing values and 2) exporter-reported values are somewhat larger than importer-reported values at most percentiles of the distribution (including the median). The data for trade in services relate to the period from 2002 to 2009.

The primary source for data on nominal GDP and value added is the World Bank's website on the World Development Indicators (WDI). The other control variables are taken from the Distances dataset that is available from CEPII. These are dummy variables indicating whether two countries have a common border (BORDER), share a common language (LANGUAGE), had a colonial relationship in the past (COLONY), have been colonised by the same country in the past (COMCOL), or were once part of the same country (SAMECTRY).

6.4 Regression results for trade in goods

Cross-section gravity regressions often produce results that are not robust across samples and specifications. For this reason, we first assess whether an individual variable is robust across a number of samples and estimators. At the end of this section all robust variables are included in the same regression. As the number of indicators of VAT policy is quite large, this section presents four sets of regression results. Each set considers a different set of VAT-related indicators:

1. compliance cost indicators for the exporting country
2. compliance cost indicators for the importing country
3. VAT dissimilarity indicators
4. combinations of compliance cost and dissimilarity indicators

For the first three sets, two tables are displayed:

- The first table contains summary information on the significance of an indicator for the three estimators and for the subsample of intra-EU trade. Each cell in this table is a separate regression.
- The second table shows complete regression results for the most robust indicators identified in the first table, based on the random effects estimator. Combinations of the robust indicators are also reported.

Compliance costs in the country of origin

Table 6.3 contains the regression results for indicators of VAT compliance costs that exporters face in the country of origin. Each cell of the table refers to a unique regression. When a cell is marked with an "X", this means that the compliance cost indicator listed in the first cell of that row is statistically significant at the 5% confidence interval. The compliance costs indicators vary only at the country level, which causes standard errors to be underestimated. In order to correct for this, the standard errors are clustered by exporting country.

Each column refers to a different type of estimation. The first column contains cross-section results, the second column contains pooled results, the third column is for random effects, and the fourth column is random effects, but for a subsample of the dataset that is limited to intra-EU25 trade. With each regression, exporter and importer GDP and all other control variables (the x_k) are included, but none of the compliance cost indicators, except the one indicated in the first cell of the row.

Three exporter compliance cost indicators are statistically significant with at least two different estimators: the primary VAT registration threshold (regcutoff), the threshold for annual VAT refund (anrefund), and the threshold for quarterly VAT refund (qtrefund). Only the primary VAT registration threshold is statistically significant in the intra-EU subsample.

Table 6.3. Which export compliance cost indicators are robust?

Indicator	(1)	(2)	(3)	(4)	Tot
VAT rate variability (cov_rate)	X				1
Extra obligations, number (nonEUobl)					0
Extra obligations, share (nonEU_ab)					0
VAT registration threshold (regcutoff)	X			X	2
VAT refund thresh., annual (anrefund)	X	X	X		3
VAT refund thresh., quart. (qtrefund)	X	X			2
Invoice storage duration (inv_yrs)					0
VAT filing deadline (filedays)					0
VAT admin. burden, rev. (abvat_rev)					0
VAT admin. burden, GDP (abvat_gdp)					0
Burden per firm (logabfirm)					0
Number of payments (antaxpmt)					0
Tax time burden (antaxtime)					0
Number of export docs (no_expdoc)					0
Observations	5107	26454	26454	2952	
Controls	Yes	Yes	Yes	Yes	
Year dummies	No	Yes	Yes	Yes	
Missing dummy	Yes	Yes	Yes	No	
Years	2008	All	All	All	
Sample	Full	Full	Full	Intra-EU	
Method	OLS	OLS	RE	RE	

Notes: each cell is a regression; an "X" means that the indicator is statistically significant at the 5% confidence interval; standard errors are clustered by exporting country.

Table 6.4 reports details of the regressions (with random effects) on robust export compliance indicators. The first column displays the basic specification without any VAT-related regressors and standard errors clustered by exporting country. All controls have the expected sign and magnitude and are statistically significant. The second column reports results when the threshold for annual VAT refund is added to the regressors. A higher threshold is associated with a positive effect on trade. The threshold for a quarterly refund is added in column (3). The coefficient is positive, but smaller than for the annual threshold.

The fourth column adds the VAT registration threshold. A higher VAT registration threshold is associated with larger trade flows, although the coefficient is not statistically significant when the random effects estimator is used. A small positive relation is expected as small transactions are less costly to execute.[126] The specification in the last column has all three indicators added simultaneously. The annual VAT refund threshold and the VAT registration threshold both retain the magnitude of their trade effect, but the effect of the quarterly VAT refund threshold vanishes.

Table 6.6 focuses on the three indicators for compliance costs in the importing country that are relatively robustly associated with trade. Column (1) shows the specification with only control variables included as regressors and standard errors clustered by importing country. The second column shows that the proportion of non-EU VAT revenue is negatively associated with trade. The time needed for tax forms and the number of import documents needed are both positively correlated with trade flows, perhaps indicating regulatory sophistication that arises with large importers.

[126] Intra-EU trade data is compiled from VAT records. As we use trade reported by the importing country for intra-EU data, trade that does not need to be reported in the exporting country is still observed in our dataset.

Table 6.4. Main regression results for export compliance cost indicators

	(1)	(2)	(3)	(4)	(5)
log GDPEX	1.26**	1.25**	1.25**	1.25**	1.26**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
log GDPIM	1.08**	1.08**	1.07**	1.07**	1.08**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
log DISTANCE	-1.16**	-1.12**	-1.12**	-1.11**	-1.12**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
BORDER	0.48**	0.52**	0.53**	0.52**	0.50**
	(0.18)	(0.17)	(0.17)	(0.17)	(0.17)
LANGUAGE	0.74**	0.77**	0.78**	0.82**	0.81**
	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)
COLONY	0.61**	0.61*	0.60*	0.63**	0.65**
	(0.23)	(0.24)	(0.24)	(0.23)	(0.23)
COMCOL	2.30**	2.35**	2.34**	2.33**	2.36**
	(0.24)	(0.25)	(0.25)	(0.25)	(0.25)
SAMECTRY	1.03**	1.07**	1.07**	1.05**	1.07**
	(0.35)	(0.35)	(0.36)	(0.35)	(0.34)
VAT refund thres		0.00**			0.01**
ann. (anrefund)		(0.00)			(0.00)
VAT refund thres			0.00		-0.00
quart. (qtrefund)			(0.00)		(0.00)
VAT reg. thresh.				-0.01	-0.01
(regcutoff)				(0.00)	(0.00)
Observations	26454	26454	26454	26454	26454
R2 within	0.12	0.12	0.12	0.12	0.12
R2 overall	0.77	0.77	0.77	0.77	0.77

Notes: random effects estimator; s.e.'s reported in parentheses; clustering by exporting country; year dummies, missing value dummies not reported; sign.: * 5%, ** 1%.

Compliance costs in the destination country

Table 6.5 reports results for VAT compliance costs in the destination country. As compliance costs indicators vary only at the country level, standard errors are clustered by importing country. Three indicators have statistically significant coefficients for three of the four different estimation setups: national obligations beyond EU VAT requirements as percentage of VAT administrative burden (nonEU_ab), hours needed by a firm for tax payments (antaxtime), and number of documents required for import (no_impdocs).

VAT dissimilarity indicators

Summary results for the effects of dissimilarity in VAT regimes between the origin country and the destination country can be found in Table 6.7. Clustering of standard errors is treated in three ways: clustering at the level of country pairs, clustering at the level of the exporting country, and clustering at the level of the importing country. Two dissimilarity indicators are robustly correlated with trade flows: dissimilarity in VAT administrative procedures (hvadm), and dissimilarity in VAT rates on specific goods and services (hvsrat). [127]

[127] These goods and services are a group that are often subject to reduced rates: foodstuffs, water supplies, pharmaceuticals, medical equipment for disabled persons, books, newspapers, periodicals, agricultural inputs, passenger transport, admission to cultural. services, pay / cable TV, writers / composers, social housing, hotel accomodation, admission to sporting events, use of sports facilities, social services, medical and dental care, and waste collection.

Table 6.5. Which import compliance cost indicators are robust?

Indicator	(1)	(2)	(3)	(4)	Total
VAT rate variability (cov_rate)	X				1
Extra obligations, numbr (nonEUobl)				X	1
Extra obligations, share (nonEU_ab)	X			X	2
VAT registration thresh. (regcutoff)				X	1
Invoice storage duration (inv_yrs)					0
VAT filing deadline (filedays)					0
VAT admin. burden, rev. (abvat_rev)					0
VAT admin. burdn, GDP (abvat_gdp)					0
Burden per firm (logabfirm)					0
Number of payments (antaxpmt)				X	1
Tax time burden (antaxtime)	X	X	X		3
Import documents (no_impdocs)	X	X	X		3
Observations	5107	26454	26454	2952	
Controls	Yes	Yes	Yes	Yes	
Year dummies	No	Yes	Yes	Yes	
Missing dummy	Yes	Yes	Yes	No	
Years	2008	All	All	All	
Sample	Full	Full	Full	Intra-EU	
Method	OLS	OLS	RE	RE	

Notes: each cell is a regression; an "X" means that the indicator is statistically significant at the 5% confidence interval; standard errors are clustered by importing country.

Table 6.6. Main regression results for import compliance cost indicators

	(1)	(2)	(3)	(4)	(5)
log GDPEX	1.26**	1.26**	1.26**	1.26**	1.26**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)
log GDPIM	1.08**	1.07**	1.07**	1.07**	1.06**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
log DISTANCE	-1.16**	-1.14**	-1.12**	-1.12**	-1.13**
	(0.05)	(0.05)	(0.06)	(0.06)	(0.09)
BORDER	0.48**	0.52**	0.51**	0.51**	0.49**
	(0.13)	(0.12)	(0.12)	(0.12)	(0.18)
LANGUAGE	0.74**	0.76**	0.79**	0.78**	0.77**
	(0.15)	(0.15)	(0.15)	(0.15)	(0.22)
COLONY	0.61*	0.60*	0.63*	0.62*	0.64**
	(0.25)	(0.25)	(0.25)	(0.25)	(0.23)
COMCOL	2.30**	2.34**	2.36**	2.34**	2.37**
	(0.24)	(0.24)	(0.24)	(0.24)	(0.25)
SAMECTRY	1.03**	1.05**	1.04**	0.98**	0.97**
	(0.35)	(0.35)	(0.36)	(0.36)	(0.35)
Extr. oblig. imp		-0.01			-0.01**
(nonEU_ab)		(0.00)			(0.00)
Time burdn imp			0.00*		0.00**
(antaxtime)			(0.00)		(0.00)
No. import docs				0.12*	0.08**
(no_impdocs)				(0.05)	(0.03)
Observations	26454	26454	26454	26454	26454
R2 within	0.12	0.12	0.12	0.12	0.12
R2 overall	0.77	0.77	0.77	0.77	0.77

Notes: random effects estimator; s.e.'s reported in parentheses; clustering by importing country; year dummies, missing value dummies not reported; sign.: * 5%, ** 1%.

Table 6.7. Which dissimilarity indicators are robust?

Indicator	(1)	(2)	(3)	(4)	(5)	(6)	Tot
Diss. adm. burden VAT (hvab_)							0
Diss. VAT procs. (hvadm)	X	X	X				3
Diss. adm. effncy (hvadreg)							0
Diss. VAT system (hvall)							0
Diss. VAT complexity (hvgen)							0
Diss. VAT rates (hvsrat)	X	X	X	X	X		5
Diss. VAT on goods (hvtg_)							0
Diss. VAT on services (hvts_)			X				1
Observations	5107	26454	26454	26454	26454	2952	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	
Year dummies	No	Yes	Yes	Yes	Yes	Yes	
Miss. dummy	Yes	Yes	Yes	Yes	Yes	No	
Years	2008	All	All	All	All	All	
Sample	Full	Full	Full	Full	Full	Intra-EU	
Method	OLS	OLS	RE	RE	RE	RE	
Clustering	Pair	Pair	Pair	Exp	Imp	Pair	

Notes: each cell is a regression; an "X" means that the indicator is statistically significant at the 5% confidence interval; standard errors are clustered as indicated.

Table 6.8. Main regression results for dissimilarity indicators

	(1)	(2)	(3)	(4)	(5)
log GDPEX	1.26**	1.25**	1.25**	1.26**	1.26**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
log GDPIM	1.08**	1.07**	1.07**	1.07**	1.07**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
log DIST	-1.16**	-1.12**	-1.12**	-1.15**	-1.13**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
BORDER	0.48**	0.49**	0.50**	0.50**	0.50**
	(0.12)	(0.13)	(0.12)	(0.12)	(0.12)
LANG	0.74**	0.75**	0.75**	0.75**	0.74**
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
COLONY	0.61**	0.63**	0.63**	0.61**	0.64**
	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)
COMCOL	2.30**	2.32**	2.32**	2.30**	2.32**
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
SAMECTRY	1.03**	1.06**	1.05**	1.02**	1.08**
	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)
Diss. VAT pr.		-1.42**			-1.32**
(hvadm)		(0.38)			(0.38)
Diss. VAT on			-0.45**		-0.24
serv. (hvts_)			(0.16)		(0.16)
Diss. VAT				-0.65*	-0.59*
rates (hvsrat)				(0.27)	(0.26)
Observations	26454	26454	26454	26454	26454
R2 within	0.12	0.12	0.12	0.12	0.12
R2 overall	0.77	0.77	0.77	0.77	0.77

Notes: random effects estimator; s.e.'s reported in parentheses; clustering by country pair; year dummies, missing value dummies not reported; sign.: * 5%, ** 1%.

Table 6.8 shows regression results for the three statistically significant dissimilarity indicators in detail. The first column shows the specification with only control variables included as regressors and standard errors clustered by country pairs. Column (2) adds dissimilarity of administrative procedures (hvadm) to the specification. In line with expectations, administrative dissimilarity is negatively correlated with trade. Column (3) adds an indicator of dissimilarity in VAT rates on trade-related services and column (4) adds an indicator of dissimilarity in VAT rates for specified goods and services. Both indicators are negatively related to trade. The last column shows results when all regressors are included simultaneously. The indicators that remain statistically significant are dissimilarity in administrative procedures and general VAT rate dissimilarity.

Combined results

Table 6.9 combines the indicators that were identified as robust in the last regressions of each subsection above. Columns (1)-(3) show standard errors that are clustered in different ways. Column (1) has standard errors clustered by country pair. Most compliance cost and dissimilarity indicators remain statistically significant. Column (4) is based on the subsample of intra EU trade. Coefficients tend to be smaller in the last column, but the direction of the effects remains unaltered.

Table 6.9. Regression results for combined specification

	(1)	(2)	(3)	(4)
VAT refund thresh. exp. cntry	0.001**	0.001**	0.001**	0.001
(anrefund)	(0.00)	(0.00)	(0.00)	(0.00)
VAT registr. thresh. exp. c.	-0.01**	-0.01	-0.01**	-0.001**
(regcutoff)	(0.00)	(0.00)	(0.00)	(0.00)
Extra obligations imp. cntry	-0.01*	-0.01**	-0.01*	-0.01*
(nonEU_ab)	(0.00)	(0.00)	(0.00)	(0.00)
Tax time burden imp. cntry	0.001**	0.001**	0.001	0.001
(antaxtime)	(0.00)	(0.00)	(0.00)	(0.00)
No. import docs	0.07*	0.07*	0.07	-0.02
(no_impdocs)	(0.03)	(0.03)	(0.04)	(0.04)
Diss. VAT procedures	-1.40**	-1.40*	-1.40**	-0.86*
(hvadm)	(0.39)	(0.56)	(0.48)	(0.43)
Diss. VAT on services	-0.14	-0.14	-0.14	-0.09
(hvts_)	(0.17)	(0.22)	(0.21)	(0.18)
Diss. VAT rates	-0.49	-0.49	-0.49	0.36
(hvsrat)	(0.27)	(0.29)	(0.32)	(0.21)
Controls	Yes	Yes	Yes	Yes
Sample	Full	Full	Full	Intra-EU
Clustering	Pair	Exporter	Importer	Pair
Observations	26454	26454	26454	2952
R2 within	0.12	0.12	0.12	0.44
R2 overall	0.78	0.78	0.78	0.88

Notes: random effects estimator; standard control variables included but not reported for brevity; year dummies, missing value dummies not reported; sign.: * 5%, ** 1%.

The estimation results in Table 6.9 do not give any direct information on the quantitative importance of compliance costs for the value of trade flows. In order to give an impression of the impact of compliance cost on trade, we have computed the

percentage change in trade if several compliance cost indicators were to fall by 10%, 50%, and 100%. Table 6.10 contains the trade effect for selected indicators based on the coefficient estimates of Table 6.9, column (1). These results only capture the direct (partial equilibrium) effects of VAT harmonisation and do not take into account trade diversion and other substitution effects. . Furthermore, the estimated coefficients on dissimilarity in the VAT rates of specified goods and services (hvsrat) and dissimilarity in VAT rates on specified services (hvts_) are not statistically significant in the regressions reported in Table 6.9. The size of these coefficients has become smaller in comparison to the estimates reported in Table 6.8. The full effects on trade are simulated using WorldScan and are presented in Section 6.6.

Table 6.10. Direct effects of VAT harmonisation on intra-EU trade in goods

Indicator	Change in trade (%) due to a reduction of		
	10%	50%	100%
Extra obligations, share (nonEU_ab)	0.2	0.9	1.9
Diss. VAT procs. (hvadm)	5.0	27.9	63.8
Diss. VAT rates (hvsrat)*	2.3	12.1	25.8
Diss. VAT on services (hvts_)*	0.8	3.9	7.9

* Coefficient estimate for this variable is not statistically significant.

The largest impact on trade (64%) is due to a reduction by 100 percent of dissimilarity of VAT administrative procedures (hvadm). This estimate is unrealistically large. As discussed above, we are likely to overestimate the negative impact of dissimilarity on trade because policymakers choose to reduce dissimilarity with their main trading partners (rather than with unimportant partners). This endogeneity of tax policy amplifies any negative correlation between trade and VAT dissimilarity. Another reason for these unrealistic outcomes is that (unknown) variables that determine both trade and VAT dissimilarity have been omitted from the regression (omitted variable bias).

The second-largest effect (26%) belongs to a 100 percent reduction in the dissimilarity of VAT rateson specified goods and services (hvsrat). This result is also unrealistic and probably biased upward because of policy endogeneity and/or omitted variable bias.

6.5 Regression results for trade in services

Given the large heterogeneity in different types of services, three categories of services are analysed: *Total services trade*, *Travel*, and *Other business services*. (A number of other services categories (e.g. *Education*) have not been studied becuase they are less relevant in the context of this report.) Services trade is also different from trade in goods as the destination principle does not apply to all types of services. Travel is of particular interest as it primarily covers the goods and services acquired from an economy by travellers during visits of less than one year in that economy. As travellers pay the VAT-rate in the country of origin of the purchased goods and services, the destination principle does not apply to the category *Travel*. For each category of services a set of regression results is presented. A robustness analysis is presented in Annex D.

In order to verify whether deviations from the destination principle play an important role in services trade, the difference between the main VAT rates (vatratedif) in the origin and destination countries is included as a regressor. Besides this variable, the same set of control variables is used as for trade in goods. The indicator for common coloniser (COMCOL) had to be excluded as the sample of countries for which services trade data are available does not include most developing countries. In addition, a selection of the VAT-related indicators used above is included in the regressions. These are national obligations going beyond EU VAT requirements as percentage of the VAT administrative burden in the importing country (nonEU_ab), and the dissimilarity indexes on administrative procedures, VAT rates in general, and VAT rates on services. These indicators were selected based on the results from gravity analysis on trade in goods.

Table 6.11 presents the regression results for bilateral trade in total services. In specification (1) only the control variables are included. Not all controls are statistically significant. Presence of a common border, a colonial relationship and having been part of the same country do not seem to influence trade in services. These outcomes differ from the regressions on trade in goods not only because of the nature of the transactions, but also because the sample of countries is skewed more towards OECD countries.

The bilateral log difference in main VAT rates is added to the specification in column (2), together with a dummy that indicates whether data on VAT rates is missing for at least one of the countries in the pair (coefficient estimates for missing value indicators

are omitted from the table). The coefficient on the VAT-rate difference is small and not significantly different from zero. In column (3) the indicator of additional national requirements is added. Again the estimated coefficient is small and statistically insignificant.

Specifications (4), (5) and (6) test the impact of the three VAT dissimilarity indices on trade in services. Only dissimilarity in administrative procedures has a clear impact. When two countries have dissimilar VAT procedures, this seems to have a strong positive effect on trade in services. Although the other dissimilarity indicators are statistically insignificant, their coefficients are also positive. These results suggest that some international transactions in services occur *because* there are differences in VAT regimes. Of course, these results might also be due to omitted variable bias. The last regression has all explanatory variables included simultaneously. The coefficient estimates do not change much, the only notable change being that the coefficient on dissimilarity in VAT rates on specified goods and services becomes weakly statistically significant.

This analysis for total services trade is repeated for travel services. The results are reported in Table 6.12 In contrast to the findings for total services, most control variables have a strong effect on trade in travel services. National obligations in addition to EU regulation have a negative impact on travel. This is the only VAT-related regressor that is statistically significant.

The third type of services trade that is analysed is the category “other business services”. Table 6.13 shows the regression results for the same specifications as for the other two categories of services. Extra national obligations have a negative and statistically significant effect on services trade, while all dissimilarity indices have a positive impact. In the last specification, dissimilarity in both VAT procedures and rates on specified goods and services are weakly statistically significant.

Table 6.11. Regression results bilateral trade in total services

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log GDPEX	0.84**	0.84**	0.84**	0.84**	0.84**	0.84**	0.83**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
log GDPIM	0.79**	0.79**	0.79**	0.79**	0.79**	0.79**	0.78**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
log DISTANCE	-0.78**	-0.78**	-0.68**	-0.66**	-0.63**	-0.63**	-0.66**
	(0.05)	(0.05)	(0.06)	(0.09)	(0.08)	(0.08)	(0.08)
BORDER	0.21	0.18	0.28	0.30*	0.25	0.27	0.29
	(0.14)	(0.14)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
LANGUAGE	0.68**	0.68**	0.69**	0.73**	0.70**	0.71**	0.71**
	(0.18)	(0.18)	(0.18)	(0.18)	(0.19)	(0.18)	(0.19)
COLONY	0.41*	0.43*	0.45*	0.45*	0.48*	0.48*	0.47*
	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.22)	(0.21)
SAMECTRY	0.10	0.09	0.14	0.14	0.24	0.23	0.12
	(0.23)	(0.22)	(0.23)	(0.24)	(0.23)	(0.23)	(0.23)
VAT rate diff.		0.03					0.09
(vatratedif)		(0.06)					(0.07)
Extra obligations			-0.03				-0.03
(nonEU_ab)			(0.02)				(0.02)
Diss. VAT procs.				1.95**			1.84**
(hvadm)				(0.51)			(0.53)
Diss. VAT rates					0.42		0.55*
(hvsrat)					(0.25)		(0.25)
Diss. VAT on services						0.27	0.14
(hvts_)						(0.22)	(0.23)
R-squared	0.77	0.77	0.78	0.78	0.78	0.78	0.78

Notes: N. obs. is 3101; s.e.'s reported in parenthesis and are clustered by trade pair; year dummies and missing value dummies are included but not reported; significance levels: * 5% and ** 1%.

Table 6.12. Regression results bilateral trade in travel services

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log GDPEX	0.84**	0.83**	0.83**	0.85**	0.84**	0.85**	0.84**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
log GDPIM	0.83**	0.85**	0.84**	0.84**	0.84**	0.85**	0.86**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
log DISTANCE	-0.84**	-0.78**	-0.72**	-0.54**	-0.54**	-0.54**	-0.49**
	(0.06)	(0.07)	(0.09)	(0.11)	(0.11)	(0.10)	(0.11)
BORDER	0.81**	0.84**	0.91**	0.94**	0.93**	0.94**	0.99**
	(0.16)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.18)
LANGUAGE	0.98**	0.97**	0.97**	1.03**	1.02**	1.02**	0.97**
	(0.26)	(0.25)	(0.27)	(0.26)	(0.26)	(0.27)	(0.26)
COLONY	0.51*	0.52*	0.54*	0.64*	0.64*	0.64*	0.62*
	(0.24)	(0.23)	(0.24)	(0.26)	(0.26)	(0.26)	(0.26)
SAMECTRY	0.19	0.23	0.22	0.43	0.44	0.42	0.42
	(0.24)	(0.24)	(0.25)	(0.26)	(0.26)	(0.26)	(0.26)
VAT rate diff.		-0.13					-0.09
(vatratedif)		(0.07)					(0.08)
Extra obligations			-0.06*				-0.06**
(nonEU_ab)			(0.02)				(0.02)
Diss. VAT procs.				0.16			0.24
(hvadm)				(0.54)			(0.55)
Diss. VAT rates					0.25		0.28
(hvsrat)					(0.29)		(0.29)
Diss. VAT serv.						-0.41	-0.33
(hvts_)						(0.27)	(0.27)
R-squared	0.74	0.74	0.75	0.75	0.75	0.75	0.76

Notes: N. obs is 3101; s.e.'s reported in parenthesis and are clustered by trade pair; year dummies and missing value dummies are included but not reported; significance levels: * 5% and ** 1%.

Table 6.13. **Regression results bilateral trade in other business services**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
log GDPEX	1.00**	1.00**	0.99**	1.00**	0.99**	1.00**	0.98**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
log GDPIM	0.84**	0.84**	0.85**	0.84**	0.84**	0.84**	0.82**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
log DISTANCE	-1.04**	-1.04**	-0.89**	-0.89**	-0.87**	-0.87**	-0.88**
	(0.05)	(0.06)	(0.07)	(0.09)	(0.09)	(0.09)	(0.09)
BORDER	-0.32	-0.33	-0.21	-0.22	-0.27	-0.24	-0.20
	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.18)
LANGUAGE	0.63**	0.62**	0.63**	0.67**	0.64**	0.67**	0.66**
	(0.21)	(0.21)	(0.21)	(0.20)	(0.21)	(0.21)	(0.21)
COLONY	0.43	0.43	0.48*	0.48*	0.51*	0.50*	0.49*
	(0.25)	(0.25)	(0.24)	(0.24)	(0.24)	(0.25)	(0.24)
SAMECTRY	0.11	0.10	0.16	0.17	0.27	0.25	0.15
	(0.27)	(0.27)	(0.27)	(0.29)	(0.28)	(0.28)	(0.28)
VAT rate diff.		0.01					0.11
(vatratedif)		(0.07)					(0.08)
Extra obligations			-0.05*				-0.06**
(nonEU_ab)			(0.02)				(0.02)
Diss. VAT procs.				1.65**			1.47*
(hvadm)				(0.60)			(0.63)
Diss. VAT rates					0.52		0.70*
(hvsrat)					(0.31)		(0.31)
Diss. VAT on serv.						0.40	0.30
(hvts_)						(0.27)	(0.28)
R-squared	0.75	0.75	0.75	0.75	0.75	0.75	0.76

Notes: N. obs. is 3101; s.e.'s reported in parenthesis and are clustered by trade pair; year dummies and missing value dummies are included but not reported; significance levels: * 5% and ** 1%.

The estimation results in Tables 6.11, 6.12, and 6.13 do not give any direct information on the quantitative importance of compliance costs for the value of trade flows. In order

to give an impression of the impact of compliance cost on trade, we have computed the percentage change in trade if several compliance cost indicators were to fall by 10%, 50%, and 100%. Table 6.14 contains the effect on trade in total services for selected indicators based on the coefficient estimates in Table 6.11, column (7). The estimated coefficient on dissimilarity in VAT rates on specified services (hvts_) is not statistically significant in de regressions reported in Table 6.13.

Table 6.14. Direct effects of VAT harmonisation on intra-EU trade in *Total services*

Indicator	Change in trade (%) due to a reduction of		
	10%	50%	100%
Extra obligations, share (nonEU_ab)	0.7	3.8	7.8
Diss. VAT procs. (hvadm)	-6.6	-28.7	-49.0
Diss. VAT rates (hvsrat)	-2.5	-11.7	-21.9
Diss. VAT on services (hvts_)*	-0.9	-4.2	-8.2

* Coefficient estimate for this variable is not statistically significant.

Removal of extra national obligations is estimated to increase trade in services by 8%. Removal of dissimilarity in VAT procedures and rates leads to a decline in services trade ranging between 8% and 49%. This latter decline in services trade is not likely to be welfare-reducing, however. It is more likely that part of services trade is due to exploitation of dissimilarity in national VAT systems. Harmonizing VAT procedures and rates might reduce trade motivated by tax avoidance. An alternative explanations is that dissimilarity in VAT regimes induces firms to set up a foreign subsidiary. Such a strategy might go hand-in-hand with intra-firm services trade, such that services trade would be higher between dissimilar countries.

As has been emphasised in the previous subsection, the estimated magnitude of these effects is likely to be biased because of endogeneity of tax policy. Governments have a greater incentive to harmonise tax policies with their main trading partners, such that it appears that small differences in VAT policies lead to large trade flows while causation runs in the other direction. Another estimation problem is omitted variable bias. In cross-section gravity regressions it is not possible to control for unobserved effects. This leads to biased results if an omitted regressor is correlated with both trade flows and VAT policy.

6.6 WorldScan computable general equilibrium simulations

How do the trade effects of VAT reforms estimated in Sections 6.4 and 6.5 translate into macroeconomic outcomes? For an answer to this question, we run simulations with the computable general equilbrium model WorldScan. WorldScan is a multi-sectoral, multi-regional, recursively dynamic, numerical model of the word economy. It models inter-sectoral input flows by nested CES production functions, bilateral trade flows by a differentiated-goods approach and country-specific consumption structures by linear expenditure systems. A detailed model description can be found in Lejour et al. (2006). The model is based on the GTAP 7 world trade and input-output data set (Narayanan and Walmsley, 2008) and allows for flexible aggregation of regions and sectors. For the present purpose, we use a version of WorldScan that has previously been applied to the evaluation of the EU Lisbon Strategy (Gelauff and Lejour, 2006). It uses a regional aggregation that is almost at country level within the EU (with two exceptions due to data restrictions) and three large regions outside the EU (see Table 6.15). In production, WorldScan distinguishes four manufacturing sectors, classified by the level of technology, two non-manufacturing goods and four types of services (see Table 6.16). Details on the calibration of the model can be found in Annex E.

Table 6.15. Regions in WorldScan

AUT	Austria	BLU	Belgium + Luxemburg
DNK	Denmark	FIN	Finland
FRA	France	DEU	Germany
GBR	United Kingdom	GRC	Greece
IRL	Ireland	ITA	Italy
NLD	Netherlands	PRT	Portugal
ESP	Spain	SWE	Sweden
CZE	Czech Republic	HUN	Hungary
POL	Poland	SVK	Slovakia
SVN	Slovenia	BGR	Bulgaria
ROM	Romania	REX	Remaining EU 25
ROE	Rest of the OECD	USA	United States
AAT	Rest of the world		

Table 6.16. Production sectors in WorldScan

AGO	Agriculture and Minerals	ENG	Energy goods
LTM	Low tech manufacturing	MLM	Medium-low tech manufacturing
MHM	Medium-high tech manufacturing	HTM	High tech manufacturing
TRA	Transport	OCS	Other commercial services
OSR	Non-traded services	R_D	Research and development

The crucial model feature for the simulation of VAT reform policies is non-tariff barriers that are – together with transport costs, import and export tariffs – part of the wedge between export and import prices. These non-tariff barriers are first calibrated to match those implied by the partial-equilibrium simulations of the gravity model, and then abolished, to simulate the macroeconomic effects of reform in general equilibrium.[128]

We simulate six policy reforms. Four of them are based on policy variables that turned out to have statistically significant effects in the gravity regressions:

1. "nonEU_ab": Reducing the national obligations beyond EU VAT requirements to zero.
2. "hvadm": Reducing the dissimilarity in the general VAT administrative procedures by 10 percent.
3. "hvsrat": Reducing the dissimilarity in VAT rates applied to specific goods and services by 50 percent.
4. "hv_ts": Reducing the dissimilarity in VAT rates on specified services that are subject to international trade to zero.

As these four simulations are based on regression results that are potentially biased, we add two scenarios that are based on more plausible levels of compliance costs. An indication of plausible compliances costs is provided by the European Tax Survey (European Commission 2004, Table 2-3). This survey shows that 78.9% of responding firms have VAT compliance costs of 1 percent of foreign sales or less. 87% of respondents indicate compliance costs of less then 3 percent of foreign sales.

[128] The information that we transfer from the gravity model to WorldScan is about partial equilibrium trade changes. We therefore remain agnostic about the overall trade barrier that is due to VAT heterogeneity. We only implement the part of the barrier that corresponds to the respective scenario. This barrier is then completely removed.

We take the results of the European Tax Survey (European Commission 2004) as a basis for two additional scenarios in which we assume that compliance costs on intra-EU trade are a fixed percentage of a firm's sales that is uniform across country pairs.[129] The additional scenario's are:

5. "NTB_1%": Removal of compliance costs corresponding to a non-tariff-barrier of 1% for all country pairs.
6. "NTB_3%": Removal of compliance costs corresponding to a non-tariff-barrier of 3% for all country pairs.

Scenarios 5 and 6 can be considered to yield upper bounds on the effects of VAT compliance costs on trade and GDP, since only a small minority of firms reported compliance costs in excess of 3 percent of foreign sales.

In scenarios 1, 5 and 6, non-tariff barriers cover all goods and services, whereas in scenarios 2, 3, and 4, they are restricted to the goods sectors, because the respective coefficients turned out to be not statistically significant for services (see Section 6.5). The scale of the policy reforms has been chosen so that the changes remain in a range of a few percent, which corresponds to the character of the estimated coefficients as marginal effects.

In somewhat more detail, the policy simulations proceed in the following steps:

1. The partial equilibrium effects of a policy reform are simulated in the econometric gravity model by changing the respective policy variables by the required amount and recording the resulting changes in trade volumes. (These differ by country pair, but are uniform over sectors.)
2. The partial equilibrium trade changes are then transferred to WorldScan. In WorldScan, corresponding non-tariff barriers are calibrated (see Annex E). The model is set up with an initial situation that includes these non-tariff barriers. As the targeted trade changes (by country pair) are uniform across sectors, but sectoral conditions (trade elasticities and value shares) differ, we end up with sectoral variation in the non-tariff barriers.
3. As the level of the non-trade barriers is calibrated so as to match each policy shock individually, they are simply set to zero in the general equlibrium policy simulations. The resulting macroeconomic changes (including all general equilibrium feedback) are reported.

[129] Scenarios 5 and 6 have been added on request of the EC.

In scenarios 5 and 6, the procedure is simpler, because the level of the non-tariff barriers is part of the scenario definition.

We perform a static simulation for the year 2011. This means that the model baseline is set up from the GTAP 7 base year 2004 until 2011. In the last year, the policy change is applied, assuming instantaneous adjustment in all markets. In reality, the adjustment process will take time, but as we do not know anything about adjustment lags from the empirical estimation, we remain agnostic in this respect.

Table 6.17 shows the average level of non-tariff barriers that is associated with each of the four policy scenarios. In most cases, this is less than one percent of import prices, with a maximum of slightly above three percent. The average is taken over sectors and trade partners. Note that it also includes the service sectors which, as discussed above, have no (VAT-related) non-tariff barriers in most cases. The corresponding averages for the goods sectors only would be higher. Differences between countries in Table 6.17 then are due to both the distance of the countries' VAT regime from the EU average and to the share of affected sectors in total imports.

Table 6.17. Average non-tariff-barrier reduction (percent of import price)

	nonEU_ab	hvadm	hvsrat	hv_ts	NTB_1%	NTB_3%
AUT	0.5	0.7	1.4	1.2	0.7	2.2
BLU	0.4	0.8	3.2	1.4	0.6	1.9
DNK	0.1	0.6	0.9	0.9	0.6	1.9
FIN	0.0	0.4	1.0	0.7	0.5	1.6
FRA	0.2	0.5	1.3	0.7	0.6	1.9
DEU	0.6	0.4	0.9	0.7	0.6	1.7
GBR	0.0	0.4	0.9	0.6	0.5	1.6
GRC	0.5	0.6	1.0	0.7	0.6	1.7
IRL	0.3	0.5	0.8	0.6	0.6	1.7
ITA	0.8	0.4	1.3	0.8	0.6	1.7
NLD	0.0	0.4	0.9	0.6	0.5	1.6
PRT	1.0	0.7	1.8	1.3	0.7	2.1
ESP	0.9	0.5	1.0	1.1	0.6	1.9
SWE	0.0	0.6	1.2	1.0	0.7	2.0

CZE	0.1	0.8	1.9	1.2	0.7	2.2
HUN	0.1	0.6	1.4	1.1	0.7	2.0
POL	0.2	0.5	1.3	1.0	0.7	2.0
SVK	0.3	0.6	1.4	1.1	0.7	2.2
SVN	0.0	1.0	1.7	1.1	0.7	2.2
BGR	0.4	0.5	0.0	0.5	0.5	1.5
ROM	0.1	0.7	0.0	0.9	0.6	1.9
REX	1.8	0.5	1.2	0.9	0.6	1.7
EU27	*0.4*	*0.5*	*1.3*	*0.9*	*0.6*	*1.8*

Table 6.18 shows how import volumes change as a response to the reduction in non-trade barriers by the amount given in Table 6.17. As the numbers in Table 6.17 can be read as percentage reductions in import prices, the combination of Tables 6.17 and 6.18 gives us the implicit general equilibrium import elasticities. These are quite high: larger than one in all cases, and often even in the range of five. This may seem high, but is not outside the range of trade (Armington) elasticity estimates by Hummels (1999) used in WorldScan.

Apart from the own-price effect of lower import prices, leading to higher import volumes, we have cross-price effects as well, albeit on a much lower scale. This can be seen when decomposing imports by source (not shown here). While imports within Europe increase, imports from non-EU countries slightly decrease (trade is diverted). Most substitution, however, is going on from domestically produced goods and services to imports.

Table 6.19 shows, as a mirror image of Table 6.18, the change in export volumes by country. We see that exports by country actually closely follow imports. This is a consequence of the model's requirement of a balanced current account. In general equilibrium, all prices adjust, so that imports and exports move in parallel. This clearly is a long-term feature which must be kept in mind when interpreting the static simulations for the year 2011.

Table 6.18. Percentage change in import volumes by country

	nonEU_ab	hvadm	hvsrat	hv_ts	NTB_1%	NTB_3%
AUT	2.6	2.9	6.4	5.1	3.2	10.1
BLU	1.7	3.3	14.9	5.7	3.1	9.7
DNK	0.7	2.8	4.5	4.5	2.8	9.0
FIN	0.6	2.2	5.5	3.6	2.7	8.5
FRA	1.3	2.6	7.2	3.8	3.1	9.7
DEU	2.4	2.4	5.9	4.8	2.9	9.4
GBR	0.4	2.0	4.4	3.0	2.3	7.3
GRC	2.0	1.8	3.2	2.4	2.0	6.2
IRL	1.7	2.9	6.0	4.1	3.1	9.7
ITA	3.1	2.1	7.0	4.3	2.8	8.7
NLD	1.0	2.3	6.1	4.0	2.9	9.3
PRT	3.8	2.9	7.8	5.3	3.1	9.9
ESP	2.9	2.2	5.0	5.3	2.8	9.0
SWE	0.4	3.1	6.3	5.5	3.1	9.9
CZE	1.2	4.2	10.3	6.8	4.1	13.2
HUN	1.1	3.3	7.9	6.3	3.8	12.1
POL	1.7	2.4	7.4	5.2	3.3	10.6
SVK	1.9	3.2	9.1	6.2	4.3	13.5
SVN	0.8	4.7	8.7	5.6	3.6	11.3
BGR	2.2	3.2	-0.3	3.1	3.1	9.9
ROM	0.9	3.1	-1.0.	4.1	3.2	10.1
REX	5.7	2.1	4.9	3.5	2.5	7.9
ROE	-0.1	-0.1	-0.4	-0.2	-0.1	-0.4
USA	-0.0	-0.1	-0.3	-0.2	-0.1	-0.2
AAT	-0.1	-0.2	-0.5	-0.3	-0.2	-0.6
EU27	*1.8*	*2.5*	*6.7*	*4.5*	*2.9*	*9.2*

Table 6.19. Percentage change in export volumes by country

	nonEU_ab	hvadm	hvsrat	hv_ts	NTB_1%	NTB_3%
AUT	2.3	2.4	5.2	4.1	2.7	8.4
BLU	1.6	3.1	13.6	5.3	2.9	8.9
DNK	0.5	2.1	3.3	3.3	2.2	6.8
FIN	0.4	1.7	4.1	2.7	2.0	6.3
FRA	1.2	2.3	6.4	3.4	2.7	8.6
DEU	1.8	1.8	4.4	3.6	2.2	6.9
GBR	0.4	1.9	4.1	2.8	2.2	7.0
GRC	2.2	1.4	2.4	1.9	1.7	5.5
IRL	1.0	1.8	3.6	2.4	1.9	5.9
ITA	2.6	1.9	6.2	3.8	2.4	7.7
NLD	0.9	1.9	4.9	3.3	2.4	7.6
PRT	4.0	3.2	8.5	5.8	3.4	10.8
ESP	2.7	2.2	4.9	5.2	2.9	9.0
SWE	0.3	2.3	4.4	3.9	2.3	7.1
CZE	1.2	3.7	8.8	5.9	3.6	11.4
HUN	1.0	3.0	7.1	5.7	3.4	10.9
POL	1.7	2.3	6.8	4.9	3.2	9.9
SVK	1.6	2.7	7.5	5.1	3.6	11.2
SVN	0.7	4.2	7.6	5.0	3.1	9.8
BGR	1.9	2.8	-0.5	2.7	2.7	8.7
ROM	0.9	2.8	-1.3	3.6	2.9	9.1
REX	4.9	2.0	4.6	3.3	2.3	7.4
ROE	-0.1	-0.2	-0.6	-0.4	-0.2	-0.8
USA	-0.1	-0.3	-0.7	-0.5	-0.3	-0.8
AAT	-0.1	-0.2	-0.6	-0.4	-0.2	-0.8
EU27	*1.6*	*2.2*	*5.8*	*3.8*	*2.5*	*7.9*

Of particular interest for EU policy is the develpment of intra-EU trade. This is displayed in Table 6.20. The table contains – per country and for the EU as a whole – the volume of exports to other EU countries. Given that there is trade diversion from non-EU countries, the changes of intra-EU trade are significantly larger than those of trade in general.

Table 6.20. Percentage change in intra-EU trade volume

	nonEU_ab	hvadm	hvsrat	hv_ts	NTB_1%	NTB_3%
AUT	3.8	3.7	8.2	6.3	4.2	13.1
BLU	2.4	4.4	19.1	7.5	4.4	13.7
DNK	1.7	4.1	6.6	6.4	4.1	12.9
FIN	1.6	3.6	8.7	5.7	4.2	13.1
FRA	2.4	3.8	10.7	5.7	4.5	14.0
DEU	2.7	3.4	8.5	6.9	4.0	12.5
GBR	1.2	3.9	8.6	5.8	4.5	14.0
GRC	5.2	2.9	4.9	3.9	3.9	12.1
IRL	2.5	3.6	7.9	5.3	3.7	11.5
ITA	4.0	3.4	11.0	6.8	4.3	13.6
NLD	1.9	3.1	8.1	5.4	3.8	12.0
PRT	4.9	4.3	11.2	7.6	4.6	14.6
ESP	3.3	3.3	7.3	7.7	4.2	13.3
SWE	1.0	4.3	8.5	7.4	4.3	13.3
CZE	1.8	4.7	11.0	7.5	4.7	14.6
HUN	1.7	3.9	9.3	7.5	4.6	14.6
POL	2.5	3.2	9.8	6.9	4.4	13.9
SVK	2.0	3.4	9.6	6.3	4.5	14.1
SVN	1.8	6.3	11.6	7.6	4.9	15.4
BGR	2.8	5.1	-0.7	5.0	4.8	15.3
ROM	1.6	4.0	-1.9	5.3	4.3	13.5
REX	6.2	3.8	8.8	6.0	4.7	14.9
EU27	*2.6*	*3.7*	*9.8*	*6.5*	*4.3*	*13.3*

How do changes in imports and exports translate into national production and consumption? Answering this question is one of the main reasons for performing a general equilibrium analysis in addition to the partial equilibrium estimation in Sections 6.4 and 6.5. The effects on real GDP are shown in Table 6.21 and those on real consumption (which is a good approximation of welfare, given that labour supply is held fixed in WorldScan) in Table 6.22. Roughly, both GDP and consumption change in proportion to trade, but less so. The percentage changes in GDP are about one third of those in trade, and the changes in consumption are still lower. Both changes in

production and in consumption are straightforward to explain. The reduction in import prices through the elimination of non-tariff barriers means an improvement in the terms of trade, i.e. the same amount of domestic resources can be exchanged for more imported resources. This shifts the production possibility frontier outwards, so that both more is produced and more can be consumed.

Table 6.21. Real GDP by country (change in percent)

	nonEU_ab	hvadm	hvsrat	hv_ts	NTB_1%	NTB_3%
AUT	0.7	0.7	1.5	1.1	0.7	2.3
BLU	0.7	1.4	6.0	2.4	1.3	4.0
DNK	0.3	0.5	0.9	0.8	0.5	1.7
FIN	0.3	0.5	1.2	0.8	0.5	1.7
FRA	0.3	0.3	0.8	0.4	0.3	1.0
DEU	0.2	0.4	1.0	0.8	0.4	1.3
GBR	0.1	0.2	0.4	0.3	0.2	0.7
GRC	0.3	0.1	0.1	0.1	0.2	0.6
IRL	0.8	1.0	2.3	1.5	1.1	3.4
ITA	0.1	0.2	0.8	0.5	0.3	0.9
NLD	0.5	0.6	1.4	1.0	0.7	2.1
PRT	0.3	0.4	1.0	0.6	0.4	1.4
ESP	-0.0	0.2	0.6	0.6	0.3	1.0
SWE	0.2	0.5	1.0	0.9	0.5	1.5
CZE	0.6	1.3	2.8	2.0	1.3	4.0
HUN	0.6	0.9	2.2	1.7	1.0	3.3
POL	0.4	0.4	1.2	0.8	0.5	1.6
SVK	0.5	0.8	2.5	1.5	1.1	3.4
SVN	0.4	0.9	1.7	1.1	0.7	2.1
BGR	0.3	0.6	-0.1	0.6	0.5	1.7
ROM	0.3	0.5	-0.3	0.6	0.5	1.6
REX	0.9	0.5	1.2	0.8	0.6	1.9
ROE	-0.0	-0.0	-0.1	-0.1	0.0	-0.1
USA	-0.0	-0.0	-0.1	-0.0	0.0	-0.1
AAT	-0.0	-0.0	-0.1	-0.1	0.0	-0.1
EU27	*0.2*	*0.4*	*1.1*	*0.7*	*0.4*	*1.4*

In the case of consumption (interpreted as welfare), let us try to get a feeling for the quantities. Are they in a reasonable range? Can they be derived from more fundamental data? As a partial equilibrium approximation, we can take the reduction in import prices, multiply them by the pre-reform import quantities and divide by pre-reform consumption. This is the pure gain in terms-of-trade improvement, expressed as a share of consumption, without any general equilibrium adjustment. The result of this calculation (done individually by sector and trade partner, and then added up) can be seen in Table 6.23. It turns out that the approximation is quite good. In many cases (but not always), the general equilbrium effects are somewhat higher, but not by much. All in all, Tables 6.22 and 6.23 resemble each other closely. This means that general equilibrium feedback, even if present, does not fundamentally alter the conclusions from the partial analysis.

Table 6.22. Real consumption by country (change in percent)

	nonEU_ab	hvadm	hvsrat	hv_ts	NTB_1%	NTB_3%
AUT	0.5	0.5	1.2	1.0	0.6	2.0
BLU	0.5	0.8	3.5	1.4	0.8	2.4
DNK	0.1	0.4	0.6	0.6	0.4	1.4
FIN	0.1	0.2	0.6	0.4	0.3	0.9
FRA	0.1	0.2	0.6	0.3	0.3	0.8
DEU	0.3	0.3	0.6	0.5	0.3	1.1
GBR	0.0	0.2	0.4	0.2	0.2	0.6
GRC	0.2	0.2	0.3	0.2	0.2	0.6
IRL	0.7	1.1	2.3	1.5	1.1	3.6
ITA	0.2	0.1	0.4	0.3	0.2	0.6
NLD	0.2	0.4	0.9	0.6	0.5	1.5
PRT	0.5	0.3	0.9	0.6	0.4	1.2
ESP	0.3	0.2	0.4	0.4	0.2	0.8
SWE	0.1	0.4	0.7	0.7	0.4	1.2
CZE	0.2	0.9	2.1	1.4	0.9	2.8
HUN	0.2	0.5	1.2	0.9	0.6	1.8
POL	0.2	0.2	0.7	0.5	0.4	1.1
SVK	0.3	0.5	1.4	1.0	0.7	2.2
SVN	0.1	0.6	1.2	0.8	0.5	1.5
BGR	0.3	0.5	-0.1	0.5	0.5	1.5
ROM	0.1	0.3	-0.1	0.4	0.4	1.1
REX	1.0	0.4	0.8	0.6	0.4	1.3
ROE	-0.0	-0.0	-0.0	-0.0	0.0	0.0
USA	-0.0	-0.0	-0.0	-0.0	0.0	0.0
AAT	-0.0	-0.0	-0.0	-0.0	0.0	-0.1
EU27	*0.2*	*0.3*	*0.7*	*0.5*	*0.3*	*1.0*

Table 6.23. Proxy for real consumption gain (change in percent)

	nonEU_ab	hvadm	hvsrat	hv_ts	NTB_1%	NTB_3%
AUT	0.4	0.5	1.0	0.8	0.5	1.6
BLU	0.5	0.9	3.7	1.6	0.7	2.2
DNK	0.0	0.3	0.5	0.5	0.3	1.0
FIN	0.0	0.2	0.6	0.4	0.3	0.9
FRA	0.0	0.2	0.5	0.3	0.2	0.7
DEU	0.3	0.2	0.4	0.3	0.3	0.8
GBR	0.0	0.1	0.3	0.2	0.2	0.6
GRC	0.2	0.2	0.4	0.3	0.2	0.7
IRL	0.4	0.6	1.0	0.7	0.7	2.1
ITA	0.3	0.1	0.5	0.3	0.2	0.6
NLD	0.0	0.2	0.5	0.4	0.3	0.9
PRT	0.5	0.3	0.9	0.6	0.3	1.0
ESP	0.4	0.2	0.4	0.5	0.3	0.8
SWE	0.0	0.3	0.6	0.5	0.3	1.0
CZE	0.1	0.7	1.7	1.1	0.7	2.0
HUN	0.1	0.6	1.3	1.0	0.6	1.7
POL	0.1	0.2	0.7	0.5	0.3	1.0
SVK	0.3	0.6	1.4	1.1	0.8	2.3
SVN	0.0	0.9	1.6	1.0	0.7	2.0
BGR	0.3	0.3	0.0	0.3	0.4	1.1
ROM	0.0	0.4	0.0	0.5	0.4	1.2
REX	1.6	0.4	1.0	0.8	0.5	1.5
EU27	*0.2*	*0.2*	*0.6*	*0.4*	*0.3*	*0.8*

With respect to the quantitative interpretation of the effects given in Tables 6.19 to 6.23, the same caveats apply as in the discussion of the gravity estimation results. Most likely, the effects are strongly biased upwards, because it was not possible to control for possible endogeneity of the regressors and because no panel dataset was available for estimation. These limitations translate directly from the estimation into the general equilibrium analysis. A number of aspects of the simulation outcomes can be interpreted with confidence – in particular, the distribution of the effects across countries and the relative consequences for imports, exports, production and

consumption. In contrast, the overall level of the effects must be interpreted with utmost caution.

6.7 Synthesis of estimation and simulation results

We have analysed how VAT policies of EU member states affect intra-EU trade in goods and services and how simulated changes in VAT policies and the resulting changes in trade affect GDP and consumption. A key input for this analysis has been the indicators on VAT compliance costs and dissimilarity in VAT regimes that were introduced in Chapter 5. The impact of these VAT-policy indicators on trade, GDP and consumption has been derived in two steps.First, a gravity regression is used to capture the direct (partial equilibrium) effects of VAT policy on trade in goods and trade in services. In order to take into account the large heterogeneity in services, we have made a distinction between three types of trade flows: *Total services*, *Travel*, and *Other business services*. Second, the overall effects of changes in VAT policies have been simulated with the computable general equilibrium model WorldScan.

It turned out to be difficult to get reliable estimates of the impact of VAT compliance costs on trade in the regression analysis. Therefore, two additional simulations have been performed based on assumed levels of VAT compliance costs. These simulations serve as a benchmark for the simulations that rely on regression estimates for VAT compliance costs. Nevertheless, the regression analysis provides some qualitative support for hypothesis that VAT compliance costs matter for trade in goods and services.

There are four main findings from the regression analysis of trade in goods.

1. Dissimilarity in tax regimes is relatively *robustly negatively* correlated with the value of bilateral trade flows. Robust trade-impeding effects are found for dissimilarity in VAT administrative procedures, and dissimilarity in VAT rates applied to specified goods and services (not simply the standard VAT rate).[130] A reduction of the dissimilarity of VAT administrative procedures by 10 percent is estimated to increase intra-EU trade by 5%; a reduction in the dissimilarity of VAT rates for specified goods and services by 50 percent increases intra-EU trade by

[130] Recall that these goods and services are a group that are often subject to reduced rates: foodstuffs, water supplies, pharmaceuticals, medical equipment for disabled persons, books, newspapers, periodicals, agricultural inputs, passenger transport, admission to cultural. services, pay / cable TV, writers / composers, social housing, hotel accomodation, admission to sporting events, use of sports facilities, social services, medical and dental care, and waste collection.

12%. These results probably overestimate the true effects for three reasons: First, they are direct (partial equilibrium) effects and do not take into account that a change in trade costs for trade between one pair of countries is likely to affect the trade between other countries as well (trade diversion). These and other secondary (general equilibrium) effects are incorporated in the WorldScan simulations. Second, tax policy is likely to have responded to large trade flows: policymakers may choose to reduce dissimilarity with their main trading partners (rather than with less important partners). This by itself introduces a negative correlation between trade and VAT dissimilarity even when there would be no effect of dissimilarity on trade. Tax policy thus responds endogenously to the magnitude of trade (endogeneity bias). Third, there might be (unknown) variables that influence both trade and VAT policy and that are omitted from the regressions (omitted variable bias).

2. Compliance cost indicators relevant for the exporting country tend to suggest that higher compliance costs are correlated with larger trade flows. This unexpected result might stem from endogeneity of VAT policy with trade: countries with a lot of trade might have an inclination to have more regulation on trade-related activities than countries that are less open to trade. Similarly, large countries might have an inclination to have more detailed VAT systems than small countries.
3. National regulation in the destination country that is additional to EU VAT regulation is negatively associated with trade. In the absence of additional national VAT regulation, we estimate that trade would increase by 2%. As with the other results, endogeneity bias and omitted variable bias might have affected this estimate – either upward or downward.
4. Other compliance cost indicators relevant for the importing country tend to suggest that higher compliance costs are correlated with larger trade flows. Endogeneity of regulation with trade might provide an explanation for this. The costs of introducing new regulation are to a large extent independent of the size of trade flows, while the benefits of regulation do vary with trade flows. In particular, policymakers in the importing country might find that the benefits of regulating small trade flows (e.g. for consumer protection) are too small to cover the costs of new regulation. The optimal amount of regulation will therefore vary with the size of the trade flow.

For the regression analysis of trade in services our two main findings are:

1. VAT-related obligations in the importing country that are in addition to EU guidelines have a negative effect on services trade. The rise in services trade

associated with the removal of these extra obligations is estimated to be 8% (partial equilibrium).

2. Different categories of services are influenced in different ways by changes in VAT policy. *Travel services* are negatively related with trade barriers in a way similar to goods trade, while *Other business services* are positively related to dissimilarities in VAT regulation and rates. Besides bias due to endogeneity or omitted variables, a possible explanation for the positive relation between trade in *Other business services* and differences between VAT policies is that firms exploit differences in tax systems to avoid paying taxes.

The regression results have been used for four simultations with WorldScan:

1. A removal of national obligations that go beyond EU VAT requirements.
2. A reduction of 10 percent in the dissimilarity of the general VAT administrative procedures between countries.
3. A reduction of 50 percent in the dissimilarity of VAT rates applied to specified goods and services.
4. A removal of dissimilarity in VAT rates on specified services that are subject to international trade.

In addition to these simulations, we have simulated two scenarios in which we assume that compliance costs of intra-EU trade are a uniform, fixed percentage of a firm's sales. The European Tax Survey (European Commission, 2004) suggests that these scenarios can be considered to represent an upper bound of the plausible magnitude of the effects of VAT compliance costs on trade and GDP. The two additional scenarios are:

5. Removal of compliance costs that are 1% of sales for all country pairs.
6. Removal of compliance costs that are 3% of sales for all country pairs.

The results of the simulations are summarised in Table 6.24. (Detailed results, including results broken down by country, are reported in Section 6.6.) Removal of all national VAT obligations that go beyond EU requirements can bring a modest gain in intra-EU trade of 2.6 percent (the direct effect is estimated at 1.9 percent). Reducing differences in VAT procedures between member states by just 10 percent raises intra-EU trade by almost 4 percent, which is one percentage point below the direct estimate. Real GDP is expected to rise by 0.4%. Halving the dissimilarity between VAT rates on specified goods and services can yield about 10 percent more intra-EU trade and gains of 1.1 percent in GDP and 0.7 percent in consumption. Removal of dissimilarities in the VAT rates that apply to specified internationally traded services might bring 6.5 percent more

trade and 0.7 percent more GDP. The last two simulations show that the other simulations are comparable to a removal of VAT compliance costs that are between 1 and 3 percent of sales.

Table 6.24. Summary of scenario results for EU27 (change in percent)

	Scenario	Intra-EU trade (regression)	Intra-EU trade (WorldScan)	Real GDP (WorldScan)	Consumption (WorldScan)
Extra obligations (%)	-100	1.9	2.6	0.2	0.2
Diss. VAT procedures	-10	5.0	3.7	0.4	0.3
Diss. VAT rates	-50	12.1	9.8	1.1	0.7
Diss. VAT on services	-100	7.9	6.5	0.7	0.5
Adm. burden of 1%	-100	n.a.	4.3	0.4	0.3
Adm. burden of 3%	-100	n.a.	13.3	1.4	1.0

Note: Results for the regressions refer to trade in goods only; WorldScan results are for the sum of goods and services.

Although there a number of reasons to believe that the results reported in this chapter overestimate the true effects of VAT harmonisation, we find indications that harmonisation of VAT rates and procedures might bring gains in trade, GDP, and consumption. For trade in services, our regression results indicate that differences in VAT rates and procedures have a positive effect on trade, especially in the category *Other business services*. There are at least two possible explanations for this result. First, a part of services trade is due to tax avoidance. Services traded between subsididaries of multinationals can be used implicitely allocate profits in the country most favourable tax regime. Tax avoidance is more likely to apply to trade in services than to trade in goods because transport costs for some types of services are zero or small (see also the discussions in Chapter 3 and Chapter 11 of this report). Second, dissimilarity in VAT-regimes induces firms to open foreign subsidiaries, such that intra-firm services trade might be larger between dissimilar countries. Results for trade in *Travel services* are similar to the results for trade in goods. The scenarios assuming upper-bound compliance costs of 1 or 3% of sales suggest that a complete removal of VAT compliance costs leads to a maximum increase in intra-EU trade of 13% and a maximum increase in GDP of 1.4%.

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Annex C. Countries included in the gravity analysis

Argentina	Greece	Romania
Australia	Hungary	Slovakia
Australia	Iceland	Slovenia
Austria	India	South Africa
Belgium and Luxembourg	Indonesia	Spain
Brazil	Ireland	Sri Lanka
Bulgaria	Italy, San Marino, Vatican	Suriname
Canada	Japan	Sweden
Chile	Korea, Rep. of	Switzerland, Liechtenstein
China	Malta	Thailand
Cyprus	Mexico	Turkey
Czech Republic	Netherlands	United Kingdom
Denmark	New Zealand	USA, PR., Virgin Isds.
Finland	Norway, Sv., JM., Bouvet	Venezuela
France, Monaco, overseas	Poland	Zimbabwe
Germany	Portugal	
Aggregates:		
East Asia and Pacific	Middle-East and North Africa	Subsaharan Africa
Latin America and Carribean	South Asia	

Annex D. The robustness of gravity analysis for services

Three types of robustness test are reported for each of the three categories of services trade, in one table per category. Column (1) of each table reproduces the baseline results for the full specification that is discussed in the main text. Column (2) contains the result of a cross-section regression for the year 2008. In column (3) a random effects panel estimator is used. The last column (4) repeats the random effects estimation for a sub-sample of that only includes trade between EU countries.

Table D.1. Robustness of regressions on total services

	(1)	(2)	(3)	(4)
log GDPEX	0.83***	0.81***	0.80***	0.80***
log GDPIM	0.78***	0.77***	0.80***	0.84***
log DISTANCE	-0.66***	-0.63***	-0.69***	-0.91***
BORDER	0.29	0.32	0.26	0.26
LANGUAGE	0.71***	0.72***	0.70***	-0.01
COLONY	0.47*	0.48*	0.61**	0.30
SAMECTRY	0.12	0.01	0.11	0.01
VAT rate difference	0.09	0.04	0.10	0.10
(vatratedif)	(0.07)	(0.07)	(0.07)	(0.09)
Extra obligations, share	-0.03	-0.04	-0.03	-0.02
(nonEU_ab)	(0.02)	(0.02)	(0.02)	(0.02)
Diss. VAT procs.	1.84***	2.00***	2.03***	2.20***
(hvadm)	(0.53)	(0.59)	(0.54)	(0.54)
Diss. VAT rates	0.55*	0.65*	0.52*	0.48
(hvsrat)	(0.25)	(0.27)	(0.25)	(0.25)
Diss. VAT on services	0.14	0.20	0.20	0.11
(hvts_)	(0.23)	(0.24)	(0.23)	(0.22)
Period	2002-2009	2008	2002-2009	2002-2009
Sample	Full	Full	Full	Intra-EU
Method	OLS	OLS	RE	RE
Observations	3101	461	3101	1916
Groups			574	338
R-squared (overall)	0.78	0.77	0.78	0.81
R-squared (within)			0.59	0.63

Notes: standard errors of control variables are omitted for brevity; clustering by trade pair; year dummies and missing value dummies are not reported; significance levels: * 5%, ** 1%, and *** 0.1%.

Table D.2. Robustness of regressions on travel services

	(1)	(2)	(3)	(4)
log GDPEX	0.84***	0.88***	0.79***	0.89***
log GDPIM	0.86***	0.87***	0.85***	0.95***
log DISTANCE	-0.49***	-0.43***	-0.60***	-0.54**
BORDER	0.99***	1.07***	0.99***	1.19***
LANGUAGE	0.97***	1.14***	0.90***	-0.15
COLONY	0.62*	0.62	0.78**	0.21
SAMECTRY	0.42	0.49	0.28	0.68*
VAT rate difference	-0.09	-0.10	-0.01	-0.24*
(vatratedif)	(0.08)	(0.09)	(0.08)	(0.11)
Extra obligations, share	-0.06**	-0.06**	-0.06*	-0.05*
(nonEU_ab)	(0.02)	(0.02)	(0.02)	(0.02)
Diss. VAT procs.	0.24	-0.05	0.29	0.11
(hvadm)	(0.55)	(0.60)	(0.59)	(0.56)
Diss. VAT rates	0.28	0.31	0.26	-0.01
(hvsrat)	(0.29)	(0.31)	(0.28)	(0.27)
Diss. VAT on services	-0.33	-0.15	-0.36	-0.34
(hvts_)	(0.27)	(0.29)	(0.27)	(0.27)
Period	2002-2009	2008	2002-2009	2002-2009
Sample	Full	Full	Full	Intra-EU
Method	OLS	OLS	RE	RE
Observations	3101	461	3101	1916
Groups			574	338
R-squared (overall)	0.76	0.77	0.33	0.38
R-squared (within)			0.77	0.81

Notes: standard errors of control variables are omitted for brevity; clustering by trade pair; year dummies and missing value dummies are not reported; significance levels: * 5%, ** 1%, and *** 0.1%.

Table D.3. Robustness of regressions on other business services

	(1)	(2)	(3)	(4)
log GDPEX	0.98***	0.94***	0.96***	0.93***
log GDPIM	0.82***	0.81***	0.83***	0.85***
log DISTANCE	-0.88***	-0.97***	-0.93***	-1.01***
BORDER	-0.20	-0.23	-0.25	-0.13
LANGUAGE	0.66**	0.73**	0.66***	0.18
COLONY	0.49*	0.54*	0.56*	0.45
SAMECTRY	0.15	-0.11	0.13	0.05
VAT rate difference	0.11	0.05	0.12	0.07
(vatratedif)	(0.08)	(0.09)	(0.08)	(0.11)
Extra obligations, share	-0.06**	-0.05	-0.06*	-0.03
(nonEU_ab)	(0.02)	(0.03)	(0.02)	(0.02)
Diss. VAT procs.	1.47*	1.91*	1.55*	1.66**
(hvadm)	(0.63)	(0.83)	(0.61)	(0.62)
Diss. VAT rates	0.70*	0.45	0.83**	0.80**
(hvsrat)	(0.31)	(0.37)	(0.30)	(0.30)
Diss. VAT on services	0.30	0.08	0.35	0.32
(hvts_)	(0.28)	(0.31)	(0.27)	(0.28)
Period	2002-2009	2008	2002-2009	2002-2009
Sample	Full	Full	Full	Intra-EU
Method	OLS	OLS	RE	RE
Observations	3101	461	3101	1916
Groups			574	338
R-squared (overall)	0.76	0.74	0.32	0.36
R-squared (within)			0.79	0.79

Notes: standard errors of control variables are omitted for brevity; clustering by trade pair; year dummies and missing value dummies are not reported; significance levels: * 5%, ** 1%, and *** 0.1%.

Annex E. Calibrating non-tarriff barriers in the Worldscan model

The aim of the calibration is to determine non-tariff barriers whose elimination would cause imports from a given region (or a set of regions) to increase by a certain percentage, obtained by estimating a gravity equation. For concreteness, assume that we have this target increase for a single region i given as Δ_i, resulting in a positive non-tariff barrier to be calibrated. Object of the calibration is the Armington function, which splits domestic demand between imports from different regions and domestic production, according to the relative prices and an elasticity of substitution, σ_A, called the "Armington elasticity". In this exposition we concentrate on the Armington function of a single good and a single importing country. There is no interaction between goods and between imports of different countries, so the respective indices can be suppressed. What remains is an index i for the country of origin, including the importing country itself.

The calibration of non-tariff barriers in WorldScan is based on the calibrated share form of a CES Armington function:

$$x_i^A = \bar{x}_i^A \left(\frac{P^A}{p_i^A / \bar{p}_i^A} \right)^{\sigma_A} \frac{X^A}{\bar{X}^A} \tag{0.1}$$

$$P^A = \left[\sum_i \theta_i \left(\frac{p_i^A}{\bar{p}_i^A} \right)^{1-\sigma_A} \right]^{\frac{1}{1-\sigma_A}} \tag{0.2}$$

where x_i^A is the quantity demanded, p_i^A is the corresponding price (including, except for domestic deliveries, import and export taxes, trade margins and,possible non-tariff barriers). P_A and X_A are corresponding aggregate priceand demand indices, so that the total value of demand is

$$P^A X^A = \sum_i p_i^A x_i^A$$

A variable with an upper bar denotes the initial value of the respective variable in the base year. The θ_i are the share parameters of the CES function, with

$$\theta_i = \frac{\bar{p}_i^A \bar{x}_i^A}{\bar{X}^A}$$

(By construction, $P_A = 1$). Compared to the coefficient form of the CES function, the calibrated share form has two advantages. First, by expressing all prices and quantities

as multiples of some initial (base year) value, it clearly conveys the idea that the only information CES functions contain is information about the change of relative quantities as a response to changes in the relative prices. The expressions "(0.1)" and "(0.2)" also make clear that any quantity-price split in the initial situation (choice of units) is arbitrary. This is the basis for the second advantage. Unlike in the coefficient form, the share parameters can be directly interpreted as preference parameters, which are insensitive to re-normalisations of the prices. In contrast, in the coefficient form, share parameters depend on initial prices and must be re-calculated when prices are re-normalised.

The basic idea of the calibration is to determine the value of p_i^A that is necessary to increase x_i^A by a certain percentage obtained from the estimation of the gravity equation, i.e.

$$x_i^A = \bar{x}_i^A \left(1+\Delta_i\right)$$

In principle, "(0.1)" and "(0.2)" are then solved as a system of two equations in the variables p_i^A and P_A. The difference between the calibrated p_i^A and its initial value is interpreted as the non-tariff barrier. However, it becomes clear from the equations that a number of auxiliary assumptions must be made for the system to be solvable. We first list the assumptions currently implemented in the calibration procedure, and then discuss other options.

4. With respect to the other prices, p_j^A ($j \neq i$), we assume that they are fixed at their initial value:

   $$p_i^A = \bar{p}_i^A$$

   This means that the demand quantities for the other regions x_j^A ($j \neq i$) are determined endogenously by evaluating equation "(0.1)".

5. 2. With respect to aggregate demand, X_A , we assume that it adjusts so that the value of demand remains constant, i.e.

   $$P^A X^A = \bar{P}^A \bar{X}^A$$

   "(0.1)" then changes to become

   $$x_i^A = \bar{x}_i^A \left(\frac{P^A}{p_i^A / \bar{p}_i^A} \right)^{\sigma_A} \frac{\bar{P}^A}{P^A} \qquad (0.3)$$

These choices cannot be taken without a certain amount of arbitrariness. Other options are the following:

6. Other prices, p_i^A ($j \neq i$), need not necessarily be fixed. They can be used to target other demand quantities. In particular, some quantities can be targeted to not changing compared to the initial situation. Fixing the other prices, as in the current specification, can be backed up with two arguments: (a) It it plausible that removing non-trade barriers between a country pair will produce trade diversion from other exporters and from domestic sources. These are not fully captured in the gravity estimation and are therefore constructed in the calibration. (b) In this way, non-trade barriers are only constructed for country pairs between which trade is targeted to increase. This makes interpretation straightforward.

7. Instead of fixing the value of aggregate demand, we could have fixed the volume of demand, i.e.

$$X^A = \overline{X}^A$$

or assume some demand function

$$X^A = X^A\left(P^A\right)$$

This choice is difficult to motivate, because in the gravity estimation, we estimate aggregate trade flows, whereas in WorldScan, we calibrate sectoral Armington functions. For aggregate demand, assuming a constant value is appropriate (except if we model the consumption-savings trade-off, which is not the case inWorldScan). For sectoral demand, there is, in principle, the issue of demand shifts from non-traded goods (which do not experience price reductions from the removal of trade barriers) to traded goods (which do). When fixing the value of demand for the sectoral calibration, we counterfactually assume that all sectors are affected by non-tariff barriers in the same way or that the elasticity of substitution in demand is one (Cobb-Douglas case with constant value shares).

8. Finally, instead of targeting changes in trade volume, we could also have targeted changes in trade value. The problem is that in the gravity estimation, changing import prices are not an issue, so that the volume-value distinction is not necessary. In WorldScan, however, removal of the non-tariff barriers means a drop in import prices, and targeting volumes is different from targeting values. The issue is not completely clear, but targeting volumes seems to be more in line with the assumption of unchanging prices in the gravity estimation.

The calibration procedure described so far focused on the targeting of a single import quantity. The generalisation to several (n) targets is straightforward. We then have n equations of the type "(0.1)" or "(0.3)", plus equation "(0.2)", to be solved in n prices p_i^A and the price index P_A.

7 VAT and external competitiveness (CAPP)

This chapter is primarily intended to address the following specific element mentione in the project Terms of Reference:

(D) Analysis of the impact of the VAT system on competitiveness of EU firms as opposed to firms established outside the EU, e.g. what impact it has on the global competitive position of EU firms, if it influences and to what extent the withdrawal of certain products or services from the market, if it leads to new or the closing down of business and if some products/ businesses are treated differently from others in a comparable situation.

It also contributes somewhat towards the following:

(E) Quantitative evidence of the impact of the diversity of rates, exemptions and schemes applied to goods and services in the EU under the current VAT system on the job creation, value added, economic growth, welfare gain, consumption, labour market, national revenues, and the proper functioning of the internal market.

Summary

- This chapter provides a survey of the literature on the effects of VAT on international competitiveness from both theoretical and empirical points of view.
- The relationship between VAT and international competitiveness is clear and well-understood in the economic literature: a well designed and properly functioning VAT system does not affect trade.
- In the real world, however VAT is not neutral in its effect on trade, for at least two reasons: first, a shift from direct taxation to VAT can affect trade (what we term the macroeconomic channel); and second, the ideal properties of the VAT are rarely met in the real world (production costs and export price channel). The chapter is organised in two parts, along these two channels.
- There are two key conclusions from the empirical literature. The first is that the effects of VAT on competitiveness are the results of the shift from other forms of

taxation that have a direct effect on trade. The second, based on cross-sectional and panel data estimations is that the adoption of VAT has an effect on trade and trade openness that is neutral or negative.

- The new simulations performed using the Prometeia international model suggest that the shift from direct to indirect taxation is not neutral with respect to price competitiveness, at least for some years, even if the size of the effect is low.
- The second part of this chapter deals with the distortions arising from particular applications of VAT. In this case the literature finds that the presence of different rates, exemptions, high and differentiated compliance and administrative costs, and imperfections in the refund rules, affect the costs of goods and services used as input in other production processes. As a consequence, because of the increase in production costs, VAT has a cascading effect on domestic and export prices.
- The presence of exemptions and of compliance and administrative costs is evaluated. Focusing in particular on financial services, as the most important and widespread example of exemption for services, we contribute to the existing literature by evaluating the effect of their VAT exemption on the production process and on the price setting mechanism by means of a price model based on input-output tables. The estimation is undertaken for the four big EMU countries and, according to our calculations, the share of non-recoverable VAT on financial sector output spans from 2.1% of Spain to 4.3% of France.
- The model predicts that the price of financial services provided to the business sector would be lower if financial services were not VAT exempt, and this would mean lower prices for tradeables, with the price effect smallest in Spain (-0.2%) and greatest for France (-0.8%).
- The model is also used to estimate the impact of VAT compliance costs on the price of tradeables. If these costs could be removed completely, our model predicts a reduction in the price of tradeables of between 0.7% in Germany and 1.7% in Spain.

7.1 Introduction

The purpose of this chapter is to provide a survey of the literature on international competitiveness and to augment this with new empirical work that investigates some of the major results of the existing theoretical and empirical literature.

The standard of living of an economy is not determined by whether it can produce tradeable goods more cheaply than its "competitors" but by the level of its output per head. Moreover, flows of trade depend on the differences in the relative productivity levels in different sectors (the law of comparative advantages[131]) and not on the absolute level of productivity or a concept of overall country competitiveness. Nonetheless, empirical and policy analyses often refer to international competitiveness, by which is meant overall price competitiveness and which is usually measured by the ratio of export to import prices (the terms of trade). In this chapter we refer to this definition when we use the term "international competitiveness", even if in highly stylised model-economies the terms of trade are represented by the ratio of prices of non-tradables to tradables.

The relationship between a value added tax (VAT) and international competitiveness is clear and well-understood in the economic literature. Rooted in the work of Grossman (1980) and Feldstein and Krugman (1989), the conclusion is straightforward: a well designed and properly functioning VAT system does not affect trade - it is neutral with respect to the relative price of domestic and imported goods and to the choice of location across countries. This is because the VAT paid on intermediate input and capital outlays is recoverable, so that the tax will not affect production costs and will ultimately fall on final consumption only at the legal rate applied at this final stage, independently of the rates applied throughout the whole production chain.

More precisely, as Grossman states, "since the publication of the so-called 'Tinbergen Report' in 1953 trade theorists have known that a uniform indirect tax is trade-neutral in the standard two-good trade model if factor prices and goods prices are flexible" (Grossman, 1980). Flexible exchange rates may substitute for flexibility of factor prices. In a more general model, which allows for trade in intermediate goods, the trade-neutrality of a uniform sales tax is assured only when applied according to the destination principle whereas a 'stage of processing'[132] value added tax is trade-neutral under both the origin and destination principles. In particular, Grossman assesses that the "European value added tax", as it is currently administered (i.e. using the

[131] "… nations do not compete for the world markets as the corporations do." (Krugman 1996a) In the case of a country, it is sufficient to understand the textbook model of comparative advantages, and "… one has the picture of a world in which wage, prices, the pattern of specialisation and production, and the size of the world markets are all simultaneously and mutually determined; in which productivity growth will feed back to wages, in which output growth will feed back to demand." (Krugman 1996a).

[132] Using the Grossman definition: "By 'stage of processing' value added tax is meant a tax collected at each stage of production only on the value added during that stage." (Grossman, 1980)

destination principle), is trade-neutral, since it is designed to tax final output, by allowing a rebate of taxes paid on intermediate transactions. The author focuses precisely on this issue, which is highly controversial in the public debate in the US, in order to show that it is only under the destination principle, in which taxes on exports are rebated, that the VAT is trade neutral.

Feldstein and Krugman (1989) build on this seminal contribution in order to explain why, despite the results of the economic literature, VAT is frequently considered a trade-distorting tax. Using their words, "in large part, the belief that VATs are trade-distorting policies reflects a failure on the part of non economists to understand the basic economic argument." But they add: "There is also another factor, however: in reality, VATs will not be neutral in their effect on trade, for at least two reasons." In this way, the authors introduced the two main channels through which VAT can affect external competitiveness, putting them into a formal context.

First, VAT is a substitute for other taxes that do affect trade: we call this the "macroeconomic channel". Second, the ideal properties of the VAT are rarely met in the real world because of the presence of different rates, exemptions, high and differentiated compliance and administrative costs, imperfections in the refund system and so on: we call this the "production costs and export prices channel".

The chapter is organised as follows. Section 7.2 deals with the macroeconomic channel. The main findings of the literature based on the macroeconomic aspects are presented, and simulations using the Prometeia international model are described. Three scenarios are presented in order to evaluate the effect on external competitiveness of a shift from direct taxation (consisting of personal income tax, social security contributions and corporate income tax) to indirect taxation. Section 7.3 deals with the production costs and export prices channel, i.e. with the distortions arising from the particular applications of VAT (exemption, reduced rates, high compliance costs etc.). A survey of the literature on the features of actual VAT systems that violate the neutrality of the tax with respect to production efficiency is presented. We then investigate the impact of VAT exemption of financial services and VAT compliance costs using our model. The analysis is carried out for the four big EMU countries with a price model based on input-output tables. The effect of the VAT exemption of financial services on the cost of tradeable goods is then used to obtain quantitative evaluations on trade competitiveness using the Prometeia model. Finally, some empirical findings of Chapter 5 on the magnitude of administration and compliance costs are used as an input

to the input-output and to the Prometeia model in order to quantitatively assess their effect on trade competitiveness.

7.2 Effects via macroeconomic channels

Survey of the literature

According to Feldstein and Krugman (1989), the first reason why, in practice, VAT is not neutral in its impact on trade is that usually it is a substitute for other taxes (such as corporate or personal income taxes or social security contributions) that affect factor costs and are not neutral with respect to trade. They focus their analysis on the substitution of an income tax with a VAT. Using a model with three goods (exports, imports, and non-tradables), two periods, and standard neoclassical features (technology represented by a production function, preferences of individuals expressed in terms of a welfare function), they firstly confirm the standard result that an idealised VAT is neutral with respect to trade. Interestingly, they stress "that the widespread belief that the use of export rebates in a value-added tax system is questionable and perhaps an unfair protectionist device is very nearly the opposite of the truth. In fact, the export rebate is necessary if the VAT is not to have a protectionist effect, reducing the volume of trade and probably reducing the size of the tradable sector".

The second step, more interesting in our respect, is to study the effect of a substitution of a VAT for an income tax. The well known effect of an income tax is to distort the incentive to consume and save. In their model, it induces consumers to shift consumption to the present from the future and this will tend to lead to trade surplus, at least in the short run, increasing the size of the traded goods sector. Nevertheless, the authors add that "the short term increase in net exports leads to an accumulation of overseas assets that eventually finances an excess of imports over exports".

The recent debate in both the US and the EU on the benefits that may derive by shifting the tax burden from direct (labour and capital taxes) to indirect taxation is rooted in this literature[133]. Notwithstanding that this is not the focus of this chapter, it is worth noting here that using theoretical frameworks more complex than those of Grossman's and

[133] In the US, the debate on the shift towards the VAT system is recurrent and has renewed even recently (see footnote 2 in Nicholson (2010) for a summary of last interventions on newspapers). A similar debate is repeatedly raised in Italy concerning the opportunity to increase the relative burden of VAT and correspondingly reducing the Italian Regional Tax on Productive Activities (IRAP) which is a tax based on a measure of value added of the net income type, levied on the basis of the origin principle.

Feldstein and Krugman's seminal papers, the effects on competitiveness pass through several channels, as the analysis below shows.

In Dahlby (2003) the focus is on the efficiency effect of a shifting from direct to indirect taxes and the issue of competitiveness is not taken into account explicitly. However it is interesting that the authors observe that "while the level effects (static efficiency gains) from adopting a consumption tax are ambiguous, there is mounting evidence from simulation models and econometric studies that switching to consumption taxation has very significant growth effects (dynamic efficiency gains)". This is especially true for small open economy for which the gross rate of return on saving is determined on international markets: therefore, reducing the direct tax increases the return to saving, increasing investment and therefore increasing growth[134]. Similarly, Esenwein and Gravelle (2004) provide a qualitative survey of the main channels through which tax policy may affect economic performance, taking into account also the effects on trade. They recognise that tax adjustments that change the product prices of traded goods are ultimately offset by exchange-rate adjustments with "no effect on a nation's balance of trade or its basic competitiveness". Nevertheless, they add that "this is not to say that changes in the tax structure could not influence trade levels or patterns." In particular, their analysis suggests that the macroeconomic variables that rule international flows, influenced by the shift in taxes, include saving, domestic prices, wages, capital flows, and the balance of trade. Short and long run effects will depend on the specification of the model and on how monetary policy makers respond and how quickly exchange rates adjust.

