A study on the economic effects of the current VAT rates structure

Final Report

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Contents

List of Tables

List of Figures

List of Acronyms and abbreviations

AGO	Agriculture
AT	Austria
BE	Belgium
BG	Bulgaria
CES	Constant Elasticity of Substitution
CGE	Computational General Equilibrium
COICOP	Classification of Individual Consumption by Purpose
CPA	Classification of Products Activity
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
EU	European Union
EU-27	Current Member States of the European Union minus Croatia
EUROSTAT	Statistical Office of the European Union
FI	Finland
FR	France
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GTAP	Global Trade Analysis Project
HBS	Household Budget Survey
HU	Hungary
IBFD	International Bureau of Fiscal Documentation
IE	Ireland

IT	Italy
LCFS	Living Costs and Food Survey
LES	Linear Expenditure System
LT	Lithuania
LTM	Low-tech Manufacturing
LU	Luxembourg
LV	Latvia
MT	Malta
NA	National Accounts
NACE	Statistical Classification of Economic Activities in the European Community
NL	Netherlands
NPISH	Non-Profit Institutions Serving Households
OCS	Commercial Services
OECD	Organisation for Economic Cooperation and Development
OSG	Public Services
OSR	Other Services
PL	Poland
PT	Portugal
RO	Romania
ROW	Rest of the World
SE	Sweden
SI	Slovenia
SILC	Statistics on Income and Living Conditions
SK	Slovakia
TAXUD	Taxation and Customs Union Directorate-General *(European Commission)*
TRA	Transport
UK	United Kingdom
UN	United Nations

USA	United States of America
VAT	Value Added Tax
VATTL	VAT Total Tax Liability
WIOD	World Input Output Database
WS	WorldScan

Preface

This final report presents the results of the project "A study on the economic effects of the current VAT rates structure", Specific Contract no. TAXUD/2012/DE/323, implementing Framework Service Contract no. TAXUD/2010/CC/104 for the provision of economic analysis in the area of taxation.

The main research question of the project is to quantify for each Member State (EU-27):

- how much, broken down by categories of goods and services, private households and non-taxable and taxable persons carrying out exempt activities spend on VAT
- how much they would spend in case
  - zero and reduced rates[1] were abolished
  - zero and reduced rates were abolished and replaced with a new revenue neutral standard rate.
  - zero and reduced rates were abolished and low-income households receive lump sum transfers in compensation for their higher VAT bills.

We also calculate VAT revenues for each Member State (EU-27) and the EU-27 as a whole for each of these scenarios.

Changes in the prices of goods and services lead to changes in total expenditure and expenditure patterns. For some countries these changes in the consumption of private households have been analysed in a previous project of the consortium (see IFS et al., 2011). The present study, however, ignores behavioural reactions while performing the analysis on the reform scenarios regarding effects on households, non-households and VAT revenues. The underlying assumption is that net expenditures (both of households and non-households) remain constant notwithstanding changes in absolute and relative prices of goods and services.

The second part of the study includes a simulation of the general equilibrium effects on main macroeconomic indicators (GDP, consumption, employment, foreign trade) following changes in the VAT regime. This analysis takes into consideration

[1] We use "zero and reduced rates" 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.

behavioural reactions to external shocks such as changes in tax regimes. Given the different concepts of analysis (static and general equilibrium analysis) the scenarios analysed in the latter are similar, though not equal, to the ones specified above.

The report presents the situation in 2011, as the latest available data for most countries are from 2011.

The report presents the results obtained given the available data. Especially the analysis for private households has several shortcomings, as a request for additional data to Eurostat was not answered favourably[2]. Therefore, the following information requested in the Terms of Reference could not be delivered:

- VAT paid as a proportion of household income (both disaggregated data on mean income in relation to the various household groups and data on mean income per income and expenditure quintiles are not available)
- Results broken down by expenditure quintiles (both data on mean consumption expenditure and on the structure of consumption expenditure by expenditure quintile are not available)

For some countries information on certain tables is missing.[3] Also, more detailed information on the definition of breakdowns could not be obtained.

The final version of the report will extend this version by adding the following:

- Abstract in French
- Executive Summary in French

We gratefully acknowledge the comments on a first draft of this report received from Tuomas Kosonen, Andreas Peichl and European Commission staff.

[2] Unlike other European statistics (such as the EU-SILC or the Labour Force Survey) HBS micro data are not yet available for research purposes, although there are intentions to change this in near future when aspects of anonymisation and confidentiality are settled.

[3] Italy: missing data for households broken down by income quintiles (we provide results based on micro data instead).
Netherlands: missing data for households broken down by the number of active persons in the household and for different household types.
Romania: missing data for households broken down by the activity status of the household head.
Sweden: missing data for households broken down by the number of active persons in the household.
Slovenia: data provided by household type is too fragmentary to enable calculations.
Slovakia: missing data for households broken down by the number of active persons in the household.
In addition, some subgroups are missing in some countries (e.g. the self-employed in Sweden).

Abstract

This study provides a comprehensive overview of the distributional effects of the VAT rates structures currently in place in the EU-27 Member States. It builds on a consistent database and uses a coherent methodology that facilitates the meaningful comparison of effective VAT rates across categories of goods and services and across countries. This is crucial as the degree to which governments rely on zero and reduced rates varies greatly across countries, generating an uneven picture of effective VAT rates in the EU. This report sets out to analyse, for each country, the distributional effects of the current, diversified VAT rates structure, and to estimate how the abolition of zero and reduced rates would affect VAT payments by households and non-households, both overall and for socio-economic sub-groups (low-income households, single-parent households, etc.) and sector (health, education, etc.). It estimates the magnitude of additional VAT revenues that could be generated by abolishing zero and reduced rates, and quantitatively assesses the likely macroeconomic consequences (in each Member State and across the EU) of the implementation of a uniform VAT rates structure within each Member State.

Executive Summary

Objective

VAT rates structures in the European Union are widely diversified. The objective of this study is twofold: first, we collect data on the VAT rates structure currently in place in the EU-27 Member States, on expenditures and the corresponding VAT payments. Second, we estimate the potential effects of abolishing all zero and reduced rates[4] currently in place on households, non-households, VAT revenues and various important macroeconomic indicators, for all EU-27 countries. The data are collected and prepared for each Member State, taking into account the country's rules regarding exemptions, zero, super-reduced, reduced and parking rates.

Data and procedure

We use several databases to perform the analyses. For the analysis of households, we use aggregate information from national Household Budget Surveys provided by Eurostat. We uprate the latest available data from 2005 to 2011 using information on expenditure growth from National Accounts data. We then apply the VAT rates in place in 2011 in each Member State to the various categories of goods and services. We calculate how much an average household pays in VAT in absolute terms and as a proportion of their total expenditure, and further break down the results by socioeconomic characteristics (income, household type). We analyse three reform scenarios: 1., abolish all zero and reduced VAT rates (and tax the formerly zero or reduced rated goods and services at the standard rate), 2., abolish all zero and reduced rates, but lower the standard rate such that the reform is revenue neutral and 3., as scenario 1, but compensate households in the first and second (3a) or first income quintile (3b) for their higher VAT payments. We analyse how each reform scenario would change the average VAT burden in each Member State.

The analysis of non-households and VAT revenues uses data from the World Input Output Database (WIOD) and supplemental information gathered from communications from national authorities. Again we apply VAT rates to the classification of goods and services and calculate VAT liabilities for all Member States and different kinds of non-households (exempt sectors, government, non-profit institutions serving households and irrecoverable input VAT paid on gross fixed capital

[4] We use "zero and reduced rates" 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 Member States.

formation). We calculate the changes in VAT liabilities for non-households for scenarios 1 and 2. Furthermore, we calculate increases in VAT revenues that would be expected following the implementation of scenario 1, and consider an additional scenario that compensates households in the first and second (scenario 3a) or in the first income quintile (scenario 3b) for their higher VAT payments.[5]

These analyses are performed assuming that behaviour does not change as a consequence of the reforms (households and non-households continue to purchase the same amount of goods and services). In addition, we perform a general equilibrium analysis incorporating behavioural responses using the general equilibrium model WorldScan. The impact of different reform scenarios on GDP, employment, consumption and trade volumes are analysed for the EU as a whole and separately for each Member State (EU-27).

Results

Households

Households account for 60 % of all VAT liability across the EU-27 countries. We find that the average EU-27 household faces a VAT bill that amounts to 11 % of their total expenditure. This ratio is highest in Romania and Hungary (17.8 % and 17.5 %), followed by Latvia (15.3 %), Lithuania (14.7 %) and Slovakia (13.7 %). Households in Luxembourg (6.2 %), Cyprus (6.8 %), Spain (7.2 %), the Netherlands (7.7 %) and the United Kingdom (8.0 %) face the lowest VAT bill as a proportion of expenditure. In most countries, the largest part of private households' VAT bill relates to goods and services belonging to the category "Transport": Expenditure on the purchase and use of vehicles is high and usually taxed at the standard rate. In those countries where food is taxed at the standard rate, VAT paid on food and non-alcoholic beverages is substantial. Expenditure on housing and energy is usually taxed far below the standard rate. However, as expenditure on housing is an important part of total expenditure, VAT payments relating to these categories are high in many countries.

Abolishing zero and reduced rates (scenario 1) increases the average VAT rate faced by households, but the size of the change varies considerably between Member States. The effect is almost non-existent in Bulgaria, Denmark, Slovakia and Estonia, where zero or

[5] As we lack the necessary information we cannot perform an analysis of scenario 3 for different household types. For example, we do not know how many single households are in the first income quintile and are therefore not affected by VAT increases in scenario 3 – this could only be done with micro data.

reduced rates apply only to very few supplies. Households in Poland, on the other hand, face an increase in the average VAT rate of more than 6 percentage points. We also find large increases in Portugal, Malta, Ireland, Italy, France, Spain, the UK, Austria, Luxembourg, Belgium, Greece, the Czech Republic, Slovenia and the Netherlands. Scenario 2 (introducing a uniform, but lower VAT rate) increases overall VAT payments for private households in most countries, because they benefit more from zero and reduced rates in the status quo than non-households.

To analyse the distributional effects of the current and alternative VAT rates structures, we separate households into five equally sized income groups or quintiles. In all countries, high-income households pay more VAT than low-income households in absolute terms. We find the largest gap in Luxembourg – where the highest income quintile pays seven times more VAT than the lowest income quintile – and the smallest gap in the Czech Republic, Austria and the Netherlands. Looking at VAT bills as a proportion of total expenditure, we find Hungary to be the only country with a regressive system (low-income households face a higher VAT burden as a fraction of total expenditure than high-income households). The VAT system in 11 countries (Spain, Romania, Bulgaria, Lithuania, Slovakia, Estonia, Greece, Austria, the Czech Republic, Cyprus and Latvia) is approximately proportional: that is, all income quintiles pay roughly the same share of their expenditure in VAT. We find a progressive system in the United Kingdom, Luxembourg, Italy, Belgium, Poland, Malta, Slovenia, Finland, Ireland, Denmark, Sweden, Portugal, France, the Netherlands and Germany.

Abolishing zero and reduced rates does not have the same effect on households across the income distribution. In nine countries (Romania, Lithuania, the Netherlands, Latvia, France, Austria, Hungary, Finland and Sweden) the increase in VAT as a fraction of expenditure is similar across all income groups (with the average change ranging from 0.5 percentage points in Latvia to 3.5 percentage points in France). In the remaining 14 countries,[6] poorer households face a larger increase as a fraction of expenditure than richer households. Thus, in these countries, the zero and reduced VAT rates currently in place seem to do quite well at reducing the VAT burden of poorer households. High-income households, however, face larger increases in absolute VAT payments in all countries as a consequence of the reform. That is, in all countries, high-income households benefit more from zero and reduced rates in absolute terms, while low-income households benefit more as a percentage of expenditure.

[6] Recall that there are almost no reform effects in 4 countries (Bulgaria, Denmark, Estonia and Slovakia).

Abolishing zero and reduced rates, but lowering the standard rate to make the reform budget neutral, leads to higher losses for lower income than for higher income households in most countries. Higher-income households allocate a larger share of their expenditure to supplies currently taxed at the standard rate. Therefore, in this scenario, they benefit more from the reduction in the standard rate. On the other hand, lower-income households suffer more from the abolition of zero and reduced rates and benefit less from the reduction in the standard rate.[7]

Non-households

Across all EU-27 countries, on average, exempt sectors account for 19 % of total VAT liabilities. Other non-households such as governments and non-profit institutions serving households account for 21 %. These numbers differ between countries. We find the largest share of VAT liabilities of non-households in Luxembourg (65 %), followed by the Netherlands (56 %) and Sweden (48 %), and the lowest in Lithuania (26 %), Greece (29 %) and Malta (30 %). Non-households are affected by the reform scenarios through non-recoverable VAT they pay on inputs.

In most countries, following the abolition of zero and reduced rates, non-households face a lower increase in their VAT bills than households. The increase in VAT payments faced by exempt sectors is 14 % for the EU-27 on average, while VAT liability for other non-households increases by 13 %. Seven of the 36 sectors are affected by the reform in all countries (average increase in VAT liabilities across the EU-27 given in brackets):

- Real Estate Activities (20 %)
- Education (20 %)
- Health and Social Work (19 %)
- Other Community, Social and Personal Services (18 %).
- Public Administration and Defence (11 %)
- Financial Intermediation (7 %)
- Post and Telecommunications (5 %)

Abolishing zero and reduced rates and lowering the standard rate accordingly, by construction, does not change overall VAT liability. However, in most countries non-

[7] Although we focus on the analysis of VAT expenditure patterns across the income distribution, this study also shows breakdowns by other household characteristics (activity status of the household head, number of active persons in the household, household type and age of the household head).

households benefit from such a reform because the reduction in the standard rate is more than sufficient to compensate for the abolition of zero and reduced rates on supplies purchased by exempt sectors and other non-households. On average, VAT liability for exempt sectors decreases by 4 %. For other non-households, VAT liability decreases by 5 %.[8]

Additional VAT revenues

We calculate additional VAT revenues for the reform scenario in which zero and reduced rates are abolished. In addition, we consider a scenario where low-income households are reimbursed for their additional VAT burden via a lump-sum transfer allowing them to buy the same basket of supplies as they did in the base scenario (scenario 3). We consider two different definitions of "low-income" households. First, we compensate households in the first and second income quintile (3a); second, we compensate households in the first income quintile only (3b).

Abolishing zero and reduced rates in all Member States (EU-27), on the EU-27 average, leads to an increase in VAT revenues of 1.6 % of GDP. The increase is largest for countries making extensive use of zero and/or reduced rates, such as Poland and Portugal (these countries experience an increase in VAT revenues of 3.3 % of GDP), followed by Italy (+3.0 %), Spain (+2.9 %) and Malta (+2.8 %). On the other hand, the effect is virtually zero in Denmark, Bulgaria and Slovakia. On the EU-27 average, compensating low-income households decreases the additional VAT revenues to 1.3 % of GDP (compensating first and second quintile, scenario 3a) or 1.5 % (compensating first quintile only, scenario 3b). This is because higher income households are responsible for the lion's share of spending, even on zero and reduced rated supplies, in absolute terms.

General equilibrium effects of VAT reforms

We estimate the medium-term effects of various VAT reform scenarios using a Computational General Equilibrium (CGE) model, WorldScan. This analysis of the broader economic consequences of VAT reforms is conceptually different from the static analysis of households, non-households and VAT revenues; therefore, the

[8] In Estonia, Cyprus, Latvia, Lithuania, Romania and Slovakia exempt sectors face an increase in their VAT burden. This is the case for other non-households in Spain, France and Italy.

scenarios analysed in this dynamic part do not directly correspond to the three scenarios analysed above.

In scenario A, we abolish zero and reduced VAT rates, and the additional VAT revenues are channelled back into the economy by increases in transfers and public spending. In this scenario, effective VAT rates increase, reducing production in those sectors facing the highest increases in VAT (agriculture, low-tech manufacturing and transport) in the medium-run. For the EU-27 as a whole, we find relatively small changes in the main macroeconomic indicators. EU-27 GDP decreases by 0.4 %. These reductions are in line with reductions in consumption (-0.7 %), employment (-0.5 %, with a larger reduction for low-skilled than for high-skilled workers) and international trade (export and import volumes decrease by 0.7 % and 0.5 %, respectively). Targeting the additional VAT revenue specifically to economically weak households (low-skilled employed and unemployed households, scenario E) does not substantially change these results.

When we decrease the standard VAT rate such that the abolition of zero and reduced rates is revenue neutral (scenario B), we find no effect on GDP on the EU-27 average. The effects on the other macroeconomic variables are also small; however, we do find some employment growth, this time benefitting low-skilled households relatively more than high-skilled households. In addition, wages of low-skilled workers increase compared to those of high-skilled workers. In this scenario, the effects vary between Member States. GDP increases in 14 Member States (Latvia experiences the biggest increase – 1.02%, Portugal and Cyprus are tied for the second largest increase – 0.36%) and decreases in 11 Member States (Hungary faces the largest decrease -0.18 %, followed by France and Lithuania with -0.17 % and -0.16 % respectively). There is no change in two Member States (Estonia and Malta).

Scenarios A, B and E disregard the potential reduction of the administrative burden of VAT collection that could arise from a simpler VAT rates structure. Taking these effects into account (scenario C) leads to very small positive effects on all main macroeconomic variables (GDP +0.11 %, consumption +0.08 % employment +0.04 %, export volumes +0.14 % and import volumes +0.05 %) in the EU-27 on average. Finally, using the additional VAT revenues to finance cuts in the capital-investment tax (scenario D) leads to increases of GDP in the EU-27 average (+0.6 %).

Conclusions

Given the heterogeneous VAT rates system in the EU-27, the reform scenarios have very different effects in the different Member States. This makes drawing general and committed conclusions on the results of this study somewhat difficult. We can, however, conclude that:

- Zero and reduced rates overall achieve their goal of lowering the VAT burden of low-income households when we look at VAT payments as a proportion of expenditures.
- However, in Member States with an extensive use of zero and reduced rates, substantial additional VAT revenues could be raised by abolishing these VAT rate reductions; and most of these additional VAT revenues would be paid by high-income households. This demonstrates that the potential of zero and reduced VAT rates as a tool for redistribution is limited. More targeted policy instruments could accomplish the task of compensating low-income households for their additional VAT payments at comparably low costs.
- The introduction of a budget-neutral uniform VAT rate, replacing all zero, reduced and standard rates, benefits non-household entities while households suffer a loss in most countries. In particular, we find that low-income households suffer more in proportion to their expenditures. When transfers are paid to compensate these households, revenue-neutrality of the reform requires a higher uniform VAT-rate (Crawford et al., 2010).
- Concerning the medium-run macroeconomic consequences of reforms of the VAT rates structure, we find that harmonising diverging VAT rates within each Member State does not necessarily have significant effects, as both VAT exemptions and large rate differences between Member States continue to exist. However, if we allow for possible efficiency gains generated by simpler VAT rates systems, we find larger positive effects on Member States' economies.

1 Introduction

1.1 The VAT in the European Union

On 17 May 1977, the Sixth VAT Directive was adopted which led to a uniform VAT coverage in the European Union. The VAT Directive[9], enacted on 1 January 2007 and replacing the Sixth Directive, contains legislations concerning the common VAT system currently in place.[10] The Directive does not stipulate one uniform percentage rate for the whole Union, but sets boundaries for the Member States. It restricts the minimum standard rate to 15 % (this regulation has been extended to 31 December 2015) and allows for two reduced rates of at least 5 % for goods and services listed in the Annex III of the VAT Directive. Moreover, after consultation of the VAT Committee, each Member State may apply a reduced rate to the supply of natural gas, electricity or district heating. Some derogations and exceptions for Member States are in place, entailing the existence of zero rates, super reduced, reduced and parking rates. These derogations were granted during the negotiations of the VAT rates provisions or in the Acts of Accession to the European Union. Most of them are part of the so called "stand-still" situation and apply until the adoption of definitive arrangements of VAT relating to the trade between Member States. The main objective of these derogations is to ensure the gradual transition towards the application of uniform rules. Overall, such derogations prevent a coherent system of VAT rates in the EU from being applied.

The VAT is a major source of tax revenue in the EU, yielding € 904 billion in 2011 alone. This amounts to generating 7.2 % of the EU's GDP or 17.8 % of all public revenues. The average standard rate in the EU was 20.7 % in 2011, compared to 19.4 % in 2008, mirroring the need for financial consolidation in many Member States in the wake of the financial crisis. In 2011, the lowest standard rates could be found in Cyprus and Luxembourg, which both exhausted the minimum 15 %. The highest standard rates were applied in Denmark, Hungary and Sweden with 25 %. It is also Denmark where the VAT made up the biggest share of GDP, 9.9 %, whereas Spain had the lowest share with 5.4 %.[11] Table 1 illustrates the differences in VAT revenue and its share of GDP across EU Member States.