Quantitative evaluations, obtained by a calibrated DSGE model, are presented by Lipinska and von Thadden (2009) who discuss monetary and fiscal interactions between member countries of a monetary union in response to a unilateral fiscal reform in one of the countries. The paper addresses a number of questions which emerge if one of the countries directs its tax structure more strongly towards indirect taxes. For our purposes, it is interesting to note that the results not only depend on the direct effects of taxes but also on several other channels. In particular, the authors highlight i) whether the fiscal reform allows for temporary budget imbalances or not, ii) whether the central bank's objective is specified in terms of pre-tax or after-tax consumer prices, and iii) whether the policy change is anticipated by the private sector or not. The model

[134] The reason for this is that eliminating the tax on the return to saving increases the return to saving by the full amount of the tax. In a closed economy (or in an economy large enough to influence the international rate of return), an increase in saving causes a one-for-one increase in investment, which leads to a lower rate of return on capital, thereby partially offsetting the initial increase in the return on saving. (ibidem)

indicates that only if the additional indirect tax revenue is used to finance a cut in direct taxes is there some, though limited, scope for spillovers between countries.

The European Commission also presents some quantitative results on the macroeconomic effects of a shift from direct to indirect taxation for the EU countries, using its QUEST III model (European Commission (2006, 2008)). After recalling the well known result that increasing VAT would not have any direct effect on foreign trade, they argue that increasing taxation on consumption tends to boost capital accumulation, and hence labour productivity from which an improvement in competitiveness could be expected.

To sum up, the VAT effects on competitiveness are either second round effects, which can be detected by macroeconomic models only or the results of a shift from other forms of taxation which do have direct effects on trade.

On the empirical side, there is another strand of literature that focuses on the relationship among VAT and trade performance, using simpler econometric models.

For instance, Desai and Hines (2005) use three different models to investigate the effect of VAT on trade-openness. First, cross-sectional analysis using a sample of 136 countries and 2000 data; second, a model using an unbalanced panel of up to 168 countries over the 1950-2000 time period is estimated; and third, models examining the impact of different VAT systems on the international trade conducted by the foreign affiliates of American multinational firms are estimated by using year 2000 firm level data. The results of all three models imply the same conclusions: "The proposition that value added taxes encourage exports by rebating taxes at the border appears to have no empirical foundation. Instead, countries that rely heavily on VATs export and import less as a fraction of GDP than do other countries, and the negative relationship between VATs and exports persists after controlling for observable variables". The study also confirms the prediction, arising from the theoretical model of Feldstein and Krugman, of a shift from tradable to non-tradable sectors, as VATs tend to be imposed most heavily on the traded sector of the economy.

As is well known, empirical analysis based on cross-section or panel data are particularly exposed to the problem of endogeneity.[135] The inclusion of many control

[135] In fact, in these kinds of empirical models, one must worry about not only reverse causality (that is whether Y might be causing X rather than X causing Y) but also the possibility that both X and Y are

variables and specific dummies tends to reduce this risk, but cannot eliminate it. The upshot is that the results of these analyses should be interpreted with caution. In this context the comments of Keen and Lockwood (2007) are interesting. Using a panel of 143 countries over 25 years they estimate the causes and consequences of the adoption of a VAT system and find a result they describe as "particularly intriguing": that is openness has a consistently negative impact on the probability of adoption of a VAT scheme. The result might not simply reflect a specification error but relate to the fact that "a country's openness is plausibly endogenous to the presence of a VAT: to the extent that export refunds are improperly denied, for example, the VAT may function as an export tax and thus be a cause of, rather than a consequence of, reduced openness.[…] Desai and Hines (2005) interpret their finding that openness is lower, all else equal, in countries that have a VAT as suggestive that the VAT may in practice operate to some degree as an export tax. But it could be, conversely, that the apparently negative impact of the VAT on openness stressed by Desai and Hines arises simply because more open economies are for some reason less likely to adopt a VAT, and does not reflect the impact of the VAT itself."

Keen and Syed (2006) study the ways in which the tax structure affects exports and, after defining a theoretical model, estimate a panel model using 27 OECD countries over the 1967-2003 period. The focus of the paper is on addressing directly the issue of the tax mix, and estimating the relationship between net exports and both VAT and corporate taxes. The results generally confirm the view that the VAT is inherently trade neutral, whereas corporate taxes affect net exports.

Nicholson (2010) presents an example of how the role of VAT in affecting exports can be seen from the perspective of the US, the only OECD country that has not adopted a VAT scheme. The paper addresses the issue of how the structure of the domestic tax system (particularly that of corporate taxes) and of the VAT in the trade partner country, affects export performance of the US. Using data on the bilateral US trade for 146 countries, 29 sectors, and 12 years (1997-2008), Nicholson runs panel regressions based on a gravity model. There are two main findings: first, that the introduction of a VAT in foreign countries has led to a decline in both US exports and imports over the past decade, even if the results for imports are much less strong and appear dominated by the extractive sector; second, the US corporate tax tends to decrease US trade competitiveness. These results tend to confirm previous analysis. Nicholson's finding

being driven by an omitted variable such as local economic and political conditions which can be difficult to measure. The addition of "control" variables is the way usually adopted to reduce this risk.

that the impact of VAT on trade differs substantially between sectors can be seen as indirectly supporting the Feldstein and Krugman (1989) prediction. Since tax rates usually differ across industries and types of goods and services, in the direction of exempting or applying reduced rates to non-tradables, the VAT system may reduce the traded sector of the economy. Exports could be penalised, in favour of production and consumption of non-tradables.

The empirical analysis

The empirical analysis of the macroeconomic effects of VAT on external competitiveness is undertaken by running the Prometeia international model. First, we briefly describe the main characteristics of the model and the transmission channels of a VAT change. Subsequently, three scenarios are presented, simulating the shift to indirect from direct taxation, distinguishing between household income, corporate income, and labour taxes, as proxied by social contributions, with the aim of giving quantitative assessment of the macro effects of the shifts.

The Prometeia international model

The Prometeia international model lies in the tradition of the large macroeconometric models. It covers the world economy divided into 26 countries and regions. The block of international trade considers separately commodities and manufacturing goods for both prices and volumes. On the contrary, the supply side does not consider any sectoral breakdown.

The model equations have been estimated in a way that takes into account the possible different behaviour of economic agents in the various countries. The equations are largely in the form of an Error Correction Mechanism so to identify relationships that econometrically represent the long-run equilibrium to which the model ultimately converges. It follows the model is essentially a demand side one, focused on effective output in the short run and on the off-equilibrium macroeconomic effects.

16 countries are considered separately: US, Japan, Canada, United Kingdom, China and the 11 biggest economies of the European Monetary Union. The remaining countries are grouped into 10 regions, 3 of them regard the remaining Western countries, the other 7 regions group together into homogeneous areas the emerging economies and the Far-Eastern countries. These areas are Latin America, India with its neighbour countries, the Middle East, the Sub-Saharan Africa, the Central and Eastern Europe countries, Russia with most of the ex-Soviet Union Republics, the Mediterranean

countries that group the North-Africa ones and Turkey, the South-East Asian countries (the former NIC and NEC). The European Monetary Union as a whole is obtained with a bottom-up approach, that is summing-up single countries.

Each country/area is described by national models linked together by the trade block. The models for the single countries are more detailed than those for the areas. For the big countries, the behaviour of households for private consumption and of firms for investments describes the demand side of the economy, whereas the supply side is represented by the price system and by the labour market. The most important items of revenue and expenditure of the public sectors are also described in order to determine endogenously the Government budget. The models for the emerging areas are simpler in term of description of the domestic market from both the demand and the supply side. Moreover, the public sector and the labour markets are not described.

The trade block represents the core of the world model. Its structure is common to countries and areas and it describes import and export demands at constant prices and their associated prices. In particular, imports depend on total demand and the relative import to domestic prices; exports depend on world demand and the relative exports to competitor prices. For each country/area, the world demand depends on the single country's international position on the external markets. In addition, the other main items are considered in order to define the current account of the balance of payments. With respect to trade prices, manufacturing import prices are defined as an average of the export prices of the trading partners, weighted by the geographical composition of imports, whereas commodity import prices are an average of the international prices of food and agriculture, energy, and non-oil raw materials. Competitor prices are similarly an average of the export prices of competitors weighted by the geographical composition of exports.

For the EMU countries the international trade keeps separate the intra-area from the extra-area flows of imports and exports with the assumption that there is no pricing to market, that is export prices of goods are fixed on the basis of both production costs and competitor prices and do not vary according to the destination market of exports. This assumption does not seem to be too stringent, as according to the literature (Bugamelli, Tedeschi 2008, among others) it depends on several factors (depreciation vs appreciations, competitive position of firms and of markets, etc) that are difficult to quantify at the macroeconomic level, given the lack of detailed data for each country.

The model takes into account the transmission mechanisms of both fiscal and monetary policies, with a thinner detail for the big countries. In particular, for the US and the EMU monetary policy is described by a Taylor Rule. The short term interest rate along with agents (adaptive) expectations on future growth is the main driver for the 10 years Government bonds' yield. With respect to fiscal policy, for the industrialised countries the main items of the tax revenues are endogenous in order to determine the budget deficit and hence the public debt. Direct taxation of household and corporate income affects respectively household disposable income, and hence consumption, and the user cost of capital, and hence investment. In particular, for households income an average tax rate is computed as the ratio of households direct taxes to total income, whereas for firms the statutory corporate tax rate affects the user cost of capital. For indirect taxation an effective tax rate (computed as the ratio of VAT revenue to domestic consumption) influences the level of consumer prices with a unitary elasticity: that is we assume a full pass-through of VAT changes into the consumer price level. Finally, social security contributions represent part of the labour costs for firms and are shifted into prices.

For the OECD and the emerging areas, fiscal policy affects domestic demand through public consumption only. These areas do not have a national monetary policy either, but it is assumed that their cost of borrowing depends on the international interest rates, also taking into account the variations of the national currency exchange rate in the international markets and domestic inflation.

The exchange rate of the US dollar with respect to the euro has been estimated following a BEER (Behavioural Equilibrium Exchange Rate) approach which uses econometric methods to establish a behavioural link between real exchange rate and relevant economic variables (Clark and MacDonald, 1998). In our model, the main determinants for the US/euro real exchange rate are the relative prices in the traded and non-traded good sectors, the relative external positions, the relative fiscal position and the international real interest rate differential. The exchange rates of remaining countries move in line with the US dollar or the euro accordingly to rules derived from past experience.

According to the literature, the model's price structure does not allow for any direct impact of VAT on external competitiveness, insofar as:

- imports and domestic products pay the same tax rate, as the destination principle holds, and

- exports and competitors prices depend on production costs not affected by VAT.

Finally since the model is essentially demand side and not a general equilibrium model, the results of the simulations have to be interpreted as effects on the effective output and not on the potential output. Hence, although results might be inconsistent with "standard" microeconomic theory they are informative with respect to the off-equilibrium short-run effects. The ten years horizon of the simulations is intended to show where the results converge rather than to represent the ultimate long run equilibrium with supply-side adjustments.

The simulation exercises

This section presents some simulation exercises in order to evaluate the effects on external competitiveness of a shift from direct taxation to VAT. The above mentioned literature and the debate in the US and in the EU suggest that, in the short-run, this tax shift should achieve higher growth and employment without worsening public finance.

In the long-run a tax on earnings formally levied on employers should have the same economic effects as a tax formally levied on employee. However, by using a demand-side model we can allow for short term impacts to differ depending on the direct effect of reforms on factor costs and second round effects on macroeconomic variables. To investigate this possibility three exercises have been run with taxes shifting as follows:

i) from household income tax to VAT,
ii) from corporate income tax to VAT,
iii) from social security contributions to VAT.

The following assumptions hold for all the three scenarios.

a. For each country, the tax shift is calculated on an ex-ante budgetary neutral assumption. In order to guarantee the ex-post neutrality, a tax rule on minor budgetary items on the revenue side is at work if a deficit occurs; otherwise, if a surplus is the result of the different tax mix, no further correction works, and the obtained surplus reduces the public debt.
b. Transfers to households are partly indexed to domestic prices in order to compensate the income recipients for the increase in consumption taxes.
c. Central Bank reacts to pre-tax prices. This means that it does not react to increased domestic prices due to VAT rate increase; the Central Bank reacts to variations of domestic prices net of taxes.

d. Labour supply is inelastic with respect to real wages. Hence employment is determined by the demand curve. The influence of labour-market imperfections and institutions (e.g. trade unions) is taken into account by allowing the effective wage to be higher than the reservation wage meaning that there may be involuntary unemployment.
e. International commodity prices are kept exogenous[136] and equal to their value in the baseline scenario.
f. Finally, the tax shift in all the three exercises has been applied to the biggest four EMU countries, that is Germany, France, Italy and Spain and to UK.

The results of the exercises presented refer to EMU as a whole and are percentage deviations or, in the case of GDP shares, first differences, with respect to a baseline scenario.[137]

Tax shift from household income tax to VAT

The simulation is characterised by the following assumptions:

- 1 per cent of ex-ante GDP increase in indirect taxation,
- 1 per cent of ex-ante GDP reduction in household income taxation.

The model predicts a positive effect on GDP that tends to vanish within the time horizon, permanent higher consumer prices, no relevant effects on employment and a negligible worsening of competitiveness with no significant effects on the trade balance (Fig. 7.1).

The mechanics of the model simulations are the following. The VAT rate increase reduces the purchasing power of domestic agents through the increase of consumer prices which completely reflects the VAT rate hike. The simultaneous increase in the indirect tax rate and decrease in household income tax rate does not allow for a unique expected reaction of real disposable income, depending on the relative magnitude of the variables involved. More specifically, in the short run the neutral effect on real disposable income depends on the initial relative value of tax rates (VAT vs income

[136] Give the small size of the results of these simulation exercises on world demand, this assumption does not seem too stringent as the effects on commodity prices are negligible.
[137] As the countries considered in the simulations represent more than the 75 per cent of the EMU and given the country detail of the model, the results of a fully coordinated tax shift would not be significantly different from those presented.

tax) and on the propensity to consume[138]. In other words, disposable income is penalised by higher domestic prices and it benefits from the reduction in direct taxation, hence the total effect on real disposable income might not be neutral at least in the short run. In addition, the benefit recipients are compensated by the indexation of transfers to domestic prices. All together, in our simulation the tax shift increases real disposable income. The model assumes that the incidence of the personal income tax falls on the individual because there is little chance for shifting it, owing to labour supply being unaffected by real wages.[139]

At the same time, the Central Bank does not react to the temporary higher domestic inflation due to the VAT rate hike. The relative labour to capital cost remains substantially stable. The increased demand and domestic production brings about a (negligible) increase of employment and capital accumulation.

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[138] Y = nominal income at time 0
c = real consumption at time 0
p = consumer price before VAT tax at time 0
$y_r^d(0)$ = real disposable income at time 0
$y_r^d(1)$ = real disposable income at time 1
t = income tax rate at time 0
τ = VAT rate at time 0
$\Delta t = [t(1) - t]$
$\Delta\tau = [\tau(1) - \tau]$

$$y_r^d(0) = \frac{Y(1-t)}{p(1+\tau)} \qquad y_r^d(1) = \frac{Y(1-t-\Delta t)}{p(1+\tau+\Delta\tau)}$$

if real disposable income does not change after the increase of the VAT rate and the decrease of the income tax the following equality should hold:

$$\frac{(1-t)}{(1+\tau)} = \frac{(1-t-\Delta t)}{(1+\tau+\Delta\tau)}$$

if $\Delta t = \frac{\Delta R}{Y}$ and $\Delta\tau = \frac{\Delta R}{pc}$, where ΔR = change in government revenue,

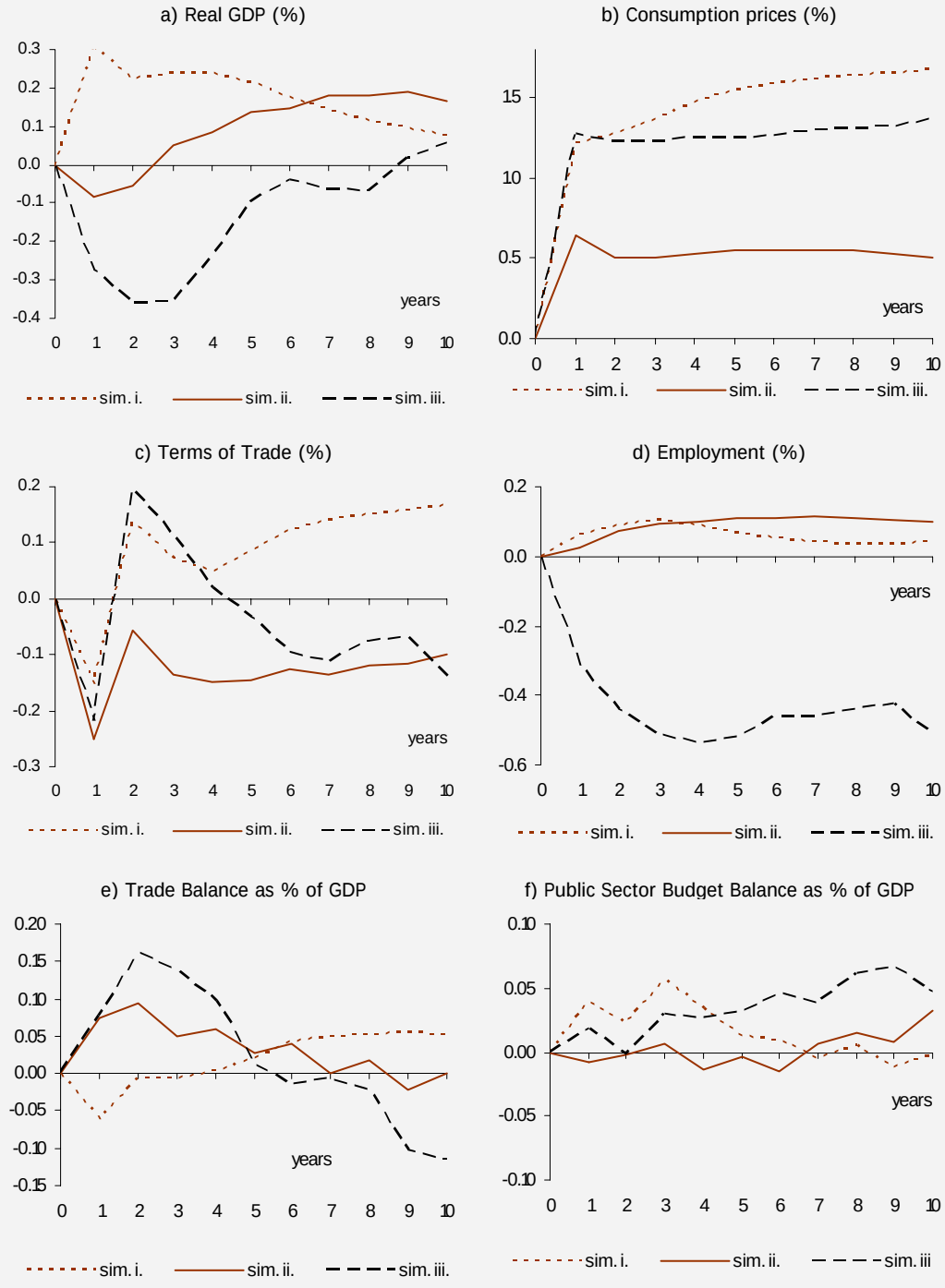
the previous equality condition becomes: $\frac{(1-t)}{(1+\tau)} = \frac{Y(1-t) - \Delta R}{pc(1+\tau) + \Delta R} \frac{pc}{Y}$

This shows that the ex ante neutrality depends both on the ratio of t to τ, and the propensity to consume.

[139] See for instance Fullerton, Metcalf (2002): "… for the personal income applied studies have consistently assumed that economic incidence is the same as statutory incidence – on the taxpayer - even though this assumption has never been tested."

Stronger domestic demand reflects into higher production and export prices. On the whole, the terms of trade improves leading to a modest deterioration of competitiveness. The effects on the trade balance are negligible as the price effect tends to be compensated by the quantity effect on imports (due to the higher demand).

Fig. 7.1 Simulation results for the Euro area countries (differences from the baseline)



sim. i.: shift from household income tax to VAT;
sim. Ii.: shift from social contribution to VAT;
sim. iii.: shift from corporate tax to VAT

Tax shift from corporate income tax to VAT

The simulation is characterised by the following assumptions:

- 1 per cent of ex-ante GDP increase in indirect taxation,
- 1 per cent of ex-ante GDP reduction in corporate income tax.

Before commenting on the results, it is worth noting that the model does not include endogenous capital flows between countries. Hence it is not possible to take into account the effects of changing the corporate fiscal burden on capital movements.

The model predicts a negative short run effect on GDP that tends to reduce over time; permanently higher consumer prices; a negative permanent effect on employment; a temporary deterioration of competitiveness in the first five years of the simulation (excluding the impact in the first one) and an improvement in the following five; and no significant effects on the trade balance after the fifth year of simulation, (Fig. 7.1).

Lower tax on corporate income reduces the user cost of capital with a consequent reduction of the capital to labour price ratio that shifts the relative demand of productive factors from labour to capital, being the elasticity of substitution between labour and capital higher than 1 in absolute terms. It also increases firms net profits with an expansionary effect on economic activity through investments. Employment decreases notwithstanding the positive effects from the augmented demand. Higher domestic output and lower employment determine higher labour productivity that from one side tend to push up salaries and from the other side reflect into lower production prices, partly transferred into consumer prices. Lower domestic prices allow the central bank to reduce nominal policy interest rates, deepening the reduction of the user cost of capital and amplifying the stimulus on domestic demand.

The positive effects on investments of the tax shift do not compensate the reduction of private consumption suffering from both lower employment and lower purchasing power, with a overall negative effect on GDP.

With respect to the terms of trade, in the first few years of the simulation, lower production prices, due to higher productivity, contribute to appreciate the national currency, amplifying the disinflationary effects on production costs, but with a reduction of import prices in national currency that overcome the lower export prices.

Overall this implies a deterioration of competitiveness. In the second part of the simulation period, lower interest rates contribute to a depreciation of the domestic currency and a consequent worsening of the terms of trade with respect to the baseline. The price effect tends to prevail on the trade balance: it improves in the first years of the simulation, but tends to reduce and stabilise around zero from the fifth year.

Tax shift from social security contributions to VAT

The simulation is characterised by the following assumptions:

- 1 per cent of ex-ante GDP increase in indirect taxation,
- 1 per cent of ex-ante GDP reduction in social security contributions.

It is worth recalling that within our model social security contributions are explicitly levied only on employers. The model predicts a positive effect on GDP, higher consumer prices, but lower than in both the previous exercises, a positive effect on employment and a gain of competitiveness that nevertheless improves the trade balance only in the first years of the simulation (Fig. 1).

Lower labour taxes on employers reduce wage costs for firms that transfer the lighter fiscal burden into lower production prices and hence export prices. Lower domestic production prices contribute to appreciate domestic currency with the effect of reducing import prices in national currency, feeding the disinflationary effects on production prices. On the whole, the terms of trade deteriorates. In addition, lower domestic prices allow the Central Bank to reduce policy interest rates.

Lower wage costs lead to an increase in employment.

With respect to GDP components, the gain in competitiveness boosts exports. The VAT rate increase reduces the purchasing power of domestic agents with negative effects on consumption that are nevertheless mitigated by the positive effects on the formation of disposable income due to higher employment. Investments tend to increase, fed by external demand through exports.

Higher domestic demand tends to raise imports, with some delay with respect to the increase of exports due to the better competitive position. This leads to an improvement of the trade balance in the first period of the simulation, until the quantitative effect on imports tends to overcome the price effect.

In summary

All in all, the results of the exercises run with the Prometeia international model confirm that the shift from direct to indirect taxation is not neutral with respect to price competitiveness at least in the first years of the simulations, with negligible effects on the trade balance.

According to the above simulations, and recalling the short run properties of the model, it emerges that the reduction of the employer social contribution financed by an increase of VAT rate would provide a deterioration of the terms of trade (an improvement of competitiveness). Nevertheless, trade balance improves only in the first six years of the exercise. When shifting from income taxation to indirect taxation competitiveness deteriorates in the first few years. While in the case of household income the deterioration of competitiveness is confirmed in all the simulation period, in the case of corporate income, competitiveness improves in the second part of the sample. In all the simulations, the effects on the trade balance as a share of GDP are negligible. They tend to stabilise very close to zero from the fifth year.

Even if the magnitude of the tax mix on the terms of trade is quite low (between -0.1% and +0.2% with respect to the baseline scenario) it is worth underlining that the difference between exercise i. (from direct household income taxation to VAT) and ii. (from social security contributions to VAT) lies essentially in a different reaction of the exchange rate. In the first scenario the euro tends to remain stable versus the US dollar, whereas in the second scenario the euro appreciates, thanks to lower labour costs for firms. The model structure regarding the incidence of different taxes on prices is the main reason of this result.

With respect to GDP, the results obtained are broadly in line with the already mentioned scenarios presented by the Commission (2006 and 2008), the main differences being on the magnitude of the effects (higher for the Commission than for Prometeia). The explanation lies in the different structure of the models. In particular, our exercises suggest that the business cycle effects (as indicated by the Prometeia model) expected from a redistribution of the fiscal burden among different taxes are more limited than the possible equilibrium effects, as DSGE model predicts. In fact, whereas QUEST is a calibrated DSGE model, with a particular focus on equilibrium relationships and on potential output, Prometeia model is an estimated model, with the focus on business cycle behaviours and on effective output.

7.3 Effects via production costs and export prices

Survey of the literature

It is a well known conclusion of the literature that the ideal properties of a VAT system are rarely met in reality because of the presence of different rates, exemptions, high and differentiated compliance and administrative costs, imperfection in the refund rules and so on (Tait, 1988, Ebrill et al. 2001).

As is recognised in the recent EU Green Paper (2010)[140], the VAT systems currently applied may create a wide range of economic distortions. Several features may violate the neutrality of the tax with respect to production efficiency and affect costs and export prices. Distortions might be bigger in the EU than in other countries (i.e. Australia and New Zealand) where the VAT was introduced more recently, since "modern" VAT systems tend to show fewer exemptions and get closer to a general and more efficient tax system.

Two aspects, as the most important, are worth considering: the presence of compliance and administrative costs and the presence of exemptions.

VAT administration, delay or imperfect and partial refund of VAT on export, and taxpayers' compliance costs may significantly contribute to increase production costs and affect international competitiveness[141]. Differences in compliance costs across countries may affect domestic and export prices. Moreover, to the extent that compliance costs differ depending on whether the transaction is domestic, intra-EU or extra-EU, because of the different procedure and information obligations under these three different types of sale, compliance costs may divert trade and in particular favour domestic as well as extra-EU trade, with respect to intra community transactions. We do not deal with the effect of these distortions because a proper section of this research project (Chapter 5) is devoted to survey and to analyse these costs and their relevance.

The second feature of real VAT systems that may violate the neutrality of the tax with respect to production efficiency (see Englisch, 2011, for a comprehensive view) and affect costs and export prices is the presence of exemptions. In fact, exempt goods and

[140] See also PriceWaterhouseCoopers (2006) for more evidence on differences between EU member states on the non deductible VAT.

[141] Cfr. EU Project on Baseline Measurement and Reduction of Administrative Costs (2009); Cnossen and Verwaal (2002); Vaillancourt, Clemens, Palacios (2008).

services incorporate the VAT paid on inputs used to produce them and non-refundable as a credit.

The effects of exemptions were first explored analytically by Gottfried and Wiegard (1991), using a numerical general equilibrium model based on input-output tables (for Germany) aggregating the production side of the economy into 15 producer goods industries. In general, exemption produces a break in the chain of VAT credits and "because exempt firms are not entitled to deduct VAT on inputs, taxes remain on their intermediate products and investment goods". Even if exemption has many effects[142], the focus here is that it jeopardises the destination principle in international trade. In particular, as Gottfried and Wiegard underline "in the case of exemption, exported commodities implicitly carry some tax load when crossing the border." Moreover, it acts as an import subsidy, because import prices (free of tax) are lower than the same prices for goods produced domestically. Exemption can affect competitiveness also indirectly to the extent that exempt goods and services are used as input in the production process. The tax will have a cascading effect, increasing production costs. This would in turn translate into higher domestic and export prices.

Along the same line of reasoning, Hellerstein and Duncan (2010) underline that "exemptions undermine the destination principle because it is not possible to remove the consequences of exemption at an earlier stage in the production chain".

In addition to this cost effect, there can be another distortion on competitiveness. As Hellerstein and Duncan (2010) and Ebrill et al. (2001) summarise: "firms using inputs that are exempt have an incentive to import those inputs – which will be zero-rated rather than exempted in the country of export – instead of purchasing tax-laden items from exempt domestic producers. Indeed, there is an incentive for exempt producers to artificially export their output (and so have it zero-rated) in order that domestic producers can escape indirect taxation through the input into the exempted sector."

From the empirical side, the evidence on the economic effects of exemptions is scant and scattered across countries and time periods. To our knowledge, studies of this kind focusing on the effect on competitiveness (or at least on domestic production prices) are not frequent.

[142] Ebrill et al. (2001) list them: exemptions undermine VAT economic neutrality by distorting input choices and creating an incentive to self-supply; they create administrative complexity by requiring differential treatment of taxable and exempt commodities and suppliers; they have uncertain revenue consequences; and they commonly lead to exemption creep or appeals for more exemptions.

Exempt sectors are quite similar among countries and usually related to education, health, insurance and financial services[143]. The EU countries are characterised by a wider area of exemptions with respect to late comers in the VAT club, such as Australia and New Zealand which have much more general systems.

Exemptions have different effects on economic agents: for instance, education and health services mainly influence the behaviour of households, whereas the exemption of the insurance and financial services can significantly affect the production process.

In general, only detailed empirical studies are able to acknowledge these effects and a proper way to incorporate the complexity of the tax code is to use input-output analysis[144]. In fact, input-output tables provide detailed information on the production processes, the interdependence in production, and the use of intermediate goods and services.

A well established strand of research builds on models based on input-output matrices and deals with the non deductable VAT issue (Bardazzi, Grassini and Longobardi, 1991, Bardazzi, 1992, Boratynski, 2005). With the aim to extend the elementary input-output model to represent the role of indirect taxes, they overcome the lack of detailed data on tax components in the individual cells of the tables. Our empirical analysis is based on their analytical approach, as detailed below.

A recent example on the issue is a study on the Vietnam VAT system (Giesecke and Tran, 2009), which incorporates several details of the tax code in an input-output structure and uses this information to assess, in a CGE model, the effect of a tax reform devoted to simplify the Vietnamese VAT system, by reducing exemptions, different tax rates and consequently compliance costs too. Using a model with a high level of products disaggregation (113 products are considered) they simulate the economic effects of an equalisation of the VAT rates and of a removal of exemptions[145], finding a positive result on output (especially over the medium term).

[143] In addition, some countries provide exemptions for small firms, below a certain limit of turnover or unincorporated family firms and, especially in developing countries, to agriculture.
[144] Cfr. Ye et al. (2010).
[145] In term of magnitude, the major effect comes from the reduction of compliance costs, but this of course depends on the particular feature of the Vietnamese system, that is very complex.

Further studies on the economic consequences of exemptions, even though not focused on external competition, are two companion papers (Dietl et alt. 2010a-b) that build an analytical model, calibrated using stylised market data for the postal service sector, as a good example of the distortion that exemptions can produce. They find that exemption affects the competitive position of taxed versus non taxed firms, but the proportion is very difficult to assess, because it depends on the specific characteristic of the legislation, as well as of the market and of the firms involved.

Focusing on financial services, Huizinga (2002) explores the effect of different reform options in terms of VAT revenue and economic welfare, with the aid of a simple partial equilibrium model and using households data for the Netherlands. He concludes that "exemption (…) raises the price of financial services faced by EU businesses while lowering the price faced by households. It puts EU banks at a competitive disadvantage vis-à-vis banks based in nations that have no VAT. And, since the operation of the exemption is complex, it fosters indirect fiscal competition among EU tax authorities in the financial sector".

The same conclusions are summarised by Monacelli and Pazienza (2007): "The VAT exemption generates a "hidden tax burden" on the financial sector due to the VAT paid on the inputs and non-refundable. The potential tax shifting from the banking sector towards the other sectors of the economy – which are financed by the banks – generates distortions that are responsible for non-neutralities, first among financial and non-financial firms, and second among financial firms in EU or in non-EU countries. Such non-neutralities are enhanced by the differences that still characterise the VAT regimes in the EU countries." With particular reference to international competitiveness, the dimension of the distortions that this tax regime implies depends primarily upon: (i) the statutory rates; (ii) the borderline between taxable and exempt services; (iii) the specific rules governing the recovery of VAT on input; (iv) the availability of VAT grouping. In the authors' view, because of the strong differences among countries, the distortionary effects of the exemption are widely divergent, introducing further obstacles to the international competitiveness and to the development of the European single market.

With the aim of analysing from a legal and economic perspective the proposal for reforming the VAT treatment of financial services, de la Feria and Lockwood (2010) provide a quantitative evaluation of non-recoverable VAT for financial services. Drawing from input-output tables the total value of purchases of intermediate inputs by the financial services industry from all other industries, they estimate the amount of

irrecoverable VAT by applying the corresponding VAT rates[146]. A comparison with our calculations is shown below.

The empirical analysis

The input–output analysis

In this section we provide a quantitative evaluation of the magnitude of the effect of non-deductible VAT on export prices. Our empirical analysis concentrates on financial services[147], as the most important and widespread example of an exempt item that can affect competitiveness. Education and health services are also usually exempt, but they can be considered not relevant as intermediate goods for the manufacturing sector[148], and can be considered mainly as non tradables. We do not consider other kinds of exemption, related for instance to the size of the firm, because dimensionally less appreciable.

As confirmed in the EU VAT Directive (Directive 2006/112/EC)[149] most financial and insurance services are exempt in the EU. However, the Directive does not provide specific and precise definition and rules, so that there are considerable differences among member states (PriceWaterhouseCoopers, 2006). It is worth remembering that it is widely recognised that the exemption of most financial services from VAT does not seem to depend on economic reasons[150] regarding the efficiency of the tax system, but rather on the difficulties to identify the exact price to which the VAT should be applied.

In the following, the relevance of the insurance and financial service sectors into the production processes of some countries of the Euro area is assessed by input-output analysis. A formal description of data problems and of some methodological issues

[146] The VAT Revenue Ratio has been applied to the standard rate in order to take into account of several factors: exemptions, reduced rates, application of taxation/registration threshold for small traders, poor compliance or poor tax administration or a combination of these.

[147] Precisely for "financial sector" we consider the aggregation of the following items: financial intermediation services, insurance and pension funding services (except compulsory social security services) and services auxiliary to financial intermediation.

[148] Unless the "reproduction" costs of the labour services are taken into account. In addition, as in the majority of European countries, these services are provided by the public sector. So we can consider that their prices do not depend on non-deductible VAT, because VAT is a cost but at the same time a revenue.

[149] This Directive repealed the Sixth EU VAT Directive from 1.01.2007. The Directive provides for the exemption of a series of transactions such as those relating to education, health services, the services of traditional insurance and financial services.

[150] Among others, Honohan (2003).

related to this analysis is presented in Box. 7.1, whereas in the following the focus is on the impact of abolishing VAT exemption on prices and on the results of the macroeconomic simulations.

Box. 7.1 The input-output price model

Input-output analysis[151] as a theoretical framework and an applied economic tool was developed by Wassily Leontief (published in 1936), that transforms the Francois Quesnay's *Tableau Economique* - a descriptive device showing sales and purchases relationships between different producers and consumers in an economy - into an analytical framework by introducing the assumption of fixed-coefficient linear production functions relating inputs used by an industry to its output flow, i.e., for one unit of every industry's output, a fixed amount of input of each kind is required.

The basic input-output system of equations can be written as:

7.1.1 $AX + Y = X$

where X is the vector of output
Y is the vector of final demand
A is the input-output coefficient matrix.

The input structures (represented by the A-matrix) show the type and amount of various inputs each industry requires in order to produce one unit of its output but tell nothing about indirect effects. For example, the effect of the production of a motor vehicle does not end with the steel, tyres and other components required. It generates a long chain of interaction in the production processes since each of the products used as inputs needs to be produced and will, in turn, require various inputs. The production of tyres, for instance, requires rubber, steel and cloths, etc. which, in turn, require various products as inputs including the transport service provided by motor vehicles that necessitates the production of motor vehicles in the first place. One cycle of input requirement requires another cycle of inputs which in turn requires again another cycle. This chain of interactions goes into infinity, but can be mathematically solved as follows:

7.1.2 $X = (I - A)^{-1}Y$

The sum of all these chained reactions is determined from the value of the so called Leontief inverse. This inverse matrix $(I-A)^{-1}$ is fundamental to input-output analysis as it shows the full impact of an exogenous increase in net final demand (Y) on all industries (X). With such a matrix it is possible to unravel the technological interdependence of the productive system and to trace the generation of output demand from final consumption which is part of net final demand throughout the system. It is then possible to calculate what output levels would be required to meet various postulated levels of net final demand and consequently how output

[151] For a detailed description United Nations, 1999, Handbook of National Accounting, Handbook of input-output table compilation and analysis, Studies in Methods Series F, No. 74, New York.

levels would be required to change in order to meet postulated changes in net final demand. The sum of direct inputs and indirect inputs is normally called indirect effects.

An extension of this kind of analysis is the price model: in a simplified input-output model with constant coefficients, price analysis takes the form of equation 1.3:

7.1.3 $p = (I-A')^{-1}\ va$

Prices (p) are determined in an input-output system from a set of equations which states that the price which each sector of the economy receives per unit of output must equal the total outlays incurred in the course of its production. Outlays include not only payments for input purchased from the same and from other industries but also the value added (va). The price of every product in vector p in model 1.3 is equal to 1 when no change is made in coefficient A or in the vector of value added. This model can be used to calculate changes in prices as a result of changes in exogenous variables.

In our case, in order to have a price model able to take into account indirect taxes (and non deductible VAT especially) and the structure of interdependence of sectors, input-output tables are used, following the literature[152], in a more complex way. Such a model, in the base year, can be defined as:

7.1.4 $p_d = \{I-[A_d'^{\circ}(J+H'T)](I+S_d+D)\}^{-1} * \{[A'_m{}^{\circ}(J+H'T)]\ (I+S_m+D)p_m+va\}$

where:

- p_d and p_m are two vectors of *i* elements of basic price (net of taxes, trade, and transport margins) indices of domestic goods, the former, and of imported goods, the latter;
- A_d and A_m are the matrices of technical coefficients;
- S_d and S_m are diagonal matrices of average rate of all indirect taxes except non-deductible VAT;
- D is the diagonal matrix of trade and transport margins,
- T is the diagonal matrix of the average nominal VAT rates for products *i*;
- the elements of matrix H represent the part of individual purchase subjected to non deductible VAT;
- va is the vector of value added per unit of output associated with each good and service;
- I is the identity matrix;
- J is the matrix where each element is 1;
- the symbol ° indicates multiplication element by element.

The major problem in empirical studies is that the necessary data to define the parameter matrices S, D, H, and T for the European countries are not available to the public. To overcome this problem and, in particular, to have an estimation of the matrices of non-deductible VAT (H and T), some simplifications have to be introduced.

[152] The formula follows closely Boratynski (2005), but similar expressions can be found in Bardazzi, Grassini and Longobardi (1991), Bardazzi (1992).

In some cases[153], a vector of total amount of non-deductible VAT, referred to both intermediate use and consumers, is available. In this case, and on the base of hypothesis drawn by the structure of the matrix and by the characteristics of the VAT system, it is possible to allocate to each sector the non-deductible VAT.

But this is not the most common situation. For the European countries[154] also the vector of non-deductible VAT is not separately available but is aggregated with other taxes on products net of subsidies. Hence, additional simplifications are necessary.

•

Then, we rewrite the price model 1.4 in a simpler way, where trade and transport (the matrix D) are not isolated but remain incorporated in the intermediate costs; and S_d and S_m are no more matrices but become the r vector of the amount of all indirect taxes except non-deductible VAT net of subsidies. Thus, we obtain our input-output price model:

7.1.5 $p_d = \{I-[A_d'^{\circ}(J+H'T)]\}^{-1} * \{[A'_m{}^{\circ}(J+H'T)]\, p_m + r + va\}$

It is worth noting that the model assume full transfer of costs on prices.
We estimate non deductible VAT (H and T) and then we calculate the other taxes net of subsidies (r), so it is possible to simulate the model.

This is the model used for the evaluation of the VAT exemption and of compliance cost presented in the Chapter.

The use of input-output tables allows us to take into account the burden of the embedded VAT on intermediate costs for the financial service sector and their possible transfer into the costs of other sectors. As a consequence, it is possible to have quantitative information on how financial services, as an intermediate input, affect directly and indirectly the other sectors of the economy and the final demand. Directly, because the input-output tables give a detailed description of the input requirements of each industry-product from any other industry-product. These pieces of information allow us to calculate the technical coefficients, i.e. the constant quantities of each of the various inputs necessary to supply a unit of product. Indirectly, because through manipulation (Leontief inverse) of input-output tables one gets the overall amount of each sector product that a unit increase of the final demand requires, both as direct input, and as indirect input.

We proceed as follows. First of all, we calculate the non-deductible VAT in the financial sector (Table 7.1). We apply to each intermediate good and service used by

[153] Boratynski (2005).
[154] This information is not available, as verified through a request made to Eurostat.

Table 7. 1 Calculations on non-deductible VAT of financial sector in 2005 (%)

	(1)	(2)	(3)
	share of taxable costs on total intermediate costs	share of non recoverable VAT on intermediate costs	share of non recoverable VAT on output
Germany	42.20	6.28	3.46
France	53.30	8.65	4.32
Italy	39.70	6.79	2.70
Spain	45.10	6.05	2.13

the financial sector its proper statutory tax rate[155], taking into account that several inputs are zero-rated or exempted or charged at lower rate (e.g. public sector services, transport, books and newspapers, construction[156]). Our approach, that use statutory instead of effective tax rates, does not take into account tax evasion; nevertheless this approach seems correct, to the extent that it is usually difficult for financial companies to evade VAT on their inputs.

We focus on the larger EMU countries (Germany, France, Italy, and Spain) in 2005, as the most updated year for which input-output tables are available for all countries. We could not find updated input-output tables for the UK.

According to our calculations, the share of taxable intermediate costs over the total intermediate costs (Table 7.1, column 1) is on average around 45%, spanning from 39.7% in Italy to 53.3% in France. This is broadly in line with Huizinga (2002), who calculates a share of 41.7% for the average of eight European countries. Monacelli and Pazienza (2007), referring to Italy and using Tax Administration Data, find that taxable purchases under VAT have lost weight (from around 50% before 2000 to less than 20% in 2003) which could be ascribed to the two main structural breaks in legislation occurred in the last period (pro-rata system and VAT grouping treatment) even if the variability of these data remains strong.

[155] European Commission, VAT Rates Applied in the member states of the European Union.
[156] Please note that we assume that for these sectors the non-deductible VAT does not influence their prices.

In addition, studies based on firm data show a strong heterogeneity. PriceWaterhouseCoopers (2006) studies 22 financial services firms and finds that between 0% and 74% of VAT on inputs is recovered, depending on the location of the firm, the nature of the customer base, etc. On average, according to PWC, financial firms recover about 20% of the VAT paid on inputs, so the amount of really irrecoverable VAT is 80%.

According to our calculations (Table 7.1, column 2), non-recoverable VAT, as a share of intermediate costs, is lower than that obtained by de la Feria and Lockwood (2010), especially for Germany and Spain, even if they correct the standard tax rate for the VAT Revenue Ratios (actual VAT revenue as a fraction of what it would be if the standard rate were successfully applied to all consumption). The more precise calculations we make resulted in a lower burden of non-deductible VAT on intermediate costs.

The next step is to have a price model able to take into account the complex structure of interdependence of sectors depicted by input-output tables, as described in Box 7.1. After the estimation of non deductible VAT, we have all the information we need to use our price model (7.1.5 in Box.7.1). The price model has been run under the assumption that financial services are not exempted, in order to evaluate the effects on prices of non-deductible VAT. The results in terms of percentage difference between prices in the two cases (without and with exemptions) are reported in Table 7.2.

In general, the model works as follow.[157] Abolishing exemption in the financial sector would reduce costs and the production price of financial services. The other products of the economy would benefit from this price reduction; the amount of the benefit will depend on both the reduction in the production price of the financial service sector and the relevance of this sector as direct and indirect input for the rest of the national products.

[157] It is worth noting that the input-output model typically does not consider any demand side adjustment and effect on fiscal sector.

Table 7.2 Estimated effect on prices of abolishing VAT exemption in the financial sector (%)

	(1) output prices of financial services	(2) output prices of all economy	(3) output prices of tradables
Germany	-4.780	-0.408	-0.630
France	-5.626	-0.503	-0.838
Italy	-3.690	-0.259	-0.386
Spain	-2.549	-0.149	-0.231

As expected, abolishing the VAT exemption would reduce the costs of financial companies and the price of their services (Table 7.2 column 1). This effect is higher, in absolute terms, than the proportion of non-deductible costs on output (Table 7.1, column 3), because the model allows us to take into account not only direct but also indirect effects.

The largest effect on output prices arises for France (Table 7.2); this result does not seem to depend only on the statutory VAT rates but also on a higher burden of irrecoverable VAT on output, that can reflect a different cost structure, perhaps linked to a different degree of vertical integration of financial firms, or different options for financial institutions allowed by national legislations.[158] This larger effect depends also on the relative magnitude of financial sector in the economy. In more detail, for all the countries considered, as expected, the major contribution to the decline of the tradable prices comes from the reduction of financial service prices. In particular, for France the tradable prices reduction by -0.84% (Table 7.2, column 3) is due for -0.63 percentage points to the contribution of financial service prices, for Germany these figures are respectively -0.63% and -0.51 percentage points, for Italy -0.38% and -0.28 percentage points, for Spain -0.23% and -0.18 percentage points.

With respect to other sectors, for France the main contributions come from transport and communication, food and beverage and tobacco. These products are also those that benefit from the biggest decline in their output prices, given the larger role of financial services in their production processes.

[158] In France and other countries, banks can opt for the VAT on transaction-by-transaction basis in case of services rendered to business (B2B), while keeping the services to consumers (B2C) exempt.

For Germany, the contribution of transport and communication sector follows that of financial services, given its relevance for output, even if its contribution is lower than 0.1 percentage points. Apart from considering the dimension of the sector, with respect only to the reduction of sector prices, agriculture (-0.19%), transport and communications (-0.18%) record the biggest reduction. For these two sectors, in fact, the relevance of the financial services is among the highest and their indirect input is more than half of the total inputs.

For Italy as well, the major contribution comes from transport and communications, followed by basic metals, fabricated metal products, and machinery and equipment. These goods also record the most relevant reduction of their prices (-0.15% for transport and communication, -0.13 the others), as these products have the highest input from the financial services among all the tradable goods.

As for Spain contribution of transport and communication is not much high, and the major contribution is from food and leather and leather products. For food in particular, the inputs from the financial services are relatively high especially the indirect ones (two thirds of these inputs are indirect). Finally, the variability of the reaction of sector prices is in Spain the lowest among the countries here considered, whereas France has the highest.

Summing up, the sector producing services for transport and communication would be most favoured by a tax reform eliminating the VAT exemption on financial services. In fact, this sector has the highest inputs from the financial services, especially the indirect ones. Among countries, France would benefit from abolishing the exemption of financial services more than Italy and Germany, whereas in Spain the benefits would be more evenly spread among sectors.

Macroeconomic effects of exemption and administrative costs on competitiveness

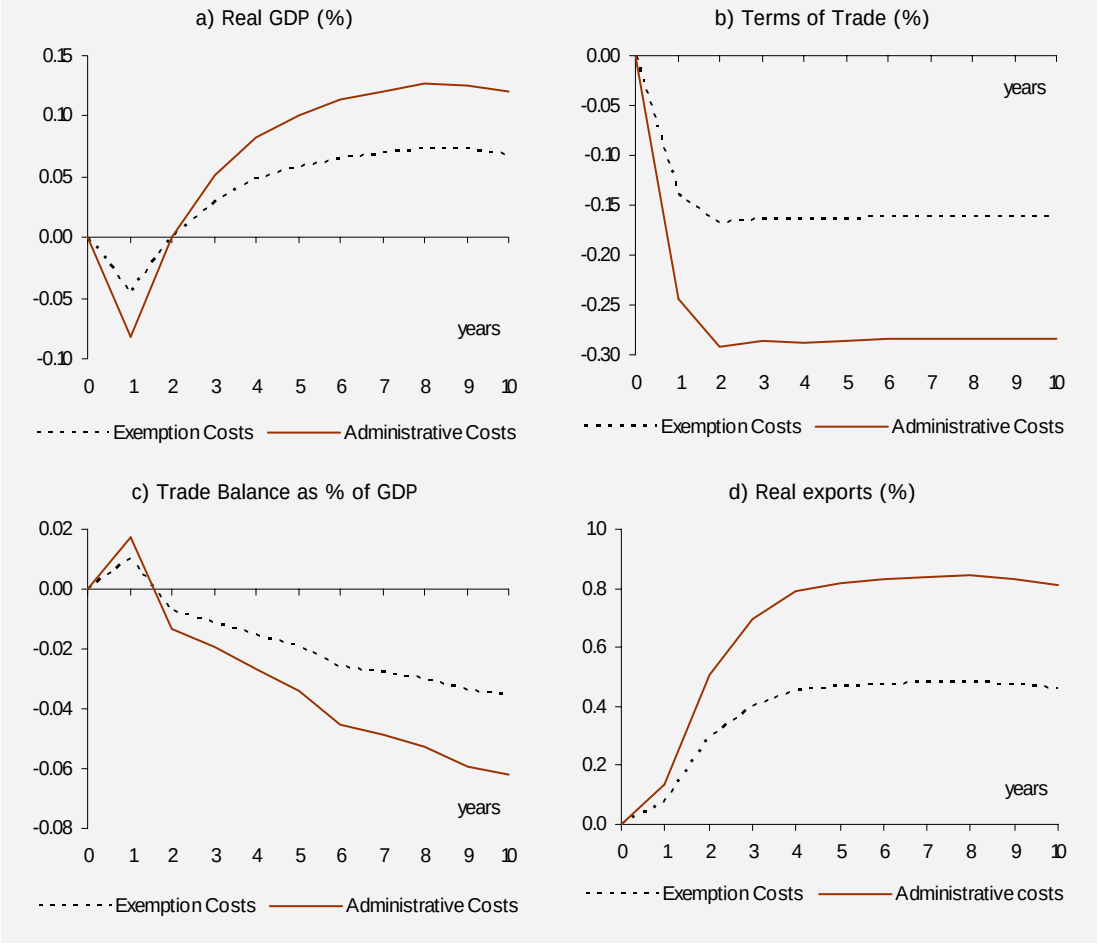
VAT exemption of some sectors, as well as the VAT-related obligation, represent important sources of administrative burden and costs for the European firms that are likely to transfer into production prices and hence to affect competitiveness through export prices. In order to evaluate the effects, from one side, of abolishing VAT exemption and, on the other side, of the extreme assumption of a complete removal of the compliance costs on the international competitiveness of the EMU as a whole, two simulations are run with the international model of Prometeia. The input-output price

model provides the measure of the incidence of these costs on the domestic production prices of the big four EMU countries. As the target of these simulations is international competitiveness, we do not consider the effects on consumer prices due to VAT incidence on financial services, as well as the effect on public sector budget, that is how to finance this reform. The main results of the exercises are reported in Fig. 7.2.

With respect to abolishing VAT exemption in the financial services, we assume the production prices of the big four European countries to be lower with respect to the baseline according to the results obtained with the price model (Table 7.2 column 3). The production price reduction is transferred into export prices implying a reduction of the terms of trade and hence an improvement in price competitiveness. The amount of reduction with respect to the baseline scenario is estimated around 0.16 per cent for the Euro area. Improved competitiveness boosts exports with positive effects on GDP. Nevertheless, the trade balance does not significantly deviate from the baseline, as the price effect tends to compensate the quantitative one.

As for the removal of the compliance costs and administrative burden, in chapter 5 an evaluation of these costs is provided for all the EU countries as a percentage share of GDP (Tab. 5.10 column 2). Here we consider only the big four EMU countries and through the input-output price model we obtain an evaluation of these costs in terms of incidence on the domestic production prices. In order to achieve this result we split the aggregate evaluation of these costs into the sectors of the input-output tables. We do it assuming that the incidence on the output is the same for all the sectors (tradable and non tradable), and neglecting compliance and administrative costs related to the services provided by the public sector.

Fig. 7.2 Simulation results for the Euro area countries of abolishing VAT exemption in financial services and of removing compliance costs (differences from the baseline)



The results obtained (Tab. 7.3) mainly reflect the different weight of the administrative burden on the single country. Spain has the higher VAT-related administrative burden for firms as share of GDP and hence not surprisingly the effects on its domestic production prices are higher with respect to the other EMU countries and with respect to what obtained in the case of VAT exemption of the financial sector. Italy follows, whereas for France and Germany the lower burden of the administrative costs related to VAT reflects into an estimated effect on producer prices broadly in line with that obtained in the calculation of the VAT exemption of the financial sector.

Table 7.3 Estimated effect on prices of compliance cost removal (%)

Germany	-0.7
France	-0.9
Italy	-1.3
Spain	-1.7

In the case of removal of compliance costs and administrative burden the gain of competitiveness for EMU as a whole is higher (Fig. 7.2, 0.3 per cent the deterioration of the terms of trade with respect to the baseline scenario) with respect to the abolishing of exemption VAT in financial sector. Exports grow by 0.8 per cent with positive effects on GDP that feed imports so that the total effect on the trade balance is negative.

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8 The effect of VAT on price-setting behaviour (IHS[159])

This chapter contributes towards answers to the following evaluation question in the project Terms of Reference:

(12) To what extent and how does the current VAT system impact the price-setting mechanism in the short and long run?

It contributes towards the following specific element:

(G) Evaluation of the welfare impact of the multiple-rate VAT system. In particular, the evaluation should examine the economic effect of the adjustments in the VAT rates on real relative price changes.

Summary

This chapter provides a literature survey on the price-setting behaviour of firms as a result of VAT rate changes. It gives an overview of theoretical results and of existing empirical estimates for general VAT rate changes and VAT rate and excise tax changes for specific products, as well as some new case studies.

- From a theoretical point of view the degree to which changes in VAT rates are passed through ('shifted') into consumer prices largely depends on the form of competition in the market and on demand and supply behaviour.
- Theory states that consumption taxes may be under-, fully- or even overshifted into consumer prices, the latter meaning that prices rise (fall) by more than the amount of the VAT increase (cut).
- In a perfect competition setting, only full or under-shifting should be observed and the degree of shifting is higher, the less responsive demand is to price changes and the more responsive supply is.
- In models with imperfect competition the results can differ. If firms compete by setting prices (Bertrand competition), the results are the same as for perfect competition. However, if firms compete by choosing the level of output (Cournot

[159] With additional contributions (the case studies) from ETLA, IFO and Alain Trannoy.

competition) and prices are determined in the market, VAT can be under-, fully- or even overshifted, depending on the structure of the market as well as on demand and supply elasticities.

- In macroeconomic models monopolistic competition is often assumed. In the case of constant marginal costs, this type of competition implies full shifting of taxes.
- A VAT may also have an impact on the quality of products. A tax increase can imply a lower quality demanded, and as a consequence can even lead to a price decrease rather than an increase.
- The impact of a VAT rate change for one good will likely to be different to the impact of a broad-based VAT rate change as the substitution of consumers between different goods will be of less importance in the second case. The supply and especially the demand elasticities of a narrowly-defined good are likely to be different from those for a broadly-defined set of goods.
- This implies that it will be possible to observe a wide range of price reactions of a VAT rate change from a theoretical point of view. It is not possible to draw a simple universal conclusion either quantitatively or qualitatively.
- Prices may not adjust immediately to changes in VAT rates. Several reasons are put forward for why price changes might be delayed or might even anticipate the implementation of announced tax reforms. Important factors in the short-run may be a fixed capital stock, price adjustment costs (menu costs) or advanced purchases. Such factors can also imply different reactions for tax increases and decreases in the short-run.
- In line with theoretical conclusions, there is a wide range of empirical results for tax shifting. Many papers find that taxes are shifted either fully or only partially on to prices. But there are also papers finding overshifting. Unfortunately, most studies do not analyse the structure of the market in which the VAT rate change happened. However, there seems to be evidence that, in line with theory, more competitive markets more often feature full shifting of taxes, whereas less competitive markets feature both under- and overshifting of taxes.
- Studies dealing with the impact of a general VAT rate change on the average price level mostly find full shifting of taxes or close to it. Nevertheless, even for a change in general VAT rates, the price impact in different markets varies a lot.
- In general, most empirical studies find that tax shifting occurs rather swiftly and sometimes in advance of the reform's implementation, which may be the result of advance purchases. Where (unlike general practice in the EU) prices are expressed excluding VAT, the shift should be even quicker as prices need not to be adjusted for the VAT change to be fully passed through to consumers.

- There seems to be some evidence that the short-run shifting of taxes in cases of a VAT rate increase is greater than for a VAT rate decrease. This could result from fixed input factors (especially capital, but also skilled labour) such that higher demand leads to higher prices and therefore a lower tax shift. In the medium- and long-run this difference should disappear.
- The impact on prices of a tax reform in a single country may differ from the impact of an EU-wide reform.
- Distinct countries may be affected differently by EU-wide taxation of a single good as a consequence of varying market structures. This may imply a more diverse burden on firms and households in the member states than for a broad-based VAT as VAT overall seems to be subject to close to full pass-through.

8.1 Introduction

Tax incidence is an important area of research in public economics. It deals with the impact of taxes on the distribution of welfare within a society (see Fullerton and Metcalf (2002)). In general, one has to distinguish between the statutory burden of a tax, i.e. who has the obligation to pay the tax, and the economic burden. The economic burden may differ significantly from the statutory burden as a matter of tax shifting. There is no evidence, even in the short run, that statutory incidence equals economic incidence of taxes. The uncertainty about who bears the economic burden of a tax makes it necessary to analyse how the behaviour of households and firms changes and what can be expected from future changes in taxes. In theory it does not matter whether the consumer or the producer is obliged to pay the consumption tax. The economic outcome in these two cases will be the same. This result is called incidence equivalence. Ruffle (2005) shows that this holds also in an experiment.

The analysis of economic incidence is necessary for two reasons. First, from an efficiency point of view, it is of interest how the economic burden influences the behaviour of households and firms and what is the impact on the economy. There will be differences whether the burden is mainly on consumers or on producers. The difference will lead to altered behaviour and therefore also to different economic impacts. In general tax incidence analysis should be based on a general equilibrium analysis, meaning that not only consumers and producers should be taken into account in the analysis, but also the impact of taxes on the factor inputs labour and capital. Incidence will not stop on consumers and producers and will imply effects on the overall economy. Many theoretical studies analyse the partial equilibrium effect only, e.g. they determine the division of the burden of a consumption tax between consumers

and producers. This is also the main focus of the next chapter dealing with theoretical considerations of tax shifting. General equilibrium analysis goes further and takes also into account the effect on all other economic agents in an economy. In general one has to expect that the empirical literature measures general equilibrium effects as the partial equilibrium impact will not be observable.

Second, from a distributional point of view it is of interest how different groups in the population will be affected by a tax change, e.g. whether low-income households are more affected or the other way round. A VAT rate change on certain luxury goods could have a greater impact on the workers producing these goods than on wealthy persons, if the demand for these goods is rather price sensitive and consumption is directed towards other goods, being taxed less heavily. Relying on the statutory incidence could lead to totally wrong conclusions. In the public discussion however, statutory incidence receives often much more attention than economic incidence, as it is more obvious to the public than the results of rather complicated and often not available economic analysis.

The following sections discuss theoretical results how the burden of a VAT is divided between consumers and producers and provide estimates to confront the theoretical conclusions. Section 8.2 provides an overview about theoretical predictions of tax incidence, where different types of models are discussed. Empirical results in the literature for changes of the general VAT rate, specific VAT rates and excise taxes are presented in Section 8.3. In addition, the authors performed own case studies of tax changes in France and Germany and discuss several case studies for Finland in Section 8.4. These studies deal with the impact of a VAT rate change for specific goods.

8.2 Theoretical results

In this chapter we summarise the theoretical results about tax incidence from a partial equilibrium perspective, concentrating on one good. The impact on factor prices, like wages or profits, and corresponding changes in factor demands, like labour and investment, are not considered here. The literature highlights the impact of the level of competition in the corresponding goods market for the incidence results. The analysis starts by presenting results in the case of perfect competition and relaxes this assumption afterwards. In addition, the difference between an ad valorem tax and an excise tax will be discussed. In the former case the tax is defined as a proportion of the price and the tax per unit sold increases with the price. A prominent example is the

value added tax. An excise tax is a fixed value for each unit sold. The level of the tax is therefore independent of the price. This difference leads to a different economic outcome in theory. The survey is based to a large extent on the work of Fullerton and Metcalf (2002), Delipalla and Keen (1992), Baker and Brechling (1992) and Carbonnier (2006).

Theoretically, the results regarding the incidence of the taxation of single goods on the one hand and of overall VAT on the other hand will differ from each other. One aspect which is neglected if one focuses on a single good is the possibility of the private household to substitute consumption away from the taxed good towards another good. In case of a VAT, most goods will be taxed at the same rate, which implies that relative prices will not be affected by a VAT rate change. So the substitution between goods will be much lower in this case. This will also imply a lower demand elasticity compared to a scenario in which only one of several goods will be taxed. However, the income effect, meaning a lower disposable income as a result of higher taxes, will imply a lower demand. The theoretical part should provide the reader with important insights from a partial equilibrium perspective, the empirical results have to be interpreted as a general equilibrium outcome as the data reflect already the overall effect of a tax change.

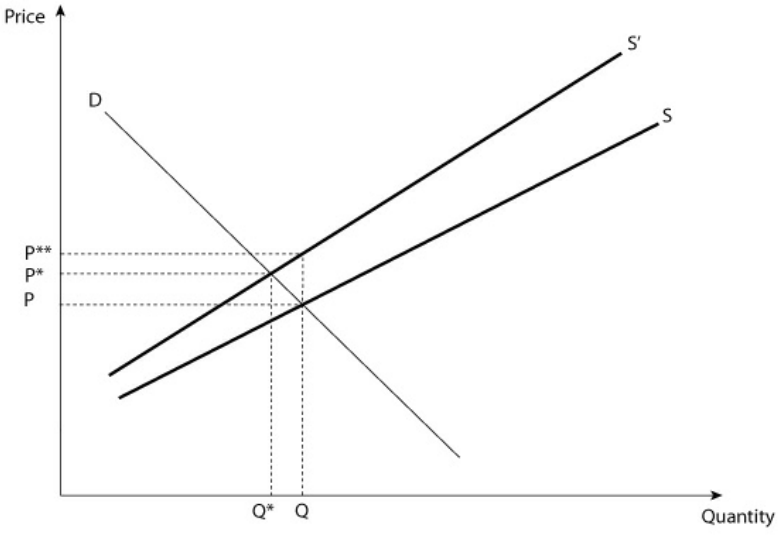
Perfect competition

In the theoretical analysis the assumption of perfect competition between producers plays an important role. Perfect competition implies that prices are taken as given by the producers and consumers (both are *price takers*) and are being determined by aggregate supply and demand. In the following, we concentrate only on goods on which the value added tax is levied, other markets are not taken into account. This type of analysis is also called partial equilibrium analysis, as only the impact on the considered market is analysed. Prices of other goods are assumed to be fixed. In this analysis the price is determined by the intersection of the demand curve and the supply curve. In this case, the market is cleared, implying that there is neither excess demand nor supply. The demand curve is downward sloping as the demand for the good decreases as the price increases.[160] The other way round, supply is positively related to the price, implying an increase of supply with higher prices.

[160] In the analysis we concentrate on *normal* goods, for which demand decreases with the price level. Instead *Giffen* goods, for which demand raises with the price level, could also be possible but will not be considered.

Starting with a situation without taxes, the introduction of a value added tax shifts the supply curve to the left (from S to S') as shown in Figure 8.1. The reason is the following. The introduction of a VAT raises the market price P (consumer price) by the amount of the tax increase. Firms will supply the same amount if market prices are higher by the amount of the tax payment such that the firm receives the same revenues as before the implementation of the tax, i.e. the same producer price. However, the higher price induces consumers to demand less of the good, leading to a new intersection of demand and supply. The partial equilibrium amount traded decreases from the quantity Q in the case without the VAT to Q*. One can see in this example that the market price increases by less (from P to P*) than the original price plus tax reflected by the price P**. Nevertheless, given that the price for consumers rises and the producer price decreases, these together imply that less of the taxed good will be traded.

Figure 8.1: Impact of a VAT on the price (perfect competition and upward sloping supply curve)



The impact of the VAT on prices and goods traded depends on how demand and supply react to price changes. The more responsive demand for the good is (the flatter the

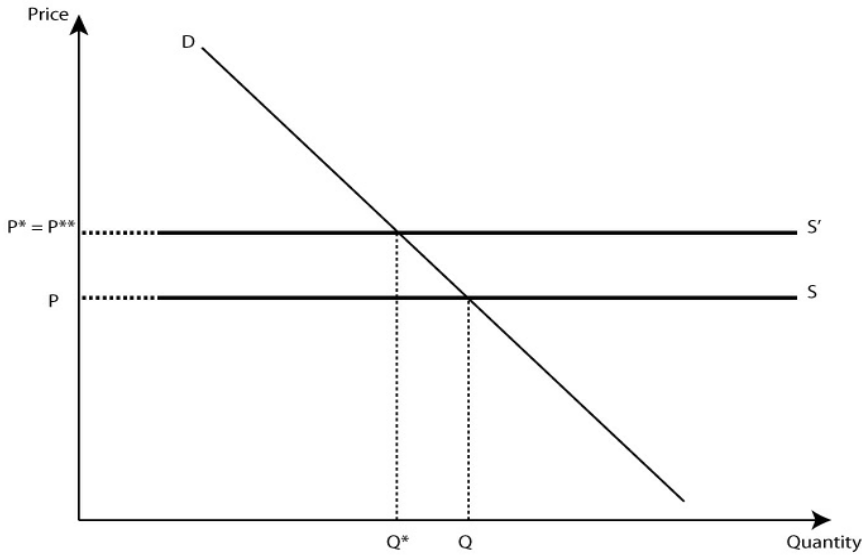
demand curve), the lower will be the price effect, meaning that the tax shift onto consumers is smaller. If consumers are less willing to pay more for a good then there will be a stronger impact on the quantities traded, but a small price effect of the tax. The other way round if supply of goods shows a stronger reaction to price changes (reflected in a flatter supply curve), then also a strong price reaction is to be expected for a given demand curve. From this analysis one can conclude that in the case of perfect competition, implying that firms and households are price takers and cannot influence the market price, tax shifting depends on the sensitivity of demand and supply to price changes. The more sensitive demand reacts to price changes the less tax shifting will occur, the more sensitive supply is the more tax shifting should arise. Given a downward sloping demand curve and an upward sloping supply curve then always less than the tax will be shifted into prices. However, the tax shift is always positive. Therefore it is possible to conclude, that part of the VAT will be shifted into prices. This result can be stated as (see e.g. Fullerton and Metcalf)[161]:

$$\tau^c = \frac{\varepsilon^S}{\varepsilon^S - \varepsilon^D}, ,$$

where τ^c reflects the relative burden of the consumer, ε^S is the elasticity of supply of the consumption good and ε^D is the elasticity of demand for the consumption good. The relative burden states how much of the tax increase will be shifted into prices. The share τ^c lies between zero and one and is assigned one if the tax is fully shifted into prices and zero if prices will be unchanged, implying the burden of the tax is completely held by the producer. The elasticities state by how many percent demand (supply) for (of) a consumption good will change if the price changes by 1 percent. If demand for the taxed consumption good is flat, then the whole burden is borne by the producer. At the other extreme, if the costs of producing one additional unit are independent of the output level (labelled as constant marginal costs) then supply of goods will be flat, implying infinite supply elasticity and therefore a complete shift of a VAT into prices (see Figure 8.2). In this case also the impact of a VAT (ad valorem tax) and an excise tax (specific tax) are identical. In case of an upward sloping supply curve, ceteris paribus, the price effect of an excise tax will be larger and fewer goods will be traded compared to the impact of a VAT.

[161] The formula holds exactly for small tax and therefore price changes. However, as price change induced by a VAT reform are rather small this result is a very good approximation for a typical change of the VAT rate.

Figure 8.2: Impact of a VAT on the price (perfect competition and perfectly elastic supply curve)



Imperfect competition

The assumption of perfect competition will not hold for all markets in an economy. There will be markets where firms are able to exert market power, implying that these firms will not take the price level as given and their supply will influence the market price. In theory different forms of imperfect competition are distinguished. The most prominent forms are Bertrand and Cournot oligopolies and monopolistic competition. These different forms of imperfect competition will also imply different theoretical results for tax shifts.

The *Bertrand* model is characterised by firms choosing the price at which goods are sold in the market. In this model products of the firms are homogenous, meaning that firms produce goods which are perfectly equivalent from a consumer perspective. Additionally, it is assumed that there are no capacity constraints so that in principle, one firm is able to handle the complete demand for a good and production costs are linear (i.e. marginal costs of production is constant), implying that costs of production for each unit are the same. In this case the interaction between the decisions of firms leads to prices equal to unit costs. If a firm would deviate from this strategy and sets higher

prices it would not sell any products as other firms would handle with the demand of this firm. In this case, as costs are assumed to be linear, no firm can deviate towards a lower price as otherwise the price for which the good is sold would be lower than the costs of producing the good. For this reason a VAT but also excise taxes would be shifted *completely* forward into prices, implying a price increase by the change of the VAT. In case of a positive aggregate supply elasticity, implying an upward sloping supply curve like in Figure 8.1, the result is the same as under perfect competition. This means that the burden of the tax is divided between consumer and producer according to their shares of elasticity relative to the sum of both price elasticities.

In a *Cournot* model firms choose the level of output they produce in contrast to the Bertrand model in which firms select the price at which output is sold. Given the decisions of the firms and therefore aggregate production the prices are determined in such a way to clear markets. In this type of model firms take into account the impact of their output decision on aggregate output and therefore on the price. The higher market price compared to the unit costs of production implies excess profits for the firms.

In a Cournot setting the degree of price shifting of taxes depends on four important factors. First, it depends on the demand function of the households. Starting from the same price level, undershifting of a VAT rate change occurs if demand reacts more strongly to a price increase than to a price decrease. This means that price increases will have a stronger effect on demand if the original price level is higher. On the other hand, overshifting becomes more likely if demand reacts less sensitively to price increases. In other words, if the price level is low, small increases in the price level imply a strong absolute decrease in demand; but the demand decrease gets smaller and smaller as the price level increases. Intuitively, as a VAT increase leads to a higher price level, it may be profitable in this case for a firm to increase prices by more than the VAT change would suggest, as the reduction in sales volume will be much smaller compared to a situation where the price level is lower.[162] In the theoretical literature, the latter type of demand function is often assumed, which implies that in theoretical economic models overshifting may happen, also depending on the cost structure and the extent of competition discussed below. These incidence results hold for changes of the VAT rate as well as for an excise tax change, and differ significantly from the incidence results in perfect competition models.

[162] For a formal discussion see Delipalla and Keen (1992) and Carbonnier (2006).

Second, it depends on the cost function of the firms. If production costs per unit produced will increase with the level of output then a tax increase will imply a weaker tax shift and price increase implying a smaller demand and therefore output decrease. As production costs in this case will decrease more than proportionally as demand declines, this implies a dampening effect on the price increase induced by higher consumption taxes. This impact of the structure of production costs is qualitatively comparable to the results in a perfect competition environment.

Third, the result depends on a factor which indicates the extent of competition the firm perceives. The extent of competition is defined as the extent to which the quantity of goods produced by other firms changes if one producer changes its own output. If the output of other firms will not change then this case is referred to a more competitive case. If all the other firms change the output to the same extent then this case is labelled as lower perceived competition. The extent of price shifting increases as the level of perceived competition decreases. In other words, if there is an increase in the VAT rate and the firms assume that all other firms will decrease output like oneself then this implies a strong reduction of aggregate supply and therefore a large price increase to clear the market.

Fourth, tax shifting depends on the number of firms. The degree of over- or undershifting is dampened as the number of firms in the economy rises, but the number will not determine whether over- or undershifting will happen. The latter is determined by the structure of demand and production costs. The more firms operate in the market, everything else the same, the more tax shifting converges to full shifting. For a given demand and cost structure, under- or overshifting is maximised if only one firm operates in the market.

One would think that overshifting would increase profits of the firm. However, this will not be necessarily the case. It depends on whether overshifting and therefore the rise of profit per unit sold is strong enough to compensate for the loss in demand. As demand decreases due to higher prices implied by the tax, the firms increase prices by more to be compensated for the loss in demand. To increase profits of the firms it is necessary that the change in price sensitivity of demand is sufficiently low, given the higher level of prices.

What about the relation between VAT and excise taxes in a market with Cournot competition? In case of perfect competition and constant unit costs both taxes lead to the same tax shift onto prices, i.e. full shifting (see also Figure 8.2, in which VAT and

excise taxes are equivalent). Delipalla and Keen (1992) show that an ad valorem tax is less likely overshifted in a Cournot oligopoly model than a unit tax. Ad valorem taxes dampen the price effect. The result implies that the market acts in a more competitive manner in case of a VAT compared to an excise tax (Venables (1986)). The reason for this effect is the following. Let us assume that the producer wants to change the producer price by Δp, then the consumer price will change by $\Delta p(1+t)$, by more than Δp. In case of an excise tax the change will instead be only Δp. The larger consumer price change for the same adjustment in producer prices in case of the VAT implies a stronger reaction of demand. Taking this into account price changes will be moderated. In case of the VAT part of the additional rent of a price increase is directed towards public revenues. The same argument also leads to a moderation in the consumer price adjustment as a consequence of tax changes.

Another important type of model we want to address here is the concept of differentiated goods and *monopolistic competition*, as pioneered by Dixit and Stiglitz (1977). In the Bertrand and Cournot models firms produce homogenous goods, meaning that they are perfectly substitutable to each other. The idea of differentiated goods or monopolistic competition is that each firm produces a differentiated good with different characteristics. Households decide how much of these differentiated goods they want to buy according to their preferences for these goods and the prices. All other firms know the characteristics of products of other firms. Firms now have to decide for which price the good should be sold. Each differentiated good is produced by a monopoly as no other producer provides the same good, only goods with differentiated characteristics. The decrease of competition between firms as a fact of differentiation leads to higher prices compared to a situation in which all the firms produce the same homogenous good. In such a model an ad valorem tax is shifted *entirely* onto consumers, but no overshifting will happen. Excise taxes on the other hand will be overshifted even for reasonable functional forms.[163] The reason for the result is again that the government rather than the firm can claim part of the price increase for an ad valorem tax, which is not the case in the unit tax as the public revenue per unit sold is independent of the price level (see Delipalla and Keen (1992)).

Whether tax shifting is stronger under the discussed imperfect competition models is not clear in advance. In a Bertrand competition model as well as in the monopolistic

[163] The result is based on the analysis of Fullerton and Metcalf (2002). They assume linear costs in the production implying marginal production costs being independent of the level of output. Furthermore, this type of model is characterised by a constant elasticity of demand for the different product varieties. These assumptions allow for a stronger conclusion than even in the perfect competition setting.

competition model, tax shifting is full, such that the burden is completely borne by the consumer. In the perfect competition model tax shifting is at most fully such that compared to the two above mentioned models the consumer burden is equal or lower. Compared to the results of a Cournot oligopolistic model the answer is ambiguous. To a large extent, it depends on the production costs function and the demand function. If taxes are overshifted, then the answer is unambiguous and the consumer burden is higher than under perfect competition. On the other hand, if taxes are undershifted then the burden of consumers is lower the less firms are active in the market, i.e. the lower the level of competition.[164] So, one can find a higher tax shift in imperfect competition models, compared to a model with perfect competition, as well as a lower tax shift.

Subsequently we would like to take a look at a special case analysed in the theoretical literature. Cremer and Thisse (1994) analyse the effect of a VAT in a vertical differentiation model. In this model firms choose the quality of the products they offer to heterogeneous consumers, who choose different levels of quality. In such a setting a uniform VAT lowers the quality offered and, contrary to what one would expect, the prices at which goods are sold. Lower prices are the outcome of two different effects. First, lower quality decreases production costs and therefore the price. The second effect is the result of a stronger price competition as a result of the decrease in quality differences of supplied goods. Additionally, the authors find that higher tax rates on goods with a higher quality combined with lower rates on low quality goods would improve the welfare of private households.

In general one would expect price changes to happen immediately after a tax policy change. However, there may be reasons why adjustments may occur delayed or even in advance. Baker and Brechling (1992) provide three explanations which influence the timing of tax shifting and may therefore exert influence on the results of empirical estimates. For example, price adjustment costs may lead to infrequent adjustment. In such a case firms may combine tax changes with other changes of production costs in the adjustment process and may therefore delay the adjustment. In case of a credible announcement it may be possible that firms try to bring forward the price change. Another reason may be that firms try to keep the price on the original level to force competitors to drop out of the market. A third explanation is that firms base their decisions on wrong conjectures about the behaviour of other firms in the market. This could lead to different levels of tax shifting in the considered firms in the relevant market and also to additional delayed adjustments. A fourth argument stated in the

[164] See also Carbonnier (2006).

literature deals with the observation that the capital stock of a firm is often rather fixed in the short run, i.e. investment takes time, see e.g. Carbonnier (2006). This implies a lagged increase of production following a demand increase. This may lead to some kind of asymmetry in the tax shift of VAT rate changes. Following this argument, as it is easier to reduce production than to expand the level of production, it may be the case that tax shifts are higher for VAT rate increases than for VAT rate cuts in the short-run.

Summary

The survey about the theoretical literature highlighted the importance of the demand behaviour of households and of the supply side, determined by the structure of the production costs as well as the market structure (e.g. the level of competition). The main results can be summarised accordingly:

- In a perfect competition market, a VAT is either fully- or undershifted. The degree of tax shifting depends on the demand and supply function. The less elastic demand (for a given supply schedule) the higher is the consumer share and the other way round.
- In an imperfect competition market, under-, over- and full shifting of taxes can be found.
- In a Bertrand model, the result is the same as in a perfect competition model.
- In a monopolistic competition model, the VAT is shifted fully onto prices, excise taxes are overshifted.
- In a Cournot model, the result depends on the production costs function, the demand function and the perceived competition of firms. All degrees of tax shifting are possible in this model. Tax shifting of a value added tax will always be below tax shifting of an excise tax, as part of the revenues of a price increase is transferred to the government in case of a VAT. Tax shifting of a VAT is closer to full shifting if the level of competition is higher.
- In the short-run several reasons may imply a different and asymmetric level of tax-shifting compared to the medium- and long-term result. A fixed capital stock is mentioned most often.

Given these results, we expect that we will find a range of possible results for tax shifting in the empirical literature as well as in the case studies given the different market structures. The following chapter deals with empirical estimates of tax shifting of observed tax reforms in different countries. Additionally, case studies for Finland, Germany and France are provided.

8.3 Empirical evidence

After having reviewed the theoretical literature on the economic incidence of consumption taxes, we will turn the focus on the empirical evidence. In most cases, analysis is based on so-called natural experiments, i.e. statutory adjustments of tax rates. To a large extent, the empirical literature concentrates on changes of the VAT rate or excise taxes for specific goods. To a lesser extent, the impact of the general VAT rate on the overall price level in the economy is studied. The reason for this is that the former approach provides better possibilities to get rid of the impact of the overall economic situation on prices. The idea of focussing on tax changes for single goods is that the prices of the considered goods are affected by the business cycle in the same way as the average price of all goods or a specific price of a proper control good. When analysing the impact of a general VAT rate change, it is more difficult to control for the economic situation in a meaningful way. Apart from discussing relevant studies about changes of VAT rates on particular goods and the general VAT rate, we will also focus on excise taxes, like taxes on tobacco or alcohol. Although the impact of excise taxes is not of special interest in this study, the empirical results should not be neglected. Estimates of the influence of VAT rate changes on the economy are rather sparse. As the theoretical part has shown, shifting of excise taxes on to consumers is of the same magnitude or higher than shifting of a VAT. For this reason the empirical results about the impact of excise taxes can be seen as an upper bound for tax shifting of VAT rate changes. Given that the number of empirical studies on VAT rate changes is not very large, we think that this strand of the literature provides important additional insights for this study and should not be neglected. The summary will not only summarise the main results but will also try to reconcile the empirical evidence with the theoretical literature.

VAT on particular goods

Copenhagen Economics (2007) provides an analysis of reduced VAT rates in the European Union. In their econometric analysis, they examine the economic incidence of changes of reduced VAT rates for eight case studies from six different sectors in individual member states. In their estimation, the price is dependent on a series of lagged prices[165], a series of lagged VAT indicator variables and further variables, but they are not controlling for some exogenous events and they do not include the price of a different item in their estimation. The authors argue that small changes of VAT rates in the analysis would make it difficult to separate the economic incidence of tax

[165] This means that a series of prices of previous periods is taken into account.

changes from other stochastic noise. For this reason, they restrict their analysis to changes of the VAT rate of at least 2 percentage points. This is one of several conditions they impose on the tax experiments so that they restrict their analysis to eight cases only. The authors find significant pass-through of VAT rate changes in many cases, but there is large variation in the estimated medium-term pass-through, ranging up to substantial over-shifting of about 160 percent, see Table 8.1. They find some evidence that there is an asymmetry in the price-response in the sense that tax increases are more heavily passed to consumers than tax decreases. In particular, as can be seen in Table 8.1, they find overshifting for the two VAT increases,[166] and less than full shifting (or even no significant effect on prices) for VAT cuts. However, given their limited amount of cases and the fact that this analysis provides estimates for different sectors and different countries, this statement is not very strong. The authors also find that most of the price adjustment takes place within a few months. On the other hand, they state that VAT reductions with a temporary nature will only marginally lead to lower prices.

Table 8.1: Results of econometric pass-through analysis of Copenhagen Economics

Sector	Country	VAT change (percentage points)	Estimated pass-through
Books	Sweden	-19	82
Footwear	Italy	4	163
Periodicals	Italy	10	134
		-16	0*
Beverages	Portugal	-5	0*
		-7	0*
Restaurants	Portugal	-5	19
Hairdressers	Ireland	-8	46

* The estimated coefficients were zero or even had the wrong sign.
Source: Copenhagen Economics (2007).

Jonker et al. (2004) perform an analysis of the pricing behaviour of retail firms in the Netherlands using a database with monthly prices of 49 products representing different product types that cover around 8 percent of the Dutch CPI. They consider the impact of VAT rate changes on the so-called hazard ratio and the magnitude of price changes

[166] They also find overshifting for the other five cases of VAT increases that are reported, but where the tax increase is low (either one or two percentage points).

and differentiate between VAT rate increases and decreases. The hazard ratio reflects the probability of a price change.[167] They find that a change of VAT rates increases the probability of changing the consumer price in the month the VAT change takes place. It seems like firms do not spread the price change to the months preceding or following the month in which the VAT shock takes place for the entire sample of goods. Looking at specific product groups, however, they find that price changes are spread over two months for transport and recreation and culture goods. The authors study the impact of a VAT rate decrease by 11.5 percentage points for haircuts for men and for women. Prices decreased by 2 percent following the tax cut and approximately increased by 7 percent less than in the other years. This calculation suggests that hairdressers and their customers shared the tax cut roughly equally. An interpretation of this result should take into account that this method provides only a rough assessment of the tax incidence as the authors do not control for the economic environment.

Carbonnier (2007) studies the impact of two French VAT reforms by using the price index time series IPC. He analyses a decrease of the rate on car sales from 33.3 to 18.6 percent in 1987 and a decrease of the rate on housing repair services from 20.6 to 5.5 percent in 1999. The consumer share of a sales tax burden is measured by using the new car sales index and the housing repair service index as well as the general index[168] in order to implement a double difference regression. Production costs are used as a control variable. Similar to Copenhagen Economics (2007), the author argues that an analysis of these large changes is superior to an analysis of smaller changes because estimates of the consumer share will be more precise in the former case.

The author finds that the consumer share in housing repair services is 77 percent and 57 percent in new car sales. Both values are precisely estimated so that the difference between these two shares is also highly significant and both shares are significantly lower than 100 percent. The author argues that the difference between those two shares can be explained by the different degree of competitiveness on the markets. While the housing repair service market is close to being a perfectly competitive market, the new cars market is quite close to an oligopoly with very few firms competing. Intuitively, as prices are close to marginal costs in perfect competition markets, firms cannot pay a large sales tax share (which would imply a consumer share of 100 percent). On the other hand, oligopoly firms already capture a consumer surplus portion without sales

[167] To be more precise, the hazard ratio is the conditional probability that, given the spell of unchanged prices has lasted until time t, the spell will end in a short interval of time after t.

[168] More precisely speaking, the author 'subtracts' the car sales index and the housing repair service index, respectively, from the general index for the two estimations.

taxes and hence bear a larger sales tax burden share. A further result of his analysis is that, for both goods, tax shifting on prices happens very fast. Almost the entire shift takes place in the first two months after the VAT reform.

Starting in January 2000, nine member states of the European Union participated in an 'experiment' during which VAT rates on labour intensive services were reduced. The objectives of this experimental reduction were job creation and the reduction of the informal economy. The basic idea underlying this experiment is that if the consumer price of a product declines, demand for this product might rise, which could boost employment. European Commission (2003) summarises country-specific evaluations of the different measures undertaken in the member states. They find that reduced rates were never fully reflected in consumer prices. Of those services concerned, the highest shifting of tax reductions took place in renovation and repair of private dwellings. Moreover, in sectors (e.g. shoe, bicycle and clothing repair in the Netherlands and repairs of dwellings in France), in which part of the reduction was shifted to consumers immediately, subsequently firms seemed to increase their prices at a higher rate than inflation. This would imply that a reduced rate would only temporarily reduce consumer prices. One has to remark, that the different member states often provide only an ad-hoc analysis of the tax incidence and do not control for changes in the economic environment in their analysis.

Poterba (1996) analyses whether state and local retail taxes are fully shifted on to consumer prices by focusing on city-specific clothing and personal care price indices in the United States during the two periods 1925-39 and 1947-77. For his empirical approach, the author uses the nationwide price increase as a control variable because it is probably a good proxy for the price increase that would have happened in a particular city if there had been no tax change.[169] The empirical equation includes both current and lagged tax changes as independent variables in order to allow for adjustment lags and includes quarterly seasonal indicator variables to control for a seasonal behaviour of inflation rates. His findings for the post-war period suggest full shifting of taxes on prices. Even though the estimates for two of the three commodity groups indicate overshifting, the null hypothesis that taxes are fully shifted cannot be rejected. A more detailed analysis reveals that the null hypothesis of full shifting can only be rejected for 3 out of the 24 city-commodity-groups. The author finds some evidence for adjustment lags, but most of the price adjustments took place within the same (quarterly) period of

[169] The author believes that a sales tax rate for a given product in any state or city will have a small impact on nationwide overall inflation, which seems to be a reasonable statement.

a tax change. His findings for the pre-war period suggest that around 60 percent of a tax change is shifted to consumers. In this pre-war period, the null hypothesis of full shifting is rejected, indicating that structural changes may have occurred between the pre- and the post-war period.

General VAT rate

Carbonnier (2005) studies the economic incidence of general VAT taxes with the help of two natural experiments in France. In particular, relying on an increase of the general VAT rate by 2 percentage points in 1995 and a decrease of this rate by 1 percentage point in 2000, he analyses the extent of asymmetry and the impact of a different degree of competitiveness on markets. To investigate the latter question, he uses data about several labour intensive services which, he claims, are representatives of a perfectly competitive market, whereas manufactured production, which requires to a large extent fixed capital, has therefore high fixed costs and few competitors, is a representative of an imperfectly competitive market in his setting. The author provides difference in difference estimates where the control variable is the price of books, which have not been affected by these VAT reforms as they are subject to a reduced rate.[170] Furthermore, other control variables, namely energy prices and rents and the before tax price of alcoholic drinks (for the regression for restaurants) are taken into account in the regression that provide information on production costs. Given his approach and using monthly data, the author interprets his results as short-run effects over a four months window.[171]

Carbonnier finds that, for each 'labour intensive service' ('perfectly competitive market'), the tax shifting parameter is higher upwards than downwards, see Table 8.2. The average tax shifting parameter for the different labour intensive services is 91 percent upwards and only 22 percent downwards and these two values are significantly different. On the other hand, for each 'capital intensive' product ('imperfectly competitive market'), the tax shifting parameter is lower upwards (52 percent on average) than downwards (130 percent on average). In the latter case, the 95 percent confidence intervals of the average shift for tax increases and decreases do cross, but the 85 percent intervals do not. In other words, the evidence of an

[170] One might think that the price of books is not the best control group for the variables of interest. Indeed, the author states that he runs the same regressions with the price of drugs as control instead of the price of books, 'which gives globally the same results'.

[171] The author states that he also runs regressions with further delays but the additional coefficients were close to zero and not significantly different from zero.

asymmetric economic incidence is less clear for capital intensive services than for labour intensive services.

Table 8.2: Empirical estimates for tax shifting parameters in France

		VAT rate increase (1995)	VAT rate decrease (2000)
Capital Intensive	Domestic Machines	58 %	139 %
	Home Repair Products	49 %	147 %
	Earthenware	46 %	126 %
	Crockery	57 %	107 %
	Average Capital Intensive	52 %	130 %
Labour Intensive	Restauration (controlled)	65 %	32 %
	Cafes (controlled)	72 %	20 %
	Hairdressing	81 %	36 %
	Domestic Machines Repairs	107 %	-9 %
	Technical Repairs	131 %	33 %
	Average Labour Intensive	91 %	22 %

Source: Carbonnier (2005), p. 9f.

Following the arguments of the author, these different effects might be caused by two counteracting facts. On the one hand, it is probably more difficult for firms to increase than to decrease production in the short- and medium-run. If this is the case, profit-maximising producers would have fewer incentives to decrease prices in case of a VAT reduction because they could not satisfy higher demand anyway. This argument would imply less shifting of a VAT decrease than of an increase. On the other hand, if firms act in an imperfectly competitive market and have some price-setting power, they will take into account the reaction of consumers. There is some evidence that demand reaction is disproportionately higher if the price change is higher. If this is the case, price increases might be relatively weak (in order to prevent a fall of demand) whereas price decreases might be relatively strong (in order to trigger higher demand). These two counteracting effects might explain why tax shifting is stronger upwards than downwards in competitive markets (‘labour intensive’) and vice versa in imperfectly competitive markets (‘capital intensive’). Even though these results should be treated with some care (e.g. the definition of competitive markets is rather vague), they might provide valuable insights of asymmetric economic incidence of VAT taxes. One should keep in mind that the arguments proposed by the author to explain this asymmetric shift will probably not be valid in the long-run. Furthermore, one has to take into account

that the change of the VAT rate has been rather small in both cases. Thus, the estimates of the tax incidence are more likely to be distorted by independent changes of the economic environment and by strategic behaviour of firms (such as e.g. 'waiting for the next price adjustment' if price adjustment is costly) than estimates of the tax incidence in case of larger reform steps.

The delay of price adjustments may differ for different tax systems as well as for different regions (countries) and sectors. With tax-inclusive pricing like in almost all countries using a VAT system the issue of the cost of changing posted prices (in catalogues, menus etc.) may be of importance. In a tax-exclusive system, if prices posted remain unchanged, a pass-through of the tax of 100 percent is generated. In a tax-inclusive system prices must be adjusted, which implies additional costs for the firms. This may induce a slower adjustment of prices to changes in the tax rate compared to a tax-exclusive system. On the one hand, one could imagine that firms delay price adjustments (e.g. as they would have to raise prices in the near future for example due to the impact of overall inflation on labour costs or changes of input prices for production). On the other hand, firms may raise prices immediately, but by more or less than the tax change would suggest, to cover previous cost changes or to avoid a price increase in the future.

According to Dhyne et al. (2005), prices in Europe are rather sticky compared to the US. On average, 15.1 percent of prices are changed every month and the duration of a price spell ranges from 4 to 5 quarters in Europe. For the US, Bils and Klenow (2004) find that more than one quarter of prices is adjusted in a month. Heterogeneity across countries is relevant but less important than cross-sector heterogeneity. With the exception of services, price cuts are very common. On average 40 percent of price changes are price reductions. The frequency of price changes is presented in Table 8.3. This may give a hint in which sectors and countries tax changes may be passed-through into prices quickly and in which sectors it may take a longer time to be reflected, especially if the tax change is moderate. However, VAT rate changes influence the frequency of price adjustments. For France, Baudry et al. (2004) find an increase of the probability of price adjustments of 5.6 percentage points for the 1995 VAT reform (increase of the tax rate by 2 percentage points) and 8.5 percentage points for the 2000 VAT reform (decrease by 1 percentage point) for the month the reform came into effect. This would imply that the tax decrease in 2000 led to more price changes than the VAT increase in 1995. Also Hoffmann and Kurz-Kim (2006) for Germany and Aucremanne and Dhyne (2005) for Belgium find a higher frequency of price changes in response to VAT reforms. Hoffmann and Kurz-Kim similarly get the result that, at the

moment of impact of the VAT rate reform, price changes happen more often for VAT rate cuts than for increases, but tax cuts were higher than tax increases in the observed years.

Table 8.3: Frequency of consumer price changes per month

	Unprocessed food	Processed food	Energy	Non energy industrial goods	Services	Total
Austria	37.5	15.5	72.3	8.4	7.1	15.4
Belgium	31.5	19.1	81.6	5.9	3.0	17.6
Germany	25.2	8.9	91.4	5.4	4.3	13.5
Spain	50.9	17.7	0.0	6.1	4.6	13.3
Finland	52.7	12.8	89.3	18.1	11.6	20.3
France	24.7	20.3	76.9	18.0	7.4	20.9
Italy	19.3	9.4	61.6	5.8	4.6	10.0
Luxembourg	54.6	10.5	73.9	14.5	4.8	23.0
Netherlands	30.8	17.3	72.6	14.2	7.9	16.2
Portugal	55.3	24.5	15.9	14.3	13.6	21.1
Euro area	28.3	13.7	78.0	9.2	5.6	15.1

Source: Dhyne et al. (2005), p.45.

Deutsche Bundesbank (2008) performs a so-called intervention analysis of the increase of the standard VAT rate from 16 to 19 percent in 2007 (which was at the same time accompanied by a (less pronounced) decrease of social security contributions in order to reduce the high burden on labour). They estimate the impact on the monthly rate of the overall HICP (Harmonised Index of Consumer Prices) and on its main components by controlling for the economic environment. They find that the VAT increase has largely been passed through to prices but that these price increases have also taken place prior to and past the exact date of the tax increase. For a supplementary analysis, they analyse individual data for 40 goods and services. They find that the average price-increase was effectively solely caused by a higher frequency of individual price increases and not by larger price increases or by smaller or less frequent price reductions.

Carare and Danninger (2008) also investigate the impact of the VAT increase in the year 2007 in Germany. They explore whether the inflation dynamics of goods subject to the VAT increase differed from the dynamics of those goods that were not. In

particular, the authors investigate what they call 'inflation smoothing', meaning whether the rather small hike of inflation that was observed right at the time of the VAT increase indicates that firms did only shift a small share to consumers or whether this can be explained by the fact that firms have increased their prices in 2006 in anticipation of the tax increase. Basically, the authors provide two possible reasons for the advanced price reactions of firms. First, according to a sticky price model, firms may find it difficult to frequently adjust their prices for some reason (e.g. menu costs). Thus, firms might make larger price increases in anticipation of a VAT increase. Second, if consumers anticipate price increases and shift consumption to before the date of the tax increase, firms might be able to extract some rents by increasing the price prior to the tax increase to some extent.

The authors develop a monthly panel of annual inflation rates for two-digit items in Germany for the period 2005-2008. Apart from several general control variables (euro area specific inflation variables for each item, a time trend, time dummies and idiosyncratic shocks), the authors include several specific variables that allow them to investigate inflation experiences from the VAT increase. Given that it is often harder to find a control group in the case of a general VAT shock than to find a control group in the case of a shock to specific items, their way of including an item by item comparison to euro wide inflation might be a more promising approach than Carbonnier's approach of defining a control group in the same country but a different item which is not affected by the VAT change.[172] The results of their analysis imply that there was an acceleration of the inflation rate of the goods subject to the VAT increase already in anticipation of the shock and a jump increase right at the time of the shock. However, contrary to Deutsche Bundesbank (2008), they do not find empirical support for a delayed price increase during 2007. They also find some evidence, that price increases were stronger among durables and in less competitive markets, which gives some indication that rent extraction (i.e. the second reason stated for an increase already in 2006) may have been a motive for price increases prior to the shock. They find that, cumulatively, the pass-through of the VAT increase amounted to 73 percent. Broken down, 24 percent have taken place before January 2007, while 49 percent have taken place in 2007 (almost primarily in January). Thus, their analysis implies that, even though there was no massive increase of inflation in January 2007, the pass-through of the tax increase was still pronounced when anticipation is taken into account.

[172] See, for instance, the result of Dhyne et al. (2005) who find that heterogeneity of price changes across different sectors is much more relevant than heterogeneity of price changes across different European countries.

In addition to the analysis of VAT rate changes on specific goods, Jonker et al. (2004) also discuss the impact of a general VAT rate change in January 2001 in the Netherlands. The general VAT rate was increased by 1.5 percentage points. To receive insights, they compare monthly price changes from December to January in the year of the reform with price changes in the two years preceding the reform. In the year of the reform, prices increased by 0.3 percent from December to January, whereas they declined by around 1 percent in the two years preceding the tax increase.[173] This calculation would suggest that the increase was almost completely passed through to consumer prices. However, due to possible shortcomings of this very simple way of controlling for the economic environment, this result should be treated with care. Combined with their results for VAT changes on particular goods as cited before, their results might give some indication of a lower pass-through of VAT decreases than of increases. Of course, as the evidence is limited, one should be cautious in interpreting the asymmetric response as a general result.

Based on a panel of quarterly data for 12 commodities and 155 cities in the United States over the period of 1982-1990, Besley and Rosen (1999) analyse the economic incidence of sales taxes. Apart from the tax rate, which is of course the main independent variable, they use proxies for wage costs, energy costs and rental costs of the firms as control variables, but they do not include a further price as a control variable. Furthermore, this specification allows to control for geographic and time fixed effects. In their main specification, the authors find that they cannot reject full shifting for several of their commodities and they even find overshifting for more than half of their commodities. As outlined in the theoretical part of this literature review, overshifting can be explained by theoretical models, but unfortunately the authors do not confront their estimates with empirical information on characteristics of the different markets analysed. As a sensitivity analysis, Besley and Rosen estimate several further specifications, but their main results do not change pronouncedly. One of these alternative specifications includes a more detailed analysis of the dynamic adjustment of prices.[174] They find that the long-run effect of a sales tax is larger than the short-run impact but they also find that prices respond quite rapidly to a change of tax rates as the mean lag length is only about one quarter.

[173] The 'general' picture of price decreases can be explained by winter sales.

[174] The authors state that they also tried an approach in first differences but they claim that this specification is 'not consistent with our data' (p. 174).

Kesselman (2011) and Smart (2011) describe the impact of recent sales tax reforms on prices in two Canadian provinces. Kesselman investigates the impact of a reform in British Columbia and Smart the changes in Ontario. In both provinces the reform implied a switch from a retail sales tax to a VAT. One feature of the retail sales tax was the taxation at different stages of business, namely extracting raw materials, manufacturing, and retailing. In British Columbia for example about 48 percent of the tax was levied at the first two stages of business. The reforms also led to tax cuts for some goods as these are now tax exempted under the VAT but were taxed under the old regime since only final sales were tax exempted for these goods. In addition, there are also newly taxed items, like real estate commissions, electricity, repair services or gasoline in Ontario for example.

Both studies use the CPI of other provinces as a control variable to derive the impact of the reform on prices by using the different growth rates of the CPIs. They do not use other controls like differences in regional growth rates or income. This method is rather simple but allows for an impression of the effect. Nevertheless, one has to be cautious, especially if one takes a look at a more disaggregated level as local and regional demand and supply effects may become more pronounced in that case.

For British Columbia, Kesselman finds that the pass-through of the VAT was nearly complete. If one takes into account tax rate increases on retailing, the CPI would increase by 1.3 percent. If the abolishment of taxation at the other stages of production is taken into account the increase would shrink to 0.6 percent. In the month of the tax reform, prices rose by 1 percent compared to the other provinces. In the following five months the difference diminished to 0.6 percent which would imply a full pass-through of the reform. One reason for the delayed pass-through of the cut of taxation on extracting raw materials and manufacturing may be that it takes some time until already taxed inventories are sold, whereas tax increases at the retailing stage are passed on immediately. Also special rules like in Ontario (see below), not mentioned by the author, could be a reason for this result. On a disaggregated level the tax change was approximately fully passed-through for food purchased from restaurants and stores as well as for tobacco. For the latter, prices increased by even slightly more than the tax change would suggest, which could be the result of a low elasticity of demand for tobacco. For other goods, like telephone services, personal care and recreation, and homeowners' maintenance and repairs, which are now taxed under the new regime, the price increase was markedly lower than the tax change would suggest. From our point of view the simple comparison of price changes between different provinces on a

disaggregated level should not be overstated as regional effects can influence the result considerably.

The result of the reform in Ontario was comparable. The reform, if fully passed-through, was estimated to increase the CPI by 0.8 percent. The comparison of the price changes in Ontario with the changes in Quebec implied an immediate effect of 1.2 percent price increase, which diminished to 0.6 percent in the following five months. In a sensitivity analysis, in which Smart compared year to year estimates and used the price level in the second quarter instead of June prices as a starting point, the price effect after six months is estimated to be 1 percent or 0.7 percent, respectively. The effect after six months is close to a full pass-through into prices of the tax reform. Again differences between the impact implied by the statutory changes and observed data arise on a disaggregated level. For gasoline, personal care services and tobacco products the estimated change in prices is close to the statutory changes. For water, fuel and electricity the estimated effect after six months is much lower than the statutory effect. For example, the price for natural gas remained stable in Ontario whereas it increased in Quebec, although the additional tax of 8 percent was levied. However, one has to take into account that the market for natural gas is regulated. The decrease of the price effect over the following five months after the reform is regarded to be the result of the delayed shift of the tax cut on intermediate production. One reason for this effect is that the full tax cut did not come immediately into effect as for large firms temporary restrictions were obliged.

Another important feature of the reforms was revenue neutrality for the government. Additional revenues were returned to the private households as income tax cuts or income tax credits. This implies that in neither case there should be an income effect as the budgetary situation of the households remains unchanged ceteris paribus. However, the different tax treatment of different goods and therefore the change of relative prices will imply substitution effects between goods such that the result on the disaggregated level will not only be the effect of tax rate changes but also of different demand patterns to some extent.

These results confirm the findings of Smart and Bird (2009), who analyse the impact of a VAT reform in three other provinces in the year 1997 in Canada, namely Newfoundland and Labrador, Nova Scotia and New Brunswick. Also in these provinces the retail sales tax with taxation at different stages of business was replaced by a VAT with different rates and exemptions for different goods. The authors find that the overall impact of prices is consistent with full shifting of taxes on to prices, whereas this holds

only for four of eight categories on a disaggregated level (statistically indistinguishable from 1), namely Food, Shelter, Clothing and Footwear and Alcohol and tobacco products. For the other categories the estimated elasticity is either much higher than one or negative (Transportation). The results can be found in Table 8.4.

Table 8.4: Expenditure Shares and Estimated Elasticity for different consumption good categories

	Expenditure Shares	Estimated Elasticity
All Items	100.0 %	1.0** (0.45)
Food	16.8 %	1.4** (0.60)
Shelter	26.3 %	1.4** (0.62)
Household operations and furnishings	11.1 %	2.1*** (0.33)
Clothing and footwear	6.0 %	1.0*** (0.20)
Transportation	19.4 %	-1.5* (0.91)
Health and personal care	4.6 %	8.6*** (1.89)
Recreation, education, and reading	12.5 %	0.2 (0.24)
Alcohol and tobacco products	3.3 %	1.0* (0.55)

*, **, *** mean significance at the 10, 5, 1 percent levels, standard errors in parentheses.
Source: Smart and Bird (2009), p. 92.

Chirakijja et al. (2009) analyse the effect of a temporary VAT cut in the United Kingdom in 2008. In November 2008, the government announced a temporary cut of the standard VAT rate from 17.5 percent to 15 percent from December 2008 to the end of 2009. If the tax cut would have been fully passed-through the reform should have lowered prices of applicable goods by 2.1 percent. The standard rate is applied to about 55 percent of all consumption expenditures. As excise duties were increased for some goods (alcohol, tobacco and petrol) to offset the cut of the standard rate a little bit less than 50 percent of consumption expenditures were affected. Overall, the VAT rate

change should have lowered the CPI by about 1 percent. The authors use a weighted fixed-effects estimation, in which they control for different types of goods and use non-treated goods as controls, to derive the impact of the reform. They find that about 75 percent of the tax cut were passed-through into prices and full pass-through cannot be rejected. They find no different effect between durables and non-durables, which is interesting, as one could imagine that temporary cuts could induce private households to bring forward purchases of durable goods implying higher prices by the higher demand. They also find that pass-through of the tax cut was immediately.

Specific excise taxes

Delipalla and O'Donnell (2001) empirically analyse tax incidence in the European cigarette industry by using data for 12 member states of the European Union for the period 1982 to 1997. Apart from an analysis of the economic incidence for both ad valorem taxes (tax rates levied on the price of the good) and specific taxes (absolute monetary amount levied on the number of cigarettes), they introduce a model that allows them to provide estimates of market conditions. In particular, the mark-up of firms is determined by a ratio of the amount of tax shifting for specific taxes on the one hand and ad valorem taxes on the other hand. All of their analysis is based on comparative statics.[175] Specifically, the authors estimate price functions, where the price depends on taxes and other exogenous determinants of demand and cost conditions and country- and time fixed effects. The ad valorem tax used in the estimation is the sum of the ad valorem excise duty and VAT expressed as a percentage of the tax inclusive retail price whereas the specific tax is the amount levied on 1 000 cigarettes.

As the sample size is rather small, Delipalla and O'Donnell state that their country-specific estimates are not very accurate so that they rely on a grouping of countries. Whereas group 2 consists of countries with state production (France, Italy, Portugal and Spain), production from domestically grown tobacco (Greece) and a very large amount of cross-border shopping (Luxembourg), group 1 consists of countries which do not have one of these 'special' features. The empirical results in group 1 might thus be less influenced by special economic features in the market mentioned above. In group 1, there is significant undershifting of both types of taxes. Whereas a unit increase in tax arising from a higher ad valorem tax results in an increase of the consumer price by

[175] The authors state, however, that they also tried to include dynamics in their model by inclusion of lagged dependent variables, but this was not found to be appropriate. Furthermore, the authors also performed a specification in first differences, but, at least for group 1, the results were very similar.

0.72, a unit increase of the specific tax increases the consumer price by 0.92. The latter coefficient is different from 1 (which would imply perfect shifting) at a 95 percent significance level and the two coefficients differ significantly. This means that the amount of shifting is (significantly) lower for the ad valorem than for the specific tax. These results are consistent with a model of imperfect competition and the mark-up over marginal costs is estimated to be 28 percent. In countries of group 2, the authors find overshifting for both the specific tax (factor 2.17) and the ad valorem tax (1.48). The difference in the price effects of the two taxes is significant at the 10 percent level. If one would follow this theoretical model, this would imply a mark-up of 47 percent.[176] From a fiscal policy point of view, the authors state that their results indicate that, given that the impact of taxes is different in different countries, European tax harmonisation might be more difficult. Moreover, they suggest that a more careful analysis of the distributional[177] and health-related consequences of tax policy proposals would sometimes be desirable.

Alm et al. (2008) provide an analysis of the incidence of gasoline excise taxes in the 50 US states for the period 1984-1999. They argue that an analysis of gasoline excise taxes has several advantages compared to the examination of other products. Among others, as the wholesale price of gasoline is the most important cost factor for the retail price, this provides good information about the production costs.[178] Using the real monthly weighted end-user price of gasoline as dependent variable and the inflation-adjusted state gasoline tax as primary regressor, they provide results of panel estimations with controls and fixed state and time effects. In their most general specification, they find that there is a one-for-one increase of the end-user price resulting from an increase in the gasoline tax. The authors state that this finding is consistent with a gasoline retail market where firms are perfectly competitive and produce at constant marginal costs. Furthermore, they find no statistical evidence of lagged responses to changes in the gasoline tax. The authors find no statistical evidence for an asymmetric response to changes in gasoline taxes, which indicates that tax increases and decreases are shifted to

[176] It should be noted, though, that several countries in group 2 have state production, in which case the assumption of profit maximising firms is probably misguided.

[177] Distributional consequences of a tax reform proposal are mostly analysed by assuming full tax-shifting to consumers. Conclusions are different if taxes are over- or undershifted.

[178] The authors state that the inclusion of the wholesale price as a control variable makes the model more accurate. However, one should consider the following argument (it is especially true in this case, but it is valid for the inclusion of any other control variable). The method carried out by the authors is adequate to determine the economic incidence of an excise tax *if the wholesale price is not affected by the change of the tax rate*. If, however, a change of the tax rate causes a change of the wholesale price, this method does result in a distorted estimate of 'the change of the consumer price triggered by a tax change'.

consumers by the same amount.[179] In addition, the authors perform separate regressions on three subsamples of states, categorised according to a measure of urbanicity (i.e. low, medium and high urbanicity) to test whether tax-shifting is more pronounced in more competitive, urban areas than in less competitive rural areas. Indeed, they claim that their results indicate that gasoline prices in rural markets exhibit less than full shifting. In our view, the estimation results presented by the authors with respect to the urbanicity or degree of competitiveness are more ambiguous than the authors claim.[180]

Young and Bielinska-Kwapisz (2002) investigate the economic incidence of alcohol taxes in the United States. The price of alcohol in the different US states is assumed to depend on the Federal excise tax and state and time specific fixed effects. This approach is performed separately for beer, wine and spirits (and the adequate excise tax rates) and their findings are very similar for these three items. First, they find that taxes are overshifted on retail prices (prices rose by around 160 to 170 percent on average of the tax increase). Second, the pass-through seems to happen very fast within only one quarter. Lagged variables of the alcohol tax are not significant.[181] The authors argue that the incidence of alcohol taxes might be different from more general retail taxes for several reasons. First, market structure and demand curves might differ substantially. Second, a general sales tax might induce much less substitution towards other goods than a tax on alcohol and, in particular, a tax on one specific alcoholic item. Third, a general tax has a much larger effect on the real income of consumers than a tax on alcohol. A priori, an assessment of the impact of these differences on the economic incidence is very hard.

Baker and Brechling (1992) examine the extent of shifting of excise taxes for five different goods, namely beer, wine, spirits, tobacco and petrol. They use quarterly data of the UK retail price index (RPI) for the period 1973-1990 and estimate a first difference model in logs with the change in the log of the excise duty as their 'main' regressor and different control variables for the different items under investigation.

[179] In contrast to that, the authors find that tax-inclusive gasoline prices are more responsive to increases than to decreases in gasoline wholesale prices. They state that these results might be due to institutions by which gasoline taxes are collected and under which wholesale and retail gasoline firms operate. For example, tax changes are likely to be known before becoming effective while the wholesale price is not, which gives agents the possibility to plan accordingly in advance in case of a tax change.

[180] They even find overshifting of the tax for the group of medium urbanicity (degree of competitiveness), which contrasts their claim to some extent.

[181] Apart from these two results relevant for this literature review, the authors also find that alcohol taxes are a bad predictor for the retail price of alcoholics. This can be explained by the fact that these taxes only have a very small share on the retail price.

However, according to our view, they sometimes do not find good control variables for production costs. The authors differentiate revalorised changes and real changes, where the latter is defined as a percentage duty increase in excess of 5 percentage points above the inflation rate and includes one large absolute decrease of the duty for wine.[182] Their estimates (see Table 8.5) suggest that, with the exception of tobacco and wine, the amount of shifting is close to 100 percent for revalorised changes and it is not possible to reject the hypothesis that revalorised changes to excise duties are fully shifted to retail prices. Excise duties on tobacco and wine were found to exhibit under- and overshifting behaviour for revalorised changes, respectively. The authors state that undershifting in the case of tobacco may be caused by the severe market concentration there. Furthermore, the wine equation was the only one which revealed significant evidence of a lagged adjustment to a change of excise duties. Concerning real changes, the authors find that excise duties are less than fully shifted onto retail prices, with estimated shift parameters in the range of 57 to 70 percent for the different sectors.

Table 8.5: Estimated shift parameters for excise duties in the UK

	Revalorised duty change	Real duty change
Beer	102 %	70 %
Wine	164 %	62 %
Spirits	91 %	-
Tobacco	71 %	57 %
Petrol	91 %	62 %

Source: Baker and Brechling (1992), p. 57.

Kenkel (2005) uses the natural experiment of an increase of alcohol taxes in Alaska in 2002 to analyse the economic incidence. Basically, he conducts telephone surveys to receive information on prices just before and one year after the tax hike and compares these price increases to increases of the general inflation rate in the same period.[183] Basically, he finds that alcohol taxes are more than fully passed through to higher beverage prices. The average pass-through rates found by the author are very high (around 200 percent or even more). Moreover, the pass-through seems to be rather similar across the most popular brands of beer, wine and spirits. It should be noted,

[182] As excise taxes are not ad valorem taxes, keeping the duty constant in absolute terms would imply a diminishing value of the duty in real terms. Therefore, policy-makers frequently adjust duties in order to avoid this. Such a change is categorised as a revalorised change in their analysis.

[183] This approach might result in an underestimation of tax shifting if firms had already increased prices prior to the first interview in anticipation of the tax shock.

though, that his model is rather simple and he basically only controls for the general inflation rate and for no other development.[184]

Barnett et al. (1995) investigate the economic incidence of federal versus state tax rates by focusing on the US cigarette industry. They model the cigarette market as a system of equations that determines demand, the retail price, the wholesale price and manufacturing costs. In particular, the retail price is estimated as a function of, inter alia, the wholesale price, the federal excise tax rate and a variable that comprises state and local excise tax rates. Payroll costs of tobacco wholesalers and the scale of retail groceries are used as control variables. After estimating this system of equations, the authors perform two simulations in which they increase the federal and the state excise tax rate by 1 cent, respectively. They find that the retail price increase is more pronounced in case of a federal tax increase (the price increases by 1.02 cent) than in case of a state tax increase (price increase by 0.9 cent). Their explanation is demand-driven. Some consumers might respond to a tax increase in a particular state by cross-border shopping in a neighbouring state. The opportunities for cross-border shopping are much more restricted in case of a federal tax increase. The method of estimating a system of equations and running simulations with the resulting estimates is a promising approach. In that way, general equilibrium effects that might not be taken into account in a single equation might be considered.

Chouinard and Perloff (2004) investigate whether the economic incidence of federal gasoline specific taxes is different to that of state taxes. The authors use monthly data for the 48 mainland states and the District of Columbia from 1989 to 1997 to estimate a wholesale and a retail price equation using several exogenous variables and thus controlling for several different factors such as cost factors, seasonality and market power. In contrast to Barnett et al. (1995), they find that the degree of tax shifting of a state specific gasoline tax to the retail price is higher than that of a federal tax. An increase of the federal tax is shifted to consumers by around 50 percent, whereas an increase of the state specific tax is fully shifted to consumers (in a state with an average quantity share of gasoline). They claim that the elasticity of supply to a given state might be greater than to the nation as a whole. Wholesalers might shift gasoline supply to another state in reaction to a state tax increase. It should be noted, though, that the authors don't give a convincing economic reason for their argument. Their argument

[184] Thus, as the author states himself, 'if inflation was higher in some parts of Alaska, or if there were costs shocks other than the tax hike over this period, the estimates … may overstate the rate of pass-through'.

might be true, however, in an environment of increasing marginal production costs for example.

The results of Barnett et al. (1995) and Chouinard and Perloff (2004) might also comprise some information for European policy makers in the sense that the incidence for a national tax change might be different to the incidence of a European wide change. The two papers provide results for the gasoline market and the cigarette market that seem to contradict each other at first sight. Their estimations might be reconciled to some extent if one takes into account that individuals face higher transport costs for cross-border shopping of gasoline than of cigarettes. Thus, demand might react less elastic to a state tax increase in the former case. Simply speaking, economic incidence of a state tax would be 'more demand-driven' in the cigarette market and 'less demand-driven' in the gasoline market.

Summary

Following the results of the theoretical part, important determining factors for the level of price shifting are the elasticities of demand and supply as well as the market structure in the relevant sector. Given that these parameters differ substantially for different markets (and in different countries), it is not surprising that the empirical literature finds a wide range of results of the economic incidence of consumption taxes. Therefore this literature review cannot come up with one number for the amount of shifting. Thus, as Copenhagen Economics (2007) states, 'the main objective of the empirical analysis of price, production, and employment effects from VAT changes is not to gauge the size of these effects historically, but to learn more about the circumstances under which these effects become larger or smaller'.

The empirical methods applied by the authors differ to some extent. Whereas some authors perform rather sophisticated econometric methods such as difference-in-difference estimation, others provide a rather simple estimation of the pass-through of taxes. It is not clear, however, whether estimates derived by a simplistic approach are distorted upwards or downwards. Our literature survey suggests drawing the following conclusions:

- Concerning the amount of tax shifting, there is a wide range of results found in the empirical literature. Although many papers find that consumption taxes are only partly or fully shifted on to consumer prices, there is also a considerable amount of

studies that find overshifting. One can conclude that the theoretical finding of possible overshifting is found to be a relevant issue in empirical analysis.

- These vast differences of findings are not very surprising, given that markets differ substantially with respect to the relevant characteristics. Unfortunately, many empirical studies do not confront their findings with a closer look on the market structure. However, those studies that provide information on the market situation seem to find evidence that markets which are closer representatives of perfect competition markets more often feature full shifting of taxes, whereas less competitive markets feature both under- and overshifting more often.
- There is some evidence, that the degree of shifting is higher for excise taxes than for ad valorem taxes, which is in line with theory.
- Taking a look at the results of the study one could conclude that the pass-through of VAT rate changes on services seems to be lower than on goods and partially far away from a full pass-through. However, evidence about the pass-through of the VAT on goods comes mainly from the change of excise taxes for which the pass-through should be higher. In addition this may also be influenced by the lower frequency of price adjustments.
- The pass-through of a general VAT rate change seems to be closer to fully pass-through than for a change of the tax rate for a specific good. A change of the general VAT rate will also imply a stronger adjustment of wages than a VAT rate change of the same extent for a specific good. The higher impact on production costs will also be reflected in the prices.
- The literature review suggests that overshifting is more often found in studies that analyse US markets than in studies for European countries or the European Union as a whole. However, given the still rather limited amount of work on this issue, one should be careful in drawing a final conclusion on this topic.
- There is some evidence that the degree of shifting is different for a tax levied in smaller areas (such as US states) than for a tax levied in larger areas (such as the US as a whole). This might also be relevant for national versus EU-wide tax changes.
- There is fairly robust evidence that the shifting of taxes on to consumer prices occurs very swiftly, within a few months at most. This is found both for the US market and the European Union. Price adjustments in advance of a VAT reform were also found.

- Empirical literature on an asymmetric shifting of taxes (different for tax increases and decreases) is rather inconclusive.[185] Available empirical evidence seems to be in favour of the idea that the degree of shifting is higher for tax increases than for tax decreases. One should keep in mind, however, that the theoretical arguments which are brought forward to explain asymmetric reactions should be valid in the short- and medium-run only. However, it is tough to determine long-run effects as long as no good control variables are available.

8.4 Discussion of case studies

In this section we discuss several case studies. They cover VAT reforms in Finland, Germany and France. These reforms deal with VAT rate changes for specific goods, like foodstuff, hotels, and so on. These studies provide additional insights with respect to the price setting behaviour of VAT rate reforms. In all these cases the aim was to boost demand and employment in the corresponding economic sectors, which are all labour intensive.

Reduction in the VAT rate on foodstuffs in Finland (ETLA)

Background

The efficiency and redistribution implications of targeted VAT rate reductions are quite complicated. The main factors are demand and supply elasticities and consumption shares. In case of foodstuffs bought from shops the price elasticity of demand is low, because it is a necessity good (Soppi (2006)). It has no close substitutes other than eating out. The market for foodstuffs is competitive in the member states due to the possibility of importing. The described combination of low demand and high supply elasticities should lead to high pass-through of the VAT rate on food prices and small employment effects in agriculture, food processing industry and trade.

Reduced VAT rates on foodstuffs are common in EU, but there are also countries that apply high standard rates on food. The prime example is Denmark with its 25 percent VAT rate. Taxation of food is a highly political issue due to its actual and fictional redistribution effects.

[185] Related to that topic, Dhyne et al. (2005) find no evidence of a general downward price rigidity in Europe. They state that price decreases are not uncommon, except for services. In addition price increases and decreases have a similar magnitude, although price increases seem to be slightly larger on average.

The aim to keep the price on food low has been justified by the fact that the expenditure share is higher among poor people. There are, however, caveats. Lifetime income distribution is much more equal than the yearly income distribution. Keeping the price of foodstuffs low by tax relief is also a very expensive method for redistribution, because the middle class and the affluent people pay most of the VAT on food. Targeted income transfers operate more efficiently (Crawford et al. (2010)).

Finland joined the EU in 1995 with a VAT rate of 17 percent on foodstuffs. There was a plan to reduce the rate to 12 percent in 1997, but the weak finances of the central government prevented this (Rauhanen and Peltoniemi (2006)). The reduction would have increased the difference between VAT rates of home meals and restaurant food to 10 percentage points, distorting further the choices of consumers. The programme of the government prepared in 2007 (Government of Finland (2007)) promised both to implement the reduction of the VAT rate on food and also to promote the possibility of adopting a reduced VAT rate on restaurant services in the EU.

The measure and its justifications

The VAT rate on foodstuffs was lowered from 17 to 12 percent in October 2009. The decision was part of a larger VAT reform which also raised all VAT rates by one percentage point and cut the VAT on restaurant food in July 2010. The government bill presented to parliament (Government of Finland (2008)) justified the reduction of VAT on food bought from shops by fairer taxation, even though it also noted that the measure would not markedly change the income distribution.

The potential outcomes of the reform had been studied extensively already by 2006. Examples of the studies are Viren (2005), who analysed the effects of VAT on prices in EU countries, Soppi (2006), who estimated demand elasticities of foodstuff and restaurant services and Ulvinen (2006), who analysed the supply side in a study that considered the competition and profitability of the food industry and related services. The main results of this research programme were as follows. There is much competition in food processing as well as in the wholesale and retail sectors, even though concentration rates are quite high.[186] The price elasticity of demand was estimated to be fairly low, -0.36. The pass-through of the foodstuff VAT rate reduction was not estimated herein. The estimated pass-through of 80 percent reached by Viren (2005) for overall consumer goods was used by Holm et al. (2007) in the economic analyses of the tax rate cut. With 80 percent pass-through a reduction of the VAT rate

[186] This observation was confirmed later by Kotilainen et al. (2010).

on foodstuff from 17 to 12 percent would lower prices by 3.5 percent. The corresponding employment increase was deduced to be 6 200 man-years (0.25 percent of the total employment in Finland). If all these employed persons were permanently unemployed before the reform, the measure would weaken public sector finances by EUR 300 mill. per year. Those on low incomes would benefit from the reform, but the overall influence on redistribution would be small.

The government bill (Government of Finland (2008)) includes an updated assessment of the economic effects. It is based on simulations of the CGE model VATTAGE and the 2006 Household Budget Survey of Statistic Finland. The results are similar to those of the first estimates. Prices should fall by 4.1 percent during the first year, i.e. the pass-through would be immediate and almost full. The employment effects and the public economy implications were comparable. The lowest income decile would benefit yearly by 49 euros and the highest by 106 euros.

Evaluation of the reform

Several large trade groups committed themselves to reducing their prices immediately and by the full amount of the VAT cut. Some shops even showed the old and new prices of the products side by side for some time after reform. Statistics Finland announced that the price of food fell by 5.6 percent from September to October 2009, i.e. the pass-through seemed to be higher than 100 percent. The overreaction of prices was explained by seasonal factors. Consumer Survey from November 2009 reveals, however, that only 57 percent of the interviewed persons had observed the lower prices (Kangassalo (2009)).

National Consumer Research Center published two follow-ups for the price development (Peltoniemi and Varjonen (2010, 2011a)). The first study followed the prices of 171 food products and 21 non-food products in 81 shops between October 2008 and January 2010. The prices were collected at seven points of time; four times before and three times after the reform. The food prices fell 5.7 percent from September to October 2009 and increased 1.7 percent from October 2009 to January 2010. For non-food products, which served as a control group, there was no change in prices in autumn 2009. The second study extended the analysis to October 2010. The latter period included an overall hike of one percentage point in the VAT rate in July 2010. In October 2010 the food prices were 2.4 percent lower than in October 2008 and 3.4 percent higher than in October 2009. The corresponding increases in the prices of non-food products were 5 percent and 1.2 percent during these periods. The reports

identify also many other reasons for variation in food prices, such as changes in prices of oil and agricultural products.

How about the actual overall economic outcome of the reform? There have been no studies on that subject. Preliminary conclusions can be made on the basis of the full pass-through on prices. It seems indeed that the price elasticity of demand of foodstuff is low and the price elasticity of supply is high. This suggests that the reform influenced the economy through income effect. Consumers had more money left after purchases of food and this money was either saved or spent following the income elasticities of demand. As the consumption shares of food do not differ markedly between the households representing various income deciles, the redistribution effects are likely to be modest and, from the point of view of public economy, quite expensive.

Conclusions
The VAT rates seem to be passed through fully on the prices of food bought from shops. In that way the reform fulfilled the expectations. There were, however, signs that before the reform the consumer prices of some products fell less than in EU15 countries and less than the producer prices (Kotilainen et al. (2010)).

Realisation of the other objectives, fairer taxation and higher employment are harder to detect. The high propensities to consume among the poor (1.4 in the first income decile) reported by Holm et al. (2007) suggests that some part of income poverty is temporary and therefore the long-term effects on redistribution are even less observable than the government bill assumes. The price tag for additional employment is probably much higher than assumed in the calculations, since it is likely that many of those who are employed because of the reform would also have found a job without it. The VAT rate reduction on food also required the lowering of the VAT rate on restaurant services, emphasizing the negative revenue and political-economy effects of extending reduced rates of VAT. So it seems that politics justified the reform more than economics.

Reduction in the VAT rate on restaurant and catering services in Finland (ETLA)

Background
Restaurant and catering are labour intensive services traded in competitive markets. So the supply is likely to be price elastic. From the point of view of a consumer these

services are luxury goods, with high price elasticity of demand.[187] Price elastic demand and supply suggest that a targeted VAT reduction could be effective in increasing use and production of these services. The overall amount of food consumed is limited, but a shift from home meals to eating out might lead to efficiency gains due to improved distribution of work. Lower VAT may also reduce informal market provision even though income taxes are likely to be more important. There is no equity reason for subsidising restaurant food by lower taxes.

VAT rates on restaurant services vary largely in the old EU countriesmainly due to the derogations permitted before 2009. In 2009 all member states were allowed to adopt reduced VAT rates. These services are mainly used locally which allows different national VAT rates without major internal market distortions. The decision of the Commission was supported by a simulation study produced by Copenhagen Economics (2007).

There are not many empirical studies that analyse the economic effects of VAT rate reduction in this industry. An econometric analysis of a 5 percentage point reduction in the VAT rate shows that the pass-through on prices was 19 per cent in Portugal (Copenhagen Economics (2007)). In France the restaurant prices fell only 1.4 percent after the VAT rate reduction from 19.6 percent to 5.5 percent, while a full decrease would have been 11.8 percent (Charlet and Owens (2010)).

The discrepancy between the VAT rates on foodstuff and restaurant services has been discussed for a long time in Finland. The main argument has been that the lower VAT rate on food bought from shops distorts production decisions and creates inefficiency.

Tax rate change and its justification

On 1st of July 2010, the VAT rate on restaurant and catering services (excluding serving of alcoholic drinks) was lowered from 22 to 13 percent in Finland. The aim was to equalise the tax rates on meals taken at restaurants and home. This objective had already been written into the 2007 government programme, but the implementation had to be postponed until the permission of the Commission. The decision was part of a larger reform, which included a reduction of the VAT rate of foodstuff from 17 to 12 percent on 1 October 2009 and a hike of all VAT rates by one percentage point on 1

[187] Soppi (2006) estimated that the expenditure elasticity of demand for restaurant services in Finland is 1.3 and the price elasticity of demand -0.84. The data cover the period from 1975 to 2004 and the demand system estimated was dynamic AIDS.

July 2010. The government bill included an assessment of the economic effects of the overall reform, based on simulations of the CGE model VATTAGE (Government of Finland (2009)). The simulations were performed assuming a full pass-through on prices, i.e. as the consumer prices of the restaurant and catering services fell by 7.4 percent. The results show that production increases by 3.4 percent and employment by 3 000 persons, which is 5.6 percent of the total employment measured by man-years in this line of business.

MaRa, the trade and labour market association for the Finnish hospitality industry recommended that the prices should be lowered by the full amount. The majority of the members agreed on that, especially the largest restaurant and cafeteria chains.

Evaluation of the 2009 reform

The prices of restaurant and cafe meals went down in July 2010 by an average of 5.7 percent. This result is based on the monthly questionnaire of Statistics Finland, aimed at calculating the Consumer Price Index. A more comprehensive analysis on the pass-through of the VAT rate cut on prices was provided by Peltonen and Varjoniemi (2011b). The results show that the prices fell by 4.1 percent between the end of May and the beginning of September 2010. This is 58 percent of the full amount. The study was implemented by sending a questionnaire to 392 restaurants. A comparison between restaurant categories reveals that prices fell the least in non-chain fast food restaurants like pizzerias.

The outcome of this reform was studied econometrically by the Government Institute for Economic Research (VATT), see Harju and Kosonen (2010). The method used was a difference-in-differences estimator, with the control groups being Finnish hotels and Estonian restaurants before and after the reform. The result was that the price of the services fell on average by 2.1 percent, i.e. by less than one third of the corresponding cut in the VAT rate. The reduction was bigger in lunch restaurants, which are exposed to more intense price competition.

The discrepancy between the results of the Consumer Agency and VATT raised an intensive discussion. The main reason turned out to be weighting of the restaurants. Harju and Kosonen (ibid.) chose the respondents by randomised sampling among the companies listed in the Business Registers of Finland and Estonia. The observations were not weighted in the baseline analysis. The authors also present results using turnover of the restaurants as weights. The outcome was a reduction of 5.2 percent in

the prices. Obviously, restaurants and cafes which have large turnover lowered their prices more.

Conclusions
The reduction of the Finnish VAT rate on restaurant and cafeteria services was well justified on the condition that the other alternative was to continue with favouring strongly food that was bought from shops. The other option to level the playing field, i.e. setting the tax rates on the level of the general VAT rate, has not been analysed.

Has the reform reached it goals? The jury is still out, but it is not likely that there will be a complete pass-through on to consumer prices. Turnover of the restaurant business increased strongly after the reform, but the same thing also happened to the turnover of hotels, which served as a control group in the price study. There has been no increase in the man-hours worked in this industry after the reform. Profitability is still weak due to the effect of the financial crisis on the demand of the services.

Reduction in the VAT rate on hairdressing services in Finland (ETLA)

Background
Hairdressing is characterised as a luxury consumption service[188] produced locally with labour-intensive technology and traded in competitive markets. Evidence on price elasticities of supply and demand for this kind of service is sparse, but it is likely that the supply elasticity is higher.[189] In that case the pass-through of a VAT reduction to consumer prices should be large and the employment effects small. The share of informal markets can be high, especially in countries with high tax rates. On the other hand, the efficiency arguments for lower taxation are mitigated by the fact that medium-skilled professionals are needed to produce the service and therefore the possibilities for do-it-yourself work are limited. Equity justifications for lower VAT on hairdressing are weak.

Hairdressing belongs to those labour-intensive services which are subject to a lower VAT rate in EU. The aim of this is to generate jobs and mitigate the informal economy. Initially, the application of lower rates was restricted to the years 2000 to 2002. The evaluation of this policy measure (European Commission (2003)) found no solid

[188] Leonardi (2010) estimates an income elasticity of the demand for hairdressing services of 1.64.
[189] The estimate provided by Hultkranz and Nordström (1995) is -0.69.

evidence of strong employment effects. The Commission concluded that lower VAT rates are passed on to consumer prices only partially or not at all. The experiment was extended first to 2003 and later to 2005. In 2006 new EU-countries were allowed to participate and the new deadline was set to 2010.

The European Economic Recovery plan (European Commission (2008)) recommended that the optional use of reduced VAT rates in labour-intensive local services should be allowed permanently. The aim was to increase demand for labour. In 2009 the VAT Directive was amended and also new industries, such as restaurant services, were included. The preceding impact assessment referred to the study of Copenhagen Economics (2007) stating that the uncertainty involved in temporary measures discourages firms to invest and employ. This uncertainty was suggested to be the main reason for the unsatisfying results of the 2000-2002 experiment.

The Government Institute for Economic Research (VATT) studied the employment and public economy outcomes of a lower VAT rate on local labour intensive services in 1999 (Rauhanen, 1999). The aim was to produce information for the decision whether Finland should join the initial EU experiment. The results were negative in the sense that the budgetary cost of additional employment was estimated to be high even in the case of full pass-through of the tax reduction on consumer prices. The main reason for the outcome was the low price elasticity of the demand of the services. The Finnish government decided not to participate in the experiment.

The reform and its justification

However, Finland joined the next phase of the EU experiment in 2006. The VAT rate on hairdressing and some other consumer-oriented small businesses was cut from 22 to 8 percent in 2007. The bill presented to parliament (Government of Finland (2006)) included an impact assessment of the measure. In that assessment the employment effects were considered to be somewhat larger and the cost of additional employment lower than in the previous evaluation in 1999. Both these evaluations note that hairdressing has a low price elasticity of demand. The justification given for the experiment referred nevertheless to a positive influence in employment and a reduction in informal economy.

The Finnish government was next obliged to determine its position on the reduced VAT rates in 2010, when the deadline was coming up. The Council had just adopted the directive (Council Directive 2009/47/EC) allowing the lower VAT rates to become permanent. The government decided to extend the expiry date of the derogation only to

the end of 2011 (Government of Finland (2010)). The justification given for such a short prolongation was that the ruling government did not want to tie the hands of the next government, which was expected to carry out an extensive tax reform. The working group for developing the Finnish tax system was founded to back this reform. The group reported its results in December 2010 (Ministry of Finance (2010)). This report refers to negative experiences from the reduced VAT rates on labour-intensive services concluding that it is not reasonable to continue keeping the tax rates low.

Evaluation of the 2007 reform

The Government Institute for Economic Research (VATT) studied the effects of the 2007 VAT rate cut on the prices of hairdressing services (Kosonen (2011)). The method used was a difference-in-differences estimator, with the control groups being beauty salons, day spas and masseurs before and after the reform. In the case of consumer price changes, the outcome measures by how much prices fell in hairdressing compared to the simultaneous change in the prices of the control group. The results show that prices went down by 7.2 percent by mid-2009, while a complete pass-through would have suggested a cut of 11.5 percent. The data employed were the observations used to calculate monthly consumer prices of the services from 2002 to mid-2009. Kosonen (ibid.) also describes more detailed data in the report which consist of prices of every product of about 400 hairdressers before and after the reform. These data show that the average reduction in prices was only 3 percent.

The second objective of the study was to analyse the impact of the VAT rate cut on turnover of the firms. Again the difference-in-differences estimator was used, with the same control group. The data was provided by tax authorities. The turnover of the treated group fell marginally.

The author also addressed the influence of the reform on the demand of the services. There were no observations on the amount of services used, but firm-level data on turnover and prices. So, a 2SLS strategy was exploited in which first the influence of the reform on prices was estimated and in the second stage the changes in turnover were explained by the results of the first stage. No statistically significant coefficients were found in the second stage, which was interpreted to show that the tax rate reduction did not affect the demand of the services. Evaluation of the link between the tax reform and the wage bill generated the same outcome. These negative results were also backed by the observation that firms did not claim higher VAT deductions after the reform, indicating that there was no increase in the use of inputs in production. It seems that in

the short term the tax reform increased the profitability of the businesses, but not the produced amount of services and thereby employment in the sector.

The price effects of the VAT rate cut were also observed by the Consumer Agency with the support of Finnish County Administrative Boards. They sent a questionnaire to 427 hairdressers before (November 2006) and after (March 2007) the reform asking the prices of 55 different services. The outcome was that roughly ten percent of the hairdressers reduced the prices with full amount and the average reduction was 3 percent (Ruhanen (2007)).

Conclusions
The lower VAT rate on hairdressing aims to increase employment and reduce the informal economy. It is, however, difficult to find firm statistical evidence supporting the existence of such links. The recent Finnish econometric study presented above claims that the short-term pass-through on prices is far less than complete. Moreover, there were no signs of positive employment effects. These results are in line with the outcomes described in the evaluation of the EU experiment 2000-2002. They also suggest that the short-term demand and supply elasticities are low and taxing hairdressing with VAT is not very distortive.

The studied follow-up period in the Finnish study was fairly short, 2.5 years, and there was ongoing uncertainty whether the reduction would be continued after 2010. These factors may have dampened the estimated impacts of the reform on prices and quantities. On the other hand, changing prices and scaling the production up or down in a labour-intensive line of business should happen rather swiftly.

The negative results of the VATT study affected the opinions of the taxation working group and the new government. The government agreed that the VAT rate on hairdressing and some other consumer-oriented services will be raised to the standard rate of 23 percent in 2012.

The reduction of the VAT rate on hotels in Germany in 2010 (IFO)

The reform
On 1 January 2010, the VAT rate on hotels, guesthouses, and campsites in Germany was reduced from the standard rate of 19 percent to a reduced rate of 7 percent. This step was taken in the context of the 'Growth Acceleration Law' (Gesetz zur Beschleunigung des Wirtschaftswachstums), which was enacted by the German federal

government in December 2009 and became effective in January 2010. This economic stimulus package aimed to design various tax policy measures in order to stimulate growth in Germany in the aftermath of the financial and economic crisis. As such, it was the last of three similar stimulus packages that had been launched within one year. The package contained various measures to relieve the tax burden on households and companies in a direct and rapid way. The programme was decided in the coalition talks between the ruling parties, CDU and FDP, shortly after the federal elections in fall 2009. As a result of this dense timing, the change in the VAT rate for hotel services became effective very shortly after it had been announced for the first time and posed somewhat of a surprise to the German public.

Background

Accommodation services are labour intensive services traded in local markets. The market structure is not straightforward due to local limitation of one hotel's market and a very specific structure of supply. Unfortunately, there exists only limited research on market concentration and price elasticities in the hotel industry, especially for Germany. A rough estimate of the overall market concentration in Germany gives a Herfindahl-Hirschmann Index of 0.01 percent.[190] For the UK, Burke and Hanley (2009) find that 'Our concentration measure reports high values in the Tobacco industry and Public Utilities (16 and 40 respectively) and low values are reported for concentration in the Hotel sector and other Services (55 and 93 respectively).' However, this may give a biased picture of the actual market structure as the market for accommodation services is locally limited to a high degree, implying that single hotels dispose of considerable market power. As a further specific characteristic of the hotel industry, the supply of rooms is fixed in the short and medium term. From these facts one presumes a relatively low price elasticity of supply in this period. Indeed, Hiemstra and Ismail (2001) find a low price elasticity of supply for lodging services of 0.11 for the US. From the consumer's point of view, the sensitivity to price changes in lodging services is also determined by their local provision and the amount of competitors in a specified region, especially at certain business centres or typical holiday resorts. Furthermore, there exist no close substitutes to accommodation services. Thus, if accommodation is needed anyway, price elasticity should be rather low. On the other hand, accommodation is a kind of luxury good for many consumers, implying a relatively high general price elasticity of demand.[191] Taken together, the facts are not clear-cut but they suggest that the pass-through of a VAT reduction in the hotel industry is likely to

[190] The figure is based on firms turnover provided by the German Federal Statistical Office.
[191] Hiemstra and Ismail (1992) find a price elasticity of demand for hotels services of -0.44 for the US.

be low, given a relatively competitive market and a low price elasticity of supply in the short and medium term.

Evaluation
This study aims to evaluate the reduction of the VAT rate on hotel services and to shed some light on the question of the incidence of this particular piece of tax policy. Some implications of the short timespan between the announcement of the policy measure and its coming into effect are that we do not expect to find any advance price changes and that the probability of finding a full (or high) pass-through directly after the introduction is low. Moreover, the study will naturally focus on a relatively short-term perspective and might omit long-term effects of the reduction in the VAT rate as the change took place only recently. The study proceeds in three steps: First, a bird's eye view will be given by looking at macroeconomic data on consumption expenditures on hotels. Second, deeper insights on the extent and the timing[192] of the pass-through are obtained from data on the consumer price index, disaggregated for hotel services. Third, the Ifo business survey, which reports firms' expectations of future changes in their own prices is evaluated.

To start with, we look at aggregate data on *consumption expenditures* on accommodation services from the German Federal Statistical Office. Ceteris paribus, if the twelve percentage point decrease in the VAT rate on accommodation services had been fully passed through on the exact date it came into effect, the hotel price would have fallen by 10.08 percent as of 1 January 2010.[193] Table 8.6 in the Annex shows the nominal and price-adjusted series, as well as the deflator and the resulting inflation rate for the period from 2005 to 2010. Apparently, the price adjustment in 2010 for hotel services has been relatively low, which might be due to the reduction of the VAT rate for accommodation services in 2010. This indicates that only a small share of the tax cut has been passed on to consumers, since the VAT rate decreased by 12 percentage points, while hotel prices remained almost unchanged. Since overall inflation was 2.0 percent in 2010, a rough estimate of the pass-through would be 20 percent within the 12 months following the tax cut.

For a more detailed analysis, we turn to monthly data of the *Harmonised Index of Consumer Prices* (HICP), which is provided by the Federal Statistical Office since

[192] For evidence on variations in timing of adaptation to new VAT rates in Germany, see Deutsche Bundesbank (2008).
[193] The full pass-through of the tax cut of 10.08 percent is calculated as ((1+0.07)/(1+0.19))*100 -100, where 0.07 reflects the new VAT rate and 0.19 the old one.

1997. Graphical inspection of the data as shown in Figures F.3 to F.8 in Annex F points at a slow, partial pass-through of the VAT rate reduction. In order to obtain precise estimates of the pass-through and to be able to control for other factors, we pursue an empirical strategy similar to that of Carbonnier (2007). Basically, we conduct a difference-in-difference estimation, comparing price developments before and after the VAT reduction for accommodation services and the control group, which is the HICP excluding energy and accommodation services. Additionally controling for production costs, we are able to estimate the isolated incidence of the VAT change on consumer prices. Summing up the results presented in Table F.6 in the Annex, the reduction of the VAT rate had only small effects in the first six months after it came into effect, namely in February and April. From the second half of 2010 on, the tax cut contributed to a slowed growth of accommodation prices compared to the rest of the economy. This trend became even more pronounced in the first months of 2011 and continues until recently, such that the process of pass-through does not seem to have ended at the time of this study.[194] Our estimates suggest that the aggregated pass-through after 12 months is 20.7 percent and the aggregated pass-through after 15 months amounts to 28.4 percent.[195]

Finally, these findings are contrasted with observations from the monthly micro-data provided by the *Ifo Business Survey* in the Services. The monthly survey data allow for comparisons between the hotel, guestroom, and campsites segment (HGC) and the total service sector as a control group. Firms participating in the survey report whether they expect their own prices to increase, decrease or remain constant in the near future.We therefore follow a simple logic: if one could observe a significant increase in the number of HGC companies planning to decrease their prices after January 2010, this could potentially be related to a price adjustment in response to the VAT reduction. However, we find that the data do not confirm the earlier findings and do not point at a significant pass-through of the VAT reduction in 2010, at least not by the majority of participating companies.[196] Although a significant price drop was expected directly after the implementation of the tax cut, these expectations were corrected rapidly and turned in the opposite direction during the year 2010. If expectations are built for a relatively

[194] Simpler estimations without the limitation of available observations indicate that the significant VAT effect even continues until June 2011. We conducted test regressions including the French accommodation price index to rule out that this is some general trend in hotel prices that should not be attributed to the VAT reform. The results presented here proved robust against this hypothesis.

[195] Note that these figures present something like an upper bound of our estimates, since price adaptions were obviously relatively pronounced precisely in December 2010 and in March 2011, yielding high coefficients in these months.

[196] The monthly trends of anticipated price changes are depicted in Figures F.9 and F.10 in Annex F.

long horizon, these findings might indicate an end of the unfinished adaption process that was identified in the consumer price data.

Conclusions

The analysis shows that the reduction of the VAT rate on hotels from 19 percent to 7 percent, that became effective in Germany in January 2010, was passed on to consumers to a limited extent only. The theoretically possible price drop in the case of a 100-percent pass-through of this tax cut could have been quite substantial at 10.08 percent. We find that pass-through did not happen instantaneously but was extended over a long period and seems to continue until the present. The total pass-through of the tax relief is estimated to be 28.4 percent after 15 months. These findings are in line with our theoretical expectations that pass-through would be rather low and that it would not happen immediately after the reform, since it was announced at very short notice.

Aggregate data on consumer expenditure suggest a low shift of the tax cut of only 20 percent. The much more detailed picture provided by the monthly consumer price index shows that the reduction of the VAT rate indeed had only small effects in the first six months after it came into effect. However, from the second half of 2010 on, the tax cut contributed to a notably slower growth of accommodation prices as compared to the rest of the economy. This development goes on in the first months of 2011 and seems to continue until June 2011. However, survey data stating the expectations of the hotel sector regarding own future price changes do not indicate any pass-through effects of the reform. This can probably be attributed to the relatively small size of the effect and its spread over a long period.

Considering the political aim of the tax reform to increase competitiveness of German hotels against competitors in neighbouring countries, the policy measure was probably not successful as prices did not decrease to large extent. However, developments do not seem to have finished by the time of this report.[197]

Our findings are in line with theoretical considerations. The case study shows that the pass-through of the tax cut is very modest. Assuming perfect competition in the hotel industry, following the arguments in the introduction, and applying the low supply elasticity of 0.11 and the demand elasticity for the US of -0.44 one could expect a pass-

[197] There is an additional point worth mentioning in the context of the incidence of this tax reform. A considerable fraction of hotel guests in Germany are employees of firms which are entitled to deduct the incurred input tax. To these customers changes in the VAT rate make no difference as they will be able to deduct the costs anyway.

through of 20 percent of the tax cut. The estimated effects of the reform in Germany imply a similar magnitude. Also the long duration of pass-through can be explained by the stickiness of prices in the service sector in Germany, as Table 8.3 of the report states.

The reduction of the VAT rate on restaurants in France in 2009 (Alain Trannoy)

Background

This case study deals with a VAT rate change for restaurants in France in the year 2009. In most of the decade before the measure, there were three different VAT regimes depending on the type of restaurant service delivered to the consumer. First, the standard rate of 19.6 percent was applied to restaurants, including beverages, when the customer eats and drinks on the premises. The reduced rate of 5.5 percent was applied to take-away food and to food served by corporate canteens. When a restaurant offered both types of food (food eaten on the premises and take-away food) it should charge a different price. If not, which was often the case, the restaurateur pocketed a 14 percent additional margin.

The VAT argument between the union of restaurateurs and the successive governments started as early as the eighties when the argument of an unfair competition was put forward between big corporations selling take-away foods and small restaurants serving food on the premises. According to the restaurateur unions, this 'unfair' tax treatment was explaining the decrease of the market share of the traditional restaurants. The argument was not fully compelling since the standard rate of 19.6 percent was applied on food on the premises in the fast-food chains as well. However, it is still true that there has been a marked decline in the market share of traditional restaurants. According to the Houel Report (2010) established with INSEE data, the turnover of traditional restaurants decreased by 10 percent from 1995 to 2009, while the turnover increased by 30 percent in the same period in fast-food restaurants in real terms.

From the 1st July 2004 up to the 1st July 2009 restaurants received a subsidy for each employed person. The total costs of the subsidy over this period amounted to €2.7 billion (See Bazen and Joutard (2011) for an appraisal). In July 2008, the European Commission presented a proposal for a Directive to amend the VAT Directive as regards the rules on VAT rates for labor-intensive services. On the 20th January 2009 President Sarkozy obtained a pre-agreement between France and Germany concerning the list of services among which restaurants were included. The finance ministers

decided to put the restaurants on the list of the sectors that could benefit from a reduced rate of the VAT on the 10th March 2009.

The reform

The reform reduced the VAT rate on restaurants from 19.6 percent to 5.5 percent. Alcoholic beverages are not affected and still taxed at 19.6 percent. For take-away meals and soft drinks the VAT rate of 5.5 percent remained unchanged. The French government gathered the representatives of the business associations of the sector in what has been called 'les Etats généraux de la restauration'. The talks were about the compensations in terms of tax shifting to consumers, employment and investment that these representatives were willing to recommend to their affiliates. This commitment was denominated the 'Contrat d'Avenir', the Future Contract, even if it did not have the legal status of a contract. Furthermore, more than one half of the restaurateurs were not affiliated to a business association. This commitment was signed on 28th April 2009. Basically, the idea of the agreement was that the cake would be divided into three equal slices, one third for the consumers, one third for the employees, one third for investment. Therefore, the degree of VAT shifting on consumer prices should conform to this target of one third. Article 2 of this agreement indicated how this commitment had to be respected. Shops were not free to organise how they wanted to shift the tax cut to customer prices. Restaurants committed to fully shift the decrease in VAT to at least 7 over 10 of a list of products, that is, a decrease in price of 11.8 percent (=1-1.055/1.196). The restaurant should further show the former and new prices of the products side by side on the menu.

The agreement was signed by business associations which represent no more than half of the restaurateurs. It is quite natural to assume that affiliated restaurateurs would be more respectful towards the agreement than unaffiliated restaurateurs. Unaffiliated restaurateurs can be tempted to free ride affiliated restaurateurs. Even in the case where we assume that affiliated restaurants followed the commitment, we should observe tax shifting of less than one third. Although, this reasoning may reflect what happened just after the tax cut, it is not fully convincing in the long run. It does not integrate the forces of competition, the mobility of customers, and the price elasticity of demand. All these forces should be measured at a local level. We can imagine that, ex ante, each restaurateur sets up his menu price to maximise profit. Costs conditions have changed with the VAT cut. The rational restaurateur will adjust his price accordingly to maximise profit.

Evaluation

The evaluation goes through the evolution of the consumer price index of restaurants and is based on a comparison of consumer price indices and on a more sophisticated econometric evaluation. Annex G contains more information and technical explanations. The comparison of the consumer price index for restaurants and cafés in France with its neighbours of the Euro zone shows a clear drop of the price index in the first two months following the reform and a flatter price growth afterwards compared to the price growth before the tax cut. The change in the trend growth implies that tax shifting did not come to a halt immediately after the reform. The comparison of the price index for restaurants and cafés with the price index of canteens, which were not affected by a change of the VAT rate and have a very similar cost structure, also shows a different development shortly after the reform, implying that the VAT reform dampened price growth.

The econometric evaluation is based on regressions for different horizons as the inspection of the price index suggests the full reflection of the VAT cut in prices may take several months. The most accurate model takes into account a horizon of 18 months. The regression takes also the cost structure of the restaurant sector into account, reflected by a totat cost index. The strongest impact on prices happened immediately, more than 40 percent of the whole price effect, but also in the following months important price effects can be determined. For the longest window we receive a pass-through of the VAT rate change of 44.7 percent, which implies an immediate pass-through of about 19 percent.

Conclusions

The analysis in this subsection shows that the VAT reform for restaurants in France led to a degree of tax shifting of almost 45 percent a year and a half after the measure was implemented. The strongest impact happened immediately, which is also visible in the price index for restaurants and cafés. Interestingly, this under-shifting represents an over-shifting with respect to the target of one third set up by the government. This result could not be anticipated when we know the conditions under which this reform was decided. Lobbying from restaurant professionals has convinced the French government to reduce the VAT rate on restaurants. At the end of the day, almost half of the decrease of the tax has been shifted to consumers. An economist is tempted to explain this statement of facts by the forces of competition.

Conclusions from case studies

The case studies present results of VAT rate reforms in Finland, Germany and France. In all these cases taxes on specific and labour intensive goods were reduced. The aim was to boost demand and as a consequence labour demand. Tax rate reductions are very pronounced. The estimated pass-through of the VAT rate decreases vary significantly for the different goods. One can conclude the following:

- In all cases markets seem to be close to perfectly competitive, the result should therefore depend on demand and supply reactions.
- Pass-through of VAT rate changes ranges from about 15 percent to full pass-through.
- Like one would expect from the assumption of a perfectly competitive environment, overshifting was observed in neither case.
- For restaurants, hairdressing and hotels supply restrictions (at least in the short- and medium term) seem to exist, for foodstuff no such restrictions seem to prevail.
- Results confirm findings of Copenhagen Economics (2007) and Carbonnier (2005), implying that country effects seem to be of a minor importance.

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Annex F. Details of the analysis for hotels in Germany

Consumption expenditure

Aggregate data on consumption expenditure can be obtained from the German Federal Statistical Office (Fachserie 18, series 1.2).[198] The national account series contains detailed figures on aggregate private consumption expenditures in Germany on an annual basis.[199] For our purposes, we look at the expenditures on accommodation services.[200] Division of the nominal series by the price-adjusted series yields the deflator, from which one can infer the inflation rate for accommodation services. Table F.1 shows the nominal and price-adjusted series, as well as the deflator and the resulting inflation rate for the period from 2005 to 2010. Apparently the inflation rate for accommodation services declined to 0.2 percent in 2010, indicating that it was low in 2010 as compared to previous periods. The development of the deflator and inflation rate for consumption expenditures on accommodation are illustrated in Figures F.1 and F.2. Additionally, Figure F.2 shows the inflation rate of aggregated consumption expenditure in Germany as well as the inflation rate of consumption expenditure on catering services during the period 1992 to 2010.

Table F.1: National accounts data on accommodation consumption (2005-2010)

	2005	2006	2007	2008	2009	2010
in current prices (*bn. EUR*)	10.59	11.5	12.31	12.81	12.48	13.14
price-adjusted (2000=100)	100.37	107	112.3	115.13	109.83	115.46
deflator (2000=100)	109.79	111.84	114.07	115.78	118.24	118.42
inflation rate	1.1%	1.9%	2.0%	1.5%	2.1%	0.2%

Source: German Federal Statistical Office, calculations of the ifo Institute

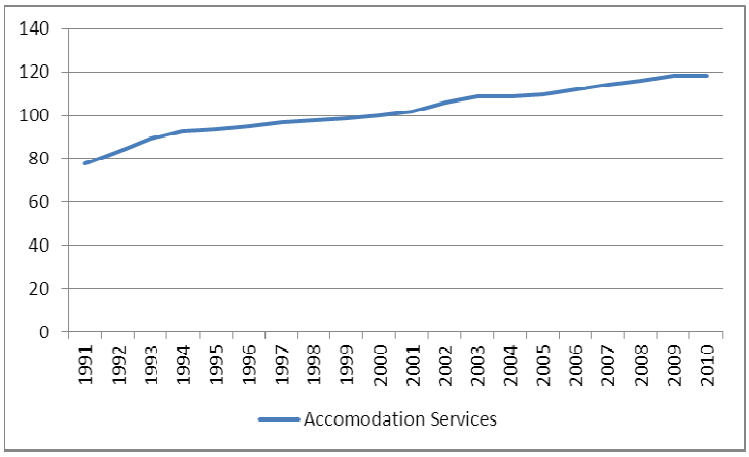
[198] Note, that the subcategory accommodation services was almost entirely affected by the VAT change. According to Elbel und Werner (2008) the average VAT rate in COICOP 11.2 before the change was 18.5 percent (compared to the nominal rate of 19 percent), with youth hostels and some similar services being fully exempted. Thus, all firms subject to the full rate before the tax reform were affected by the VAT reduction.

[199] Expenditures are reported for a huge variety of goods and services both at current prices and price adjusted. The goods and services are classified according to the international 'Classification of Individual Consumption by Purpose' (COICOP) and therefore provide the expenditures on accommodation services in nominal and real terms for the period from 1991 to 2010.

[200] Note, that the subcategory accommodation services was almost entirely affected by the VAT change. According to Elbel und Werner (2008) the average VAT rate in COICOP 11.2 before the change was 18.5 percent (compared to the nominal rate of 19 percent), with youth hostels and some similar services being fully exempted. Thus, all firms subject to the full rate before the tax reform were affected by the VAT reduction.

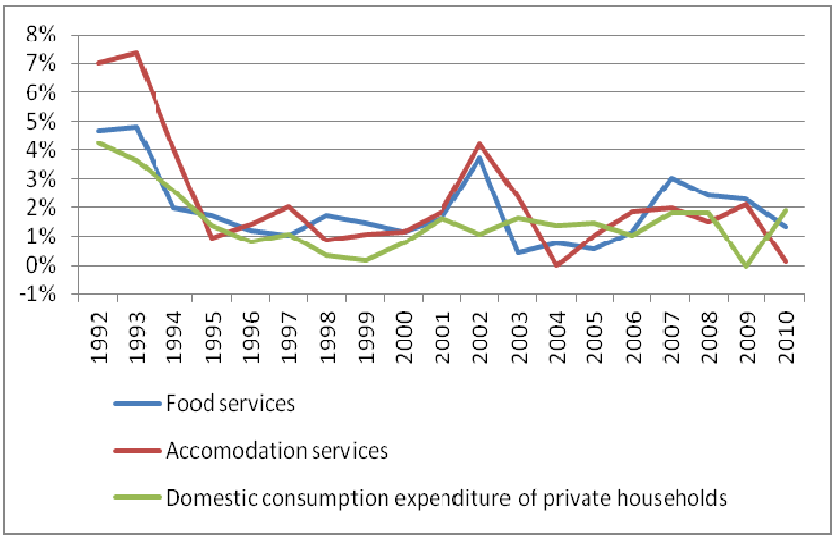
Except for the years after the German Reunification, aggregated inflation has predominantly been between 1.0 and 1.5 percent. While the inflation rate for general consumption expenditures fell to 0.2 percent in 2009, the price level of consumption expenditures on accommodation services reached 2.0 percent. However, in 2010 price growth of accommodation services fell to 0.2 percent, while aggregated inflation rose again to 2.0 percent. Note in this context that average inflation – especially between 2008 and 2010 - is strongly driven by oil-price jumps and the serious economic downturn. Nevertheless, the price adjustment in 2010 for hotel services has been relatively low, which might be due to the reduction of the VAT rate for accommodation services in 2010. This indicates that only a small share of the tax cut has been passed on to consumers, since the VAT rate decreased by 12 percentage points, while hotel prices remained almost unchanged. Since overall inflation was 2.0 percent in 2010, a rough estimate of the pass-through would be 20 percent within the 12 months following the tax cut.

Figure F.1: Deflator of private consumption expenditures on accommodation services 1991 – 2010 (2000=100)



Source: German Federal Statistical Office, calculations of the ifo Institute

Figure F.2: Price changes of private consumption expenditures 1992 – 2010 (in %)



Source: German Federal Statistical Office, calculations of the ifo Institute

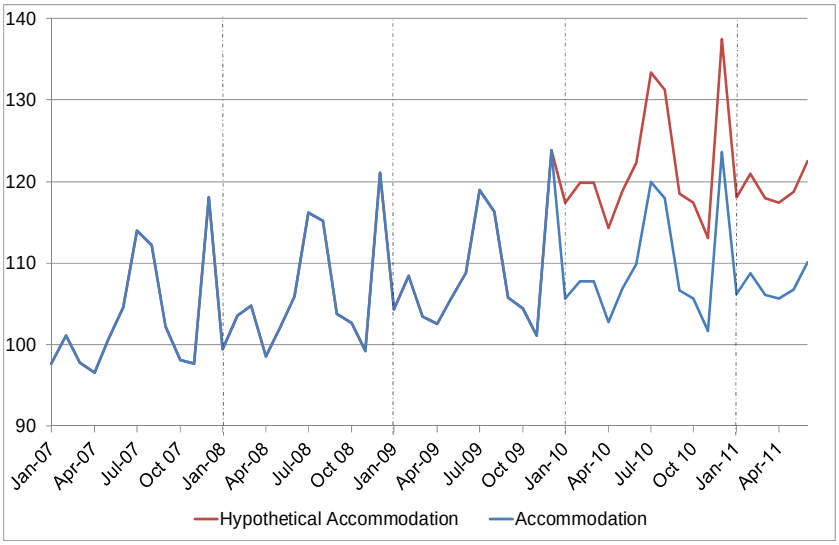
Consumer Price Index

For the detailed analysis, we rely on the Harmonised Index of Consumer Prices (HICP) which is provided by the Federal Statistical Office since 1997. The HICP is used to measure inflation in the context of international, mostly inner-European comparisons. Its calculation reflects the development of prices in the individual states based on national consumption patterns.[201]

To start with a little thought experiment, Figure F.3 shows the actual development of the price of accommodation services compared to a hypothetical price index that is calculated under the assumption of a constant VAT rate of 19 percent. Accordingly, there is no evidence for a full pass-through in January 2010. However, the price jump from January 2009 to January 2010 seems to be notably smaller than in previous years and the trend of the actual line flattens out a bit from January 2010 onwards, possibly pointing at a slow pass-through over time.

[201] Technically, the HICP is calculated as a chain linking Laspeyres price index. The index weights are generally updated at five-year intervals, with the current weights being based on the consumption structure of the year 2005. The index is based on the international 'Classification of Individual Consumption by Purpose' (COICOP), and the prices collected for the German CPI are also used to calculate the German HICP. The part of the index that is of particular interest for this study is the COICOP 11.2, 'accommodation services'.

Figure F.3: Actual and Hypothetical Price of Accommodation Services, 2008 – 2011 (2005=100)



Source: German Federal Statistical Office, calculations of the ifo Institute

Illustrating things further, Figure F.4 depicts the development of the overall HICP, the HICP excluding Energy and Accommodation Services,[202] and the single index of accommodation services from January 1995 to June 2011. Not surprisingly, the index for accommodation services exhibits a very strong seasonal pattern, making it difficult to analyse.[203] To help visual inspection, Figure F.5 provides a 12-month moving average smoothed versions of the time series, zoomed into the period July 2008 – June 2011. The figures suggest a lagged pass-through of the tax relief over the 18 months following the introduction. This impression is further confirmed by Figure F.6, which depicts the year-on-year growth rates from July 2008 – June 2011 for both time series. Accommodation price growth lags well behind total consumer price growth towards the

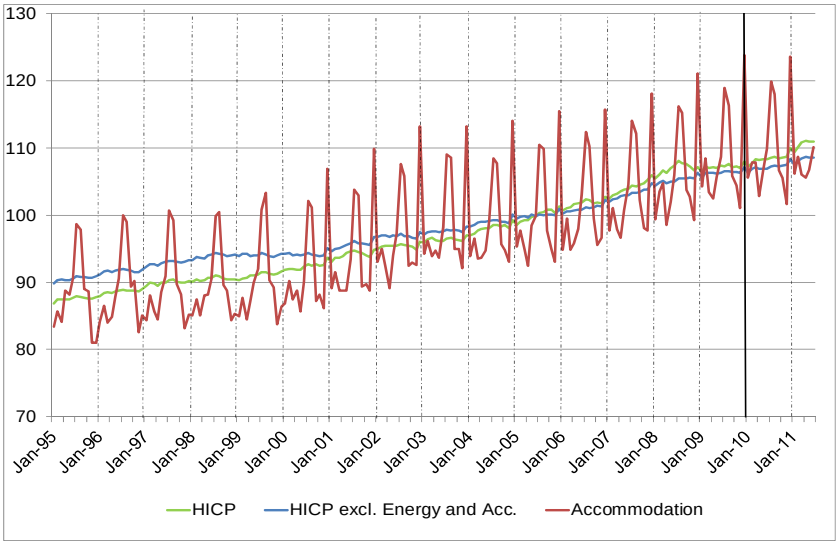
[202] Following the examples of Carare and Danninger (2008) or Carbonnier (2007), we use the weight coefficients of the HICP and calculate a modified version, excluding the COICOP categories related to energy (equivalent to the "HICP all items excluding energy" provided by EUROSTAT and excluding the category Accommodation Services). This modified index is also used in the estimations in the remainder of this study.