[9] Council Directive 2006/112/EC of 28 November 2006.
[10] see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:347:0001:0118:en:PDF [2013/03/25]
[11] Source: Eurostat, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database, Economy and finance, Government statistics, Annual government finance statistics, Main national accounts tax aggregates [2013/06/29]

Not only is the VAT a vital source of tax revenue but being a consumption tax, it also has some valuable economic advantages over other taxes. Not taxing intermediate supplies[12] avoids distortions in the production process. Furthermore, taxing only consumption avoids disincentives on savings and investments (IFS et al., 2011).

As mentioned above, Member States are entitled to introduce up to two reduced VAT rates of at least 5 %. In addition to these reduced rates, some Member States also have super-reduced rates, parking rates (see below) and zero rates.[13] The main reasons for the existence of reduced rates are equity concerns (this applies especially to every day goods that lower-income households spend a higher fraction of their income on, e.g. foodstuffs) and accounting for positive externalities and internalities (IFS et al., 2011).[14] Even if a good or service is not listed in Annex III of the VAT Directive, Member States can tax it at a reduced rate, if it was subject to a reduced rate before 1 January 1991 and the reduced rate is at least 12 % (a "parking rate"). Furthermore, regardless of whether or not a good or service is listed in Annex III of the Directive, if it was subject to a zero rate or a rate lower than 5 % before 1 January 1991, Member States may continue using this rate, provided that the reductions are "in accordance with Community law and […] have been adopted for clearly defined social reasons and for the benefit of the final consumer" (the zero and the so called super-reduced rates).

Table 2 gives a general overview of the different VAT rates in place in all Member States. The table reflects the VAT rates applicable in 2011 which have been used for the analysis carried out in this study. An updated situation of the VAT rates applied in the Member States can be found on the Commission's website.[15]

In addition to the already large number of exceptions, one can find further special rates scattered across some of the EU-27 Member States for very specific supplies, such as

[12] VAT is applied at each stage of production; however, businesses have a right to deduct the tax on their inputs.

[13] In addition, several supplies are completely exempt from VAT. In article 132, the VAT directive lists supplies that shall be exempt from VAT; Annex X, part b lists supplies Member States can continue to exempt. A zero rate is different from an exemption of VAT in so far as a zero rate indeed guarantees a tax free product. The producer can deduct VAT on inputs for the production of zero rated supplies, which is not the case for supplies that are exempted from VAT. In that case, although the final consumption good is tax free, the producers have no right to deduct the VAT they had to pay on their input goods.

[14] The following section 1.2 will summarise the discussion on reduced rates in economic theory.

[15] http://ec.europa.eu/taxation_customs/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.pdf [2013/06/29]

for tolls on bridges in the Lisbon area, or for the supply of liquid petroleum gas (LPG) in cylinders in Cyprus. Generally speaking, the VAT systems in place across the European Union are still quite heterogeneous, despite the common legal framework and guidelines in place.

Table 1: Total VAT revenue – in absolute terms and relative to GDP (as of 2011)

Country	VAT Revenue (in millions of €)	% of GDP
BE	26,021	7.0
BG	3,352	8.7
CZ	10,994	7.0
DK	23,870	9.9
DE	189,920	7.3
EE	1,363	8.5
EL	15,027	7.2
ES	57,376	5.4
FR	140,506	7.0
IE	9,782	6.2
IT	98,557	6.2
CY	1,517	8.4
LV	1,368	6.8
LT	2,444	7.9
LU	2,667	6.3
HU	8,517	8.5
MT	520	7.9
NL	41,610	6.9
AT	23,447	7.8
PL	29,843	8.0
PT	14,235	8.3
RO	11,412	8.7
SI	3,049	8.4
SK	4,711	6.8
FI	16,915	8.9
SE	36,642	9.5
UK	128,299	7.3
EU 27	**903,961**	**7.2**

Source: Eurostat[16]

Note: Exchange rates of 1.956 Bulgarian levs, 24.590 Czech koruny, 7.451 Danish kroner, 0.706 Latvian lats, 3.453 Lithuanian litai, 279.370 Hungarian forints, 4.121 Polish zloty, 4.239 Romanian lei, 9.030 Swedish kronor and 0.868 British pounds to 1 Euro.

[16] http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database, Economy and finance, Government statistics, Annual government finance statistics, Main national accounts tax aggregates [2013/06/29]

Table 2: VAT rates in Member States (as of 2011)

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

Note: All countries have VAT exemptions in place for some supplies.
Source: European Commission (2011a).

1.2 The case for a diversification of VAT rates – insights from economic theory

In this section, we discuss differentiated VAT rates from the perspective of economic theory, relying on general economic reasoning and recent literature on the subject. The aim of this section is to review which arguments have been put forward in favour of taxing some goods and services at zero or reduced rates, and assess the theoretical merit of reduced VAT rates as compared to other policy instruments. Any conclusions in this section are based on the cited literature and not on the original results of this study (for conclusions based on our own results, see chapter 4).

The theory of optimal taxation takes as a benchmark the case in which consumption taxes are uniform on all final consumption goods, and zero on all intermediate goods. Not taxing (intermediate) production inputs[17] prevents distortions in the allocation of factor inputs, while taxing final consumption at a uniform rate avoids the distortion of consumption choices (e.g. Mankiw et al., 2009). In addition to distorting consumption choices, VAT exemptions distort competition (as exempt sectors, most prominently the financial sector, face different input prices across EU countries)[18], and create a bias towards self-supply and towards imports[19] (Crawford et al., 2010).

Reasons put forward for nevertheless taxing some goods and services at reduced rates can be grouped into three categories (IFS et al., 2011, Copenhagen Economics, 2007):

- equity concerns (alleviate the potentially regressive nature of consumption taxes)
- efficiency (counteract adverse effects of other features of the tax system on the incentive to purchase goods and services on the market, or produce them at home)
- positive production/consumption externalities, and what IFS et al. (2011) and Copenhagen Economics (2007) call "internalities", that is, positive effects of the consumption of a good or service on the

[17] VAT is applied at each stage of production; however, businesses have a right to deduct the tax on their inputs.

[18] Financial service providers face different input taxes in different countries of the European Union, which distorts competition if financial services are especially transferable across countries.

[19] To understand why VAT exemptions can create a bias towards imports, consider a sector that is exempt in country A. As a domestic exempt firm cannot deduct VAT on its inputs, unrecovered VAT is cascading into the cost price of this supplier. In contrast, a firm producing in country B (not an exempt firm, just a firm producing supplies that are exempt in country A) and exporting to country A can deduct VAT on inputs. As the price of the supplies of the foreign firm does not include VAT on its inputs, this creates a bias towards imports (Crawford et al., 2010, p. 305)

consumers themselves, that are not fully taken into account when making consumption decisions.

1. Equity concerns

The first point – equity concerns – relates to the frequently asserted regressive nature of consumption taxes. Poorer households tend to spend a larger share of their income on consumption than wealthier households, who tend to have a higher savings rate. As a consequence, VAT payments disproportionally burden households at the bottom of the income distribution (European Commission, 2012). Taxing goods and services that are considered to cover basic needs, such as food, water or social housing, at a reduced rate aims to ease this burden. The reasoning is that, as wealthier households have more income left to spend on non-essential goods after fulfilling their basic needs, taxing non-essential goods at higher rates means that a larger share of the total tax revenue is being borne by higher income households. The reduced rates therefore work to redistribute purchasing power from richer to poorer households (IFS et al., 2011), softening the burden on the latter (note that introducing reduced rates on necessities make the VAT system more progressive, regardless of the ex-ante distributional impact of a VAT system). This notion is supported empirically: it has been shown that the regressive effect of consumption taxes varies considerably between countries, and that countries with similar levels of standard VAT rates can exhibit very different overall distributional effects of the VAT system (European Commission, 2012, O'Donoghue et al., 2004). For instance, Belgium and France have nearly the same standard VAT rate (21 % and 19.6 %, respectively), but the incorporation of consumption taxes into an assessment of disposable income inequality leaves the Gini Coefficient[20] of Belgium nearly unchanged (it increases by less than 0.25 percentage points), while France's Gini Coefficient increases by more than 3.3 percentage points (O'Donoghue et al., 2004). The authors attribute this primarily to the share of goods and services that are exempt from VAT or taxed at a lower rate, and to the differences in savings rates across the income distribution (European Commission, 2012).

The VAT system is regressive when the analysis is based on VAT payments expressed in terms of (disposable) income. However, this conclusion no longer holds when the relationship between VAT payments and total expenditures is considered (IFS et al.,

[20] The Gini Coefficient is a measure of income inequality that takes the value of 0 if income is distributed equally, and 1 if one household (or person) has all income in the economy. That is, a lower Gini Coefficient corresponds to a more equal income distribution.

2011). When looking at VAT payments as a percentage of total expenditure (as opposed to disposable income), Figari and Paulus (2012) conclude that for the five European countries they consider (Belgium, Greece, Ireland, Hungary and the UK), the VAT system does not seem to be regressive. Indeed, households in the richest disposable income decile pay a higher fraction of their total expenditure on VAT than households in the lowest income decile (because they spend a higher proportion of their expenditure on goods and services that are taxed at higher rates).

Richer households also pay more VAT in absolute terms (Crawford et al., 2010), and, since expenditures rise with income, also benefit more from VAT exemptions and reduced rates in absolute terms (IFS et al., 2011).

Furthermore, there exist other policy tools, such as means-tested transfers and income tax exemptions, which might be better suited to reach distributional objectives, because they can be more effectively targeted at low income households. Revenues generated by the abolition of reduced rates could be used to increase income related benefits to low income households (Crawford et al., 2010).

From a theoretical point of view, the main argument against using differentiated consumption taxes as a tool for redistribution is that if personal *preferences* for consumption do not directly depend on income (or the underlying ability determining income)[21], any information conveyed by individual consumption choices is also available in individual incomes. But redistributing income through the income tax is less costly in efficiency terms, because it does not distort individual consumption (Mankiw et al., 2009). That is, if the policy objective is to tax individuals based on their income, it is preferable to directly tax income, unless consumption choices reveal something about income that cannot be captured by personal income tax (e.g. there is significant tax evasion and underreporting that hinders the efficient collection of income tax, and consumption tax is less prone to evasion).[22]

[21] It is important to distinguish preferences from demand, because demand will typically be influenced by a household's budget constraint, and therefore household income.

[22] Consider a country in which all high income individuals have a well-known proclivity for caviar, while all low-income individuals despise it, and personal income tax collection is problematic because of prevalent misrepresentation of income and fraud. In this country, consumption of caviar would convey information about income that income does not, because income is not correctly reported, and caviar consumption is a tell-tale sign of high income. If, on the other hand, income is observable, income can be taxed directly without distorting the caviar price; therefore, taxing caviar is not necessary.

2. Efficiency

A second reason for taxing some goods and services at a lower rate is to mitigate distortions that arise elsewhere in the tax system. This applies to labour intensive services that can be substituted by (tax-free) household production, such as household cleaning, minor repairs (Do-It-Yourself) or food preparation.[23] Income tax and VAT generate a disparity between the market price of work and take-home pay; therefore, workers value hours worked less than the market does. Individuals might choose to perform tasks themselves (which is tax free) rather than to buy the same service on the market and work additional hours in their normal job (both of which are taxed), if the price of the service including taxes exceeds the take-home pay they would receive if they worked the time necessary to perform the task themselves. If the same services would have been purchased on the market in the absence of earnings and commodity taxation, the result is a welfare loss. Therefore, there is an economic case for taxing services that can be substituted by home production at a lower rate, because subsidising their consumption in fact counteracts inefficiencies caused by the tax system. But this argument in favour of differentiated VAT rates only applies to services that can reasonably be substituted by home-production (e.g. childcare services). Other labour intensive, though professionalised services (such as hairdressing), that are in fact eligible for a reduced VAT rate under EU law[24], are less suitable to be substituted by (untaxed) home production. Therefore, the case for taxing such services favourably is weak (IFS et al., 2011, Copenhagen Economics 2007).

Also, as IFS et al. (2011) observe, some goods and services that are presently eligible for a reduced VAT rate under EU law do not correspond well with the labour intensive services prone to substitution by home production. For example, basic food supplies that are taxed at a reduced rate in many countries should be seen as a substitute for work because they require preparation (and hence time input), whereas expenditure on restaurants, which are currently taxed at the standard rate in 15 Member States, generally rises with hours worked. Nonetheless, 12 Member States currently apply a reduced rate to restaurants.

[23] Specifically, EU VAT law allows for reduced rates on minor repairs of bicycles, shoes, leather goods, clothing and household linen, renovation and repairs of private dwellings (excluding materials), domestic cleaning and cleaning of windows in private households, as well as restaurant services, in all Member States (IFS et al., 2011, pp. 539).

[24] IFS et al., 2011, p. 540.

Another reason to tax labour intensive sectors at a lower rate is to promote employment in general by promoting products and services provided by low-skilled workers. This argument is not limited to sectors that are at risk to be substituted by home production, but products and services produced or provided primarily by lower skilled workers. This argument relies on the assertion that structural unemployment by low skilled workers is at least partly due to restrictive labour market regulations, high minimum wages and non-wage labour costs that have disproportionally affected low skilled workers. Taxing sectors that primarily employ low skilled workers at favourable rates is therefore an adequate way to boost demand, drive up wages and increase employment in those sectors; while employment in other sectors characterised by a higher skilled workforce is not harmed to the same extent, because labour markets for higher skilled workers are more flexible, and therefore better able to adjust to changes in demand (Copenhagen Economics, 2007).[25] This argument only applies if the joint design of labour market regulations, minimum wages and unemployment benefits is such that it creates structural unemployment to a markedly higher degree for low skilled than for higher skilled workers. If this is not the case, any reductions in low skilled unemployment will be matched by an increase in structural unemployment of highly skilled workers (due to a distortion of demand away from the goods and services that are primarily produced by them). In addition, favourable VAT treatment is unlikely to reduce structural unemployment if the targeted products or services are tradable, and the boost in demand will partly boost imports. Furthermore, differences in employment shares of low-skilled workers between sectors are actually rather modest (Copenhagen Economics, 2007), which implies that allowing VAT reductions to improve the employment prospects of low skilled workers is a poorly targeted policy measure.

3. Production/consumption externalities

A third reason why some products are taxed at reduced rates is that their consumption is deemed desirable in a way that is assumed not to be fully internalised by consumers. For example, some goods may have positive production and/or consumption externalities to the wider society that are not fully taken into account by individual consumers, such as public transport or other environmentally friendly products. Other supplies may be more beneficial to the consumers than they themselves realise, such as

[25] See also Report (COM(2003) 309) from the Commission on the experimental application of a reduced rate of VAT to certain labour-intensive services. http://ec.europa.eu/taxation_customs/taxation/vat/how_vat_works/labour_intensive_services/index_en.htm, [2013/06/30]

sports activities, books and other cultural or educational events, and should therefore be promoted through favourable VAT treatment. Also here, the question is whether a subsidy through the VAT rates system is the best policy to boost consumption of these goods and services. The first issue is that, because VAT is calculated as a fraction of the product price, reduced VAT rates provide a larger subsidy to more expensive products than to cheaper ones. Therefore, for reduced VAT rates to be a well-designed subsidy, the social benefit of a product needs to rise with its price. In many cases this would be hard to argue – why would it be desirable to subsidise first class train tickets more than second class train tickets, as the former reduce the trains capacity by more than the latter, driving up ticket prices? Why would one want to subsidise the hard cover version of a book by more than the soft cover version? Also, reduced VAT rates on such products can only incentivise consumers, not businesses, because VAT paid on immediate inputs can be deducted by most businesses. Therefore, subsidising environmentally friendly technology and the like through reduced VAT rates only encourages their use by private consumers, not businesses. Likewise, in this case, the problem of the VAT as a subsidy is that it cannot be specifically targeted at certain groups of consumers. For example, if under-consumption of books and other educational activities is seen as a problem for certain groups of people – e.g. young people or those on moderate incomes – significant subsidies may be enjoyed by those who already read aplenty. So, even if aggregate demand for books is higher because they are less burdened by VAT, it is not certain that the original problem is alleviated. More targeted policies apart from reduced VAT rates – such as direct price subsidies for cultural or educational events for young people, or people on moderate incomes – are thinkable to reach the goal of boosting consumption of goods and services that are deemed desirable.

4. Conclusion

To sum up, whether zero and reduced VAT rates are the best means to achieve the goals they have been introduced for is questionable, although an economic case for a differentiated VAT rates structure does exist for some very specific goods and services (Copenhagen Economics, 2007). This already somewhat ambiguous case in support of zero and reduced rates is accompanied by adverse effects of the heterogeneous VAT rates structure in the EU: differentiated VAT rates distort consumption choices and can therefore decrease efficiency. Furthermore, the complexity of the current VAT system generates important compliance costs for businesses and may harm the functioning of the internal market by discouraging intra-EU trade (European Commission, 2011b). The European Commission's communication on the future of VAT (European

Commission, 2011b) therefore suggests a fundamental overhaul of the EU VAT structure towards a simpler, more unified design.

This study sets out to assess the likely effects of a change in the differentiated VAT structures that presently exist in the EU-27 Member States. It aims to inform policy makers about the likely risks and benefits of changes to this important source of revenue.

1.3 Tasks performed, reform scenarios and report outline

We analyse the current VAT rates structure in 27 Member States of the European Union and calculate the distributional, revenue and macroeconomic effects of reforms of this structure. For this purpose we perform four tasks.

The first three tasks are purely static. We calculate the effects of three reform scenarios on VAT payments of households and non-household entities assuming no behavioural reactions.

- Scenario 1: zero and reduced rates are abolished, and all goods and services that were taxed at these rates are now taxed at the standard rate applicable in each Member State.
- Scenario 2: the abolition of zero and reduced rates is compensated by lowering the standard VAT rate to a level that makes the reform budget neutral for each Member State.
- Scenario 3: zero and reduced rates are abolished, but households in the first and second (3a) or first (3b) income quintile (bottom 40 % or 20 % of the income distribution, respectively) are compensated for their (average) loss with lump sum transfers.

Task 1

For scenarios 1 and 2, we analyse how much, broken down by category of goods and services (12 expenditure categories following the COICOP[26] classification), households pay on average in VAT in absolute terms and in relation to household expenditure.

We disaggregate these results by the following household characteristics:

- activity status of the household head

[26] Classification Of Individual COnsumption by Purpose; a description of categories can be found in the Annex (section A.2).

- number of household members who are active in the labour force
- income quintile
- household type (single person household, single person household with dependent children etc.)
- age of the household head.

Task 2
Broken down by categories of goods and services, we analyse how much the different types of non-taxable persons and taxable persons other than households, who carry out exempt activities, spend on VAT payments in the status quo and how much they would spend if zero and reduced rates were abolished.

Task 3
We provide an estimate of the additional revenues that would be generated if all zero and reduced rates were abolished and if low income households were compensated for their additional VAT payments, separately for 27 Member States and for the EU as a whole.

Task 4
We analyse the effects of an abolishment of zero and reduced rates on macroeconomic indicators using a computational general equilibrium (CGE) model of the European economy, WorldScan. WorldScan, as CGE models in general, is a complex model that incorporates all major parts of an economy (firms, households, and government), their interaction and their behavioural adjustments to external shocks. The results of WorldScan are medium-term and show the difference of the new equilibrium values of important macroeconomic indicators (GDP, consumption, employment, foreign trade) following an external shock (such as a change in effective VAT rates due to a change in the VAT rates structure) compared to the status quo.

Due to the conceptual differences to the analyses performed in tasks 1 to 3, the reform scenarios analysed in task 4 are similar but not identical to those examined in the first part.

- Scenario A: Zero and reduced rates are raised to the level of the standard rate. The additional government revenues are channelled back into the economy according to the share of public spending (consumption and transfers).[27]
- Scenario B: Zero and reduced rates are abolished and the standard rate is replaced by a new rate that is calculated to be revenue neutral after behavioural response.[28]
- Scenario C: We would expect that the abolition of zero and reduced rates eases the administrative burden associated with VAT collection. The practicalities of tax collection (and any compliance or administrative costs to governments or firms) are not modelled in WorldScan. Hence, scenarios A and B do not take into account possible gains from a decreased administrative burden that could result from a simpler, uniform VAT rates structure. In scenario C, we therefore explore the economic effects of simplifying VAT compliance and administration.
- Scenario D: In this scenario, the VAT increase of scenario A is compensated by a decrease in the capital-investment tax such that the reform is overall budget neutral.
- Scenario E: This scenario simulates the same VAT increase as scenario A, but the additional tax revenues associated with the VAT increase are transferred to low-skilled unemployed and employed households.

This report is structured according to these four tasks. Tasks 1 to 3 are tackled in chapter 2. In section 2.1 we describe the data and procedures used in the analysis. Section 2.2 gives a short introduction to the results for the EU-27 Member States. Section 2.3 presents the analysis for private households, section 2.4 for non-household entities with non-refundable VAT liabilities on their intermediate consumption, section 2.5 presents the additional VAT revenues expected from reform scenarios 1 and 3. Chapter 3 presents the methodology and discusses the results of the general equilibrium analysis performed to answer the questions of task 4. Chapter 4 concludes.