[203] Note, that there is structural change in the seasonal pattern of the accommodation services index from January 2001 on, which is obvious in Figure F.4. This is due to a change in the collection scheme of prices at the German Statistical Office at that point in time. This poses no problem for the empirical analysis in this study since it only relies on values after 2001.

end of the time series, with this development apparently coinciding with the introduction of the lower VAT rate for hotels.

Figures F.7 and F.8 compare the seasonal patterns of the accommodation price index (Figure F.7) and its year-on-year growth rate (Figure F.8), respectively, for several consecutive years.[204] In general the growth rates in the last period are consistently lower than in previous years. In particular, there is a sharp drop in January and February 2010, followed by a relatively constant trend until the most recent data point. However, the year-on-year growth rate turns negative only in February 2010 and then again in December 2010. Again, these observations point at a slow, partial pass-through of the VAT rate reduction, which did not happen at once, but was (and possibly still is) distributed over time.

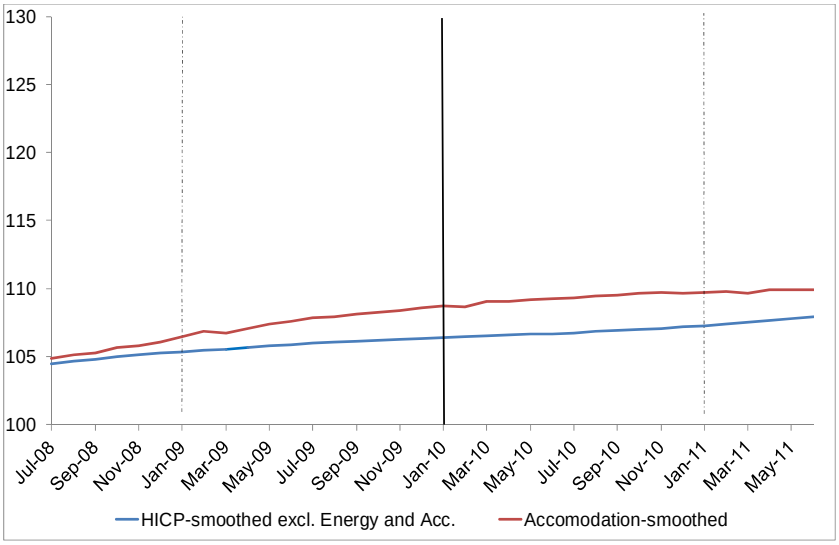
Figure F.4: HICP, HICP excl. Energy and Acc., and Accommodation Services, 1995 – 2011 (2005=100)



Source: German Federal Statistical Office, calculations of the ifo Institute

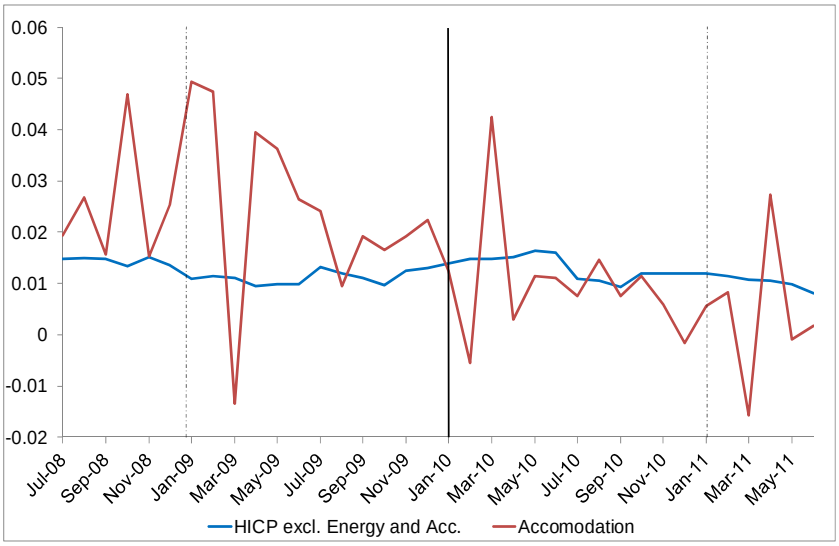
[204] Note that the irregular movements in March and April are due to varying timing of the Easter weekend which goes hand in hand with two week school holidays in Germany. For example, the rather extreme spikes in the growth rates in March 2008 and 2009 (in different directions) coincide with Good Friday being on 21 March in 2008, whereas it was on 10 April in 2009.

Figure F.5: HICP excl. Energy and Acc. and Accommodation Services, seasonally adjusted, July 2008 – June 2011 (2005=100)



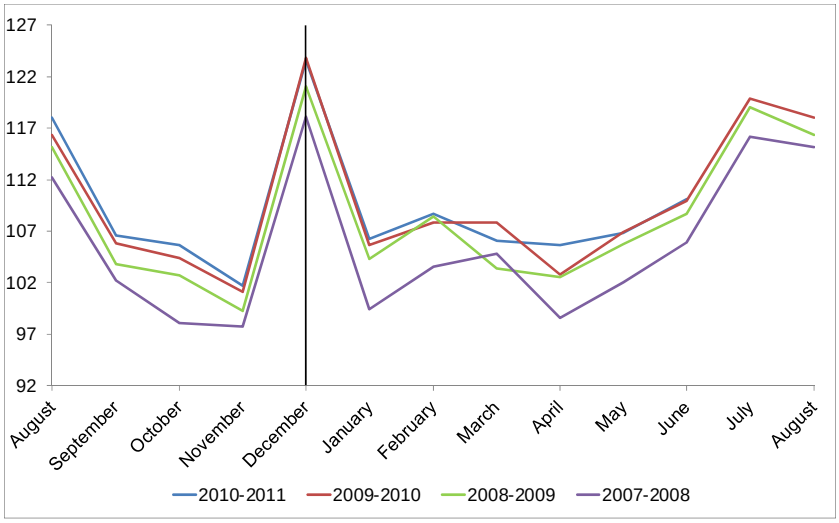
Source: German Federal Statistical Office, calculations of the ifo Institute

Figure F.6: HICP excl. Energy and Acc. and Accommodation Services, year on year growth rates, July 2008 – June 2011



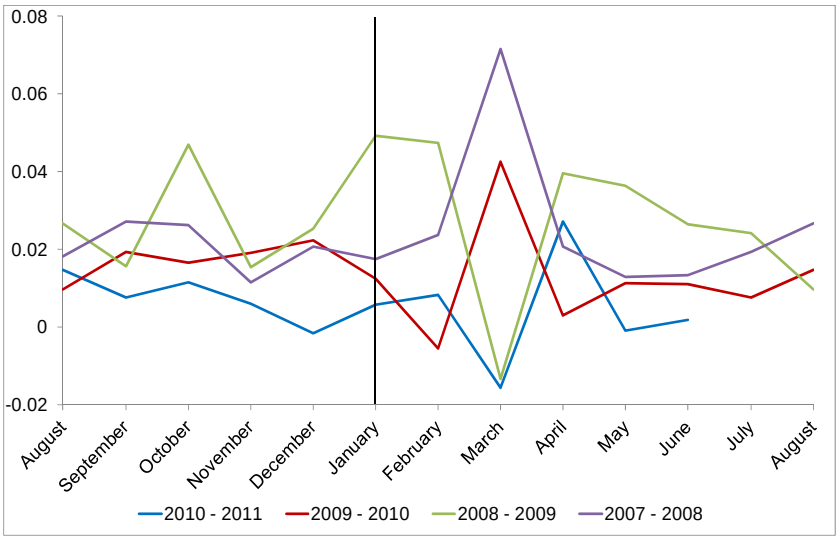
Source: German Federal Statistical Office, calculations of the ifo Institute

Figure F.7: Year to Year Comparison of Accommodation Services (2005=100)



Source: German Federal Statistical Office, calculations of the ifo Institute

Figure F.8: Year to Year Comparison of Accommodation Services, year on year growth



Source: German Federal Statistical Office, calculations of the ifo Institute

Table F.2 provides the annual averages of the HICP excluding energy and accommodation services and Accommodation Services, along with the corresponding growth rates. Since energy price movements are relatively volatile, we prefer the HICP excluding energy and accommodation over the HICP as the relevant control group. The average price of accommodation services rose by 2.6 percent from 2007 to 2008 and by another 2.4 points from 2008 to 2009, despite the crisis, and the HICP excluding energy and accommodation services by a very moderate rate of 1.1 percent in from 2008 to 2009. In comparison to that, the 2010 growth is 1.0 percent points for hotel prices and 0.8 for the control index. These figures do not at all point at a pass-through of the VAT reduction in 2010, compared to 2009. However, a comparison of the averaged indices for 18 months before and 18 months after the VAT reform gives an inflation-corrected decrease in hotel prices of 1.5 percent after the tax cut. This number implies a preliminary estimate of the average pass-through of 14.5 percent of the tax cut within 1.5 years.

Table F.2: Annual Averages 2006 – 2010

	HICP exclusive Energy and Acc.		**Accommocation Services**	
	2005=100	Growth rate	2005=100	Growth rate
2006	100.99		101.33	
2007	103.15	0,021	103.39	0,020
2008	105.24	0,020	106.03	0,026
2009	106.35	0,011	108.62	0,024
2010	107.18	0,008	109.68	0,010
Jul 08 – Dec 09	106.11		108.98	
Jan 10 – Jun 11	107.56	0,014	108.87	-0,001

Source: German Federal Statistical Office, calculations of the ifo Institute

To obtain more precise estimates of the pass-through and to be able to control for other factors, we pursue an empirical strategy similar to that of Carbonnier (2007). We conduct a difference-in-difference estimation, comparing price developments before and after the VAT reduction for accommodation services and the control group, which is the HICP excluding energy and accommodation services. The regressions control for production cost, which is proxied for by the producer price indices for water and for electricity, respectively. Furthermore, the labour cost index for the hotel and restaurant industry is included as an important part of production cost in a labour-intensive

business.[205] Including these measures in our regressions allows us to estimate the isolated incidence of the VAT change on consumer prices, keeping the costs of production constant.[206] As the descriptive analysis above already indicated, price changes attributable to the tax cut are not easy to identify empirically. This is on the one hand due to the fact that the pass-through was apparently not very pronounced. On the other hand, it is a consequence of the strong seasonal pattern in the data. To deal with the latter, we use monthly year-on-year inflation rates in our analysis and control for seasonal effects like the timing of Easter. The effect of the VAT cut and its timing are accounted for by dummy variables in the respective months after the reform. We exploit data availability of all covariates from January 2001 to March 2011 to obtain precise estimates despite of the presumably small effect. The results are presented in Table F.3. Column I gives a clear picture of the timing of the price adaption to the new VAT rate. An example should help with the interpretation of the numbers in Table F.3: The significantly negative coefficient on VAT in February 2010 means that - because of the VAT reduction - price growth from February 09 to February 10 was on average 1.9 percentage points lower than the same growth rate for previous periods, accounting for inflation and keeping production cost constant. Thus, within the first half of 2010, the VAT cut dampened year-on-year inflation significantly only in February and April. From September 2010 on, the VAT reduction permanently leads to significantly lower inflation rates.[207] This pattern is in line with what one might expect from inspection of Figure F.5. Column II reports the same estimation, reporting the average VAT effect for each quarter instead of each month. Finally, column III reports the average effect for 2010 and for the first quarter of 2011. According to our estimates, the aggregated pass-through after 12 months is 20.7 percent and the aggregated pass-through after 15 months is 28.4 percent.

[205] All three (sub-)indices are provided by the German Federal Statistical Office.

[206] It is possible that part of the VAT rate change was also passed on to the factor labour. Comparative inspection of the labour cost index for the hotel and restaurant industry and the labour cost index for the entire service sector reveals that both indices increased in an almost identical way after the reform, except for the first quarter of 2010 when the index for the hotel and restaurant sector rose relatively stronger. However, given the short timespan between the announcement of the reform and its coming into effect, we consider this increase in labour costs to be independent of the VAT reform, especially since wages in the German hotel sector are subject to unionized bargaining at the state level. As the object of this study and of this chapter is the effect of a VAT on consumer prices, we do not look further into the incidence of the VAT rate change at the market for labour.

[207] The monthly VAT coefficients have to be interpreted cautiously. Inflation rates do not necessarily decline from month to month, but the overall VAT-induced price change with respect to the same month of the previous year remains significantly negative. This is also reflected in the varying values of coefficients and is a result of the pronounced seasonal movements in accommodation prices.

Table F.3: Estimated accommodation price responses to the VAT reduction

	I		II		III	
VAT Jan 2010	-0.002	(-0.64)				
VAT Feb 2010	-0.019	(-6.73)				
VAT Mar 2010	0.008	(0.79)				
VAT Apr 2010	-0.031	(-3.03)				
VAT May 2010	-0.003	(-1.19)				
VAT Jun 2010	-0.002	(-0.81)				
VAT Jul 2010	-0.008	(-3.63)				
VAT Aug 2010	-0.002	(-0.97)				
VAT Sep 2010	-0.009	(-4.52)				
VAT Oct 2010	-0.008	(-3.33)				
VAT Nov 2010	-0.014	(-7.53)				
VAT Dec 2010	-0.021	(-10.34)				
VAT Jan 2011	-0.015	(-5.75)				
VAT Feb 2011	-0.012	(-5.6)				
VAT Mar 2011	-0.037	(-19.78)				
VAT Q1 2010			-0.004	(-0.46)		
VAT Q2 2010			-0.011	(-1.47)		
VAT Q3 2010			-0.006	(-2.28)		
VAT Q4 2010			-0.014	(-3.74)		
VAT Q1 2011			-0.021	(-2.97)	-0.021	(-3)
VAT 2010					-0.009	(-2.38)
HICP excl. En. a. Acc.	0.436	(2.00)	0.463	(2.18)	0.443	(2.1)
Obs.		123		123		123
R^2		0.365		0.322		0.316

Bold: Significant at min. 10% level. t-values in parenthesis, based on heteroscedasticity robust standard errors.
Dependent Variable: Monthly year-on-year inflation rate for Accommodation Services. All estimations control for seasonal effects, producer's electricity-, water-, and labour-cost indices.

Ifo Business Survey

The findings are contrasted with observations from the monthly micro-data provided by the Ifo Business Survey in the Services. This monthly survey among the business-oriented segments of the German service sector consists of more than 2 500 company responses, which comprise a variety of service sub-segments, such as hotel and gastronomy, transportation, telecommunication, etc. The Ifo Business Survey data allow for comparisons between the hotel, guestroom, and campsites segment (HGC)

and the total service sector as a control group. Firms participating in the survey provide, amongst others, information about their expectations with regard to future changes in their own prices. More precisely, firms report whether they expect their own prices to increase, decrease or remain constant in the near future. This enables us to analyse potential price adjustments in the HGC segment in response to the reduction in the corresponding VAT rate. For the available period from January 2009 to December 2010 Figure F.9 shows the monthly trend of price changes that were anticipated by the around 150 HGC companies participating in the Ifo Business Survey. Analogously, Figure F.10 depicts the comparable price development assessed by the whole German service sector for the same period.

Figure F.9 shows that around 19 percent of the surveyed HGC companies expected a price decrease at the time of the VAT cut, well above the 11 percent in December 2009. Yet the price-reducing signal caused by the VAT reduction disappeared rapidly: the share started to decline continuously from February 2010 on and reached a negligible level of over 2 percent in August 2010. In comparison, the share of responding HGC companies which predicted no price adjustment (despite the tax reduction) has been predominant and grew from approximately 68 percent to 90 percent in the first half of 2010. On the other hand, the number of HGC companies who foresee a price increase started to grow strongly in June 2010 until it reached 30 percent in December 2010. This corresponds to the rapid decrease in the share of HGC firms expecting no changes in prices in that period. This expected price development is likely to be led by the general increase in demand stimulated by economic upswing in Germany. However, it does not correspond very well to the figures of the consumer price index shown above. In contrast, companies seem to increasingly have expected price growth precisely for that period in which actual price growth in the hotel sector started to slow down.

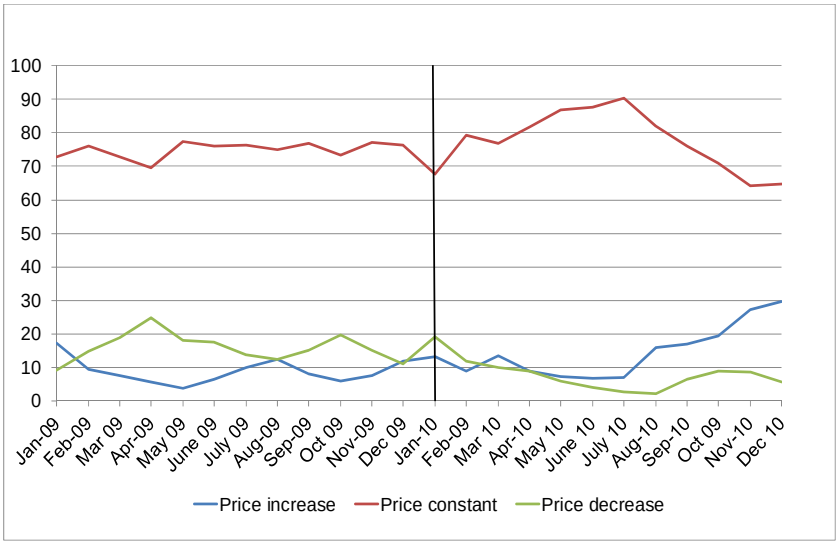
In comparison, the patterns of expected price development have been much less volatile for the entire service sector (see Figure F.10) in the same period. The dominant share of German service firms which foresaw no price changes stayed stable, ranging from 75 percent to 83 percent in the investigated period. There is no reflection of the price-decreasing effect of the VAT reduction for the HGC segment in the general price prediction of the whole service sector.[208] Analogous to the HGC case, a continued growth of German service firms which anticipate the price increase was observed in the second half of 2010, while the share of those service firms expecting a price decrease remained rather low in the same period of time. In this case, the expected price trend is

[208] The share of HGC companies in the survey sample is quite minor at around 6 percent.

indeed reflected in the pronounced increase in the HICP from the third quarter 2010 onwards.

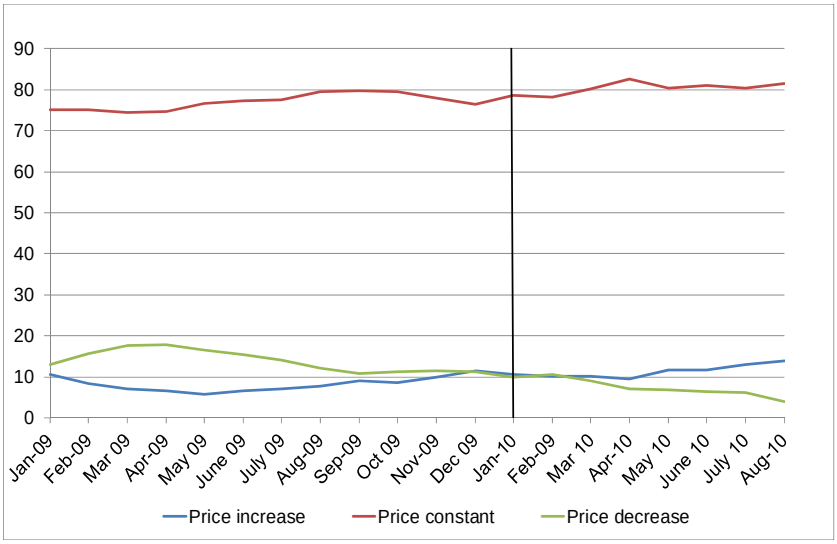
Concluding, data on expected price changes in the hotel sector do not confirm the earlier findings and do not point at a significant pass-through of the VAT reduction in 2010, at least not by the majority of participating companies.

Figure F.9: Ifo Business Survey, HGC Segment, January 2009 – December 2010



Source: ifo Institute

Figure F.10: Ifo Business Survey, Service Sector, January 2009 – December 2010



Source: ifo Institute

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Annex G. Details of the analysis for restaurants in France

The decrease of the VAT rate from 19.6 percent to 5.5 percent implies a decrease of the price index for restaurants of 11.8 percent. Since not all products whose price is reported to build the restaurant price index were impacted by the decrease in VAT (VAT rates for alcohol sales, take-away meals and soft drinks were not affected) a full shift of the tax decrease would imply a lower impact on the index. Using the Houel report (2009) we find that the maximum rate of shifting to consumers would be 8.7 percent.

On 1st July 2009, a second shock besides the VAT rate reduction occurred simultaneously for the French restaurateurs, namely the cancellation of the labour subsidy. Then the true net cost for the state of both fiscal shocks is not €3 billion (VAT reduction) but €2.6 billion for the restaurant sector itself. We correct the estimation of the degree of pass-through as follows. Suppose that we obtain 40 percent for the tax shifting rate. It means that the consumers get 40 percent of €3 billion, that is, € 1.2 billion. Since the restaurateurs benefited from a net reduction of taxes of €2.6 billion, the true share of consumers of this fiscal cake can be revised upward to 46 percent. At the end of the computation we will apply the coefficient of 1.154 to obtain a final evaluation of the pass-through.[209]

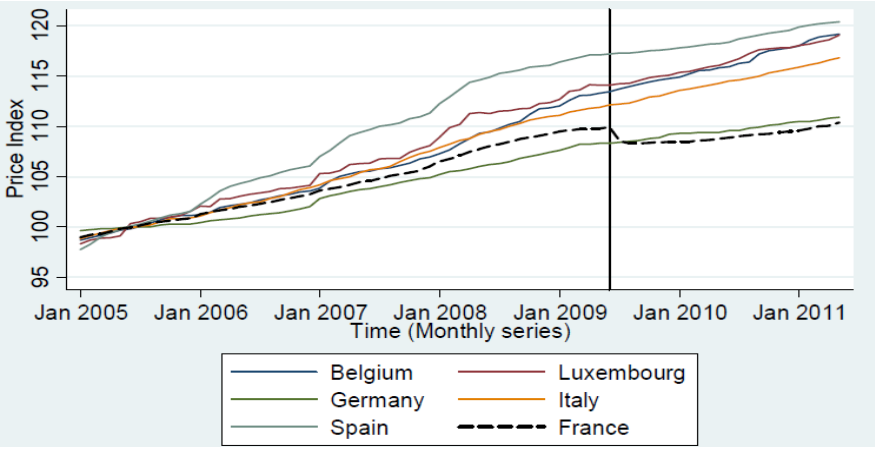
Consumer price index

To begin with the evaluation, it is instructive to compare the evolution of the consumer price index for restaurants and cafés in France with its neighbours of the Euro zone (Figure G.1). Starting below the index 100 on January 2005, the clear impact of the VAT reduction in France can clearly be seen from July 2009 onwards. The drop of 1.5 points in the first two months following the implementation of the measure has been followed by a trend in price growth quite comparable to Germany's, while it was steeper before July 2009. The other countries experience a higher growth of restaurant prices, and specifically, Belgium and Luxembourg, which are in many respects between Germany and France. The rate of growth has decreased in Spain since the beginning of the economic crisis, although it remains significantly higher than Germany's and France's.

[209] In addition, on the 1 January 2010 the taxe professionelle which had to be paid by any business was abolished. We take this rather minor reduction into account by increasing the level of tax shifting by 10 percent.

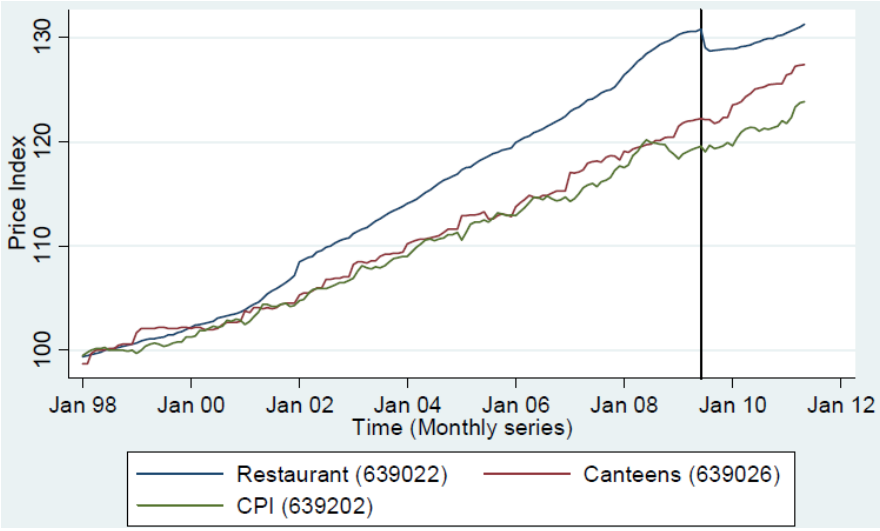
We now compare the evolution of the restaurant price index with IPC's and the price index of canteens (Figure G.2). Canteens are interesting since they are an obvious candidate as control group. Indeed, they were not affected by any change of the tax rate, they clearly belong to the same industry as restaurant, the catering industry, and have more or less the same structure of costs. The negative shock in the restaurant price index is clearly identified in July 2009, whereas no similar shocks can be detected in the two other time series. More interestingly, the rate of growth of the restaurant price index is clearly affected by the measure. While it increased more swiftly before the tax shock than the IPC, it increases more slowly after. There is a change in trend, which implies we should not choose a too short window to measure tax shifting. The quite smooth evolution of the restaurant price index is also quite striking. The physical costs of adjusting prices to unforeseen shocks have been baptised ‘menu costs’ that is, the cost of changing price lists. The smooth evolution demonstrates that the 90 000 French restaurants do not choose the same moment of the year to change their price list. It also explains why it may take at least a year and a half to capture the whole effect of the measure.

Figure G.1 Evolution of the consumer price indexes for restaurants and cafes in six European countries



Source: EuroStat – COICOP: CP1111

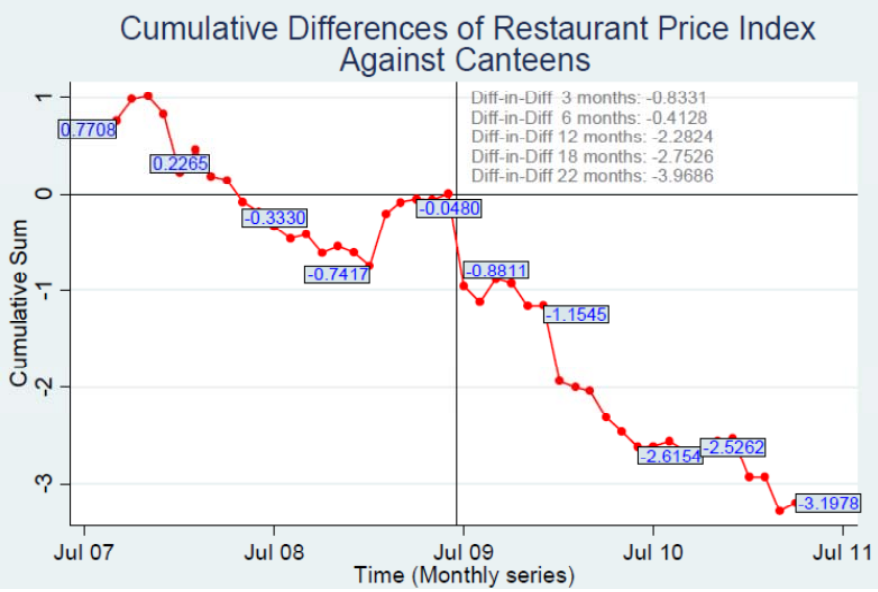
Figure G.2: Evolution of the CPI, the restaurant price index and the canteen price index in Fance (1998 = 100)



Source: INSEE (brackets identifying INSEE series)

Figure G.3 shows the results of the computation of the cumulated price change of the restaurant price index from June 2009 both in the forward and the backward directions by performing a difference in differences calculation. The price index of canteens serves as control group. We choose different horizons for cumulated price change, 3 months, 6 months, 12 months, 18 months, and 22 months. For a larger window (22 months before and after the reform), the decrease in price amounts to nearly 4 percent compared to the canteen price index. The order of magnitude of the tax shifting to consumers is 33.6 percent with the hypothetical change of the tax rate of 11.8 percent and 45.6 percent with the true rate of 8.7 percent. After one year of the reform the impact is however lower. Only 57 percent of the consumer price change was registered in this period. Obviously, the canteen price can play the role of a coarse control variable. The drawback of this first pass is that we do not control for changes in cost or demand conditions, which will be the case in the econometric estimation.

Figure G.3: Cumulative Differences of the Restaurant price index against the Canteen price index (24 months before and after the reform)



Source: INSEE, authors' calculations

Econometric estimation

The trading account of restaurants at the aggregated level reveals that we can focus on only three main items to reproduce the evolution of the total costs in the restaurant sector. First, total labour cost account for 37.1% of the total cost, purchases of raw materials which represents 31.4% of the total cost and a more heterogeneous third group which amounts to 27.8% of the total cost. It mixes up other purchases and depreciation, rents and energy, insurance and accounting costs. Unfortunately, we do not have the weight of each specific item within this third group but our guess is that commercial rent represents the most important item of this third group. The cumulated share of these three groups amounts to 96.3% of the total cost. Our strategy is here to test two specifications. We compute a Laspeyres index of operating costs with the time series of labour cost, the cost of raw materials and commercial rent and the weights indicated above. From an econometric point of view, the specification is more constrained than using the separate time series as control variables and imposes that the lag with which each cost item passes through consumer prices is the same. On the other hand, it is always better to have a more parsimonious list of explanatory variables.

In 2008 and 2009, France experienced the most severe downturn since the great depression. We tested several control variables that can capture general demand conditions addressed to the restaurant sector, the net creation of jobs on the market sector (quarterly basis), the evolution of the GDP in real terms (quarterly basis), the household consumption (quarterly basis), the business climate and the household confidence (monthly basis).

Regressions were performed for four different horizons (3, 6, 12 and 18 month) and several specifications. In this report only the results for an 18 months horizon and the most accurate model (in the sense of the least unexplained trend of the price index) are presented in Table G.1. The shifting rate is given in the last line of the table with respect to the hypothetical tax reduction of 11.8 percent. The endogenous variable is the monthly relative price change. The constant of the regression is then the rate of growth of the price index of restaurants which is not explained by the explanatory variables of the model. The unexplained trend of increase of the restaurant price index is about 0.15 percent (monthly). The operating costs index in this model is lagged three months and amounts to 0.26 which implies that a 1 percent increase in the operating costs induces an increase of the restaurant price index by 0.26 percent. The coefficients which give the reaction to the restaurant price to the VAT rate change are highly significant for most of the different lagged months (M1 to M18). The strongest impact happens immediately (M1) with an elasticity of 0.13, but also the coefficients of consecutive months are important such that the elasticity after 18 months corresponds to 0.3. For the longest window, we therefore obtain a hypothetical pass-through of 30 percentage points which gives 40.7 percentage points for the true drop of the VAT rate. Making the correction for the two other fiscal shocks leads to the final statement of a shifting rate of 44.7 percentage points a year and a half after the reform.

Table G.1: Regression 18 months

Variable	
Constant	0.0015*** (0.0003)
CHR Operating Costs Index-lag(3)	0.2598** (0.0897)
M_1	0.1283*** (0.0024)
M_2	0.0378*** (0.0031)
M_3	0.0096*** (0.0025)
M_6	0.0196*** (0.0034)
M_7	0.0181*** (0.0032)
M_8	0.0110*** (0.0024)
M_{10}	0.0199*** (0.0041)
M_{11}	0.0095** (0.0027)
M_{12}	0.0088* (0.0033)
M_{13}	0.0134** (0.0040)
M_{14}	0.0073* (0.0031)
M_{15}	0.0092** (0.0025)
M_{16}	0.0131*** (0.0024)
M_{17}	-0.0139** (0.0047)
M_{18}	0.0064* (0.0025)
N	44
Consumer Share – Measure 1	0.301
Consumer Share – Measure 2	0.407
Consumer Share – Measure 3	0.447

Brackets: Newey-West Standard Errors Significant: * p<0.10; ** p<0.05; *** p<0.01; only significant variables shown

9 Quantitative analysis of VAT rate structures (IFS[210])

This chapter contributes towards answers to the following evaluation question in the project Terms of Reference:

(11) To what extent does the current diversification of the VAT rates, including the reduced VAT rates, continue to be relevant as compared with the needs they aimed to satisfy? Do the original motives for their introduction still justify their application?

It also addresses the following specific elements:

(F) Analysis in the more general context of the welfare and equity impacts of the VAT system. In particular, a number of derogations applied by the member states have been introduced for reasons of social justice (i.e. redistribution of income) or for historical reasons (grandfathering clauses). A question to be answered in this context is whether the redistribution effect has been achieved, if any, by applying specific elements of the VAT system. Also, the share of the exempt, zero, reduced and standard rate in the total theoretical tax revenue should be estimated.

(G) Evaluation of the welfare impact of the multiple-rate VAT system. In particular, the evaluation should examine the economic effect of the adjustments in the VAT rates on real relative price changes.

Summary

In this chapter of the report we quantitatively assess the distributional and behavioural effects of VAT rate structures for a number of EU countries. We find that:

[210] IFS took overall responsibility for writing this chapter and for drawing conclusions from the quantitative analysis. Analysis for Belgium, Greece and Hungary performed by KU Leuven, for France by Vanessa Denis, Nicolas Ruiz and Alain Trannoy, for Germany by DIW Berlin, for Italy by CAPP, for Poland by CENEA and for the UK by the IFS. The analysis of wealth effects in section 9.4 was conducted by ETLA.

- Analysing the distributional impact of VAT by measuring the amount of VAT paid as a proportion of income is likely to give a misleading impression because of the ability of households to borrow or save. A more meaningful picture of the distributional impact of VAT is obtained by measuring the amount of VAT paid as a proportion of expenditure.
- VAT is progressive in the majority of countries considered when measured as a proportion of expenditure, with the exception being Hungary, where it is broadly distributionally neutral.
- The progressive nature of existing EU VAT systems reflects the fact that existing zero and reduced rates of VAT are of greater proportional benefit to poorer than richer households. However, they are of greater benefit in absolute (cash) terms for richer households.
- Abolishing zero and reduced rates and reducing the standard rate so that the overall package was revenue neutral would be a regressive reform, hurting poorer households and benefitting richer ones, on average, in all countries studied.

However, the fact that existing zero and reduced rates of VAT are progressive does not mean that they are a good way to redistribute because of the distortions caused to households' spending. For a subset of the countries we estimate models of household spending patterns and find:

- Existing VAT rates, including zero and reduced rates, do distort spending patterns, although, generally the impact is fairly modest.
- By distorting spending patterns, zero and reduced rates of VAT lead to a reduction in aggregate welfare. That is, in principle, it would be possible to retain some additional revenue after abolishing zero and reduced rates of VAT and compensating all households.

We also use a model of financial and housing wealth to ascertain the impact of reforms to taxation that decrease labour income taxes and increase VAT and find that:

- Shifts in taxation towards VAT act as a capital levy, reducing the purchasing power of existing financial wealth. Shifts towards VAT therefore hurt those with high levels of financial wealth relative to labour incomes. Housing is somewhat different as it both an asset and a consumption good.
- Because older generations hold most financial (and indeed housing) wealth, this capital levy also acts to redistribute from older generations who have done most of their savings to younger generations who have yet to do so.

9.1 Introduction

In this chapter of the report we quantitatively assess the distributional and behavioural effects of VAT rate structures for a number of EU countries. This provides part of the evidence base for chapter 10 in which we assess how well suited zero and reduced rates[211] are for achieving various policy goals. The focus here and in the next chapter is on the effects of rate structures: exemptions, registration thresholds etc are discussed in Chapter 3.

The principal reasons usually given for applying zero and reduced rates of VAT are distributional. Therefore, in section 9.2, we first use static VAT micro-simulation models to quantify how the burden of VAT payments is spread across different types of households under the existing VAT systems – including the effects of zero and reduced rates applied to particular goods and services – for a number of EU member states. These are Belgium, France, Germany, Greece, Hungary, Italy, Poland, Spain and the United Kingdom. To complement this static analysis, in section 9.3 we estimate the effect that these departures from uniformity have on households' consumption patterns in Belgium, France, Germany, Spain and the United Kingdom; the estimation of this also allows us to estimate the effects of departures from uniformity on households' welfare, under the assumption that uniformity is optimal. Taken together, this major empirical exercise provides an unprecedented cross-country picture of the effects of VAT rate differentiation across the income and expenditure distributions, and on consumption patterns and household welfare. The analysis of sections 9.2 and 9.3 is based on the rates of VAT prevailing on 1st of January 2011.

It should be noted that the static and behavioural analysis in sections 9.2 and 9.3 consider the effects of VAT imposed on goods and services other than housing. Housing is somewhat different to other goods in that it is also a large part of most households' wealth. Going a step further than most previous distributional analyses, section 9.4 takes into account the fact that changes in VAT affect the purchasing power of existing stocks of wealth, including that embodied in housing, as well as the purchasing power of future flows of income. The likely empirical significance of such effects is investigated using a general equilibrium model and quantified for Finland.

[211] In chapter 9 and 10, "zero and reduced rates" is used as a short-hand description of the full set of reduced rates, super-reduced rates, parking rates and zero rates of VAT applied in different EU countries. Chapter 2 of this report gives further detail on the various non-standard rates of VAT, including whether they are available to all EU members or are granted to specific countries by derogations.

9.2 The distributional impact of VAT

Zero or reduced rates of VAT are a feature of the VAT systems of all EU member states, although the number of goods and services to which they are applied varies widely across countries. In this section we make use of static (no-behavioural response) tax micro-simulation models to estimate how VAT payments and the impact of zero and reduced rates of VAT varies across different household types and across the income and expenditure distributions.

Unfortunately, a static micro-simulation model of indirect taxes such as VAT does not exist for the EU as a whole. Therefore, instead, we rely on case studies for a number of different EU countries: Belgium, France, Germany, Greece, Hungary, Italy, Poland, Spain and the United Kingdom. Annex H provides a description and explanation of the static micro-simulation models and the underlying household data used for each of these countries. Whilst care has been taken to ensure the analyses and results for each of these countries are as comparable as possible, differences in the underlying household data have necessitated slight differences in methodology between countries. Furthermore, whilst most of the household surveys used here under-record average household expenditure (and, to a lesser extent, average household income) relative to that implied by national accounts, the extent of under-recording varies across countries.[212] As a result, estimates of VAT revenues and cash VAT payments by households will differ from actual revenues and payments, with the discrepancy being larger for some countries than others. It might therefore be advisable to focus on the results showing VAT payments in proportional terms, particularly when making cross-country comparisons, although results are presented in cash terms as well.

The key focus of this section is not revenues, however, but the distributional impact of the current VAT system and existing reduced rates. A tax or tax reform that hits the rich

[212] Adjustments could be made to the raw data from the household surveys so that household expenditures and incomes match National Accounts. However, doing this would introduce a number of problems. For instance, one option would be to multiply spending on all types of goods and services by a constant factor so that total expenditure equalled that recorded in national accounts. But we know that different types of spending are more subject to under-recording (such as spending on alcohol and tobacco), than other types (such as spending on food). Adjustment by different factors for different types of spending would recognise this problem, but would involve potentially dramatic changes to individual households' spending patterns and re-ranking of households' total expenditures. With no clearly satisfactory way to adjust household spending in the surveys to match National Accounts, we have chosen to use the micro-data without adjustment in all countries included in this study except France, where the team performing the analysis felt that the degree of under-reporting was so large for some commodity groups that they had to adjust the underlying survey data (using different factors for different types of spending).

proportionally harder than the poor is often described as progressive, whilst a tax or tax reform that hits the poor proportionally harder is often described as regressive. This terminology will be used in this report.

In principle the most interesting question might be the impact of VAT on the lifetime-rich versus the lifetime-poor, and analysis based on lifetime income and lifetime expenditure would give similar answers since the two are generally similar (the main difference being bequests made and received). Unfortunately we do not have data on lifetime resources. The survey data available instead provide snapshots of households' incomes and expenditures at a particular point in time. Both are used in this report.

When looking at snapshots of resources as a particular point in time, measured income and expenditure can differ substantially, as households borrow and save to meet their (possibly changing) consumption needs in the face of (varying) income.[213] In particular, households with low reported current income typically report spending more than their income, whilst those with high current income typically report spending less. Past research has shown that income-based and expenditure-based distributional analyses can display strikingly different patterns (see, for example, Ruiz and Trannoy (2008) Crossley, Phillips and Wakefield (2009) and Carrera (2010)). When income and expenditure differ in this way, analysing the distributional effects of VAT involves two conceptually distinct choices:

- First, should income or expenditure be the measure of whether a household is 'rich' or 'poor'? If the aim is to gauge a household's lifetime living standards, the question is whether income or expenditure varies less around its long-term average. This will vary widely from case to case; overall we think the choice is finely balanced, and we show results ranking households by both income decile and expenditure decile to give complementary measures.
- Second, should we measure how hard a household is hit by looking at their VAT payments in absolute (cash) terms, as a percentage of income or as a percentage of expenditure? Looking at cash payments is clear, but perhaps less interesting: in cash terms the rich will pay more of almost any tax, but the payments may nevertheless be less burdensome for them. We will argue that payments as a percentage of expenditure are more informative than payments as a percentage of income when looking at an expenditure tax such as VAT, because (in the absence of data on lifetime resources) it is likely to be a better guide to the lifetime

[213] A further source of difference between income and expenditure in surveys are reporting errors by the respondent.

distributional effects of VAT. We develop this argument further below and focus accordingly on VAT payments as a percentage of expenditure, although we again include both measures for completeness.

The analysis in this chapter assumes that VAT is fully passed through into consumer prices. Chapter 8 of this report has studied, in some depth, the evidence on the extent to which VAT, and changes in VAT, are passed through to consumer prices. However, most of the case studies considered in chapter 8 investigate the degree of pass-through of changes in VAT rates to consumer prices when the reforms to rates affect only a small number of goods or services. In such instances, consumers can often respond fairly easily by changing what they buy, which explains why such studies often find less-than-full pass-through. The reforms considered in this chapter, on the other hand, involve much bigger changes to the VAT rate structure (e.g. the abolition of zero and reduced rates, or the abolition of VAT), and, therefore there is less scope for consumers to respond easily by changing what they buy (although there is some scope as shown in section 9.3). Indeed, chapter 8 notes that pass-through seems closer to complete when changes in VAT are broader-based. This means an assumption of full pass-through is likely to be less problematic for the reforms considered here.

A full assessment of what would happen if pass-through was less-than-full would also require knowledge of how that part of the tax not passed-through was borne. For instance, it could be borne by the workers, shareholders or suppliers of firms producing the goods affected. The household surveys available to us and used in our analysis do not provide enough information on who produces particular goods and services, so we cannot model the distributional impact of VAT that is not passed through to consumers. Qualitatively, what could the impact of less-than-full pass-through be? Consider the reduced (or in some cases, zero) rate of VAT levied on food in most EU countries. With full pass-through, those seeing the biggest proportional gain from this would be those who spend proportionally the most on food: that is, poorer households. That is the reduced or zero rates of VAT for food would be progressive. If, instead, there were less-than-full pass-through of VAT, part of these gains would accrue to the producers and sellers of food. This may be the workers or shareholders of supermarkets, or of their suppliers (such as farmers). These people may not be poor, and the reduced rate of VAT for food may therefore look less progressive, and perhaps, not progressive at all.

More generally, how less-than-full pass through affects the distributional impact of the VAT system or parts of the VAT system (e.g. zero and reduced rates), depends upon whether those who bear the part of the burden of VAT not passed on are richer or

poorer than the consumers of the relevant goods. This depends upon the good in question (whether it is consumed disproportionately by the poor, such as food, or by the rich, such as luxury goods), and by who in particular bears that part not passed through (for instance, whether the shareholders or workers, and the relative earnings of the workers who make that good). The average shareholder is likely to be richer than the average worker, who is likely to be richer than the average individual (i.e. consumer). A uniform rate of VAT on all goods and services would therefore be more progressive with less-than-full pass-through than full-pass through. That is because shareholders and workers who are richer than the average individual would bear part of the burden. But we cannot say how less-than-full pass-through would affect the distributional pattern of existing VAT systems in Europe as they are far from uniform, other than to say "it may have an effect".

Readers should also note that the measures of net income and expenditure used in this chapter include imputed rents to capture the consumption value of owner-occupied housing or housing rented at less than market rents.[214] If housing consumption is distributed more or less equally than other consumption (and income), including it is important and its omission could affect the results of the analysis.

VAT revenues and the distribution of payments under the existing system

Table 9.1 shows estimates of VAT revenues obtained from the micro-simulation models and compares them to the official estimates 2009 (the latest year for which figures are available for all countries considered).[215] Modelled revenues are lower than actual revenues for three reasons. First, we consider only VAT paid directly by households, and not that paid by businesses selling exempt goods or services and other organisations unable to reclaim VAT paid on purchases. Second, we do not consider VAT raised from the sale of new build residential property. Third, as discussed above, the surveys underlying the micro-simulation models typically under-record aggregate household expenditure compared to the national accounts. Together, these lead to a discrepancy with official estimates of total VAT revenue that is most significant for Germany and least significant for Greece.

[214] Actual rents are used for those renting from a private landlord at market rates. Mortgage interest payments are deducted from income for owner-occupiers with outstanding mortgage debt.

[215] Figures for the UK are adjusted to account for the fact that the standard rate of VAT has increased from 17.5% to 20% since 2009, and it is the 20% rate which we model in this report.

Table 9.1 Revenue under the existing VAT rate structures

	Estimates from micro-simulation model		Official Estimates	
	€ (billions per annum)	% of existing VAT revenues	€ (billions per annum)	% of GDP
Belgium	14.5	N/A	23.6	7.0
France	91.5	N/A	129.4	6.8
Germany	78.8	N/A	177.7	7.4
Spain	42.0	N/A	43.4	4.1
United Kingdom	70.0	N/A	120.1	7.7
Greece	14.4	N/A	14.9	6.4
Hungary	5.1	N/A	7.8	8.4
Italy	62.1	N/A	86.6	5.7
Poland	14.3	N/A	23.1	7.4

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed for the micro-simulation model. Exchange rates for official estimates are those applying during 2009. Micro-simulation estimates exclude VAT raised during intermediate transactions of exempt goods, and from the sale of new-build housing.

Sources: Various household surveys (see Annex H) and authors' calculations. Official estimates from Taxation Trends in the European Union (2011).

We now consider the distributional impact of the existing VAT systems. Table 9.2 shows how VAT payments are distributed across the distribution of household equivalised[216] net income. Results are reported in cash terms (panel A), as a proportion of household net income (panel B), and as a proportion of expenditure (panel C).

[216] Equivalisation is a process which adjusts household income to account for different needs. In practice the equivalence scales used, such as the modified OECD scale (see Anyaegbu (2010)) used in this chapter, distinguish between households with different numbers of people, and by the age of those people. However, in principle, other characteristics could be taken into account (such as health, employment status, etc).

Table 9.2A VAT payments across the income distribution (Euros per week)

Income Decile Group	Average VAT Payment per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	28.58	28.59	16.70	29.90	35.78	31.38	15.12	21.60	10.00
2	35.41	34.81	23.70	33.13	34.45	40.78	15.79	28.70	12.66
3	48.68	41.43	27.40	36.93	33.91	44.23	18.11	32.90	14.48
4	51.63	51.39	33.30	39.56	37.99	53.68	20.40	37.70	15.92
5	54.48	60.51	37.70	42.78	44.35	60.69	23.04	40.50	16.91
6	64.27	70.12	42.10	46.89	47.83	66.28	24.77	45.60	18.91
7	71.88	82.76	49.30	51.31	48.92	75.57	27.63	52.50	21.53
8	81.40	91.06	49.90	54.14	59.85	86.02	31.23	57.90	24.18
9	86.61	107.73	60.50	63.48	72.75	101.06	36.54	67.00	28.92
Richest	111.84	137.37	79.30	75.65	103.02	133.55	48.63	89.50	42.88

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table 9.2B VAT payments across the income distribution (% of income)

Income Decile Group	Average VAT Payment per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	11.12%	12.91%	9.78%	13.93%	9.87%	27.85%	22.44%	10.20%	11.62%
2	8.76%	9.47%	8.30%	10.83%	7.44%	20.87%	16.62%	8.60%	9.50%
3	9.32%	8.62%	7.40%	10.21%	7.02%	18.00%	15.71%	8.10%	9.15%
4	8.63%	8.70%	7.43%	9.20%	6.93%	17.62%	15.36%	8.00%	9.05%
5	7.92%	8.51%	7.13%	9.04%	7.28%	16.33%	14.89%	7.70%	8.60%
6	8.13%	8.39%	6.96%	8.63%	7.09%	14.86%	14.05%	7.70%	8.68%
7	7.81%	8.41%	7.07%	8.27%	6.43%	14.38%	13.79%	7.80%	8.72%
8	7.85%	7.82%	6.25%	7.86%	6.96%	13.89%	13.55%	7.50%	8.66%
9	7.14%	7.61%	6.25%	7.60%	6.76%	13.21%	13.25%	7.30%	8.62%
Richest	6.22%	6.13%	5.46%	6.23%	6.28%	11.23%	11.77%	6.40%	7.46%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

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Table 9.2C VAT payments across the income distribution (% of expenditure)

Income Decile Group	Average VAT Payment per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	7.73%	7.61%	7.45%	8.28%	8.80%	12.46%	17.35%	7.50%	7.87%
2	7.80%	7.33%	8.20%	8.10%	8.39%	12.63%	17.23%	7.80%	7.98%
3	8.37%	7.20%	8.13%	8.11%	8.27%	12.97%	17.14%	7.80%	8.05%
4	8.45%	7.27%	8.37%	7.92%	8.35%	12.92%	17.10%	7.90%	8.21%
5	8.20%	7.36%	8.49%	8.00%	8.55%	13.04%	17.25%	7.90%	8.07%
6	8.58%	7.36%	8.42%	7.97%	8.56%	12.88%	17.26%	8.00%	8.35%
7	8.91%	7.59%	8.81%	8.00%	8.37%	13.09%	17.50%	8.30%	8.58%
8	8.86%	7.58%	8.48%	7.79%	8.92%	13.22%	17.48%	8.40%	8.83%
9	9.40%	7.64%	8.70%	7.91%	9.06%	13.29%	17.54%	8.70%	9.18%
Richest	10.06%	7.79%	8.88%	7.63%	9.06%	13.62%	17.51%	9.10%	10.12%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

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Cash VAT payments generally increase as one moves up the income distribution for all of the countries considered. This pattern is strongest in Poland and Germany, where VAT payments by households in the top 10% of the income distribution are five times as large as those by households in the bottom 10%, on average. The pattern is less clear in the UK where VAT payments fall slightly between the first income decile group, and the third income decile group. As discussed above, the households with the lowest incomes may not necessarily have low spending (and therefore low cash VAT payments), and this seems to be particularly true of the UK.

Measured as a percentage of income, VAT payments are highest, on average, for households at the bottom of the income distribution, and then generally fall as one moves up the income distribution in all of the countries considered. With low-income households paying more VAT as a proportion of their incomes than high-income households, this is the result that leads to the typical claim that VAT is a regressive tax. The apparent degree of regressivity does vary somewhat by country: the pattern looks strongest in Greece, Spain and Hungary, and least strong in Italy, Poland and the UK. In the UK, a clearly regressive pattern is discernable only because of the large hit as a fraction of income for the bottom decile groups: over the remaining 90% of the income distribution, the impact of VAT appears broadly distributionally neutral.

If we instead measure VAT payments as a percentage of expenditure, the picture changes dramatically. In Belgium, Germany, Italy and Poland, there is a small but clear increase in the proportional burden of VAT as one moves up the income distribution, whilst in the other countries considered VAT payments as a proportion of expenditure vary little across the income distribution. That is, measured this way, current VAT systems look to be distributionally neutral in some countries, and slightly progressive in others. This is not conventional wisdom but does have an intuitive explanation. Food, which forms a large part of expenditure subject to zero or reduced rates for most countries considered is a bigger part of low income households' budgets than high income ones. More of the total expenditure of low income households is therefore subject to zero or reduced rates than that of high income households, and therefore low income households pay less VAT as a proportion of their total expenditure. The reason that low income households spend more of their total budget on zero and reduced rate goods does not also imply lower VAT payment as a proportion of their income reflects

the fact that they often report spending more than their current income, presumably funded by borrowing or drawing down their savings.[217]

But if households are able to borrow or draw down savings when their income is low to fund purchases and save for a rainy day when income is high, perhaps expenditure is a better indicator of a household's long-run living standards than their income. In this case it would be better to judge whether a household is rich or poor according to their place in the distribution of expenditure rather than the distribution of income. Table 9.3 shows how VAT payments vary across the distribution of household equivalised expenditure.

[217] Part of the difference between spending and income also reflects errors in reported spending and income by survey respondents.

Table 9.3A VAT payments across the expenditure distribution (Euros per week)

Expenditure Decile Group	Average VAT Payment per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	19.85	14.96	13.20	14.95	13.51	16.01	10.29	14.80	8.27
2	27.29	24.84	19.80	22.93	20.97	26.78	14.09	22.10	11.77
3	35.21	32.06	25.60	27.74	26.71	35.67	16.92	27.70	13.76
4	41.16	39.60	29.50	33.79	30.91	43.32	19.18	32.40	14.70
5	48.96	48.58	35.10	39.03	37.77	51.67	21.57	38.90	16.11
6	57.66	59.76	37.90	43.86	43.60	63.56	24.85	41.00	17.72
7	64.64	72.46	44.50	49.92	54.00	74.23	28.16	47.20	19.88
8	75.09	91.85	51.20	58.85	64.29	90.25	32.82	58.20	22.50
9	94.38	121.32	60.80	73.77	85.91	113.78	39.23	69.40	27.96
Richest	170.57	199.56	102.30	108.94	141.29	177.99	54.15	122.60	53.70

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table 9.3B VAT payments across the expenditure distribution (% of income)

Expenditure Decile Group	Average VAT Payment per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	4.71%	3.38%	5.18%	5.33%	2.87%	8.75%	10.32%	4.70%	5.31%
2	4.99%	4.29%	5.31%	6.20%	4.01%	9.78%	11.25%	5.40%	6.23%
3	5.73%	5.11%	5.56%	6.52%	4.82%	10.77%	12.00%	5.70%	6.73%
4	6.02%	5.43%	5.87%	6.94%	5.05%	10.92%	12.71%	6.00%	7.03%
5	6.11%	6.24%	6.01%	7.35%	5.79%	12.30%	13.05%	6.30%	7.39%
6	6.67%	6.81%	5.93%	7.78%	6.00%	13.30%	14.13%	6.90%	7.75%
7	6.99%	7.41%	6.32%	8.12%	7.15%	14.23%	14.30%	7.20%	8.17%
8	7.66%	8.20%	6.38%	8.49%	7.66%	14.60%	14.89%	7.60%	8.67%
9	8.74%	9.55%	6.91%	9.59%	8.63%	16.87%	15.55%	8.30%	9.47%
Richest	13.03%	12.37%	9.09%	11.42%	10.48%	20.28%	16.23%	11.30%	13.38%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table 9.3C VAT payments across the expenditure distribution (% of expenditure)

Expenditure Decile Group	Average VAT Payment per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	6.92%	5.53%	7.14%	7.05%	6.10%	12.84%	17.21%	6.90%	7.63%
2	7.17%	5.91%	7.59%	7.20%	6.72%	12.64%	17.25%	7.50%	7.70%
3	7.53%	6.19%	7.91%	7.29%	7.31%	12.58%	17.08%	7.60%	7.85%
4	7.73%	6.33%	8.18%	7.54%	7.53%	12.55%	17.13%	7.60%	7.83%
5	8.12%	6.74%	8.38%	7.68%	8.01%	12.44%	17.23%	7.70%	7.89%
6	8.29%	7.00%	8.30%	7.72%	8.12%	12.83%	17.33%	7.90%	8.05%
7	8.42%	7.28%	8.61%	7.84%	8.73%	12.95%	17.36%	8.00%	8.25%
8	8.70%	7.70%	8.63%	8.00%	8.96%	13.11%	17.53%	8.50%	8.50%
9	9.36%	8.23%	8.79%	8.23%	9.52%	13.46%	17.50%	8.50%	8.96%
Richest	10.77%	8.68%	9.13%	8.54%	10.10%	13.72%	17.54%	9.50%	10.91%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Measured as a percentage of income, VAT payments increase considerably as one moves up the distribution of expenditure for all countries considered, but particularly for France and the UK where VAT payments are over three times greater, proportionally, for households in the top expenditure decile group than those in the bottom expenditure decile group. This would suggest that VAT was a strongly progressive tax, with the poor paying proportionally much less of their income in VAT than the rich.

Measured as a percentage of expenditure, VAT payments again generally increase as one moves up the distribution of expenditure, but to a much lesser extent than when they are measured as a percentage of income. That is, the pattern looks progressive (except in Hungary which operates close to a uniform VAT system), but not as strikingly so. This progressive pattern reflects the fact that more of the total expenditure of low spending households is subject to zero or reduced rates than that of high spending households. The reason the pattern looks even more progressive when VAT payments are expressed as a percentage of income instead of spending is that low spending households typically have incomes that are higher than their spending, whilst high spending households typically have incomes that are lower than their spending. That is, when people are defined as rich or poor based on their position in the income distribution, borrowing and saving by households drives the differences in results between analyses where VAT is expressed as a proportion of income and those where VAT is expressed as a proportion of expenditure.

Whether the existing VAT systems in place in the countries considered appear regressive or progressive, and the degree of apparent progressivity or regressivity, therefore depends on whether one classifies households as rich or poor based on their income or expenditure, and whether one presents the VAT payments as a fraction of income or expenditure. For instance, the VAT system in every country considered looks to place a larger proportional burden on low income households than high income households if VAT payments are expressed as a proportion of income, but the burden looks to be smaller for those with low income, or at worst, similar, if VAT payments are instead expressed as a proportion of expenditure.

This would appear to present significant difficulties to the analyst: results are highly sensitive to how one decides to calculate the proportional burden of VAT. However, careful consideration suggests analyses of the VAT system which show payments as a fraction of income (across either the income or expenditure distribution) are likely to be misleading.

To see this, consider the case of a uniform VAT on all goods and services. Over a lifetime, if lifetime income and lifetime expenditure are equal[218] this can be clearly seen as distributionally neutral: as it is imposed on all goods and services at the same rate, it has the same proportional effect on the purchasing power of rich and poor households. VAT payments under such a system would be the same fraction of both lifetime income and lifetime expenditure for rich and poor households. But suppose, as in reality, we only have information on current income and spending. If VAT payments are presented as a fraction of current expenditure, this distributionally neutral pattern of payments would be found. However, because households with low current income tend to spend more than their income, and those with high current income tend to spend less, showing payments as a fraction of net income will make the uniform VAT look regressive if households are defined as rich or poor based on their current income. On the other hand, if households are defined as rich or poor based on their current expenditure, because households with the lowest spending tend to report incomes that are higher than their spending, and those with high spending tend to report incomes that are lower than their spending, showing VAT payments as a fraction of net income will make the uniform VAT look progressive. That is, a distributionally neutral uniform VAT can be misleadingly labelled progressive or regressive if VAT payments are expressed as a proportion of net income. For this reason, analysis showing VAT payments as a proportion of household expenditure should be considered more informative and will be the focus of discussion in the remainder of this chapter (although results will be presented as a proportion of income in Annex I for the purpose of completeness).

The argument that showing VAT payments as a fraction of income may give a misleading impression of the lifetime distributional impact of VAT is driven by the potential for households to borrow and save, but it does not rely on households being able to borrow freely or have large amounts of savings to draw-down. Neither does it rely on consumers being rational and forward-looking or engaging in optimal consumption smoothing.

[218] The assumption that lifetime income and expenditure are equal means that we abstract from gifts and bequests. This is for ease of exposition only: the argument with bequests is more complicated but conclusions are unchanged. For example, when assessing the proportional impact of VAT on households that are recipients of gifts and bequests, it seems clear that we would want to take into account those gifts and bequests when measuring their lifetime resources. We would not, for instance, wish to say that a household with zero income but large expenditures funded by gifts and bequests is hit infinitely hard by VAT. Including bequests and gifts in the lifetime resources of the recipient makes subtracting them from the resources of the giver attractive to avoid the double counting of gifts and bequests. Adding and subtracting gifts and bequests when calculating lifetime resources in this manner means a uniform VAT would be found to be a constant fraction of both lifetime resources (income) and lifetime expenditure, i.e. it would be distributionally neutral as in the case with no gifts and bequests.

To see this, consider a poor household with a long-run income of 100 euros per week but who is currently spending 200 euros per week, funded by drawing down the last of their savings. Furthermore, suppose that the rate of VAT is 25% on all goods and services. The household would pay 40 euros per week in VAT, equal to 20% of their current spending but 40% of their current income. The question is, which measure is a better reflection of the impact of VAT on the household? It is true that their current income is a better measure of their long-run purchasing power than their current expenditure is. But it does not follow that expressing VAT payments as a proportion of current income gives a better measure of the impact of VAT on that long-run purchasing power. This is because when the household is forced to cut their spending back to the level of their long-run income (100 euros per week), the amount of VAT they would pay falls to 20 euros per week. This is equal to 20% of their current and long-run income, and their long-run expenditure of 100 euros per week.

Measuring VAT payments as a percentage of current spending thus gives a more meaningful measure of VAT's distributional impact than measuring payments as a percentage of current income, even in cases where current income is the better measure of long-run living standards. This demonstrates a key point: the best measure of lifetime living standards might be current income for some households, and current spending for other households. This is a separate issue from the arguments in favour of expressing VAT as a percentage of expenditure instead of income.

Because it is not clear whether the "rich" or "poor" are best defined by their current income or current spending we continue to show analysis based on both income decile groups and expenditure decile groups. As a rough rule-of-thumb, if VAT payments are a bigger fraction of household spending as you move up both the income distribution and up the expenditure distribution, then the VAT system will be progressive with households ranked on lifetime resources. On the other hand if VAT payments are a smaller fraction of household spending as you move up both the income distribution and up the expenditure distribution, then the VAT system will be regressive over the distribution of lifetime resources. If VAT payments as a proportion of expenditure increase as you move up the income distribution and decrease as you move up the expenditure distribution, or vice versa, the picture is less clear cut.

On this measure, the VAT systems of Belgium, Germany, Greece, Italy and Poland are clearly progressive: both the income-poor and the spending-poor pay a lower proportion of their total spending in VAT than the rich. In the UK and France there is, perhaps, a small increase in the proportion of expenditure taken as VAT as one moves up the

income distribution, and a much clearer increase as one moves up the expenditure distribution. This again suggests progressive systems, albeit less clearly so. In Spain, there is a small fall in the proportion in VAT as a proportion of expenditure as one moves up the income distribution, but a small increase as one moves up the expenditure distribution. This means it is not clear whether the Spanish system is progressive or regressive. The Hungarian system looks to be distributionally neutral with the income-poor and spending-poor both paying a very similar fraction of their total spending in VAT as the rich.

This finding that – contrary to popular perception – the VAT systems of most of the countries considered are progressive does suggest that, taken together, the reduced rates of VAT currently in operation are meeting one of their aims: a reduction in the burden of VAT on poorer households.[219] We look at the distributional impact of zero and reduced impacts specifically in the next sub-section.

It is also interesting to investigate whether certain types of households (such as families with children or pensioners) are hit harder or less hard by VAT than others. Therefore, table 9.4 shows how VAT payments differ across different household types.

This shows that VAT generally makes up a slightly smaller fraction of expenditure for non-working households than working households, on average, particularly for working-age households where there are no children (the only exceptions being France, for single working-age adults, and Belgium, for couples). This, at least in part, reflects the lower total spending of non-working households, for whom zero or reduced rate food is therefore a larger share of total spending. Controlling for the number of workers in a household, having children makes little difference to the proportional burden of VAT, except in the UK and Greece, where VAT is a lower fraction of spending for families with children than those without, and in France, where VAT is a higher fraction of spending for families with children. The slightly lower burden of VAT for families with children in the UK may partly reflect the zero-rating of children's clothing.

[219] Of course, the general progressivity of existing zero and reduced rates does not mean that the application of zero or reduced rates to each individual good or service currently covered is progressive.

Table 9.4A VAT payments across different household types (Euros per week)

Household Type	Average VAT Payment per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	49.14	49.74	32.70	33.35	39.37	56.85	22.29	34.60	16.57
1 Ad, 0 Ch, NW	32.21	32.02	17.60	25.09	16.37	33.65	12.95	20.80	9.02
1 Ad, ≥1 Ch, W	52.72	57.32	37.70	34.23	40.71	65.52	24.99	39.80	18.79
1 Ad, ≥1 Ch, NW	33.55	38.48	23.50	30.30	24.92	37.85	18.09	25.00	11.81
>1 Ad, 0 Ch, NW	55.17	62.74	36.30	39.96	39.97	58.03	21.51	36.80	15.88
>1 Ad, 0 Ch, 1 W	63.23	77.90	48.50	48.80	59.07	74.08	25.95	51.80	20.45
>1 Ad, 0 Ch, >1 W	84.26	100.75	62.40	65.44	73.94	99.23	33.78	69.30	27.71
>1 Ad, 1 Ch, NW	32.30	55.73	27.20	35.02	42.16	71.60	22.90	40.10	14.50
>1 Ad, 1 Ch, 1 W	74.02	78.14	49.90	48.97	57.63	76.34	29.42	47.30	21.32
>1 Ad, 1 Ch, >1 W	87.45	104.72	61.60	63.90	75.34	102.94	35.23	73.90	29.79
>1 Ad, >1 Ch, NW	41.11	59.24	37.00	37.41	33.26	60.10	24.51	33.60	14.83
>1 Ad, >1 Ch, 1 W	87.29	90.11	63.30	52.99	57.35	81.31	32.09	52.10	21.85
>1 Ad, >1 Ch, >1 W	104.84	114.64	69.20	68.54	78.13	108.21	39.77	71.20	29.06
1 Ad, aged 60	32.00	31.87	23.50	18.78	22.59	26.16	12.23	23.40	9.37
>1 Ad, all aged ≥ 60	55.47	62.22	45.00	36.22	48.21	40.06	19.28	40.70	16.99

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table 9.4B VAT payments across different household types (% of expenditure)

Household Type	Average VAT Payment per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	9.18%	7.41%	8.70%	8.03%	8.94%	13.02%	17.51%	8.03%	8.74%
1 Ad, 0 Ch, NW	8.36%	7.63%	7.87%	7.18%	5.79%	11.29%	17.20%	6.71%	6.95%
1 Ad, ≥1 Ch, W	8.78%	7.49%	8.70%	7.63%	8.23%	12.13%	17.62%	8.27%	8.53%
1 Ad, ≥1 Ch, NW	7.99%	7.90%	7.98%	7.97%	6.78%	11.00%	17.07%	7.46%	7.49%
>1 Ad, 0 Ch, NW	8.83%	7.30%	8.65%	7.65%	7.96%	13.29%	16.95%	7.45%	7.97%
>1 Ad, 0 Ch, 1 W	8.48%	7.63%	8.73%	7.99%	9.21%	13.46%	17.45%	8.40%	8.66%
>1 Ad, 0 Ch, >1 W	9.24%	7.85%	9.04%	8.46%	9.47%	13.64%	17.64%	8.94%	9.43%
>1 Ad, 1 Ch, NW	7.41%	7.73%	8.16%	8.03%	8.68%	12.81%	16.31%	7.86%	7.64%
>1 Ad, 1 Ch, 1 W	9.06%	7.81%	8.51%	8.33%	8.38%	12.59%	17.38%	8.46%	8.75%
>1 Ad, 1 Ch, >1 W	8.97%	8.02%	8.82%	8.49%	9.06%	12.86%	17.70%	8.94%	9.61%
>1 Ad, >1 Ch, NW	7.64%	7.90%	8.28%	8.15%	7.71%	11.82%	17.35%	8.16%	7.79%
>1 Ad, >1 Ch, 1 W	9.50%	7.67%	8.70%	8.31%	8.14%	12.56%	17.48%	8.39%	8.84%
>1 Ad, >1 Ch, >1 W	9.57%	8.10%	9.09%	8.27%	8.96%	12.86%	17.56%	8.44%	9.24%
1 Ad, aged 60	7.37%	6.24%	7.57%	5.94%	7.04%	12.93%	16.99%	6.92%	6.78%
>1 Ad, all aged ≥ 60	8.16%	6.83%	8.16%	6.81%	8.55%	13.15%	16.49%	8.01%	7.95%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Annex I contains a 'reverse' analysis of the existing VAT systems the nine countries considered. That is, rather than asking how the cash and proportional amount of VAT paid varies by the characteristics of households, instead it demonstrates how the characteristics of households vary by the proportional amount of VAT paid.

The results show that, generally, those households paying proportionally the most VAT contain adults who are younger than average and have more education than average. Such households are more likely to contain children, to contain one or more working adults, and to be owned by the occupier. They are also more likely to contain more than on adult than average. This reflects the fact that households with these characteristics tend to be better off, and therefore a higher fraction of their spending goes towards goods on which the standard rate of VAT is levied, and a lower fraction on goods on which a reduced or zero rate is levied (such as food). There are exceptions to these general patterns and for information about specific countries, see annex I, tables I.1 to I.8.

The revenue and distributional impact of zero and reduced rates

The analysis of the distributional impact of the existing VAT systems found a broadly progressive patten. One reason for this may be that the zero and reduced rates for goods such as food which form larger shares of poorer households' budgets. Here we investigate the distributional impact of zero and reduced rates more directly by seeing how their abolition (and the imposition of the standard rate on goods currently subject to zero and reduced rates) affects different types of households. First, table 9.5 shows the estimated revenues forgone due to zero and reduced rates of goods (except those on the construction of housing, if that is subject to zero or reduced rates).

Table 9.5 Revenue from the abolition of zero and reduced rates

	Estimates from micro-simulation model	
	€ (billions per annum)	% of existing VAT revenues
Belgium	4.7	32.7%
France	48.8	53.3%
Germany	17.5	21.2%
Spain	17.7	41.6%
United Kingdom	24.4	34.9%
Greece	3.0	20.7%
Hungary	0.4	8.2%
Italy	23.8	38.3%
Poland	7.0	48.9%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed. Micro-simulation estimates exclude VAT raised during intermediate transactions of exempt goods, and from the sale of new-build housing.

Sources: Various household surveys (see Annex H) and authors' calculations.

As a proportion of existing VAT revenues, the additional revenue that would be raised by imposing the standard rate VAT on goods and services currently subject to the zero or reduced rate would be lowest in Hungary at around 8%. This reflects the fact that the reduced rate applied to food in Hungary is, at 18%, only a little lower than the standard rate of 25%. There is also a lower reduced rate of 5% on goods such as books, newspapers and medical supplies, but as these make up a relatively small fraction of total expenditure, little additional revenue is raised from taxing them at the full rate. On the other hand, in France, it is estimated that an amount equal to around 53% of existing VAT revenues could be raised if existing super-reduced and reduced rates were increased to the standard rate. This reflects both the wide coverage of reduced rates, and the large gap between the reduced rate of 5.5% and the standard rate of 19.6%.

Tables 9.6 and 9.7 show how much households would lose (in additional VAT payments) across the income and expenditure distributions, respectively, if the existing zero and reduced rates were abolished and instead, the standard rates of VAT were

imposed. Losses are presented in both cash terms (panel A) and as a fraction of household expenditure (panel B).[220]

The losses (i.e. additional VAT payments) increase steadily in cash terms as one moves up the income distribution and up the expenditure distributions in every country considered.[221] That means that richer households gain more in cash terms from the existing reduced rates of VAT than do poorer households. However, measured as a percentage of expenditure, the losses would be higher for low income (and low spending) households, than they would be for high income (and high spending) households. That is, the imposition of standard rates of VAT on goods currently subject to zero or reduced rates would be clearly regressive, hitting the poor proportionally harder than the rich. Or, expressed another way, existing zero and reduced rates are, taken together, progressive, helping the poor proportionally more than the rich. This means that if zero and reduced rates of VAT were introduced to make the tax more progressive, that objective is still being met (although chapter 10 will argue that it is the progressivity of the tax system as a whole, and not of a particular tax that matters).

Analysis by household type can be found in annex I, tables I.11 to I.13. Overall, the biggest gainers in cash terms are working households, largely because they spend more in total than non-working households. As a proportion of expenditure, the workless households gain more from zero and reduced rates than working households, and, with the exception of Greece and Hungary, households with children gain more than households without children.

[220] Losses measured as a fraction of household income can be found in annex G, tables G.9 and G.10. Readers should recall that we consider analysis based on gains/losses as a fraction of income to be less informative than that based on a fraction of spending, and, indeed, potentially misleading.

[221] The first four income decile groups in the UK are an exception to this pattern.

Table 9.6A Gains/Losses due to abolition of zero and reduced rates across the income distribution (Euros per week)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-12.38	-20.79	-4.90	-13.88	-15.46	-9.30	-1.38	-10.80	-6.90
2	-15.15	-22.50	-6.20	-15.10	-15.55	-11.05	-1.60	-13.10	-8.08
3	-17.92	-26.32	-7.10	-16.07	-14.47	-10.93	-1.77	-14.50	-8.74
4	-18.51	-29.58	-8.50	-17.81	-15.30	-12.55	-2.02	-15.90	-9.00
5	-19.82	-33.89	-9.10	-18.60	-17.67	-13.59	-2.11	-16.70	-9.54
6	-22.05	-38.15	-10.00	-19.39	-17.52	-14.68	-2.20	-17.90	-9.94
7	-23.16	-41.64	-10.70	-20.78	-17.60	-15.42	-2.20	-20.00	-10.74
8	-25.40	-45.75	-11.30	-22.10	-19.70	-16.53	-2.44	-21.10	-11.23
9	-25.33	-53.15	-12.20	-24.92	-21.92	-18.50	-2.57	-23.40	-12.21
Richest	-28.03	-64.37	-13.40	-28.44	-25.89	-20.55	-3.15	-28.20	-14.59

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table 9.6B Gains/Losses due to abolition of zero and reduced rates across the income distribution (% of expenditure)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-3.35%	-5.54%	-2.17%	-3.84%	-3.80%	-3.69%	-1.58%	-3.74%	-5.43%
2	-3.34%	-4.74%	-2.16%	-3.69%	-3.79%	-3.42%	-1.75%	-3.58%	-5.09%
3	-3.08%	-4.57%	-2.12%	-3.53%	-3.53%	-3.21%	-1.67%	-3.46%	-4.86%
4	-3.03%	-4.18%	-2.14%	-3.57%	-3.36%	-3.02%	-1.69%	-3.33%	-4.64%
5	-2.98%	-4.12%	-2.05%	-3.48%	-3.41%	-2.92%	-1.58%	-3.27%	-4.55%
6	-2.94%	-4.01%	-2.00%	-3.30%	-3.14%	-2.85%	-1.53%	-3.13%	-4.39%
7	-2.87%	-3.82%	-1.91%	-3.24%	-3.01%	-2.67%	-1.39%	-3.18%	-4.28%
8	-2.77%	-3.81%	-1.93%	-3.18%	-2.94%	-2.54%	-1.37%	-3.07%	-4.10%
9	-2.75%	-3.77%	-1.75%	-3.10%	-2.73%	-2.43%	-1.23%	-3.02%	-3.88%
Richest	-2.52%	-3.65%	-1.50%	-2.87%	-2.28%	-2.10%	-1.13%	-2.85%	-3.44%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table 9.7A Gains/Losses due to abolition of zero and reduced rates across the expenditure distribution (Euros per week)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-10.75	-15.79	-4.40	-8.54	-10.18	-6.13	-1.15	-8.60	-6.60
2	-12.74	-22.28	-6.00	-11.99	-13.10	-8.83	-1.50	-10.70	-8.27
3	-16.54	-25.19	-7.30	-13.90	-14.56	-10.76	-1.67	-12.90	-8.87
4	-18.39	-29.42	-8.00	-16.22	-15.29	-11.87	-1.92	-14.30	-9.08
5	-19.34	-32.14	-9.30	-18.04	-16.91	-13.20	-1.99	-16.40	-9.43
6	-21.85	-35.50	-9.70	-19.89	-18.57	-14.64	-2.11	-16.60	-9.91
7	-24.11	-40.72	-10.40	-21.45	-19.98	-16.35	-2.33	-19.70	-10.49
8	-25.30	-45.95	-11.50	-23.93	-20.98	-17.72	-2.52	-22.00	-10.95
9	-26.97	-53.40	-12.40	-27.91	-23.25	-19.40	-2.79	-25.50	-12.19
Richest	-31.76	-75.44	-14.30	-35.22	-28.25	-24.23	-3.43	-34.80	-15.18

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table 9.7B Gains/Losses due to abolition of zero and reduced rates across the expenditure distribution (% of expenditure)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-3.75%	-5.84%	-2.35%	-4.03%	-4.59%	-4.92%	-1.92%	-4.03%	-6.09%
2	-3.35%	-5.30%	-2.31%	-3.76%	-4.20%	-4.17%	-1.84%	-3.65%	-5.41%
3	-3.54%	-4.86%	-2.26%	-3.66%	-3.98%	-3.80%	-1.69%	-3.54%	-5.06%
4	-3.45%	-4.70%	-2.23%	-3.62%	-3.73%	-3.44%	-1.72%	-3.37%	-4.84%
5	-3.21%	-4.46%	-2.23%	-3.55%	-3.59%	-3.18%	-1.59%	-3.23%	-4.62%
6	-3.14%	-4.16%	-2.13%	-3.50%	-3.56%	-2.95%	-1.47%	-3.22%	-4.50%
7	-3.14%	-4.09%	-2.00%	-3.37%	-3.23%	-2.85%	-1.44%	-3.34%	-4.35%
8	-2.93%	-3.85%	-1.94%	-3.25%	-2.92%	-2.57%	-1.35%	-3.20%	-4.14%
9	-2.67%	-3.62%	-1.80%	-3.11%	-2.58%	-2.29%	-1.24%	-3.11%	-3.91%
Richest	-2.01%	-3.28%	-1.28%	-2.76%	-2.02%	-1.87%	-1.11%	-2.68%	-3.08%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

The reverse analysis can be found in Annex I (tables I.14 to I.21). Households losing the most proportionally from the abolition of zero and reduced rates are placed in quintile 1 and those losing the least are placed in quintile 5. The results show, in general, that those households which would lose most in proportional terms from the abolition of zero and reduced rates have adults who are older and have less education than average and are more likely to have no adults working. There is no clear cross-country pattern for whether home-owners, families with children and single adult households are more likely to be amongst the biggest or smallest losers from the abolition of reduced rates.

A concern for the distributional impact of VAT is clearly one reason for the existence of some categories of zero and reduced rates, and our analysis shows that taken as a whole, such rates do act to reduce the burden of VAT proportionally more for poorer households than richer ones. One key reason for the overall progressive impact of such rates is that all the countries considered apply a reduced rate to the majority of foodstuffs (and food makes up a larger fraction of the spending of poorer households than richer households, on average). The zero rate applied to children's clothing in the UK, and the reduced rate applied to domestic energy in the UK, Italy and Greece are also progressive. On the other hand, reduced-rates for goods such as books, magazines and newspapers, public transport, cultural activities, hotels, and restaurants are generally either distributionally neutral, or regressive, providing a bigger proportional benefit to richer households. Of course, there may be reasons other than distributional for reduced rates of VAT, and we assess this issue more fully in the next chapter of this report.

If zero and reduced rates were abolished, rather than raising additional net revenue, governments could decide to use the money raised to reduce the standard rate of VAT so that the overall package was revenue-neutral. The new uniform rates of VAT would then be:

- Belgium: 15.80% (existing standard rate is 21%)
- France: 12.70% (existing standard rate is 19.6%)
- Germany: 15.54% (existing standard rate is 19%)
- Spain: 12.70% (existing standard rate is 18%)
- UK: 14.88% (existing standard rate is 20%)
- Greece: 19.00% (existing standard rate is 23%)
- Hungary: 23.10% (existing standard rate is 25%)
- Italy: 13.70% (existing standard rate is 20%)

- Poland: 15.45% (existing standard rate is 23%)

Annex I.3, tables I.22 to I.30 show the distributional effects of such a reform. The progressive pattern of existing zero and reduced rates mean that such a reform would be regressive: poorer households (both measured in terms of their income or spending) would end up paying more VAT, whilst richer households would end up paying less VAT. Average VAT payments would increase for the six or seven poorest income decile groups and for the seven or eight poorest expenditure decile groups meaning that middle income (and spending) households would lose, on average, as well as poor households. Households consisting only of adults aged 60 or over would pay more VAT, on average, in all countries. Amongst the rest of the population, the pattern is less clear-cut, but household types where no adult works generally lose out (i.e. pay more VAT) on average, with household types that have working adults more likely to gain (i.e. pay less VAT), on average.

The reverse analysis can also be found in annex I (tables I.31 to I.39). Households losing the most, proportionally from the revenue-neutral abolition of zero and reduced rates are placed in quintile 1 and those gaining the most are placed in quintile 5. The results show, in general, that those households which would lose most in proportional terms from the abolition of zero and reduced rates have adults who are older and have less education than average and are more likely to have no adults working. Conversely, those households gaining the most contain younger, more educated adults, and are more likely to have two or more workers. There is no clear cross-country pattern for whether home-owners, families with children and single adult households are more likely to be amongst the biggest losers or biggest gainers from the abolition of reduced rates.

The revenue and distributional impact of increasing the standard rate of VAT

Because of the progressive nature of zero and reduced rates, if a government wanted to raise revenue through VAT in a progressive manner, they could do so by increasing the standard rate of VAT. Table 9.8 shows the estimated revenues from increasing the standard rate of VAT by 1 percentage point. As a fraction of existing VAT revenues, the additional revenue raised is lowest (at 2.9%) in Italy, where a relatively large fraction of VAT is raised from goods taxed at the reduced rates due to their wide use. It is highest in the UK at 4.9% of existing revenues, due to the fact that reduced rates are little used (although zero-rates are widely used) and the low level of the reduced rate (5%).

Table 9.8 Revenue from increasing the standard VAT rate by 1 percentage point

	Estimates from micro-simulation model	
	€ (billions per annum)	% of existing VAT revenues
Belgium	0.6	4.0%
France	3.7	4.0%
Germany	3.6	4.4%
Spain	1.7	4.1%
United Kingdom	3.4	4.9%
Greece	0.5	3.2%
Hungary	0.2	3.7%
Italy	1.8	2.9%
Poland	0.5	3.5%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed. Micro-simulation estimates exclude VAT raised during intermediate transactions of exempt goods, and from the sale of new-build housing.

Sources: Various household surveys (see Annex H) and authors' calculations.

Annex I (tables I.39 to I.47) shows the distributional effects of increasing the standard rate by 1 percentage point. Unsurprisingly, the amount of additional VAT that would be paid increases in cash terms as one moves up either the income or expenditure distributions. It also increases in proportional terms for most countries, using either

household income or expenditure to rank households as rich or poor, although the pattern is stronger when expenditure is used. The progressive nature of an increase in the standard rate of VAT is least significant in Hungary, where the standard rate applies to most goods and services. In general, working households would be hit proportionally harder from an increase in the standard rate of VAT than households without workers and those where all adults are aged 60 or over.

Reverse analysis can also be found in annex I (tables I.48 to I.55). Households losing the most proportionally from the 1 percentage point increase in the standard rate of VAT are placed in quintile 1 and those losing the least are placed in quintile 5. The results show that households with younger, more educated adults would be more likely than average to be amongst the biggest proportional losers of such a reform. As would households consisting of more than one adult, and households with two or more workers. The patterns for other characteristics are less clear-cut.

Summary

This section has analysed the distributional effects of existing VAT rate structures for a number of EU countries, with a special focus on the impact of zero and reduced rates.

We have argued that the distributional impact of VAT is best assessed by looking at how VAT payments as a proportion of expenditure vary between poorer and richer households. When doing this, VAT levied on non-housing expenditure is found to be at least a little progressive in Belgium, France, Germany, the UK, Greece, Poland and Italy, and broadly distributionally neutral in Hungary. The case is less clear-cut for Spain.

This finding of progressivity contrasts with the general view that VAT is a regressive tax. Findings of regressivity are generally based on analysis of VAT payments as a proportion of income (rather than expenditure) and it is true that low-income households pay more in VAT as a percentage of their income than high-income households. We show that whilst such analysis is not 'incorrect' it is likely to be misleading with regards to the impact of VAT over the lifetime because it does not adequately take into account the fact that people can and do borrow and save to fund their spending and spread their income over their lifetimes.

But we also think that the finding of progressivity is quite intuitive. Much of the spending which is subject to zero and reduced rates of VAT is on goods which are consumed disproportionately by the poor, most notably, food. Therefore it is not surprising that VAT makes up a lower proportion of the expenditure of poor households than rich households. If zero and reduced rates of VAT were introduced to make VAT a more progressive tax they clearly continue to meet this aim. However, whilst zero and reduced rates of VAT are found to be of bigger proportional benefit to poor households, richer households gain more, on average, in absolute cash terms. This indicates the limitation of using VAT to redistribute, something which we return to in the next chapter.

9.3 Impact on spending patterns and consumer welfare

So far, we have analysed the revenue and distributional implications of the current VAT systems (and the existing zero and reduced rates) using a static framework. That is, we have calculated revenues from (and the distributional impact of) the existing system and broadening the VAT base, holding the quantity purchased of each good or service fixed, whereas in reality, they would adjust as purchasing power changes and the relative prices of different goods and services change. We now use demand systems estimated for a sub-set of the countries analysed so far to study the impact of the existing VAT rate structures (including zero and reduced rates) on expenditure patterns, on consumer welfare, and to look at how estimates of the revenue that could be obtained if existing zero and reduced rates were abolished are affected by behavioural response. The countries considered in this section are Belgium, France, Germany, Spain and the United Kingdom.

The demand system that forms the basis of this analysis is called the Quadratic Almost Ideal Demand System (QUAIDS). Developed in Banks, Blundell and Lewbel (1997), this model has the benefit of being flexible enough to account for many of the patterns observed in expenditure data (for instance the fact that the shares of some goods first rise and then fall – or vice versa – with the level of total expenditure), whilst being feasibly estimated using standard statistical techniques. Full details of this model and of the particular details of its application in each of the case studies can be found in Annex J. This includes full sets of price and total expenditure elasticities. Readers should note that the demand model employed in France does not satisfy all the conditions of the QUAIDS and this has prevented its use to analyse the welfare effects of VAT. It has also not been possible to generate reliable welfare analysis for Spain. However, the models for France and Spain can and have been used to look at the effects of VAT on spending patterns.

Estimating demand systems is not trivial. It requires reliable data on households' spending on different goods and services, their total spending, and on the prices households face when making purchases. Because of the poor quality of the household survey data available to us, and because we have only limited (and potentially inaccurate) information on the prices consumers face, the estimates should be treated as indicative only. Furthermore, in order to our feasibly estimate our demand systems, we have had to group expenditure into fairly broad categories. Whilst, where possible, we have grouped goods and services according to VAT treatment and having the same broad function (e.g. "leisure", "household goods"), our method will not pick up

substitution between specific products (e.g. between DVDs and sporting goods). This means that the broad qualitative results are highly likely to be correct (e.g. whether the abolition of existing zero and reduced rates gives scope for improvements in aggregate consumer welfare), the estimated magnitude of the effects (e.g. the size of the aggregate improvement in consumer welfare) should be treated with caution. Where we have particular concerns about the plausibility of magnitudes of results we shall highlight them.

A further important point to bear in mind is the number of assumptions underlying QUAIDS. First, is the assumption that the welfare obtained from any and all goods is independent of whether and how much one works. The model also assumes that there are no social costs or benefits from comsuming certain goods and services. Together, these imply that taxation should not distort the relative prices of different goods and services, meaning that a uniform VAT rates for all goods and services would be economically efficient. The assumption of separability between consumption and working decisions can be tested using the method of Browning and Meghir (1991). We have done so for the UK only and the assumption is found to be violated, the full implications of which are discussed in our qualitative assessment of the VAT system in chapter 10. The welfare effects (such as the potential gain from moving towards a uniform VAT rate) reported in this chapter could be larger or smaller if one could account for this issue. This reinforces the point that the exact quantitative results of our models should be treated with caution. Unfortunately, models of demand for all goods and services which relax this restriction are not available

The effect of abolishing VAT on spending patterns and welfare

The existence of VAT in its current form distorts spending patterns from what they would be in the absence of VAT, due to both a reduction in overall purchasing power, and its effect on relative prices. Tables 9.9A to 9.9E show spending patterns under the current VAT system, and what our demand models imply they would be in the absence of VAT (where overall purchasing power is greater and relative prices different).The expenditure categories are those included in the demand systems for the relevant country and shares are expressed as a fraction of modelled expenditure (some categories of goods and services are excluded from the demand models). The first two columns of each table show the share of modelled expenditure going towards each category. Following a change in the VAT system, this would change due to both changes in the amount of that category purchased, and any change in the price of the category resulting from the change in VAT rates. The second two columns of each table

strip out the price changes and show the change in quantity. Because each category contains many different specific goods and services, there are no natural units for quantity, and for this reason quantities are normalised to 100 for each category for the existing VAT system. Hence, a number greater than 100 indicates more of the good would be consumed under a reform system, and vice versa.

Table 9.9A Expenditure Patterns in Belgium

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	VAT Abolished	Existing VAT	VAT Abolished
Food	17.4%	14.4%	100.0	88.2
Alcohol and tobacco	2.9%	5.8%	100.0	238.2
Clothing	4.9%	3.3%	100.0	80.2
Housing non-durables	20.2%	14.3%	100.0	75.8
Transport	8.4%	20.2%	100.0	281.0
Recreation	12.4%	6.6%	100.0	60.6
Restaurants	8.8%	14.2%	100.0	185.0
Other nondurables	18.5%	13.4%	100.0	76.2
Durables	6.5%	7.8%	100.0	145.1

Notes: Housing non-durables includes spending on rent (which is VAT exempt)

Sources: Authors' calculations, household surveys and Belgian price indices (see Annex J)

Table 9.9B Expenditure Patterns in France

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	VAT Abolished	Existing VAT	VAT Abolished
Food at home	13.1%	12.9%	100.0	104.4
Alcohol and tobacco	2.8%	2.6%	100.0	110.8
Clothing and footwear	4.7%	3.7%	100.0	106.3
Housing and energy	29.3%	30.9%	100.0	100.9
Furniture and maintenance	5.7%	5.7%	100.0	119.6
Medicine and Education	4.5%	4.5%	100.0	107.9
Transport	13.7%	13.0%	100.0	112.2
Leisure and Communication	10.6%	10.6%	100.0	117.4
Restaurants and Hotels	5.9%	5.8%	100.0	103.8
Other Goods	10.2%	10.2%	100.0	119.2

Notes: Housing and energy includes spending on rent (which is VAT exempt)

Sources: Authors' calculations, household surveys and French price indices (see Annex J)

Table 9.9C Expenditure Patterns in Germany

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	VAT Abolished	Existing VAT	VAT Abolished
Food	27.7%	26.6%	100.0	103.0
Services	10.1%	9.1%	100.0	104.1
Health	7.1%	8.5%	100.0	129.2
Transport	19.5%	19.5%	100.0	112.4
Domestic Energy	13.4%	12.3%	100.0	106.3
Leisure	12.6%	13.8%	100.0	119.0
Restaurants	9.6%	10.2%	100.0	121.6

Notes: Housing and durable goods are excluded from the demand model (with changes in VAT treatment for such goods included in a no-behavioural-response form, where appropriate)

Sources: Authors' calculations, household surveys and German price indices (see Annex J)

Table 9.9D Expenditure Patterns in Spain

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	VAT Abolished	Existing VAT	VAT Abolished
Food and non-alcoholic drinks	14.4%	15.1%	100.0	112.0
Alcohol	0.6%	0.6%	100.0	124.2
Tobacco	1.5%	1.2%	100.0	128.5
Clothing and footwear	5.8%	5.4%	100.0	109.4
Housing	22.8%	23.1%	100.0	100.9
Household goods	10.4%	11.8%	100.0	129.1
Household energy	1.2%	0.9%	100.0	91.4
Health	3.2%	3.6%	100.0	113.6
Petrol	4.1%	4.0%	100.0	117.7
Other private transport	3.4%	3.7%	100.0	126.6
Public transport	0.8%	0.8%	100.0	114.3
Communications	3.1%	3.1%	100.0	117.9
Leisure	17.6%	17.5%	100.0	108.7
Education	0.9%	1.1%	100.0	115.7
Durable goods	5.2%	3.0%	100.0	67.5
Other non durables	4.9%	5.0%	100.0	106.8

Notes: All goods included in the model but tax changes not applied to exempt goods and housing.

Sources: Authors' calculations, household surveys and Spanish price indices (see Annex J)

Table 9.9E Expenditure Patterns in the UK

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	VAT Abolished	Existing VAT	VAT Abolished
Zero-rated food	12.1%	11.6%	100.0	96.2
Standard-rated food, catering and alcohol	12.1%	11.2%	100.0	111.5
Leisure goods and services (inc. tobacco)	22.3%	23.4%	100.0	126.3
Domestic energy	5.7%	6.0%	100.0	111.7
Household goods and services	11.9%	12.9%	100.0	130.4
Personal goods (inc. clothes) and services	14.5%	14.9%	100.0	123.1
Private transport	19.2%	18.4%	100.0	114.5
Other zero-rated goods	2.3%	1.6%	100.0	67.8

Notes: Exempt housing costs (such as rent) are excluded from the demand model

Sources: Authors' calculations, household surveys and UK price indices (see Annex J)

The existing system of standard, reduced and, in the case of the UK, zero rates of VAT means that prices for different expenditure categories are affected differently by VAT, and hence would see different falls in their prices if VAT were abolished. How sensititive demand is to the prices of different categories also differs across the expenditure categories. Together, this means the impact of abolishing VAT on spending patterns is not something that can be easily predicted. The share of spending going to a good currently subject to VAT may rise (if quantity purchased goes up more than the price falls) or fall (if it does not) when VAT is abolished, and there is no *a priori* way to tell which will happen.

The impact on spending patterns is estimated to be largest in Belgium. This is not because the VAT system is more complex or distortionary in itself, but because the demand system for Belgium implies households are much more responsive to changes in prices and taxes than those in the other countries studied.[222] Indeed, the magnitude of the responses seem somewhat implausible to us, although they are based on a model estimated on data on spending and prices over many years. Focusing on the direction

[222] Technically, the own- and cross-price elasticities of demand are often very large for Belgium. See Annex H.

rather than the magnitude of effects, the existing VAT system seems to distort spending away from alcohol and tobacco, transport and restaurants, and therefore the abolition of VAT would lead to larger fractions of spending going towards these goods meaning a much greater quantity of these goods would be consumed. On the other hand, the existing VAT is estimated to distort spending towards food, housing non-durables, recreation and other non-durables so that its abolition would lead to not only smaller fractions of spending going towards these goods but also lower quantities consumed.

The estimated effect of VAT on spending patterns in the other countries is more modest.

In France the abolition of VAT would see the fraction of spending going towards housing and energy rise slightly. On the other hand, there would be modest falls in the share of spending going towards food and transport, and a more notable fall in the share going towards clothing and footwear. Quantities consumed would increase for all goods, however.

In Germany, the abolition of VAT is estimated to lead to small increases in the share of spending going towards medical goods, leisure and restaurants and small falls in the share of spending going towards food, services, and domestic energy. Whilst spending on food, services and domestic energy is estimated to fall by around 4%, 10% and 8%, respectively, following the abolition of VAT, prices would have fallen even more (by 7.5%, 14.4%, and 15.8%), so that the quantities of these goods consumed would be higher without VAT.

In Spain, the abolition of VAT is estimated to lead to small increases in the share of spending going towards food, health, housing and durable goods, and falls in the share going to tobacco, clothing, household goods, petrol, private transport and communication. However, with the exception of tobacco, the estimated falls in expenditure are smaller than the falls in price implies that a greater quantity of the goods would be purchased. The fact that the model finds that more tobacco is consumed with VAT than if it were abolished, despite the fact that the standard rate of VAT is levied on tobacco shows the importance of allowing for interactions between the prices of different goods (called cross-price effects).

In the UK, the most notable distortion to spending patterns is the encouragement to purchase other zero-rated goods (books, children's clothing and public transport): in the absence of VAT, the share of spending on these goods would be around one-third lower

than it is under the current rate of VAT. Because the price of these goods would be unaffected by the abolition of VAT (they are currently zero-rated), this means the quantity of such goods consumed would also fall by around one-third. In other words, the existing VAT system appears to make people buy more of these goods than they otherwise would. The quantity of zero-rated food consumed would also be lower in the absence of VAT. Consumption of household goods and services, and leisure goods and services is most suppressed by the existing VAT system and would be between a quarter and a third higher in the absence of VAT.

Tables 9.10 to 9.12 show how the welfare effects of the abolition of VAT vary across the distribution of household income and household expenditure. Results for the household types considered in section 9.1 can be found in table J.11 in Annex J.

Our measure of the welfare effect of a VAT change is the amount of money that would have to be given to (or taken from) a household following a reform (for instance, the abolition of VAT) such that their level of consumer welfare would be exactly the same as it is under the existing VAT system. In other words it is the amount that we would need to give or take away from a household to compensate them for the effects of the reform. Economists call this measure of the welfare effect of a price or tax change the compensating variation (CV). Details on the calculation of it can be found in Annex J. A positive estimated CV for a particular household means it requires a transfer of resources to reach its pre-reform level of welfare, and therefore that the reform has made the household worse off. However, to be consistent with the analysis of section 9.2, such welfare losses are shown as negative numbers in the following tables. A negative estimated CV, on the other hand, means a welfare gain which is shown as a positive number.

The CV is a convenient way of describing the welfare effect of a tax change in money-terms: it is the monetary amount of compensation required following a reform. However, a Euro is not worth the same in terms of underlying welfare to every household: it is worth more to a poorer household than a richer one. Hence, a welfare loss requiring 10 Euros per week compensation would involve a bigger fall in underlying welfare for a poor household than a rich household. This should be borne in mind when looking at the cash-terms welfare gains/losses in tables 9.10 and 9.11 and the rest of the tables in this section. The welfare gains/losses expressed as a proportion of household expenditure are likely to better reflect the impact on household's underlying welfare.

The results are very similar to those of the static analysis. The amount that would need to be taken off households to 'compensate' them for the abolition of VAT increases as one moves up both the income distribution and the expenditure distribution. This is unsurprising: richer households spend more and therefore gain more, in cash terms from the fall in prices associated with the abolition of VAT, and therefore require more cash to be taken from them to leave their welfare unaffected by the reform. However, the amount that would need to be taken off households is higher for richer households than poorer households not only in cash terms, but also measured as a fraction of spending. For instance, an amount equivalent to 10.07% of expenditure would need to be taken off households in the top tenth of the expenditure distribution in the UK, on average, versus 6.18% of expenditure for those in the bottom tenth. This means that the possibility of substitution between different types of goods and services when prices change does not fundamentally change our picture of VAT for Belgium, Germany, Spain and the UK: it is slightly progressive, involving a bigger proportional hit to the rich than the poor.

Table 9.10 Change in welfare across the income distribution following abolition of VAT (Euros per week, % of spending)

Income Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	40.11	10.91%	16.30	7.26%	35.25	8.67%
2	48.48	10.68%	23.50	8.14%	35.28	8.60%
3	61.09	10.50%	27.30	8.12%	33.70	8.21%
4	68.16	11.15%	33.40	8.40%	37.84	8.32%
5	71.59	10.77%	38.20	8.60%	44.39	8.56%
6	82.50	11.01%	42.50	8.51%	48.30	8.65%
7	97.66	12.10%	49.60	8.87%	49.55	8.48%
8	104.66	11.39%	50.90	8.64%	61.02	9.09%
9	115.98	12.59%	61.20	8.81%	74.48	9.28%
Richest	135.95	12.23%	80.80	9.04%	104.81	9.22%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: Authors' calculations using demand systems and various household surveys (see Annex J).

Table 9.11 Change in welfare across the expenditure distribution following abolition of VAT (Euros per week, % of spending)

Expenditure Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	29.44	10.26%	12.60	6.82%	13.69	6.18%
2	39.89	10.48%	19.50	7.48%	21.33	6.84%
3	50.22	10.74%	25.70	7.96%	27.45	7.51%
4	58.14	10.92%	29.60	8.21%	31.60	7.70%
5	66.89	11.08%	35.60	8.50%	38.32	8.12%
6	78.08	11.24%	38.20	8.37%	45.07	8.39%
7	87.33	11.39%	44.80	8.67%	54.72	8.85%
8	100.11	11.60%	52.10	8.78%	64.46	8.98%
9	119.63	11.85%	61.50	8.89%	87.16	9.66%
Richest	196.41	12.40%	104.20	9.30%	140.91	10.07%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

The effect of abolishing zero and reduced rates of VAT on spending patterns and welfare

The existence of zero and reduced rates of VAT distort spending patterns from what they would be if VAT were charged at a uniform rate for all goods and services. Tables 9.12A to 9.12E show spending patterns under the current VAT system, and what our demand models imply they would be if VAT were charged at the existing standard rate of VAT on all goods and services currently zero or reduced rated (except housing). The spending patterns under the uniform VAT system differ to existing spending patterns due to both a reduction in overall purchasing power, and changes in relative prices.

Table 9.12A Expenditure Patterns in Belgium

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food	17.4%	19.8%	100.0	99.8
Alcohol and tobacco	2.9%	3.4%	100.0	116.1
Clothing	4.9%	5.0%	100.0	100.5
Housing non-durables	20.2%	16.4%	100.0	81.0
Transport	8.4%	8.0%	100.0	93.3
Recreation	12.4%	10.7%	100.0	84.9
Restaurants	8.8%	9.7%	100.0	104.9
Other nondurables	18.5%	19.4%	100.0	103.5
Durables	6.5%	7.8%	100.0	117.4

Notes: See notes of table 9.9A.

Sources: See sources of table 9.9A.

Table 9.12B Expenditure Patterns in France

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food at home	13.1%	13.6%	100.0	91.6
Alcohol and tobacco	2.8%	2.8%	100.0	100.0
Clothing and footwear	4.7%	4.2%	100.0	100.0
Housing and energy	29.3%	28.6%	100.0	97.5
Furniture and maintenance	5.7%	5.7%	100.0	100.0
Medicine and Education	4.5%	4.5%	100.0	98.6
Transport	13.7%	13.8%	100.0	99.1
Leisure and Communication	10.6%	10.5%	100.0	97.9
Restaurants and Hotels	5.9%	6.1%	100.0	92.3
Other Goods	10.2%	10.2%	100.0	100.0

Notes: See notes of table 9.9B.

Sources: See sources of table 9.9B.

Table 9.12C Expenditure Patterns in Germany

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food	27.7%	28.6%	100.0	93.7
Services	10.1%	9.6%	100.0	95.9
Health	7.1%	7.2%	100.0	101.7
Transport	19.5%	19.0%	100.0	97.2
Domestic Energy	13.4%	12.8%	100.0	94.7
Leisure	12.6%	12.8%	100.0	96.6
Restaurants	9.6%	10.0%	100.0	103.7

Notes: See notes of table 9.9C.

Sources: See sources of table 9.9C.

Table 9.12D Expenditure Patterns in Spain

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food and non-alcoholic drinks	14.4%	16.0%	100.0	100.5
Alcohol	0.6%	0.5%	100.0	84.9
Tobacco	1.5%	1.5%	100.0	101.5
Clothing and footwear	5.8%	5.7%	100.0	97.8
Housing	22.8%	22.6%	100.0	99.0
Household goods	10.4%	13.3%	100.0	126.1
Household energy	1.2%	1.2%	100.0	101.6
Health	3.2%	3.4%	100.0	99.6
Petrol	4.1%	3.6%	100.0	89.7
Other private transport	3.4%	3.6%	100.0	103.7
Public transport	0.8%	0.8%	100.0	96.1
Communications	3.1%	2.8%	100.0	90.7
Leisure	17.6%	15.7%	100.0	82.9
Education	0.9%	0.6%	100.0	67.2
Durable goods	5.2%	3.5%	100.0	66.5
Other non durables	4.9%	5.2%	100.0	105.3

Notes: See notes of table 9.9D.

Sources: See sources of table 9.9D.

Table 9.12E Expenditure Patterns in the UK

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Zero-rated food	12.1%	13.5%	100.0	93.6
Standard-rated food, catering and alcohol	12.1%	10.8%	100.0	89.9
Leisure goods and services (inc. tobacco)	22.3%	22.0%	100.0	98.9
Domestic energy	5.7%	6.9%	100.0	106.8
Household goods and services	11.9%	12.6%	100.0	106.4
Personal goods (inc. clothes) and services	14.5%	14.3%	100.0	98.3
Private transport	19.2%	18.4%	100.0	95.7
Other zero-rated goods	2.3%	1.4%	100.0	49.5

Notes: See notes of table 9.9E.

Sources: See sources of table 9.9E.

The effect of VAT on spending patterns is, again, modest in most instances.

In France the effect of the the reform is very modest. The fraction of spending going towards food and restaurants would rise slightly reflecting the higher prices for these types of goods and services following the imposition of the standard rate of VAT on them. In other words, reduced rates of VAT reduce the amount that households spend on these goods (but not neccessarily the amounts purchased). The share of spending going towards housing and energy (which is largely exempt from VAT) would fall slightly.

In Germany, spending on food would rise a little (by around 3%), although not enough to offset the higher cost of food (around 9%) if reduced rates were abolished. In other words, reduced rates of VAT reduce the amount that households spend on food, but increase the quantity purchased. Existing reduced rates also act to increase the share of spending going towards services, transport, and domestic energy, and to reduce the share of spending going towards leisure and restaurants.

In Spain, spending on food and leisure would rise a little, meaning that existing reduced rates act to reduce the share of spending going towards these goods. The fraction of spending going towards other goods and services would generally fall, although the effects are very minor.

In the UK, the abolition of zero and reduced rates of VAT would again lead to a notable fall in the fraction of spending going towards other zero-rated goods. The share of spending going towards these goods would fall by around 40% (from 2.3% to 1.4% of modelled expenditure), which means a reduction in the quantity of such goods purchased of almost 50% (as the imposition of the standard rate of VAT on them would raise their price by 20%).

Tables 9.13 and 9.14 show how the welfare effects of the abolition of zero and reduced rates vary across the distribution of household income and household expenditure. Results for the various household types can be found in table H.12.

Table 9.13 Change in welfare across the income distribution following the abolition of zero and reduced rates of VAT (Euros per week, % of spending)

Income Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	-8.73	-2.38%	-3.00	-1.32%	-14.82	-3.65%
2	-11.00	-2.42%	-3.40	-1.19%	-14.40	-3.51%
3	-12.94	-2.22%	-3.80	-1.12%	-13.62	-3.32%
4	-14.04	-2.30%	-3.90	-0.99%	-15.02	-3.30%
5	-14.62	-2.20%	-4.10	-0.92%	-16.68	-3.21%
6	-16.08	-2.15%	-4.20	-0.84%	-16.56	-2.96%
7	-17.70	-2.19%	-4.40	-0.78%	-16.47	-2.82%
8	-17.25	-1.88%	-4.40	-0.75%	-18.03	-2.69%
9	-18.58	-2.02%	-4.40	-0.64%	-18.99	-2.37%
Richest	-17.76	-1.60%	-4.30	-0.48%	-19.83	-1.74%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Table 9.14 Change in welfare across the expenditure distribution following the abolition of zero and reduced rates of VAT (Euros per week, % of spending)

Expenditure Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	-7.86	-2.74%	-2.60	-1.42%	-9.88	-4.46%
2	-10.00	-2.63%	-3.30	-1.27%	-12.11	-3.88%
3	-12.06	-2.58%	-3.60	-1.12%	-13.69	-3.75%
4	-13.16	-2.47%	-3.90	-1.09%	-14.23	-3.47%
5	-14.48	-2.40%	-4.20	-0.99%	-15.47	-3.28%
6	-16.25	-2.34%	-4.40	-0.96%	-16.75	-3.12%
7	-17.28	-2.25%	-4.30	-0.84%	-18.28	-2.96%
8	-18.53	-2.15%	-4.50	-0.75%	-19.21	-2.68%
9	-19.44	-1.93%	-4.70	-0.67%	-21.19	-2.35%
Richest	-19.59	-1.24%	-4.40	-0.39%	-23.62	-1.69%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Again, the results are very similar to those of the static analysis. The amount that would need to be given to households to compensate them for the abolition of zero and reduced rates of VAT increases as one moves up both the income distribution and the expenditure distribution. This reflects the fact that richer households purchase more zero and reduced rate goods and services in absolute terms than do poorer households. However, measured as a fraction of expenditure, the amount needed to compensate households is smaller for richer households than poorer households. For instance, an amount equivalent to 4.46% of expenditure would need to be given to households in the bottom tenth of the expenditure distribution in the UK, on average, versus 1.69% of expenditure for those in the top tenth to compensate for the abolition of zero and reduced rates. This means that the possibility of substitution between different types of goods and services when prices change does not fundamentally change our picture of zero and reduced rates of VAT in Belgium, Germany, Spain and the UK: they are progressive, helping the poor proportionally more than the rich, particularly in the UK.
As discussed in more detail in chapter 10 of this report, that does not mean that zero and reduced rates of VAT are a good way of redistributing purchasing power from richer to poorer households. Indeed, because they distort relative prices of different goods and services, and therefore spending patterns, they are generally an inefficient way to redistribute.

One measure of the cost of this distortion is the amount of revenue that would be left over after compensating households for the effect of abolishing zero and reduced rates of VAT. Table 9.15 shows this (in cash terms and as a fraction of household expenditure), as well as the revenue raised by the reforms after allowing for behavioural response (before compensation).[223]

[223] When households are compensated for an increase in VAT (such as the abolition of zero and reduced rates), they use their additional income to increase expenditure, increasing the yield of the original VAT increase. It is the revenue that would be raised after such compensation that must be compared to the amount of compensation required, rather than the amount of revenue that would be raised from the reform alone (i.e. before compensation).

Table 9.15 Revenue and efficiency implications of abolishing zero and reduced rates of VAT

Country	Revenue remaining following compensation of households		Revenue (before compensation)
	Cash Terms	% of Revenue (after compensation)	
Belgium	0.12	4.6%	2.26
Germany	10.3	58.0%	7.5
UK	0.81	3.5%	19.5

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

The results show the potential for a welfare gain from the abolition of zero and reduced rates of VAT. The estimated size of the potential welfare gain is much larger than one would expect in Germany. However, whilst we may doubt the accuracy of the magnitude of the effects, the results clearly point to the potential for welfare gains and improvements in economic efficiency from abolishing zero and reduced rates.

One way to compensate households, on average, is to reduce the uniform rate of VAT so that it raises the same amount of revenue that the existing system of zero, reduced and standard rates of VAT raises. After allowing for behavioural response the following rates would be required:

- Belgium: 18.20% (existing standard rate is 21%)
- France: 12.70% (existing standard rate is 19.6%)
- Germany: 16.21% (existing standard rate is 19%)
- Spain: 12.70% (existing standard rate is 18%)
- UK: 14.95% (existing standard rate is 20%)

Tables 9.16A to 9.16E show spending patterns under the current VAT system, and what our demand models imply they would be if VAT were charged at the above uniform rates on all goods and services currently subject to zero, reduced or standard rates (except housing). The spending patterns under the revenue-neutral uniform VAT system differ to existing spending patterns due to only changes in relative prices: revenue neutrality ensures there is no change in households' purchasing power, on average.

Table 9.16A Expenditure Patterns in Belgium

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food	17.4%	18.3%	100.0	94.5
Alcohol and tobacco	2.9%	4.1%	100.0	142.3
Clothing	4.9%	4.5%	100.0	93.1
Housing non-durables	20.2%	15.8%	100.0	78.9
Transport	8.4%	11.4%	100.0	136.7
Recreation	12.4%	9.6%	100.0	77.3
Restaurants	8.8%	11.0%	100.0	121.0
Other nondurables	18.5%	17.8%	100.0	95.3
Durables	6.5%	7.7%	100.0	120.2

Notes: See notes of table 9.9A.

Sources: See sources of table 9.9A.

Table 9.16B Expenditure Patterns in France

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food at home	13.1%	13.4%	100.0	95.6
Alcohol and tobacco	2.8%	2.8%	100.0	103.3
Clothing and footwear	4.7%	4.0%	100.0	102.0
Housing and energy	29.3%	29.4%	100.0	98.7
Furniture and maintenance	5.7%	5.7%	100.0	106.1
Medicine and Education	4.5%	4.5%	100.0	101.7
Transport	13.7%	13.5%	100.0	103.1
Leisure and Communication	10.6%	10.6%	100.0	103.9
Restaurants and Hotels	5.9%	6.0%	100.0	95.8
Other Goods	10.2%	10.2%	100.0	105.9

Notes: See notes of table 9.9B.

Sources: See sources of table 9.9B.

Table 9.16C Expenditure Patterns in Germany

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food	27.7%	28.3%	100.0	94.8
Services	10.1%	9.5%	100.0	96.9
Health	7.1%	7.4%	100.0	105.4
Transport	19.5%	19.1%	100.0	99.2
Domestic Energy	13.4%	12.7%	100.0	96.2
Leisure	12.6%	13.0%	100.0	99.7
Restaurants	9.6%	10.1%	100.0	106.1

Notes: See notes of table 9.9C.

Sources: See sources of table 9.9C.

Table 9.16D Expenditure Patterns in Spain

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Food and non-alcoholic drinks	14.4%	15.8%	100.0	103.5
Alcohol	0.6%	0.5%	100.0	94.2
Tobacco	1.5%	1.4%	100.0	109.2
Clothing and footwear	5.8%	5.6%	100.0	101.0
Housing	22.8%	22.8%	100.0	99.7
Household goods	10.4%	12.9%	100.0	127.5
Household energy	1.2%	1.2%	100.0	99.1
Health	3.2%	3.4%	100.0	103.1
Petrol	4.1%	3.7%	100.0	96.7
Other private transport	3.4%	3.6%	100.0	109.9
Public transport	0.8%	0.8%	100.0	100.3
Communications	3.1%	2.9%	100.0	97.8
Leisure	17.6%	16.2%	100.0	89.5
Education	0.9%	0.7%	100.0	76.5
Durable goods	5.2%	3.3%	100.0	66.7
Other non durables	4.9%	5.1%	100.0	106.0

Notes: See notes of table 9.9D.

Sources: See sources of table 9.9D.

Table 9.16E Expenditure Patterns in the UK

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Reduced Rates Abolished	Existing VAT	Reduced Rates Abolished
Zero-rated food	12.1%	13.1%	100.0	94.4
Standard-rated food, catering and alcohol	12.1%	10.9%	100.0	94.6
Leisure goods and services (inc. tobacco)	22.3%	22.4%	100.0	104.8
Domestic energy	5.7%	6.7%	100.0	108.0
Household goods and services	11.9%	12.7%	100.0	111.6
Personal goods (inc. clothes) and services	14.5%	14.4%	100.0	103.7
Private transport	19.2%	18.4%	100.0	99.8
Other zero-rated goods	2.3%	1.4%	100.0	53.4

Notes: See notes of table 9.9E.

Sources: See sources of table 9.9E.

The fraction of spending going towards food, currently subject to a zero or reduced rate of VAT, would increase in all countries under a revenue-neutral uniform rate of VAT. However, with food prices rising by even more than expenditure on food, the quantity of food purchased would fall (except in Spain). In other words, zero and reduced rates of VAT act to increase the quantity of food purchased. Whilst this may be what one would expect, it does not have to hold (due to interactions with the effect of zero and reduced rates of VAT on the prices of other goods). Results also give further support to the finding that the existing VAT rates in the UK encourage purchasing of books, childrens clothing and public transport.

For other categories of spending, the impact of moving towards a revenue-neutral uniform rate of VAT is less clear. Some categories that would see a fall in the rate of VAT (and hence in their price) would see an increase in the fraction of spending going towards them: for instance, restaurants in Germany, or household goods and services in

the UK. This implies relatively strong distortions of spending away from such goods under existing VAT systems. In some instances, categories that would see a fall in the rate of VAT see a fall in spending on them that is larger than the fall in their price (for instance standard rated food, catering and alcohol in the UK). This would mean that despite prices being higher under the existing VAT system than they would be under the uniform VAT system, a larger quantity of these goods is bought. This shows the importance of allowing for interaction effects: that is the effect of the price of each category on the demand for not only itself but also all other categories.

Tables 9.17 and 9.18 show how the welfare effects of the revenue-neutral uniform rate of VAT vary across the distribution of household income and household expenditure (the results for the various household types are in table J.13 in Annex J).

Table 9.17 Change in welfare across the income distribution following the revenue-neutral abolition of zero and reduced rates of VAT (Euros per week, % of spending)

Income Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	-0.98	-0.27%	0.00	0.00%	-2.19	-0.54%
2	-1.15	-0.25%	0.70	0.25%	-1.86	-0.45%
3	-1.08	-0.19%	1.00	0.29%	-1.68	-0.41%
4	-0.95	-0.16%	1.80	0.45%	-1.68	-0.37%
5	-0.30	-0.04%	2.40	0.54%	-1.27	-0.24%
6	-0.06	-0.01%	2.90	0.59%	-0.19	-0.03%
7	0.50	0.06%	3.80	0.69%	0.20	0.03%
8	2.49	0.27%	4.10	0.69%	1.92	0.29%
9	2.29	0.25%	5.60	0.80%	4.60	0.57%
Richest	6.61	0.59%	8.60	0.96%	11.63	1.02%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Table 9.18 Change in welfare across the expenditure distribution following the revenue-neutral abolition of zero and reduced rates of VAT (Euros per week, % of spending)

Expenditure Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	-1.78	-0.62%	-0.30	-0.15%	-3.93	-1.77%
2	-1.91	-0.50%	0.20	0.08%	-3.67	-1.18%
3	-2.01	-0.43%	0.90	0.28%	-3.31	-0.91%
4	-1.68	-0.32%	1.20	0.34%	-2.67	-0.65%
5	-1.40	-0.23%	1.90	0.46%	-1.90	-0.40%
6	-1.13	-0.16%	2.20	0.47%	-1.14	-0.21%
7	-0.54	-0.07%	3.20	0.62%	0.15	0.02%
8	0.43	0.05%	4.20	0.70%	1.91	0.27%
9	2.74	0.27%	5.40	0.79%	6.16	0.68%
Richest	14.66	0.93%	12.00	1.07%	17.91	1.28%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

As before, the results are similar to those of the static analysis. Poor households in Belgium and the UK see a welfare loss from the imposition of a revenue-neutral uniform rate of VAT, whilst richer households would see a welfare gain. For Germany, poor households are estimated to see their welfare relatively unaffected whilst richer household would see a welfare gain. The fact that richer households do better from this policy than poorer ones reflects the fact that poorer households spend a relatively large fraction of their budgets on zero and reduced rate goods and services such as food, and therefore the higher rates of VAT on these goods under uniformity more than offset the lower rates of VAT on goods currently subject to the standard rate of VAT. The reverse is true for richer households.

There is one major difference in the results using the demand system than those based on the static arithmetic analysis of section 9.1. The static analysis is based on changes in tax payments so that a revenue neutral reform sees losses (tax increases) for some households exactly off-set by gains (tax cuts) for others. However, when households can change their behaviour in response to changes in VAT rates, replacing the multiple rates of VAT with a single uniform rate removes a distortion to relative prices, and therefore leads to an increase in overall welfare.

The aggregate welfare gain is estimated at 0.17 billion Euros (or 0.74 Euros per week per household) in Belgium, 5.8 billion Euros (or 3.10 Euros per week per household) in Germany, and 1.3 billion Euros (or 1.07 Euros per week per household) in the UK. Again, whilst we would not put too much emphasis on the exact numbers, the results demonstrate that the existing systems of several VAT rates does entail a reduction in overall welfare: on average, people would pay to move towards a uniform rate structure. In other words, in principle, those households that would benefit from a uniform rate of VAT would still be better off even after using part of their gains to fully compensate those made worse off from a uniform rate of VAT.

The effect of increasing the standard rate of VAT by 1 percentage point on spending patterns and welfare

Tables 9.19A to 9.19E show spending patterns under the current VAT system, and what our demand models imply they would be if the standard rate of VAT were increased by 1 percentage point (except on housing). They show, as expected, that a small change in relative prices and in overall purchasing power has only a very modest impact on spending patterns. But the (modest) changes in spending patterns demonstrate how the

increases in the difference between the standard and zero and reduced rates of VAT further increase the distortion to spending patterns. For instance, in Belgium, the fraction of spending on transport falls further, whilst in the UK, the fraction going towards books, childrens clothing and public transport (other zero rated goods) rises further.

Table 9.19A Expenditure Patterns in Belgium

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Standard Rate up 1 ppt	Existing VAT	Standard Rate up 1 ppt
Food	17.4%	17.4%	100.0	100.2
Alcohol and tobacco	2.9%	2.8%	100.0	94.4
Clothing	4.9%	5.0%	100.0	100.8
Housing non-durables	20.2%	20.5%	100.0	101.4
Transport	8.4%	7.9%	100.0	93.4
Recreation	12.4%	12.7%	100.0	101.9
Restaurants	8.8%	8.5%	100.0	96.7
Other nondurables	18.5%	18.7%	100.0	100.9
Durables	6.5%	6.5%	100.0	98.1

Notes: See notes of table 9.9A.

Sources: See sources of table 9.9A.

Table 9.19B Expenditure Patterns in France

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Standard Rate up 1 ppt	Existing VAT	Standard Rate up 1 ppt
Food at home	13.1%	13.1%	100.0	100.1
Alcohol and tobacco	2.8%	2.9%	100.0	99.5
Clothing and footwear	4.7%	4.2%	100.0	99.7
Housing and energy	29.3%	29.2%	100.0	100.0
Furniture and maintenance	5.7%	5.7%	100.0	99.2
Medicine and Education	4.5%	4.5%	100.0	99.6
Transport	13.7%	13.8%	100.0	99.5
Leisure and Communication	10.6%	10.6%	100.0	99.3
Restaurants and Hotels	5.9%	5.9%	100.0	100.0
Other Goods	10.2%	10.1%	100.0	99.2

Notes: See notes of table 9.9B.

Sources: See sources of table 9.9B.

Table 9.19C Expenditure Patterns in Germany

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Standard Rate up 1 ppt	Existing VAT	Standard Rate up 1 ppt
Food	27.7%	26.9%	100.0	97.2
Services	10.1%	9.7%	100.0	95.7
Health	7.1%	7.4%	100.0	104.9
Transport	19.5%	19.3%	100.0	98.3
Domestic Energy	13.4%	13.6%	100.0	100.7
Leisure	12.6%	13.2%	100.0	104.0
Restaurants	9.6%	9.9%	100.0	102.1

Notes: See notes of table 9.9C.

Sources: See sources of table 9.9C.

Table 9.19D Expenditure Patterns in Spain

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Standard Rate up 1 ppt	Existing VAT	Standard Rate up 1 ppt
Food and non-alcoholic drinks	14.4%	14.3%	100.0	99.1
Alcohol	0.6%	0.6%	100.0	98.4
Tobacco	1.5%	1.5%	100.0	98.3
Clothing and footwear	5.8%	5.8%	100.0	99.4
Housing	22.8%	22.8%	100.0	99.7
Household goods	10.4%	10.2%	100.0	97.8
Household energy	1.2%	1.2%	100.0	99.6
Health	3.2%	3.2%	100.0	99.0
Petrol	4.1%	4.1%	100.0	99.3
Other private transport	3.4%	3.4%	100.0	98.6
Public transport	0.8%	0.8%	100.0	99.6
Communications	3.1%	3.1%	100.0	99.2
Leisure	17.6%	17.7%	100.0	100.1
Education	0.9%	0.9%	100.0	101.2
Durable goods	5.2%	5.6%	100.0	106.4
Other non durables	4.9%	4.9%	100.0	98.9

Notes: See notes of table 9.9D.

Sources: See sources of table 9.9D.

Table 9.19E Expenditure Patterns in the UK

Expenditure Category	Share of Modelled Expenditure		Relative Quantities	
	Existing VAT System	Standard Rate up 1 ppt	Existing VAT	Standard Rate up 1 ppt
Zero-rated food	12.1%	12.1%	100.0	100.1
Standard-rated food, catering and alcohol	12.1%	12.1%	100.0	99.5
Leisure goods and services (inc. tobacco)	22.3%	22.2%	100.0	98.9
Domestic energy	5.7%	5.6%	100.0	99.5
Household goods and services	11.9%	11.8%	100.0	98.9
Personal goods (inc. clothes) and services	14.5%	14.5%	100.0	99.1
Private transport	19.2%	19.3%	100.0	99.4
Other zero-rated goods	2.3%	2.4%	100.0	101.4

Notes: See notes of table 9.9E.

Sources: See sources of table 9.9E.

The distributional effects after allowing for behavioural response are very similar to the results of the static analysis of this policy in section 9.2: such an increase in VAT is progressive, hitting richer households harder in both absolute and proportional terms. Tables J.14 to J.16 in Annex J show how the welfare effects of a 1 percentage point increase in the standard rate of VAT vary across the distribution of household income, household expenditure and for various household types.

Summary

Augmenting our static analysis of the VAT system with behavioural models of consumer demand and welfare has allowed us to demonstrate how existing VAT rate structures distort consumer spending patterns, and assess the implications of this for consumer welfare. The distributional impact of the existing VAT system, and of zero and reduced rates looks very similar when measures of consumer welfare are used instead of tax payments. But new insights are gained. The distortions to spending patterns caused by having different rates of VAT for different goods are found to have an economic cost. Households would, on average, be willing to pay to replace the

system of zero and reduced and standard rates of VAT with one based on a single revenue-neutral rate. Or, alternatively, if zero and reduced rates of VAT were abolished and the standard rate of VAT on imposed, one would still have additional revenue remaining after compensating every household. Designing a scheme to compensate for the abolition of zero and reduced rates of VAT is complicated (see, for instance Chapter 9 of the Mirrlees Review (2011) for an example from the UK), and in practise it would be impossible to compensate all households, but the analysis still shows there may be scope for both simplifying the VAT system and improving welfare at the same time. This is an important lesson that feeds into our evaluation of zero and reduced rates in chapter 10.

Until now, the analysis of this chapter has focused on how the impact of VAT varies according to how much one is spending or earning. We now ask how the impact varies according to the amount of wealth one has using a case study provided by ETLA based on the Finnish context.

9.4 The impact of VAT in the context of wealth and asset prices (ETLA)

An increase in consumption taxes – of which VAT is the most important in EU countries – increases the rate of tax on not only consumption funded by future flows of income, but also consumption funded by existing savings. Therefore, VAT shares some similarities with a one-time capital levy, lowering the purchasing power of previously accumulated wealth. As stressed in Correia (2010), this mechanism is quantitatively important for the distributional effects of tax reforms that involve changes in consumption taxes.

It is important to note, however, that housing wealth – which in all EU countries makes up a large share of households' total wealth – is different from financial wealth in this respect. The implicit capital levy provided by an increase in the rate of VAT on housing does not apply to housing wealth. This is because the flow of consumption benefits from existing houses are not directly taxed via VAT in any EU countries and one can continue to live in a house one already owns after a tax reform.

Instead, most (but not all) EU countries tax the construction of housing. In that case, a VAT increase should increase the (after-tax) price of new houses. The increase in the price of new houses should in turn increase the price of houses that were already built before the tax change as existing and new houses are close substitutes. Hence, the

market value of existing houses actually increases following a VAT increase.[224] The value of existing housing wealth is effectively protected vis a vis the price of new-build housing, unlike financial wealth. This benefits those who at some point in the future wish to reduce their stocks of housing capital, and penalises those who would wish to increase their stocks.

The purpose of this section is to analyse the distributional effects of the capital levy provided by a VAT increase taking into account the special role of housing wealth. To this end, we use a model of household saving, consumption and labour supply decisions that features heterogeneity in financial and housing wealth, as well as labour productivity (and hence income). We calibrate the model so that it replicates the empirical distribution of housing wealth and financial wealth for Finnish households.
Our main focus in this section is on the analysis of reforms that consist of increasing VAT and lowering labour income taxes. The model is used to study the distributional effects of the tax reforms by computing the welfare gains or losses, as well as changes in the tax burden for households with different initial levels of housing wealth, financial wealth and labour income.

It is worth stating up front some of the limitations of the model and the inferences that can be drawn from it. First, the model abstracts from lifecycle issues such as the accumulation and then (possible) decumulation of housing assets and financial assets as one ages. Households are assumed to have chosen their optimal level of housing wealth and to have no reason to change this in the future, except in response to changes in asset prices and tax treatment. With no-one wanting to "trade up" or "trade down", the effect of VAT on housing redistributing from the former (who will pay more to buy a house) to the latter (who will receive more when they sell their house) is not allowed to operate. Second we assume that the supply of new housing is completely elastic (or demand inelastic). This means increases in the rate of VAT are fully reflected in the after-tax price of new housing, and hence the price of existing housing. If on the other hand, the increases in VAT were borne, at least in part, by the suppliers of new housing (or landowners), the distributional effects could be quite different. Nevertheless, by allowing for the implicit capital levy embodied in a VAT increase, and the fact that this effect does not apply to housing wealth when VAT on housing is increased, it is an important complement to the traditional distributional and demand analysis of sections 9.2 and 9.3.

[224] This issue is also discussed in Mirrlees et al (2011, chapter 16).

The rest of this section proceeds as follows. We first outline the model, before presenting the data and describing the distribution of labour income, financial wealth, and housing wealth. After that, we present the results of the policy experiments. Annex K describes the technical details of the model and its calibration.

Outline of the model

We consider a version of the neoclassical growth model where infinitely lived households, or dynasties, decide upon consumption, housing, financial savings and labour supply. The households are heterogeneous in their initial financial wealth and labour productivity.[225] All households are homeowners and, because they do not see changing housing needs over their lifetimes, own an amount of housing that they would wish to own permanently, given current asset prices and tax structures. Hence we cannot account for the distributional effects of VAT changes stemming from households wishing to trade up or trade down in future. We focus instead on the effects that stem from households' different housing and financial wealth positions, and their labour productivity.

There are two capital goods: business and housing capital. Business capital is used in the production of an output good which can be converted into a consumption good and new business and housing capital. Since Finland, like many EU member states, is best characterised as a small open economy, we assume a fixed international interest rate on financial and business assets. The international interest rate pins down the after-tax return to business capital in the economy. The wage rate is determined as the marginal productivity of labour.

The government faces an intertemporal budget constraint with the level of public spending being fixed. Hence, any change in revenue from one tax must be offset by changes in revenues from other taxes. The tax system consists of flat-rate taxes on non-housing consumption (VAT on non-housing consumption), housing construction (VAT on housing), labour income, and interest income. VAT on housing also applies to the maintenance investments in housing.

[225] The model is similar to that in Eerola and Määttänen (2006), which in turn builds on Krusell and Rios-Rull (1999) and Caselli and Ventura (2000).

We assume that house prices are determined by after-tax construction costs. After-tax constructions costs are, of course, the sum of pre-tax constructions costs and the VAT levied on such costs. Pre-tax construction costs are assumed to be constant, which is an implicit assumption that housing supply is perfectly elastic (or demand inelastic). The importance of this assumption is discussed later. After-tax construction costs also determine housing maintenance costs, which are assumed to be proportional to the amount of housing owned.

The distribution of financial wealth and housing wealth

We use the 2004 Wealth Survey conducted by Statistics Finland. The survey includes detailed portfolio information from 3 455 Finnish households. Households were also asked to give an estimate of the current market value of their housing wealth. We also consider their (before-tax) labour earnings and financial (net) wealth, which is computed as the sum of their financial assets (e.g. cash, bond, and stock holdings) less all debt (including mortgage loans). We consider here only households where the reference person is of age 35 – 60. This is because we want to compare households that should have similar housing preferences and focus on differences that stem from differences in income and wealth.

We first sort homeowner households by the financial and housing wealth quintiles that they belong to. This gives us 25 groups. The first group, for instance, consists of households that belong to the first (poorest) financial wealth quintile and first (poorest) housing wealth quintile.

Tables 9.20 and 9.21 display the average housing wealth and the average financial wealth in the 25 groups of homeowner households. The average housing wealth ranges from EUR 51 000 to EUR 386 000. The average financial wealth ranges from EUR -127 000 to EUR 298 000.[226]

These tables make it clear that households have very different asset positions regarding housing and financial wealth. Many households have negative financial wealth because of mortgages. As a result, housing wealth constitutes over 100% of their total net

[226] The average net financial wealth among all these households is perhaps surprisingly low – just EUR 13 000. One explanation for this is the fact that the state pension system in Finland is quite comprehensive and accrurals under this scheme are not counted as part of financial wealth.

wealth. In relative terms, housing wealth is much more evenly distributed than financial wealth.[227]

Table 9.20: Average housing wealth (1 000 euros)

	Housing wealth quintile					
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**	**All**
1.	61	92	134	178	295	182
2.	59	92	129	180	280	138
3.	55	93	129	176	288	128
4.	54	93	133	178	350	144
5.	51	92	130	179	386	190
All	55	92	132	178	324	156

Source: Finnish Wealth Survey (2004) and authors' calculations

Table 9.21: Average financial wealth (1 000 euros)

	Housing wealth quintile					
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**	**All**
1.	-80	-73	-85	-55	-127	-98
2.	-25	-27	-28	-29	-26	-27
3.	0	-1	-0	-1	1	-0
4.	18	20	18	23	22	20
5.	113	115	145	127	298	170
All	9	14	-0	1	40	13

Source: Finnish Wealth Survey (2004) and authors' calculations

[227] The share of renters is 20%. The average financial wealth among them is 8 700 euros. The average housing wealth among renters is very close to zero (it is nevertheless strictly positive because some renters own secondary homes).

Calibration of the model

We calibrate the model so that it can replicate the joint distribution of financial and housing wealth that we observe in the data. Specifically, we consider 25 household types and choose their labour productivities, initial financial wealth positions and preference parameters so that the steady state of the model under the baseline tax system replicates tables 9.20 and 9.21. The baseline tax system is designed to capture the relative tax treatment of non-housing consumption, housing, capital income, and labour income in Finland. The labour productivities are chosen so that households would choose to have the amount of housing wealth that we observe in the data. In other words, we use information about households' housing demand, together with an assumption of the type of preferences they have for housing versus other forms of consumption, to infer their productivity, which we do not observe directly. The model is also calibrated so that it matches the average labour income to housing wealth ratio. Further details of the calibration are presented in Appendix I.

Table 9.22 shows the resulting relative labour productivities. For instance, the labour productivity (or wage level) of households belonging to the bottom housing wealth quintile and bottom financial wealth quintile is 40% of the average labour productivity. Clearly, for a given level of financial wealth, higher housing wealth must be associated with higher labour productivity. Otherwise the household could not afford its housing. Similarly, for a given housing wealth, higher financial wealth must be associated with lower labour productivity since households with more financial wealth receive also capital income (or at least need to pay less interest on their debt). The reason why labour productivity nevertheless increases as we go down the last column is that housing wealth varies substantially even within a housing wealth quintile. In particular, households in the top housing and financial wealth quintile have much more housing than households in the top housing wealth quintile and the bottom financial wealth quintile.

Table 9.23 displays the relative (before tax) total income of the different household types. Total income here consists of wage income and capital income including interest payments on debt but excluding the imputed rent on housing. These numbers also reflect the fact that different household types supply different amounts of labour. Given that households have the same preferences, it is clear that the housing wealth poor are also poor in terms of total income. There is some variation in total income within the same housing wealth quintiles because housing wealth changes also with financial wealth quintiles.

Table 9.22: relative labour productivities

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	0.4	0.6	0.8	1.1	1.9
2.	0.4	0.6	0.8	1.1	1.8
3.	0.3	0.6	0.8	1.1	1.8
4.	0.3	0.6	0.8	1.1	2.2
5	0.3	0.6	0.9	1.2	2.5

Source: Finnish Wealth Survey (2004) and authors' calculations

Table 9.23: Relative total incomes

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	0.4	0.6	0.8	1.1	1.9
2.	0.4	0.6	0.8	1.1	1.8
3.	0.3	0.6	0.8	1.1	1.8
4.	0.3	0.6	0.9	1.1	2.3
5	0.3	0.6	0.9	1.2	2.5

Source: Finnish Wealth Survey (2004) and authors' calculations

Table 9.24: Financial wealth-to-labour income ratios

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	-3.5	-2.3	-1.9	-1.6	-1.3
2.	-1.3	-0.9	-0.7	-0.5	-0.3
3.	0.0	0.0	0.0	0.0	0.0
4.	1.2	0.7	0.4	0.4	0.2
5.	11.3	5.1	4.4	2.6	2.9

Source: Finnish Wealth Survey (2004) and authors' calculations

Finally, table 9.24 displays households' financial wealth relative to their labour income. As we will explain, it is this relation that largely determines the distributional effects of

the tax reforms considered. Clearly, given the observed levels of financial wealth and estimated (permanent) labour incomes, households have very different amounts of financial savings relative to their labour income.

Applying the model: the distributional impact of VAT reforms

We consider hypothetical tax reforms that consist of changing the relative tax burden between non-housing consumption, housing, and labour income. All the reforms are revenue neutral in the sense that the present value of government revenue is fixed at its baseline level.

For each tax reform considered, we compute the welfare gains or losses for all 25 household types. We measure the welfare gains and losses as the percentage change in non-housing consumption in all periods that would make the households indifferent between the tax reform and the status quo. A positive welfare effect of, say, 1%, means that a household would be exactly indifferent between the status quo and the reform, if its non-housing consumption in the status quo were increased by 1%. In that case, we say that the tax reform increases the welfare of this particular household by 1% (in terms of non-housing consumption). The average welfare effect in turn refers to the change in consumption that would make the representative household – the household with average labour productivity, financial wealth and housing wealth – indifferent between the status quo and the reform.

This measure of the welfare gain or loss following a reform is called the equivalent variation (because it tells us how much consumption would have to change to give the equivalent change in welfare as the reform). This is different to the previous section where the measure used was the compensating variation (how much consumption would have to change after the reform to return welfare to its original level).

As an alternative way of quantifying the distributional effects, we also compute the change in the present value of taxes paid by different households. In other words, we compute how much taxes a household pays under the baseline systems and compare it to the taxes it pays given the tax reform. Future tax payments are discounted using the fixed international interest rate. It should be noted that a tax reform may increase the welfare of a household even if the household pays more taxes as a result of the reform. This is because the reform may improve welfare by reducing distortions to their consumption or labour supply decisions.

Tax Reform 1: increasing VAT and decreasing labour income taxes

In this reform, we increase VAT on both non-housing consumption and housing construction by 2 percentage points (from 0.23 to 0.25) and lower the labour income tax accordingly so that the present value of government revenue stays constant. As a result, the labour income tax falls from 0.220 to 0.207.

The average welfare effect is positive but very small (about 0.01% in terms of consumption). In other words, a household with average financial wealth, housing wealth and labour income finds this tax reform slightly better than the baseline system. The reason why the aggregate welfare effect is positive is that part of the increase in VAT is a tax on past savings, which is non-distortionary, whilst the entire labour income tax cut reduces the distortions to labour supply caused by the tax. Hence, the reform creates an efficiency gain. The reason why the welfare effect is small is twofold. First, aggregate financial savings are small relative to aggregate labour income. Second, the tax reform is very moderate in that the VAT increase is small.

Interestingly, however, even this relatively small tax reform has non-trivial distributional effects. Table 9.25 shows the welfare effects for different household types. It reveals a systematic pattern. The reform benefits those with little (or negative) financial wealth and little housing wealth and hurts those with lots of financial wealth and little housing wealth. For instance, households in the first financial wealth quintile and the first housing wealth quintile gain by 0.8% in terms of non-housing consumption. Households with a lot of financial wealth and little housing wealth in turn lose the most. Households in the fifth financial wealth quintile and the first housing wealth quintile lose by 1.1%. It is worth nothing that both the biggest losers and the biggest winners belong to the first housing wealth quintile. These are the poorest households in terms of total income.

Table 9.26 shows the change in taxes paid by different household groups. For instance, households in the first financial wealth quintile and the first housing wealth quintile pay 1.5% less taxes after the reform than in the status quo. Those in the last financial wealth quintile and the first housing wealth quintile in turn pay 1.8% more taxes. Numbers in table 9.25 roughly mirror those in table 9.26. Those that benefit from the reform in welfare terms also see their tax bill reduced.

Table 9.25: Uniform VAT vs. labour income taxation: welfare effects (%)

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	0.8	0.5	0.4	0.4	0.3
2.	0.3	0.2	0.2	0.2	0.1
3.	0.1	0.1	0.1	0.1	0.1
4.	-0.1	-0.1	-0.0	-0.0	0.0
5.	-1.1	-0.6	-0.5	-0.3	-0.3

Source: Finnish Wealth Survey (2004) and authors' calculations

Table 9.26: Uniform VAT vs. labour income taxation: change in taxes paid (%)

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	-1.5	-0.9	-0.7	-0.6	-0.5
2.	-0.5	-0.4	-0.3	-0.2	-0.2
3.	-0.1	-0.1	-0.1	-0.1	-0.1
4.	0.3	0.1	0.1	0.0	-0.0
5.	1.8	1.1	0.9	0.6	0.6

Source: Finnish Wealth Survey (2004) and authors' calculations

The pattern of results in Table 9.25 reflects the patterns found in Table 9.24. In other words, the results are driven by households' financial savings-to-labour income ratio. The higher that ratio is, the bigger is the welfare loss. As discussed above, an increase in the VAT rate is, in part, a capital levy on existing financial wealth. As a result, a VAT increase and a reduction in the labour income tax shift resources away from households having lots of financial wealth relative to labour income. For them, the reduction in the labour income tax rate is not sufficient to compensate for the decrease in the purchasing power of their financial savings. On the other hand, those who have lots of debt gain from the reduction in the real value of this debt.

However, why is it that for households in the bottom two financial wealth quintiles it is households with less housing that fare better (given financial wealth) while in the top two financial wealth quintiles it is households with more housing that fare better (or lose less)?

To explain this pattern, let us first consider households in the top two financial wealth quintiles. These households have all positive financial wealth. For a given financial wealth, households with less housing are inferred to have a lower labor income than households with more housing. Hence, households with little housing wealth have also more financial wealth relative to their labour income than those with lots of housing wealth. As a result, their contribution to the capital levy relative to their gains from the lower labour income tax is much more significant than for households with similar financial but more housing wealth.

Now consider households in the first two financial wealth quintiles. As revealed by Table 9.21, these households all have negative financial wealth. For a given financial wealth, households with less housing are again inferred to have lower labor income, and low consumption overall. As a result, households with little housing have lots of debt relative to labor income. Such highly indebted households must consume much less than what they earn as labor income and therefore are hit relatively little by the increase in VAT. Therefore they gain more than the high housing wealth households consuming relatively large amounts.

Tax Reform 2: increasing VAT on non-housing consumption and decreasing labour income taxes

In this reform, VAT is increased on non-housing consumption only, offset again by a lower labour income tax rate. To ensure comparability with the previous results, we increase VAT on non-housing consumption by an amount that allows the labour tax to be reduced to exactly the same level (0.207) than in the previous reform where VAT on non-housing consumption and housing construction were reduced uniformly. As a result, the tax rate on non-housing consumption increases from 0.230 to 0.258.

The aggregate welfare effect is now negative - albeit still close to zero. In other words, a household with average financial wealth, housing wealth and labour income would prefer the status quo over this tax reform. This reflects the fact that housing is undertaxed in the status quo because the imputed rent goes untaxed. Increasing VAT on non-housing consumption without increasing VAT on housing construction aggravates this distortion.[228]

[228] On optimal housing taxation in a similar set-up, see Eerola and Määttänen (2010).

Table 9.27 displays the welfare effects for different household types. The effects are very similar to those in Table 9.25. The difference is that welfare losses are a bit larger and welfare gains somewhat smaller. Also changes in taxes paid, reported in Table 9.28, are very similar to the results presented above.

Table 9.27: VAT on non-housing goods vs. labour income taxation: distributional effects (%)

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	0.7	0.4	0.4	0.3	0.2
2.	0.2	0.2	0.1	0.1	0.1
3.	0.0	0.0	0.0	0.0	0.0
4.	-0.2	-0.1	-0.1	-0.1	-0.0
5.	-1.2	-0.7	-0.6	-0.4	-0.4

Source: Finnish Wealth Survey (2004) and authors' calculations

Table 9.28: VAT on non-housing goods vs. labour income taxation: change in taxes paid (%)

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	-1.5	-0.9	-0.7	-0.6	-0.5
2.	-0.5	-0.4	-0.3	-0.2	-0.2
3.	-0.1	-0.1	-0.1	-0.1	-0.1
4.	0.3	0.1	0.1	0.0	-0.0
5.	1.8	1.1	0.9	0.6	0.6

Source: Finnish Wealth Survey (2004) and authors' calculations

Tax Reform 3: increasing VAT on housing and decreasing labour income taxes

In this reform, VAT is increased on housing alone (from 0.23 to 0.31) and the tax on labour income is lowered from 0.22 to 0.207. The average welfare effect is now slightly positive (about 0.03% in terms of consumption). In other words, the representative household would prefer to tax housing at a higher rate than non-housing consumption.

This reflects the fact, discussed above, that in the current tax system housing is undertaxed because of the non-taxation of imputed rents.

The distributional effects, presented in Tables 9.29 and 9.30, are again very similar to the previous ones. In other words, it does not make a big difference whether one increases VAT on non-housing consumption, residential construction, or both. This may seem surprising given that increases in the rate of VAT on housing have an effect on after-tax construction costs, and hence on house prices, which is not the case for increases in VAT on other goods and services.

To understand this result, it is important to note that in this model a house price change does not have important distributional effects. This is because the model assumes away trading-up and trading-down in the housing market which would be the key driver of such distributional affects. Instead, an increase in house prices increases housing wealth but also increases the user-cost of housing because the cost of maintaining the housing stock (required because housing depreciates at rate δ) is also assumed to increase. This is because even if only VAT on housing is increased, the maintenance cost of housing increases as a higher VAT also applies to housing maintenance investments. This effect increases the cost of living for everyone.[229]

Again, whether a household is better or worse off following this tax reform depends on whether the decrease in the labour tax rate suffices to compensate it for this increase in the cost of living. As with the tax reforms considered above, this ultimately depends on the extent to which the household finances its consumption (both housing and non-housing) with labour income. If the household has little labour income relative to its consumption or total income, it is worse off because it does not benefit much from the reduction in the labour income tax.

[229] Another way to think of this is that each house faces a probability δ of being destroyed in any given period.The householder would therefore need to purchase a new build house (subject to VAT) with probability δ in each period, and the purchase of this new build house would be subject to the higher rate of VAT.

Table 9.29: VAT on housing vs. labour income taxation: distributional effects (%)

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	0.8	0.5	0.5	0.4	0.3
2.	0.3	0.3	0.2	0.2	0.2
3.	0.1	0.1	0.1	0.1	0.1
4.	-0.1	-0.0	0.0	0.0	0.1
5.	-1.1	-0.6	-0.5	-0.3	-0.3

Source: Finnish Wealth Survey (2004) and authors' calculations

Table 9.30: VAT on housing vs. labour income taxation: change in taxes paid (%)

	Housing wealth quintile				
Financial wealth quintile	**1.**	**2.**	**3.**	**4.**	**5.**
1.	-1.5	-0.9	-0.7	-0.6	-0.5
2.	-0.5	-0.4	-0.3	-0.2	-0.2
3.	-0.1	-0.1	-0.1	-0.1	-0.1
4.	0.3	0.1	0.1	0.0	-0.0
5.	1.9	1.1	0.9	0.6	0.6

Source: Finnish Wealth Survey (2004) and authors' calculations

Sensitivity analysis

In this section, we briefly report how changing a number of assumptions, including the degree of elasticity of housing supply, affects the results one would obtain from the model. For ease of exposition, all discussion focuses on the first tax reform: increasing VAT uniformly on housing and non-housing consumption by 2 percentage points with an offsetting reduction in labour income taxes.

First, increasing the interest rate works to magnify the distributional effects of the tax reforms. This is because it increases the share of consumption that is financed with financial savings which in turn makes the capital levy mechanism more important. On the other hand, varying the depreciation rate over a reasonable range changes the results very little.

Second, we have considered how the distributional results would change if households had more financial wealth. We have conducted two experiments. In the first experiment we assumed that the average financial wealth is twice that in the benchmark calibration and that the relative differences in financial wealth are the same. In the second experiment we increased all households' financial wealth by the same absolute amount so that again the average financial wealth doubles. Compared to the benchmark calibration, the first experiment magnifies the distributional effects. Both the welfare gains and losses roughly double. The second experiment in contrast decreases the distributional effects substantially. The reason for these results is that, compared to the benchmark economy, the first experiment increases differences in financial assets-to-labour income -ratios while the second decreases them. This demonstrates and confirms the importance of the degree of inequality in households' financial asset positions relative to their labour incomes for the distributional effects of the VAT and income tax changes considered.

Third, how does allowing for renting rather than owning homes affect results? Rents for residential housing are not taxed via VAT. However, since an increase in VAT should increase house prices, it should also increase rents (per unit of housing), at least in the long run. If rents did not increase, landlords' return to rental housing would fall relative to the return on alternative assets which in turn would reduce the supply of rental of housing. Hence, we may assume that a VAT increase would increase rents by the same factor that it increases house prices.

In the data, very few renters own any housing. Hence, the purchasing power of their wealth is not even partly protected against a VAT increase. However, just as in the case of homeowners, the distributional effects among renters depend on the amount of financial wealth households have relative to their labour income. In the data, the average annual labour income and net financial wealth among renters are about EUR 26 000 and EUR 8 700, respectively. A household in such an asset position is virtually indifferent between the status quo and reform.

Furthermore, renters' relative financial wealth positions vary much less than those of homeowners. In particular, since renters do not have mortgages, they typically do not have a negative financial wealth position. Also, very few of them have large amounts of financial assets. This implies that the welfare effects resulting from the tax reform considered are much less diverse among renters than among homeowners.

Fourth, the assumptions about the supply of housing are varied. As noted above, the model assumes housing supply is perfectly elastic so that an increase in construction taxes increases house prices one-to-one. This assumption significantly simplifies analysis but is unrealistic given the limited supply of developable land in many areas (due to both physical or legal constraints). If the supply of land is not fully elastic, changes in VAT on construction would not be fully reflected in changes in the post-tax price of new housing. This would mean that the price of existing housing would also rise less, and that part of the burden of the tax falls on the owners of developable land or construction firms.

However, whether or not the pass-through of VAT into house prices is perfect is not crucial for the results. Let us assume that house prices are unaffected by the increase in VAT on the construction of new housing. As explained above, changes in house prices do not have large distributional effects in the model. This is because households do not want to upsize or downsize their housing (except for small adjustments to tax policy changes) and therefore the price of their house and other housing matters little to them. Hence, the distributional effects would again be mainly determined by households' financial wealth-to-labour income ratio.

Summary

An increase in VAT and reduction in labour income taxation works as a capital levy in the sense that it reduces the purchasing power of households' existing savings. This section has quantified the distributional effects of such a reform using a model that is calibrated to Finnish household data, and in contrast to the previous literature, has taken housing wealth explicitly into account.

The capital levy provided by an increase in VAT is found to have non-trivial distributional effects, driven by the way that households' financial wealth is distributed relative to labour income. A tax reform that consists of increasing VAT and lowering labour income taxes tends to benefit households that have low or negative net financial wealth. On one hand, they benefit from a lower labour income tax. On the other hand, since they don't have positive financial wealth, they do not contribute to the capital levy. At the same time, households with lots of financial wealth relative to their labour income are hit hardest by the capital levy and benefit proportionally less from the reduction in labour income taxes.

An increase in VAT may therefore be seen as progressive in terms of wealth as well as income, hitting those with high levels of financial assets harder than those with low levels. However, given that holdings of financial assets typically increase with age (at least up to a point), shifts towards VAT are also likely to lead to redistribution from older generations who have already done their saving to younger ones who have yet to do so. This inter-generational aspect of tax policy is often overlooked and may be an important consideration for governments, particularly in the context of demographic change.

The position of housing wealth differs from financial wealth because it is not only a form of wealth but also generates a flow of consumption directly. The flow of consumption benefits from existing housing is not subject to VAT (only construction is) and hence existing housing wealth is effectively protected from the capital levy. However, if the flow of consumption from existing stocks of housing were subject to VAT, for instance, by applying VAT to imputed or actual rents, the capital levy would apply to housing as well as financial wealth.

Finally, it should be stressed that the model is highly stylised. In particular, households are infinitely lived and have preferences for housing that are fixed for their entire lifetime. Hence they do not wish to trade up or trade down in the housing market, except for the small changes to optimal allocations of expenditure between housing and other consumption caused by changes in the tax system. In reality, by increasing house prices, increasing VAT would tend to benefit those households that wish to downsize in future, and vice versa. Such distributional effects could be even larger than those considered here making this an important area for future research.

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Annex H. Modelling VAT payments at the household level

This annex explains the methods used in our static (no-behavioural-response) modelling of the VAT system, including specific details of how the methods are applied in each case study.

The static analysis uses micro-simulation models for each of the nine countries to calculate the amount of VAT paid by each household included in that country's household survey under the existing VAT system. The models are then used to calculate the change in the amount of VAT that would be paid following reforms the VAT system under two key assumptions:

- The change in VAT rates is fully passed through to consumer prices, leaving pre-tax prices unchanged, and;

- The quantities of each item purchased is unchanged following a reform.

Sample weights from the household surveys are then used to calculate the aggregate revenue under the existing systems and from the VAT reforms, and the distribution of VAT payments by various household characteristics. The change in VAT paid by a household holding quantities fixed tells you how much more (or less) the household would need to spend to buy the bundle of goods and services it was buying before the reform after the reform takes effect. Because households can substitute between goods when taxes and prices change, this is not the same as the welfare effect of the tax change.[230] However it is an intuitive measure of the impact of a tax change on a household's purchasing power.

[230] Although it does not measure the change in welfare, the change in VAT payments holding quantities fixed does provide an upper (lower) bound an important measure of the welfare cost (gain) from an increase (decrease) in VAT. It measures how much you would need to give the household (or take off them) so that they could just afford to purchase their pre-reform bundle of goods, which would provide them with their pre-reform level of welfare. If, following the change in relative prices and such "compensation", the household decided not to buy their old bundle of goods but instead a different one, the new bundle must yield greater welfare than the old one. Therefore the maximum amount you would need to give a household to compensate fhem from a VAT rise, or the minimum amount you would need to take off them to compensate for a VAT cut is the change in VAT payments holding quantities fixed at their pre-reform level.

The data used in the micro-simulation models is typically not fully up-to-date, and for this reason we up-rate expenditures for each category of good by the rate of growth in nominal household consumption (as recorded by the National Accounts) between when the survey was collected and 2010-11. Where possible this will be done separately by category of expenditure. However in some of the countries considered, National Accounts categories do not line-up well with those included in the expenditure surveys and so we will up-rate expenditure on each good or service by the growth rate in total aggregate expenditure.

The following bullets describe the specific details of each case study.

- Belgium

André Decoster and Dirk Verwerft at KU Leuven developed and maintain the tax microsimulation model for Belgium. The source of household micro-data is the 2005 wave of L'enquête sur le budget des ménages (EBM)[231] which is the official household budget survey for Belgium. The survey covers around 3 550 households and includes a very detailed breakdown of expenditure into categories that align very closely to VAT treatments. This makes it a suitable source for modelling the VAT system.

Expenditure on each category of good or service is uprated by the growth between 2005 and 2010 for the relevant category in the National Accounts. For instance, spending on food and non-alcoholic beverages was uprated by 20.3%, whilst it was decreased by 5.4% for communications. The overall average uprating factor was 18.5%.

The analysis updates previous work (Decoster et al (2010)) that has looked at the distributional impact of indirect taxes in general, and VAT in particular, in Belgium along with Greece, Hungary, Ireland and the UK.

- France

Nicolas Ruiz (IDEP, University of Marseilles) and Alain Trannoy (EHESS and IDEP, University of Marseilles) have developed the tax microsimulation tool for France. It's source of household micro-data is the 2005 Enquête Budget des Familles (EBF) which has a sample size of around 10 000. The survey includes around 1000 different categories of expenditure which for the purposes of modelling are grouped into 71

[231] The survey is known as the Het huishoudbudgetonderzoek (HBO) in Dutch.

broader categories that align perfectly with VAT treatment. The EBF is the official French household budget survey.

Expenditure on each category of good or service is uprated by the growth between 2005 and 2009 for the relevant category in the National Accounts. For instance, spending on food and non-alcoholic beverages was uprated by 54.4%, whilst it was decreased by 0.6% for clothing. Spending on all categories was then uprated by 2.3% to account for growth in spending between 2009 and 2010.

The analysis for France updates earlier work (Ruiz and Trannoy (2008)).

- Germany

DIW Berlin maintain the tax microsimulation model for Germany. The source of micro-data is the 2007 wave of the Laufende Wirtschaftsrechnungen (LWR), the official survey of about 8 000 households used for measuring household expenditure. It includes highly disaggregated expenditure categories that align very closely to VAT treatments. Some additional variables necessary for modelling are taken from the Einkommens und Verbrauchsstichprobe (EVS), the larger survey to which the LWR is administered to a subsample. Micro data from the laufende Wirtschaftsrechnungen (LWR) have been provided by the Research Data Centre of the Statistical Offices of the Laender (Forschungsdatenzentrum der Statistischen Landesaemter).

Expenditure is uprated separately by broad category of expenditure to account for changes in nominal household spending between 2007 and 2010. First, total expenditure is uprated by the growth in National Accounts nominal expenditure (4.6%). The growth rate of each broad category then depends on whether price inflation for that category was higher or lower than average: categories with higher inflation are adjusted by an amount greater than 4.6%, whilst those with lower inflation are adjusted by less than 4.6%. Incomes are adjusted by the rate of growth of nominal GDP (2.7%).

Earlier work that has investigated the German VAT system includes Bach (2011).

- Spain

The Spanish Instituto de Estudios Fiscales (IEF) developed and maintains the static microsimulation model used for Spain. The source of household micro-data is the 2009 wave of the Encuesta Continua de Presupuestos Familiares (ECPF) which has a sample

size of 22 316 households and is the official household budget survey for Spain. Expenditure is uprated by the 4.1% growth recorded in Quarterly National Accounts, and incomes by the 2.2% recorded, to be consistent with 2010 levels.

It is important to note that a large percentage of households (66.9 percent) in the survey do not provide point estimations of their income but instead report whether their income falls in one of ten bands. An imputed continuous income variable is calculated by the Spanish Statistical Office, and this is used. Imputed rents for owner occupiers (and actual rents for renters) are also calculated by the Spanish Statistical Office. The method of imputation makes use of subjective valuations by the survey respondent, rents paid by similar renting households in the survey, and external data on local rents. Mortgage interest payments of owner occupiers are not recorded in the survey and are imputed by the IEF using data on mortgage repayments (which are recorded) and data on mortgage interest rates available in Encuesta Financiera de las Familias (2005).

- United Kingdom (IFS)

The IFS maintains a comprehensive tax-benefit microsimulation tool (TAXBEN) that will be used to perform the static distributional and revenue analysis for the United Kingdom. When used for the analysis of indirect taxes, the official household budget survey – the Living Costs and Food Survey (LCFS) – is the source of household micro-data.[232] Data from the Living Costs and Food Survey are produced by the Office for National Statistics and are Crown Copyright. They are reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

This analysis makes use of the latest year for which data is available, 2009, with expenditure on each item uprated by the growth in National Accounts household consumption, and incomes uprated in line with average earnings or nominal GDP depending upon source, to the 2010-11 average.

LCFS consists of a sample of approximately 6 000 households and contains a detailed breakdown of expenditure by goods and services. However, it should be noted that the categories do not correspond perfectly to the categories of goods to which different VAT rates apply. Where more than one VAT rate applies to goods in a single category,

[232] The survey was renamed the LCFS in 2008. Before that, it was the Expenditure and Food Survey (EFS) between 2001-02 and 2008, and the Family Expenditure Survey (FES) in 2001 and earlier.

we make a judgement as to which rate is most appropriate to apply to the category as a whole.

Imputed rents for owner occupiers and those renting their house at below-market rates are calculated by the IFS. The method of imputation makes use of actual rents paid by similar households renting in the private sector. Mortgage interest payments of owner occupiers are recorded in the survey. Full details are available on request.

The analysis for the UK updates a number of previous IFS studies looking at the distributional and revenue effects of changes in the standard rate of VAT and the extension of the standard rate of VAT to goods and services currently taxed at a reduced or zero rate (Crossley et al (2009), Crawford et al (2010), Mirrlees et al (2011)).

- Greece

André Decoster and Dirk Verwerft at KU Leuven developed and maintain the tax microsimulation model for Greece. The household micro-data used is the 2004 Έρευνας Οικογενειακών Προϋπολογισμών (the official family budget survey) which covers around 6 555 households. The categories of expenditure are highly disaggregated and allow accurate treatment of goods that are taxed at different rates.

Expenditure on each category of good or service is uprated by the growth between 2004 and 2010 for the relevant category in the National Accounts. For instance, spending on food and non-alcoholic beverages was uprated by 20.1%, whilst it was decreased by 6.6% for alcohol and tobacco. The overall average uprating factor was 26.3%.

The analysis updates previous work (Decoster et al (2010)).

- Hungary

André Decoster and Dirk Verwerft at KU Leuven developed and maintain the tax microsimulation model for Hungary. The household micro-data used is the 2005 wave of the Háztartási Költségvetési Felvétel (the official household budget survey) which covers around 8 710 households. The categories of expenditure are highly disaggregated and allow accurate treatment of goods that are taxed at different rates.

Expenditure on each category of good or service is uprated by the growth between 2005 and 2010 for the relevant category in the National Accounts. For instance, spending on food and non-alcoholic beverages was uprated by 31.3%, whilst it was decreased by 24.4% for durable goods. The overall uprating factor was 29.4%.

The analysis updates previous work (Decoster et al (2010)).

- Italy

Massimo Baldini of CAPP and the University of Modena and Reggio Emilia maintains the tax microsimulation model (Mapp) for Italy. The source of household micro-data is a hybrid dataset which uses information from both the EU-SILC survey (which has a sample size of 20 982 households) and the Indagine sui Consume delle Famiglie (ICF) (which has a sample size of 24 400 households). The EU-SILC data provides the core data used to simulate direct taxes and income transfers, whilst the ICF provides a detailed breakdown of expenditure by category that allows highly accurate modeling of the VAT treatment of different goods and services. The ICF is the official household expenditure survey for Italy.

Expenditures are uprated by the growth in nominal spending between 2007 and 2010 according to National Accounts, separately for nine categories of goods and services. Incomes are uprated using the growth in nominal GDP (per household) between 2007 and 2010.

The analysis follows earlier work looking at the redistributive effects of the VAT rate structure of Italy (Liberati (2001) and Baldini (2009)).

- Poland

CENEA maintain the tax microsimulation model (SIMPL) used for Poland. The source of household micro-data is the 2009 wave of the Polish Household Budget Survey (HBS) which has a sample size of 37 300 households. The Polish Household Budgets' Survey 2009 data used in this report have been made available to CenEA for research purposes by the Polish Central Statistical Office (GUS).

The data include over 300 spending categories, which in the large majority of cases allows exact distinguishing of goods by their VAT rate status. In the small number of

cases where a category contains products subject to different VAT treatment, judgement is used to determine which VAT rate to apply.

Expenditure on all categories of goods is uprated by the growth in National Accounts household consumption between 2009 and the first quarter of 2011. Benefits from social security payments (mainly state pensions) are uprated using the National Accounts pensions index, earnings and self-employment income by the earnings index and other income by the growth rate of consumption.

To the best of our knowledge, VAT simulations have not been performed using Polish HBS data in the past, making this a particularly important new piece of research.

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Annex I. Further analysis of the distributional impact of VAT

This annex contains additional distributional analysis of VAT to accompany the analysis and discussion contained in Chapter 9.

Section I.1 provides further results on the distributional impact of VAT as a whole. In particular it shows how the characteristics of households vary for households paying VAT equal to different proportions of spending. This is the reverse of the standard distributional analysis included in chapter 9 which looks, instead, at how cash and proportional VAT payments vary by household characteristics.

Households are split into five groups called quintile groups based on how much VAT they pay as a proportion of their total expenditure, or the size of their gain/loss from a simulated reform. The characteristics included in this analysis are:

- The average age of adults in the household
- The average age at which adults left full time education
- The fraction of single-adult households
- The fraction of households with children
- The fraction of workless households
- The fraction of households with 1 adult working
- The fraction of households with more than 1 adult working
- The fraction of households owning their home (either outright or with a mortgage)

When analysing the VAT system as a whole those households with the smallest proportional payments are in quintile 1 and those with the highest proportional payments are in quintile 5.