This report includes several annexes. Section A.1 contains the growth rates used to uprate the data for the household analysis to the reference year (2011). Section A.2 shows the COICOP classification, used for the break-down of household consumption expenditures. Section A.3 compares our results based on aggregate data to results of an analysis using micro data as a validation exercise. Section A.4 deals with goods and services that are eligible for zero and reduced VAT rates, while potentially being in

[27] In WorldScan as in other CGE models the government cannot save or borrow money – all additional revenues are spent. As some of this additional spending is transferred to low-income households by an increase in transfers, scenario A is more comparable to scenario 3 than to scenario 1.

[28] This new standard rate takes into account behavioural responses and therefore differs from the one calculated in scenario 2.

conflict with other EU policies trying to reduce or change their consumption.[29] Section A.5 showsA.4 the WIOD classification of products and sectors used for the analysis on non-households and additional VAT revenues. And section A.6 shows the GTAP classification used in World Scan (the model used to perform task 4).

In addition to this report we deliver an Addendum, containing more detailed analyses on the results of tasks 1 and 2 for each Member State. Furthermore, we provide spreadsheets with detailed tables for the results of tasks 1 and 4. A reading instruction to the spreadsheets on the results of task 1 can be found at the end of the Addendum.

[29] See European Comission (2011b), section 5.2.2.

2 Static analysis of VAT structure and reforms

2.1 Data and procedure

Analysis for households

Data

As we were not granted access to micro data for every EU Member State, we use summary data of the national Household Budget Surveys (HBS) provided publicly by Eurostat[30] to conduct distributional analyses on the current VAT rates structure and the reform scenarios.[31]

Eurostat publishes National Accounts (NA) data on an annual basis and figures are available up to 2011 for most countries. In contrast, Household Budget Survey (HBS) data are published in longer intervals, with the data from 2005 being the most recent data accessible at the time of writing. We could have performed the analysis using data from 2005 applying 2005 VAT rates, essentially analysing what would have been the effect if zero and reduced rates had been abolished in 2005. However, in the eight years since 2005, VAT rates have changed considerably; therefore, this type of analysis would not give a satisfying answer to the research question. We decided to uprate the HBS data from 2005 to the last available year of NA data (2011) and apply the VAT rates of that year. Rather than using one single average growth rate per country, we calculated separate rates for the main groups of expenditures. In this way, not only we can account for the nominal increase in expenditure, but also for changes in the structure of household consumption. In order to control for population growth, we used per capita figures rather than absolute numbers. Rates for all countries were calculated in Euros[32] and can be found in the annex (section A.1).

Generally speaking, Household Budget Surveys are sample surveys of private households which provide information on household consumption expenditures on

[30] http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database, Population and social condition, Living conditions and welfare, Consumption expenditure of private households [2013/03/18]

[31] We perform a validation exercise and repeat our simulations using micro data for a subgroup of countries for which we have access to disaggregated consumption surveys: Austria, Italy and the UK. The results of this exercise can be found in the Annex (section A.3).

[32] All results are presented in Euros. The applied exchange rates – calculated from NA in 2011 – are specified for each table.

goods and services. Eurostat provides aggregated data on household expenditures for categories of goods and services at the two-digit level (12 categories) or at the more detailed three-digit (47 categories) and four-digit (113 categories) levels. Detailed information on the COICOP classification can be found in the annex (section A.2). In addition, consumption expenditure is broken down according to some demographic and socio-economic characteristics such as number of economically active persons in the household, household type or income quintiles (see below).

Eurostat receives these data from Member States' National Statistical Offices which carry out the Budget Surveys in their respective country. Unlike other European statistical domains, however, the provision of HBS data is voluntary; consequently, the extent to which figures are available varies considerably (European Commission, 2005). As a result, some statistics are missing for some countries in the Eurostat data set.[33]

When assessing the quality/accuracy of the data we must be aware that the Eurostat statistics, generated from HBS data, may be prone to errors, which are inherent to any sample survey. Perhaps most importantly, sampling and non-sampling errors must be considered. Sampling errors arise from assuming that it is possible to adequately estimate the characteristics of a population by looking at a subset of that population. Non-sampling error is an umbrella term for many types of errors, e.g. coverage and measurement errors.

When it comes to sampling errors, it should be mentioned, that in comparison to other EU household surveys, e.g. the Labour Force Survey (LFS) or the Statistics on Income and Living Conditions (SILC), the HBS samples are rather small for some countries (European Commission, 2005). For about half of all countries, the sample size is lower than 5,000; one of the lowest numbers being 1,570 households in the Netherlands. On the other hand, sample sizes larger than 20,000 were achieved for Germany, Italy, Poland and Romania (Table 3). Obviously, the level of sampling errors directly depends on the achieved sample size: the higher the sample size, the better the accuracy. All in

[33] We specified these in the Preface: For all countries, we cannot calculate VAT paid in proportion to household income and we cannot break down our results by expenditure quintiles. In addition, for some countries, specific tables are missing: Italy (income quintiles), Netherlands (number of active persons in the household, household types), Romania (activity status of the household head), Sweden (number of active persons in the household), Slovenia (household types), Slovakia (number of active persons in the household).

all, however, Eurostat concludes that from a policy making perspective the attained sample sizes are still more than satisfactory (European Commission, 2005).

Table 3: Sample Size Household Budget Surveys 2005

Country	Sample Size (households)
BE	3,550
BG	2,870
CZ	2,965
DK	2,449
DE	52,217
EE	3,432
EL	6,555
ES	8,881
FR	12,240
IE	6,884
IT	24,107
CY	2,990
LV	2,774
LT	7,586
LU	3,202
HU	9,058
MT	2,586
NL	1,570
AT	8,400
PL	34,767
PT	16,700
RO	33,066
SI	3,725
SK	4,710
FI	4,007
SE	2,079
UK	6,785

Source: European Commission (2005)

When it comes to non-sampling errors, potential coverage errors are an issue. Generally, coverage errors occur if the probability of being included in the HBS is not equal for all households, which can lead to over- or under-coverage, causing bias in the estimated figures, e.g. if certain types of households with very specific consumption

patterns are not sampled. One should be aware that HBSs generally only sample private households, disregarding collective households such as elderly homes, military barracks or jails. Moreover, some countries exclude specific categories of households or certain remote geographical areas which are difficult to access. For example, Germany, did not sample households with a monthly net income exceeding € 18,000, and the United Kingdom excluded some Scottish off-shore Islands and the Isles of Scilly (European Commission, 2005).

Non-response is another source of bias in sample estimates, particularly if the non-respondents have specific characteristics (i.e. they differ from sampled households in a non-random way). This is an important point, considering that for the Household Budget Survey 2005, the mean response rate for the EU as a whole was around 60 %, with important variations between countries – ranging from 6 % in Belgium to 89 % in Cyprus and 90 % in Romania. Measurement and processing errors resulting from recall problems, underreporting of expenditures on certain "undesirable" products (such as gambling, alcoholic drinks, tobacco or drugs) and interviewer influence represent other potential sources of non-accuracy. Also, for about half of all countries, the year in which interviews for the HBSs took place did not match the reference year of 2005, and price coefficients were used to adjust for this difference. Finally, the HBS data for four countries – the Czech Republic, Hungary, Malta and Romania – do not contain information on imputed rents, leading to an underestimation of expenditures for housing and presumably an overestimation of the VAT burden in proportion to expenditures (see below).

In conclusion, while a lot of progress has been made and much harmonization has been achieved over the past years, methodology of data collection and quality of data can still vary substantially between Member States. For more detailed information on this issue, the reader is referred to the "Quality report of the Household Budget Surveys 2005", provided by Eurostat (European Commission, 2005).

Procedure

For the distributional analysis for private households (task 1) we calculate the VAT liability on private household consumption expenditures in 2011 as well as in reform scenarios 1 and 2. From our data we know how much households in the EU-27 Member States spend on goods and services. From this information we deduce how much VAT they had to pay on their consumption, using information on VAT rates applicable in the respective countries. However, it is likely that some fraction of household expenditure

is made abroad, leading to different VAT payments due to different VAT rates. We do not know the share of expenditures spent abroad or in which country money was spent and assume that all expenditures take place in the Member State where the HBS data is from. For each country, we associate the categories of goods and services with the VAT rate they are taxed with. We apply the rates to the most detailed classification available and calculate weighted averages for the average household and each sub-group of interest. The assumptions we made when associating expenditure categories with VAT rates are listed in the Addendum, delivered with this report; it also contains more detailed country analyses. The spreadsheets, also delivered with this report, contain additional, detailed country tables. A reading instruction for these spreadsheets is provided in the Addendum. In addition, this Addendum contains a comprehensive list of assumptions we made when applying the VAT rates to the data. Moreover, every country chapter contains a short introduction to the relevant national VAT system.

Regarding our assumptions on VAT rates on passenger transport services, two issues should be kept in mind. First, our data does not distinguish between expenditures on domestic or international transport services. In many countries, though, VAT rates differ depending on whether the service was domestic or international. Second, even if we could distinguish the two, we would still be ignorant as to the specific destination and transit countries involved or how travel costs are divided between countries, information that would be necessary to accurately calculating VAT on transport.[34] Researching the exact share of transport expenditures accruing to domestic or international transport, respectively, for each Member State would require a tedious exploration of a vast number of different data sources. This venture would be even further complicated by obtaining information on the travel destinations. Given the comparably small amount of household expenditures spent on transport services (on average over the EU-27 1.4 % of household expenditures, ranging from 0.7 % in Spain to 2.5 % in Latvia) this effort is not reasonable. We therefore make simplifying assumptions.[35] We use the domestic rate for all modes of transport apart from air travel.[36]

[34] Passenger transport services are taxable where they are performed. In case of cross-border (intra-community) transport services VAT applies proportionate to the distance covered.

[35] Some Member States further distinguish VAT rates on passenger transport, e.g. depending on whether the rail transport is long- or short distance or whether the transport service is scheduled or not. The assumptions made to deal with these issues are listed in the Addendum.

[36] For transport services by rail we base this assumption on data provided by Eurostat, stating that EU wide international passenger transport by rail makes up less than 6 % of total passenger transport by rail. (See http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Passenger_transport_statistics, 2013/08/23)

We deviate from this general assumption for passenger transport by air and apply the rate for international flights (a zero rate in all Member States), as Eurostat data[37] indicate that this transport mode is predominantly international. Even for countries where more than 10 % of total air travel is national (seven countries[38], Italy leads the ranking with a share of 27 %) we assume that private households spend most of their expenditures on flights on international flights.[39] Therefore we keep the assumption of a zero rate for expenditures on air travel for all Member States. This assumption is not quantitatively important: Taxing all expenditures on transport by air in Italy, Spain and Sweden (the countries with the highest share of domestic flights) with the domestic rate would lead to increases in average VAT expenditures by € 3 to € 4.

Unless stated otherwise, the following supplies are exempted in all Member States[40]:

- imputed rentals for housing[41] (CP041)

For transport by road and sea/inland waterway EU-wide data on the share of national and international transport are not available. Regarding transport by road the assumption that household expenditures are mostly spent on national services seems sensible. Regarding transport by sea or inland waterway one would need to go further into detail on whether expenditures are higher on transport on inland waterways or on sea, and whether the routes are national or international. Again, the share of expenditures on passenger transport by sea and inland waterway is very small (on average 0.05 %, highest in Malta with 0.2 %) such that we refrain from this option and use the simplifying assumption that all expenditures on this transport mode are for domestic services only.

[37] http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database, Transport, Air Transport, Air transport measurement – passengers, Overview of the air passenger transport by country and airports, Air passenger transport by reporting country [2013/08/09]

[38] UK (10 %), DE (14 %), FI (17 %), FR (21 %), ES (23 %), SE (24 %), IT (27 %)

[39] National flights are presumably more important for business clients or tourists. In case households fly nationally they presumably spend less money on these flights than they do on international ones.

[40] The EU VAT Legislation contains two sorts of exempt supplies. Supplies mentioned in Annex X/b (e.g. telecommunication services, services provided by artists or members of free professions, supply of water by public institutions etc.) can be exempted from VAT. Other supplies such as those mentioned in Article 132 (postal or hospital services, social security, education, etc.) or in Article 135 (insurance and financial services, some supplies related to immovable property, etc.) have to be exempted from VAT.

[41] Comprehensive measures of consumption and income both need to incorporate housing as a major element. This is complicated by the fact that housing consumption and housing income are often not observable cash-flows. Most importantly, owner-occupiers can be thought of as implicitly paying themselves a (notional or imputed) rent for their property: in their capacity as occupiers they are consuming a valuable stream of 'housing services', and in their capacity as owners they are receiving an 'in-kind' income in the form of those services.
The consumption value of living in a property is given by the market rental value of the property being occupied. This is observed in the data for those households who rent their property from a private landlord. To consider the rental value for owner-occupiers or for tenants of 'social landlords' (paying a rent which is typically lower than the market rent) National Accounts data as well as most Household Budget Surveys contain *imputed rents* as part of household consumption. Since consuming dwellings one owns involves no monetary transaction, imputed rents are not liable to VAT. In accordance with the

- actual rentals paid for housing (CP042)
- out-patient and hospital services (CP062 and CP063)
- postal services (CP081) [42]
- games of chance (CP0943)
- education (CP10)[43]
- social protection (CP124)
- insurance services (CP125)
- financial services (CP126)

We assume households do not adjust their consumption; that is, following the reform, they buy the same basket of goods and services as before. This is a simplifying assumption, as zero and reduced VAT rates distort consumption choices because they change relative prices. The abolition of zero and reduced rates would have a substitution effect (as consumers switch away from products and services that were previously taxed at favourable rates) and an income effect (as overall purchasing power decreases following an effective VAT increase), and the removal of the price distortion caused by VAT could lead to an increase in consumer welfare (that is, the utility consumers derive from the bundle of goods they purchase). The magnitude of these effects depends on the change in the effective VAT rate and the relevant demand elasticities.[44]

approach used in IFS et al. (2011), we include expenditures on imputed rents when calculating average expenditures, but treat these payments as VAT exempt. (Changing) VAT rates on the purchase or construction of dwellings by private households cannot be captured with the data at hand.

[42] For the purposes of our analysis we treat all postal services as exempted from VAT, even though services not provided by universal postal services providers are usually subject to the respective standard rate of a country. This approach has two reasons. First, average household expenditure on postal services in EU Member States only makes up a marginal part of total household expenditure (this share is highest in Malta with 0.14 %), allowing for a rather simple assumption. Second, universal postal services providers still hold major market shares in all EU Member States, though this varies between different mailing segments and countries (see Copenhagen Economics, 2010). Assuming the opposite, i.e. taxing the whole sector at the standard rate, only leads to marginal changes in VAT expenditures. In Malta, for example, this would lead to an increase in VAT expenditures of less than € 5 for an average household.

[43] Some expenditures falling in category CP10 "Education" might not be exempt from VAT, such as expenditures for school excursions. We could not make this distinction in the aggregate data, as expenditure on subgroups of CP10 (or even on the main aggregate) is rarely specified. Our simplifying assumption, therefore, is to exempt the whole category CP10.

[44] Alm and El-Ganainy (2013) find that for a sample of fifteen EU countries the effective VAT rate is negatively correlated with aggregate consumption: a one percentage increase in the VAT rate is associated with about a one percentage decline in per capita aggregate consumption. IFS et al. (2011) estimate the effect of an abolition of zero and reduced VAT rates on private expenditures for five EU Member States (Belgium, France, Germany, Spain and the UK) using a Quadratic Almost Ideal Demand System (QUAIDS) framework. While results differ between countries, they conclude that abolishing zero

VAT reforms also affect labour supply because they influence real wages, specifically, a VAT increase would be expected to decrease labour supply (because consumption becomes more expensive in comparison to leisure, this mechanism is the same as in the case of personal income taxes). Moreover, a VAT on work-related expenses such as travel or clothing could provide further disincentives for work, in particular for secondary earners (Metcalf, 1995).[45]

In addition, we assume that an increase in VAT rates is fully incident on consumer prices. From a theoretical perspective, the degree to which changes in VAT rates are passed-through ('shifted') onto consumer prices depends on the structure of the relevant market. Consumption taxes may be under-, fully or even overshifted onto consumer prices; that is, prices can rise less, by the same amount or even more than VAT (IFS et al. 2011). In the short-run (i.e. before firms can adjust their capacity to a change in VAT rates and hence relative prices), in a perfectly competitive market (i.e. individual consumers and producers assume that they cannot influence the market price), VAT is passed onto consumer prices to a lower degree the more elastic the demand is. That is, the easier it is for consumers to substitute away from the good, the lower the fraction of the VAT increase that is passed onto them. Conversely, VAT changes are passed onto consumer prices to a higher degree for a given demand if the supply is elastic (that is, producers curb or expand production readily in response to small price changes), see e.g. Fullerton and Metcalf (2002).

In a monopolistic market, VAT is expected to be fully shifted onto prices as firms have full control over prices. In an oligopolistic market, all degrees of tax shifting are possible depending on the level of competition and supply and demand elasticities (i.e. how strongly supply and demand react to changes in prices). If demand reacts more strongly to price increases than to price decreases (i.e. if the demand function is sufficiently concave), price increases have a strong effect on demand if the price level is high, i.e. undershifting might occur in this case. Conversely, if demand reacts less

and reduced VAT rates would lead to a welfare gain. Also, they find that the distributive effect of this VAT reform – that is, the relative additional VAT burden for households according to expenditure deciles – is very similar to the static analysis.

[45] Blumkin et al. (2008) compare income and consumption taxes in an experimental framework. They find that consumption taxes discourage labour supply less than wage taxes, because of the temporal separation between the labour supply and the consumption decision. Metcalf (1996) estimates the labour supply effects of a shift from income to consumption taxation. He finds that the adverse effects on labour supply are quite small in such a scenario. Lehmus (2011) analyses a similar reform scenario in a dynamic general equilibrium model with heterogeneous agents. He replaces the progressive labour tax with a flat-rate consumption tax and also finds negligible changes in labour supply and gross labour income distribution.

sensitively to price increases (i.e. the demand function is sufficiently convex), small price increases have a strong effect on demand if the price level is low, but the absolute decrease in demand diminishes as prices increase further. In this case, it might be more profitable for a firm to increase prices by more than the VAT increase, as the increase in price will be sufficient to more than offset the reduction in sales volume and possible rise in costs (Delipalla and Keen, 1992, and Carbonnier, 2006).

The empirical literature confirms that markets that can be described as close to perfect competition tend to feature full shifting, while less competitive markets feature both under- as well as overshifting of taxes, e.g. Delipalla and O'Donell (2001), Carbonnier (2007) and Smart and Bird (2009). Concerning the effect of an overall VAT rate change on the average price level, studies have found full or near-full shifting of taxes – at least in the long-run –, e.g. Copenhagen Economics (2007).

To sum up, the theoretical and empirical literature provides inconclusive results on the degree of the incidence of VAT, with both under- and overshifting being possible depending on the market structure. However, both the theoretical and the empirical literature suggests that pass-through of VAT onto consumer prices is generally closer to full-shifting in competitive markets and for broader-based VAT changes. In line with Copenhagen Economics (2007) and IFS et al. (2011), and since we do not possess sufficient information that would allow us to define different levels of shifting across countries and sectors with any reasonable certainty, we assume full-pass through of VAT changes to prices. As the reform scenarios analysed here stipulate VAT changes for many broadly defined categories of goods and services (such as foodstuffs) in many countries, this assumption does not seem unreasonable.

We calculate household VAT bills on average as well as broken down by COICOP categories and household characteristics. The household characteristics we consider are the following:

- Activity status of the household head[46]:
  - manual worker in industry and services
  - non-manual worker in industry and services
  - employed person except employees (self-employed person, farmer or agricultural worker)

[46] The household head (or the household reference person) is usually defined as the household member contributing most to household income. However, not all countries follow this definition (European Commission, 2005).

  - unemployed person
  - retired person
  - other inactive person (student or in national service, person exclusively dedicated to household duties / caregiving, person engaged in a non-economic activity, person unable to work)
- Number of active persons in the household: "active" includes all employed persons from above (workers, self-employed, farmers) as well as unemployed persons.
- Income quintile: For each country households are sorted according to their household income[47] (from poorest to richest) and then divided into five equally sized groups. The 20 % of households with the lowest household income make up the first quintile, the next 20 % the second quintile and so on. The fifth quintile contains the 20 % of households with the highest household income.
- Household type: Households are separated according to the number and age of their members (number of adults and dependent children; a dependent child is a person aged 15 years or younger, or a person aged 23 years or younger if the person is not yet active on the labour market, i.e. not working and not unemployed).
- Age of the household head[48]

In order to analyse the distributional consequences of the current VAT rates structure and of prospective reforms we calculate VAT payments in absolute values as well as in proportion to total expenditure. As a measure of the living standard of a household we refer to the income quintile the household belongs to. Data on expenditure is sometimes considered to be a better measure of living standards than income because it conveys more information on households' well-being over the life cycle (e.g. Crossley et al., 2009, IFS et al. 2011). This is because individuals can smooth their consumption over the life-cycle by borrowing, saving, and subsequently drawing on their savings. An individual in her peak earning years with a high savings rate, for example, would appear to be less affected by VAT because of her low consumption expenditure. As a retiree, however, she would be hit by the tax, as she uses up her savings to complement her decreased income. She would not be spared from incurring VAT payments, but only

[47] We assume household incomes were not equivalised in this procedure. "Equivalisation" intends to make income comparable across differently sized households. This adjustment typically consists of dividing expenditure by the modified OECD scale. This scale gives a weight of one to the first member of the household, a weight of 0.5 to every additional adult member and a weight of 0.3 to every child living in the household. This approach assumes economies of scale in consumption. A family of two adults and one child would thus have to earn 1.8 times as much as a single person to be considered as having the same "equivalised" income.