Section I.2 repeats this analysis to assess the impact of abolishing zero and reduced rates of VAT. When analysing the impact of changes to the current VAT system the households suffering the biggest losses are in quintile 1 and those with the biggest gains / smallest losses are in quintile 5.

Section I.2 also includes tables that show the losses to households of abolition zero and reduced rates measured as a percentage of current income instead of as a percentage of current spending as is the case in chapter 9.This is done for completeness and readers should be reminded that analysis where gains/losses due to VAT reforms are measured

as a percentage of spending is more informative of the life-time distributional impact of VAT reforms.

Section I.3 provides a full set of tables on the distributional impact of abolishing zero and reduced rates of VAT and reducing the standard rate of VAT so that the overall package is revenue neutral. Section I.4 repeats includes the same set of tables for an increase in the standard rate of VAT by 1 percentage point.

I.1. Additional analysis of existing VAT systems

Table I.1 Average age of adult household members by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	55.0	50.0	48.0	45.0	43.0	48.2
France	(2)	59.2	51.7	47.7	45.3	43.5	49.5
Germany	(3)	58.7	55.7	52.4	50.5	49.0	53.3
Spain	(4)	60.9	50.6	46.1	43.6	41.6	48.5
United Kingdom	(5)	55.2	49.7	48.8	47.4	46.5	49.5
Greece	(6)	48.2	51.1	53.9	52.1	52.0	51.5
Hungary	(7)	55.2	53.5	50.7	48.2	45.2	50.6
Italy	(8)	58.0	53.0	49.0	48.0	50.0	51.0
Poland	(9)	56.1	50.5	46.9	44.4	43.1	48.2

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.2 Average age at which adult household members left education by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	19.4	19.4	19.8	19.9	20.3	19.8
France	(2)	16.6	17.6	18.1	18.5	18.6	17.8
Germany	(3)	n/a	n/a	n/a	n/a	n/a	n/a
Spain	(4)	13.5	15.1	15.5	15.6	15.6	15.1
United Kingdom	(5)	16.6	17.2	17.3	17.4	17.8	17.3
Greece	(6)	18.9	18.8	18.7	18.7	18.8	18.8
Hungary	(7)	18.4	18.7	18.7	18.8	18.6	18.6
Italy	(8)	18.7	18.5	18.8	18.8	19.5	18.9
Poland	(9)	18.1	18.8	19.2	19.5	19.7	19.1

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.3 Percentage of single adult households by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	48.7	34.8	30.9	26.7	27.0	33.6
France	(2)	45.5	34.2	29.9	29.8	29.4	33.8
Germany	(3)	54.9	44.6	35.2	31.1	30.2	39.2
Spain	(4)	39.9	20.7	13.6	11.5	15.4	20.2
United Kingdom	(5)	59.8	35.9	30.7	21.3	21.6	33.8
Greece	(6)	29.1	21.2	20.3	19.2	18.6	21.7
Hungary	(7)	34.7	32.0	31.3	30.5	34.8	32.7
Italy	(8)	52.0	29.0	24.0	18.0	26.0	30.0
Poland	(9)	48.8	30.5	21.6	17.2	14.9	26.6

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.4 Percentage of households with children by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	15.5	21.9	29.0	32.1	33.5	26.4
France	(2)	14.4	26.2	34.5	34.9	35.6	29.1
Germany	(3)	11.2	16.7	24.3	26.4	23.6	20.4
Spain	(4)	12.7	27.7	38.3	41.9	39.2	32.0
United Kingdom	(5)	21.1	32.0	32.3	31.0	28.8	29.0
Greece	(6)	32.0	32.4	25.4	22.4	18.3	26.1
Hungary	(7)	38.9	46.6	54.7	59.7	55.8	51.1
Italy	(8)	14.0	26.0	30.0	38.0	30.0	28.0
Poland	(9)	20.3	31.2	38.2	44.0	44.7	35.7

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.5 Percentage of workless households by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	55.0	42.1	36.8	26.2	19.6	35.9
France	(2)	57.8	42.3	35.3	31.2	28.6	39.1
Germany	(3)	61.5	51.8	41.1	31.4	26.2	42.4
Spain	(4)	62.3	35.0	20.8	17.4	15.0	30.1
United Kingdom	(5)	61.8	38.6	29.1	23.6	20.3	34.7
Greece	(6)	36.9	37.2	40.2	35.0	30.2	35.9
Hungary	(7)	55.3	46.0	38.7	31.6	22.6	38.8
Italy	(8)	50.0	34.0	26.0	20.0	22.0	30.0
Poland	(9)	58.6	41.9	30.1	21.4	17.2	33.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.6 Percentage of households one adult working by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	29.5	31.4	31.6	31.8	34.9	31.8
France	(2)	27.1	31.0	31.0	32.8	33.2	31.0
Germany	(3)	27.5	32.4	39.4	41.4	39.9	36.1
Spain	(4)	25.4	37.1	38.3	36.0	37.9	34.9
United Kingdom	(5)	23.9	30.7	31.5	28.9	29.2	28.8
Greece	(6)	35.5	32.1	28.3	30.6	33.6	32.0
Hungary	(7)	25.8	26.7	28.7	32.1	38.1	30.3
Italy	(8)	34.0	41.0	41.0	44.0	41.0	40.0
Poland	(9)	23.6	30.2	31.7	32.0	29.2	29.3

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.7 Percentage of households with more than one adult working by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	15.6	26.6	31.6	42.0	45.5	32.2
France	(2)	15.2	26.7	33.7	36.0	38.2	29.9
Germany	(3)	11.0	15.8	19.5	27.2	33.9	21.5
Spain	(4)	12.4	27.9	40.9	46.6	47.1	35.0
United Kingdom	(5)	14.3	30.6	39.4	47.5	50.5	36.5
Greece	(6)	27.5	30.7	31.6	34.4	36.2	32.1
Hungary	(7)	19.0	27.3	32.6	36.3	39.4	30.9
Italy	(8)	16.0	25.0	33.0	36.0	37.0	30.0
Poland	(9)	17.8	27.9	38.2	46.6	53.6	36.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.8 Percentage of owner-occupied households by quintile of proportional VAT payment

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	65.2	68.3	69.5	70.8	74.8	69.7
France	(2)	66.4	63.0	59.6	54.1	45.8	57.8
Germany	(3)	51.3	50.3	49.0	48.2	41.7	48.1
Spain	(4)	88.0	83.9	82.9	78.8	64.2	79.5
United Kingdom	(5)	52.6	61.2	71.3	75.0	79.4	67.9
Greece	(6)	45.5	72.0	89.1	95.2	97.9	80.0
Hungary	(7)	80.3	89.7	92.1	93.5	94.4	90.0
Italy	(8)	70.0	68.0	69.0	67.0	68.0	69.0
Poland	(9)	81.6	80.4	79.5	79.5	79.8	80.1

Sources: Various household surveys (see Annex H) and authors' calculations.

I.2. Additional analysis of abolishing zero and reduced rates of VAT

Table I.9 Gains/Losses from abolishing zero and reduced rates of VAT across the income distribution (% of income)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-4.82%	-9.56%	-2.84%	-6.47%	-4.26%	-8.26%	-2.04%	-5.06%	-8.02%
2	-3.75%	-6.12%	-2.18%	-4.94%	-3.36%	-5.66%	-1.69%	-3.92%	-6.06%
3	-3.43%	-5.48%	-1.93%	-4.44%	-3.00%	-4.45%	-1.53%	-3.57%	-5.51%
4	-3.10%	-5.01%	-1.90%	-4.14%	-2.79%	-4.12%	-1.52%	-3.36%	-5.11%
5	-2.88%	-4.76%	-1.72%	-3.93%	-2.90%	-3.66%	-1.36%	-3.17%	-4.84%
6	-2.79%	-4.56%	-1.65%	-3.57%	-2.60%	-3.29%	-1.25%	-3.01%	-4.56%
7	-2.52%	-4.24%	-1.53%	-3.35%	-2.31%	-2.93%	-1.10%	-2.97%	-4.36%
8	-2.45%	-3.93%	-1.42%	-3.21%	-2.29%	-2.67%	-1.06%	-2.74%	-4.02%
9	-2.09%	-3.76%	-1.26%	-2.98%	-2.04%	-2.42%	-0.93%	-2.55%	-3.64%
Richest	-1.56%	-2.87%	-0.92%	-2.34%	-1.58%	-1.73%	-0.76%	-2.01%	-2.53%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.10 Gains/Losses from abolishing zero and reduced rates of VAT across the expenditure distribution (% of income)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-2.55%	-3.58%	-1.71%	-3.05%	-2.16%	-3.35%	-1.15%	-2.73%	-4.25%
2	-2.33%	-3.84%	-1.62%	-3.24%	-2.51%	-3.22%	-1.20%	-2.64%	-4.37%
3	-2.69%	-4.03%	-1.59%	-3.27%	-2.63%	-3.25%	-1.19%	-2.67%	-4.33%
4	-2.69%	-4.05%	-1.60%	-3.33%	-2.50%	-2.99%	-1.27%	-2.66%	-4.34%
5	-2.41%	-4.13%	-1.60%	-3.40%	-2.59%	-3.14%	-1.21%	-2.64%	-4.32%
6	-2.53%	-4.04%	-1.52%	-3.53%	-2.56%	-3.06%	-1.20%	-2.78%	-4.33%
7	-2.61%	-4.17%	-1.47%	-3.49%	-2.64%	-3.13%	-1.18%	-3.00%	-4.31%
8	-2.58%	-4.11%	-1.43%	-3.45%	-2.50%	-2.87%	-1.14%	-2.87%	-4.22%
9	-2.50%	-4.22%	-1.41%	-3.63%	-2.34%	-2.88%	-1.11%	-3.07%	-4.13%
Richest	-2.43%	-4.67%	-1.27%	-3.69%	-2.09%	-2.76%	-1.03%	-3.20%	-3.78%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.11 Gains/Losses from abolishing zero and reduced rates of VAT across household types (Euros per week)

Household Type	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	-12.44	-23.23	-5.90	-12.23	-10.02	-9.63	-1.19	-12.50	-6.96
1 Ad, 0 Ch, NW	-9.74	-17.44	-4.30	-8.56	-7.38	-7.59	-1.35	-9.90	-5.20
1 Ad, ≥1 Ch, W	-16.00	-30.77	-7.80	-15.14	-18.48	-14.36	-1.65	-16.10	-9.65
1 Ad, ≥1 Ch, NW	-14.03	-21.87	-6.50	-12.10	-14.81	-9.03	-1.71	-10.90	-7.82
>1 Ad, 0 Ch, NW	-18.86	-35.63	-8.10	-17.84	-16.02	-13.78	-2.54	-17.00	-9.25
>1 Ad, 0 Ch, 1 W	-23.01	-40.02	-11.00	-20.54	-18.57	-14.99	-2.23	-19.40	-10.27
>1 Ad, 0 Ch, >1 W	-25.69	-47.27	-12.40	-26.01	-21.20	-18.19	-2.02	-23.50	-11.72
>1 Ad, 1 Ch, NW	-13.78	-34.09	-8.30	-15.67	-17.47	-15.90	-2.34	-18.90	-9.84
>1 Ad, 1 Ch, 1 W	-24.06	-39.91	-12.10	-19.12	-21.67	-16.26	-2.18	-19.30	-10.86
>1 Ad, 1 Ch, >1 W	-28.18	-48.63	-14.00	-24.54	-26.71	-18.52	-2.23	-25.80	-12.70
>1 Ad, >1 Ch, NW	-21.01	-35.32	-10.90	-17.13	-19.17	-15.16	-1.97	-15.10	-10.46
>1 Ad, >1 Ch, 1 W	-26.50	-48.69	-14.80	-22.08	-26.84	-17.16	-2.18	-21.60	-11.73
>1 Ad, >1 Ch, >1 W	-29.89	-53.68	-15.70	-27.26	-30.17	-20.83	-2.50	-26.30	-13.36
1 Ad, aged 60	-13.33	-24.27	-5.70	-9.60	-9.70	-7.33	-1.79	-10.90	-6.03
>1 Ad, all aged ≥ 60	-22.66	-41.72	-10.90	-17.68	-17.33	-11.23	-3.02	-16.90	-10.31

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.12 Gains/Losses from abolishing zero and reduced rates of VAT across household types (% of expenditure)

Household Type	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	-2.32%	-3.46%	-1.56%	-2.93%	-2.27%	-2.21%	-0.94%	-2.91%	-3.67%
1 Ad, 0 Ch, NW	-2.53%	-4.16%	-1.92%	-3.62%	-2.61%	-2.55%	-1.80%	-3.18%	-4.00%
1 Ad, ≥1 Ch, W	-2.67%	-4.02%	-1.81%	-4.01%	-3.74%	-2.66%	-1.17%	-3.34%	-4.38%
1 Ad, ≥1 Ch, NW	-3.34%	-4.49%	-2.20%	-5.23%	-4.03%	-2.62%	-1.61%	-3.25%	-4.96%
>1 Ad, 0 Ch, NW	-3.02%	-4.15%	-1.92%	-4.26%	-3.19%	-3.16%	-2.00%	-3.44%	-4.65%
>1 Ad, 0 Ch, 1 W	-3.09%	-3.92%	-1.97%	-3.70%	-2.90%	-2.72%	-1.50%	-3.14%	-4.35%
>1 Ad, 0 Ch, >1 W	-2.82%	-3.69%	-1.80%	-3.24%	-2.72%	-2.50%	-1.05%	-3.04%	-3.99%
>1 Ad, 1 Ch, NW	-3.16%	-4.73%	-2.47%	-4.96%	-3.59%	-2.84%	-1.67%	-3.71%	-5.19%
>1 Ad, 1 Ch, 1 W	-2.94%	-3.99%	-2.06%	-4.01%	-3.15%	-2.68%	-1.29%	-3.45%	-4.46%
>1 Ad, 1 Ch, >1 W	-2.89%	-3.72%	-2.00%	-3.37%	-3.21%	-2.31%	-1.12%	-3.12%	-4.09%
>1 Ad, >1 Ch, NW	-3.90%	-4.71%	-2.43%	-5.87%	-4.45%	-2.98%	-1.40%	-3.66%	-5.50%
>1 Ad, >1 Ch, 1 W	-2.89%	-4.14%	-2.04%	-4.47%	-3.81%	-2.65%	-1.19%	-3.47%	-4.75%
>1 Ad, >1 Ch, >1 W	-2.73%	-3.79%	-2.06%	-3.46%	-3.46%	-2.48%	-1.10%	-3.12%	-4.25%
1 Ad, aged 60	-3.07%	-4.75%	-1.82%	-2.98%	-3.02%	-3.63%	-2.48%	-3.23%	-4.36%
>1 Ad, all aged ≥ 60	-3.33%	-4.58%	-1.97%	-3.27%	-3.07%	-3.69%	-2.59%	-3.32%	-4.82%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.13 Gains/Losses from abolishing zero and reduced rates of VAT across household types (% of income)

Household Type	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	-1.92%	-3.81%	-1.21%	-2.93%	-1.73%	-2.49%	-0.86%	-2.80%	-3.96%
1 Ad, 0 Ch, NW	-2.89%	-5.44%	-1.86%	-3.62%	-2.08%	-4.14%	-1.75%	-3.59%	-6.67%
1 Ad, ≥1 Ch, W	-2.25%	-5.24%	-1.55%	-4.01%	-3.13%	-4.29%	-1.00%	-3.61%	-4.96%
1 Ad, ≥1 Ch, NW	-3.00%	-6.05%	-1.94%	-5.23%	-2.87%	-5.95%	-1.43%	-4.31%	-6.10%
>1 Ad, 0 Ch, NW	-3.14%	-4.72%	-1.86%	-4.26%	-2.85%	-3.86%	-1.70%	-3.03%	-5.31%
>1 Ad, 0 Ch, 1 W	-2.76%	-4.19%	-1.49%	-3.70%	-2.48%	-2.86%	-1.22%	-2.63%	-4.34%
>1 Ad, 0 Ch, >1 W	-2.31%	-3.68%	-1.26%	-3.24%	-2.02%	-2.52%	-0.79%	-2.49%	-3.48%
>1 Ad, 1 Ch, NW	-2.67%	-6.43%	-2.04%	-4.96%	-3.05%	-4.40%	-1.45%	-4.05%	-6.45%
>1 Ad, 1 Ch, 1 W	-3.04%	-4.54%	-1.62%	-4.01%	-2.73%	-3.60%	-1.06%	-3.42%	-4.83%
>1 Ad, 1 Ch, >1 W	-2.32%	-4.14%	-1.46%	-3.37%	-2.57%	-2.54%	-0.87%	-2.96%	-3.63%
>1 Ad, >1 Ch, NW	-4.15%	-6.19%	-2.26%	-5.87%	-2.78%	-4.82%	-1.20%	-4.21%	-6.80%
>1 Ad, >1 Ch, 1 W	-2.72%	-5.28%	-1.54%	-4.47%	-3.32%	-3.80%	-0.98%	-3.75%	-5.16%
>1 Ad, >1 Ch, >1 W	-2.09%	-4.33%	-1.49%	-3.46%	-2.86%	-2.81%	-0.85%	-3.00%	-3.69%
1 Ad, aged 60	-3.05%	-4.36%	-1.58%	-2.98%	-2.35%	-3.71%	-2.19%	-3.06%	-5.36%
>1 Ad, all aged ≥ 60	-3.24%	-3.88%	-1.61%	-3.27%	-2.59%	-3.68%	-1.98%	-2.80%	-4.91%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.14 Average age of adult household members by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	51.5	48.1	48.6	47.5	45.3	48.2
France	(2)	57.9	52.2	48.0	45.8	43.4	49.5
Germany	(3)	54.7	52.8	52.3	52.8	53.8	53.3
Spain	(4)	50.2	48.0	47.4	48.0	49.2	48.5
United Kingdom	(5)	50.2	50.5	50.2	49.7	47.0	49.5
Greece	(6)	65.6	53.6	48.6	45.5	44.1	51.5
Hungary	(7)	65.6	54.4	47.3	44.5	41.0	50.6
Italy	(8)	54.1	50.6	49.3	52.8	50.1	51.4
Poland	(9)	50.4	48.5	48.1	47.6	46.5	48.2

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.15 Average age at which adult household members left education by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	19.4	19.7	19.8	19.9	20.1	19.8
France	(2)	16.2	17.4	18.0	18.6	19.0	17.8
Germany	(3)	n/a	n/a	n/a	n/a	n/a	n/a
Spain	(4)	14.3	14.8	15.4	15.5	15.4	15.1
United Kingdom	(5)	17.0	16.8	17.2	17.5	17.9	17.3
Greece	(6)	18.2	18.5	18.8	19.0	19.4	18.8
Hungary	(7)	18.5	18.6	18.7	18.7	18.8	18.6
Italy	(8)	19.1	18.8	18.6	18.6	19.1	18.9
Poland	(9)	17.9	18.8	19.3	19.5	19.8	19.1

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.16 Percentage of single adult households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	28.8	26.7	29.8	35.3	47.6	33.6
France	(2)	44.2	30.7	28.3	30.1	35.7	33.8
Germany	(3)	32.5	32.5	35.8	43.1	52.0	39.2
Spain	(4)	19.6	14.9	14.7	19.7	32.2	20.2
United Kingdom	(5)	31.7	30.4	31.5	34.8	40.9	33.9
Greece	(6)	36.1	19.7	14.2	17.1	21.5	21.7
Hungary	(7)	47.2	33.5	25.4	24.6	32.5	32.7
Italy	(8)	29.0	22.0	31.0	35.0	32.0	30.0
Poland	(9)	23.2	22.6	25.8	29.4	31.9	26.6

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.17 Percentage of households with children by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	22.5	31.6	28.5	25.9	23.5	26.4
France	(2)	19.0	27.4	33.9	34.2	31.1	29.1
Germany	(3)	22.7	25.6	23.7	18.9	11.3	20.4
Spain	(4)	29.1	36.7	34.3	32.7	27.1	32.0
United Kingdom	(5)	39.7	33.7	29.6	22.7	19.6	29.0
Greece	(6)	8.3	22.8	30.2	35.8	33.3	26.1
Hungary	(7)	18.0	44.3	62.9	67.2	63.4	51.1
Italy	(8)	26.0	33.0	30.0	25.0	25.0	28.0
Poland	(9)	37.8	38.5	36.7	33.5	31.8	35.7

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.18 Percentage of workless households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	43.7	37.9	36.1	33.9	28.1	35.9
France	(2)	64.3	45.0	33.4	28.9	23.5	39.1
Germany	(3)	49.7	43.3	37.2	40.1	41.5	42.4
Spain	(4)	33.6	27.9	26.2	29.0	33.7	30.1
United Kingdom	(5)	40.5	38.1	33.3	30.7	30.8	34.7
Greece	(6)	72.3	40.4	26.9	21.7	18.2	35.9
Hungary	(7)	80.0	50.4	28.8	20.4	14.5	38.8
Italy	(8)	43.0	28.0	24.0	33.0	23.0	30.0
Poland	(9)	40.4	34.3	33.2	32.3	29	33.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.19 Percentage of households one adult working by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	29.6	27.3	30.1	29.9	42.3	31.8
France	(2)	22.2	28.4	31.2	33.3	39.9	31.0
Germany	(3)	30.5	33.5	38.8	37.2	40.6	36.1
Spain	(4)	33.5	36.2	34.6	34.8	35.5	34.9
United Kingdom	(5)	28.8	25.7	27.6	29.7	32.4	28.8
Greece	(6)	17.6	33.0	35.7	39.0	34.9	32.0
Hungary	(7)	12.9	27.5	34.8	36.3	39.8	30.3
Italy	(8)	37.0	40.0	45.0	35.0	44.0	40.0
Poland	(9)	29.7	30.5	28.6	28.5	29.4	29.3

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.20 Percentage of households with more than one adult working by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	26.7	34.8	33.8	36.2	29.6	32.2
France	(2)	13.5	26.6	35.3	37.7	36.6	29.9
Germany	(3)	19.8	23.2	24.0	22.7	17.9	21.5
Spain	(4)	32.9	35.9	39.2	36.2	30.8	35.0
United Kingdom	(5)	30.7	36.1	39.1	38.6	36.8	36.5
Greece	(6)	10.1	26.7	37.3	39.3	47.0	32.1
Hungary	(7)	7.1	22.1	36.4	43.3	45.7	30.9
Italy	(8)	20.0	32.0	31.0	32.0	33.0	30.0
Poland	(9)	29.9	35.1	38.3	39.2	41.6	36.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.21 Percentage of owner-occupied households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	65.0	71.7	70.5	73.0	68.3	69.7
France	(2)	46.4	62.2	64.0	61.3	55.2	57.8
Germany	(3)	34.1	45.0	49.7	54.5	57.1	48.1
Spain	(4)	66.8	79.5	81.8	83.8	85.9	79.5
United Kingdom	(5)	60.1	65.3	72.7	72.5	69.0	67.9
Greece	(6)	97.4	85.2	79.0	71.4	66.8	80.0
Hungary	(7)	93.4	93.2	91.4	88.5	83.7	90.0
Italy	(8)	62.0	67.0	67.0	74.0	73.0	69.0
Poland	(9)	70.2	78.2	82.5	84.1	85.7	80.1

Sources: Various household surveys (see Annex H) and authors' calculations.

I.3. Abolishing zero and reduced rates of VAT (revenue neutrally)

Table I.22 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across the income distribution (Euros per week)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-2.28	-3.61	-0.90	-0.97	-2.19	-2.34	-0.13	-1.80	-1.35
2	-2.68	-2.56	-0.80	-0.90	-2.61	-2.18	-0.28	-1.50	-1.27
3	-1.50	-2.75	-0.80	-0.49	-1.94	-1.49	-0.26	-1.40	-1.11
4	-1.22	-1.41	-0.90	-0.94	-1.50	-1.22	-0.32	-1.00	-0.82
5	-1.50	-1.05	-0.60	-0.55	-1.62	-0.88	-0.20	-0.80	-0.86
6	-0.76	-0.48	-0.50	0.09	-0.61	-0.83	-0.16	-0.30	-0.47
7	0.27	1.65	0.30	0.40	-0.39	0.15	0.07	0.10	-0.15
8	0.93	1.85	-0.20	0.29	0.88	1.02	0.11	0.80	0.39
9	2.27	2.83	1.10	1.03	2.56	1.96	0.40	1.70	1.29
Richest	6.46	5.83	3.50	2.09	7.44	5.82	0.77	4.40	4.28

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.23 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across the income distribution (% of expenditure)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.62%	-1.63%	-0.41%	-0.27%	-0.54%	-0.93%	-0.15%	-0.84%	-1.06%
2	-0.59%	-0.70%	-0.27%	-0.22%	-0.64%	-0.68%	-0.31%	-0.46%	-0.80%
3	-0.26%	-0.57%	-0.25%	-0.11%	-0.47%	-0.44%	-0.25%	-0.35%	-0.62%
4	-0.20%	-0.24%	-0.22%	-0.19%	-0.33%	-0.29%	-0.27%	-0.22%	-0.42%
5	-0.23%	-0.15%	-0.13%	-0.10%	-0.31%	-0.19%	-0.15%	-0.16%	-0.41%
6	-0.10%	-0.06%	-0.10%	0.01%	-0.11%	-0.16%	-0.11%	-0.05%	-0.21%
7	0.03%	0.17%	0.05%	0.06%	-0.07%	0.03%	0.04%	0.01%	-0.06%
8	0.10%	0.16%	-0.03%	0.04%	0.13%	0.16%	0.06%	0.10%	0.14%
9	0.25%	0.20%	0.15%	0.13%	0.32%	0.26%	0.19%	0.18%	0.41%
Richest	0.58%	0.26%	0.39%	0.21%	0.65%	0.59%	0.28%	0.32%	1.01%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.24 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across the income distribution (% of income)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.89%	-1.66%	-0.54%	-0.45%	-0.60%	-2.08%	-0.19%	-0.84%	-1.57%
2	-0.66%	-0.69%	-0.27%	-0.30%	-0.56%	-1.12%	-0.30%	-0.46%	-0.95%
3	-0.29%	-0.57%	-0.23%	-0.14%	-0.40%	-0.61%	-0.23%	-0.35%	-0.70%
4	-0.20%	-0.24%	-0.20%	-0.22%	-0.27%	-0.40%	-0.24%	-0.22%	-0.46%
5	-0.22%	-0.14%	-0.11%	-0.12%	-0.27%	-0.24%	-0.13%	-0.16%	-0.43%
6	-0.10%	-0.05%	-0.08%	0.02%	-0.09%	-0.19%	-0.09%	-0.05%	-0.21%
7	0.03%	0.16%	0.04%	0.06%	-0.05%	0.03%	0.03%	0.01%	-0.06%
8	0.09%	0.16%	-0.02%	0.04%	0.10%	0.16%	0.05%	0.10%	0.14%
9	0.19%	0.20%	0.11%	0.12%	0.24%	0.26%	0.14%	0.18%	0.38%
Richest	0.36%	0.26%	0.24%	0.17%	0.45%	0.49%	0.19%	0.32%	0.75%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.25 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across the expenditure distribution (Euros per week)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-3.21	-5.09	-1.20	-1.61	-4.04	-2.34	-0.28	-2.10	-1.72
2	-2.87	-5.89	-1.30	-1.70	-4.28	-2.74	-0.32	-1.70	-1.69
3	-3.78	-5.27	-1.30	-1.64	-3.87	-2.82	-0.26	-1.70	-1.44
4	-3.71	-5.41	-1.20	-1.50	-3.33	-2.43	-0.32	-1.40	-1.27
5	-2.50	-4.05	-1.20	-1.26	-2.76	-2.10	-0.21	-1.10	-1.05
6	-2.24	-2.36	-1.10	-1.14	-2.48	-1.25	-0.07	-0.70	-0.84
7	-2.23	-1.34	-0.40	-0.47	-0.84	-0.85	-0.02	-1.20	-0.52
8	-0.54	2.00	-0.10	0.38	1.07	0.76	0.16	0.20	0.03
9	2.95	7.39	0.90	1.93	4.98	3.39	0.40	0.80	0.99
Richest	18.13	20.25	6.90	7.05	15.59	10.38	0.93	8.80	7.43

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.26 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across the expenditure distribution (% of expenditure)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-1.12%	-1.88%	-0.62%	-0.76%	-1.83%	-1.88%	-0.47%	-1.00%	-1.59%
2	-0.75%	-1.40%	-0.51%	-0.53%	-1.37%	-1.29%	-0.39%	-0.56%	-1.10%
3	-0.81%	-1.02%	-0.41%	-0.43%	-1.06%	-0.99%	-0.27%	-0.45%	-0.82%
4	-0.70%	-0.86%	-0.33%	-0.34%	-0.81%	-0.70%	-0.29%	-0.33%	-0.68%
5	-0.41%	-0.56%	-0.29%	-0.25%	-0.58%	-0.51%	-0.16%	-0.22%	-0.51%
6	-0.32%	-0.28%	-0.23%	-0.20%	-0.46%	-0.25%	-0.05%	-0.13%	-0.38%
7	-0.29%	-0.13%	-0.07%	-0.07%	-0.14%	-0.15%	-0.01%	-0.20%	-0.22%
8	-0.06%	0.17%	-0.01%	0.05%	0.15%	0.11%	0.09%	0.03%	0.01%
9	0.29%	0.50%	0.13%	0.22%	0.55%	0.40%	0.18%	0.09%	0.32%
Richest	1.14%	0.83%	0.62%	0.55%	1.11%	0.80%	0.30%	0.68%	1.51%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.27 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across the expenditure distribution (% of income)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.76%	-1.16%	-0.45%	-0.57%	-0.86%	-1.28%	-0.28%	-0.67%	-1.11%
2	-0.52%	-1.01%	-0.35%	-0.46%	-0.82%	-1.00%	-0.26%	-0.41%	-0.89%
3	-0.61%	-0.84%	-0.29%	-0.39%	-0.70%	-0.85%	-0.19%	-0.34%	-0.70%
4	-0.54%	-0.74%	-0.24%	-0.31%	-0.54%	-0.61%	-0.21%	-0.26%	-0.61%
5	-0.31%	-0.52%	-0.21%	-0.24%	-0.42%	-0.50%	-0.12%	-0.18%	-0.47%
6	-0.26%	-0.26%	-0.17%	-0.20%	-0.34%	-0.26%	-0.04%	-0.11%	-0.37%
7	-0.24%	-0.14%	-0.05%	-0.08%	-0.11%	-0.16%	-0.01%	-0.18%	-0.21%
8	-0.06%	0.18%	-0.01%	0.05%	0.13%	0.12%	0.07%	0.03%	0.01%
9	0.27%	0.58%	0.10%	0.25%	0.50%	0.50%	0.16%	0.09%	0.34%
Richest	1.38%	1.26%	0.62%	0.74%	1.16%	1.18%	0.28%	0.81%	1.85%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.28 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across different household types (Euros per week)

Household Type	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	2.75	2.16	1.20	1.16	2.76	1.75	0.59	0.50	0.77
1 Ad, 0 Ch, NW	0.60	-0.23	-0.30	1.34	-1.22	-0.54	-0.27	-1.40	-0.54
1 Ad, ≥1 Ch, W	0.95	-0.12	0.50	-0.65	-3.16	-0.69	0.37	-0.60	-0.32
1 Ad, ≥1 Ch, NW	-2.29	-0.87	-1.00	0.35	-4.52	-1.01	-0.20	-0.90	-1.37
>1 Ad, 0 Ch, NW	-0.61	-1.40	0.00	-0.82	-1.52	-1.49	-0.71	-2.10	-1.00
>1 Ad, 0 Ch, 1 W	-1.74	1.01	-0.10	-0.15	1.52	0.25	-0.09	0.30	-0.18
>1 Ad, 0 Ch, >1 W	1.42	4.24	1.20	0.87	3.41	1.90	0.70	-2.20	1.23
>1 Ad, 1 Ch, NW	-2.42	-2.84	-1.80	-0.72	-2.01	-0.93	-0.43	2.60	-1.85
>1 Ad, 1 Ch, 1 W	0.12	1.17	-0.80	0.91	-1.15	-0.41	0.22	-0.80	-0.30
>1 Ad, 1 Ch, >1 W	0.33	4.73	-0.20	1.45	-0.31	2.26	0.61	1.80	1.25
>1 Ad, >1 Ch, NW	-5.69	-2.42	-2.10	-1.07	-5.59	-2.28	0.04	-1.60	-2.16
>1 Ad, >1 Ch, 1 W	1.56	-0.39	-0.60	0.00	-5.06	-0.31	0.42	-1.20	-0.71
>1 Ad, >1 Ch, >1 W	3.33	4.89	-0.30	0.86	-2.16	1.25	0.71	0.70	0.56
1 Ad, aged 60	-2.15	-4.73	-0.40	-1.29	-1.35	-1.60	-0.72	-1.40	-0.98
>1 Ad, all aged ≥ 60	-3.39	-5.55	-0.70	-1.87	-0.38	-2.46	-1.33	-0.90	-1.35

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.29 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across different household types (% of expenditure)

Household Type	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	0.51%	0.35%	0.31%	0.28%	0.63%	0.40%	0.46%	0.12%	0.41%
1 Ad, 0 Ch, NW	0.16%	-0.07%	-0.14%	0.38%	-0.43%	-0.18%	-0.36%	-0.50%	-0.42%
1 Ad, ≥1 Ch, W	0.16%	-0.02%	0.10%	-0.15%	-0.64%	-0.13%	0.26%	-0.13%	-0.15%
1 Ad, ≥1 Ch, NW	-0.55%	-0.24%	-0.34%	0.09%	-1.23%	-0.29%	-0.19%	-0.38%	-0.87%
>1 Ad, 0 Ch, NW	-0.10%	-0.18%	0.01%	-0.16%	-0.30%	-0.34%	-0.56%	-0.37%	-0.50%
>1 Ad, 0 Ch, 1 W	-0.23%	0.11%	-0.02%	-0.02%	0.24%	0.05%	-0.06%	0.05%	-0.08%
>1 Ad, 0 Ch, >1 W	0.16%	0.33%	0.18%	0.11%	0.44%	0.26%	0.36%	0.23%	0.42%
>1 Ad, 1 Ch, NW	-0.56%	-0.54%	-0.54%	-0.16%	-0.41%	-0.17%	-0.30%	-0.55%	-0.98%
>1 Ad, 1 Ch, 1 W	0.02%	0.13%	-0.14%	0.16%	-0.17%	-0.07%	0.13%	-0.15%	-0.12%
>1 Ad, 1 Ch, >1 W	0.03%	0.40%	-0.03%	0.19%	-0.04%	0.28%	0.31%	0.21%	0.40%
>1 Ad, >1 Ch, NW	-1.06%	-0.42%	-0.48%	-0.23%	-1.30%	-0.45%	0.03%	-0.44%	-1.14%
>1 Ad, >1 Ch, 1 W	0.17%	-0.04%	-0.08%	0.00%	-0.72%	-0.05%	0.23%	-0.20%	-0.29%
>1 Ad, >1 Ch, >1 W	0.30%	0.39%	-0.03%	0.10%	-0.25%	0.15%	0.31%	0.08%	0.18%
1 Ad, aged 60	-0.50%	-0.85%	-0.11%	-0.41%	-0.42%	-0.79%	-1.01%	-0.40%	-0.71%
>1 Ad, all aged ≥ 60	-0.50%	-0.52%	-0.13%	-0.35%	-0.07%	-0.81%	-1.14%	-0.15%	-0.63%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.30 Gains/Losses due to revenue-neutral abolition of zero and reduced rates of VAT across different household types (% of income)

Household Type	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	0.43%	0.35%	0.24%	0.28%	0.48%	0.45%	0.43%	0.12%	0.44%
1 Ad, 0 Ch, NW	0.18%	-0.07%	-0.14%	0.57%	-0.34%	-0.29%	-0.35%	-0.50%	-0.69%
1 Ad, ≥1 Ch, W	0.13%	-0.02%	0.09%	-0.17%	-0.54%	-0.21%	0.22%	-0.13%	-0.16%
1 Ad, ≥1 Ch, NW	-0.49%	-0.24%	-0.30%	0.15%	-0.88%	-0.66%	-0.17%	-0.38%	-1.07%
>1 Ad, 0 Ch, NW	-0.10%	-0.19%	0.01%	-0.20%	-0.27%	-0.42%	-0.48%	-0.37%	-0.58%
>1 Ad, 0 Ch, 1 W	-0.21%	0.11%	-0.02%	-0.03%	0.20%	0.05%	-0.05%	0.05%	-0.08%
>1 Ad, 0 Ch, >1 W	0.13%	0.33%	0.13%	0.11%	0.32%	0.26%	0.27%	0.23%	0.37%
>1 Ad, 1 Ch, NW	-0.47%	-0.53%	-0.44%	-0.23%	-0.35%	-0.26%	-0.27%	-0.55%	-1.21%
>1 Ad, 1 Ch, 1 W	0.02%	0.13%	-0.11%	0.19%	-0.15%	-0.09%	0.11%	-0.15%	-0.13%
>1 Ad, 1 Ch, >1 W	0.03%	0.40%	-0.02%	0.20%	-0.03%	0.31%	0.24%	0.21%	0.35%
>1 Ad, >1 Ch, NW	-1.12%	-0.43%	-0.45%	-0.37%	-0.81%	-0.73%	0.02%	-0.44%	-1.40%
>1 Ad, >1 Ch, 1 W	0.16%	-0.04%	-0.06%	0.00%	-0.63%	-0.07%	0.19%	-0.20%	-0.31%
>1 Ad, >1 Ch, >1 W	0.23%	0.39%	-0.02%	0.11%	-0.20%	0.17%	0.24%	0.08%	0.16%
1 Ad, aged 60	-0.49%	-0.85%	-0.10%	-0.40%	-0.33%	-0.81%	-0.89%	-0.40%	-0.87%
>1 Ad, all aged ≥ 60	-0.49%	-0.52%	-0.10%	-0.35%	-0.06%	-0.80%	-0.87%	-0.15%	-0.64%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.31 Average age of adult household members by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	53.4	50.0	47.8	46.4	43.4	48.2
France	(2)	61.0	52.0	47.7	44.1	42.6	49.5
Germany	(3)	56.6	54.5	52.9	51.9	50.5	53.3
Spain	(4)	54.8	50.5	48.2	46.5	42.6	48.5
United Kingdom	(5)	52.0	50.6	49.8	48.1	46.1	49.5
Greece	(6)	64.8	52.7	48.1	45.9	45.9	51.5
Hungary	(7)	65.2	54.3	47.6	44.2	41.5	50.6
Italy	(8)	56.3	52.1	51.7	48.6	48.3	51.4
Poland	(9)	53.6	51.1	47.9	44.9	43.5	48.2

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.32 Average age at which adult household members left education by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	19.2	19.6	19.8	20.0	20.2	19.8
France	(2)	15.9	17.4	18.3	18.6	19.0	17.8
Germany	(3)	n/a	n/a	n/a	n/a	n/a	n/a
Spain	(4)	13.8	14.7	15.3	15.6	16.0	15.1
United Kingdom	(5)	16.7	16.9	17.2	17.6	17.9	17.3
Greece	(6)	18.2	18.5	18.8	19.1	19.2	18.8
Hungary	(7)	18.5	18.6	18.7	18.7	18.7	18.6
Italy	(8)	18.9	18.9	18.7	18.8	19.1	18.9
Poland	(9)	17.6	18.7	19.2	19.7	20.1	19.1

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.33 Percentage of single adult households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	34.8	29.7	32.2	34.2	37.3	33.6
France	(2)	44.7	33.8	30.2	30.4	29.8	33.8
Germany	(3)	39.6	36.8	36.7	36.8	46.0	39.2
Spain	(4)	25.4	19.0	18.8	19.4	18.6	20.2
United Kingdom	(5)	41.8	35.0	34.7	28.9	28.8	33.8
Greece	(6)	36.8	21.2	16.3	15.6	18.6	21.7
Hungary	(7)	46.4	32.8	26.7	25.8	31.5	32.7
Italy	(8)	39.0	29.0	30.0	27.0	24.0	30.0
Poland	(9)	31.4	31.4	27.8	22.7	19.7	26.6

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.34 Percentage of households with children by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	19.8	26.1	29.3	27.7	29.1	26.4
France	(2)	14.8	27.2	33.3	35.6	34.8	29.1
Germany	(3)	18.4	22.3	23.5	22.3	15.6	20.4
Spain	(4)	22.8	30.1	34.2	35.3	37.4	32.0
United Kingdom	(5)	33.9	32.6	28.3	27.1	23.4	29.0
Greece	(6)	9.2	27.2	30.6	33.9	29.6	26.1
Hungary	(7)	18.5	45.0	61.4	67.1	63.8	51.1
Italy	(8)	22.0	27.0	27.0	33.0	30.0	28.0
Poland	(9)	30.4	32.9	36.1	39.3	39.6	35.7

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.35 Percentage of workless households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	51.0	40.6	37.1	29.0	21.9	35.9
France	(2)	68.1	43.9	33.2	26.2	23.7	39.1
Germany	(3)	57.0	46.8	41.8	35.4	30.8	42.4
Spain	(4)	45.1	34.4	29.0	24.5	17.5	30.1
United Kingdom	(5)	50.2	40.3	24.8	27.8	20.3	34.7
Greece	(6)	72.4	38.9	28.4	21.3	18.5	35.9
Hungary	(7)	79.6	50.5	29.3	20.7	14.0	38.8
Italy	(8)	50.0	35.0	29.0	20.0	18.0	30.0
Poland	(9)	50.7	42.4	33.5	24.3	18.4	33.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.36 Percentage of households one adult working by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	26.8	31.8	27.1	34.4	39.1	31.8
France	(2)	20.4	30.6	32.9	34.9	36.3	31.0
Germany	(3)	27.9	33.1	36.1	39.5	44.0	36.1
Spain	(4)	30.1	33.5	35.3	36.4	38.5	34.9
United Kingdom	(5)	27.2	25.3	31.0	28.4	32.4	28.8
Greece	(6)	17.6	34.4	37.2	36.0	35.0	32.0
Hungary	(7)	13.2	27.8	35.0	35.5	39.8	30.3
Italy	(8)	33.0	39.0	42.0	43.0	43.0	40.0
Poland	(9)	27.2	29	30	30.5	30	29.3

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.37 Percentage of households with more than one adult working by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	22.2	27.6	35.8	36.7	39.0	32.2
France	(2)	11.5	25.5	33.9	38.9	40.0	29.9
Germany	(3)	15.1	20.1	22.1	25.1	25.2	21.5
Spain	(4)	24.0	32.1	35.7	39.1	44.0	35.0
United Kingdom	(5)	22.6	34.3	34.2	43.9	47.3	36.5
Greece	(6)	10.0	26.8	34.4	42.8	46.5	32.1
Hungary	(7)	7.2	21.7	35.7	43.8	46.1	30.9
Italy	(8)	17.0	26.0	29.0	37.0	39.0	30.0
Poland	(9)	22.1	28.6	36.5	45.2	51.6	36.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.38 Percentage of owner-occupied households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	65.5	69.5	67.0	74.0	72.6	69.7
France	(2)	56.0	60.9	59.4	58.4	54.3	57.8
Germany	(3)	37.5	45.9	52.1	54.1	50.9	48.1
Spain	(4)	74.0	82.2	81.6	81.6	78.4	79.5
United Kingdom	(5)	55.4	64.1	69.6	73.2	77.2	67.9
Greece	(6)	90.6	77.2	75.7	75.0	81.3	80.0
Hungary	(7)	92.9	92.7	88.6	86.9	89.0	90.0
Italy	(8)	63.0	67.0	70.0	70.0	72.0	69.0
Poland	(9)	72.2	79	83.1	82.3	84.2	80.1

Sources: Various household surveys (see Annex H) and authors' calculations.

I.4 Increasing the standard rate of VAT by 1 percentage point

Table I.39 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across the income distribution (Euros per week)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-1.10	-1.04	-0.70	-1.22	-1.74	-0.85	-0.54	-0.60	-0.32
2	-1.35	-1.34	-1.10	-1.35	-1.67	-1.16	-0.57	-0.80	-0.41
3	-1.92	-1.59	-1.20	-1.52	-1.65	-1.31	-0.65	-0.90	-0.49
4	-2.05	-2.03	-1.50	-1.61	-1.85	-1.63	-0.74	-1.00	-0.54
5	-2.15	-2.41	-1.70	-1.75	-2.16	-1.89	-0.84	-1.10	-0.57
6	-2.56	-2.82	-1.90	-1.95	-2.34	-2.08	-0.90	-1.30	-0.65
7	-2.88	-3.39	-2.30	-2.14	-2.39	-2.44	-1.01	-1.50	-0.76
8	-3.30	-3.74	-2.30	-2.24	-2.93	-2.84	-1.14	-1.70	-0.85
9	-3.53	-4.43	-2.80	-2.65	-3.57	-3.39	-1.35	-2.00	-1.04
Richest	-4.65	-5.72	-3.80	-3.18	-5.08	-4.68	-1.81	-2.70	-1.61

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.40 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across the income distribution (% of expenditure)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.30%	-0.28%	-0.33%	-0.34%	-0.43%	-0.34%	-0.62%	-0.19%	-0.25%
2	-0.30%	-0.28%	-0.37%	-0.33%	-0.41%	-0.36%	-0.62%	-0.21%	-0.26%
3	-0.33%	-0.28%	-0.36%	-0.33%	-0.40%	-0.39%	-0.62%	-0.21%	-0.27%
4	-0.34%	-0.29%	-0.38%	-0.32%	-0.41%	-0.39%	-0.62%	-0.22%	-0.28%
5	-0.32%	-0.29%	-0.38%	-0.33%	-0.42%	-0.41%	-0.63%	-0.22%	-0.27%
6	-0.34%	-0.30%	-0.38%	-0.33%	-0.42%	-0.40%	-0.63%	-0.22%	-0.29%
7	-0.36%	-0.31%	-0.41%	-0.33%	-0.41%	-0.42%	-0.64%	-0.24%	-0.30%
8	-0.36%	-0.31%	-0.39%	-0.32%	-0.44%	-0.44%	-0.64%	-0.24%	-0.31%
9	-0.38%	-0.31%	-0.40%	-0.33%	-0.44%	-0.45%	-0.65%	-0.25%	-0.33%
Richest	-0.42%	-0.32%	-0.42%	-0.32%	-0.45%	-0.48%	-0.65%	-0.27%	-0.38%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.41 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across the income distribution (% of income)

Income Decile Group	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.43%	-0.48%	-0.43%	-0.57%	-0.48%	-0.75%	-0.80%	-0.26%	-0.37%
2	-0.33%	-0.36%	-0.37%	-0.44%	-0.36%	-0.59%	-0.59%	-0.23%	-0.31%
3	-0.37%	-0.33%	-0.33%	-0.42%	-0.34%	-0.53%	-0.56%	-0.22%	-0.30%
4	-0.34%	-0.34%	-0.33%	-0.37%	-0.34%	-0.54%	-0.55%	-0.22%	-0.31%
5	-0.31%	-0.34%	-0.32%	-0.37%	-0.36%	-0.51%	-0.54%	-0.21%	-0.29%
6	-0.32%	-0.33%	-0.32%	-0.36%	-0.35%	-0.47%	-0.51%	-0.22%	-0.30%
7	-0.31%	-0.35%	-0.33%	-0.34%	-0.31%	-0.46%	-0.50%	-0.22%	-0.31%
8	-0.32%	-0.32%	-0.29%	-0.32%	-0.34%	-0.46%	-0.50%	-0.22%	-0.30%
9	-0.29%	-0.31%	-0.29%	-0.32%	-0.33%	-0.44%	-0.49%	-0.21%	-0.31%
Richest	-0.26%	-0.25%	-0.26%	-0.26%	-0.31%	-0.39%	-0.44%	-0.19%	-0.28%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.42 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across the expenditure distribution (Euros per week)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.73	-0.45	-0.60	-0.57	-0.64	-0.35	-0.36	-0.30	-0.25
2	-1.03	-0.83	-0.90	-0.89	-1.00	-0.67	-0.50	-0.60	-0.38
3	-1.32	-1.14	-1.10	-1.09	-1.29	-0.95	-0.60	-0.70	-0.45
4	-1.55	-1.44	-1.30	-1.34	-1.50	-1.22	-0.69	-0.90	-0.48
5	-1.90	-1.84	-1.60	-1.56	-1.83	-1.51	-0.78	-1.10	-0.54
6	-2.26	-2.35	-1.70	-1.77	-2.13	-1.95	-0.90	-1.20	-0.61
7	-2.52	-2.89	-2.00	-2.04	-2.64	-2.33	-1.03	-1.30	-0.68
8	-2.99	-3.77	-2.30	-2.44	-3.15	-2.96	-1.20	-1.70	-0.79
9	-3.86	-5.11	-2.80	-3.12	-4.23	-3.88	-1.45	-1.90	-1.00
Richest	-7.34	-8.65	-4.90	-4.77	-6.99	-6.43	-2.03	-3.80	-2.06

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.43 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across the expenditure distribution (% of expenditure)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.25%	-0.17%	-0.30%	-0.27%	-0.29%	-0.28%	-0.60%	-0.16%	-0.23%
2	-0.27%	-0.20%	-0.33%	-0.28%	-0.32%	-0.32%	-0.61%	-0.19%	-0.25%
3	-0.28%	-0.22%	-0.35%	-0.29%	-0.35%	-0.33%	-0.61%	-0.20%	-0.26%
4	-0.29%	-0.23%	-0.36%	-0.30%	-0.36%	-0.35%	-0.62%	-0.21%	-0.26%
5	-0.32%	-0.26%	-0.37%	-0.31%	-0.39%	-0.36%	-0.62%	-0.21%	-0.26%
6	-0.32%	-0.28%	-0.37%	-0.31%	-0.40%	-0.39%	-0.63%	-0.22%	-0.28%
7	-0.33%	-0.29%	-0.39%	-0.32%	-0.43%	-0.41%	-0.64%	-0.22%	-0.28%
8	-0.35%	-0.32%	-0.39%	-0.33%	-0.44%	-0.43%	-0.64%	-0.24%	-0.30%
9	-0.38%	-0.35%	-0.41%	-0.35%	-0.47%	-0.46%	-0.65%	-0.24%	-0.32%
Richest	-0.46%	-0.38%	-0.44%	-0.37%	-0.50%	-0.50%	-0.66%	-0.30%	-0.42%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.44 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across the expenditure distribution (% of income)

Expenditure Decile Group	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
Poorest	-0.17%	-0.10%	-0.22%	-0.20%	-0.14%	-0.19%	-0.36%	-0.11%	-0.17%
2	-0.19%	-0.14%	-0.23%	-0.24%	-0.19%	-0.24%	-0.40%	-0.14%	-0.20%
3	-0.21%	-0.18%	-0.24%	-0.26%	-0.23%	-0.29%	-0.43%	-0.15%	-0.22%
4	-0.23%	-0.20%	-0.26%	-0.28%	-0.24%	-0.31%	-0.46%	-0.16%	-0.23%
5	-0.24%	-0.23%	-0.27%	-0.29%	-0.28%	-0.36%	-0.47%	-0.17%	-0.24%
6	-0.26%	-0.26%	-0.27%	-0.31%	-0.29%	-0.41%	-0.51%	-0.19%	-0.26%
7	-0.27%	-0.30%	-0.29%	-0.33%	-0.35%	-0.45%	-0.52%	-0.20%	-0.28%
8	-0.31%	-0.34%	-0.29%	-0.35%	-0.38%	-0.48%	-0.55%	-0.22%	-0.30%
9	-0.36%	-0.40%	-0.32%	-0.41%	-0.42%	-0.58%	-0.57%	-0.23%	-0.34%
Richest	-0.56%	-0.53%	-0.44%	-0.50%	-0.52%	-0.73%	-0.61%	-0.35%	-0.51%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.45 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across different household types (Euros per week)

Household Type	Average gain/loss due to changes in VAT payments per household (Euros per week)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	-2.03	-2.06	-1.50	-1.41	-1.93	-1.94	-0.84	-0.99	-0.59
1 Ad, 0 Ch, NW	-1.31	-1.29	-0.80	-1.11	-0.79	-1.05	-0.47	-0.53	-0.30
1 Ad, ≥1 Ch, W	-2.14	-2.31	-1.70	-1.39	-1.98	-2.09	-0.92	-1.12	-0.65
1 Ad, ≥1 Ch, NW	-1.30	-1.53	-1.00	-1.30	-1.20	-1.15	-0.65	-0.69	-0.38
>1 Ad, 0 Ch, NW	-2.21	-2.50	-1.70	-1.64	-1.95	-1.76	-0.77	-0.98	-0.53
>1 Ad, 0 Ch, 1 W	-2.50	-3.18	-2.20	-2.01	-2.90	-2.39	-0.95	-1.49	-0.72
>1 Ad, 0 Ch, >1 W	-3.41	-4.18	-2.90	-2.72	-3.64	-3.31	-1.26	-2.05	-1.00
>1 Ad, 1 Ch, NW	-1.26	-2.17	-1.20	-1.45	-2.07	-2.24	-0.83	-1.08	-0.47
>1 Ad, 1 Ch, 1 W	-3.01	-3.18	-2.30	-2.09	-2.82	-2.43	-1.08	-1.33	-0.75
>1 Ad, 1 Ch, >1 W	-3.51	-4.37	-2.80	-2.70	-3.70	-3.47	-1.30	-2.15	-1.08
>1 Ad, >1 Ch, NW	-1.56	-2.28	-1.60	-1.54	-1.60	-1.79	-0.86	-0.92	-0.47
>1 Ad, >1 Ch, 1 W	-3.57	-3.63	-2.90	-2.22	-2.79	-2.60	-1.17	-1.45	-0.76
>1 Ad, >1 Ch, >1 W	-4.33	-4.77	-3.20	-2.87	-3.83	-3.58	-1.46	-2.06	-1.04
1 Ad, aged 60	-1.22	-1.15	-1.10	-0.73	-1.08	-0.73	-0.44	-0.60	-0.30
>1 Ad, all aged ≥ 60	-2.14	-2.36	-2.00	-1.43	-2.35	1.11	-0.68	-1.13	-0.56

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed
Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.46 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across different household types (% of expenditure)

Household Type	Average gain/loss due to changes in VAT payments per household (% of expenditure)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	-0.38%	-0.31%	-0.41%	-0.34%	-0.44%	-0.45%	-0.66%	-0.23%	-0.31%
1 Ad, 0 Ch, NW	-0.34%	-0.31%	-0.35%	-0.32%	-0.28%	-0.35%	-0.63%	-0.17%	-0.23%
1 Ad, ≥1 Ch, W	-0.36%	-0.30%	-0.40%	-0.31%	-0.40%	-0.39%	-0.65%	-0.23%	-0.30%
1 Ad, ≥1 Ch, NW	-0.31%	-0.31%	-0.35%	-0.34%	-0.33%	-0.33%	-0.62%	-0.21%	-0.24%
>1 Ad, 0 Ch, NW	-0.35%	-0.29%	-0.40%	-0.31%	-0.39%	-0.40%	-0.61%	-0.20%	-0.27%
>1 Ad, 0 Ch, 1 W	-0.34%	-0.31%	-0.40%	-0.33%	-0.45%	-0.43%	-0.64%	-0.24%	-0.30%
>1 Ad, 0 Ch, >1 W	-0.37%	-0.33%	-0.42%	-0.35%	-0.47%	-0.46%	-0.66%	-0.26%	-0.34%
>1 Ad, 1 Ch, NW	-0.29%	-0.30%	-0.35%	-0.33%	-0.43%	-0.40%	-0.59%	-0.21%	-0.25%
>1 Ad, 1 Ch, 1 W	-0.37%	-0.32%	-0.38%	-0.36%	-0.41%	-0.40%	-0.64%	-0.24%	-0.31%
>1 Ad, 1 Ch, >1 W	-0.36%	-0.33%	-0.40%	-0.36%	-0.44%	-0.43%	-0.65%	-0.26%	-0.35%
>1 Ad, >1 Ch, NW	-0.29%	-0.30%	-0.36%	-0.34%	-0.37%	-0.35%	-0.61%	-0.22%	-0.25%
>1 Ad, >1 Ch, 1 W	-0.39%	-0.31%	-0.40%	-0.35%	-0.40%	-0.40%	-0.64%	-0.23%	-0.31%
>1 Ad, >1 Ch, >1 W	-0.40%	-0.34%	-0.41%	-0.35%	-0.44%	-0.43%	-0.64%	-0.24%	-0.33%
1 Ad, aged 60	-0.28%	-0.23%	-0.34%	-0.23%	-0.34%	-0.36%	-0.61%	-0.18%	-0.22%
>1 Ad, all aged ≥ 60	-0.31%	-0.26%	-0.37%	-0.27%	-0.42%	-0.36%	-0.58%	-0.22%	-0.26%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.47 Gains/Losses from increasing the standard rate of VAT by 1 percentage point across different household types (% of income)

Household Type	Average gain/loss due to changes in VAT payments per household (% of income)								
	Belgium (1)	France (2)	Germany (3)	Spain (4)	UK (5)	Greece (6)	Hungary (7)	Italy (8)	Poland (9)
1 Ad, 0 Ch, W	-0.31%	-0.34%	-0.32%	-0.34%	-0.33%	-0.50%	-0.61%	-0.22%	-0.34%
1 Ad, 0 Ch, NW	-0.39%	-0.40%	-0.34%	-0.47%	-0.22%	-0.57%	-0.61%	-0.19%	-0.39%
1 Ad, ≥1 Ch, W	-0.30%	-0.39%	-0.35%	-0.37%	-0.34%	-0.62%	-0.55%	-0.25%	-0.34%
1 Ad, ≥1 Ch, NW	-0.28%	-0.43%	-0.31%	-0.56%	-0.23%	-0.76%	-0.55%	-0.27%	-0.29%
>1 Ad, 0 Ch, NW	-0.37%	-0.33%	-0.38%	-0.39%	-0.35%	-0.49%	-0.52%	-0.17%	-0.31%
>1 Ad, 0 Ch, 1 W	-0.30%	-0.33%	-0.30%	-0.36%	-0.39%	-0.46%	-0.52%	-0.20%	-0.30%
>1 Ad, 0 Ch, >1 W	-0.31%	-0.32%	-0.30%	-0.34%	-0.35%	-0.46%	-0.49%	-0.22%	-0.29%
>1 Ad, 1 Ch, NW	-0.24%	-0.41%	-0.29%	-0.46%	-0.36%	-0.62%	-0.51%	-0.23%	-0.31%
>1 Ad, 1 Ch, 1 W	-0.38%	-0.37%	-0.30%	-0.44%	-0.35%	-0.54%	-0.53%	-0.24%	-0.33%
>1 Ad, 1 Ch, >1 W	-0.29%	-0.37%	-0.29%	-0.37%	-0.36%	-0.48%	-0.51%	-0.25%	-0.31%
>1 Ad, >1 Ch, NW	-0.31%	-0.40%	-0.34%	-0.53%	-0.23%	-0.57%	-0.52%	-0.26%	-0.30%
>1 Ad, >1 Ch, 1 W	-0.37%	-0.39%	-0.30%	-0.45%	-0.35%	-0.58%	-0.53%	-0.25%	-0.33%
>1 Ad, >1 Ch, >1 W	-0.30%	-0.39%	-0.30%	-0.36%	-0.36%	-0.48%	-0.49%	-0.24%	-0.28%
1 Ad, aged 60	-0.28%	-0.21%	-0.30%	-0.23%	-0.26%	-0.37%	-0.53%	-0.17%	-0.26%
>1 Ad, all aged ≥ 60	-0.31%	-0.22%	-0.30%	-0.26%	-0.35%	-0.36%	-0.45%	-0.19%	-0.27%

Notes: Exchange rates of 0.886 British pounds, 268.20 Hungarian forints, and 4.0119 Polish zloty to 1 Euro are assumed

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.48 Average age of adult household members by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	43.1	45.3	47.5	49.7	55.6	48.2
France	(2)	43.2	44.4	47.0	51.4	61.4	49.5
Germany	(3)	49.1	50.6	52.2	55.9	58.7	53.3
Spain	(4)	41.8	43.8	46.4	50.4	60.4	48.5
United Kingdom	(5)	46.3	47.5	48.6	49.8	55.5	49.5
Greece	(6)	48.1	48.5	49.3	52.3	59.3	51.5
Hungary	(7)	45.1	47.1	49.9	53.4	57.3	50.6
Italy	(8)	48.8	48.1	49.6	52.0	58.5	51.4
Poland	(9)	43.2	44.0	46.5	50.2	57.1	48.2

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.49 Average age at which adult household members left education by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	20.3	19.9	19.8	19.5	19.3	19.8
France	(2)	18.8	18.6	18.2	17.6	16.2	17.8
Germany	(3)	n/a	n/a	n/a	n/a	n/a	n/a
Spain	(4)	15.7	15.7	15.4	15.0	13.5	15.1
United Kingdom	(5)	17.8	17.5	17.3	17.3	16.5	17.3
Greece	(6)	19.1	18.9	18.8	18.7	18.4	18.8
Hungary	(7)	45.1	47.1	49.9	53.4	57.3	50.6
Italy	(8)	19.0	19.5	18.1	18.8	19.0	18.9
Poland	(9)	19.9	19.5	19.2	18.8	17.9	19.1

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.50 Percentage of single adult households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	28.6	27.8	31.1	34.9	45.8	33.6
France	(2)	27.9	29.3	31.1	33.9	46.9	33.8
Germany	(3)	33.4	30.9	33.8	44.5	53.3	39.2
Spain	(4)	14.2	14.2	15.2	19.5	37.9	20.2
United Kingdom	(5)	21.2	21.4	29.9	37.0	59.8	33.9
Greece	(6)	17.4	14.7	17.6	22.3	36.5	21.7
Hungary	(7)	34.6	30.7	29.2	31.5	37.3	32.7
Italy	(8)	20.0	28.0	21.0	27.0	53.0	30.0
Poland	(9)	15.7	16.9	21.3	30.3	48.8	26.6

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.51 Percentage of households with children by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	33.2	32.9	27.7	23.5	14.8	26.4
France	(2)	35.7	36.6	33.9	26.0	13.3	29.1
Germany	(3)	22.6	26.2	25.1	17.0	11.3	20.4
Spain	(4)	40.0	41.5	37.1	28.8	12.6	20.2
United Kingdom	(5)	28.7	30.8	32.3	33.2	20.2	29.0
Greece	(6)	25.4	28.8	30.8	28.2	17.3	26.1
Hungary	(7)	55.1	60.8	57.5	47.5	34.7	51.1
Italy	(8)	31.0	36.0	31.0	28.0	14.0	28.0
Poland	(9)	43.4	44.0	39.5	31.8	19.6	35.7

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.52 Percentage of workless households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	20.2	27.0	34.2	42.9	55.5	35.9
France	(2)	26.0	29.8	32.7	41.9	64.9	39.1
Germany	(3)	26.0	30.9	41.1	52.4	61.3	42.4
Spain	(4)	15.6	18.3	23.1	33.5	59.9	30.1
United Kingdom	(5)	20.1	23.8	28.7	38.3	62.6	34.7
Greece	(6)	21.1	26.6	30.2	40.4	61.3	35.9
Hungary	(7)	21.0	27.0	35.9	48.1	62.2	38.8
Italy	(8)	18.0	20.0	25.0	34.0	54.0	30.0
Poland	(9)	17.0	20.2	28.7	41.6	61.8	33.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.53 Percentage of households one adult working by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	36.0	30.9	32.8	30.5	28.9	31.8
France	(2)	34.4	32.7	32.6	32.1	23.1	31.0
Germany	(3)	41.4	41.4	38.4	31.9	27.5	36.1
Spain	(4)	38.3	36.9	37.6	35.8	26.0	34.9
United Kingdom	(5)	29.0	28.1	32.2	31.4	23.5	28.8
Greece	(6)	35.3	33.3	35.0	31.1	25.4	32.0
Hungary	(7)	37.5	34.0	30.1	27.1	22.6	30.3
Italy	(8)	44.0	42.0	46.0	37.0	32.0	40.0
Poland	(9)	29.1	32.3	31.9	30.4	23.0	29.3

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.54 Percentage of households with more than one adult working by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	43.8	42.1	33.0	26.6	15.6	32.2
France	(2)	39.5	37.5	34.7	25.9	11.9	29.9
Germany	(3)	32.6	27.7	20.5	15.7	11.2	21.5
Spain	(4)	46.0	44.8	39.3	30.8	14.1	35.0
United Kingdom	(5)	50.9	48.1	39.1	30.3	13.9	36.5
Greece	(6)	43.6	40.0	34.8	28.6	13.4	32.1
Hungary	(7)	41.5	39.0	34.0	24.8	15.2	30.9
Italy	(8)	38.0	38.0	29.0	29.0	14.0	30.0
Poland	(9)	54.0	47.5	39.4	28.0	15.2	36.8

Sources: Various household surveys (see Annex H) and authors' calculations.

Table I.55 Percentage of owner-occupied households by quintile of gain/loss

Demographic Breakdown		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Average
Belgium	(1)	75.5	70.7	69.1	67.8	65.4	69.7
France	(2)	51.1	54.7	58.8	60.6	63.8	57.8
Germany	(3)	44.0	49.3	50.8	48.3	48.1	48.1
Spain	(4)	70.2	78.7	80.9	82.9	85.0	79.5
United Kingdom	(5)	78.8	75.3	71.2	61.7	52.3	67.9
Greece	(6)	91.7	86.3	78.9	75.0	67.9	80.0
Hungary	(7)	93.9	93.1	92.5	89.3	81.3	90.0
Italy	(8)	70.0	68.0	70.0	69.0	66.0	69.0
Poland	(9)	81.8	80.8	79.8	79.8	78.4	80.1

Sources: Various household surveys (see Annex H) and authors' calculations.

Annex J. Demand Modelling

J.1. The Quadratic Almost Ideal Demand System

The Quadratic Almost Ideal Demand System (QUAIDS) is a generalisation of the Almost Ideal Demand System (AIDS) model that allows for quadratic Engel curves. This demand system developed in Banks, Blundell and Lewbel (1997) can therefore allow a good to be a luxury at one level of income and a necessity at another, a property these authors find to be of empirical relevance. The QUAIDS demand system is based on the following indirect utility function:

$$lnV = \left\{ \left[\frac{\ln x - \ln a(p))}{b(p)} \right]^{-1} + \lambda(p) \right\}^{-1}$$

Where x is total expenditure, p is the vector of prices, and a(p), b(p) and λ(p) are defined as:

$$\ln a(p) = \alpha_0 + \sum_i \alpha_i \ln (p_i) + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln(p_i) \ln (p_j)$$

$$b(p) = \prod_{i=1}^{n} p_i^{\beta_i}$$

$$\ln\lambda(p) = \sum_{i=1}^{n} \lambda_i \ln (p_i)$$

where (i=1,..., n denotes a good). Applying Roy's identity this gives the following equation for w_i, the share of expenditure on good i in total expenditure is, for each household:

$$\mathbf{w_i} = \boldsymbol{\alpha_i} + \sum_{\boldsymbol{j=1}}^{\boldsymbol{n}} \boldsymbol{\gamma_{ij}} \mathbf{ln}(\boldsymbol{p_j}) + \boldsymbol{\beta_i} \mathbf{ln}\left(\frac{\boldsymbol{x}}{\boldsymbol{a(p)}}\right) + \frac{\boldsymbol{\lambda_i}}{\boldsymbol{b(p)}} \left(\mathbf{ln}\left(\frac{\boldsymbol{x}}{\boldsymbol{a(p)}}\right) \right)^{\mathbf{2}}$$

For the resulting demands to be consistent with utility maximisation, the demand system must satisfy four key properties: adding-up; homogeneity; symmetry; and negativity (negative semi-definiteness). The first three imply the following linear restrictions on the parameters of the model:

(adding up)

$$\sum_{i=1}^{n} \alpha_i = 1 ; \qquad \sum_{i=1}^{n} \beta_i = 0 ; \qquad \sum_{i=1}^{n} \gamma_{ij} = 0 \; \forall \, j ; \qquad \sum_{i=1}^{n} \lambda_i = 0$$

(homogeneity)

$$\sum_{j=1}^{n} \gamma_{ij} = 0 \; \forall \, i$$

(symmetry)

$$\gamma_{ij} = \gamma_{ji}$$

Additivity is imposed by omitting the equation for one of the goods from the demand system and calculating the coefficients entering that equation such that the adding up conditions hold. Homogeneity and symmetry can be imposed by restricting the parameters using linear conditions at the estimation stage. However, the model can also be estimated in an unrestricted manner and these restrictions tested and subsequently imposed. Negativity cannot be imposed in such a manner but the estimated parameters can be tested to see if they satisfy this criterion.

It is possible to allow for household demographics to affect preferences (and therefore demands) in a theoretically consistent manner. Demographics enter as taste-shifters in the share equations, and to maintain our ability to conduct welfare analysis are therefore part of α_i terms in ln*a(p)*:

$$\ln a(p) = \alpha_0 + \sum_i \left\{ \alpha_i + \sum_{k=1}^{K} \alpha_{ik} z_k \right\} \ln (p_i) + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln(p_i) \ln (p_j)$$

Which gives us the following new adding-up conditions that supersede $\sum_{i=1}^{n} \alpha_i = 1$:

$$\sum_{i=1}^{n} \alpha_i = 1 ; \qquad \sum_{i=1}^{n} \alpha_{ik} = 0 ;$$

J.2 Simulating spending patterns and welfare effects

Having estimated a fully specified demand system, one can estimate the impact of price changes, for instance due to the VAT regime, on spending patterns (using the demand equations) and on consumer welfare (using the associated expenditure functions which tell you how much you need to spend to each a given level of utility given a particular set of prices). An attractive measure of the welfare impact is the compensating variation (CV). In this context this measure tells us how much additional income a household would require to compensate them from a move from the present VAT system to, for instance, a uniform VAT without zero and reduced rates. It also allows us to calculate how much revenue from such a reform would be left over after compensating every household to ensure that they are exactly compensated for the change. This is a useful measure of the potential gain to society from moves towards a uniform VAT (i.e. the costs of existing VAT rate differentiation).

The CV is calculated as

$$CV = E(u^*, p^1) - E(u^*, p^0)$$

where u^* is the original value of the utility index, p^0 is the initial price vector, p^1 is the new price vector and $E(u^*, p^y)$ (y=0,1) is

$$E(u^*, p^y) = e^{\ln a(p^y) + b(p^y)\left\{\frac{1}{\ln u^*} - \lambda(p^y)\right\}^{-1}}$$

and where $\ln u^*$ can be calculated using the indirect utility function at the pre-reform prices.

J.3 Methodology for this study and the particular case studies

We now explain the particular issues involved in implementing the demand models and modelling tax reforms in this study, including details on the datasets used and the goods categories considered in each country.

First, whilst the surveys underyling our microsimulation and demand models contain expenditure for very detailed categories of goods and services, feasibility requires a relatively small number of goods categories in the demand system. This necessitates aggregating the disaggregated commodities into broader groups. Because the price changes that the demand system will be used to simulate relate to changes in VAT rates only, these broad groups are defined so that, in as far as is practical, they correspond to

goods categories subject to different VAT rates, whilst at the same time, contain goods and services of a similar nature.

We must also calculate prices for these broad groups based on the prices and expenditure shares of the component goods and services that make up the group. In principle there are two main ways to do this. The first is to use an arithmetic average which implies that there is no substitution between goods within a broad group when the relative price of goods within the group changes. The second is to use a geometric average which implies that expenditure shares within groups remain constant following relative price changes, implying an own-price elasticity of -1 for each good in each group, and zero cross-price elasticities between goods within groups. Using an arithmetic average has the benefit that if no between-group substitution is found, an assumption of no within-group substitution means results will be consistent with no behavioural response. On the other hand, if we find there is substitution between groups it seems implausible to assume that substitution would not occur within groups (which are made up of fairly similar goods and services), suggesting a geometric average may be better. We think consistency on this point is important and in the final report the demand systems used in each case study will use the same form of price index to calculate prices for commodity groups.

A second issue relates to the source of price variation required to estimate the impact of relative prices on commodity demands. Ideally we would make use of as much price variation as possible: both over time and across households within a given time period. However, we do not observe prices at the household level. This means, where we have expenditure data covering long time periods we use changes in relative prices over time as our source of variation. However, in some instances the expenditure data used for estimation does not cover a long enough period of time to rely on this variation alone. Instead rather than calculating the price of a commodity group using population-average within-group expenditure shares of each of the detailed categories of goods or services making up a particular group, we make use of household level differences in the within-group expenditure shares. This means differences in the composition of a group across households is used to proxy differences in the prices of different commodity groups across households. A key drawback of this approach is that it may conflate quality variation (for instance if one household consumes fillet steak whilst another consumes mince beef) with price variation. However, where our survey data covers only a short time period, this problem is unavoidable.

Our demand systems are estimated using prices that are contemporaneous with the survey data used. However, our simulations are conducted on the basis of total expenditure and relative prices (and VAT rates) as of January 2011. The estimated demand systems will imply that the changes in relative prices since the survey year will have resulted in changes in spending patterns. These predicted spending patterns will likely differ from the spending patterns obtained by the uprating procedures used in the static no-behavioural-response analysis (see Annex H). This, together with the fact that the static analysis is based on actual as opposed to predicted expenditure patterns, means that the VAT payments calculated in the static analysis will not provide bounds to the welfare costs of VAT calculated using the demand system.

We now present some details of the models that shall be estimated in each of the case studies.

- Belgium

André Decoster and Dirk Verwerft at KU Leuven maintain the QUAIDS model used for Belgium. It is estimated using data from 1979-79 to 2005 and includes 9 categories of goods and services.[233] Prices for these goods are calculated as arithmetic weighted averages of the prices of the goods making up the categories, where the weights are aggregate weights from the Belgian consumper price index.

Because the survey enquires about spending on items in the previous month only, and many items are purchased less frequently than monthly (e.g. clothing, durable goods, medical products), expenditures are imputed for a number of goods that are infrequently purchased. These goods are determined by comparing the fraction of households purchasing a good in recent surveys with the fraction purchasing observed purchasing in the 1978-79 survey where households expenditure was recorded for a full year. The goods thus adjusted were clothing, restaurants and hotels and durable goods. Expenditure on these goods was imputed by estimating the liklihood of each household being observed to purchase the good that month (using a Probit regression), and then multiplying this by an estimate of how much that household would have purchased that month if it had been observed purchasing a positive amount (using a Tobit regression originally estimate on those purchasing a positive amount only). Such imputation is

[233] Food, alcohol and tobacco, clothing, household non-durables, transport, recreation, restaurants, other non-durables, and durable goods.

necessary because of the very many zero observed expenditures for certain categories in the one-month data, and the difficulties such zero expenditures pose for estimation.

Table J.1 shows the estimated income elasticities, and table J.2 shows the estimated compensated price elasticities.

- France

Nicolas Ruiz (IDEP, University of Marseilles) and Alain Trannoy (EHESS and IDEP, University of Marseilles) have estimated a simplified set of demand equations that are based on the QUAIDS model. Unlike the full QUAIDS model, estimation difficulties have meant that cross-price effects have had to be omitted: in other words, demand for a particular good is assumed to depend on the price of that good only and not on the prices of other goods. This means the equation for the share of good i is:

$$\mathbf{w_i} = \boldsymbol{\alpha_i} + \boldsymbol{\gamma_i} \ln(\boldsymbol{p_i}) + \boldsymbol{\beta_i} \ln\left(\frac{\boldsymbol{x}}{\boldsymbol{p'}}\right) + \boldsymbol{\lambda_i} \left(\ln\left(\frac{\boldsymbol{x}}{\boldsymbol{p'}}\right)\right)^2$$

where:

$$\boldsymbol{p'} = \prod_i^n p_i^{w_i}$$

Satisfaction of homogeneity and additivity would require that $\boldsymbol{\gamma_i} = 0$ but this is not imposed. Hence, the model is not integrable and it is not possible to conduct fully theoretically consistent analysis of the welfare effects of tax reforms. However, it is possible to calculate an approximate measure that makes use of the own-price elasticities of demand. Banks et al (1996) provides details on this procedure.

The model includes eight categories of goods and services.[234] This relatively coarse categorisation means that some categories contain products taxed at different rates. Where this is the case, the tax rate applied to a category is the VAT rate that is most common for that category. Prices for these categories are constructed using cross-sectional variation in the within-category shares for each of the sub-goods making up a category. For instance, the price of food for a particular household varies according to the type of food the household is buying.

[234] Food, restaurants, tobacco and alcohol, clothing, housing and energy, motorcars and transport, leisure, and miscellaneous.

Table J.3 shows the estimated income elasticities, and table J.4 shows the estimated compensated price elasticities.

- Germany

DIW maintains the QUAIDS model used for Germany. The source of expenditure and demographic data is the 2000 to 2007 waves of the laufende Wirtschaftsrechnungen (LWR). Micro data from the LWR have been provided by the Research Data Centre of the Statistical Offices of the Laender (Forschungsdatenzentrum der Statistischen Landesaemter).

Expenditure is aggregated to 7 broad categories[235] for the purposes of modelling. This relatively coarse categorisation means that some categories contain products taxed at different rates. Where this is the case, the tax rate applied to a category is the weighted average of the tax rates applying to the goods making up the category. Prices for the categories are constructed using cross-sectional variation in the within-category shares for each of the sub-goods making up a category. For instance, the price of food for a particular household varies according to the type of food the household is buying.

Durable goods, housing, maintenance and repairs, and financial services are not included in the demand model. Changes to the VAT treatment of these goods are simulated holding quantities fixed, with the changes in VAT payments added to the revenue and welfare effects estimated for those goods included in the demand system.
Table J.5 shows the estimated income elasticities, and table J.6 shows the estimated compensated price elasticities.

- Spain

The Spanish Institute for Fiscal Studies (IEF) maintain the QUAIDS model that is used for Spain. It is estimated using data from 1985 to 2004 from the Encuesta Continua de Presupuestos Familiares (ECPF) and includes 15 categories of non-durable goods and services,[236] plus an aggregated category of durable goods.

[235] Food, restaurants and alcohol, services, transport, energy, leisure or entertainment (inc. tobacco), and health.

[236] Food and non-alcoholic drinks, alcoholic beverages, tobacco, clothing and footwear, housing expenses (excluding fuel), household non-durable goods and services, fuel for housing, petrol, private transport services, public transport, communications, leisure (including holidays), education products and services, health products and services, other non-durable goods and services.

In order to make estimation feasible, the cross-price elasticities of demand for durable goods with respect to the prices of non-durable commodities are assumed to be the same for all non-durable commodities. This is implemented by estimating in a single equation for durables which includes as a regressor the price of an aggregated category with all non-durable commodities.

Table J.7 shows the estimated income elasticities, and table J.8 shows the estimated compensated price elasticities.

- United Kingdom

IFS has developed a QUAIDS demand system estimated using Living Costs and Food Survey (LCFS), Expenditure and Food Survey (EFS) and Family Expenditure Survey (FES) data covering the period 1978 – 2009. Data from the LCFS, EFS and FES are produced by the Office for National Statistics and are Crown Copyright. They are reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

The household surveys are used for expenditures and demographics, whilst prices are obtained using national time-series data. 8 categories of expenditure are considered[237] and while effort has been made to ensure that these correspond closely to goods that are subject to standard rate VAT and goods that are subject to reduced or zero rates, it is not always possible to do this exactly.

Table J.9 shows the estimated income elasticities, and table J.10 shows the estimated compensated price elasticities.