[48] The information on all definitions was obtained from European Commission (2006). We could not verify whether every country followed these definitions.

defer them over time. As pointed out by IFS et al. (2011), ideally, we would be interested in the impact of VAT on the lifetime-rich versus the lifetime-poor. However, data on lifetime income and lifetime expenditure are generally not available. Because consumption expenditure varies less over the life-cycle than income, it can be argued to be more informative of individual lifetime resources than income (Crossley et al., 2009).

Also, whether the VAT burden of a household is measured in terms of VAT payments as a percentage of income or expenditure has implications on whether a VAT system appears to be distributionally regressive, neutral or progressive. This is because households' savings rate varies with income: low income households tend to spend more than their income, while high income households tend to spend less than their income (IFS et al. 2011, Carrera 2010).

When looking at VAT payments as a proportion of expenditure, across the expenditure distribution[49], VAT will appear more progressive than when looking at VAT payments as a proportion of income, across the income distribution. Because many low income households have expenditures higher than their income, the VAT burden on low income households measured as a fraction of their income will appear high, making the VAT system look regressive. On the other hand, looking at VAT payments as a percentage of expenditure, over the expenditure distribution, will make the system look progressive, because low expenditure households tend to spend a higher fraction of their total expenditure on zero and reduced rated items than high expenditure households, which will result in a lower VAT burden on low expenditure quintiles when measured as a percentage of expenditure. The VAT system will look even more progressive when assessed based on VAT payments as a proportion of income, across the expenditure distribution, because low spending households generally have incomes exceeding their spending, leading to a low ratio of VAT payments to disposable income, while the reverse is true for high spending households. Carrera (2010) shows that, when looking at quintiles of the expenditure distribution, VAT as a percentage of disposable income increases in the UK, hence makes the system appear progressive, while it decreases over the income distribution, implying it to be regressive.

[49] That is, we define households with high expenditures as rich, and those with low expenditures as poor. If we use the income distribution as a benchmark, we define those with low incomes as poor, and those with high incomes as rich. As argued above, the expenditure distribution might carry more information on life-time resources, but one still might prefer to use the income distribution.

This introduces some ambiguity into the assessment of the progressivity of VAT systems. However, it can be argued, that measuring VAT as a proportion of income can be misleading (IFS et al. 2011). Consider the example of an economy where lifetime income equals lifetime expenditure (that is, there are no bequests), individuals can borrow and save, and there is a uniform VAT rate on all goods and services; in this case, the VAT system would not influence the distribution of resources in the economy (everyone would pay the same fraction of their lifetime resources on VAT). When assessing this VAT system empirically using a cross section of income and expenditure data, we would correctly identify this VAT system to be distributionally neutral when looking at VAT payments as a fraction of expenditure, regardless of whether we look at the income or expenditure distribution. When looking at VAT payments as a proportion of income, however, we would judge it to be regressive if individuals with high income save, and those with low income borrow, when looking at the income distribution. When looking at the expenditure distribution, we would mistakenly judge it as progressive.

Total VAT liabilities of households

Because of a host of potential problems with Household Budget Surveys (as discussed above) we use another data source (WIOD data, see below) to estimate households' total liabilities as well as any changes in revenues due to changes in the VAT rates structure (task 3). Using this database not only gives us more accurate estimations of the static revenue effects, estimation of revenues obtained from households are furthermore congruent with the calculations of those obtained from non-household entities.[50] The WIOD database is, among others, based on National Accounts, which are, in turn, based on the information provided by the Household Budget Surveys. However, both NA and WIOD data include additional estimates for underrepresented categories or households that are not part of the reference population in the Household Budget Surveys. It has to be noted, however, that HBS, NA and WIOD all exhibit different expenditure structures, which can lead to different estimations of average VAT rates. We will discuss this issue briefly below and draw attention to it when necessary while discussing the results.

[50] For this reason we also refrain from the possibility to calculate additional VAT revenues for households based on National Accounts data. Although basing on each other there are differences in total household expenditures as well as in expenditure structures between NA data and the WIOD database for most countries.

Scenario 3 calculates by how much households defined as low-income households would have to be compensated in scenario 1 in order to be able to buy the same bundle of goods and services as in the base scenario. We use two definitions of low-income households based on income quintiles. In scenario 3a we compensate the 40 % of households with the lowest incomes (first and second income quintiles); in scenario 3b we compensate the 20 % of households with the lowest incomes (first quintile only). Scenario 3 calculates the additional VAT liabilities that can be expected from abolishing zero and reduced rates even though especially vulnerable groups are compensated for their increase in VAT such that they are able to buy the same bundle of supplies as before the reform.

In order to compensate especially vulnerable households for an increase in VAT, vulnerable households have to be specified. There is a vast literature on the definition and measurement of income inequality and poverty, and some approaches stress non-economic components to well-being such as health or varying needs across individuals (see e.g. Sen, 2000). As far as income inequality is concerned, the concept of income quintiles has a number of practical advantages, e.g. it can deal with negative incomes and is invariant to the scale in which income is measured. It is not the only measure that satisfies these requirements, others include the Gini-Coefficient (see e.g. Cowel, 2000), the income quintile share (S80/S20) ratio or the at-risk-of-poverty (ARP) rate. The two latter measures are the most commonly used ones according to Eurostat (2013b). The income quintile share is the ratio of total income received by the fifth income quintile to that of the first income quintile (income in terms of equivalised disposable income) (Eurostat, 2013a), while the ARP rate is the share of the population whose income is lower than the at-risk-of-poverty threshold of 60 % of the median (equivalised) income (Eurostat, 2013a). Households at-risk-of-poverty would be a candidate for compensation in the present analysis; however, our data does not contain this information. While we would expect a substantial overlap between households in the first and second income quintiles with those at-risk-of-poverty, and the poorest households would be considered poor according to both measures, they do not need to coincide. For example, in a very egalitarian society, only the poorest households might have incomes that are lower than 60 % of the median income, so policy makers might not even want to compensate the entire first income quintile; in a society with an income distribution that features many equally poor households, more than 40 % may have an income beneath the at-risk-of-poverty threshold. For the EU as a whole, around 16 % of the population are currently at-risk-of-poverty (Eurostat, 2012). In the context of our study, this indicates that when compensating the first income quintile, we would

compensate those households who either are at-risk-of-poverty, or barely escape this definition. When we also compensate the second income quintile, while we would be still compensating those with incomes below the median, we would be compensating many households towards the centre of the income distribution. While income quintiles are the only measure we can use in this study because of the data availability, they are a heavily used measure in the empirical literature (e.g. OECD (2008) and OECD (2011), IFS (2011) to name a few). It is however a drawback that our data do not reveal more about the composition of the income quintiles with regards to household type, activity status etc. This is also the reason why we cannot make a distributional analysis of scenario 3 for other aspects of household characteristics: We simply do not know how many households with children or households headed by a retired head will be compensated according to our definition.

As discussed in detail above, both income and expenditure can be used as a measure of material well-being, but representing VAT payments as a percentage of total expenditure is a more accurate measure of the relative VAT burden of a given household. Compensating low income households (as opposed to low expenditure households) for their losses after a VAT increase makes sense if life-time income is not equal to life-time expenditure (that is, individuals with high savings rates will not ultimately consume their savings and therefore be hit by VAT at a later point in life). In this case, compensating low expenditure individuals would be akin to a subsidy to savings, and not necessarily benefit the life-time poor.

As there is no information on income distribution in the WIOD tables, we use HBS and NA data to calculate the share of additional VAT payments that accrue to low income households.[51] Specifically, when calculating the budget effect of the reform, we subtract the fraction of the additional VAT paid by low income households, as estimated with HBS and NA data, from the additional revenue calculated using WIOD data, because this fraction is assumed to be used to compensate low income households for the reform by enabling them to buy the same basket of supplies as before the reform.

[51] In some countries expenditure structures are similar in HBS and NA data. When this is the case, it does not matter whether we calculate the share of the additional VAT burden arising from scenario 1 accruing to low income households with HBS data only or with a combination of HBS and NA data. However, for countries with deviating expenditure structures (and thus deviating average VAT rates on the households' consumption) the shares calculated with HBS and NA data typically differ. As we are interested in additional revenues and NA data are more appropriate to calculate revenues, we prefer using the combination of HBS data (from which we obtain the shares in expenditure of low income households) and NA data (from which we obtain the average VAT rates).

Analysis for non-households

We estimate for each Member State how much, broken down by category of goods and services, the different types of non-households would have to spend on irrecoverable VAT payments in the status quo and in scenarios 1 and 2.[52]

The estimation involves the following tasks and data:

- Gathering relevant data for tax rates by product, following the 59-product classification (see section A.4 in the Annex) in the Eurostat tables, as updated by WIOD[53], and collecting comparable data on exemptions;
- Estimating the 2011 use tables, extrapolated from the 2009 WIOD tables;
- Estimating the *propex* factor (percentage of sector output which is exempted from VAT, and which therefore cannot recover VAT on inputs) for each of the 35 sectors considered in the WIOD classification, as well as other items that increase the amount of unrecoverable VAT (small business exemptions, limits on deductibility of expenses on company cars and expenses for entertainment purposes);
- Estimating the percentage of Gross Fixed Capital Formation (GFCF) belonging to non-household, non-government sectors which are exempt from VAT.

Details on each of these components are as follows.

Calculations of VAT rates and exemptions

We calculate VAT rates for 59 CPA (Classification of Product Activities) supplies for all EU countries, for 2011 (7,965 cases total, NACE Rev 1 classification). Relevant data sources include:

- EU TAXUD publications on VAT rates (European Commission, 2011a),
- International Bureau of Fiscal Documentation (IBFD) database on VAT rates[54],
- IBFD publication of national tax codes and
- IBFD taxation news to track any changes in the legislation.

The estimation involved several steps:

- We constructed VAT rates for each of the 2,531 6-digit CPA supply categories, using the IBFD database. All EU countries taken together, we defined VAT rates

[52] In addition, as mentioned above (p. 46), changes in VAT liabilities in total (for households and non-households) are calculated based on the data and procedure described below.
[53] World Input-Output Project, available at http://www.wiod.org/database/nat_suts.htm [2013/03/26]
[54] See http://www.ibfd.org/ [2013/07/04]. The referenced database is available by subscription only.

for 68,319 cases. However, even at this level of detail, in 2,727 cases it was not possible to define a single VAT rate applying to the entire category. For example, different VAT rates commonly apply to international and domestic transport services, which fall into the same 6-digit CPA category. In cases as this, we took note of the possible differing VAT rates, and used additional assumptions when aggregating those rates to the 2-digit level.

- With respect to standard vs. reduced rates or exemptions, we found that in 80 % of all 68,319 cases, the standard VAT rate applies to the category in question. The remaining cases (13,341) are either taxed at a reduced rate or exempt. We researched rates applying to these categories in the relevant appendices of national tax codes or EU TAXUD publications.
- Finally, we aggregated the 6-digit CPA VAT rates into 59 2-digit categories (a total of 1,674 total cases per annum).

2011 Use tables: choice and estimations

There are three different types of use tables that are widely available and comparable across countries: EUROSTAT NACE Rev 1, EUROSTAT NACE rev 2 and WIOD (which provides estimates for all countries, albeit based on 2007/2008 original data). For ease of comparison across countries, we chose to use the WIOD database and proceeded to forecast the 2011 use tables through rescaling based on actual National Accounts data for Final Demand and Intermediate Consumption.

Propex factor (unrecoverable VAT on inputs in exempt entities)

Due to the lack of data on the number of supplies that are exempt from VAT at the level of disaggregation of the WIOD tables, we have adopted the propex methodology developed by Reckon consultancy in the estimation of the VAT gaps (Reckon LLP, 2009). In a nutshell, this methodology consists of assuming that the share of output within a 2-digit NACE sector reflects the share of inputs used to produce that set of goods and services. For example, “postal services”, which belong to “Post and telecommunication services” NACE rev 1 I.64 sector, are exempted in Austria and other Member States. We assume that the propex (or the share of VAT non-deductible inputs) for I.64 sector is equal to the share of “postal services” output in the total “Post and telecommunications” sector total output.

We used this method to compute *propex* for all exempt activities, with the exception of the financial services sector, for which we use estimates based on information gathered through communications from national authorities.[55]

We also allowed for restrictions generally imposed on firms to deduct VAT related to the purchase of cars, as well as for purposes of entertainment. Finally, and again on the basis of country submissions, we estimate the number of small businesses (businesses below the threshold for VAT registration in countries that have such thresholds) that might choose to register in order to recover VAT on their inputs.

GFCF not attracting VAT

Entities that are exempt or sell exempted goods are also unable to recover VAT on their expenditures on GFCF (Gross Fixed Capital Formation). In order to estimate this unrecoverable liability, we first disaggregate the GFCF data provided in the use tables (GFCF is recorded as a single column, distributed among the 59 products) between non-financial corporations, financial corporations and other economic agents (government, households, non-profits). We then use data provided by national authorities to calculate the average VAT rate on purchases of goods and services for GFCF purposes by exempt entities.

Comparison of average effective VAT rates

For both analyses on private households (task 1 distributional analysis and task 3 additional revenues) we calculate average effective VAT rates. The analysis on task 1 is based on HBS data, the analysis of task 3 on WIOD data. The resulting rates differ (see Table 4). For most countries the deviations are acceptable, given the fact that the average VAT rates depend on the expenditure structure and that there are necessary differences between data taken directly from surveys and data incorporating other sources as well.[56]

For the following countries, however, the gap amounts to more than 1.5 percentage points, with the average VAT rate from HBS data being larger than the one obtained from WIOD data:

[55] Generally, financial services are exempt from VAT, with a few exceptions. In some countries, VAT is recoverable for exports of financial services to non-EU countries.

[56] See the short discussion above on supplies typically underestimated in survey data and populations excluded from the sample population.

- Czech Republic (1.6 percentage points)
- Hungary (5.4 percentage points)
- Latvia (3.4 percentage points)
- Malta (1.8 percentage points)
- Austria (1.6 percentage points)
- Romania (4.0 percentage points)

The fact that rents are not imputed in HBS data contributes considerably to the divergences between the results from the two data-sources in the Czech Republic, Hungary, Malta and Romania. In these countries household expenditures are calculated without adding this notional consumption expenditure. Since imputed rents are exempt (because no actual transaction takes place) including them in total household expenditure automatically reduces the average VAT rate. Comparing the HBS to the NA data (which do contain imputed rents)[57] shows a difference in the average VAT rates for these countries (average VAT rates of 12.3 %, 17.3 %, 9.2 % and 17.1 % in NA data for the Czech Republic, Hungary, Malta and Romania, respectively). Also for Latvia, the difference to the average VAT rate calculated from NA data (which is 15.9 %) is considerable. Primarily responsible for this divergence is that, in some expenditure categories, there are marked differences in the distribution of expenditure over sub-categories between the two datasets. For example, CPO4 has a higher share of exempt rents in the NA data, or in CP12, exempt insurance and banking services are more important as a fraction of total expenditure in the NA data than in the HBS data. For Austria there is a difference between rates obtained from HBS and NA data as well, even though not as big as in the other countries analysed above.[58]

[57] The WIOD data are based on NA data; a comparison to WIOD data nevertheless is not straightforward, as WIOD data uses a different categorization of goods and services, see above.

[58] The rate estimated from NA data amounts to 12 %, which is closer to the rate estimated from WIOD data (11 %). Some categories are taxed at a lower rate in NA due to a higher share of exempt supplies within the main categories (CP04 with a higher share in imputed rents, CP06 with a higher share in health services, CP08 with a higher share of postal services). Tables on this and the other comparisons are available upon request.

Table 4: Comparison of average effective VAT rates in 2011 in HBS and WIOD

Country	HBS data	WIOD data
BE	11.1%	10.0%
BG	14.8%	13.6%
CZ	13.8%	12.3%
DK	15.3%	14.8%
DE	10.1%	10.0%
EE	14.6%	15.0%
EL	13.0%	12.2%
ES	7.7%	8.3%
FR	9.0%	10.3%
IE	9.7%	8.7%
IT	9.3%	10.2%
CY	7.3%	6.4%
LV	18.1%	14.7%
LT	17.2%	17.2%
LU	6.6%	8.0%
HU	21.2%	15.8%
MT	11.2%	9.4%
NL	8.3%	8.3%
AT	12.8%	11.3%
PL	11.9%	11.4%
PT	9.9%	11.3%
RO	21.7%	17.7%
SI	11.7%	11.4%
SK	15.9%	14.9%
FI	12.3%	11.2%
SE	13.3%	12.2%
UK	8.6%	9.7%

Source: WIOD, Household Budget Surveys, National Accounts (Eurostat), own calculations.

This problem also affects reform scenario 2, where a new budget neutral standard rate is applied to all supplies not exempt from VAT. The simulation of scenario 2 with WIOD data suggests a decline in aggregate VAT payments of households for Estonia, Italy, Lithuania and Romania. Simulating scenario 2 with HBS data arrives at the same results for Estonia, in the other countries listed above it predicts an increase in the VAT burden of private households. On the other hand, HBS data predict a decrease in the VAT bill of households in Denmark, Latvia and Hungary, while WIOD data calculate

an increase. Also, the gaps between the situation in 2011 and scenario 2 are different in some countries. HBS data predict a much higher increase for France (21 % compared to 2 % according to WIOD data), Luxembourg (27 % compared to 10 %), Poland (13 % compared to 4 %), Portugal (16 % compared to 3 %) and the UK (16 % compared to 5 %).

Again, a detailed analysis of the differences between HBS and WIOD data is not straightforward. Looking at the differences between HBS and NA data – both of which use the same classification of goods and services – we get significant differences in the average VAT rates, originating in different shares of consumption for specific supplies. In most countries we observe large discrepancies in CP04 (relation between imputed and actual rents as well as share of other expenditures in this category compared to – usually exempt – rents), CP12 (share of insurances and financial activities) and CP02 (alcohol and tobacco).

Although it is not desirable to work with different average VAT rates in the analysis, we do not have a choice, as HBS data are the only available data source for the analysis of the distributional effects of the VAT rates structure. This problem should therefore be kept in mind, and we will mention it in the remainder of the report whenever some results deviate strongly from results based on WIOD data. In order to maintain consistency in the calculation of additional VAT revenues due to the reform scenarios (section 2.5) we calculate these based on WIOD data for all institutional sectors (households and non-households).

2.2 Results: Overview

This section provides a bird's eye view of the overall VAT liability in 2011, and the VAT liabilities of institutional sectors (see below). Table 5 toTable 9 provide baseline information for the EU-27. Table 5 and Table 6 show three institutional sectors: Households, Intermediate Consumption and Others. Intermediate Consumption accounts for the VAT liability on inputs of sectors producing exempt goods and services; exempt sectors cannot recover VAT liabilities on production inputs. The category "Others" subsumes non-recoverable VAT liability relating to government consumption, Non-Profit Institutions Serving Households (NPISHs) and Gross Fixed Capital Formation (GFCF) activities by exempt sectors, and other small adjustments. Table 7 toTable 9 provide more detailed information on the most important (exempt) sectors, government consumption, NPISHs and GFCF.

Overall, in 2011, the Household sector accounts for an average of 60 % of all VAT liability in the EU-27 countries. Unrecoverable VAT liabilities from intermediate inputs purchased by sectors producing exempt supplies account for 19 %, and the remaining 21 % accrue to the Government, NPISHs and unrecoverable VAT on GFCF expenditures of exempt sectors. There is considerable dispersion in these ratios across the EU, with the share of Household consumption on total VAT liabilities ranging from a low of 35 % in Luxembourg, to a high of 74 % in Lithuania. This range reflects both the existence of multiple rates and of exemptions (for instance, the low value for Luxemburg is due to the importance of financial services in the economy).

While statutory VAT rates range from 15 % to 25 % across the European Union, there is a much wider dispersion of effective rates[59] faced by the institutional sectors considered in our analysis. For instance, Household Consumption, once zero and reduced rates and exempt supplies are taken into account, faces an effective rate that ranges from 6 % in Cyprus (standard rate 15 %) to 18 % in Romania (standard rate 24 %). Sectors producing exempt goods and services (the sector Intermediate Consumption) face an effective VAT rate ranging from 2 % in Luxembourg to 17 % in Romania. Effective rates faced by government and NPISH range from less than 1 % in Greece or Cyprus to 5 % in Romania due to a high share of exempted or non-taxable expenditures (e.g. salaries of teachers) in total government final consumption.

[59] We calculate the effective VAT rate by dividing VAT liabilities by the tax base (net expenditures). Contrary to the standard VAT rate the effective VAT rate informs about how much the different institutional sectors really pay on their consumption, taking into consideration zero and reduced rates as well as exemptions.

Table 5: 2011 Baseline VAT Liability (million Euros)[60]

Country	Total	Statu-tory Rate	House-hold Liability	Percent of Total	Effect. rate	Interm. Cons.	Percent of Total	Effect. rate	Others	Percent of Total	Effect. Rate (Gov. and NPISH)	Total effect. rate
BE	30,612	21%	16,845	55%	10%	6,788	22%	10%	6,979	23%	1%	8%
BG	4,001	20%	2,565	64%	14%	816	20%	14%	620	15%	2%	11%
CZ	15,481	20%	8,573	55%	12%	3,805	25%	14%	3,102	20%	3%	10%
DK	26,112	25%	14,291	55%	15%	6,959	27%	16%	4,862	19%	1%	11%
DE	219,804	19%	129,502	59%	10%	38,895	18%	10%	51,406	23%	2%	8%
EE	1,694	20%	1,060	63%	15%	274	16%	14%	360	21%	2%	11%
EL	24,813	23%	17,686	71%	12%	3,266	13%	15%	3,861	16%	0%	10%
ES	72,315	18%	47,372	66%	8%	12,066	17%	9%	12,876	18%	1%	7%
FR	175,004	20%	104,721	60%	10%	24,875	14%	12%	45,407	26%	2%	8%
IE	10,831	21%	5,876	54%	9%	2,585	24%	8%	2,370	22%	1%	7%
IT	133,938	20%	90,607	68%	10%	15,290	11%	9%	28,041	21%	3%	8%
CY	1,422	15%	814	57%	6%	147	10%	7%	461	32%	0%	5%
LV	2,340	22%	1,570	67%	15%	464	20%	12%	306	13%	1%	11%
LT	3,805	21%	2,818	74%	17%	436	11%	16%	550	14%	2%	13%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.
The statutory rates depict the situation in 2011.

[60] Numbers in the column "Total" differ from actual VAT collected (as shown in Table 1). Here we calculate VAT liabilities, that is given the tax base and the respective VAT rates how much VAT households and non-households have to pay on VAT (see also section 2.1)

Table 6: 2011 Baseline VAT Liability (million Euros), continued from Table 5

Country	Total	Statu-tory Rate	House-hold Liability	Percent of Total	Effect. rate	Interm. Cons.	Percent of Total	Effect. rate	Others	Percent of Total	Effect. Rate (Gov. and NPISH)	Total effect. rate
LU	3,281	15%	1,135	35%	8%	944	29%	2%	1,203	37%	1%	3%
HU	11,630	25%	7,215	62%	16%	1,963	17%	14%	2,451	21%	4%	13%
MT	541	18%	377	70%	9%	90	17%	8%	74	14%	2%	8%
NL	46,146	19%	20,253	44%	8%	13,693	30%	11%	12,200	26%	1%	7%
AT	26,349	20%	16,632	63%	11%	5,418	21%	12%	4,298	16%	1%	9%
PL	35,241	23%	21,993	62%	11%	6,268	18%	13%	6,981	20%	2%	9%
PT	16,892	23%	11,505	68%	11%	3,302	20%	13%	2,085	12%	1%	9%
RO	21,789	24%	12,206	56%	18%	2,466	11%	17%	7,116	33%	5%	15%
SI	3,319	20%	2,237	67%	11%	506	15%	12%	576	17%	2%	9%
SK	7,573	20%	5,059	67%	15%	1,133	15%	13%	1,380	18%	2%	12%
FI	19,465	23%	10,010	51%	11%	4,880	25%	15%	4,575	24%	2%	9%
SE	38,067	25%	19,613	52%	12%	10,095	27%	14%	8,360	22%	2%	9%
UK	149,809	20%	95,391	64%	10%	36,829	25%	10%	17,590	12%	1%	8%
Average				**60%**	**12%**		**19%**	**12%**		**21%**	**2%**	**9%**

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.
The statutory rates depict the situation in 2011.

Table 7: Baseline VAT Liability for main exempt sectors and activities

	Total VTTL	Total non-HH	Post and Tele-communications		Real Estate Activities		Financial Intermediation	
			Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL
BE	30,612	45%	48	0%	976	3%	1,489	5%
BG	4,001	36%	0	0%	323	8%	82	2%
CZ	15,481	45%	21	0%	1,509	10%	693	4%
DK	26,112	45%	53	0%	1,509	6%	621	2%
DE	219,804	41%	803	0%	6,562	3%	9,733	4%
EE	1,694	37%	6	0%	10	1%	32	2%
EL	24,813	29%	2	0%	338	1%	508	2%
ES	72,315	35%	153	0%	2,166	3%	1,696	2%
FR	175,004	40%	275	0%	2,491	1%	5,209	3%
IE	10,831	46%	37	0%	256	2%	487	5%
IT	133,938	32%	177	0%	347	0%	3,123	2%
CY	1,422	43%	1	0%	28	2%	24	2%
LV	2,340	33%	1	0%	201	9%	34	1%
LT	3,805	26%	0	0%	134	4%	57	1%
LU	3,281	65%	6	0%	48	1%	684	21%
HU	11,630	38%	5	0%	604	5%	344	3%
MT	541	30%	1	0%	0	0%	19	4%
NE	46,146	59%	1,299	3%	3,864	8%	2,214	5%
AT	26,349	37%	75	0%	1,585	6%	1,014	4%
PL	35,241	38%	16	0%	2,363	7%	1,093	3%
PT	16,892	32%	63	0%	133	1%	615	4%
RO	21,789	44%	66	0%	916	4%	310	1%
SI	3,319	33%	4	0%	79	2%	80	2%
SK	7,573	33%	14	0%	110	1%	151	2%
FI	19,465	49%	0	0%	1,627	8%	479	2%
SE	38,067	48%	0	0%	3,808	10%	947	2%
UK	149,809	36%	438	0%	3,396	2%	8,973	6%
Mean		40%		0%		4%		4%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.
VTTL=VAT Total Tax Liability

Table 8: Baseline VAT Liability for main exempt sectors and activities (continued from Table 7)

	Public Admin and Defence; Compulsory Social Security		Education		Health and Social Work		Other Community, Social and Personal Services	
	Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL
BE	1,303	4%	312	1%	1,678	5%	419	1%
BG	170	4%	58	1%	117	3%	67	2%
CZ	555	4%	252	2%	614	4%	162	1%
DK	1,403	5%	536	2%	1,825	7%	299	1%
DE	8,897	4%	2,479	1%	8,993	4%	1,428	1%
EE	99	6%	41	2%	54	3%	34	2%
EL	1,260	5%	135	1%	803	3%	252	1%
ES	3,335	5%	644	1%	3,061	4%	1,550	2%
FR	5,822	3%	1,488	1%	4,509	3%	5,331	3%
IE	403	4%	217	2%	727	7%	181	2%
IT	5,170	4%	486	0%	5,054	4%	513	0%
CY	54	4%	9	1%	24	2%	8	1%
LV	103	4%	37	2%	54	2%	35	1%
LT	69	2%	45	1%	105	3%	27	1%
LU	96	3%	19	1%	85	3%	6	0%
HU	442	4%	170	1%	342	3%	57	0%
MT	23	4%	3	1%	11	2%	34	6%
NE	4,645	10%	648	1%	1,945	4%	409	1%
AT	974	4%	348	1%	1,091	4%	331	1%
PL	958	3%	406	1%	737	2%	696	2%
PT	658	4%	179	1%	767	5%	434	3%
RO	280	1%	188	1%	705	3%	0	0%
SI	128	4%	60	2%	121	4%	33	1%
SK	417	6%	95	1%	212	3%	135	2%
FI	1,192	6%	354	2%	890	5%	337	2%
SE	2,114	6%	623	2%	1,661	4%	941	2%
UK	9,410	6%	2,883	2%	10,662	7%	1,066	1%
Mean		4%		1%		4%		1%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.
VTTL=VAT Total Tax Liability

Table 9: Baseline VAT Liability for main exempt sectors and activities (continued from Table 8)

	Other IC		Government final consumption		NPISH final consumption		GFCF of exempt sectors	
	Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL	Baseline VTTL	% of Total VVTL
BE	564	2%	1,266	4%	58	0%	5,655	18%
BG	0	0%	83	2%	4	0%	533	13%
CZ	0	0%	827	5%	151	1%	2,124	14%
DK	713	3%	943	4%	0	0%	3,919	15%
DE	0	0%	7,823	4%	1,535	1%	42,048	19%
EE	0	0%	66	4%	11	1%	282	17%
EL	0	0%	82	0%	40	0%	3,740	15%
ES	0	0%	2,946	4%	102	0%	9,828	14%
FR	0	0%	9,591	5%	861	0%	34,955	20%
IE	277	3%	287	3%	131	1%	1,952	18%
IT	421	0%	7,926	6%	207	0%	19,909	15%
CY	0	0%	4	0%	1	0%	455	32%
LV	0	0%	26	1%	1	0%	280	12%
LT	0	0%	93	2%	0	0%	457	12%
LU	0	0%	49	1%	7	0%	1,147	35%
HU	0	0%	745	6%	186	2%	1,520	13%
MT	0	0%	33	6%	2	0%	39	7%
NE	0	0%	2,160	5%	133	0%	9,908	21%
AT	0	0%	762	3%	45	0%	3,491	13%
PL	0	0%	1,137	3%	126	0%	5,718	16%
PT	495	3%	311	2%	105	1%	1,669	10%
RO	0	0%	731	3%	259	1%	6,127	28%
SI	0	0%	125	4%	6	0%	446	13%
SK	0	0%	285	4%	7	0%	1,087	14%
FI	0	0%	850	4%	97	1%	3,628	19%
SE	0	0%	1,658	4%	0	0%	6,702	18%
UK	0	0%	1,775	1%	1,745	1%	14,069	9%
Mean		0%		3%		0%		17%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.
VTTL=VAT Total Tax Liability

While scenario 1 abolishes all zero and reduced rates, in scenario 2, zero and reduced rates are abolished, and the standard rate is changed to a new value, without affecting total VAT liabilities of all institutional sectors. Table 10 and Figure 1 show this new standard rate and compare it to the standard rate in 2011. In the EU-27 average, the revenue neutral rate would be 3 percentage points lower than the average standard rate. It is, however, apparent that the exercise would have very different consequences for individual countries.[61] The required reduction in the standard rate ensuring a revenue-neutral outcome depends on the pervasiveness of the zero and reduced rates in the VAT rates system in place in 2011. Thus, Poland, Portugal, Ireland, Spain and Italy would see a reduction in the standard rate of more than five percentage points. On the other hand, for countries such as Bulgaria, Slovakia, Denmark and Lithuania (which rely less on zero and reduced rates) the actual standard rate in 2011 and the "revenue neutral" rate are virtually identical.

In the following two sections we analyse the situation for the different institutional sectors paying VAT (households in section 2.3, non-household entities in section 2.4) in 2011 in more detail, and perform our analysis for scenario 1 and scenario 2. Section 2.5 analyses the estimated additional revenues generated in reform scenarios 1 and 3 (compensating low income households for their additional VAT payments in scenario 1). All these tasks are performed statically, without behavioural reactions to changes in the VAT rates structure. Chapter 3 analyses the general equilibrium effects of a change in the VAT rates structure on GDP growth, employment, consumption, and import and export volumes, allowing for behavioural reactions.

[61] Note that this is the arithmetic average of the budget-neutral rate of all EU-27 countries, not the EU-27 average. Thus, introducing a new standard rate of 17.7 % in all EU-27 Member States while abolishing all zero and reduced rates would not be a budget neutral reform.

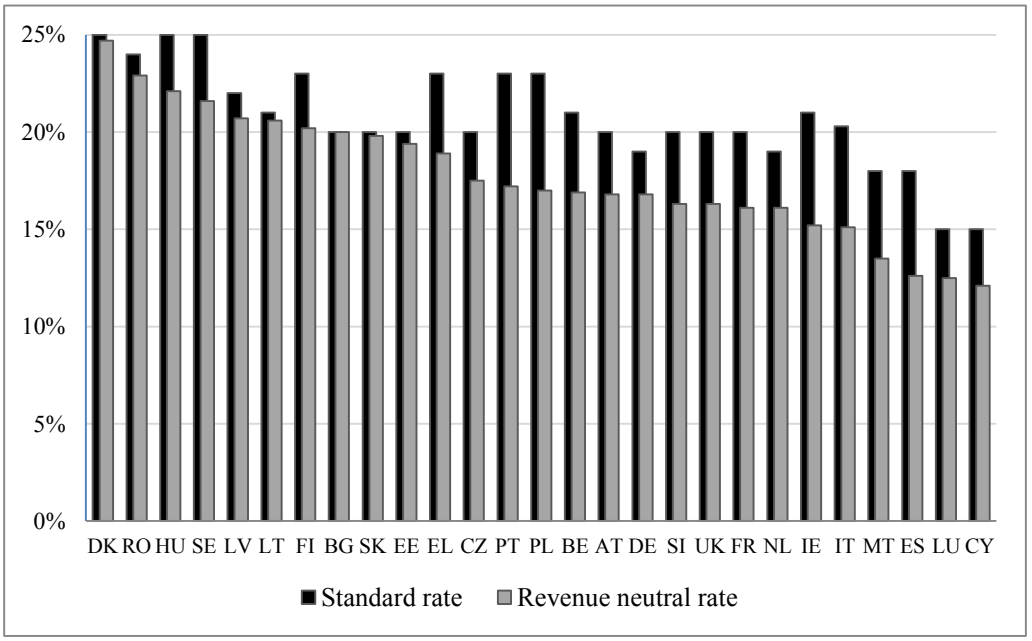
Table 10: Standard and revenue neutral rates

Country	Standard rate	Revenue neutral rate
BE	21.0%	16.9%
BG	20.0%	20.0%
CZ	20.0%	17.5%
DK	25.0%	24.7%
DE	19.0%	16.8%
EE	20.0%	19.4%
EL	23.0%	18.9%
ES	18.0%	12.6%
FR	20.0%	16.1%
IE	21.0%	15.2%
IT	20.3%	15.1%
CY	15.0%	12.1%
LV	22.0%	20.7%
LT	21.0%	20.6%
LU	15.0%	12.5%
HU	25.0%	22.1%
MT	18.0%	13.5%
NL	19.0%	16.1%
AT	20.0%	16.8%
PL	23.0%	17.0%
PT	23.0%	17.2%
RO	24.0%	22.9%
SI	20.0%	16.3%
SK	20.0%	19.8%
FI	23.0%	20.2%
SE	25.0%	21.6%
UK	20.0%	16.3%
Average	**20.7%**	**17.7%**

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.

Note: The revenue neutral rate is the standard rate that keeps revenues from all institutional sectors constant when zero and reduced rates are abolished. The standard rates depict the situation in 2011.

Figure 1: Standard and revenue neutral rates



Source: Table 10

Note: The revenue neutral rate is the standard rate that keeps revenues from all institutional sectors constant when zero and reduced rates are abolished.

2.3 Results: VAT paid by private households

This section analyses in detail the effects of the current VAT rates structure on private households. As explained in section 2.1, we use aggregate data from national Household Budget Surveys (HBS) as provided by Eurostat.[62] We calculate VAT liability on private household consumption expenditures in 2011, as well as in reform scenarios 1 and 2. We calculate total VAT liabilities for the average household as well as broken down by COICOP categories and household characteristics. In addition to the VAT payments of the average household, the focus of this chapter is on the breakdown of VAT payments by income quintile. As summarised in section 1.2, equity concerns are an important argument in favour of reduced rates. Therefore, it is interesting to know how the present and proposed VAT rates structures affect different income

[62] Section A.3 in the Annex contains a validation exercise comparing the results calculated on aggregate data with results calculated from micro data for three countries. In addition, we compare the results obtained in this study with results in IFS et al. (2011).

groups. Further breakdowns (by number of active household members and household types) can be found in the Addendum containing the country analyses. All breakdowns specified in section 2.1 can be found in the tables provided in the spread sheets.

Table 11 contains the standard VAT rate as of 2011 for each Member State (EU-27), the average VAT rate as calculated using the expenditure structure in HBS data[63] and the average VAT rates for the two reform scenarios. The deviation from the standard rate to the average VAT rate faced by private households (given their average consumption patterns) is caused by reduced, super reduced, parking and zero rates as well as exemptions.

The abolition of zero and reduced rates (scenario 1) yields higher average VAT rates for all countries. However, the size of this increase varies considerably. Poland, Malta, Portugal, Ireland, Italy and France face increases of more than 4 percentage points; the highest increase occurs in Poland (6.3 percentage points). An increase of more than 3 percentage points occurs in several other countries (Austria, Spain, the UK, Luxembourg, Belgium, Greece, the Netherlands, the Czech Republic and Slovenia). At the other end of the scale, some countries experience almost no increase: Bulgaria, Denmark, Slovakia and Estonia experience increases of less than 0.5 percentage points.

Scenario 2 uses the new standard rate calculated using WIOD data, taking all institutional sectors into account. This new standard rate is not automatically revenue neutral for households. That is, the new, budget neutral standard rate taking all institutional sectors into account can increase the VAT burden of all private households (when this is the case, of course, the VAT burden of at least one other institutional sector has to decrease). When we simulate the effect of this new rate on private households using HBS data, we see that in fact in almost all countries, the average VAT rate that households face, increases. Only Hungary (-1.0 percentage point), Latvia (-0.5 percentage points) and Denmark (-0.1 percentage points) experience decreases. In Estonia there is no change. France, Luxembourg, Poland, Portugal, the UK, the Netherlands, Malta and the Czech Republic face increases in their average VAT rates of more than 1 percentage point.[64]

[63] For a short discussion on differences to the effective VAT rates obtained from WIOD data in Table 5 and Table 6, please refer to section 2.1.

[64] We already mentioned that the average VAT rate in 2011 is different when calculated using HBS or WIOD data. This is also the case in the other scenarios, leading to different effects of the "neutral" rate in scenario 2 (see section 2.1).

Table 11: Average VAT rates of private households of EU Member States in 2011

Country	Standard rate	Average VAT rates				
		2011	Scenario 1		Scenario 2	
				%p change		%p change
BE	21.0%	11.1%	14.6%	+3.5%p	11.8%	+0.7%p
BG	20.0%	14.8%	14.9%	+0.1%p	14.9%	+0.1%p
CZ	20.0%	13.8%	17.0%	+3.2%p	14.9%	+1.1%p
DK	25.0%	15.4%	15.5%	+0.1%p	15.3%	-0.1%p
DE	19.0%	10.1%	12.0%	+1.9%p	10.5%	+0.4%p
EE	20.0%	14.5%	15.0%	+0.5%p	14.5%	+0.0%p
EL	23.0%	13.0%	16.4%	+3.4%p	13.5%	+0.5%p
ES	18.0%	7.7%	11.4%	+3.7%p	8.0%	+0.3%p
FR	19.6%	9.0%	13.3%	+4.3%p	10.9%	+1.9%p
IE	21.0%	9.7%	14.3%	+4.6%p	10.3%	+0.6%p
IT	20.3%	9.3%	13.6%	+4.3%p	10.1%	+0.8%p
CY	15.0%	7.2%	9.9%	+2.7%p	8.0%	+0.8%p
LV	22.0%	18.1%	18.8%	+0.7%p	17.6%	-0.5%p
LT	21.0%	17.2%	17.9%	+0.7%p	17.6%	+0.4%p
LU	12.0%	6.6%	10.1%	+3.5%p	8.4%	+1.8%p
HU	25.0%	21.2%	22.7%	+1.5%p	20.2%	-1.0%p
MT	18.0%	11.2%	16.6%	+5.4%p	12.4%	+1.2%p
NL	19.0%	8.3%	11.5%	+3.2%p	9.7%	+1.4%p
AT	20.0%	12.8%	16.5%	+3.7%p	13.8%	+1.0%p
PL	23.0%	11.9%	18.2%	+6.3%p	13.4%	+1.5%p
PT	23.0%	9.9%	15.3%	+5.4%p	11.4%	+1.5%p
RO	24.0%	21.7%	22.8%	+1.1%p	21.8%	+0.1%p
SI	20.0%	11.7%	14.8%	+3.1%p	12.1%	+0.4%p
SK	20.0%	15.8%	16.2%	+0.4%p	16.0%	+0.2%p
FI	23.0%	12.3%	15.1%	+2.8%p	13.3%	+1.0%p
SE	25.0%	13.3%	16.2%	+2.9%p	14.0%	+0.7%p
UK	20.0%	8.7%	12.3%	+3.6%p	10.1%	+1.4%p

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.

* The standard rate in Italy increased from 20 % to 21 % in September 2011; hence, we use a weighted average of both rates.