References

Banks, J., R. Blundell and A. Lewbel (1997), "Quadratic Engel curves, welfare measurement and consumer demand", *Review of Economics and Statistics,* 79(4), 527-539

[237] Zero-rated food, other food (inc restaurants) and alcohol, leisure (inc tobacco), domestic fuel, household goods and services, personal goods and services, private transport, and other zero rated products (books, public transport and childrens clothing)

Table J.1 Income Elasticities of Demand for Belgium

Commodity	Income Elasticity
(1) Food	0.61
(2) Alcohol and tobacco	0.71
(3) Clothing	1.25
(4) Household non-durables	0.54
(5) Transport	1.49
(6) Recreation	0.89
(7) Restaurants	1.48
(8) Other non-durables	1.00
(9) Durable goods	2.38

Table J.2 Compensated (Hicksian) Price Elasticities of Demand for Belgium

Commodity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	**-0.23**	0.41	-0.01	-0.02	-0.12	-0.21	0.76	0.03	-0.03
(2)	1.92	**-2.08**	-0.88	3.13	1.58	3.64	-1.87	0.41	-7.59
(3)	0.19	-0.52	**-3.12**	-3.58	-6.29	-0.86	2.79	6.31	6.11
(4)	-0.08	0.56	-1.03	**-1.16**	-0.24	0.59	0.23	-0.72	1.55
(5)	-0.30	0.57	-4.38	-0.76	**-0.22**	-1.48	-0.63	1.58	1.94
(6)	-0.39	1.04	-0.43	1.01	-0.98	**-0.21**	-0.71	-0.84	1.69
(7)	1.70	-0.76	1.85	0.64	-0.66	-0.96	**-0.40**	0.52	-2.16
(8)	0.08	0.08	2.01	-0.79	0.69	-0.55	0.23	**-0.44**	-0.51
(9)	0.10	-3.82	5.22	4.67	2.12	2.76	-2.62	-1.17	**-5.70**

Table J.3 Income Elasticities of Demand for France

Commodity	Income Elasticity
(1) Food	0.51
(2) Restaurants	0.72
(3) Alcohol and tobacco	0.22
(4) Clothing	0.35
(5) Housing, energy and furniture	0.84
(6) Cars and transport	0.99
(7) Leisure	1.38
(8) Other	1.11

Table J.4 Compensated (Hicksian) Price Elasticities of Demand for France

Commodity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	**-0.74**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(2)	0.00	**-0.60**	0.00	0.00	0.00	0.00	0.00	0.00
(3)	0.00	0.00	**-0.50**	0.00	0.00	0.00	0.00	0.00
(4)	0.00	0.00	0.00	**-0.32**	0.00	0.00	0.00	0.00
(5)	0.00	0.00	0.00	0.00	**-0.44**	0.00	0.00	0.00
(6)	0.00	0.00	0.00	0.00	0.00	**-0.76**	0.00	0.00
(7)	0.00	0.00	0.00	0.00	0.00	0.00	**-1.20**	0.00
(8)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**-1.00**

Table J.5 Income Elasticities of Demand for Germany

Commodity	Income Elasticity
(1) Food	0.56
(2) Services	0.80
(3) Health	2.25
(4) Transport	1.13
(5) Energy	0.61
(6) Leisure (inc. tobacco)	1.34
(7) Restaurants and alcohol	1.29

Table J.6 Compensated (Hicksian) Price Elasticities of Demand for Germany

Commodity	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	**-0.43**	0.01	-0.01	-0.01	-0.18	0.40	0.21
(2)	0.06	**-1.42**	-0.02	0.13	0.18	0.13	0.94
(3)	0.11	0.02	**-0.61**	-0.07	0.26	0.29	0.01
(4)	-0.06	0.07	0.02	**-0.41**	0.34	0.43	-0.39
(5)	-0.33	0.14	0.07	0.52	**-1.10**	-0.24	0.93
(6)	0.75	0.10	0.19	0.58	-0.21	**-1.68**	0.27
(7)	0.49	0.92	0.07	-0.72	1.15	0.38	**-2.28**

Table J.7 Income Elasticities of Demand for Spain

Commodity	Income Elasticity
(1) Food and non-alc. drinks	0.76
(2) Alcohol	1.10
(3) Tobacco	0.65
(4) Clothing	0.90
(5) Household expenses	1.70
(6) Household non-durables	2.12
(7) Domestic energy	1.05
(8) Petrol	2.22
(9) Other private transport costs	0.67
(10) Public transport	1.75
(11) Communications	1.38
(12) Leisure (inc. holidays)	0.99
(13) Education	2.55
(14) Health	0.89
(15) Other non-durables	2.65
(16) Durable goods	1.02

Table J.8 Compensated (Hicksian) Price Elasticities of Demand for Spain

Commodity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)	**-0.92**	-0.02	0.02	0.00	-0.17	0.07	-0.16	-0.01	0.05	0.1	0.01	-0.01	0.41	-0.09	-0.09	-0.11
(2)	-0.43	**-1.48**	0.19	-0.09	4.03	0.63	1.00	-4.37	-0.07	-0.41	0.82	0.12	0.98	2.46	-4.54	2.79
(3)	0.15	0.08	**-0.77**	0.05	-1.01	0.35	-0.01	0.6	0.03	-0.27	0.21	-0.11	-0.42	0.02	-0.13	0.59
(4)	0.25	-0.53	0.74	**-1.99**	-3.58	-0.76	-0.99	-0.62	0.58	2.72	-2.1	0.16	7.5	2.02	-3.99	-1.15
(5)	-0.16	0.21	-0.12	-0.03	**-2.08**	-0.39	-0.01	0.27	0.15	-0.26	-0.13	0.06	0.38	0.26	0.39	0.09
(6)	0.14	0.09	0.02	-0.02	-0.16	**-2.88**	0.11	-0.28	-0.56	-1.11	-0.54	0.45	0.76	-0.19	0.43	0.11
(7)	-1.12	-0.38	-0.01	-0.07	-0.1	0.19	**-1.05**	-1.66	0.26	0.39	-0.17	-0.06	2,00	-0.01	-0.25	1.24
(8)	-0.11	-2.31	0.76	-0.06	2.76	-0.03	-2.3	**-0.86**	0.31	3.93	1.15	-0.45	1.45	0.3	-0.82	-4.72
(9)	0.29	-0.02	0.02	0.03	0.81	-0.23	0.19	0.17	**-0.92**	0.31	-0.02	-0.07	-0.06	0.19	-0.36	-0.41
(10)	0.58	-0.13	-0.2	0.15	-1.62	-0.13	0.32	2.32	0.1	**-1.56**	0.53	-0.09	-2.33	-0.88	1.64	0.15
(11)	0.21	0.67	0.4	-0.3	-2.01	-0.67	-0.37	1.76	-0.01	1.38	**-0.22**	-0.51	-1.74	-1.81	0.2	-2.25
(12)	-0.18	0.09	-0.19	0.02	0.81	0.25	-0.1	-0.62	-0.03	-0.21	-0.46	**-1.07**	0.64	0.1	-0.04	0.29
(13)	0.95	0.12	-0.13	0.17	0.93	0.28	0.66	0.34	-0.13	-0.93	-0.27	0.11	**-3.99**	-1.42	0.76	1.03
(14)	-0.77	1.07	0.02	0.16	2.25	-0.09	-0.01	0.24	0.13	-1.23	-0.97	0.06	-4.95	**-0.49**	0.36	1.26
(15)	-0.51	-1.29	-0.09	-0.2	2.13	0.76	-0.19	-0.44	-0.35	1.48	0.07	-0.02	3.32	0.49	**-4.3**	-1.1
(16)	-0.19	0.26	0.13	-0.02	0.17	0.08	0.3	-0.83	-0.41	0.05	-0.26	0.04	0.77	0.15	-1.36	**-0.8**

Table J.9 Income Elasticities of Demand for the United Kingdom

Commodity	Income Elasticity
(1) Zero-rated food and drink	0.25
(2) Standard-rated food and drink, restaurants, takeaways and alcohol	1.15
(3) Leisure goods (inc. tobacco), and services (inc. hotels)	1.36
(4) Domestic energy	0.17
(5) Household goods and services	1.15
(6) Personal goods and services (inc. adult clothing)	1.20
(7) Private transport goods and services	1.02
(8) Other zero rated goods (children's clothing, public transport, books, etc)	1.28

Table J.10 Compensated (Hicksian) Price Elasticities of Demand for the United Kingdom

Commodity	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	**-0.11**	-0.57	0.21	0.14	0.45	0.16	0.07	-0.35
(2)	-0.55	**-0.72**	0.15	0.03	0.83	0.22	-0.27	0.31
(3)	0.14	0.10	**-0.50**	0.05	-0.52	0.29	0.38	0.05
(4)	0.30	0.06	0.17	**-0.16**	-0.47	0.00	-0.07	0.18
(5)	0.56	1.07	-0.96	-0.28	**-1.31**	0.48	0.18	0.27
(6)	0.13	0.19	0.36	0.00	0.32	**-0.79**	-0.25	0.05
(7)	0.07	-0.27	0.53	-0.03	0.14	-0.28	**-0.02**	-0.14
(8)	-1.48	1.35	0.33	0.37	0.92	0.25	-0.63	**-1.11**

Table J.11 Change in welfare across the household types following abolition of VAT (Euros per week, % of spending)

Household Type	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
1 Ad, 0 Ch, W	61.94	11.57%	32.20	8.58%	35.56	8.08%
1 Ad, 0 Ch, NW	42.26	10.97%	16.90	7.56%	16.14	5.71%
1 Ad, ≥1 Ch, W	68.18	11.36%	38.00	8.76%	41.22	8.34%
1 Ad, ≥1 Ch, NW	44.33	10.99%	22.70	7.72%	27.51	7.48%
>1 Ad, 0 Ch, NW	69.95	11.19%	36.00	8.56%	37.46	7.46%
>1 Ad, 0 Ch, 1 W	85.13	11.42%	49.30	8.87%	60.44	9.43%
>1 Ad, 0 Ch, >1 W	107.22	11.75%	62.80	9.11%	75.65	9.69%
>1 Ad, 1 Ch, NW	46.18	10.59%	27.30	8.19%	41.79	8.60%
>1 Ad, 1 Ch, 1 W	95.09	11.64%	50.50	8.61%	60.14	8.75%
>1 Ad, 1 Ch, >1 W	115.06	11.80%	63.20	9.06%	76.80	9.24%
>1 Ad, >1 Ch, NW	58.32	10.84%	37.40	8.36%	31.88	7.40%
>1 Ad, >1 Ch, 1 W	106.94	11.64%	65.00	8.95%	59.34	8.42%
>1 Ad, >1 Ch, >1 W	131.77	12.03%	70.50	9.26%	78.71	9.03%
1 Ad, aged 60	45.90	10.57%	23.30	7.50%	22.84	7.12%
>1 Ad, all aged ≥ 60	75.01	11.03%	46.20	8.38%	49.73	8.81%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Table J.12 Change in welfare across the household types following the abolition of zero and reduced rates of VAT (Euros per week, % of spending)

Household Type	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK (5)	
	Cash	%	Cash	%	Cash	%
1 Ad, 0 Ch, W	-8.49	-1.59%	-3.60	-0.95%	-10.05	-2.28%
1 Ad, 0 Ch, NW	-7.37	-1.91%	-2.90	-1.29%	-7.06	-2.50%
1 Ad, ≥1 Ch, W	-12.08	-2.01%	-3.70	-0.85%	-17.06	-3.45%
1 Ad, ≥1 Ch, NW	-8.78	-2.18%	-4.00	-1.34%	-11.20	-3.05%
>1 Ad, 0 Ch, NW	-13.85	-2.22%	-3.90	-0.94%	-13.91	-2.77%
>1 Ad, 0 Ch, 1 W	-16.24	-2.18%	-4.40	-0.79%	-16.95	-2.64%
>1 Ad, 0 Ch, >1 W	-18.77	-2.06%	-4.40	-0.63%	-18.46	-2.36%
>1 Ad, 1 Ch, NW	-11.87	-2.72%	-4.00	-1.20%	-17.05	-3.51%
>1 Ad, 1 Ch, 1 W	-18.07	-2.21%	-4.10	-0.70%	-17.77	-2.58%
>1 Ad, 1 Ch, >1 W	-19.01	-1.95%	-4.50	-0.64%	-24.00	-2.89%
>1 Ad, >1 Ch, NW	-16.67	-3.10%	-4.30	-0.95%	-19.24	-4.46%
>1 Ad, >1 Ch, 1 W	-20.59	-2.24%	-4.10	-0.57%	-24.14	-3.43%
>1 Ad, >1 Ch, >1 W	-22.41	-2.05%	-4.40	-0.58%	-28.73	-3.29%
1 Ad, aged 60	-9.35	-2.15%	-3.70	-1.19%	-9.39	-2.93%
>1 Ad, all aged ≥ 60	-15.21	-2.24%	-4.40	-0.79%	-15.40	-2.73%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Table J.13 Change in welfare across the household types following the revenue-neutral abolition of zero and reduced rates of VAT (Euros per week, % of spending)

Household Type	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
1 Ad, 0 Ch, W	2.87	0.54%	1.90	0.51%	1.47	0.33%
1 Ad, 0 Ch, NW	0.68	0.18%	0.10	0.06%	-1.21	-0.43%
1 Ad, ≥1 Ch, W	0.83	0.14%	2.70	0.62%	-2.35	-0.48%
1 Ad, ≥1 Ch, NW	-0.18	-0.04%	0.10	0.05%	-1.43	-0.39%
>1 Ad, 0 Ch, NW	-0.39	-0.06%	2.20	0.51%	-0.94	-0.19%
>1 Ad, 0 Ch, 1 W	-0.01	-0.00%	3.80	0.69%	2.58	0.40%
>1 Ad, 0 Ch, >1 W	1.32	0.14%	5.90	0.85%	5.30	0.68%
>1 Ad, 1 Ch, NW	-2.49	-0.57%	0.80	0.25%	-2.20	-0.45%
>1 Ad, 1 Ch, 1 W	-0.01	-0.00%	4.20	0.72%	1.90	0.28%
>1 Ad, 1 Ch, >1 W	2.35	0.24%	5.90	0.84%	1.44	0.17%
>1 Ad, >1 Ch, NW	-4.63	-0.86%	2.10	0.47%	-6.34	-1.47%
>1 Ad, >1 Ch, 1 W	-0.27	-0.03%	6.40	0.88%	-3.07	-0.44%
>1 Ad, >1 Ch, >1 W	2.10	0.19%	7.00	0.92%	-1.61	-0.18%
1 Ad, aged 60	-0.39	-0.09%	0.40	0.14%	-1.26	-0.39%
>1 Ad, all aged ≥ 60	-0.72	-0.11%	3.40	0.61%	1.04	0.18%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Table J.14 Change in welfare across the income distribution following an increase in the standard rate of VAT of 1 ppt (Euros per week, % of spending)

Income Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	-1.58	-0.43%	-0.80	-0.36%	-1.68	-0.41%
2	-1.97	-0.43%	-1.20	-0.41%	-1.69	-0.41%
3	-2.60	-0.45%	-1.40	-0.41%	-1.61	-0.39%
4	-2.75	-0.45%	-1.70	-0.43%	-1.81	-0.40%
5	-3.03	-0.46%	-2.00	-0.45%	-2.13	-0.41%
6	-3.47	-0.46%	-2.20	-0.44%	-2.33	-0.42%
7	-3.82	-0.47%	-2.60	-0.46%	-2.39	-0.41%
8	-4.46	-0.49%	-2.70	-0.45%	-2.97	-0.44%
9	-4.49	-0.49%	-3.20	-0.46%	-3.64	-0.45%
Richest	-5.70	-0.51%	-4.30	-0.48%	-5.16	-0.45%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Table J.15 Change in welfare across the expenditure distribution following an increase in the standard rate of VAT of 1 ppt (Euros per week, % of spending)

Expenditure Decile Group	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
Poorest	-1.12	-0.39%	-0.60	-0.33%	-0.63	-0.28%
2	-1.53	-0.40%	-1.00	-0.38%	-1.00	-0.32%
3	-1.94	-0.41%	-1.30	-0.41%	-1.30	-0.35%
4	-2.27	-0.43%	-1.50	-0.42%	-1.50	-0.37%
5	-2.62	-0.43%	-1.80	-0.44%	-1.83	-0.39%
6	-3.08	-0.44%	-2.00	-0.43%	-2.17	-0.40%
7	-3.47	-0.45%	-2.30	-0.45%	-2.64	-0.43%
8	-4.00	-0.46%	-2.70	-0.46%	-3.13	-0.44%
9	-4.85	-0.48%	-3.20	-0.47%	-4.26	-0.47%
Richest	-8.28	-0.52%	-5.50	-0.49%	-6.96	-0.50%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.

Sources: See sources of table 9.10.

Table J.16 Change in welfare across the household types following an increase in the standard rate of VAT of 1 ppt (Euros per week, % of spending)

Household Type	Average Change in Household Welfare					
	Belgium (1)		Germany (3)		UK(5)	
	Cash	%	Cash	%	Cash	%
1 Ad, 0 Ch, W	-2.52	-0.47%	-1.70	-0.44%	-1.72	-0.39%
1 Ad, 0 Ch, NW	-1.68	-0.44%	-0.80	-0.38%	-0.76	-0.27%
1 Ad, ≥1 Ch, W	-2.73	-0.45%	-2.00	-0.46%	-1.98	-0.40%
1 Ad, ≥1 Ch, NW	-1.75	-0.43%	-1.10	-0.39%	-1.31	-0.36%
>1 Ad, 0 Ch, NW	-2.77	-0.44%	-1.90	-0.44%	-1.80	-0.36%
>1 Ad, 0 Ch, 1 W	-3.39	-0.45%	-2.60	-0.47%	-2.94	-0.46%
>1 Ad, 0 Ch, >1 W	-4.33	-0.47%	-3.30	-0.48%	-3.70	-0.47%
>1 Ad, 1 Ch, NW	-1.77	-0.41%	-1.40	-0.42%	-2.00	-0.41%
>1 Ad, 1 Ch, 1 W	-3.81	-0.47%	-2.70	-0.45%	-2.92	-0.43%
>1 Ad, 1 Ch, >1 W	-4.68	-0.48%	-3.40	-0.48%	-3.74	-0.45%
>1 Ad, >1 Ch, NW	-2.23	-0.41%	-1.90	-0.43%	-1.50	-0.35%
>1 Ad, >1 Ch, 1 W	-4.30	-0.47%	-3.40	-0.47%	-2.86	-0.41%
>1 Ad, >1 Ch, >1 W	-5.37	-0.49%	-3.70	-0.49%	-3.82	-0.44%
1 Ad, aged 60	-1.80	-0.41%	-1.20	-0.38%	-1.08	-0.34%
>1 Ad, all aged ≥ 60	-2.96	-0.44%	-2.40	-0.44%	-2.40	-0.42%

Notes: Exchange rate of 0.886 British pounds to 1 Euro is assumed.
Sources: See sources of table 9.10.

Annex K. A model of VAT and wealth

There is a representative firm that employs business capital, *k*, and labour, *n*, to produce output goods, *y*. The production function *f* is of the Cobb-Douglas form: $f(k,n) = k^{\alpha} n^{1-\alpha}$. The output good can be costlessly converted into consumption goods, housing capital, and business capital. We normalise the price of the output good to one. The fixed international interest rate is denoted by $\bar{r}$. The domestic interest and wage rates in period *t*, denoted by r_t and w_t, are determined as the marginal productivities of capital and labour, respectively:

$$r_t = \alpha k_t^{\alpha-1} n_t^{\alpha} - \delta \quad (0.4)$$

$$w_t = (1-\alpha) k^{\alpha} n^{-\alpha} \quad (0.5)$$

Business capital is assumed to be internationally mobile so that the after-tax return to capital equals the international interest rate:

$$(1-\tau_t^a)(\alpha k_t^{\alpha-1} n_t^{\alpha} - \delta) = \bar{r} \quad (0.6)$$

where τ^a denotes the capital tax rate. Hence, the domestic interest rate satisfies $(1-\tau_t^a) r_t = \bar{r}$.

There are *I* types of households. The mass of households of type *i* is denoted by m_i. Each period, households are endowed with one unit of time. They derive utility from consumption goods, *c*, housing capital, *h*, and leisure, *l*. The periodic utility is determined as *u(c,h,l)*, where *u* is a standard utility function. The discount factor is denoted by β.

The problem of a household of type *i* in period 1 reads as:

$$\max_{\{c_{it}, h_{it+1}, a_{it+1}, l_{it}\}_{t=1}^{\infty}} \sum_{t=1}^{\infty} \beta^{t-1} u(c_{it}, h_{it}, l_{it})$$

s.t.

$$\sum_{t=1}^{\infty} p_t \left[(1+\tau_t^c) c_{it} + a_{it+1} + (1+\tau_t^h)(h_{it+1} - (1-\delta^h) h_{it}) - (1-\tau_t^n) \varepsilon_i w_t (1-l_t) - (1+(1-\tau_t^a) r_t) a_{it} \right] \le 0 \quad (0.7)$$

The budget constraint is written here directly in its present value form. This present value budget constraint can be derived from periodic budget constraints and a transversality condition.

The housing tax is assumed to apply to gross housing investment. An equivalent interpretation is that the housing tax increases the market price of housing. Most EU countries tax residential housing construction at the standard VAT rate. In the model this corresponds to the case where $\tau_t^h = \tau_t^c$. The (UK) case where residential housing construction is zero-rated corresponds to the case where $\tau_t^h = 0.$ The tax system does not include a tax on the imputed rent. This is also the case in almost all EU countries. Since the tax rate on interest income does not depend on whether financial assets are positive or negative, the model implicitly assumes that mortgage interests are tax deductible. This is the case in the Finnish tax system.

The household first-order conditions for consumption, housing, and labour supply can be written as:

$$\begin{aligned}
&u_{c_{it}}(1-\tau_t^n)\varepsilon_i w_t - u_{l_t}(1+\tau_t^c) = 0 \\
&\frac{u_{c_{it}}}{(1+\tau_t^c)} - \frac{\beta u_{c_{it+1}}}{(1+\tau_{t+1}^c)}(1+(1-\tau_{t+1}^a)r_{t+1}) = 0 \\
&\beta u_{h_{it+1}} - \frac{u_{c_{it}}(1+\tau_t^h)}{(1+\tau_t^c)} + \beta u_{c_{it+1}}(1-\delta^h)\frac{(1+\tau_{t+1}^h)}{(1+\tau_{t+1}^c)} = 0
\end{aligned} \qquad (0.8)$$

where δ^h denotes depreciation rate of housing capital.

The first-order condition for savings implies:

$$p_{t+1} = \frac{p_t}{1+(1-\tau_{t+1}^a)r_{t+1}} \qquad (0.9)$$

The government finances each period amount g of public expenditures. It faces the following intertemporal budget constraint:

$$\sum_{t=1}^{\infty} p_t \left\{ \tau_t^n w_t n_t + \tau_t^a r_t a_t + \tau_t^c c_t + \tau_t^h (h_{t+1} - (1-\delta^h)h_t) - g \right\} \geq 0 \qquad (0.10)$$

where $n_t, c_t, h_t,$ and a_t denote aggregate effective labour, consumption, housing capital, and financial savings in period *t*.

The open economy assumption means that the after-tax interest rate is constant and that the economy adjusts immediately to a new steady state.

We will consider different tax reforms. Formally, the government announces a tax system $\left\{\tau_t^c, \tau_t^n, \tau_t^h, \tau_t^a\right\}_{t=1}^{\infty}$ in the beginning of period 1. Of course, the tax system must satisfy the intertemporal budget constraint above.

For a given budget-feasible tax system, and for given initial asset holdings $\{a_{i1}, h_{i1}\}_{i=1}^{I}$, the equilibrium consists of prices $\{w_t, r_t, p_t\}$ and allocation $\{a_{it+1}, h_{it+1}, c_{it}, l_{it}\}_{t=1}^{\infty}$ such that

i) prices are determined by (0.4), (0.5), (0.6) and (0.8).

ii) the allocation solves the household problem for all *i=1,2,..,I*;

iii) the government budget constraint is satisfied;

iv) aggregates are determined as:

$$a_t = \sum_i m_i a_{it},\ \mathrm{n}_t = \sum_i m_i \varepsilon_i (1 - l_{it}),\ c_t = \sum_i m_i c_{it},\ h_t = \sum_i m_i h_{it} \qquad (0.11)$$

Calibration

We consider the following standard utility function

$$u(c,h,l) = \alpha_c \log(c) + \alpha_h \log(h) + (1 - \alpha_c - \alpha_h)\log(l) \qquad (0.12)$$

This utility function implies constant non-housing consumption and housing expenditure shares that are determined by parameters α_c and α_h.

The model period corresponds to one year. We set the international interest rate at $\bar{r} = 0.06$. For the model to have a steady state, the discount factor must be set at

$\beta = 1/(1+\bar{r})$ We set the capital share at $\alpha = 0.30$. In addition, we set the depreciation rate of business capital at $\delta_k = 0.10$ and the depreciation rate of housing capital at $\delta_h = 0.05$.

The initial, or status quo, tax system is as follows: $\tau^c = 0.23,\ \tau^h = 0.23,\ \tau^n = 0.22,\ \tau^a = 0.28$. This is based on the following observations. First, the general VAT rate in Finland is currently 23%. Certain goods and services (e.g. food and restaurant meals) are taxed at a lower rate while some are exempted from VAT. On the other hand, specific goods and services are subject to excise taxes in addition to VAT. As a result, the average consumption tax rate should be rather close to the general VAT rate. Second, residential construction is taxed with the general VAT rate. Third, Finland has a dual tax system where labour and capital incomes are taxed separately at the individual level. The average tax rate on earnings is about 22%. This measure does not include contributions to the mandatory earnings-related pensions *n*

10 Assessing existing rate structures (IFS)

This chapter contributes towards answers to the following evaluation question in the project Terms of Reference:

(11) To what extent does the current diversification of the VAT rates, including the reduced VAT rates, continue to be relevant as compared with the needs they aimed to satisfy? Do the original motives for their introduction still justify their application?

It also addresses the following specific elements:

(F) Analysis in the more general context of the welfare and equity impacts of the VAT system. In particular, a number of derogations applied by the member states have been introduced for reasons of social justice (i.e. redistribution of income) or for historical reasons (grandfathering clauses). A question to be answered in this context is whether the redistribution effect has been achieved, if any, by applying specific elements of the VAT system. Also, the share of the exempt, zero, reduced and standard rate in the total theoretical tax revenue should be estimated.

(G) Evaluation of the welfare impact of the multiple-rate VAT system. In particular, the evaluation should examine the economic effect of the adjustments in the VAT rates on real relative price changes.

Summary

In this chapter of the report we assess whether zero and reduced rates of VAT are a good way for the Government to meet policy objects such as redistribution and the promotion of certain goods and services. We argue that:

- Zero and reduced rates of VAT are generally somewhat progressive. But while poor households are the biggest gainers from reduced rates on items such as food in

proportional terms, richer households gain considerably more in absolute (cash) terms.

- VAT rate differentiation is not a very efficient tool for redistributing to poor households, since the allocation of expenditure between different goods and services is a poor proxy for living standards. What matters is how redistributive the tax system as a whole is rather than any one aspect such as VAT. Other instruments such as direct taxes and transfers can likely be better targeted to redistribute to poorer households and would avoid distorting households' spending patterns.
- There may be some justification for zero or reduced rates of VAT on goods or services that are complementary to work or are substitutes for do-it-yourself home production (DIY). This would offset the distortions to behaviour caused by taxation more generally, which tend to discourage working and encourage DIY. Reduced rates of VAT on certain labour-intensive services such as minor repairs, renovations, and cleaning, and on things like childcare may be justifiable on such grounds, although the overlap between items that are complementary to work and those items to which member states are allowed to apply reduced VAT rates under the rubric of 'labour-intensive services' is far from complete.
- Demonstrating that the application of a reduced rate of VAT encourages an increase in the overall consumption of a good deemed socially desirable is not sufficient evidence that such a policy is a good idea. VAT rate differentiation encourages and discourages certain activities in quite a particular way, and other mechanisms such as specific subsidies may allow better targeting of the underlying problem. For instance, reduced rates of VAT are worth more when the price of a good is higher and it is often not the case that the social benefit of consuming the good rises in line with the price. In addition, because businesses can reclaim VAT paid on inputs, reduced rates of VAT will not encourage businesses to use more of a particular good or service even if doing so would be socially beneficial (e.g. reducing pollution).
- Zero and reduced rates of VAT involve significant administrative and compliance costs, not least the creation of problematic boundaries between goods subject to different rates. This can lead to legal disagreements, fraud and potentially changes in product characteristics made only to reduce tax liabilities.

10.1 Introduction

The current VAT rate structure, with multiple reduced rates, is not accidental. Instead, it reflects a belief by policy-makers that differentiated VAT rates can help improve the efficiency of the economy, and help achieve distributional objectives and other wider

goals of Government relating to the environment, employment, health, and cultural and personal development.

In this chapter we discuss whether this belief is well placed or not, discussing the extent to which these goals are met through the existing set of reduced rates of VAT, and the costs of addressing these goals using the VAT system. As well as the distortions to consumer spending decisions (and the resultant welfare cost), we draw on the analysis in other sections to consider the impact on administration and compliance costs, and the functioning of the internal market. The rest of this section proceeds as follows. We first present the set of goods and services for which reduced rates are allowed across the EU, and the justifications generally given for the most significant of these reduced rates. Then, we discuss the usefulness of VAT rate differentiation as a tool for redistribution, drawing on the findings of chapter 9 and economic reasoning. Next we discuss the efficiency and merit goods cases for VAT rate differentiation in order to offset the distortions caused by other taxes, and to meet environmental, cultural and social objectives. Finally, we discuss the costs of VAT rate differentiation (which generally apply whatever the policy objective of the rate differentiation).

10.2 The scope of existing reduced rates of VAT

EU VAT law allows for reduced rates on the following items in all member states:[238]

(1) Foodstuffs (including non-alcoholic beverages) for humans and animals
(2) Supply of water
(3) Pharmaceutical products including contraception and sanitary products
(4) Medical equipment intended for treatment or alleviation of disability.
(5) Children's car seats
(6) Transport of passengers and accompanying luggage
(7) Books (in any physical form), and maps and charts, newspapers and periodicals supplied in hard-copy form and not substantially devoted to advertising
(8) Cultural events and facilities admission fees, excluding those supplied electronically
(9) Broadcasting, not supplied electronically

[238] This list covers those categories of expenditure included in Annex III of the EU VAT Directive (2006/112/EC), although a number of cateogies have been disaggregated. A number of countries have applied for special permissions for reduced, super-reduced or zero rates on certain categories not included above (or reductions to rates below those allowed more generally).

(10) Services provided by writers, composers and performing artists, not supplied electronically
(11) Provision, construction, renovation and alteration of social housing
(12) Supplies of services and non-capital goods to be used in agricultural production
(13) Provision of accommodation in hotels, guest-houses, caravan and camping sites, etc.
(14) Admission to sporting events and use of sporting facilities
(15) Supply of goods and services by charities (where not already exempted)
(16) Undertakers
(17) Medical and dental care (where not already exempted)
(18) Provision of street cleaning, refuse collection and waste treatment
(19) Minor repairing of bicycles, shoes, leather goods, clothing and household linen
(20) Renovation and repairing of private dwellings (excluding materials)
(21) Domestic cleaning and cleaning of windows in private households
(22) Domestic care services
(23) Hairdressing
(24) Restaurant services

In addition, a number of countries have permission to apply reduced or zero rates to other specific products. Detailed lists of the various VAT rates applicable to different goods and services for all EU member states can be found on the European Commission website.[239]

Nearly all countries in the EU and all countries studied in chapter nine have reduced or zero rates for medical equipment for disabled persons (4), and books, newspapers and periodicals (7). Most EU countries and all bar Hungary amongst those studied charge a reduced or zero rate of VAT on most foodstuffs (1), on water supplies (2) and on transport of passengers (6). Most EU countries and all those studied bar the UK charge a reduced rate on hotel accomodation (13). Other reduced and zero rate options are less frequently used.

Reduced and zero rates of VAT are defended on a number grounds. Perhaps the most important reason is a desire for equity. This mostly relates to redistribution from rich to

[239] Available at: http://ec.europa.eu/taxation_customs/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.pdf

poor households by applying reduced or zero rates to goods and services that make up a larger fraction of total expenditure for poorer households than for richer ones. Goods which the poor spend a larger fraction of their total budget on are called necessities by economists, and such goods are often seen as necessities (in the more general sense of the term) which households need to purchase to satisfy basic needs. Such concerns seem to be the main motivation for reduced rates for food (1), water (2), and social housing (11). A desire to not tax those who have additional basic needs seems to motivate the application of reduced rates to pharmaceutical goods (3), medical equipment (4), and medical and dental care (17). Fairness, more generally, may underlie the application of reduced or zero rates to undertaking (16) and charities (15).

A second argument is that some goods or services have merit (in production or consumption) not recognised by the individual making the purchasing decision. This may be due to benefits to wider society that the individual purchaser does not take into account ('externalities') or a belief that the individual purchaser does not have full information about or take full account of the benefits to themselves of consuming particular goods (what we may term 'internalities'). Reducing the price of such goods relative to others (on which the standard rate of VAT applies) would boost consumption of such goods and may therefore move consumption of such goods closer to the true social optimum. Goods may be seen as having intrinsic social or cultural value (books (7), cultural events (8), broadcasting (9), cultural services (10), sports admissions and facilities (14), the import and sale of art, and to some extent, restaurants (24)), to be beneficial to health and public health (pharmaceuticals (3), medical equipment (4), sporting facilities (14), medical and dental care (17)), or of environmental benefit.

A third set of arguments relates to the potential for reduced rates to aid economic efficiency by offsetting the distortions to economic activity caused by taxation more generally, and other government policies. For instance, taxation of earnings through income tax and social security contributions leads to people working less than they would in the absence of such taxes (because it is less worthwhile in terms of take-home pay). It also encourages people to produce more goods through home production like do-it-yourself home repairs (which are not taxed) rather than purchasing from the market from their (taxed) earnings. Reduced rates of VAT on goods which are complementary for work or which are substitutes for home production can offset these disincentive effects, increasing employment and reducing the amount of inefficient home production. Such reasoning may underlie reduced rates of VAT for labour-

intensive services such as minor repairs (19), renovations of dwellings (20), domestic cleaning (21), domestic care (22), hairdressing (23) and restaurant services (24).[240]

In the following sections we assess whether reduced rates of VAT are a sensible policy response to these distributional, efficiency and merit good concerns. In doing this, whilst we focus on the existing rate structure of VAT rather than potential reforms to VAT or other taxes, the existence of these alternative policies is a key factor in determining whether existing VAT rates are sensible.

10.3 Using reduced rates as a tool for redistribution?

Certain types of goods and services are essential for basic survival, the most obvious of which are food and drink. Spending on such necessities will make up a large fraction of the total spending of poor households but a smaller fraction of total spending for richer households who have satisfied their basic needs and can afford at least some luxury goods. The fact that spending patterns differ between poor and rich households offers governments the chance to redistribute spending power by taxing highly the goods bought disproportionately by richer households, and less highly those goods bought disproportionately by poor households. A desire for such redistribution underlies the reduced or zero rates of VAT on goods such as food, water, housing and domestic fuel and power.

In chapter 9 we quantitatively assessed the distributional impact of the existing VAT systems and zero and reduced rates for nine EU countries. We found that, in general, existing VAT systems are slightly progressive, with spending on VAT a smaller proportion of total spending for poorer households than richer ones in the vast majority of the countries included in the analysis. This reflects the fact that existing zero and reduced rates, taken together, reduce the proportion of spending taken up by VAT for poorer households more than for richer households. Applying reduced rates of VAT to goods that are a larger fraction of total spending for poorer households than richer ones (such as food) therefore does act to make VAT more progressive than it would be if charged at a uniform rate on all goods and services.

However, this does *not* provide sufficient justification for reduced rates on distributional grounds. What ultimately matters is not whether the VAT system operates

[240] Certain of these sectors – e.g.minor repairs (19), renovations (20) and cleaning (21) – may also be particularly prone to tax evasion.One reason for reduced rate of VAT for these sectors might therefore be reduce the incentive for tax evasion.

in a way that redistributes from rich to poor, but the extent to which the tax and benefit system as a whole redistributes from rich to poor. It is not feasible or desirable for each and every tax to try to satisfy all the different objectives of Government.

Using differentiated rates of VAT to reduce the impact of the tax on poorer households might conflict with other objectives the Government has. Lower rates of VAT on domestic energy, for instance, would almost certainly be redistributionary in any EU country, as poorer households generally spend a larger proportion of their budget on heating and powering their homes than richer households. However, it would also distort consumers' spending decisions, and by encouraging an increase in home energy consumption, may increase carbon emissions.

It is easy to see why changing spending patterns in such a way is likely to be undesirable. However, more generally, by distorting relative prices, zero and reduced rates of VAT distort consumer spending decisions. If the Government can adjust the rates and structures of the income tax, social security and benefits systems to redistribute between the rich and the poor, which do not distort spending patterns in the same way that VAT does, it is not necessary to use the VAT system for the purpose of redistribution. Instead, VAT could be designed to raise revenues in a way that does least damage to economic efficiency (or to meet other objectives).

Zero or reduced rates of VAT are not a particularly powerful way of redistribution in any case. As discussed above, the analysis of chapter 9 shows that zero and reduced rates lead to a larger proportional increase in the spending power of poorer households than that of richer households. However, chapter 9 also shows that the spending power of poorer households is increased by less in cash terms than that of richer households. This is because although the poor spend a higher fraction of their total budget on goods that are zero or reduced rated (such as food), they spend less on these goods than the rich in absolute cash terms.

The forgone revenue from zero and reduced rates of VAT, most of which would have come from richer households, can generally be used more effectively to increase the spending power of poorer households through direct tax and benefits measures. That is, rather than reducing VAT rates for certain necessities that are consumed disproportionately by the poor (or other particular groups of people the Government is concerned with), additional transfers using the direct tax and benefit system may allow better targeting of resources towards those for whom the costs of these goods and services would otherwise be prohibitive. For instance rather than employing a zero or

reduced rate on food to help the poor, income tax thresholds could be raised, and cash transfers to poor households increased. Each euro spent on redistribution in this way would allow bigger increases in the purchasing power of poorer households than if it were used to reduce the rate of VAT applicable to food, where much of the gains would accrue to richer households. So whilst reduced rates of VAT on goods such as food and domestic utilities are redistributionary, more powerful and appropriate tools for redistribution exist in the advanced economies of the EU. Previous research for the EU Commission (Copenhagen Economics (2007)), and by the IMF (Ebrill et al (2001)), and OECD (OECD (2010)) has also come to the same conclusion.

As well as redistribution between the rich and poor, often termed vertical equity, there are two further forms of equity that are worth considering: horizontal equity; and specific egalitarianism (Tobin (1970)).

Horizontal equity is the desire to tax similar people in similar ways (Mirrlees et al (2011)). Otherwise identical individuals (with, for instance, the same income and wealth) may differ in their preferences for different kinds of goods and services. When the rate of VAT varies across goods, some individuals are effectively rewarded for their preferences, whilst others are penalised for theirs. For instance, those who like reading music magazines often benefit from a zero or reduced rate or VAT, whilst those who prefer to listen to music CDs are taxed at the standard rate. Households that prefer to spend their spare income on more expensive food rather than more expensive clothing are also favoured. Reduced rates of VAT which lead to taxing similar people differentially according to their preferences may therefore be seen as unfair.

Specific egalitarianism is where society has preferences over the degree of inequality in consumption of specific goods or services, rather than simply overall inequality in consumption. Such a societal preference could be the justification for zero or reduced rates of VAT for certain items deemed to be essentials, such as food or domestic fuel, rather than a desire to redistribute more generally. In such a case, what distinguishes such commodities is not that they take up a larger share of poorer households' budgets but that they are deemed to be essentials of life, and therefore something that should be as affordable as possible to everyone. However, for this argument to hold, you must believe that people would choose to buy 'too little' of these goods even if they were provided with the resources to afford them through direct taxes or income transfers which, as discussed above, allow for better targeting of redistribution than reduced rates of VAT. This sits uncomfortably with a belief that people should generally be able to

make their own decisions about what to buy and consume, and seems to be better thought of as a desire to change behaviour, rather than to promote equity.

10.4 Promoting economic efficiency and changing behaviour

Although reduced rates of VAT may be a poor tool for redistribution, there may be grounds for reducing the rate of VAT on some goods (and increasing it on others) to improve economic efficiency, or to encourage or discourage the consumption of particular kinds of goods and services that the Government feels have particular social or cultural value.

Increasing efficiency by minimising the distortions caused by taxation

The case for different rates of VAT on efficiency grounds is often taken to mean that tax rates should be lower on goods or services for which demand is strongly responsive to changes in their own price, and vice versa (see for instance, Copenhagen Economics (2007)). The intuition behind this is that when demand responds strongly to the imposition of a tax, it causes a large distortion of behaviour which reduces welfare, and leads to the tax raising little revenue as people consume less of the good or service in question. However, this reasoning is not sound and may lead to variations in VAT rates that actually reduce revenue or reduce economic efficiency.

The problem is that it ignores the effect that cutting or increasing the tax on one good may have on the demands for other goods. For instance, imagine an economy with 3 goods, A, B, and C. Demand for good A is highly price responsive, and demand for good B not very price responsive, seeming to imply that a reduced rate of VAT should be imposed on good A and the standard rate imposed on good B. However, the high rate of tax on good B may lead to big falls in the demand for good C, leading to bigger distortions to behaviour and lower revenues than if the high tax had been placed on good A. In other words, one cannot simply look at how demand of a good responds to changes in its price: one needs to assess how demand for each good is affected by the price of every good.

How the demand for goods and services changes in response to changes in prices (and VAT rates) is closely related to another key reason for taxing different goods and services at different rates: how the demand for goods is affected by working decisions (and conversely, how the relative prices of different goods affect whether and how

much one works).[241] Certain goods take time to consume (such as foods requiring preparation or leisure pursuits), reducing the time available for work, whilst others save time (such as pre-prepared foods or labour saving devices), or are substitutes to things that households may do themselves (such as cleaning, childcare, or minor repairs and renovations), increasing the time available for work. All else equal, taxing the time-taking goods more highly than the time-saving goods is therefore a form of a tax on leisure and do-it-yourself (DIY) home production (and a subsidy to work), and will encourage people to work longer hours and take less leisure. Applying different tax rates to different goods along these lines can therefore offset some of the disincentive to working and transacting in the market that the tax and benefit system as a whole causes, increasing welfare and improving economic efficiency (Atkinson and Stiglitz (1976)).[242]

The reduced rates of VAT on certain labour-intensive locally-supplied services (and, perhaps, restaurants) seem to partly reflect such thinking (as well as a desire to increase employment for its own sake, separate from any welfare improvement it might bring). Services like domestic and window cleaning, and minor repairs and renovations can typically be done by either paid contractors, on which the prevailing rate of VAT and other taxes will be incurred on the time input of the contractor, or on a DIY basis, in which case no VAT or other taxes will be incurred on the time input. In general, taxation of market income or expenditure leads to a shift to DIY from purchasing things in the market, reducing productivity (as individuals are typically less productive in DIY than in their own job, and are less productive than people who specialise in the services in question). Reducing the rate of VAT payable on such services will help offset the distortion away from the market to DIY caused by taxation in general, leading to a desirable shift back from DIY to buying these services from the market.

[241] The following example illustrates the close link between these concepts. Suppose that an increase in the price of some good has little effect on the demand for it, and none on the demand for other goods and services. An increase in the price of the good in question would lead to an increase in spending on this good and because the demand for other goods is unaffected, an increase in total expenditure. This increase in total spending could only be paid for by increasing income through working longer or harder (either now or in the future). Therefore an increase in the price of the good leads to an increase in market work, and so the good in question must be a substitute to work effort (or, conversely, a complement to leisure).

[242] Unfortunately, the full picture is more complicated than this because all-else is not equal. Changes in the tax rates on particular goods affect the demands for other goods, so that a high tax on a good which is itself a complement to leisure (and therefore something you wish to discourage the consumption of) may also cause a fall in demand for another good which is a complement to work (and therefore something you wish to encourage the consumption of). This means the pattern of relative tax rates that should be applied to different goods can differ quite markedly from that suggested by considering the degree of complementarity with work for each good on its own.

For instance, consider a householder who wishes to have their house painted.[243] They can either paint the house themselves, or they can pay for a VAT-registered professional painter to do the job for them. The householder would take 20 hours to paint the house, whilst the professional would take 10 hours. The householder earns 20 Euros per hour (gross) in their own job, and pays a marginal income tax rate of 50%. Thus, they would potentially forgo 400 Euros of gross earnings to paint their house, but only 200 Euros of net earnings. The painter would be willing to work for 9 Euros per hour, but also faces a marginal tax rate of 50%, and has to charge VAT of 20% on the services he provides. Thus he has to charge a total of 22.50 Euros per hour, meaning a cost to the householder of 225 Euros for the professional painting of his house.

Suppose the householder simply chooses the cheapest option. They would therefore choose to paint the house themselves, forgoing 200 Euros in earnings, but saving the 225 Euros that the professional painter would cost. In the absence of taxation, however, they would have chosen to have the professional painter do the job which would then cost 80 Euros rather than the 400 Euros in wages the householder would have to forgo. The taxation of market-based transactions therefore clearly distorts whether the householder performs DIY or pays someone else to do the job, and in doing so, reduces overall economic output and productivity. A reduced rate of VAT (funded by higher rates on other goods and services for which DIY is not possible) could remedy this problem, however. For instance, a rate of 5% would reduce the price of the professional painter to 189 Euros, making this the cheaper option, and leading the householder to choose to employ the professional painter. In other words, the application of a reduced rate of VAT to painting has offset the distortion to decisions caused by taxation more generally.

However, it is not the fact that these services are labour intensive per se that justifies a reduced rate of VAT on them. It is the fact that these goods are substitutes for leisure and/or DIY production, and the application of a reduced rate of VAT in this case can help offset the distortions to leisure and DIY decisions resulting from taxing market-based transactions in general. Other labour intensive services such as professional hairdressing, specialised care of the disabled or elderly, or specialised building services which require a greater degree of skill are unlikely to be such close substitutes for

[243] This example draws on the discussion in Copenhagen Economics (2007).

leisure or DIY and the case for a reduced rate of VAT on these goods may therefore be weaker.[244]

There may therefore be a case for rates of VAT to vary in order to offset the distortions to labour supply and market transactions resulting from taxation.[245] However, whether this means that VAT rates should vary in practise depends on at least two things: whether the benefits of differentiation offset the very real costs of moving away from the simplicity of uniformity, and whether goods demands are actually related to labour supply (and vice versa). Browning and Meghir (1991) show how standard demand systems (like those estimated in the previous chapter) can be used to test whether goods demand is related to labour supply. This is by including hours of work as an explanatory variable in the model and seeing whether it has an impact on the predicted patterns of spending. We have done this for the UK. Table 10.1 shows how the share of each good is affected by a 10-hour increase in the working hours of the household head (statistically significant effects are labelled with a *).

The results suggest there may be some scope for varied rates of VAT to increase labour supply and economic welfare in the UK. However it is not clear that the existing reduced rates correspond well with the goods that should have reduced rates to encourage work. For instance, zero-rated food is found to be a substitute to work, whilst standard-rated food, restaurants and alcohol are found to be compliments. It is also not clear what impact these findings have on the welfare effects of moving towards a uniform VAT rate: these could either be larger or smaller than those reported in chapter 9. Further progress in the literature is required before stronger conclusions can be drawn.

[244] Copenhagen Economics (2007) make a similar argument.

[245] Economic reasoning suggests a number of related reasons for applying different rates of VAT to different goods. For instance, if Governments want to redistribute from those with high earnings ability to those with low earnings ability (as opposed to from those who have high income because they work hard to those who do not work hard), taxing more highly those goods favoured by the high ability individuals, and vice versa, can be a less distortionary way of redistributing than relying on the income tax and benefit system alone. Similarly, if earnings are volatile but people smooth their spending, higher rates of VAT on goods bought by those expecting to earn a lot over their lifetime may allow for more efficient redistribution between the lifetime rich to the lifetime poor than relying solely on an income tax and benefit system based on annual income.

Table 10.1 The effect of a 10-hour increase in work on spending shares

Spending Category	Change in predicted share
Zero-rated food	-0.0030*
Standard food, restaurants and alcohol	0.0020*
Leisure goods and services	-0.0010*
Domestic Energy	-0.0005*
Household goods and services	-0.0007*
Personal goods (inc. clothing) and services	0.0011*
Private transport	0.0023*
Other zero-rated goods	-0.0001

Sources: FES, EFS and LCFS, 1978 to 2009, and authors' calculations.

Copenhagen Economics (2007) also discusses two further reasons advanced for the application of reduced rates to labour-intensive services: tackling tax evasion; and reducing the structural unemployment of the low-skilled.

The potential to evade taxes by not declaring income and sales to the tax authorities increases the welfare costs of taxation by increasing the rate of tax required to raise a given revenue, which therefore means greater distortions to behaviour. Taxing less highly those goods and services for which tax evasion is easier and therefore more of a problem, and taxing more highly other goods and services could allow revenues to be raised more efficiently and lead to a reduction in the size of the underground economy.

Some labour intensive services such as domestic cleaning, minor repairs, and renovations are clearly sectors which offer the scope for relatively easy tax evasion. Others such as hairdressing and restaurants, where most traders operate out of permanent establishments, seem to offer fewer opportunities for tax evasion, and therefore the application of reduced rates to reduce evasion would seem less relevant in such instances. Of course, the costs of reducing evasion by application of a reduced rate of VAT must be compared to the costs of stricter enforcement and monitoring by the tax authorities.

The case for reduced rates on certain goods and services to reduce the structural unemployment of low skilled workers is weaker. The argument is that by shifting demand from goods or services produced by higher skilled workers to those produced by lower skilled workers, selective VAT reductions can improve, permanently, the employment outcomes for those with low levels of skills. A number of the sectors currently able to charge reduced rates due to their labour intensity such as domestic cleaning, certain types of minor repairs and renovations, and restaurants do have high fractions of low-skilled workers. However, Copenhagen Economics (2007) finds that because these sectors employ only a small fraction of all low-skilled workers, the boost to overall employment of low-skilled workers is very limited, and comes at the cost of distorting consumption decisions. In this case, alternative mechanisms such as active labour market policies, reductions in damaging employment regulations, tax credits for low-income workers, and investment in improving the education attainment of lower skilled individuals would seem better targeted at addressing the underlying problem of high unemployment.

Externalities and merit goods

The government may also want to encourage or discourage people buying certain goods for reasons other than increasing the amount they work. Consumption (or production) of certain goods may be perceived to have benefits or costs to wider society that the individual purchaser (or producer) does not take into account, or indeed, benefits or costs to themselves that they do not fully appreciate.[246] A significant number of countries have reduced rates of VAT on things such as books, magazines and newspapers, cultural and sporting facilities and events, services provided by writers, composers and performing artists, or restaurants, typically justified on cultural or social grounds.[247] Many countries also impose reduced rates on public transport, and the UK and Portugal on particular environmentally friendly products (such as wind turbines,

[246] When the act of consuming or producing a particular good involves a cost or benefit to other consumers or producers (termed an "externality"), or consumers are not fully informed about the benefits of consuming a particular good, the market outcome may not be socially optimal. Such market failures represent not only an economic problem, but may also represent a social, environmental or cultural problem. For instance, if books have gains to wider society that consumers do not take into account when deciding what to buy, the resulting under-consumption of books will represent both a cultural or social problem (people reading too little) and a reduction in economic efficiency (societal welfare is lower than it would be if people took into account all the gains to society from reading). Hence, by assessing the suitability of reduced rates of VAT to address the under-consumption of merit goods, we take into account not only economic efficiency but also the broader social goals driving VAT policy.

[247] Other more idiosyncratic examples exist such as reduced rates on services supplied by jockeys in Ireland, and on certain wines in Luxembourg, Austria, and Portugal.

solar panels and insulation). The justification for these reduced rates is that consumers have a tendency to purchase less than the socially optimal level of such goods and services, which a reduction in price resulting from a reduced rate of VAT may address.

It is not the purpose of this report to decide whether or not certain goods or activities are socially desirable or not, or whether in the absence of efforts to promote the consumption of such goods, significantly less than is socially optimal would be consumed. The answers to the first question are often subjective, depending upon the culture and history of the country involved. Answering the second question would require major new empirical work quantifying the social gains from the consumption of books, or restaurants, or in attending the theatre, which is beyond the scope of this review. Instead we take the merit of a good as given and ask whether reduced rates of VAT are a good policy instrument for encouraging goods that have such merit in their consumption and production. Our view is that the conditions under which a preferential VAT rate is appropriate are demanding, and unlikely to be met in many cases.

Rather simply than wishing to promote a particular product, good policy making requires careful consideration and definition of the underlying market failure that the policy wishes to address. Simply demonstrating that a reduced rate of VAT on a particular good or service that is deemed to be socially desirable increases aggregate consumption of that good is insufficient evidence that a reduced rate of VAT is (or would be) a good policy. Leaving aside the costs of VAT rate differentiation (which we discuss in the next section), one also has to compare the application of a reduced rate of VAT with other policies such as direct subsidies, and demonstrate that a reduction in the rate of VAT better tackles the perceived market failure. Often, the particular features of VAT make this unlikely to be the case.

First, a reduced rate of VAT provides a bigger subsidy to higher priced versions of the good to which the rate is applied. A reduced rate of VAT is therefore likely to be a well designed subsidy for a good where the social benefit of its consumption or production is strongly positively correlated to its price. However, in many cases the social benefit from using a high priced version may be no greater (and may even be smaller) than a low priced version.

For instance, many EU countries have a reduced rate on public transport (such as trains and buses). Whilst reduced rates on peak time travel may be justifiable on the grounds of complementarity with work, they actually apply to travel at all times and therefore also subsidise leisure travel. A clearer rationale for the policy may therefore be

environmental: by reducing prices for public transport, road congestion and pollution from private motor vehicles is reduced. However, a reduced rate of VAT provides a bigger subsidy to travelling in luxury as opposed to standard public transport, whilst the environmental benefit of using luxury public transport is unlikely to be larger than that from using standard public transport (indeed it may be smaller if part of the luxury is additional space which reduces the capacity of the public transport vehicle).

The same issue might also affect other goods and services for which zero or reduced rates are applied in many EU countries. For instance, many member states levy a reduced rate of VAT on the attendance of sports matches, and the majority levy a reduced rate of VAT on books. For a reduced rate of VAT to be a well targeted subsidy for attending sports games, attending a top-flight football game would need to have greater merit than attending a much cheaper lower league game, whilst for it to be a well targeted subsidy for books, the purchase of an expensive hard-back book would need to have more merit than the purchase of a cheaper paper-back version. It is not clear that either would be true.

There may be examples where there is a direct link between the price of the product and the social or cultural merit of the product, but the above examples clearly show that there may be instances where zero and reduced rates of VAT are applied where this is not the case.

A second issue is that most businesses are able to reclaim VAT on inputs. This means a reduced or zero rate of VAT on the good does not reduce the price paid by VAT-registered businesses and therefore does not provide an incentive for businesses to use more of it. For instance, a reduced rate of VAT on public transport would not incentivise business to switch from private transport to public transport, whilst business use of public transport is likely to be just as beneficial in reducing pollution and congestion as use by final consumers. Similarly, the reduced rates of VAT for environmentally friendly products in the UK and Portugal incentivise consumers but not businesses to purchase more of them, whereas purchases and utilisation by both would have a positive impact upon the environment (Institute for Environmental Studies (2008)).

On the other hand, because a reduction in VAT applies to purchases by all consumers, it is unlikely to be well targeted if the under-consumption of a good is deemed to affect only a particular part of the population. For instance, if there was a concern that young people or poor people were consuming too few books, or visiting too few museums and

cultural activities, the application of a reduced rate of VAT which applies to everyone may not be well targeted. When who is consuming a particular good, as well as how much is consumed in aggregate matters, simply showing that the aggregate demand for the good increases when its price falls, does not provide evidence that a reduced rate of VAT tackles the perceived problem at all, let alone that it is the best way to do so. If the increase in consumption of the good were concentrated amongst those already consuming the good in significant quantities, the underlying social problem would not be addressed at all (OECD (2010)).

The Institute for Environmental Studies (2008) argues that by piggy-backing on existing VAT administration, using reduced and zero rates can avoid some of the administration and compliance burdens that would arise if new subsidies or instruments were used. Whilst this is true, if alternative policies exist that are much more closely targeted at the underlying issue the policy maker wishes to address, their use may render the application of reduced rates of VAT redundant. Specific subsidies can be set to ensure that the financial incentive they give matches the social gain from the product, whereas the financial incentive provided by a VAT reduction varies with the price of the product, and flexibility is limited by EU rules on the number and levels of different VAT rates.[248] Subsidies can also be made available to businesses so that their behaviour, as well as that of consumers is changed but it is also possible to restrict specific subsidies or benefits-in-kind to particular types of consumers for whom under-consumption of the good is seen as a problem. They can also be restricted to beneficiaries residing in the particular country enacting the policy, whereas reduced rates of VAT cannot, due to the potential for non-residents to take advantage of such rates by cross-border shopping. That is other mechanisms may not have the internal market consequences that the application of reduced rates of VAT entail.

Specific subsidies to rail or bus transport, road pricing and excise duties applied to petrol and diesel are used in many EU member states, and are examples of mechanisms that are likely to change the behaviour of households and businesses in ways that better accord with the underlying reason for wanting to intervene: to reduce pollution and road congestion. Similarly, rather than applying a reduced rate of VAT to goods or services with perceived cultural or social benefit (such as books, the arts, or sports events), more

[248] Whilst EU VAT rules mean it is not possible to vary VAT by as much as one might like to address different externalities (or 'internalities'), the rules may limit the extent to which interest groups can lobby for more generous subsidies or extensions to additional categories of goods or services. This may make reduced rates of VAT more stable and less prone to lobbying than alternative mechanisms not subject to such constraints.

targeted subsidies or interventions might exist. For instance, if there was concern that too few low-income or young people were attending the theatre or museums, a large subsidy for tickets for such people would probably better address the problem than the relatively small and untargeted reduction in price associated with a reduced rate of VAT.

The importance of targeting the underlying problem (whether that is under-consumption of a good or an externality such as pollution) is highlighted in Copenhagen Economics (2008). Subsidies to public transport could, for instance, lead to a shift in spending not only from private transport, but also other goods and services that generate even fewer emissions and congestion. That is, although the amount of pollution and congestion generated per journey may fall, more journeys in total could be taken, leading to an increase rather than a decrease in emissions and congestion. In the case of carbon emissions, efforts to reduce them should focus on the root of the problem: the under-pricing of carbon. Putting a proper price on emissions of carbon (through, for instance, a tax or by tightening up the existing European Emissions Trading scheme) allows consumers and businesses to decide for themselves the most cost-effective ways to reduce emissions to the socially optimal level. That could be through using carbon-capture technology to reduce emissions from the burning of fossil fuels, through switching to alternative sources of energy such as the wind, water or the sun, by reducing energy consumption in the home, or by travelling less. Reduced VAT rates (or indeed any form of subsidy) for specific environmentally friendly products such as wind turbines or insulation, or public transport might skew the decisions of consumers and businesses towards such measures, even if more cost-effective alternative ways to reduce emissions exist.

To summarise, whilst reduced rates of VAT for particular goods and services can lead to increases in the amount of those goods purchased, they may not be the most appropriate tool to address the underlying social problem related to under-consumption. Reduced rates of VAT provide a subsidy that (a) is available to consumers only (and for that, all consumers), and (b) increases directly with the price of the product in question. If the social problem one wishes to address is affected by business use of a product, or is associated with the consumption of only particular kinds of consumers (e.g. the poor or children), or is unrelated to the price of the product, then applying reduced rates may not be an appropriate policy response.

10.5 The costs of VAT rate differentiation

Even if there were an *a priori* case for reduced rates of VAT on certain types of goods or services to increase labour supply, redistribute more efficiently, or encourage the consumption of certain merit goods, very real administrative and compliance issues mean that the benefits of VAT rate differentiation might be outweighed by the costs. It should be noted that many of these costs also apply to using alternative instruments such as specific subsidies and the benefits of using these would also need to be traded off against the costs.

First, the use of a uniform rate of VAT would simplify the accounting, invoicing and tax-filing requirements of businesses, eliminating the need for separate records for purchases and sales that involve different VAT rates. Simple records, invoices and tax forms would support the effective operation of the VAT self-assessment system and would make taxpayer education and staff training less problematic (Ebrill et al (2001)). By adding complexity, operating multiple rates of VAT increases compliance costs to businesses, and increases the likelihood of errors in the amount of VAT charged to customers, remitted to the tax authorities and claimed for on inputs. A clear example of the additional compliance burden is the increase in the volume of paperwork required for filing taxes. For instance, New Zealand which operates a uniform rate VAT system has a standard VAT return form of one page, whereas it is several pages in most EU countries where there are multiple rates ((Ebrill et al (2001)). The volume of explanatory notes and documentation also increases when multiple rates are in operation, as do the number of special schemes (such as retailer schemes).

Cases where the VAT rate charged on a service or product depends on what other goods or services are bundled with it are likely to be especially problematic. For instance, where delivery is charged separately but included in the sale contract, delivery charges attract the VAT rate on the goods delivered (otherwise delivery is charged at the rate of VAT applying to the supply of services). If goods with different VAT rates form part of the same delivery, the amount of VAT charged on delivery is calculated according to the proportion of the total value of the sale that can be attributed to goods subject to each rate of VAT.

Chapter 4 of this report have shown that the compliance cost burden of VAT is potentially sizeable (though estimates vary enormously – between 0.3% and 25% of VAT revenues – as discussed in that chapter), with the burden being particularly large for small firms. By increasing compliance costs, the application of zero and reduced

rates of VAT is therefore likely to be particularly costly for smaller firms. In a study of Denmark, the Netherlands, Norway and Sweden, the single rate of VAT in Denmark is suggested as one reason for its relatively low compliance costs (SCM Network (2005)).

A second issue is that multiple rates of VAT complicate the process of auditing by the tax authorities. If a single uniform rate were applied, audit work consists of largely checking whether sales (and therefore output VAT) is under-reported and purchases (and therefore VAT) is over-reported. However, when there are multiple VAT rates, significant time and effort must be spent to confirm that the stated breakdowns of inventories, purchases and sales into goods or services charged at different rates is accurate (Ebrill et al (2001)). Simple cross-checks between VAT, income tax and customs data (which can be conducted without requesting further information from the taxpayer) are also much less helpful in auditing VAT returns in the context of multiple rates than under a single rate.

Chapter 4 of this report has shown that auditing of VAT is costly and time consuming for both businesses and revenue authorities. For instance, a 1993 study of the hypothetical introduction of a VAT in the United States suggested that around 70% of the revenue authority's administrative costs associated with VAT would be the result of VAT audits (General Accounting Office (1993)).

Third, multiple rates of VAT also increase the number of VAT refunds that revenue authorities have to deal with. Firms selling goods at zero or reduced rates but who purchase standard rated inputs, especially those operating in industries that have a low ratio of value-added, may be entitled to VAT refunds on a regular basis. Chapter 4 of this report found that VAT refunds are problematic for revenue authorities and increase the potential for VAT fraud.

A key problem for both firms and tax administrators when VAT rates vary is the creation of difficult 'boundary problems' between goods subject to different rates. This can cause problems for firms, which need to determine what rate of VAT should be charged on their product, as well as for governments which must police the boundaries, and may ultimately provoke legal disagreements and give rise to fraud. Two cases from the UK have become notorious examples of this problem. First, United Biscuits took HMRC (the UK tax authority) to court over its decision that one of their products (Jaffa Cakes) was a chocolate-covered biscuit (and hence subject to the standard rate of VAT) rather than a chocolate cake (and therefore zero-rated). United Biscuits produced a giant Jaffa Cake for the court to illustrate that their product was really a miniture cake, not a

biscuit, arguing that cakes generally go hard when stale while biscuits go soft. The VAT tribunal ultimately upheld the makers' claim.[249] On the other hand, Proctor and Gamble lost a case in which they argued that one of their products (Pringles) should not be considered a potato crisp (and therefore subject to VAT) but instead a savoury cake or biscuit (and therefore zero-rated).[250] Examples from other member states include disagreements about the definition of the supply of food goods versus food services in Germany[251], and uncertainty about whether reprographics is a supply of goods or a supply of services in France.[252]

Different treatment by the VAT system (and other taxes like the excise system) of close substitutes may also lead to fraud. For instance, oil to be used for domestic heating is subject to a reduced rate of VAT in the UK, but the very similar diesel fuel to be used in motor vehicles is subject to the standard rate of VAT. Traders and individuals could therefore buy heating oil and illegally use it or sell it for use as diesel fuel. It is possible the boundaries may even prompt otherwise undesirable changes in product characteristics that are designed purely to place a product on the other side of the boundary and thus limit tax liability.

Data on how having multiple rates of VAT affects VAT compliance is, unfortunately, sparse. However using cross-country data, Agha and Haughton (1996) find that having an additional rate of VAT is associated with a 7 percentage point reduction in the rate of VAT compliance.

As well as causing administrative, compliance and enforcement problems, reducing the rate of VAT for one type or good or service may lead to lobbying for other goods or services to be entitled to a reduced rate. This is likely to be particularly true for substitutes for goods already subject to reduced rates, or if the reasons for applying the reduced rate to a particular good (e.g. cultural or distributional) can be seen to apply to other goods as well. If such lobbying is acted upon, this may lead to the system of reduced rates being politically instable and the proliferation of the coverage of reduced rates over time (Ebrill et al (2001)).

Recent experience in the EU may bear this out. For instance, most EU countries currently apply a zero or reduced rate of VAT to books, newspapers or magazines, but

[249] United Biscuits (UK) Ltd (VTD 6344)
[250] HMRC briefing 32/09.
[251] For example, cases C-501/09, C-497/09, c502/09 and C-499/09 of the European Court of Justice.
[252] Case C-88/09 of the European Court of Justice.

charge the standard rate of VAT on e-books, subscription news websites or other electronic media which may be seen as close substitutes to such printed material. This is because, it is not currently possible to charge a reduced rate on such products. Given the reduced rates available on traditional books, newspapers and magazines, this does not seem sensible: there is no clear reason why such close substitutes should be subject to different rates of VAT. Perhaps for this reason, there have been increasing calls for the extention of reduced rates to e-books in a number of EU countries (such as France and Spain) and the inconsistency of treatment is referenced in the recent EU consultation on VAT. More generally, the Commission notes the "repeated requests" for the extension or reduced rates to sectors not currently covered (European Commission (2010).

The OECD calls this the "me too" effect (OECD (2010)). It highlights the debates and consultation responses when the EU Commission was deciding to which labour-intensive services a reduced rate could be applied as an example where intense lobbying took place and affected legislation. Such lobbying led restaurants to be included, even though the characteristics of the sector mean it might not be so suitable. Copenhagen Economics (2007) suggests it might not be defined as fully local given the importance of foreign visitors to many catering establishments, whilst the problem of tax evasion and the "informal economy" (which is stated as one reason for the introduction of reduced rates) seems unlikely to be as important for the sector than others, such as cleaning, repairs, and home renovation. The consultation also led to calls for reduced rates in the tourism sector, for environmentally friendly cars, and the construction sector more generally (European Commission (2008)).

The problem of boundaries and the susceptibility of VAT rate differentiation to political lobbying would also affect other forms of support such as direct targeted subsidies. However, such direct subsidies may be more transparent than a reduction in the rate of VAT (Copenhagen Economics (2007)), which may not be recognised as the subsidy it actually is. This may mean that the political hurdle necessary for the extension of subsidies is greater than that for VAT reductions, meaning less scope for the proliferation of subsidies over time.

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11 Macroeconomic effects of VAT rates and structure (CPB)

This chapter contributes somewhat towards answers to the following evaluation question in the project Terms of Reference:

(4) What are the cost and impacts of the current exemptions for the tax revenue, the businesses and final consumers? What percentage of the member states' total consumption is VAT-exempted?

(11) To what extent does the current diversification of the VAT rates, including the reduced VAT rates, continue to be relevant as compared with the needs they aimed to satisfy? Do the original motives for their introduction still justify their application?

However, it is primarily intended to address the following specific element:

(E) Quantitative evidence of the impact of the diversity of rates, exemptions and schemes applied to goods and services in the EU under the current VAT system on the job creation, value added, economic growth, welfare gain, consumption, labour market, national revenues, and the proper functioning of the internal market.

Summary

This chapter discusses the effects of the VAT rate and structure on four macroeconomic aggregates: economic growth, consumption, (un)employment and tax revenues.

- We contribute to the existing econometric literature by incorporating more VAT indicators. In view of data availability, the VAT structure is characterised by three features:
  1. the standard VAT rate
  2. the VAT Revenue Ratio or C-efficiency ratio (defined as the ratio between actual revenue and the revenue that would be theoretically collected if the standard rate was applied at the tax base)

3. the effective VAT rate (defined as the ratio between total VAT revenue and the tax base)

- From an overview of the main theoretical and empirical studies on the relation between taxes and *economic growth* follows that the effect of tax levels should be distinguished from the effect of the tax structure. In the literature little evidence is found for a correlation between tax rates, including consumption taxes, and GDP. Tax systems that rely more on consumption than on income taxation are associated with higher long-run GDP levels (sections 11.2-11.4).
- The discussion of simulation studies of VAT reforms using applied general equilibrium models shows that outcomes are sensitive to how wages are determined and to the rule for indexing unemployment benefits (section 11.5).
- We conclude that the share of value added taxes in total taxes has no significant effect on *GDP growth rates* (when controlling for the fraction of total tax revenues in GDP). We also find no evidence that other VAT features significantly determine economic growth (section 11.8).
- We find that real private *consumption* is not significantly affected by VAT variables (after controlling for the non-VAT tax revenues; section 11.9).
- The impact of taxes on the *labour market* is traditionally captured by the total tax wedge, which incorporates the effective VAT rate. We find that the total tax wedge has a robust, positive effect on the total unemployment rate. This effect can be mainly attributed to the direct taxation of labour income, since the isolated effect of the consumption tax rate is never significant. The tax wedge seems to have a smaller effect on the long-term unemployment rate. Finally, the growth rate of employment is unexpectedly positively associated to the tax wedge (section 11.10).
- We test three hypotheses on the impact on *tax revenues*. First, in line with similar studies, we find no strong evidence on the relation between total tax revenues and the presence of VAT. The estimated effect is sensitive to the estimation method. Second, VAT revenues have partially replaced revenues from other taxes, leading in total to more tax revenues in the OECD, but often the estimated effect is implausibly large. Third, we report a robust relation between the standard and the effective VAT rate. The finding that increasing the standard rate by 1percentage point raises the effective rate by 0.4percentage point indicates the role of reduced rates, exemptions and tax evasion (section 11.11).

11.1 Introduction

This chapter discusses the effects of the VAT rate and structure on four macroeconomic aggregates: economic growth, consumption, (un)employment and tax revenues. In a

literature survey we summarise the main findings of econometric and simulation studies. Furthermore, we present our own estimation results based on an extensive panel dataset covering EU and OECD countries.

The outline of this chapter is as follows. The following three sections survey the theoretical and empirical literature on the impact of taxes on the level and growth of GDP. Section 11.5 provides an overview of simulation studies of VAT reforms using applied general equilibrium models. Section 11.6 and 11.7 document the definition, sources and descriptive statistics of all variables that are used in the following four econometric sections. We construct an additional dataset for estimating the impact on labour market variables (described in section 11.10). Section 11.8 presents the estimation results of growth regressions. Next, the impact of VAT variables on consumption is examined in section 11.9. We assess the role of taxation on employment and unemployment in section 11.10 and we test three hypotheses on the effects on tax revenues in Section 11.11. The last section summarises the main findings.

11.2 General growth empirics

According to the standard neoclassical growth model (Solow, 1970) changes in taxation or government expenditure have no influence on the long-run growth rate. Tax and expenditure measures that influence the savings rate, the decision to participate in the labour market or the incentive to invest in physical or human capital influence the equilibrium level of GDP rather than the steady-state growth rate. In more recent endogenous growth models like that of Lucas (1988) institutions and fiscal policy can directly affect the long-run rate of economic growth.

The seminal empirical work by Barro (1991) was followed by a vast literature looking for the determinants of economic growth. Barro (1991) found that GDP growth is positively related to initial human capital, negatively related to the initial level of real GDP per capita and negatively related to the ratio of real government consumption to GDP. The share of public investment to GDP was found to be insignificantly related to GDP growth. Mankiw et al. (1992) stressed the role of human capital – proxied by school enrollment rates – and Barro (1996) for example added the role of political stability and price distortions.

A more comprehensive overview of the growth literature is given by Durlauf et al. (2004) and Myles (2007). Durlauf et al. emphasise the large number of different determinants (over 90) that have been used in regressions estimating the effect on GDP

growth, showing the lack of consensus on the long-term drivers of growth in the literature. Little attention is given to tax variables; the only studies they mention that use tax variables are Levine and Renelt (1992) and Agell (2006). Myles (2007) concludes that the traditional empirical growth literature has not delivered any answers so far.

Durlauf et al. (2004) discuss various reasons to interpret results from cross-country regressions with caution, stressing the limitations of growth studies. The most important of these are endogeneity issues, model uncertainty and the general weakness of the available data for identifying the long-term drivers for growth.

Some authors have tested the robustness of the many different specifications used in growth regressions. Levine and Renelt (1992) find almost no variables that are robust among the many different specifications. They do find a positive, robust correlation between growth and the share of investment in GDP. Sala-i-Martin (1997b) also examines the robustness of 62 variables which have been found to be significant in the literature. He finds 22 variables to be robust, meaning that the coefficients have the same sign in more than 95% of the cases. Variables related to government expenditure are not robust while no measures for taxation were used (Sala-i-Martin, 1997a). Slemrod et al. (1995) question why it is so hard to find empirical evidence from cross-country regressions or time-series on the cost of having a large government. Among the main reasons they bring forward are endogeneity problems (e.g. a higher GDP level leads to a larger government); the lack of variation or extreme values in taxes and the fact that theoretical models are based on marginal tax rates while most empirical work uses average rates.

11.3 Effect of taxes on growth in theory

The fact that taxes distort private decisions, leading to suboptimal allocation of resources and deadweight loss, is generally accepted among economists. The empirical evidence for a negative effect of taxes on economic growth is rather inconclusive, however. Through what channels do taxes influence the economy? First of all a distinction can be made between the influence of taxes on the equilibrium level of GDP and the influence of taxes on economic growth.

Changes in equilibrium level of GDP

Hall and Jorgenson (1967) and more recent literature on investment find a relation between low effective tax rates on new investment and higher investment, leading to higher short-run economic growth.

Personal income taxes on labour and a general consumption tax both influence the labour participation decision, thus having a direct effect on the level of GDP. A consumption tax such as the VAT lowers the real purchasing power of individuals, thus influencing the decision between working and leisure in much the same way as an income tax (Johansson et al., 2008). When the same tax rate is applied to current and future consumption, consumption taxes do not influence the rate of return on savings and individual's savings choices as income taxes do (Johansson et al., 2008).

According to the production efficiency theorem of Diamond-Mirrlees (1971) an optimal tax system leaves production decisions undistorted. The requirement of production efficiency is a key reason for the use of a VAT system (Crawford, Keen and Smith, 2010). Cnossen (2010) concludes that a VAT is the preferred form of consumption taxation, as the VAT is more effective in confining the base to consumer goods and services, compared to a retail sales tax (RST) as used in the United States. Cnossen focuses on distortions of producer choices through taxing of business inputs (double taxation).

Long run growth effects

The long-run growth rate depends on productivity improvements in endogenous growth models. Growth is enhanced by external effects of the accumulation of physical or human capital or entrepreneurial activity. When the incentives (disincentives) for investing in physical or human capital are larger (smaller), growth rates should be higher. The role of entrepreneurial activity in raising productivity through innovative ideas was first brought forward by Schumpeter (1942). Cullen and Gordon (2002) stress the effect of the tax system on entrepreneurial activity. They conclude that reducing corporate tax rates increases entrepreneurial activity, while uniformly cutting personal income taxes decreases entrepreneurial activity because of reduced risk sharing under losses. Reducing the progressivity of the income tax is found to stimulate entrepreneurial activity. Lee and Gordon (2005) discuss the link between corporate taxation and long-run growth as a result of capital accumulation and entrepreneurial

activity. Myles (2007) also points to lower returns on R&D investments due to corporate taxation as a channel for lower long-term growth.

Personal income taxes reduce the returns to education and thus should reduce the accumulation of human capital. Heckman et al. (1998) emphasise that a progressive labour income tax discourages education, since the taxes saved while in school are lower than taxes on later earnings in higher tax brackets. Trostel (1993) finds, using general equilibrium simulations, that proportional income taxation has a significant negative effect on investment in human capital and that consumption taxation produces quantitatively similar results.

With respect to the VAT, Lee and Gordon (2005) conclude that the VAT should be neutral to risk taking and entrepreneurial activity. In the (theoretical) case when negative value added, as a result of losses, are not refunded, a higher VAT rate could then discourage risk-taking. Any effects of consumption taxes on the long-term growth rate do not seem obvious. Therefore, effects of consumption taxes are expected to be rather on the level of GDP or temporarily on growth rates on the transition path.

11.4 Empirical evidence on the effect of taxes

The empirical evidence on the effect of overall taxes on the GDP level or economic growth is mixed. A distinction between the level of taxes and the tax structure is important. The empirical literature specifically looking at the VAT as a determinant of economic growth is quite limited. For all studies holds the general remark that it is empirically hard to distinguish between effects on growth rates during transition and effects on long-run growth rates. It is hence unclear whether the findings really deal with temporary or with permanent growth effects of taxes. Table 11.1 presents an overview of the empirical literature along two dimensions. We distinguish between the effect of the overall tax level versus the tax structure and we distinguish between the effect on GDP level versus GDP growth.

Table 11.1: Overview of the empirical literature

	Effect of:	
	Tax level	Tax structure
on GDP growth	Barro (1991); Easterly and Rebelo (1993); Koester and Kormendi (1989); Fölster and Henrekson (2001); Agell et al. (2006)	Mendoza et al. (1997); Kneller et al (1999); Gemmel et al. (2006); Windmalm (2001); Lee and Gordon (2005)
on GDP level	Koester and Kormendi (1989)	Arnold (2008)

Tax level and GDP

As mentioned before, Barro (1991) found a significantly negative correlation between the ratio of real government expenditure and growth. Koester and Kormendi (1989) find little evidence for a correlation between tax rates and economic growth (and GDP levels), while using measures of the average and the marginal tax rate. From a list of average and marginal tax rates, Easterly and Rebelo (1993) find that only one measure of the marginal income tax rate is significantly correlated with growth and conclude that the empirical link between taxes and growth is fragile.[253] They do find that a government budget surplus is positively correlated with growth.

Fölster and Henrekson (2001) report a negative relationship between the size of public expenditure as a share of GDP and growth. Agell et al. (2006) argue that the methodology behind this result is flawed, since it fails to control for sample selection bias and simultaneity. They find a statistically insignificant and unstable relationship between the relative size of public expenditure and growth.

In another strand of the literature, Perotti (2011) estimates the effects of tax shocks on GDP with a VAR-model.[254] He typically finds that a one percentage point of GDP increase in taxes causes a decline in GDP by about 1.5 percentage points after 3 years. For our purposes, this study has three limitations. First, the model is estimated with US-data. Second, the results apply to the medium run (at most 6 years). Finally, the effect

[253] This marginal tax rate is obtained by regressing income tax revenues on GDP.

[254] In a VectorAutoRegressive (VAR) model each (endogenous) variable is explained by its own lags and the lags of all the other variables. Perotti (2011) uses five endogenous variables: the growth rate of GDP per capita, the (discretionary) change in taxation as a fraction of GDP, the growth rate of real primary government spending per capita, the change in the inflation rate and the change in the interest rate.

of total tax revenues is assessed, without discussing the separate effect of indirect taxation.

Tax structure and GDP

Kneller et al. (1999) and Gemell et al. (2006) criticise specifications in previous growth studies for ignoring the government budget constraint. They show that estimates of the growth impact are biased when the analysis focuses exclusively on one side of the budget, while neglecting financing restrictions. They suggest estimating the growth effects of the structure of both taxation and expenditures. Kneller et al. (1999) find evidence that a relatively heavy reliance on commodity rather than income taxation is associated with faster growth. These results are confirmed by Gemell et al. (2006), who use annual data and correct for short-run developments. For 23 OECD countries Widmalm (2001) finds that the proportion of taxes raised by personal income tax has a negative correlation with economic growth. She also finds some evidence suggesting that consumption taxes are relatively growth-enhancing.

Mendoza et al. (1997) disregard aggregate tax measures and focus on the effects of effective tax rates on labour income, capital income and consumption. Using a panel regression with 5-year averages, they find no evidence that effective tax rates are determinants of economic growth. The effective tax rates are robust determinants of the private investment rate: lower income taxes are found to increase the investment rate while lower consumption taxes are found to decrease the investment rate.

Lee and Gordon (2005) focus on the relationship between corporate taxation and average growth from 1970 to 1997. The explanatory variables are the top marginal tax rates for personal income tax and corporate tax, the statutory consumption tax rate (both VAT and RST), and control variables based on commonly used specifications from the literature. This study finds that a decrease of the corporate tax rate by 10 percentage points increases the annual growth rate by 0.6% to 1.8%, depending on the specification and estimation method. The effect of the corporate tax rate remains significant throughout various specifications, while none of the other tax variables, including the consumption tax rate, are found to be significant.

Notice that the effect of the corporate tax rate reported by Lee and Gordon is very substantial. For example, the top corporate tax rate in the Netherlands has decreased from 46% in 1970 to 25.5% in 2010; using their coefficient would explain a 1.2percentage points to 3.6percentage points higher annual growth rate, ceteris paribus.

In Germany, the top corporate tax rate decreased from 60% in 1981 to 30% in 2010, which would imply an even larger effect.

Arnold (2008) uses tax revenues as a percentage of total revenues for personal income tax, corporate income tax, consumption taxes and property taxes.[255] Data for 21 countries over the period 1971-2004 is used. An error correction model (ECM) is estimated to account for off-equilibrium dynamics in GDP per capita. In line with Kneller et al. (1999) and Gemmel et al. (2006), Arnold (2008) controls for the size of total tax (as a fraction of GDP). Next, he adds the share of one particular tax type (as a fraction of total tax revenues). The omitted taxes are assumed to close the budget. He finds the following ranking with respect to the relationship of different tax instruments to economic growth: most growth friendly are property taxes, followed by consumption taxes. Personal income taxes are found to have a significantly negative effect, while corporate taxes seem to be most harmful for economic growth. Furthermore, he finds evidence that the progressivity of personal income taxes is negatively related to economic growth.

11.5 Simulations with General Equilibrium models

Applied general equilibrium (AGE) analyses of VAT reforms are relatively scarce in the literature. We start with a discussion of two multi-country models applied to the EU. Next, we describe single-country exercises for Denmark and Germany. We end with interesting examples for US and Norway.

Copenhagen Economics (2007) developed a static AGE model to study adjustments of the VAT structure in the EU. It covers 25 EU members (excluding Bulgaria and Romania) and a region capturing the rest of the world. Behaviour of a representative consumer and production activities in 13 sectors are specified for each country. Effects of tax reforms in some sectors on the government budget are neutralised by adjusting the VAT rate for the sector 'Rest of the economy' (with a GDP-share of 67%). As a consequence, the average, effective VAT rate in EU25 remains constant (14.7%) in all scenarios. In a first scenario, a uniform, standard rate is applied on all goods and services, except those exempted from VAT. The extra tax revenues allow a reduction of the average standard VAT rate from 19.1% to 15.7% in EU25. The second set of scenarios extends the use of reduced rates to more sectors in more countries, which

[255] The OECD growth study by Johansson et al. (2008) and Arnold et al. (2011) are based on the working paper of Arnold (2008).

requires a higher standard rate. In contrast, the use of reduced rates is limited in the third set of scenarios.

The change in the structure of VAT rates seems to have little effect on aggregate variables in the long run.[256] The welfare effects are rather small. Welfare improves the most in the uniform rate structure (0.03%). Losses (of 0.02%) result in the second set of scenarios, whereas a gain (of 0.01%) is found in the third set. The welfare ranking hinges on the variability of the VAT rates: the gain increases when VAT rates become more uniform across sectors.

An earlier example of a static multi-country AGE model is discussed in Fehr et al. (1995). This model covers 7 EU countries or regions (Belgium/Luxembourg; Denmark; France, Germany, Italy, Netherlands and UK/Ireland). It features one representative consumer and 14 production sectors with differentiated VAT rates in each country. The simulations focus on adjustments of the VAT base and thus not of the tax rates. One of the simulations considers a shift from the pure destination principle to the pure origin principle.[257] This reform is found to improve VAT revenues and welfare in the countries that impose a high standard VAT rate, while the reverse holds for the low-tax countries (see Table V.5). Welfare effects mostly stem from international redistribution of VAT revenues but barely from efficiency effects.