Table 12 shows the average VAT bills of private households in the EU-27 Member States as a proportion of total household expenditures and in Euros per year. In contrast to the average VAT rate that is calculated relative to net expenditures, the average VAT bill is calculated as a fraction of gross expenditures. We can see that the VAT bill as a

percentage of total expenditure ranges from about 6.2 % to 17.8 %, with Luxembourg, Cyprus and Spain being on the lower and Romania, Hungary, and Latvia on the upper end of the spectrum. In absolute terms, Danish households face the highest average VAT bill of over € 5,000 per year, followed by countries with comparatively low average VAT rates but high expenditure levels (Sweden, Finland, Austria and Luxembourg). Households in countries with comparatively low expenditures (Bulgaria, Romania and Poland) face the lowest VAT bills in absolute terms (although Bulgaria and Romania have very high average VAT rates).[65]

Looking at the development of average VAT rates in Table 11, it is hardly surprising that the average increase of the VAT bill as a fraction of expenditure in scenario 1 is highest for Poland (+4.8 percentage points), Portugal (+4.3) and Malta (+4.2) and lowest for Bulgaria (+0.1), Denmark (+0.1), Slovakia (+0.3) and Estonia (+0.3). With respect to absolute increases, Luxembourg ranks first (plus € 2,000), followed by Ireland and France. This is because these countries face a large increase in average VAT rates, and have comparably high average consumption expenditures. In Portugal, Poland and Luxembourg, average VAT payments increase by more than 50 %.

Scenario 2 has much smaller effects, although they are not zero for private households in most countries. VAT bill increases in absolute terms are again highest in Luxembourg (in excess of € 1,000), followed by France and the Netherlands. In Luxembourg, this increase is 27 % compared to pre-reform VAT payments, in France 21 %. On the other end of the spectrum, Hungary, Latvia and Denmark experience slight decreases in their VAT payments.

[65] This ranking remains the same when we adjust average expenditures by the average household size in each country.

Table 12: Average VAT bills of private households of EU Member States as a proportion of total household expenditure and in € per year[66]

Country	VAT bill (in % of expenditure)			VAT bill in €		
	2011	Scenario 1	Scenario 2	2011	Scenario 1	Scenario 2
BE	10.0%	+2.7%p	+0.5%p	3,735	+1,156	+207
BG	12.9%	+0.1%p	+0.1%p	639	+3	+3
CZ	12.1%	+2.4%p	+0.8%p	1,275	+294	+98
DK	13.3%	+0.1%p	-0.0%p	5,035	+41	-20
DE	9.2%	+1.7%p	+0.5%p	3,078	+631	+180
EE	12.7%	+0.3%p	-0.0%p	1,139	+35	-0
EL	11.5%	+2.6%p	+0.4%p	3,521	+925	+135
ES	7.2%	+3.1%p	+0.2%p	1,914	+920	+70
FR	8.3%	+3.5%p	+1.6%p	2,767	+1,311	+586
IE	8.9%	+3.6%p	+0.5%p	3,684	+1,726	+232
IT	8.6%	+3.3%p	+0.5%p	2,682	+1,170	+184
CY	6.8%	+2.3%p	+0.7%p	2,417	+903	+261
LV	15.3%	+0.5%p	-0.3%p	1,595	+57	-41
LT	14.7%	+0.5%p	+0.3%p	1,275	+53	+28
LU	6.2%	+2.9%p	+1.5%p	3,841	+2,006	+1,031
HU	17.5%	+1.1%p	-0.7%p	1,303	+96	-61
MT	10.0%	+4.2%p	+1.0%p	2,321	+1,122	+261
NL	7.7%	+2.6%p	+1.2%p	2,548	+957	+422
AT	11.4%	+2.8%p	+0.8%p	4,089	+1,164	+324
PL	10.6%	+4.8%p	+1.3%p	988	+528	+132
PT	9.0%	+4.3%p	+1.3%p	1,827	+1,002	+289
RO	17.8%	+0.8%p	+0.1%p	853	+45	+4
SI	10.5%	+2.5%p	+0.3%p	2,426	+656	+83
SK	13.7%	+0.3%p	+0.2%p	1,591	+37	+20
FI	11.0%	+2.1%p	+0.7%p	4,105	+926	+314
SE	11.7%	+2.2%p	+0.6%p	4,355	+958	+236
UK	8.0%	+3.0%p	+1.2%p	2,609	+1,108	+420

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.

Note: Exchange rates of 1.956 Bulgarian levs, 24.590 Czech koruny, 7.451 Danish kroner, 0.706 Latvian lats, 3.453 Lithuanian litai, 279.370 Hungarian forints, 4.121 Polish zloty, 4.212 Romanian lei, 9.030 Swedish kronor and 0.868 British pounds to 1 Euro.

[66] The second guiding principle of the European Commission's current assessment of the VAT rates structure states that reduced rates on goods and services "for which the consumption is discouraged by other EU policies" should be abolished. Further, it states that "this could notably be the case for goods and services harmful to the environment, health and welfare" (European Commission 2011b, p. 11). We provide an estimate of the likely effect of an abolition of VAT reductions for those supplies that have been identified to fit this description – Water, Energy products, Street cleaning, refuse collection and waste treatment, and Housing – in the EU-27 countries in Table 47 in the Annex. In the EU-27 average, the VAT bill of a private household would increase by € 64; the UK and France would see the biggest increases (€ 242 and € 210 respectively), while Bulgaria, Estonia, Latvia, Lithuania, Hungary, Romania, Slovakia, Finland and Sweden would not see any increases. Note that this only includes households, while most businesses can deduct VAT paid on their inputs, so they would not be affected by such a reform.

Goods and services categories

As can be seen more clearly in the country analyses in the Addendum, VAT payments in 2011 differ considerably among the 12 main COICOP categories. The extent of this depends on the expenditure share for each category of goods and services as well as on the average VAT rate. Table 13 shows the categories with the highest VAT payments and their share of total VAT payments for all EU-27 countries. In 16 of 27 countries, CP07 "Transport" is the category to which most VAT payments relate. Within this group of countries, the share of payments relating to supplies in CP07 as a share of total VAT payments ranges from 33 % in Luxembourg to 20 % in Spain. The category can be further disaggregated into the subcategories CP071 "Purchase of vehicles", CP072 "Operation of personal transport equipment" and CP073 "Transport services". In all countries most VAT is paid on one of the first two subcategories, purchase and operation of a car. This is because expenditures on these categories are high and the average VAT rate is almost the standard rate on all goods and services in these two subcategories.[67] Transport services, on the other hand, only account for a small share of expenditures. In addition, public transport services are not taxed at the standard rate in many Member States.

In the remaining nine Member States, CP01 "Food and non-alcoholic beverages" and CP04 "Housing, water, electricity, gas and other fuels" rank first. Whether or not VAT payments on CP01 are high depends almost entirely on the VAT rates structure of the country: Expenditures on this category are high in all Member States, however, in only seven countries all supplies within the category are taxed at the standard rate. Among these are Bulgaria, Denmark, Estonia, Latvia, Lithuania, Romania and Slovakia. Thus, only in Greece the average share of VAT payments is highest for CP01, although the category is not taxed at the standard rate. The importance of expenditures on CP04 is driven by the importance of this category in the household budgets. Apart from two exceptions (Hungary and Romania) the average VAT rate on expenditures in this category is normally well below the standard rate. Actual rents for private households are exempt in most countries, the notional consumption expenditures on owner-occupied dwellings (imputed rents) are treated as exempt supplies, and some additional expenditures in this category are subject to reduced rates in some countries. [68]

[67] In some Member States minor repair services are taxed at a reduced rate.

[68] The HBS for the Czech Republic, Hungary, Malta and Romania do not contain information on imputed rents. In addition, in Hungary and Romania actual rents are taxed at the standard rate. Thus, the average VAT rate on CP04 according to HBS data is equal to the standard rate in these two countries.

Table 13: Categories with the highest VAT expenditure, their share and their combined share of total VAT expenditure for EU Member States, 2011

	Most Important Categories			Share of VAT			
Country	**1st**	**2nd**	**3rd**	**1st**	**2nd**	**3rd**	**Sum**
BE	CP07	CP12	CP04	22%	12%	12%	46%
BG	CP01	CP04	CP02	36%	14%	10%	60%
CZ	CP04	CP01	CP07	22%	15%	13%	50%
DK	CP01	CP04	CP07	18%	18%	17%	54%
DE	CP07	CP04	CP09	22%	16%	13%	51%
EE	CP01	CP04	CP07	31%	17%	14%	62%
EL	CP01	CP04	CP07	15%	15%	15%	46%
ES	CP07	CP01	CP03	20%	14%	13%	47%
FR	CP07	CP05	CP03	25%	12%	12%	48%
IE	CP07	CP09	CP04	21%	13%	12%	46%
IT	CP07	CP01	CP03	21%	15%	12%	48%
CY	CP07	CP03	CP01	21%	14%	11%	46%
LV	CP01	CP07	CP04	31%	14%	14%	60%
LT	CP01	CP04	CP07	39%	15%	9%	62%
LU	CP07	CP05	CP03	33%	13%	12%	58%
HU	CP04	CP01	CP07	26%	25%	13%	65%
MT	CP07	CP05	CP04	22%	14%	12%	49%
NL	CP07	CP09	CP04	22%	17%	14%	53%
AT	CP07	CP04	CP09	24%	16%	13%	52%
PL	CP04	CP07	CP01	27%	14%	13%	54%
PT	CP07	CP11	CP01	21%	14%	10%	45%
RO	CP01	CP04	CP08	40%	16%	12%	68%
SI	CP07	CP04	CP01	24%	14%	12%	51%
SK	CP01	CP04	CP07	29%	24%	9%	61%
FI	CP07	CP12	CP01	22%	15%	13%	51%
SE	CP07	CP09	CP04	21%	16%	12%	49%
UK	CP07	CP09	CP11	23%	16%	16%	54%

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.

In addition to these three categories, CP09 “Recreation and culture” (Germany, Ireland, the Netherlands, Austria, Sweden and the United Kingdom), CP03 “Clothing and footwear” (Spain, France, Italy, Cyprus and Luxembourg), CP05 “Furnishings, household equipment and routine maintenance of the house” (France, Luxembourg, Malta), CP11 “Restaurants and hotels” (Portugal and the United Kingdom), CP12 “miscellaneous goods and services” (Belgium and Finland) and CP02 “Alcoholic

beverages, tobacco and narcotics" (Bulgaria) and CP08 "Communications" (Romania) appear among the top three. We can see that, on EU-27 average the three most important expenditure categories taken together account for more than 50 % of total expenditure, in Romania they account for nearly 70 % of total expenditure. It is worth noting that Romania and Bulgaria are the only countries without CP07 in the three most important categories.[69]

Income Distribution

Table 14 to Table 18 show average VAT payments, both as a fraction of total household expenditure and in absolute terms, by income quintile[70], for all Member States (EU-27). Comparing average VAT payments for the 20 % of households with the lowest income (first quintile) and the 20 % of households with the highest income (fifth quintile), we see that in all countries, richer households paid more VAT in 2011 than poorer households. The gap is largest in Luxembourg, where the fifth quintile on average pays more than seven times as much VAT as the first quintile, followed by Portugal and Italy (5.2 and 5.1, respectively). The gap is lowest in the Czech Republic, Austria and the Netherlands (1.4, 1.7 and 2.1, respectively).

A country's VAT rates structure can be described as either proportional, regressive or progressive, depending on the importance of VAT payments in relation to total expenditure. Broadly speaking: A tax is progressive if it puts more burden on richer households (relative to their expenditure); a regressive tax over-proportionally affects the poor, while a proportional tax affects each income group similarly. We define these terms loosely by restricting our attention to the first and fifth quintile[71]. Only one country (Hungary) had a regressive VAT system in 2011; the gap between VAT payments of the first and the last income quintile as a proportion of average expenditure was 1.5 percentage points.[72] In 11 countries (Spain, Romania, Bulgaria, Lithuania,

[69] Results on how this ranking changes when zero and reduced rates are abolished are found in the Addendum containing the more detailed analyses for each Member State.

[70] For a definition of income quintiles refer to section 2.1.

[71] *proportional*: VAT as a fraction of total expenditure differs by less than 0.5 percentage points between the first and the fifth quintile

regressive: VAT as a fraction of total expenditure in the first quintile is more than 0.5 percentage points higher than in the fifth quintile

progressive: VAT as a fraction of total expenditure in the fifth quintile is more than 0.5 percentage points higher than in the first quintile

[72] Recall that the data for Hungary do not contain information on imputed rents, which might distort the picture as typically richer households face higher notional consumption expenditures on owner-occupied dwellings.

Slovakia, Estonia, Greece, Austria, the Czech Republic, Cyprus and Latvia) we find that the VAT system affects households proportionally across income quintiles. In the 15 remaining EU-27 countries, VAT payments as a fraction of expenditures are more than 0.5 percentage points higher for the richest households than for the poorest households; we therefore define these VAT systems to be progressive. Among these, the United Kingdom shows the largest gap (2.6), followed by Luxembourg (2.4), Italy and Belgium (2.3) and Poland (2.2).

Abolishing all zero and reduced rates – scenario 1 – affects income groups differently depending on the country. In thirteen countries (Romania, Lithuania, Bulgaria, Denmark, the Netherlands, Estonia, Slovakia, Latvia, France, Austria, Hungary, Finland and Sweden) the increase in VAT as a proportion of expenditure is similar over all quintiles (the lowest quintile faces an increase in VAT per expenditure under 0.5 percentage points more than the highest quintile).[73] In the remaining 14 countries, there are differences of more than 0.5 percentage points between the poorest and richest households: the gap is highest in Malta (2.4 percentage points), followed by Portugal and Poland (1.5), Ireland (1.2) and Italy (1.1). Relative to their expenditures, low-income households in these 14 Member States suffer more from an abolition of zero and reduced rates. Regarding absolute values, however, higher income households face higher increases in their average VAT bills in all countries. Households in the fifth quintile in Luxembourg, Ireland, France and Italy are faced with the highest absolute increases (€ 3.473, € 2.216, € 1.851 and € 1.695, respectively). The gap in the increase borne by the fifth and the first quintile is greatest in Luxembourg, where the fifth quintile experiences an increase 3.5 as big as the first quintile, followed by Portugal (3.3) and Italy (2.8).[74] On the other side of the spectrum we can find the Czech Republic (1.0), Austria (1.5) and Spain (1.6). That is, high income households in Luxembourg benefit 3.5 as much in absolute terms from zero and reduced rates as low income households. Coming back to our definitions of the VAT rates systems we see that scenario 1 transforms the VAT rates systems of Spain, Cyprus and Greece from being proportional to regressive[75], while the systems of Portugal, Malta, Germany and Ireland change from being progressive to proportional. Thus, scenario 1 hits lower-

[73] Recall that there are almost no reform effects in 4 countries (Bulgaria, Denmark, Estonia and Slovakia).

[74] Actually the gap is greatest in Bulgaria, where the fifth quintile experiences an increase 7.2 times as big as the first quintile, followed by Romania (4.0). Also in Denmark, Lithuania and Estonia we find a comparably high gap. However, as the absolute changes households experience in these countries are rather small, we omit these results.

[75] Our validation exercise comparing the analysis performed based on aggregate data with the one based on micro data put Austria into this group of countries as well. As discussed in section A.3, we suspect there to be an error in the aggregate data for Austria in the break down by income quintiles.

income households harder when we look at VAT payments as a fraction of total expenditure in most countries; in absolute terms, however, it is higher-income households who suffer more. That is, in absolute terms, high-income households benefit more from the zero and reduced rates that are in place at the moment than low-income households.

Scenario 2 yields much smaller effects (as a fraction of expenditure, the changes range from -0.7 to 1.6 percentage points) than scenario 1 (0.1 to 4.8 percentage points). However, we see very different results with respect to the effects on different income groups:

- In Belgium, Denmark, Germany, Estonia, Ireland, Italy, Cyprus, Latvia, the Netherlands, Austria, Poland, Slovenia, Slovakia, Sweden and the UK there is no continuous pattern in absolute changes in VAT payments over the quintiles. In most of these countries increases in absolute payments increase from low to middle income groups, and then decrease again for the highest income group.
- In five countries (the Czech Republic, Greece, Spain, Hungary, Malta) changes in absolute VAT payments decrease with income, that is, in absolute terms, lower income households lose more due to the reform. In Greece and Spain the higher income groups even gain from the reform, while lower income groups face increases in their VAT payments. In Hungary the average household gains from the reform according to HBS data. Here the absolute gain is higher for high income households.
- In the remaining seven countries (Bulgaria, France, Lithuania, Luxembourg, Portugal, Romania and Finland) increases in absolute VAT payments increase with income.[76]

As for the change in VAT payments relative to expenditures, we find that in 16 countries it is higher for lower incomes[77] and decreasing with income. The gap between the first and fifth quintile is highest for Malta (2.3 percentage points), followed by Poland (1.6) and Portugal (1.4). In the remaining countries there is either no clear pattern or almost no effect. The same countries as in scenario 1 change from proportional to regressive (Spain, Cyprus and Greece) and from progressive to proportional (Portugal, Malta, Germany, Ireland).

[76] In Bulgaria, Denmark, Estonia, Romania and Slovakia there are almost no reform effects.
[77] Difference of more than 0.5 percentage points.

Thus, in most countries, scenario 2 is a regressive reform. Higher income households spend a higher share of their expenditures on supplies taxed at the standard rate – this increases their VAT burden in the base scenario. Hence, in scenario 2, they benefit more from the lower standard rate than lower income households. Households at the bottom of the income distribution suffer from the abolition of the reduced rates to an extent that cannot be compensated by the lower standard rate.

Table 14: Average VAT bill of private households as a proportion of total household expenditure and in Euros per year, by income quintile in 2011 and reform scenarios 1 and 2, for BE, BG, CZ, DK, DE and EE

	Income Quintiles	BE		BG		CZ		DK		DE		EE	
		in %	in €	in %	in €	in %	in €	in %	in €	in %	in €	in %	in €
2011	First	8.8%	2,061	13.2%	342	12.0%	1,155	12.5%	2,654	7.7%	1,315	13.0%	607
	Second	9.3%	2,889	13.1%	490	12.1%	1,081	12.5%	3,563	8.2%	2,017	12.3%	752
	Third	9.7%	3,567	12.6%	604	12.0%	1,109	13.0%	5,043	8.5%	2,694	12.3%	915
	Fourth	10.2%	4,303	12.7%	729	12.2%	1,393	13.7%	6,195	8.5%	3,335	12.6%	1,327
	Fifth	11.1%	5,850	12.9%	1,030	12.3%	1,639	13.9%	7,697	8.5%	4,714	13.0%	2,090
Scenario 1	First	+2.9%p	+780	+0.0%p	+1	+2.7%p	+302	+0.1%p	+16	+2.3%p	+430	+0.4%p	+20
	Second	+2.8%p	+1,003	+0.0%p	+2	+2.6%p	+274	+0.1%p	+38	+2.2%p	+602	+0.3%p	+23
	Third	+2.8%p	+1,159	+0.1%p	+3	+2.5%p	+274	+0.1%p	+56	+2.0%p	+721	+0.4%p	+30
	Fourth	+2.8%p	+1,349	+0.1%p	+4	+2.3%p	+313	+0.1%p	+45	+1.8%p	+803	+0.3%p	+40
	Fifth	+2.4%p	+1,487	+0.1%p	+6	+2.0%p	+306	+0.1%p	+51	+1.5%p	+945	+0.3%p	+60
Scenario 2	First	+0.9%p	+228	+0.0%p	+1	+1.1%p	+120	-0.1%p	-16	+1.1%p	+211	+0.0%p	+1
	Second	+0.7%p	+248	+0.0%p	+2	+1.0%p	+105	-0.0%p	-5	+1.0%p	+270	-0.0%p	-0
	Third	+0.6%p	+242	+0.1%p	+3	+1.0%p	+101	-0.0%p	-5	+0.8%p	+291	+0.0%p	+2
	Fourth	+0.5%p	+253	+0.1%p	+4	+0.8%p	+100	-0.1%p	-30	+0.7%p	+281	-0.0%p	-1
	Fifth	+0.1%p	+62	+0.1%p	+6	+0.4%p	+63	-0.1%p	-42	+0.4%p	+238	-0.0%p	-4

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
Note: Exchange rates of 1.956 Bulgarian levs, 24.590 Czech koruny and 7.451 Danish kroner to 1 Euro.

Table 15: Average VAT bill of private households as a proportion of total household expenditure and in Euros per year, by income quintile in 2011 and reform scenarios 1 and 2, for EL, ES, FR, IE, IT and CY[78]

	Income Quintiles	EL		ES		FR		IE		IT		CY	
		in %	in €	in %	in €	in %	in €	in %	in €	in %	in €	in %	in €
2011	First	10.4%	1,939	7.3%	1,271	7.6%	1,654	7.8%	1,658	7.0%	1,011	6.4%	933
	Second	10.5%	2,387	7.2%	1,606	7.9%	2,203	8.1%	2,409	7.8%	1,891	6.7%	1,731
	Third	10.5%	2,876	7.4%	1,903	8.3%	2,682	8.7%	3,780	8.1%	2,269	6.8%	2,447
	Fourth	10.6%	3,711	7.2%	2,135	8.4%	3,156	9.1%	4,794	8.7%	3,282	6.8%	2,931
	Fifth	10.5%	5,148	6.9%	2,665	8.6%	4,145	9.5%	5,763	9.3%	5,140	6.8%	4,047
Scenario 1	First	+2.7%p	+579	+3.7%p	+722	+3.6%p	+879	+4.4%p	+1,065	+3.8%p	+612	+3.0%p	+481
	Second	+2.5%p	+665	+3.4%p	+844	+3.5%p	+1,103	+4.0%p	+1,368	+3.4%p	+934	+2.6%p	+739
	Third	+2.4%p	+759	+3.2%p	+909	+3.4%p	+1,267	+3.8%p	+1,875	+3.3%p	+1,054	+2.4%p	+931
	Fourth	+2.2%p	+895	+3.0%p	+990	+3.4%p	+1,462	+3.5%p	+2,125	+3.1%p	+1,333	+2.3%p	+1,063
	Fifth	+1.9%p	+1,086	+2.6%p	+1,132	+3.4%p	+1,851	+3.2%p	+2,216	+2.7%p	+1,695	+2.0%p	+1,303
Scenario 2	First	+0.7%p	+150	+0.7%p	+124	+1.8%p	+427	+1.3%p	+313	+1.2%p	+193	+1.3%p	+208
	Second	+0.5%p	+122	+0.5%p	+109	+1.7%p	+514	+1.0%p	+325	+0.8%p	+205	+0.9%p	+261
	Third	+0.4%p	+111	+0.2%p	+65	+1.6%p	+564	+0.7%p	+314	+0.6%p	+197	+0.7%p	+278
	Fourth	+0.2%p	+75	+0.2%p	+52	+1.5%p	+641	+0.4%p	+214	+0.3%p	+143	+0.6%p	+291
	Fifth	-0.0%p	-21	-0.0%p	-7	+1.5%p	+784	+0.0%p	+12	-0.1%p	-66	+0.4%p	+269

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations. (For Italy also Italian Household Budget Survey 2005, Italian EU-SILC 2006, Bank of Italy Survey on Household Income and Wealth 2006, own calculations.)

[78] As the Household Budgets Survey for Italy does not contain information on incomes this result is obtained by matching the HBS 2005 to the EU-SILC 2006, performed by CAPP. This is meant to give an impression on the proportionality of the Italian VAT rates structure. However, one has to keep in mind the different sources of information as compared to the other tables. (More on the comparability of results obtained from aggregated HBS data and micro data matched to the EU-SILC can be found in the annex, section A.3.)

Table 16: Average VAT bill of private households as a proportion of total household expenditure and in Euros per year, by income quintile in 2011 and reform scenarios 1 and 2, for LV, LT, LU, HU, MT and NL

	Income Quintiles	LV		LT		LU		HU		MT		NL	
		in %	in €	in %	in €	in %	in €	in %	in €	in %	in €	in %	in €
2011	First	15.2%	868	15.0%	697	4.6%	1,156	17.9%	871	8.5%	938	7.2%	1,859
	Second	15.1%	1,026	14.9%	913	5.0%	1,966	17.7%	984	9.8%	1,762	7.1%	1,831
	Third	15.2%	1,377	14.6%	1,183	5.6%	2,989	17.4%	1,192	10.1%	2,362	7.4%	2,286
	Fourth	15.2%	1,851	14.6%	1,490	6.2%	4,459	17.1%	1,393	10.2%	2,898	7.9%	2,941
	Fifth	15.6%	2,854	14.7%	2,098	7.0%	8,317	16.4%	1,954	10.5%	3,642	8.3%	3,815
Scenario 1	First	+0.5%p	+31	+0.4%p	+24	+3.6%p	+980	+1.2%p	+73	+5.9%p	+763	+2.6%p	+755
	Second	+0.6%p	+47	+0.6%p	+41	+3.3%p	+1,408	+1.2%p	+86	+4.6%p	+969	+2.6%p	+747
	Third	+0.5%p	+56	+0.6%p	+57	+3.2%p	+1,858	+1.2%p	+98	+4.2%p	+1,154	+2.6%p	+876
	Fourth	+0.5%p	+72	+0.5%p	+66	+2.9%p	+2,318	+1.0%p	+101	+3.9%p	+1,297	+2.5%p	+1,054
	Fifth	+0.4%p	+79	+0.5%p	+78	+2.6%p	+3,473	+0.9%p	+125	+3.5%p	+1,430	+2.6%p	+1,352
Scenario 2	First	-0.3%p	-22	+0.2%p	+11	+2.3%p	+624	-0.6%p	-34	+2.7%p	+338	+1.3%p	+356
	Second	-0.2%p	-17	+0.3%p	+22	+2.0%p	+846	-0.5%p	-35	+1.4%p	+286	+1.3%p	+353
	Third	-0.3%p	-29	+0.4%p	+33	+1.8%p	+1,050	-0.6%p	-47	+1.0%p	+275	+1.2%p	+394
	Fourth	-0.3%p	-42	+0.3%p	+36	+1.5%p	+1,189	-0.7%p	-66	+0.8%p	+249	+1.1%p	+444
	Fifth	-0.4%p	-94	+0.2%p	+37	+1.2%p	+1,508	-0.8%p	-106	+0.4%p	+162	+1.1%p	+563

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
Note: Exchange rates of 0.706 Latvian lats, 3.453 Lithuanian litai and 279.370 Hungarian forints to 1 Euro.

Table 17: Average VAT bill of private households as a proportion of total household expenditure and in Euros per year, by income quintile in 2011 and reform scenarios 1 and 2, for AT, PL, PT, RO, SI and SK

	Income Quintiles	AT		PL		PT		RO		SI		SK	
		in %	in €	in %	in €	in %	in €	in %	in €	in %	in €	in %	in €
2011	First	11.3%	3,324	9.3%	427	8.3%	691	18.1%	441	9.0%	938	13.8%	1,028
	Second	11.3%	3,183	9.7%	622	8.4%	1,145	18.0%	611	10.2%	1,823	13.8%	1,292
	Third	11.4%	3,850	10.1%	832	8.8%	1,592	17.9%	777	10.3%	2,295	13.6%	1,510
	Fourth	11.5%	4,449	10.7%	1,133	9.0%	2,139	17.8%	983	10.6%	2,985	13.6%	1,717
	Fifth	11.4%	5,646	11.5%	1,885	9.4%	3,561	17.7%	1,452	11.0%	4,100	13.7%	2,401
Scenario 1	First	+2.9%p	+1,002	+5.6%p	+301	+5.3%p	+510	+0.6%p	+19	+3.0%p	+351	+0.3%p	+26
	Second	+3.0%p	+1,001	+5.4%p	+408	+4.8%p	+751	+0.7%p	+31	+2.7%p	+546	+0.3%p	+33
	Third	+2.8%p	+1,107	+5.2%p	+504	+4.5%p	+931	+0.8%p	+43	+2.6%p	+658	+0.3%p	+36
	Fourth	+2.7%p	+1,195	+4.9%p	+610	+4.2%p	+1,151	+0.8%p	+54	+2.4%p	+774	+0.3%p	+38
	Fifth	+2.6%p	+1,501	+4.1%p	+796	+3.8%p	+1,665	+0.8%p	+77	+2.3%p	+968	+0.2%p	+48
Scenario 2	First	+0.9%p	+310	+2.1%p	+112	+2.2%p	+207	-0.1%p	-2	+1.0%p	+110	+0.2%p	+16
	Second	+1.0%p	+331	+1.9%p	+139	+1.8%p	+273	+0.0%p	+1	+0.5%p	+105	+0.2%p	+19
	Third	+0.8%p	+314	+1.7%p	+155	+1.5%p	+295	+0.1%p	+5	+0.4%p	+109	+0.2%p	+21
	Fourth	+0.7%p	+292	+1.3%p	+155	+1.2%p	+322	+0.1%p	+7	+0.2%p	+75	+0.1%p	+20
	Fifth	+0.6%p	+357	+0.5%p	+97	+0.8%p	+347	+0.1%p	+7	+0.1%p	+26	+0.1%p	+24

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
Note: Exchange rates of 4.121 Polish zloty and 4.212 Romanian lei to 1 Euro.

Table 18: Average VAT bill of private households as a proportion of expenditure and in Euros per year, by income quintile in 2011 and reform scenarios 1 and 2, for FI, SE and UK

	Income Quintiles	FI		SE		UK	
		in %	in €	in %	in €	in %	in €
2011	First	9.8%	1,980	11.0%	2,636	6.3%	1,257
	Second	10.4%	2,966	11.0%	3,216	7.1%	1,797
	Third	10.8%	3,896	11.6%	4,210	7.7%	2,341
	Fourth	11.1%	4,892	12.1%	5,131	8.4%	3,119
	Fifth	11.6%	6,784	12.3%	6,595	8.9%	4,527
Scenario 1	First	+2.4%p	+559	+2.5%p	+694	+3.6%p	+799
	Second	+2.3%p	+737	+2.4%p	+796	+3.4%p	+960
	Third	+2.2%p	+893	+2.2%p	+929	+3.2%p	+1,086
	Fourth	+2.1%p	+1,073	+2.2%p	+1,077	+2.9%p	+1,209
	Fifth	+2.0%p	+1,365	+2.1%p	+1,303	+2.6%p	+1,513
Scenario 2	First	+1.1%p	+250	+0.9%p	+241	+1.9%p	+418
	Second	+0.9%p	+286	+0.8%p	+250	+1.6%p	+450
	Third	+0.8%p	+310	+0.6%p	+230	+1.4%p	+452
	Fourth	+0.7%p	+347	+0.5%p	+232	+1.0%p	+408
	Fifth	+0.6%p	+373	+0.4%p	+229	+0.7%p	+396

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
Note: Exchange rates of 9.030 Swedish kronor and 0.868 British pounds to 1 Euro.

Household types

In addition to disaggregating households according to income quintiles, we looked at effects on subgroups of households according to all relevant demographic criteria available from the Eurostat database. All results are collected in the spreadsheets annexed; results on the breakdown by active and non-active households and household types are also listed in the Addendum containing the more detailed analyses for all countries. Here, we limit the discussion to the group that faces the highest VAT payments as a proportion of expenditure in 2011, and the group that is most affected by the two reform scenarios in absolute terms and as measured by VAT payments as a fraction of expenditure.[79]

In 2011 (Table 19), the group that pays most VAT as a fraction of expenditure is the group that benefits least from exemptions, zero and reduced rates.
Some groups rank first in more than 2 countries:[80]

- three or more active persons in the household (Germany, Greece, Spain, Ireland, Italy, Latvia, Portugal, the United Kingdom)
- three or more adults, with or without children (Bulgaria, the Czech Republic, Denmark, France, Finland and Sweden)
- households with a head under the age of 30 (Estonia, Cyprus, Luxembourg, Malta and Austria)
- the fifth income quintile (Belgium, the Netherlands and Poland)
- households with a self-employed head (Lithuania, Slovenia, Slovakia).

Table 20 lists the socio-economic group most affected by reform scenarios 1 and 2, measured by the increase in VAT payments as a fraction of total expenditure (in percentage points) for all countries. As a general rule, we observe that, in almost all countries, when measured as a fraction of expenditure, the group most affected is the group that has (presumably) the lowest disposable income:

- The first income quintile is listed thirteen times[81],
- followed by households with no active member (five times)

[79] Please refer to section 2.1 for the definition of the groups and to the preface to learn which breakdown is unavailable for which country.
[80] In some countries, as indicated in the table, there is a tie between two groups.
[81] In scenario 1 the first income quintile is listed 12 times. In Belgium households in the first quintile are most affected in scenario 2 whereas scenario 1 affects households with three or more adults and dependent children the most.

- and households where the reference person is 60 years or older (four times).[82]

The picture changes again when we look at who benefits most from zero and reduced rates in absolute terms, considering all breakdowns by household characteristics. Table 21 shows the increase in absolute VAT payments for the group most affected in scenarios 1 and 2. Because household sizes differ, we equivalise VAT payments using the number of adult equivalents provided by Eurostat for each category.[83] In 19 countries the fifth quintile is the group most affected in absolute terms by scenario 1.[84] In these countries, even when we consider different breakdowns of households, the richest households always stand to lose the most in absolute terms following the abolition of zero and reduced rates. Put differently: in absolute terms, these households benefit the most from zero and reduced rates. In Hungary, Romania and Slovakia these are households headed by a person over the age of 60 years. In these countries, reduced rates only apply to few goods and services, including pharmaceutical products and medical appliances, which is why older people particularly suffer from the abolition of reduced rates. Reducing the standard rate according to scenario 2, however, changes the picture: Only in four countries (France, Luxembourg, the Netherlands and Portugal), households in the fifth quintile remain the group most affected by the reform. In most countries, households which are not active on the labour market (that is, there is no active person living in the household, or the household is headed by an inactive person) are now those most affected. Thus, in many countries, high income households are compensated for their losses generated by the abolition of the reduced rate(s) by the lower standard rate in the revenue neutral scenario.

[82] In the remaining countries, households headed by inactive persons who are neither retired nor unemployed, headed by a person below the age of 30, or headed by an unemployed person, rank first.

[83] Eurostat does not provide this number for income quintiles. Therefore we equivalise all quintiles with the average number of adult equivalents, implicitly assuming that the households in the quintiles are equally sized.

[84] For Italy, we do not have comparable information for income quintiles. Here households with three or more active members are the ones most affected. Presumably, additional active members add to a household's income.

Table 19: Most affected socio-economic groups in 2011, measured by the proportion of VAT expenditure to total household expenditure

Country	2011	
	Group	Share of Expenditure
BE	fifth quintile	11.1%
BG	3 or more adults +	13.9%
CZ	3 or more adults	12.5%
DK	3 or more adults +	14.4%
DE	3 or more active persons*	9.0%
EE	less than 30 years	13.2%
EL	3 or more active persons	11.6%
ES	3 or more active persons*	7.8%
FR	3 or more adults +*	9.1%
IE	3 or more active persons	9.6%
IT	3 or more active persons	9.4%
CY	less than 30 years	7.5%
LV	3 or more active persons*	15.7%
LT	employed except employees	15.4%
LU	less than 30 years*	7.0%
HU	other inactive person	18.1%
MT	less than 30 years	11.4%
NL	fifth quintile	8.3%
AT	less than 30 years	12.1%
PL	fifth quintile	11.5%
PT	3 or more active persons	9.9%
RO	first quintile*	18.1%
SI	employed except employees	11.2%
SK	employed except employees*	14.0%
FI	3 or more adults +	12.3%
SE	3 or more adults	12.6%
UK	3 or more active persons	9.2%

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
"+" indicates a household with dependent children
"*" indicates that several groups are affected equally

Table 20: Most affected socio-economic groups by reform scenarios 1 and 2 in Member States, measured by the relative rise in VAT expenditure

Country	Group	Rise in VAT/EXP	
		Scenario 1	Scenario 2
BE	3 or more adults+ / first quintile	+3.0%p	+0.9%p
BG	-	-	-
CZ	no active person*	+2.9%p	+1.3%p
DK	no active person*	+0.2%p	+0.0%p
DE	first quintile	+2.3%p	+1.1%p
EE	other inactive person*	+0.5%p	+0.1%p
EL	first quintile	+2.7%p	+0.7%p
ES	first quintile	+3.7%p	+0.7%p
FR	60 years or over*	+3.8%p	+2.0%p
IE	first quintile	+4.4%p	+1.3%p
IT	no active person*	+3.6%p	+0.9%p
CY	first quintile	+3.0%p	+1.3%p
LV	no active person*	+0.7%p	-0.0%p
LT	no active person*	+1.0%p	+0.7%p
LU	first quintile	+3.6%p	+2.3%p
HU	6o years or over*	+1.6%p	-0.1%p
MT	first quintile	+5.9%p	+2.7%p
NL	less than 30 years	+2.8%p	+1.4%p
AT	unemployed person	+3.3%p	+1.2%p
PL	first quintile	+5.6%p	+2.1%p
PT	first quintile	+5.3%p	+2.2%p
RO	60 years or over	+1.8%p	+1.1%p
SI	first quintile	+3.0%p	+1.0%p
SK	60 years or over*	+0.4%p	+0.3%p
FI	first quintile*	+2.4%p	+1.1%p
SE	other inactive person	+3.1%p	+1.6%p
UK	first quintile	+3.6%p	+1.9%p

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
"+" indicates a household with dependent children
"*" indicates that several groups are affected equally
Remark: There are basically no reform effects in Bulgaria

Table 21: Most affected socio-economic groups by reform scenarios 1 and 2 in Member States, measured by equivalised absolute increase in VAT expenditure

Country	Scenario 1		Scenario 2	
	Group	VAT	Group	VAT
BE	fifth quintile	+912	3 or more adults +	+191
BG	-	-	-	-
CZ	three or more adults*	+175	no active person	+69
DK	fifth quintile	+35	no active person	+10
DE	fifth quintile	+630	third quintile	+194
EE	non-manual worker	+39	single person	+7
EL	fifth quintile	+610	no active person	+87
ES	fifth quintile	+599	first quintile	+66
FR	fifth quintile	+1,149	fifth quintile	+487
IE	fifth quintile	+1,274	60 years or over	+217
IT	3 or more active persons	+833	no active person	+175
CY	fifth quintile	+668	no active person	+170
LV	fifth quintile	+39	retired person*	-1
LT	no active person	+50	no active person	+38
LU	fifth quintile	+2,131	fifth quintile	+925
HU	60 years or over	+75	60 years or over	-6
MT	fifth quintile	+715	no active person	+253
NL	fifth quintile	+878	fifth quintile	+366
AT	fifth quintile	+944	single person	+292
PL	fifth quintile	+437	no active person*	+105
PT	fifth quintile	+930	fifth quintile	+194
RO	60 years or over	+44	60 years or over	+27
SI	fifth quintile	+541	no active person	+104
SK	60 years or over	+28	60 years or over	+20
FI	fifth quintile	+916	60 years or over	+249
SE	fifth quintile	+899	other inactive person	+328
UK	fifth quintile	+946	retired person	+343

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
"+" indicates a household with dependent children
"*" indicates that several groups are affected equally
Remark: There are basically no reform effects in Bulgaria
Note: Exchange rates of 1.956 Bulgarian levs, 24.590 Czech koruny, 7.451 Danish kroner, 0.706 Latvian lats, 3.453 Lithuanian litai, 279.370 Hungarian forints, 4.121 Polish zloty, 4.212 Romanian lei, 9.030 Swedish kronor and 0.868 British pounds to 1 Euro.

2.4 Results: VAT paid by non-household entities

Scenario 1 – Abolition of Reduced Rates

Table 22 and Figure 2 show, for all Member States (EU-27), the results of the abolition of zero and reduced rates for the economy as a whole and for economic agents other than households. Note that these results are mechanical in the sense that they do not take into account the possible reactions to increases in effective rates (in terms of both substitution effects and compliance). This caveat is particularly important, because the magnitude of the resulting increases in VAT liability is rather large in several countries, with six countries experiencing an overall increase in VAT liability in excess of 30 % (Spain 43 %, Ireland 38 %, Italy and Poland 35 %, Malta and Portugal 34 %). Some countries that do not rely on zero and reduced rates, on the other hand, would see minimal increases in the overall VAT liability (Bulgaria 0 %, Denmark and Slovakia 1 %, Lithuania 2 %, Estonia 3 % and Romania 5 %). The average, economy-wide increase in the VAT liability is 19 %, and so is the median.

As can be seen in Figure 2, in most countries, the Intermediate Consumption and "Others" sectors[85] have a lower relative increase in the VAT burden than the average economy. In other words, the highest relative increase in the VAT liability is borne by the Household sector (discussed earlier in section 2.3). This is not surprising, since most of the reduced rates are targeted at consumption goods. There are, however, some exceptions. For instance, in Italy, Spain, France and the Czech Republic, the "Others" sectors register a higher percentage increase in liability than the household sector (although not in absolute terms), whereas in Cyprus, Romania, Lithuania, Estonia and Latvia the same is true for the Intermediate Consumption sector. These results are due to the specific features of each country's VAT system (also see the country sheets in the Addendum). For the whole EU-27, the average increase in VAT liability for the sector Intermediate Consumption is 14 %, with the median at 11 %. For the "Others" sector, the average increase is 13 %, with the median at 8 %.