Examples of single-country AGE studies are found for Denmark and Germany. Sørensen (1997) simulates the role of tax policies in reducing unemployment of low-skilled workers by extending a static AGE model in two, innovative directions. First, he considers interactions between the official economy and the informal economy (including home production). The formal economy consists of three sectors, producing housing repair; other consumer services, and other goods and services. The first two sectors face competition by the (less-productive) informal economy. Second, he incorporates a dual labour market. The market for white-collar labour is assumed perfectly competitive, with flexible wages and without unemployment. The segment for

[256] Appendix III only reports changes in consumption, employment and value-added per sector. In another model, interactions between the formal and the informal economy are incorporated (see the discussion below of Sørensen, 1997). Formal GDP expands the most (by 1%) in scenarios in which reduced rates are more extensively used since it induces a shift of activities from the informal to the formal economy. GDP increases by 0.3% in the uniform rate scenario.

[257] When the destination principle is applied, exports are free of VAT in the exporting country and imports are taxed at the VAT rate of the importing country. In contrast, under the origin principle, exports are taxed in the producing country, while imports are not taxed in the country of destination.

skilled and unskilled blue-collar labour is characterised by non-competitive wage setting and unemployment.[258] The model is calibrated with Danish data.

A first set of simulations considers a shift from direct taxation of low income earners to indirect taxation. The marginal income tax rate is cut by 1 percentage point for labour income up to a threshold equal to the labour income of the lowest-paid workers in the competitive labour segment.[259] The reform is financed by a higher VAT rate. As a result, the average tax burden rises for all transfer recipients and for white-collar workers, while it falls for blue-collar workers. The outcomes strongly depend on the specification of the links between the various tax rates and the non-competitive wage formation. A higher consumption tax and a higher average income tax will have a cost-push effect on the nominal wages, whereas a higher marginal income tax is associated with wage moderation. The latter effect is explained as follows. In bargaining wages, labour unions face a trade off between higher wages and higher employment of their members. When the marginal income tax rate is raised (for a given average tax rate), claiming a higher pre-tax wage becomes less attractive since a smaller increase in the after-tax wage results. Instead, labour unions will moderate the wage claims, in exchange for a higher employment. Evidence confirms this relationship between tax rates and wage formation. However, there exists great uncertainty regarding the sizes of the elasticities in the wage equation.

In a scenario with high elasticities, the tax reform has favourable effects. A blue-collar worker on the non-competitive labour segment is facing a lower average tax burden, a higher marginal tax burden and a lower real after-tax unemployment benefit. This combination induces labour unions to moderate nominal wage claims. As a result, official employment increases (by 0.5%), unemployment falls (by 0.5 percentage point) and aggregate welfare rises (by 0.1%). Opposite effects are found in the scenario with low elasticities. Assuming that real wages depend less on changes in tax and benefit rates implies that the nominal wage will follow the increase in the consumer price more closely.

A second set of simulations analyses the proposal to introduce subsidies to sectors that use intensively unskilled labour. Price subsidies are given to ‘other consumer services’ and financed by raising the VAT on the other good and services. Aggregate welfare is

[258] To be precise, the non-competitive labour segment does not include blue-collar workers employed in the sector ‘other consumer services’.

[259] It is assumed that pre-tax benefit rates are linked to pre-tax wage rates. In other words, the gross replacement rates are kept constant.

maximised with a price subsidy of 48% to other consumer services, which requires a 9.6% higher VAT rate.[260] This reform has sizable effects on employment (+4.3%), unemployment (-2.6 percentage points) and total welfare (+2.8%).

Böhringer et al. (2005) explore the effects of taxes on labour market outcomes using a static AGE approach. Proportional consumption taxes are included with commodity-specific rates. The combination of a constant marginal tax rate with a tax allowance characterises a linear progressive labour tax. The model distinguishes 7 sectors and 3 representative households (low-skilled workers, high-skilled workers and capital owners). Wages are determined by firm-union bargaining at the sectoral level. The model is parameterised to German data. The tax reforms consider an increase in lump-sum taxes (by 2% of the total budget) that is compensated by lower consumption or labour taxes. We focus on the case in which capital is internationally mobile, with fixed rental rates.[261]

The higher lump-sum taxes are balanced by a fall in the average consumption tax rate (by 1.3 percentage points). When the unemployment benefit is a fixed fraction of the bargained wage, the reduction in the indirect tax hardly affects the difference between the net income of a worker and the fallback income of an unemployed. As a result, the labour union opts for the combination of a rather constant producer wage and higher employment. The consumer wage rises following the lower indirect tax rate, which, together with a lower lump-sum income, stimulates labour supply. With a rather constant unemployment rate, employment expands by 0.3%. The extra inflow of foreign capital at a fixed interest rate contributes to a higher GDP (by 0.3%). Workers benefit from a welfare gain since the higher wage income dominates the higher lump-sum taxes. In contrast, domestic capital owners suffer from a welfare loss, as capital income remains constant. Finally, increasing the labour income tax allowance is most effective in stimulating employment and output (0.7%). Reducing the marginal labour tax rate is the least effective (0.2%) among the tax instruments considered.

Boeters et al. (2010) simulate VAT reforms in Germany using a similar, static AGE model. The model features households in three income classes and 69 industries. The wage is determined by bargaining between firms and a trade union. It is set above the market-clearing level, resulting in equilibrium unemployment. The small open economy setting considers exogenous world commodity prices and interest rate. In the base case,

[260] Results are only available for the case with low wage elasticities.
[261] See Table 4 in Böhringer et al. (2005).

three VAT rates are distinguished: zero rate (due to exemption), reduced rate (7%) and standard rate (16%). In the simulated revenue-neutral VAT reform, a uniform rate of 14% is introduced (without changing the exemptions). This reform is found to stimulate GDP by 0.12%, employment by 0.03% and aggregate consumption by 0.03%. While the distributional effects on the households remain rather small, output effects vary widely across the industries (ranging between -1.9% and 5.5%).

Finally, VAT reforms are also analysed for non-EU members. Ballard et al. (1987) study the adoption of a VAT in the United States using their well-known time-recursive AGE model.[262] A closed economy is modelled with 19 production sectors and consumers in 12 income classes. They only report welfare effects.[263] We discuss the case in which revenue neutrality is preserved by a proportional reduction of the personal income tax rates.[264] A first scenario considers the introduction of a VAT with a uniform rate of 6.5%. The switch from progressive income taxes to uniform consumption taxes increases welfare by 0.8%. The second scenario allows for differentiated rates that are inspired by a stylised European VAT. The benefit of a slightly less regressive VAT comes at the expense of a smaller efficiency gain of 0.6%.[265]

Bye et al. (2003) apply a dynamic AGE model to analyse reforms of the Norwegian VAT system. The model has one representative consumer and 49 production sectors. The producers face fixed world market prices but they have some market power on the domestic market. The labour market is perfectly competitive. The simulated reform broadens the base of the standard VAT rate (23%), leading, in particular, to a higher rate on services.[266] The effective VAT rate on goods is slightly increased from 20.9% to 22.4%, while the rate on services rises from 4.5% to 11.7% on average. The scenario is somewhat complicated by the additional abolition of the investment tax. As a result, the effective VAT and investment tax rate on material inputs and investment goods falls

[262] In a time-recursive model agents have static expectations. This implies that variables in the current period affect future variables but future variables have no feedback effects on current values. For instance, an announced increase in future VAT rates has no effect on current consumption and savings in this type of model.

[263] The change in welfare of a consumer is computed as the present discounted value of all future welfare effects, using a 4% real discount rate. The total effect is equal to the sum of the welfare effects over all income groups (i.e. with equal welfare weights).

[264] Transfer payments are kept constant in terms of consumer prices (inclusive of VAT).

[265] Since it does not distinguish age cohorts, the model only deals with effects on the static income distribution, not on the more relevant life-cycle distribution.

[266] Exemptions are maintained for the banks' interest rate differential and non-profit institutions servings households.

from 4.0% to 0.6%. The reform is made revenue neutral by adjusting lump sum taxes. Their discussion focuses on the long-run outcomes. The reduction in costs stimulates the demand for all inputs, including labour. The resulting rise of the wage rate dominates the increase in consumer prices, which causes higher real wages. Aggregate consumption increases by 0.7%, employment remains rather constant and GDP at producer prices improves by almost 1% in the long run. The required increase in lump sum taxes is totally due to the abolition of the investment tax as the VAT part of the reform contributes to higher revenues. They conclude that switching to a more uniform VAT system would yield a welfare gain compared to the existing system.

It is difficult to draw general conclusions in view of the wide range of specifications, parameterisations and tax reforms that are considered in these AGE-studies. We want to draw two important lessons from this overview. First, simulation outcomes strongly depend on the specification of wage formation. In the literature the estimates of the effect of average and marginal tax rates on pre-tax wages are still surrounded by great uncertainty. Simulations in Sørensen (1997) show that whether employment increases or decreases after a tax reform depends on the choice of these wage elasticities. Second, simulation results are sensitive to whether real after-tax transfer benefits are assumed constant or not. In the case that transfer benefits are fully linked to consumer prices, its recipients are not affected by higher VAT rates. However, in the opposite case, they have to bear a larger burden from the higher consumer taxes, to the benefit of the working groups.

11.6 Description of variables and data sources

We have constructed a panel dataset covering EU members and non-EU OECD countries.[267] All estimations in this chapter use this database unless otherwise indicated. We distinguish three types of variables: standard control variables, general tax variables and VAT variables. We end this section with a detailed description of the data sources per variable.

Standard control variables

From the literature the standard control variables are selected (see e.g. Lee and Gordon, 2005):

[267] The OECD does not provide data for the new EU countries Bulgaria, Cyprus, Estonia, Latvia, Lithuania, Malta and Romania. Data for the latter countries originate from Eurostat databases.

- (log of) GDP per capita in starting year, to account for catching-up effects (i.e. countries grow faster when they start from a lower GDP-level)
- Government expenditures (%GDP)
- School enrollment rate (secondary and tertiary)
- Measure for trade openness: exports plus imports as a share of GDP
- EU-member (average 5 year period, with value between 0 and 1 for countries that became EU-member during a period)
- Average inflation rate (cpi)
- Population growth rate
- (non-residential) fixed capital formation (%GDP)

General tax variables

In the growth regressions we control for *total* tax revenue, expressed as % of GDP. The coefficient of this variable should not be interpreted as measuring the effect of the overall tax burden on economic growth, since this also depends on how the additional tax revenues are spent (see Kneller et al., 1999). It clearly matters for GDP-growth whether extra taxes are imposed for financing government consumption, government investment or public debt reduction. We focus on the effect of a certain tax structure for a given total tax revenue.

The effect of the general *structure* of taxation is captured by including the shares of the main tax categories in total tax revenues (see Arnold, 2008):

- Income taxes (1000, 2000 and 3000 of OECD classification)
  - Personal income taxes (1100, 1300, 2000 and 3000 of OECD classification)
  - Corporate income tax (1200 of OECD classification)
- Consumption and property taxes (4000, 5000 and 6000 of OECD classification)
  - Consumption taxes excluding property taxes (5000 and 6000 of OECD classification)
    - VAT (5111 of OECD classification)
    - other consumption taxes (5000 (excl 5111) and 6000 of OECD classification)
  - Property taxes (4000 of OECD classification)

VAT variables

To estimate the effect of a specific VAT rate and structure we will experiment with several VAT variables:

- The standard VAT rate (t_{vs})
- VAT dummy, equals one when a VAT-system is in operation
- The VAT Revenue Ratio (VRR)

The calculation and limitations of the VAT Revenue Ratio (VRR) are discussed in OECD (2011) and Ebrill et al. (2001), who refer to it as C-efficiency. The VRR is defined as the ratio between the actual VAT revenue collected (RV_{5111}) and the revenue that would theoretically be raised if the standard VAT rate was successfully applied at the total VAT tax base:

$$VRR = \frac{RV_{5111}}{B * t_{vs}}$$

A uniform VAT rate levied on the entire tax base (B) would have a VRR of unity. The main difficulties are in assessing the correct potential tax base (see OECD, 2011). Since VAT is a tax on final consumption expenditure, the two most likely candidates from National Accounts are final consumption expenditure of households and total final consumption expenditure. The European Commission (2004) gives an overview of the VAT base of the EU-15 countries in 2000: the share of final household consumption in the total VAT base ranges between 60% and 74% in these countries. The remaining VAT base is mostly made up by intermediate consumption and investment of businesses and public bodies without the right to deduct VAT[268]. In line with the OECD we will take total final consumption as the tax base, including final consumption expenditure by the general government and non-profit organisations serving households. This measure does include wages paid by the government, which are not subject to VAT, or

$$VRR = \frac{RV_{5111}}{(C - RV_{5111}) * t_{vs}}$$

[268] These are private non-profit institutions, general government and other sectors exempt from VAT such as financial services. Also investment in housing, included in fixed capital formation (investment) is part of the VAT base in most countries.

where RV_{5111} are actual VAT revenues and C is total final consumption expenditure. A low VRR may be a result of erosion of the tax base at the standard rate due to exemptions or reduced rates and/or problems to collect the tax due. We have also calculated the VRR using final consumption expenditure of households (VRR_H), thus excluding consumption expenditure by the general government. The VRR_H can have a value well above 1, since it excludes around a third of the tax base.

- The effective VAT rate (t_{ve})

The effective VAT rate can be seen as the average VAT rate paid on the tax base and is measured as follows.

$$t_{ve} = \frac{RV_{5111}}{C - RV_{5111}}$$

This is in fact equal to the VRR multiplied by the standard VAT rate:

$$t_{ve} = t_{vs} * VRR$$

The chosen tax base again influences the outcome of the effective tax rate. By using only household consumption the effective VAT rate becomes unrealistically high.

We consider several additional VAT indicators. Since we only have data for a limited number of years we cannot include these additional VAT indicators in the panel estimation:

- The VAT gap as provided by Reckon (2009).

We have data for the VAT gap for 24 EU-countries from 2000-2006. The VAT gap is calculated as the difference between actual VAT receipts and theoretical VAT liability, presented as share of theoretical liability. The expenditures that give rise to irrecoverable VAT (taking exemptions into account) are multiplied with appropriate VAT rates (based on national VAT legislation and other sources).

$$\text{VAT gap} = \frac{\text{RV}_{5111} - \text{TV}_{5111}}{\text{TV}_{5111}}$$

where theoretical VAT liability (TV_{5111}) is calculated as follows:

$$TV_{5111} = \Sigma(B_i * t_{vi})$$

where B_i stands for transactions as part of the tax base and t_{vi} stands for the VAT rate i that applies to a given transaction. Since the VAT gap is corrected for exemptions and reduced VAT rates, the remaining VAT gap could be seen as a measure for non-compliance or fraud.

However, Reckon (2009) stresses that the VAT gap is not a measure of fraud, since three important other factors may influence the VAT gap. First, the VAT gap might include VAT not paid as a result of legal tax avoidance, for example because of a VAT threshold. Second, the estimated VAT gap depends on the accuracy of the national accounts data. Taxable activities that are outside the scope of national accounts are not included in the theoretical VAT liability. Third, insolvencies may lead to unpaid VAT, while not being a consequence of fraud.

The following indicators are only available for 2000:

- The share of the standard rate base in the total VAT base (excluding exemptions)
- The implicit VAT rate, as described by EC (2004).[269] This is a weighted VAT rate: where VAT rate i is multiplied by the value of the transactions to which rate i applies divided by the total value of all taxable transactions.
- The gap between standard and implicit rates as % of the standard rate. This is another measure for the loss in revenue as a result of reduced rates.

Data sources

The following series are from the Penn World Table, version 7.0[270]:

- Real GDP per capita (US $, constant prices, constant PPPs; variable rgdpch)
- Consumption as share of Real GDP per capita (%, variable kc)
- Investment as share of Real GDP per capita (%, variable ki)
- Openness, defined as (Exports + Imports)/ GDP (%, variable openk)

The following data are from the OECD National Accounts database:

- GDP (national currency, current prices)

[269] This implicit tax rate should not be confused with the implicit tax rate on consumption reported in EC (2011b). The definition of the latter rate shows that it is equivalent to the effective tax rate on household consumption. Table 11.5 will show that the correlation between the implicit tax rate and the effective tax rate is high (0.895 in 2000).

[270] See: http://pwt.econ.upenn.edu/php_site/pwt_index.php

- Final consumption expenditure (P3, national currency, current prices)
- Final consumption expenditure of households (P31S14, national currency, current prices)

Population level statistics from the World Bank World Development Indicators (WDI) were used for calculating the population growth rate. Secondary and tertiary school enrolment rates are also from the WDI.

Information on tax revenues of the categories 1000, 2000, 3000, 4000, 5000 and 6000, expressed as percentage of GDP, come from the OECD revenue statistics. Also the VAT receipts in local currency (5111), used for the VRR and the effective VAT rate are from OECD revenue statistics.

Statutory standard VAT rates come from VAT-rates Applied in the member states of the European Union (EC, 2011a) and Consumption Tax Trends (OECD, 2011). For all current EU members we used information from EC (2011a) to calculate average yearly statutory standard VAT rates, taking into account rate changes during the year. For Israel we used information from the Ministry of Finance to calculate average yearly statutory standard VAT rates[271]. For the remaining OECD countries we used information from OECD (2011) on statutory standard VAT rates at January 1st of each year.[272]

Data on the VAT gap for EU-countries is available from Reckon (2009). Additional VAT-indicators come from VAT Indicators (EC, 2004), such as the standard VAT rate base as share of the total VAT base (excluding exemptions), the implicit VAT rate and the gap between the statutory standard VAT rate and the implicit VAT rate. We do not have separate data on VAT exemptions, apart from the information in the VRR.

11.7 Descriptive statistics

We present in Table 11.2 summary statistics of the data used in the regression. All the values presented here are 5-year averages. We have collected data for at most 40 countries for eleven 5-year periods, giving a maximum of 440 observations.

[271] See: http://www.finance.gov.il/customs/eng/faq.htm

[272] For some non-EU countries we do not have complete time series for this rate. We have asked the OECD but they cannot provide the missing data.

Both the variables 'EU member' and 'VAT in operation' are yes /no variables with a value 1 or 0 (yes being 1). Since these are 5-year averages the value can be between 0 and 1 for a country introducing a VAT system or becoming EU-member during a period. The average annual real GPD growth per capita is 2.6%. Noteworthy is the highest secondary school enrollment rate of 155. This value can be above 100 since we use gross enrollment rates. The statutory standard VAT rate ranges from 3% in Japan from 1990-1996 to an average VAT rate of 29.3% of Ireland from 1981-1985.

Table 11.2: Descriptive statistics of the panel dataset (5 year averages)

	mean	std. dev.	min.	max.	obs.
growth rate GDP/capita (%)	13.11	11.63	-23.78	65.76	380
average level GDP/capita (PPP-$)	17802	10875	1645	84778	411
average level consumption/capita (PPP-$)	11707	6426	1256	33237	411
Standard control variables					
growth rate population	3.42	3.63	-8.79	17.39	360
secondary school enrollment rate (%)	96.33	18.97	25.89	155.58	201
EU member	0.25	0.42	0.00	1.00	480
trade openness (%GDP)	56.58	46.72	2.40	314.42	411
investment rate (%GDP)	22.80	5.97	7.74	45.10	411
General tax variables					
total taxes (%GDP)	32.53	8.54	11.97	51.46	270
taxes on personal income (%Tax)	48.48	15.03	4.63	72.19	274
taxes on corporate income (%Tax)	8.10	4.83	0.36	26.23	274
VAT taxes (%Tax)	18.02	6.53	1.71	41.58	216
total taxes on goods (%Tax)	37.59	12.70	6.18	72.71	289
VAT variables					
VAT in operation	0.45	0.48	0.00	1.00	480
standard VAT rate (%)*	16.10	5.88	3.00	29.33	222
VRR (household consumption)*	0.71	0.24	0.08	1.43	208
VRR (total consumption)*	0.50	0.16	0.07	1.03	209
effective VAT rate (household consumption, %)*	11.96	5.68	0.78	26.06	215
effective VAT rate (total consumption, %)*	8.25	3.45	0.67	15.13	216

* when positive.

Table 11.3: Correlation matrix for different VAT-rates

	standard rate	VRR house	VRR total	effective house	effective total
standard vat rate	1.000	-0.021	-0.271	0.780	0.784
VRR house	-0.021	1.000	0.933	0.585	0.563
VRR total	-0.271	0.933	1.000	0.327	0.354
effective house	0.780	0.585	0.327	1.000	0.980
effective total	0.784	0.563	0.354	0.980	1.000

Table 11.4: Correlations with VAT tax gap in 2006 (21 countries)

	standard rate	VRR total	effective total	VAT gap
standard vat rate	1.000	-0.317	0.807	-0.141
VRR total	-0.317	1.000	0.292	-0.545
effective total	0.807	0.292	1.000	-0.556
VAT gap	-0.141	-0.545	-0.556	1.000

Table 11.5: Correlations VAT tax indicators in 2000 (15 countries)

	effective house	VAT gap	share standard	implicit rate	gap std, implicit%
effective house	1.000	-0.481	0.578	0.895	-0.703
VAT gap	-0.481	1.000	-0.146	-0.273	0.171
share standard	0.578	-0.146	1.000	0.760	-0.921
implicit rate	0.895	-0.273	0.760	1.000	-0.807
gap standard implicit%	-0.703	0.171	-0.921	-0.807	1.000

Table 11.3 shows the correlations between the main VAT indicators, calculated with the available 5-year averages. First, the standard VAT rate is shown to be weakly negatively correlated with the VAT Revenue Ratios but strongly positively correlated with the effective rates. The latter relationship is presented in Figure 11.1. Second, the VRR based on household consumption is strongly correlated with the VRR based on total consumption. The same finding holds for the effective tax rates (see the blocks on the diagonal). Third, the revenue rates are positively correlated with the effective rates (see also Figure 11.2).

The VAT gap variable is only available for a limited period (2000-2006) and a limited number of countries (24). We have computed in Table 11.4 the correlations between the VAT gap and other VAT indicators in 2006 (outcomes are similar for the other years). First, the findings based on 5-year averages in Table 11.3 are confirmed by the correlations for 2006 in Table 11.4. Second, the VAT gap is hardly correlated with the standard rate but negatively correlated with both the Revenue Ratio and the effective rate. Inspection of the definitions explains this negative correlation. The Revenue Ratio is equal to the ratio between observed and theoretical VAT revenues, while the gap is defined as one *minus* the ratio between observed and hypothetical revenues (after correcting for rate differentiation). Table 11.5 shows the correlations between the VAT gap and remaining VAT indicators that are only available for 2000. The results in table 11.5 present some indication that rate differentiation is correlated with a higher VAT gap.

Figure 11.1: Relationship between effective and standard VAT rates (5-year averages)

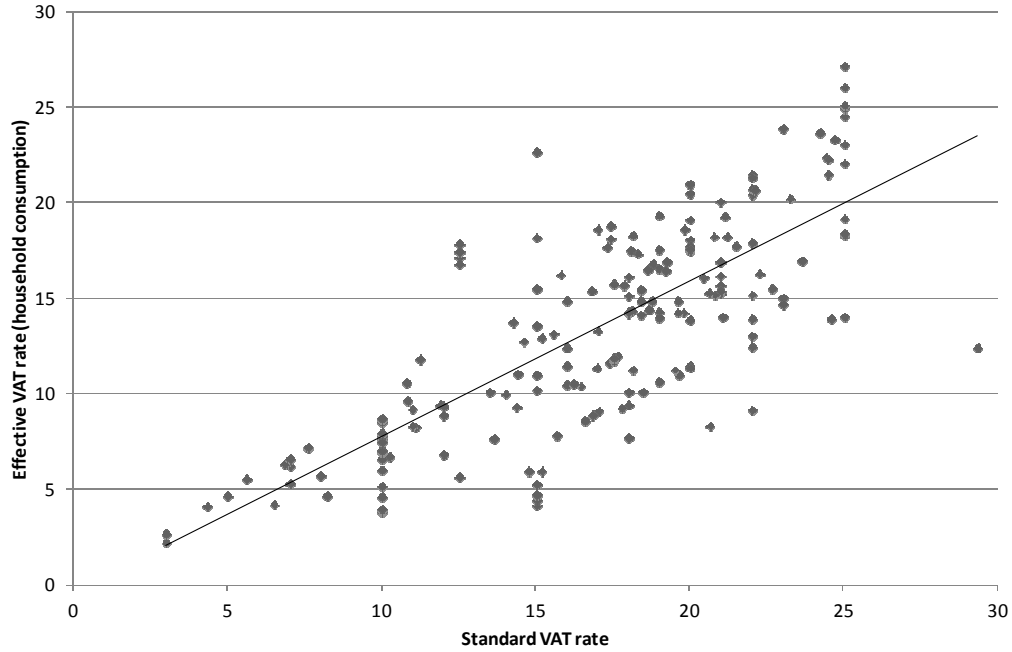
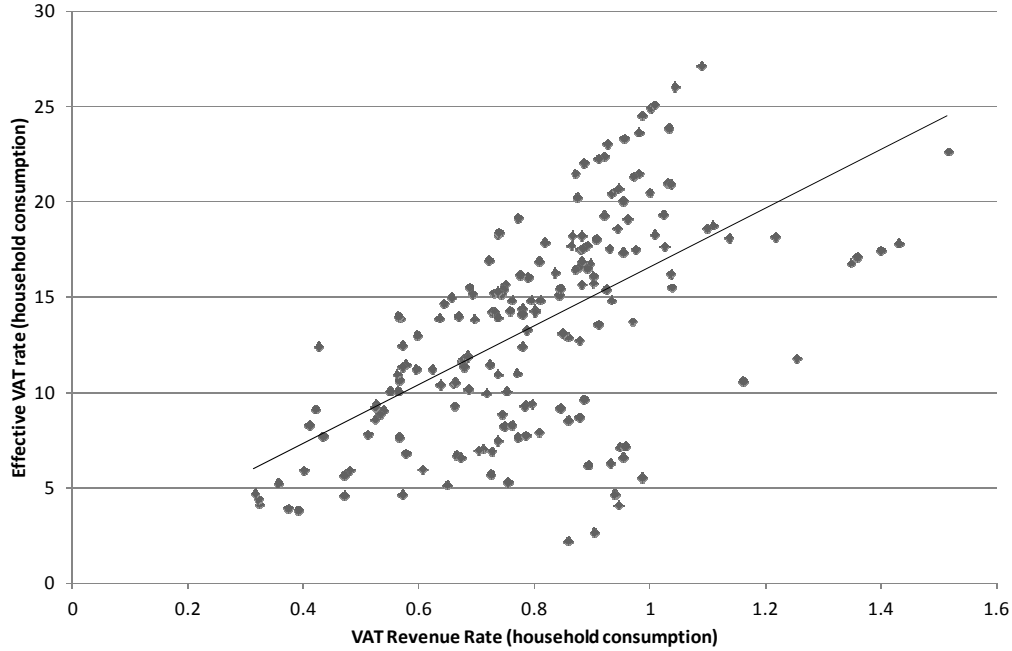


Figure 11.2: Relationship between effective rate and VAT Revenue Ratio (5-year averages)



11.8 Estimation results: Economic growth

We estimate growth regressions, focusing on the effects of elements of the VAT system. In the literature two types of specifications are found. The standard growth studies (like Lee and Gordon, 2005) focus on explaining long-run growth rates. The GDP growth rate is explained by control and tax variables in levels. The studies aim to eliminate short-run cyclical fluctuations by using five-year averages of the left-hand and right-hand side variables. As indicated before, this approach cannot really separate permanent from transitional effects on growth rates.

An exceptional approach is followed by Arnold (2008). He chooses to use annual data and to estimate explicitly the short-term dynamics. He therefore specifies an error correction model, in which the long-run and short-run components are simultaneously estimated. The long-run component relates the level of GDP per capita to explanatory variables expressed in levels. The short-run component explains annual GDP growth rates by growth rates of the explanatory variables, next to the so-called error correction term. The error correction term is defined as the deviation between the observed level and the predicted long-run level of GDP. The long-run coefficients are assumed equal across the countries, implying that the long-run relationships are homogenous for the OECD countries. In contrast, country-specific short-run coefficients and time controls are selected. Since Arnold (2008) and the related study of Johansson et al. (2008) only report long-run coefficients, their conclusions relate strictly speaking to effects on long-run GDP levels. Attaining a higher long-run level would necessitate larger transitional growth rates.

We favour the first approach because we want to restrict the number of coefficients to be estimated, in view of the limited available dataset. To maximise the number of observations, we combine time-series of different countries in a panel dataset. Only when data availability is poor or variability of crucial variables is insufficient, do we use cross-sectional estimation (i.e. a single observation is used for each country).

The left-hand side of the growth regressions is the growth rate of GDP (per capita). After including standard control variables, we focus on estimating the impact of value added taxes on economic growth. Experiments showed that including the same set of three standard control variables were sufficient:

1. Log of the initial level of GDP per capita
2. Log of the average investment share
3. Average openness (defined as the sum of exports and imports as a ratio to GDP)

We tried to extend this control set with the (log) population growth rate, (log) secondary school attainment and EU-membership. Since the corresponding coefficients were not significant, we have not included these control variables in the final regressions. Before we move to panel estimation, we start by discussing the results of cross-sectional estimation.

Cross-sectional estimation

In the first approach we regress the annual average growth rate of GDP (per capita) on the initial level of GDP and average values of the other explanatory variables (see e.g. Lee and Gordon (2005), Table 3). Average values are calculated from 1970 to 2009. This implies that we use one observation for each country.

Column (1) of Table 11.6 shows that all standard control variables are highly significant while having a plausible value in the base regression. Countries starting with a 1% higher GDP in 1970 are estimated to face a lower average growth rate by 0.008 percentage points (its sample average is 2.3%). An increase in the investment rate by 1% contributes to a higher growth rate by 0.016 percentage points. Finally, raising the openness ratio by 1 percentage point would lead to a 0.007 percentage point increase in the growth rate. These coefficients are robust to extending the regression with tax variables in the following columns.

Columns (2) to (4) explore the relationship between the overall tax structure and economic growth. Before we discuss the results, we elaborate on how the coefficients of the tax structure variables should be interpreted. Suppose two main taxes are considered: direct (income) taxes and indirect (consumption) taxes, with shares s_1 and s_2, respectively. Since the shares are expressed in terms of total tax revenues, these shares must add to one: $s_1 + s_2 = 1$. Focusing on the tax structure variables, the regression equation is briefly written as:

$$g = \alpha s_1 + \beta s_2$$

Notice that this equation cannot include a constant term since both explanatory variables add to one. However, using the identity $s_2 = 1 - s_1$, the growth equation can be written as:

$$g = \beta + (\alpha - \beta) s_1$$

This formulation clearly shows that the coefficient of the income tax share gives the relative and not the absolute contribution to growth. For example, in the case one finds that $\alpha = \beta$, or $\alpha - \beta = 0$, this does not mean that income taxes do not affect growth but that income taxes affect growth as much as the benchmark of consumption taxes. After controlling for total taxes, the tax shares represent the effect of revenue-neutral tax changes. In each regression, at least one tax category is omitted. The omitted category is assumed to compensate changes in the included taxes to ensure revenue neutrality (Arnold, 2008).

In the regressions of columns (2) to (3), we control for the size of total tax revenues (as fraction of GDP). The coefficient of this variable is significant in none of the cases. Remember that its sign is not known a priori, as it depends on how the revenues are spent. No significant effects are found for the shares of indirect taxes and value added taxes. These results remain inconclusive about which type of tax is most harmful or stimulating for economic growth. Notice that the sum of the income tax share and the indirect tax share equals one. Replacing the indirect tax share by the income tax share does not affect the outcomes in column (2), except for the sign of the coefficient of the income tax share.

Columns (4) to (7) focus on the effects of specific VAT-variables. The growth rate is not significantly affected by the standard VAT-rate, the VAT revenue ratio and the effective VAT-rate. In the last column the sample is restricted to countries that were EU member in the sample period.

Finally, we include the share of the standard rate base in the total VAT base. Data on this share are only available for 3 years (1996, 1998 and 2000) and 15 EU-countries (EC, 2004). Extending the regression with the standard-rated shares observed in 2000 does not give significant results.

The problem of the cross-sectional approach is that the sample is limited since it does not use the variation over time. Furthermore, the estimates are biased when omitted country characteristics are correlated with included explanatory variables. We therefore prefer estimation on the panel dataset.

Table 11.6: Cross-sectional growth regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln initial gdp	-0.008***	-0.007***	-0.011***	-0.008***	-0.008***	-0.008***	-0.006***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
ln investment	0.016***	0.016***	0.014***	0.016***	0.016***	0.016***	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
openness	0.007***	0.007***	0.008***	0.007***	0.007***	0.007***	0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
total tax		0.006	0.011				
		(0.015)	(0.015)				
indirect tax		0.016					
		(0.013)					
vat share			-0.027				
			(0.017)				
std. vat rate				0.003			
				(0.015)			
vrr					0.005		
					(0.006)		
effective rate						0.013	-0.031
						(0.027)	(0.028)
Observations	34	34	34	34	34	34	21
R-squared	0.704	0.719	0.729	0.705	0.711	0.707	0.902

Dependent variable is average annual growth rate of GDP/capita. Standard errors in parentheses. Constant term is not reported.
*** p<0.01, ** p<0.05, * p<0.1

Panel estimation with fixed effects

To maximise the number of observations, we constructed a panel dataset with five-year averages of the variables. We prefer to use average values to remove cyclical fluctuations. Due to the availability of the tax variables, the first period spans the years 1966-1970, while the last period covers 2006-2010. The dependent variable is now calculated as the growth rate of GDP per capita over 5 years. Openness (to trade) and (ln) initial income per capita are start-of-period values, whereas the remaining explanatory variables are period averages. The first panel estimator includes fixed effects for countries and periods (also known as the within groups estimator). The fixed effects for countries control for time-invariant country-specific effects.

Column (1) of Table 11.7 shows that the three standard control variables again have the expected sign.[273] From the tax structure variables in columns (2)-(3), only the share of VAT in total taxes has a significant, positive effect on growth. When the tax share of

[273] The coefficients are comparable to Bond et al. (2001) and Straathof et al. (2008, Table 6.1). The sample of these studies also contains developing countries.

VAT is raised by 1 percentage point (while keeping total tax revenues a constant fraction of GDP), the country grows faster by 0.03 percentage point per year.[274] From the regressions with the specific VAT rates in columns (4)-(6), the effective rate has a significant, positive effect. A 1 percentage point higher rate is related to a 0.1 percentage point higher annual growth rate. The effective rate is only marginally significant when the sample is restricted to EU members in column (7).

One could distinguish between the effect whether a VAT-system exists or not and the separate effect of a VAT rate (conditional on existence). We added to all regressions a dummy that equals one when the country applied a VAT system (the dummy equals 0.2 when the country only implemented a VAT system in one of the 5 years).[275] Including this VAT dummy does not change the qualitative findings and the results are therefore not included in the following tables.

However, the OLS-estimator applied in this section is known to suffer from three types of problems (see e.g. Bond et al., 2001). First, this estimator ignores potential endogeneity problems. Its basic assumption is that an explanatory variable can determine growth but it ignores that growth can affect the explanatory variable. For example, we examine the hypothesis that a higher income tax share is harmful for economic growth. However, when at the same time a higher growth leads to a higher tax share, the OLS estimate is biased. In addition, the growth rate on the left-hand side equals the change of GDP relative to its initial level. This means that the initial GDP-level at the right-hand side is by construction endogenous, which leads to a bias in the parameter estimate. Second, the variables in growth regressions are known to be measured with error, which results in inconsistent OLS estimates. Third, estimation suffers from bias due to omitted variables. Unobserved time-varying country-specific effects might be insufficiently captured by the country fixed effects. The System-GMM estimator is developed to tackle these problems.

[274] This is 0.14/5=0.028. To be precise, $(1+g)^5 = 1.14$ implies that $g = 0.027\%$. The average growth rate and VAT share equal 12% and 14% in this sample, respectively.
[275] US is the only country in our sample that has operated a VAT-system during none of the years.

Table 11.7: Panel estimation with fixed effects of growth regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln initial gdp	-0.249***	-0.298***	-0.288***	-0.245***	-0.232***	-0.228***	-0.348***
	(0.050)	(0.067)	(0.068)	(0.051)	(0.047)	(0.046)	(0.119)
ln investment	0.179***	0.221***	0.212***	0.178***	0.175***	0.181***	0.165
	(0.048)	(0.049)	(0.047)	(0.050)	(0.046)	(0.047)	(0.119)
openness	0.133*	0.181***	0.178***	0.133*	0.107	0.100	0.224**
	(0.070)	(0.046)	(0.044)	(0.070)	(0.065)	(0.063)	(0.080)
total tax		-0.155	-0.189				
		(0.170)	(0.175)				
indirect tax		-0.046					
		(0.160)					
vat share			0.141**				
			(0.067)				
std. vat rate				0.136			
				(0.131)			
vrr					0.059*		
					(0.031)		
effective rate						0.501**	1.126*
						(0.216)	(0.555)
Observations	380	264	267	375	365	369	105
Countries	40	39	39	40	39	39	24
R-squared	0.493	0.615	0.625	0.494	0.486	0.494	0.694

Dependent variable is 5-year growth rate of GDP/capita. Robust standard errors in parentheses. Fixed effects are included but not reported. *** p<0.01, ** p<0.05, * p<0.1

System-GMM estimation

Bond et al. (2001) propose the System-Generalised Method of Moments (GMM) estimator to overcome the OLS-problems. This technique is equivalent to replacing an endogenous explanatory variable by one or more alternative variables. The latter variables are called the instruments. Intuitively, instruments should be strongly correlated with the problematic variable but should be exogenous to the dependent variable. System-GMM uses lagged values of the corresponding variable as instruments. These lagged variables like openness in previous periods are generally highly correlated with current openness, but are less likely to be influenced by the contemporaneous growth rate.[276] This estimator is proven to yield consistent estimates, even when the number of periods is small.[277]

[276] System-GMM estimates in fact two equations: an equation in first-differences and an equation in levels. The first-difference equation uses suitably lagged levels of the explanatory variables as instruments, while the levels equation uses lagged first-differences as instruments.

[277] System-GMM estimation is performed by using the *xtabond2* command in Stata. Income per capita lagged 2 to 4 periods is included as instruments in the first-differences equation. The other regressors are

When the OLS-problems are properly tackled by using instrumental variables, only the investment ratio remains significant (Table 11.8). In our homogenous sample of developed countries, even the initial level of GDP (per capita) and the openness ratio lose their statistical significance.[278] None of the tax variables turns out to have a significant impact. In contrast, El-Ganaiy (2006, Tables B25-B29) finds that the effective VAT rate is positively and significantly correlated with growth in a sample of 14 EU-countries (EU-15, without Luxembourg). A 1 percentage point increase in the VAT rate would lead to a 0.2-0.3 percentage point increase in the growth rate. Since the estimation approach is not fully described (e.g. the exact set of instruments), we were unable to reproduce these results.

Table 11.8: System-GMM estimation of growth regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln initial gdp	-0.012	-0.002	0.038	-0.012	0.024	0.011	-0.066
	(0.038)	(0.060)	(0.061)	(0.059)	(0.075)	(0.071)	(0.112)
ln investment	0.274***	0.244***	0.244***	0.303***	0.342***	0.351***	0.233
	(0.078)	(0.090)	(0.073)	(0.067)	(0.066)	(0.076)	(0.327)
openness	0.057	0.065*	0.054*	0.007	0.014	0.003	0.000
	(0.035)	(0.037)	(0.031)	(0.063)	(0.060)	(0.066)	(0.102)
total tax		-0.534*	-0.515				
		(0.283)	(0.309)				
indirect tax		-0.137					
		(0.250)					
vat share			0.203				
			(0.259)				
std vat rate				0.232			
				(0.203)			
vrr					0.059		
					(0.066)		
effective rate						0.629	1.743
						(0.432)	(2.294)
Observations	380	264	267	375	365	369	105
Countries	40	39	39	40	39	39	24

Dependent variable is 5-year growth rate of GDP/capita. Standard errors in parentheses.
Fixed effects are included but not reported. *** p<0.01, ** p<0.05, * p<0.1

lagged 2 periods in the set of instruments. The constant term and period dummies are instrumented without lags. For the levels equation the lagged first-differences of the regressors are used as instruments. Other options include two-step estimation, robust standard errors and collapsing the number of instruments.

[278] More significant variables are reported with heterogeneous samples by Bond et al. (2001) and Straathof et al. (2008, Table 6.1).

Which estimation results should be preferred? On the one hand, panel estimation with fixed effects likely results in biased estimates, which can be tackled by applying the system GMM-estimator. On the other hand, system GMM demands more of the dataset, which is a serious issue given our short time span. In weighing the pros and cons, we consider the benefit of obtaining unbiased estimates with system GMM to be more important than the drawback of large standard errors. In the preferred System-GMM estimations, VAT-related variables have no significant effects on economic growth.

11.9 Estimation results: Private consumption

In this section we examine the effect of value added taxes on (ln) real private consumption expenditures (per capita). Inspired by the standard theories and the significant results of El-Ganainy (2006, Table B1), we decide to include three basic control variables. First, according to standard theory, the consumer aims to smooth consumption over the lifetime. As a result, consumption shows a high persistence, making its lagged level an adequate regressor. Habit formation provides an additional explanation of the effect of past consumption levels. Second, the consumption decision is based on permanent income (this is the expected average income over the lifecycle). Current income is taken as an approximation of the permanent level. Finally, consumption is specified as a function of the real long-run interest rate. The interest rate has a negative substitution effect on current consumption and a positive income effect.[279] The net effect is expected to be negative as a rising interest rate stimulates savings and depresses current consumption. When a VAT-related variable is included, we control in addition for total tax revenues, excluding VAT-taxes (as % of GDP). We expect a negative relation between non-VAT taxes and consumption. We report results for the OLS and System-GMM panel estimators in Tables 11.9 and 11.10, respectively.[280, 281]

[279] Raising the interest rate makes postponing consumption more attractive, resulting in substituting current consumption by future consumption. At the same time, for a given amount of savings, a higher interest rate results in a higher capital income. Higher future income also stimulates current consumption.

[280] Consumption and income are measured at the end of the period while the other variables are average values. For the GMM-estimation, consumption, income per capita and the real interest rate lagged 2 to 3 periods are used as instruments in the first-differences equation. The tax variables are lagged 2 periods when included in the set of instruments.

[281] The real interest rate is the real long-term interest rate, based on the deflator of private consumption, from the Ameco database (variable ILRC). Data are added from OECD Economic Outlook for Australia, Korea, Mexico and New Zealand.

Table 11.9: Panel estimation with fixed effects of consumption regressions

	(1)	(2)	(3)	(4)	(5)
ln lagged consumption	0.333***	0.362***	0.342***	0.344***	0.360***
	(0.065)	(0.065)	(0.059)	(0.060)	(0.064)
ln gdp	0.499***	0.473***	0.462***	0.457***	0.476***
	(0.104)	(0.101)	(0.102)	(0.100)	(0.099)
real interest rate	0.488**	0.463**	0.509***	0.520**	0.492**
	(0.229)	(0.211)	(0.179)	(0.200)	(0.211)
non-vat taxes		-0.109	-0.088	-0.105	-0.159
		(0.075)	(0.094)	(0.126)	(0.111)
standard vat rate			0.074		
			(0.128)		
vrr				0.004	
				(0.032)	
effective vat rate					-0.179
					(0.223)
Observations	221	208	207	207	208
Countries	38	37	37	37	37
R-squared	0.983	0.980	0.979	0.979	0.980

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 11.10: System-GMM estimation of consumption regressions

	(1)	(2)	(3)	(4)	(5)
ln lagged consumption	0.639***	0.758***	0.761***	0.746***	0.780***
	(0.066)	(0.124)	(0.167)	(0.180)	(0.137)
ln gdp	0.213***	0.243***	0.233***	0.226***	0.211***
	(0.061)	(0.078)	(0.073)	(0.065)	(0.075)
real interest rate	-0.926	-1.126	-1.408	-1.150	-1.122
	(1.029)	(0.933)	(1.120)	(0.867)	(0.967)
non-vat taxes		-0.609	-0.558	-0.484	-0.566
		(0.449)	(0.575)	(0.739)	(0.472)
standard vat rate			0.303		
			(0.247)		
vrr				0.005	
				(0.081)	
effective vat rate					0.355
					(0.288)
Observations	221	208	207	207	208
Countries	38	37	37	37	37

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Inspection of the results shows that the standard control variables provide a reasonable explanation of real private consumption (per capita). When moving from the OLS-estimates in Table 11.9 to the GMM-estimates in Table 11.10, effects of lagged consumption levels increase and (short-run) income elasticities of consumption fall. Significant, positive interest rate effects turn into negative but insignificant effects in the latter Table.

None of the tax variables are estimated significantly in Table 11.9. Surprisingly, even an increase in the standard VAT rate, which raises consumer prices, does not affect consumption significantly. GMM-estimation does not change these results (Table 11.10).

In contrast, El-Ganainy (2006, Table B1-B14) find a significant negative relationship between the effective VAT rate and aggregate private consumption in a sample of the EU15-countries over the period 1961-2000. Consumption is estimated to fall by around 1 percentage point (over five-years) after the effective rate is increased by 1 percentage point.[282] We could not reproduce significant estimates for the effective rate, nor when the subsample is restricted to EU member states.

11.10 Estimation results: Labour market

In this section we estimate the impact of VAT rates, as component of the tax wedge, on unemployment and employment rates. The specification of the equations is inspired by Scarpetta (1996).[283] He assesses the role of policy and institutional factors in explaining cross-country variation in the level of structural unemployment.[284] Estimation in Scarpetta (1996) is based on a panel of annual data over the period 1983-1993 for 17 OECD countries.[285] The effects of taxation are captured by the tax wedge between the real cost to the employer of hiring a worker and the net real wage received by the worker. The tax wedge is crudely measured as the sum of the average total tax rate on

[282] The sample mean and the standard deviation of the effective rate equal 5.4% and 4.9%, respectively.
[283] For related work, see Nickell (1998), Blanchard and Wolfers (2000) and the studies cited in Scarpetta (1996).
[284] In addition, he explores the determinants of the speed of labour market adjustments. Since the tax wedge is not included in the dynamic versions of the equations, we will not discuss this second type of regressions.
[285] The sample consists of the EU15-members (excluding Austria, Greece and Luxembourg), Australia, Canada, Japan, Norway and United States.

labour income (including employers' and employees' social security contributions) and the effective tax rate on consumption.[286]

Tyrväinen (1995) is one of the few studies that allows for differentiated effects of labour and consumption taxation on labour market outcomes. This study estimates a separate Vector Autoregressive Model for 10 OECD countries. The implications of the estimation results are best illustrated by way of simulations. The simulations consider a cut in both the income tax rate and the employers' social security contribution rate by half a percentage point and a revenue-neutral rise in the consumption tax rate. Since the consumption tax base is broader than the wage bill, the consumption tax rate increases by less than 1 percentage point and the real labour costs fall. The effects on employment and unemployment are favourable both in the short run and in the long run. However, Tyrväinen stresses that these outcomes hinge on the assumption that the real value of pensions, unemployment benefits and other public transfers are allowed to fall as a result of higher consumption taxes.

Description of the variables and data sources

For this section we constructed another panel dataset covering 27 OECD countries. These are the EU15 countries, 4 new EU members (CZ, HU, PL and SK) and 8 non-EU members (AU, CA, CH, JP, KR, NO, NZ and US). Data are available for the period 1979-2004.[287] We briefly describe the labour market variables. The source of the following variables is the Labour database of the OECD:

- The unemployment rate (% of the civilian labour force)
- The long-term unemployment rate (persons unemployed for longer than one year as a % of total unemployment). Multiplication with the first variable gives the long-term unemployed as a % of the civilian labour force.
- (civilian) employment (in 1000 persons)
- Union density (defined as the number of wage and salary earners that are trade union members, divided by the total number of wage and salary earners)

[286] This tax wedge is written as $\tau^l + \tau^c$, where τ^l denotes the total labour tax rate and τ^c the effective consumption tax rate. When the tax rates are small, $(1 + \tau^l + \tau^c)$ approximates well the alternative definition $(1 + \tau^c) / (1 - \tau^l)$ (used in e.g. Copenhagen Economics, 2007).

[287] Data on the average tax rate on labour income are only available till 2004 due to a structural break.

- ALMP (public expenditure as % of GDP on active labour market policies, categories 10-70). Dividing by the first variable gives the ALMP expenditures per unemployed person relative to GDP per member of the labour force
- Employment protection legislation (EPL) follows the OECD classification, version 1.

Variables from other sources are:

- Gross replacement rate (GRR) is taken from OECD tax-benefit models.[288] This summary measure is defined as the average of the gross unemployment benefit replacement rates for two earnings levels, three family situations and three durations of unemployment. Data are only available for odd-numbered years. For even-numbered years, we calculate the average value of the previous and the following odd year
- Output gap (defined as the deviation between actual and trend GDP, expressed as a % of trend GDP) is taken from OECD Economic Outlook No 89
- Labour tax rate is taken from OECD 'Taxing wages'. Due to data availability we use data from 'historical model A' for a one-earner married couple at 100% of average earnings, with 2 children. It is defined as employees' and employers' social security contributions and personal income tax less transfer payments as percentage of gross labour costs (gross wage earnings plus employers' social security contributions). For the period 1979-1993, data are only available for odd-numbered years. For even-numbered years, we calculate the average value of the previous and the following odd year
- Effective consumption tax rate is defined as the consumption tax revenues (OECD classification 5000), divided by final consumption expenditures minus consumption tax revenues. Since this section aims to check the outcomes of the standard specification, we do not include VAT-related variables.

We apply the panel estimator with fixed effects for countries and years, assuming that all explanatory variables are predetermined.

The unemployment rate

Table 11.11 presents the results of the regressions on the unemployment rate. We discuss these results in comparison to Table 1 in Scarpetta (1996). Column (1) first shows that the unemployment rate is lower in a booming economy. When current GDP

[288] See: www.oecd.org/els/social/workincentives

rises 1% above its trend level, the unemployment rate falls by 0.5 percentage point. This estimate is identical to the one reported by Scarpetta. Next, Scarpetta finds an insignificant effect of the total tax wedge. We find that unemployment is significantly related to the labour tax rate but not to the consumption tax rate. However, in view of the large standard errors, we cannot reject the hypothesis that the effect of the consumption tax rate equals the effect of the labour tax rate. Imposing the restriction that both tax rates have the same coefficient results in an impact of the tax wedge of 0.18% in column (2), without altering much the other coefficients. This implies that raising the effective VAT rate, or the labour tax rate, by 1 percentage point increases the estimated unemployment rate by 0.18 percentage point (ceteris paribus). The results for the included policy variables are in line with Scarpetta: unemployment is higher with a higher replacement rate and with lower expenditures on active labour market programmes per unemployed person (% of GDP per capita). Finally, in contrast to the significant, positive effect of labour union density in Scarpetta, we find insignificant estimates.

Table 11.11: Unemployment rate (% of civilian labour force)

	Annual			5-year period		
	(1)	(2)	(3)	(4)	(5)	(6)
unemployment rate (-1)			0.553***			0.675
			(0.110)			(0.626)
output gap	-0.520***	-0.544***	-0.339***	-0.813***	-0.850***	-1.010***
	(0.084)	(0.092)	(0.066)	(0.136)	(0.149)	(0.290)
labour tax rate	0.210***			0.188***		
	(0.051)			(0.045)		
consumption tax rate	0.004			-0.113		
	(0.116)			(0.204)		
labour + consumption tax rate		0.178***	0.059***		0.159***	0.059
		(0.045)	(0.018)		(0.043)	(0.139)
gross replacement rate	0.075*	0.070*	-0.019	0.056	0.051	-0.041**
	(0.038)	(0.038)	(0.021)	(0.034)	(0.033)	(0.019)
ALMP/unemployed	-0.073***	-0.075***	-0.042**	-0.068***	-0.070***	-0.016
	(0.009)	(0.008)	(0.017)	(0.011)	(0.012)	(0.091)
Union density	0.004	0.013	0.002	-0.054	-0.047	-0.005
	(0.070)	(0.068)	(0.014)	(0.069)	(0.068)	(0.028)
Observations	369	369	369	78	78	78
Countries	27	27	27	27	27	27
R-squared	0.716	0.709		0.758	0.749	

Robust standard errors in parentheses. Fixed effects for years and countries are not reported.
*** p<0.01, ** p<0.05, * p<0.1

In column (3), a dynamic specification is considered, incorporating the lagged unemployment rate at the right-hand side. We switch to the system GMM estimator, using third lags to instrument the unemployment rate. The short-run impact of the total tax wedge is 0.06. Since the long-run effects are 1 / (1-0.553) = 2.2 times larger, the estimates of column (3) are well in line with the ones in column (2).[289]

The estimated impact of the tax wedge is robust in various sensitivity analyses. First, we estimate the same regressions with averages of 5-year periods (see e.g. Blanchard and Wolfers, 2000). Column (5) confirms that the impact of the total tax wedge is hardly affected with this alternative dataset. The GMM-estimate of the tax wedge effect in column (6) is the same as in (3) but loses its significance in the small sample. The results of the following exercises are not included in Table 11.11. In a second exercise, we drop the 4 observations of each of the 4 new EU12 members. The coefficient of the tax wedge is not significantly changed. Third, we include the VAT dummy to check whether unemployment is higher in countries that operate a VAT system. The presence of a VAT system has no significant effect additional to the impact of the tax wedge. Fourth, in view of the limited time variability of the policy variables, the country fixed effects might harm estimation of the impact of these variables. However, dropping fixed effects barely changes the estimates. Fifth, the conclusions also hold when the dependent variable is expressed in logs, as in Nickell (1998). The finding that a rise in the total tax rate by 1 percentage point worsens the unemployment rate by 2.3% is consistent with the benchmark estimate in column (2).[290] Finally, Scarpetta (1996) reports a significant positive effect of the index of the employment protection legislation (EPL). Extending our regression with the EPL index results in an insignificant estimate but the coefficient of the tax wedge remains robust.

The long-term unemployment rate

Next, we explore the relation between the tax wedge and the long-term unemployment rate. This rate is defined as the fraction of the civilian labour force that is unemployed longer than one year. The results in Table 11.12 are comparable to Table 3 in Scarpetta

[289] This calculation is explained by way of the simple specification: $y_t = \alpha y_{t-1} + \beta x_t$. In the short run y_{t-1} is given and the effect of x_t on y_t equals β. In the long run we assume that y is constant, or $y_t = y_{t-1} = \overline{y}$, implying $\overline{y} = \beta x_t / (1-\alpha)$. The cumulative effect of a change in x_t on the long-run level of y_t thus equals $\beta / (1-\alpha)$.

[290] A relative change of 2.3% combined with an average rate of 7.5% implies an absolute change of 0.17 percentage point. Nickell (1998, Table 2) reports a similar elasticity of 0.027.

(1996). The sign and significance of the coefficients are similar to those in the total unemployment regressions. The long-term unemployment rate responds less to fluctuations of the output gap. Again, the long-term unemployment rate only significantly depends on the labour tax rate but the hypothesis that both taxes have a common coefficient is not rejected. The impact of the total tax wedge of 0.14 in column (2) is smaller than estimated for the total unemployment rate. In this case, Scarpetta also reports a robust estimate of around 0.11, while Nickell (1978) finds an insignificant elasticity. Estimation of the dynamic specification in column (3) shows that the long-term unemployment rate is highly persistent, rendering the coefficients of the policy variables, including the tax wedge, insignificant. Finally, estimation with 5-year averages gives similar results in columns (4) and (5). However, GMM-estimation in the last column results in implausible effects, indicating a highly explosive pattern of the unemployment rate.

Table 11.12: Long-term unemployment rate (longer than one year)

	Annual			5-year period		
	(1)	(2)	(3)	(4)	(5)	(6)
LT unempl. rate (-1)			0.958***			1.627***
			(0.154)			(0.567)
output gap	-0.270***	-0.290***	-0.130***	-0.392***	-0.427***	-0.559***
	(0.067)	(0.075)	(0.031)	(0.115)	(0.127)	(0.102)
labour tax rate	0.165***			0.163***		
	(0.047)			(0.052)		
consumption tax rate	-0.022			-0.099		
	(0.081)			(0.144)		
labour + consumption tax rate		0.138***	0.003		0.134**	-0.048
		(0.045)	(0.021)		(0.051)	(0.091)
gross replacement rate	0.037**	0.033**	-0.002	0.022	0.019	-0.073**
	(0.016)	(0.016)	(0.004)	(0.023)	(0.023)	(0.033)
ALMP/unemployed	-0.028***	-0.030***	0.004	-0.024**	-0.027***	0.071
	(0.007)	(0.007)	(0.011)	(0.010)	(0.009)	(0.064)
Union density	-0.036	-0.032	-0.003	-0.074	-0.065	0.017
	(0.048)	(0.047)	(0.005)	(0.051)	(0.049)	(0.032)
Observations	342	342	328	76	76	72
Countries	27	27	27	27	27	27
R-squared	0.595	0.582		0.625	0.607	

Robust standard errors in parentheses. Fixed effects for years and countries are not reported.
*** p<0.01, ** p<0.05, * p<0.1

Growth of employment

When the sum of employment and unemployment equals the labour force, the effect of a variable on the employment rate is simply given by minus the corresponding coefficient reported for the unemployment equation in Table 11.11. In a last set of regressions, we aim to explain the growth rate of (civilian) employment for the following reason. The change in employment (E) equals the number of persons who found a new job, measured by filled vacancies V, minus the number of persons who lost a job. If we assume that the latter is proportional to existing employment, dividing all variables by employment gives the expression:

$$\Delta E / E = V / E - \delta$$

where δ denotes the job termination rate. Under the strong assumption that δ is a country-specific constant, its effect is captured by the country fixed effect. Under these conditions, the growth rate of employment is driven by the (filled) vacancy rate (V/E).

Table 11.13 presents the estimated effects on the growth rate of employment. As expected, net vacancies grow when the economy expands. Surprisingly, employment growth increases significantly with the labour tax rate, but is insignificantly associated with the consumption tax rate. As indicated by the large standard errors, the coefficients of both tax rates are not significantly different from each other. After imposing a common coefficient in column (2), increasing the total tax rate by 1 percentage point leads to a higher growth by 0.07 percentage point (compared to an average growth rate of 1.14%). From the other control variables, only the ALMP variable is significant. Spending more on active labour market programmes contributes to less filled vacancies within the same year. The qualitative findings are similar when the regressions are re-estimated with 5-year averages (see last two columns).[291] Controlling for short-run fluctuations more than doubles the impact of the total tax wedge in the last column.

[291] In this case, the dependent variable is the average annual change in employment divided by its initial level in the period.

Table 11.13: Growth rate of (civilian) employment

	Annual		5-year period	
	(1)	(2)	(3)	(4)
output gap	0.581***	0.561***	0.389***	0.415***
	(0.095)	(0.085)	(0.091)	(0.083)
labour tax rate	0.095**		0.122*	
	(0.038)		(0.061)	
consumption tax rate	-0.080		0.340	
	(0.165)		(0.299)	
labour + consumption tax rate		0.068**		0.144**
		(0.032)		(0.063)
gross replacement rate	-0.026	-0.031	-0.047	-0.043
	(0.040)	(0.042)	(0.057)	(0.051)
ALMP/unemployed	-0.015**	-0.016**	-0.021	-0.020
	(0.005)	(0.006)	(0.019)	(0.017)
Union density	(0.005)	0.072*	-0.021	-0.026
	(0.045)	(0.037)	(0.055)	(0.061)
Observations	369	369	78	78
Countries	27	27	27	27
R-squared	0.341	0.336	0.477	0.467

Robust standard errors in parentheses. Fixed effects for years and countries are not reported.
*** p<0.01, ** p<0.05, * p<0.1

We conclude that the effective VAT rate affects labour market outcomes via the total tax wedge. We find that the total tax wedge has a robust, positive effect on the total unemployment rate. This effect can be mainly attributed to the direct taxation of labour income, since the isolated effect of the consumption tax rate is never significant. The tax wedge seems to have a smaller effect on the long-term unemployment rate. The growth rate of employment, taken as a measure of the filled vacancy rate, is unexpectedly positively associated to the tax wedge.

11.11 Estimation results: Government revenues

In this section we discuss three questions on the role of the VAT in raising government revenues. First, are total tax revenues higher in countries with a VAT? Secondly, does an increase in VAT revenues cause an increase in total tax revenues? Thirdly, which factors improve the revenue-efficiency of the VAT?

The relationship between total taxes and the presence of a VAT

Are total tax revenues higher when a VAT is present than when it is not? The question has been studied extensively in the empirical literature. Keen and Lockwood (2006) call this the weak form of the hypothesis that the VAT is a money machine. Table 11.14 documents the different approaches adopted in the studies. In particular, the specification of the dependent variable differs, although the specific choice is hardly motivated in the studies. In all studies, the VAT system is represented by a dummy taking the value unity if a VAT exists and zero if not.

Table 11.14: Overview of the literature on total tax revenue and VAT

Study	Dataset	Coverage	Dep. var.
Ebrill et al. (2001), Table 3.4	cross-section	World (71)	ln(t/1-t)
Keen & Lockwood (2006), Table 3	panel	OECD (30)	t
Keen & Lockwood (2010), Table 2	panel	World (143)	ln(t)
Martinez-Vazquez & Bird (2010), Table 4/5	panel	World (107)	t

Note: t = Total tax revenues /GDP; number of countries in parentheses.

Ebrill et al. (2001) use a cross-section of 71 countries. They find a positive relationship between the presence of a VAT and general tax revenue. The effect is increasing in GDP per capita. Surprisingly, the effect becomes insignificant when revenue is restricted to tax receipts of the central government. Keen and Lockwood (2006) report that the evidence on the impact of a VAT on revenue is not robust within the OECD. When data of 30 OECD members are analysed over the period 1965-2004, VAT variables are not significant. Only when 7 recent OECD members are dropped from the sample, has the adoption of the VAT a significant, positive effect on revenue, while this effect falls in the income level. They report that a VAT yields a positive but modest gain equal to 1.6% of GDP for an "average" OECD country. Keen and Lockwood (2010) extend the approach to a panel of 143 countries. The results indicate that a VAT contributes to a higher tax ratio in all countries (except in sub-Saharan Africa). The gains tend to be greater in higher income countries and in more open economies. VAT increases the tax ratio by 4% in EU15 (plus Norway and Switzerland).[292] Their conclusions seem to conflict with the results of Martinez-Vazquez and Bird (2010). They find that the VAT variables are only significant for a sample with developing countries but not for a sample of developed countries.

[292] This is the relative increase ($\Delta t/t$), not the absolute change (Δt).

Our own work is based on an unbalanced panel of 39 EU and OECD countries (Estonia is omitted). The estimation uses annual data over the period 1965-2009 for a better comparison with other studies. We also report results based on 5-year averages, as used in the previous sections. We first select the total tax ratio (% of GDP) as dependent variable since it simplifies the interpretation of the coefficients. This specification assumes that the *absolute* change in the tax ratio following the adoption of a VAT is constant for all countries. We also present regressions explaining the ln(tax ratio).

The first column of Table 11.15 presents panel estimates with fixed effects for years and countries. The presence of a VAT has a significant positive effect on the tax ratio. Countries collect 1.8% (of GDP) more revenue when they have a VAT than when they do not have a VAT. The tax ratio is lower for countries that are more open to international trade (as measured by the sum of exports and imports as a percentage of GDP). GDP per capita has no significant effect. These results are similar to those obtained by Keen and Lockwood (2006, Table 3, column 2), except for the GDP-effect. They find a significant negative effect of (ln) GDP, in combination with a negative effect of the share of agriculture in GDP. The negative correlation between those two variables might explain the insignificant effect of income in our regression. Column (2) adds the interaction term between the VAT dummy and (ln) GDP per capita, as well as the interaction with openness. It shows that the VAT effect does not depend on these characteristics.

However, the tax ratio is known to develop rather smoothly, creating autocorrelation over time. A basic dynamic specification is therefore considered by adding the lagged dependent variable in column (3). The simple VAT dummy remains positive, but the total VAT effect now falls significantly with GDP/capita and rises with openness (p = 5.1%). To illustrate the implications of these results, we compute the short-run change of the total tax ratio that is associated with adopting a VAT. Increasing the VAT dummy from 0 to 1, the short-run effect is calculated as $0.061 - 0.006 \ln(GDP / capita)$, while ignoring the interaction with openness. Figure 11.3 presents the relationship between the effect of VAT's presence on the total tax ratio and the income level in 2000.[293] It shows that the VAT effect is positive when GDP/capita is below the Spanish level, while it is negative for higher levels.

[293] In the regression, a linear relation is assumed between the tax ratio and *ln*(GDP/capita). This explains the non-linear function in figure 11.3 with GDP/capita on the horizontal axis.

Table 11.15: The total tax ratio and VAT existence (annual data)

	(1)	(2)	(3)	(4)	(5)
Total tax ratio(-1)			0.902***	0.700	1.164***
			(0.012)	(0.439)	(0.062)
Ln GDP/capita	0.007	0.010	0.009***	0.010	-0.011**
	(0.015)	(0.015)	(0.002)	(0.027)	(0.005)
Openness	-0.043**	-0.053	-0.010*	0.015	-0.017
	(0.021)	(0.032)	(0.005)	(0.015)	(0.015)
VAT dummy	0.018**	0.069	0.061**	0.033	0.086*
	(0.009)	(0.118)	(0.028)	(0.107)	(0.047)
Ln GDP/capita*VAT		-0.006	-0.006**	-0.003	-0.010*
		(0.013)	(0.003)	(0.011)	(0.005)
Openness*VAT		0.010	0.006*	-0.015	0.016
		(0.020)	(0.003)	(0.013)	(0.011)
Estimation method	OLS	OLS	OLS	GMM diff.	GMM syst.
Year dummies	Yes	Yes	No	No	No
Observations	1324	1324	1283	1244	1283
Countries	39	39	39	39	39
R-squared	0.660	0.661	0.920		

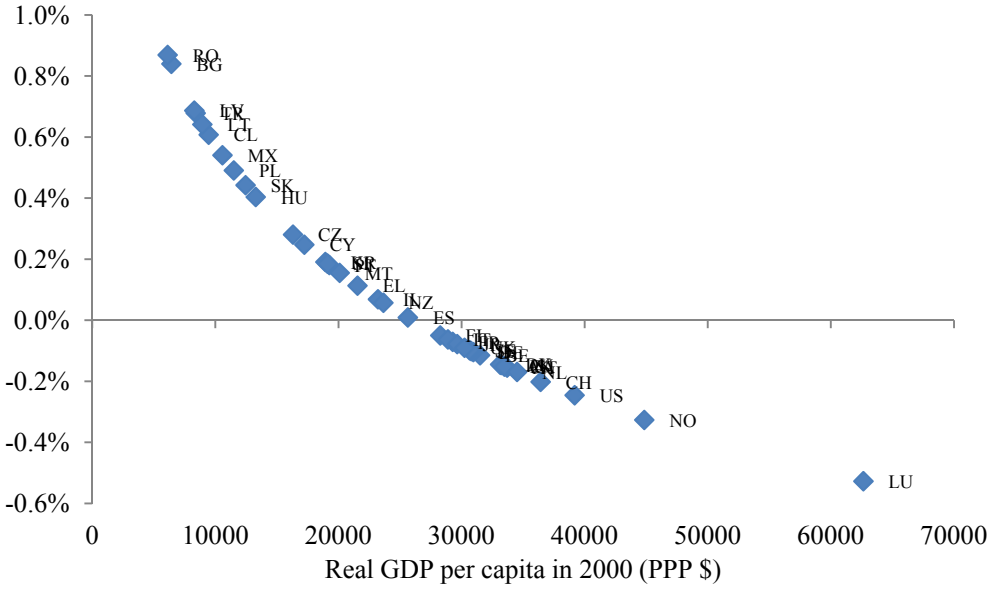
Robust standard errors in parentheses. Fixed effects for years and countries are not reported.
*** p<0.01, ** p<0.05, * p<0.1

It is likely that this estimation suffers from endogeneity problems caused by having the lagged tax ratio among the regressors. In addition, the causality may run in both directions for the other explanatory variables. In particular, the VAT dummy may be an endogenous variable when a VAT is preferred because it is believed to be an efficient tax. Keen and Lockwood (2010) do not find strong evidence of such an adoption bias. In line with Keen and Lockwood (2006, 2010) we only instrument the tax ratio, using third lags. The other variables are assumed exogenous. Following the three panel studies in Table 11.14, we first apply the difference GMM estimator.[294] Column (4) shows that this method renders all effects insignificantly different from zero. This estimator has been found to perform poorly for persistent series since lagged levels are weak instruments in estimating the difference equation (see Bond et al., 2001). The system GMM estimator is proposed as a superior method to reduce the endogeneity bias. The results of the system GMM estimation are found in the last column. This

[294] The large set of year dummies could not be included with the GMM-estimator.

regression is unattractive as the coefficient of the lagged tax ratio exceeds one. This implies that the tax ratio in every year changes more than in the previous year, meaning that the tax ratio would never stabilise. Therefore, the existence of a stable long-run value requires that the coefficient of the lagged dependent variable is smaller than one. Anyway, GMM estimation only weakly indicates favourable effects of a VAT presence (the interaction term with GDP/capita has a p-value of 5.0%). Keen and Lockwood (2006 and 2010) do not include the observations of the new EU12 members. The estimation results hardly change with the smaller sample. In sum, the preferred GMM estimation results provide no strong evidence on the relation between total tax revenues and the presence of VAT.

Figure 11.3: The short-run effect of VAT's presence on the total tax ratio



Note: based on column (3) of Table 11.15.

Next, we present regressions for which the dependent variable is alternatively specified as the *ln* of the total tax ratio (as in Keen and Lockwood, 2010). This specification assumes that the *relative* change in the tax ratio following a change in one of the explanatory variables is constant for all countries. A comparison of Table 11.16 with Table 11.15 indicates qualitatively similar findings. The significant effect of trade openness in column (1) is taken over by the GDP-terms after the interaction terms are included in column (2). The revenue gain of VAT introduction is seen to fall in the

income level. Specifically, an increase of GDP/capita by 1% leads to a fall of the tax ratio by 0.13%. From the system GMM estimates in the last column, only the coefficient of the lagged tax ratio is significant (again, with a value larger than one). In sum, GMM-estimation of an alternative specification does not change the finding of an insignificant relation between total tax revenues and the presence of a VAT. Again, the significance of the GMM-estimates might suffer from the relatively small sample size.

Table 11.16: The (ln) total tax ratio and VAT existence (annual data)

	(1)	(2)	(3)	(4)	(5)
Ln Total tax ratio(-1)			0.904***	0.793***	1.245***
			(0.012)	(0.228)	(0.151)
Ln gdp/capita	0.114	0.165**	0.034***	0.035	-0.069*
	(0.077)	(0.070)	(0.012)	(0.074)	(0.038)
Openness	-0.189**	-0.140	-0.027	0.071	-0.066
	(0.073)	(0.129)	(0.017)	(0.048)	(0.072)
VAT dummy	0.082**	1.386**	0.292*	0.533	0.072
	(0.032)	(0.608)	(0.167)	(0.633)	(0.217)
Ln gdp/capita*VAT		-0.133**	-0.030*	-0.051	-0.016
		(0.065)	(0.017)	(0.064)	(0.025)
Openness*VAT		-0.011	0.017*	-0.075*	0.068
		(0.092)	(0.010)	(0.038)	(0.061)
Estimation method	OLS	OLS	OLS	GMM diff	GMM syst
Year dummies	Yes	Yes	No	No	No
Observations	1324	1324	1283	1244	1283
Countries	39	39	39	39	39
R-squared	0.635	0.658	0.926		

Robust standard errors in parentheses. Fixed effects for years and countries are not reported.
*** p<0.01, ** p<0.05, * p<0.1

As a final form of sensitivity analysis, we estimate the *ln(t)*-regressions with 5-year averages. In line with the previous sections, an analysis with averages focuses on long-run relationships by filtering out short-run fluctuations. The conclusions drawn from Table 11.16 are robust if the sample is restricted to 5-year averages in Table 11.17.[295] As expected, the coefficient of the lagged tax ratio is smaller in the first row of Table 11.17, since the values between successive periods of 5 years are less correlated.

[295] In Table 11.17 period dummies are also included in the GMM-regressions.

In sum, the non-GMM estimates support the hypothesis that tax revenues are higher in developed countries with a VAT. When the endogeneity problem of the tax ratio is tackled by applying a GMM estimator, this finding is not longer robust. However, in view of the implausible values of the estimates, GMM estimation seems not to work with this panel.

Table 11.17: The (ln) total tax ratio and VAT existence (5-year data)

	(1)	(2)	(3)	(4)
Ln Total tax ratio(-1)			0.711***	0.712***
			(0.040)	(0.097)
Ln gdp/capita	0.149**	0.212***	0.188***	0.063
	(0.070)	(0.064)	(0.054)	(0.083)
Openness	-0.227***	-0.261*	-0.255	0.129
	(0.076)	(0.151)	(0.163)	(0.172)
VAT dummy	0.110**	1.742**	1.550***	-0.171
	(0.041)	(0.673)	(0.295)	(0.716)
Ln GDP/capita * VAT		-0.170**	-0.160***	0.029
		(0.072)	(0.033)	(0.072)
Openness * VAT		0.070	0.211	-0.131
		(0.117)	(0.143)	(0.177)
Estimation method	OLS	OLS	OLS	GMM syst
Observations	269	269	231	231
Countries	39	39	39	39
R-squared	0.659	0.689	0.849	

Robust standard errors in parentheses. Fixed effects for periods and countries are not reported.
*** p<0.01, ** p<0.05, * p<0.1

The relation between total taxes and VAT revenues

So far, we have tested whether total taxes are positively associated with a VAT system. The following question is whether an increase in VAT revenues *causes* an increase in total tax revenues? A positive association does not necessarily imply causality: revenues from all taxes may grow since they are driven by a common factor, such as an increased taste for government spending. Causality is implied by an alternative explanation: tax revenues increase *because* governments consider a VAT a more efficient tax. In this case, total revenues increase, but less than VAT revenue since the latter replaces revenues from other taxes. Keen and Lockwood (2006) call the latter explanation the strong form of the money machine hypothesis. They test the implication

that total tax revenues increase less than VAT revenues by regressing the total tax ratio on the VAT revenue-to-GDP ratio.

Keen and Lockwood (2006, Table 5) find support for the strong hypothesis. The increase of long-run revenues in the OECD exceeds the VAT revenues, but the excess remains small. The average long-run rise of total taxes of 2.4% of GDP suggests that around two-thirds of the VAT revenue (7.2% in 2005) is offset by lower other taxes. The simple dynamic specification leads to the remarkable result that the long-run increase in total taxes is about 5 times larger than the short-run increase.

To reproduce the outcomes of Keen and Lockwood (2006), we restrict the sample to 30 OECD members.[296] We first compare the OLS-estimates in column (1) of Table 11.18 with Keen and Lockwood (2006). We too find that VAT revenues have a positive effect on total tax revenues that is less than one. The significant negative discrete impact of the presence of a VAT in Keen and Lockwood is not supported by our estimates. The finding that the significant coefficients of (ln) GDP per capita have an opposite sign may be explained by Keen and Lockwood's (2006) inclusion of the share of agriculture in GDP among the regressors (with a significant negative impact). Similar to Keen and Lockwood, we also find that total taxes are lower in more open economies.

We next allow for a more dynamic specification by including the lagged tax ratio, which requires a GMM-estimation. As in Keen and Lockwood, we first apply the difference GMM estimator, again instrumenting only the tax ratio by using third lags. The pattern of the signs and significance of the coefficients in column (2) seem similar to Keen and Lockwood, but the sizes are different. The short-run impact of a VAT can be computed from column (2) as $0.370 * \text{VAT ratio} - 0.015$. On the assumption that the tax ratio stabilises in the long run, the long-run effect equals the short-run impact divided by 1 minus the coefficient of the lagged tax ratio (0.873).[297] When evaluated at a VAT ratio of 7.2% (of GDP), the short-run and the long-run effect on total taxes equal 1.2% and 9.2%, respectively. These effects are much larger than calculated in Keen and Lockwood (0.4% and 2.4%).

[296]The following 9 countries are dropped: Chile, Israel, Slovenia, Bulgaria, Cyprus, Latvia, Lithuania, Malta and Romania. We extend the sample (1965-2004) in Keen and Lockwood (2006) to 2009.
[297] The calculation of the long-run effect is explained in footnote 289.

Table 11.18: The total tax ratio and VAT revenues (%GDP)

	Annual				5-year period	
	(1)	(2)	(3)	(4)	(5)	(6)
Total tax ratio(-1)		0.873***	1.166***	0.644	0.534	0.664***
		(0.264)	(0.058)	(0.620)	(0.544)	(0.125)
VAT ratio (%GDP)	0.763***	0.370***	-0.280***	0.832***	0.486**	1.096**
	(0.226)	(0.096)	(0.091)	(0.186)	(0.219)	(0.471)
VAT dummy	-0.003	-0.015**	0.005		-0.018	
	(0.012)	(0.006)	(0.004)		(0.011)	
Ln GDP/capita	0.086***	-0.004	-0.015***	0.000	0.031	0.010
	(0.016)	(0.020)	(0.005)	(0.032)	(0.076)	(0.038)
Openness	-0.051**	-0.013	-0.002	-0.012	-0.025	-0.011
	(0.021)	(0.012)	(0.004)	(0.010)	(0.036)	(0.024)
Estimation method	OLS	diff. GMM	syst. GMM	diff. GMM	diff. GMM	diff. GMM
Observations	1187	1125	1155	756	179	102
Countries	30	30	30	29	30	27
R-squared	0.608					

Robust standard errors in parentheses. Fixed effects for years and countries are not reported. Fixed effects for years are not included in columns (2)-(4). *** p<0.01, ** p<0.05, * p<0.1

In addition, the outcomes are sensitive to using the superior considered system GMM-estimator (column 3). However, the findings that the coefficient of the lagged tax ratio exceeds one and that the coefficient of the VAT ratio is negative are implausible. Column (4) focuses on the observations for which a VAT was operational (i.e. the VAT dummy equals one). Again, unattractive estimates are obtained. When evaluated at a VAT ratio of 7.2%, an implausible large long-run effect of 16.8% can be calculated.[298] Finally, the estimations are repeated with 5-year averages (last two columns). A reasonable long-run effect of 3.6% follows from the results in column (5) but column (6) implies implausible large effects.[299]

In sum, we do not find robust evidence for the hypothesis that increases in VAT revenues are not fully offset by reduced revenues of other taxes, causing larger total tax revenues in the OECD. When estimated with adequate methods, we obtain positive net effects of VAT revenues, but often of an implausible large size.

[298] This effect equals 0.832*0.072/(1 – 0.644).
[299] The long-run effects of column (5) and (6) are computed as (0.486*0.072 – 0.018)/(1 – 0.534) = 0.036 and 1.096*0.072/(1 – 0.664) = 0.235, respectively.

Determinants of the effective VAT rate

In the previous regressions we estimated the relationship between total tax revenues and the VAT. A final set of regressions focuses on the question which factors improve the effective VAT rate? Ebrill et al. (2001, Table 4.2) analyse the factors that contribute to the performance of VAT, using a cross-section of (at most) 89 countries. They find that (ln) VAT revenues as a percentage of private consumption are positively related to the (ln) standard rate, openness and the literacy rate.[300]

We extend the analysis to a panel of 38 EU and OECD countries. The dependent variable is the effective VAT rate (i.e., VAT revenues expressed as a percentage of private consumption expenditures). When all private consumption expenditures are taxed at a uniform rate, the effective rate equals the standard rate. Column (1) in Table 11.19 shows that increasing the standard rate by 1 percentage point raises the effective rate by 0.4 percentage point. The less than one-to-one association indicates the role of reduced rates, exemptions and tax evasion. The effective rate turns out to be larger in open economies. VAT on imports act as withholding taxes and this gain seems to dominate the fraud losses related to zero-rating of exports. The significant positive effects are preserved when the VAT rates are expressed in logs in the second column.[301] The coefficient of the ln (standard VAT rate) is larger than found by Ebrill et al. (around 0.7). This specification is easily interpreted in terms of effects on the VRR. Notice from its definition (in section 11.6), that the VRR can be written as the ratio between the effective and the standard rate. Subtracting from both sides of specification (2) the ln(standard rate) yields the ln(VRR) at the left-hand side. This shows that increasing the standard rate by 1% reduces the VRR by 0.2%.[302]

[300] Martinez-Vazquez and Bird (2010, Table 3) explain the VAT Revenue Ratio.

[301] Notice that the coefficients of the standard rate in columns (1) and (2) are consistent. The sample averages of the standard and effective rate are 17.5% and 9.5%, respectively. An increase of the standard rate by 1 percentage point implies that the effective rate increases by 0.8*(1/17.5)*9.5 = 0.4 percentage point according to the estimate in (2). This is comparable to the coefficient in column (1).

[302] Notice that increasing ln(x) by one is equivalent to increasing x by 1%.

Table 11.19: The effective VAT rate

	Annual		5-year period			
	(1)	(2)	(3)	(4)	(5)	(6)
	Eff. rate	Ln Eff. rate	Eff. rate	Eff. rate	Ln Eff. rate	Ln Eff. rate
Std. VAT rate	0.392***		0.506***	0.349***		
	(0.076)		(0.042)	(0.103)		
Ln std. VAT rate		0.814***			1.020***	0.779***
		(0.073)			(0.045)	(0.124)
Openness	0.045***	0.437***	0.037***	0.036***	0.417***	0.386***
	(0.011)	(0.124)	(0.010)	(0.011)	(0.113)	(0.112)
VAT dummy	=1	=1	>0	=1	>0	=1
Observations	853	853	206	184	206	184
Countries	38	38	38	38	38	38
R-squared	0.647	0.713	0.854	0.638	0.930	0.717

Robust standard errors in parentheses. Fixed effects for years and countries are not reported.
*** p<0.01, ** p<0.05, * p<0.1

Estimation on the sample of 5-year averages hardly affects the results. In this sample the VAT dummy indicates the fraction of the period in which a VAT was operational. Hence, it equals one when a VAT was operational during all 5 years. A value of 0.2 means that a VAT was introduced in the last year. Columns (3) and (5) include all observations. Restricting the sample to the observations for which the VAT dummy is identical to one lowers the impact of the standard rate in columns (4) and (6).

In sum, we find that the effective VAT rate significantly increases in the standard rate and openness.

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