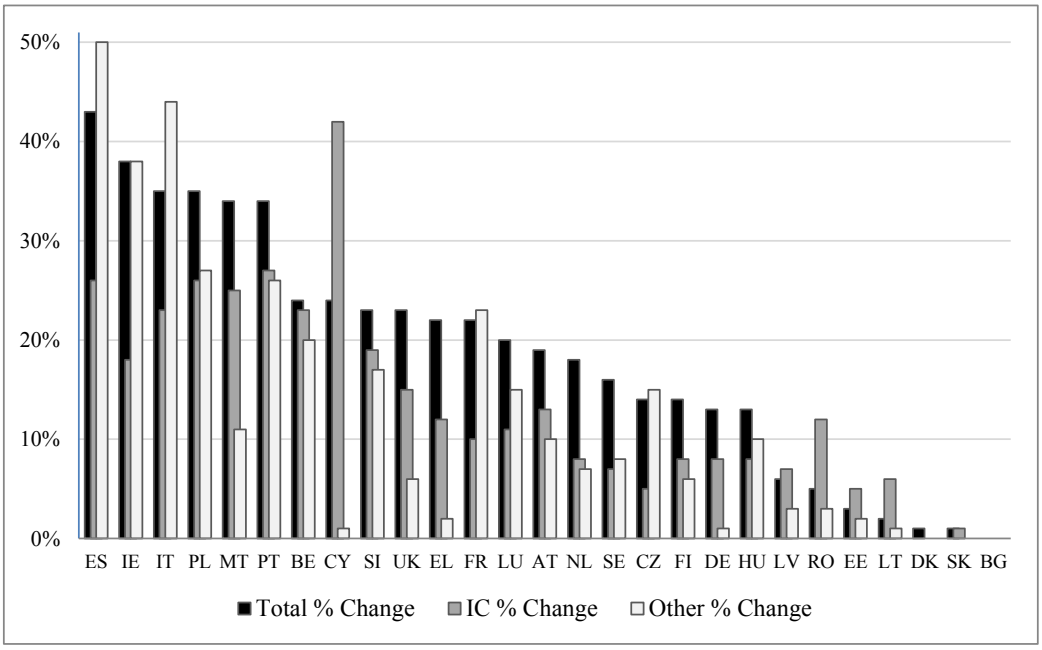
[85] "Others" includes Government and NPISH (Non-Profit Institutions Serving Households), as well as GFCF expenses exempted from VAT.

Table 22: Scenario 1 – Abolition of zero and reduced rates

Country	Total New VAT	% Change	IC	% Change	Others	% Change
BE	38,003	24%	8,316	23%	8,389	20%
BG	4,010	0%	816	0%	620	0%
CZ	17,723	14%	4,003	5%	3,569	15%
DK	26,454	1%	6,959	0%	4,862	0%
DE	247,910	13%	41,872	8%	52,158	1%
EE	1,745	3%	288	5%	365	2%
EL	30,265	22%	3,670	12%	3,945	2%
ES	103,339	43%	15,161	26%	19,326	50%
FR	212,821	22%	27,403	10%	56,048	23%
IE	14,983	38%	3,051	18%	3,262	38%
IT	180,661	35%	18,818	23%	40,284	44%
CY	1,768	24%	209	42%	467	1%
LV	2,488	6%	495	7%	316	3%
LT	3,880	2%	462	6%	555	1%
LU	3,926	20%	1,050	11%	1,378	15%
HU	13,171	13%	2,126	8%	2,689	10%
MT	724	34%	113	25%	82	11%
NL	54,486	18%	14,811	8%	13,048	7%
AT	31,442	19%	6,120	13%	4,723	10%
PL	47,623	35%	7,875	26%	8,856	27%
PT	22,586	34%	4,188	27%	2,630	26%
RO	22,820	5%	2,760	12%	7,334	3%
SI	4,084	23%	602	19%	672	17%
SK	7,658	1%	1,147	1%	1,381	0%
FI	22,201	14%	5,288	8%	4,864	6%
SE	44,125	16%	10,852	7%	9,035	8%
UK	184,118	23%	42,435	15%	18,667	6%
Mean		19%		14%		13%
Median		19%		11%		8%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.

Figure 2: Scenario 1 – Changes in VAT liabilities of non-households



Source: Table 22

Table 23 and Table 24 provide more minute details on the sector consequences of the abolition of reduced rates. In most countries seven sectors are affected through their intermediate purchases:

- Post and Telecommunications
- Real Estate Activities
- Financial Intermediation
- Public Administration and Defence
- Education
- Health and Social Work
- Other Community, Social and Personal Services

In addition, five countries (Belgium, Denmark, Ireland, Italy and Portugal) have other (minor) liabilities arising in other sectors.

Of the seven main sectors listed above, the highest average proportional increase resulting from an abolition of zero and reduced rates occurs in the Real Estate and Education sectors (20 %), followed by Health and Social Work, Other Community,

Social and Personal Services, and Public Administration and Defence (19 %, 18 % and 11 %, respectively). Post and Telecommunications and Financial Intermediation (which have a lower degree of connectivity with goods at reduced or zero rates) would see the lowest increase in VAT liability, 5.5 % and 6.6 %, respectively.

Table 23 and Table 24 also break down the "Others" category into Government and NPISHs (Non-Profit Institutions Serving Households). As mentioned above, Government and NPISH final consumption – being largely exempt from VAT – would also see a substantial increase in VAT liabilities (23.9 % and 31.8 %, respectively). While the Government is the collector of VAT, and therefore in most cases overall Government finances would not be affected, the distribution of VAT liabilities among government agencies is very uneven. This would likely lead to the need of budgetary reallocations that can be rather complicated. With respect to NPISHs, it is apparent that the abolition of zero and reduced rates would lead to substantially tighter budgets, in the absence of compensatory increases in revenues/subsidies, depending on the type of service they perform for the household sector.

Finally, we note that (as seen for the overall changes in IC and Others liabilities above) there is wide dispersion across countries with regard to the sectors that would suffer the largest increases. Within Intermediate Consumption, the increase ranges from 167 % for Real Estate activities in Cyprus, to zero or almost-zero values for several countries and sectors. It is difficult, however, to discern patterns, to the extent that such increases are the result of the interaction between existing reduced rates and patterns of consumption, approximating in many cases random events.

With regard to Government final consumption, it is noticeable that ten countries would see increases in their VAT bill of at least 25 % (with the highest values registered for Luxembourg, 82 %, and Poland, 72 %).

Table 23: Scenario 1 – Effects on main exempt sectors and activities

	Post and Tele-communications		Real Estate Activities		Financial Intermediation		Public Admin and Defence; Compulsory Social Security		Education	
	Base VTTL	% incr.	Base VTTL	% incr.	Base VTTL	% incr.	Base VTTL	% incr.	Base VTTL	% incr.
BE	48	9%	976	55%	1,489	6%	1,303	17%	312	19%
BG	0	-	323	0%	82	0%	170	0%	58	0%
CZ	21	3%	1,509	2%	693	2%	555	2%	252	9%
DK	53	0%	1,509	0%	621	0%	1,403	0%	536	0%
DE	803	5%	6,562	2%	9,733	2%	8,897	8%	2,479	17%
EE	6	4%	10	2%	32	2%	99	2%	41	6%
EL	2	4%	338	0%	508	5%	1,260	5%	135	21%
ES	153	5%	2,166	45%	1,696	13%	3,335	15%	644	25%
FR	275	5%	2,491	3%	5,209	4%	5,822	6%	1,488	24%
IE	37	6%	256	19%	487	10%	403	28%	217	25%
IT	177	22%	347	24%	3,123	10%	5,170	21%	486	18%
CY	1	1%	28	167%	24	9%	54	6%	9	41%
LV	1	3%	201	4%	34	5%	103	12%	37	5%
LT	0	1%	134	2%	57	11%	69	6%	45	19%
LU	6	3%	48	9%	684	5%	96	29%	19	50%
HU	5	3%	604	8%	344	5%	442	6%	170	8%
MT	1	9%	0	-	19	16%	23	17%	3	50%
NL	1,299	3%	3,864	1%	2,214	8%	4,645	6%	648	13%
AT	75	4%	1,585	16%	1,014	10%	974	10%	348	10%
PL	16	6%	2,363	30%	1,093	12%	958	17%	406	27%
PT	63	8%	133	81%	615	7%	658	21%	179	24%
RO	66	13%	916	5%	310	12%	280	9%	188	20%
SI	4	7%	79	33%	80	5%	128	16%	60	24%
SK	14	3%	110	1%	151	2%	417	1%	95	2%
FI	0	-	1,627	1%	479	6%	1,192	7%	354	17%
SE	0	-	3,808	2%	947	6%	2,114	4%	623	32%
UK	438	7%	3,396	2%	8,973	6%	9,410	12%	2,883	22%
Mean		5.5%		19.7%		6.6%		10.6%		19.6%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.
VTTL= VAT Total Tax Liability

Table 24: Scenario 1 – Effects on main exempt sectors and activities (continued from Table 23)

	Health and Social Work		Other Community, Social and Personal Services		Other IC		Government final consumption		NPISH final consumption	
	Base VTTL	% incr.	Base VTTL	% incr.	Base VTTL	% incr.	Base VTTL	% incr.	Base VTTL	% incr.
BE	1,678	26%	419	29%	564	10%	1,266	43%	58	41%
BG	117	0%	67	0%			83	0%	4	0%
CZ	614	14%	162	20%			827	19%	151	18%
DK	1,825	0%	299	0%	713	0%	943	0%	0	-
DE	8,993	15%	1,428	9%			7,823	8%	1,535	9%
EE	54	12%	34	4%			66	5%	11	0%
EL	803	29%	252	20%			82	13%	40	58%
ES	3,061	27%	1,550	34%			2,946	37%	102	54%
FR	4,509	16%	5,331	15%			9,591	34%	861	61%
IE	727	19%	181	16%	277	11%	287	41%	131	10%
IT	5,054	35%	513	21%	421	14%	7,926	12%	207	24%
CY	24	18%	8	18%			4	16%	1	43%
LV	54	8%	35	8%			26	35%	1	0%
LT	105	2%	27	8%			93	4%	0	-
LU	85	33%	6	64%			49	82%	7	49%
HU	342	16%	57	8%			745	23%	186	0%
MT	11	42%	34	29%			33	11%	2	2%
NL	1,945	20%	409	27%			2,160	14%	133	140%
AT	1,091	13%	331	25%			762	40%	45	41%
PL	737	45%	696	24%			1,137	72%	126	24%
PT	767	26%	434	29%	495	48%	311	22%	105	39%
RO	705	20%	0	0%			731	12%	259	37%
SI	121	19%	33	22%			125	24%	6	86%
SK	212	1%	135	2%			285	0%	7	0%
FI	890	20%	337	15%			850	17%	97	27%
SE	1,661	10%	941	19%			1,658	26%	0	-
UK	10,662	29%	1,066	12%			1,775	36%	1,745	0%
Mean		19.0%		17.7%		16.6%		23.9%		31.8%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.
VTTL= VAT Total Tax Liability

Scenario 2 – Revenue-Neutral Abolition of Reduced Rates

Table 25 displays the results of a simulation that abolishes zero and reduced rates, but decreases the overall standard rate to achieve a revenue-neutral outcome for each country. Table 10 and Figure 1 in section 2.2 display the 2011 standard rates and the "revenue neutral" rates that would be obtained.

By construction, the overall VAT liability does not change, but there are uneven consequences on the various sectors. As discussed in section 2.3, the increases in liabilities for the Household sector are substantially lower than in scenario 1, but in most countries, private households face an increase in their VAT burden in this revenue neutral scenario. Figure 3 reveals that the revenue-neutral abolition of reduced rates would generally affect the other institutional sectors in a positive way, leading to substantial reductions in the VAT liability for Intermediate Consumption (IC) and for "Others", with very few exceptions (notably Cyprus, Romania, Lithuania, Estonia and Latvia for Intermediate Consumption, and Italy, Spain, France and the Czech Republic for the "Others" category). The main reason for such favourable outcomes for the non-household sectors is the fact that indeed, as seen in Figure 3 and Table 25, in most cases the reduction in the standard rate is more than sufficient to compensate for the abolition of the reduced and zero rates applying to the goods purchased by the Intermediate Consumption and "Others" sectors. The average reduction in VAT liability for the Intermediate Consumption sector is -3.9 %, the median -5.1 %. For the "Others" category, the average and median reductions are -4.8 % and -3.2 %, respectively. Taking the Intermediate Consumption and "Others" sectors together, the reductions in liability amount to 4.6 % on average (median 4.3 %). We find small increases in three Member States (Italy 1.1 %; Lithuania 1.0 %; Romania 0.6 %) and virtually no increases in Estonia. In all other Member States VAT liabilities for Intermediate Consumption and "Others" taken together decrease, with decreases ranging from negligible amounts in Bulgaria to high decreases of 12.4 % in Greece.

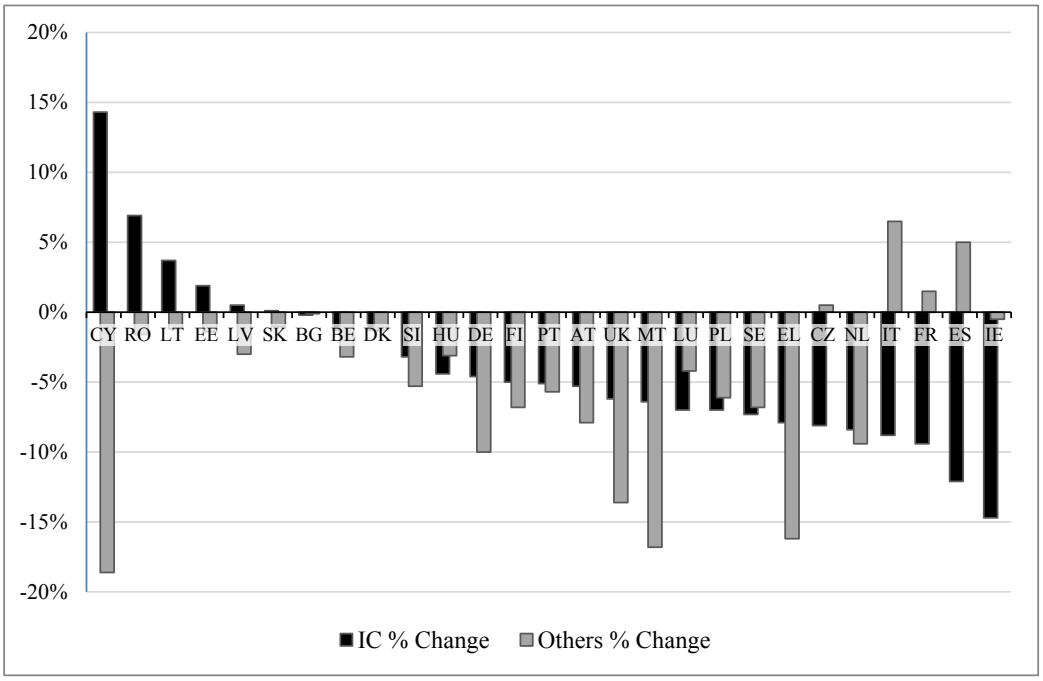
One conclusion that might be drawn from this exercise is that, to the extent that unrecoverable VAT on inputs induces unfavourable economic distortions in the affected sectors, the revenue-neutral scenario would seem to lead, for most countries and most sectors, into the direction of greater economic efficiency.

Table 25: Scenario 2 – Revenue-neutral abolition of reduced and zero rates (new liability and percentage change from baseline)

Country	IC	% Change	Others	% Change	IC & Others	% Change
BE	6,698	-1.3%	6,757	-3.2%	13,455	-2.3%
BG	815	-0.2%	619	-0.1%	1,433	-0.2%
CZ	3,496	-8.1%	3,117	0.5%	6,614	-4.3%
DK	6,869	-1.3%	4,799	-1.3%	11,668	-1.3%
DE	37,125	-4.6%	46,244	-10.0%	83,369	-7.7%
EE	279	1.9%	354	-1.4%	634	0.0%
EL	3,009	-7.9%	3,234	-16.2%	6,243	-12.4%
ES	10,610	-12.1%	13,524	5.0%	24,133	-3.2%
FR	22,534	-9.4%	46,089	1.5%	68,623	-2.4%
IE	2,205	-14.7%	2,358	-0.5%	4,563	-7.9%
IT	13,951	-8.8%	29,866	6.5%	43,817	1.1%
CY	168	14.3%	375	-18.6%	543	-10.6%
LV	466	0.5%	297	-3.0%	763	-0.9%
LT	453	3.7%	544	-1.2%	997	1.0%
LU	877	-7.0%	1,152	-4.2%	2,029	-5.5%
HU	1,877	-4.4%	2,375	-3.1%	4,252	-3.7%
MT	84	-6.4%	62	-16.8%	146	-11.1%
NL	12,544	-8.4%	11,051	-9.4%	23,595	-8.9%
AT	5,129	-5.3%	3,958	-7.9%	9,087	-6.5%
PL	5,827	-7.0%	6,554	-6.1%	12,381	-6.6%
PT	3,132	-5.1%	1,967	-5.7%	5,099	-5.3%
RO	2,635	6.9%	7,002	-1.6%	9,638	0.6%
SI	489	-3.2%	546	-5.3%	1,035	-4.3%
SK	1,134	0.1%	1,366	-1.0%	2,500	-0.5%
FI	4,637	-5.0%	4,264	-6.8%	8,901	-5.9%
SE	9,362	-7.3%	7,795	-6.8%	17,157	-7.0%
UK	34,528	-6.2%	15,189	-13.6%	49,716	-8.6%
Average		-3.9%		-4.8%		-4.6%
Median		-5.1%		-3.2%		-4.3%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.

Figure 3: Scenario 2 – Revenue neutral abolition of reduced and zero rates



Source: Table 25.

2.5 Results: Effects of different scenarios on VAT liability[86]

Table 26 shows the static effects of the abolition of reduced rates on the overall VAT liability as a percentage of GDP for each country and for scenarios 1 and 3 (for the latter, we show the results for the compensation of the bottom 40 % of households as 3a and the results for the compensation of the bottom 20 % only as 3b). Table 27 shows the same data, expressed in million Euros. Scenario 2 is revenue-neutral by design, and therefore does not require a discussion here.

In scenario 1, the countries that had registered the highest percentage change in VAT

[86] The estimates of VAT payments that are presented throughout this report (including in this section) refer to the concept of VAT Liability, namely the amount of tax that is due from various economic subjects on the basis of existing, country-specific VAT legislation and regulations. Thus, this concept assumes that collection of taxes is perfect. The reason to use this concept is that statistics on the sectoral distribution of VAT payments are not available. In reality, however, tax enforcement is not perfect for a variety of reasons, ranging from the legal to the illegal (for instance, use of legal tax avoidance schemes; uncollectable taxes due to bankruptcies; or outright fraud).

liability (Figure 2) also experience the largest increase as a proportion of GDP. The potential increase ranges from more than 3 % of GDP for Poland and Portugal, to virtually zero for Bulgaria and Denmark. The average for the EU-27 countries is 1.6 % of GDP, which is also the median.

Scenario 3a, that stipulates to compensate the bottom 40 % of the income distribution, reduces the overall potential increase in VAT liability to an average of 1.3 % of GDP (which again is the median for the EU-27). The highest increases are again registered in Poland and Portugal (2.7 %), followed by Italy (2.5 %) and Spain (2.3 %). As before, no increase is registered for Bulgaria and Denmark. Scenario 3b, which only compensates the bottom 20 % of households, produces an average increase in VAT liability of 1.5 % of GDP, and a median of 1.4 %. The same countries as in 3a register the highest and lowest increases, respectively. On average, the compensation required to shield the bottom 40 % of households from the effects of VAT increases is 0.3 % (with a median of 0.4 %) and for the bottom 20 % it declines to 0.2 % of GDP (with a median of 0.2 %).

These simulations show that the potential for increases in VAT revenues from the abolition of zero and reduced rates is substantial for a considerable number of countries – these funds could, for instance, help achieve budget deficit reduction targets. However, as seen earlier, this would come at the cost of potentially difficult-to-accept increases in the liability of households, and in many cases of non-households. If, on the other hand, a mechanism were put in place to compensate lower-income households (not a trivial task in itself), the effect on revenues would decrease, but would remain substantial even for a number of countries that have to deal with big budgetary problems at the moment. The challenge would obviously be to set-up and administer such a compensation system.

Table 26: Revenue effects and compensation, scenarios 1 and 3, expressed in % of GDP

Country	Baseline VAT Liability	Scenario 1 Increase	Scenario 3a		Scenario 3b	
			Comp.	Increase	Comp.	Increase
BE	8.3%	2.0%	0.4%	1.6%	0.2%	1.8%
BG	10.4%	0.0%	0.0%	0.0%	0.0%	0.0%
CZ	10.0%	1.4%	0.4%	1.0%	0.2%	1.2%
DK	10.9%	0.1%	0.0%	0.1%	0.0%	0.1%
DE	8.5%	1.1%	0.3%	0.8%	0.1%	1.0%
EE	10.6%	0.3%	0.0%	0.3%	0.0%	0.3%
EL	11.9%	2.6%	0.7%	1.9%	0.3%	2.3%
ES	6.8%	2.9%	0.6%	2.3%	0.3%	2.6%
FR	8.7%	1.9%	0.4%	1.5%	0.2%	1.7%
IE	6.8%	2.6%	0.5%	2.1%	0.2%	2.4%
IT	8.5%	3.0%	0.5%	2.5%	0.2%	2.8%
CY	7.9%	1.9%	0.4%	1.6%	0.1%	1.8%
LV	11.6%	0.7%	0.1%	0.6%	0.1%	0.7%
LT	12.3%	0.2%	0.0%	0.2%	0.0%	0.2%
LU	7.7%	1.5%	0.2%	1.3%	0.1%	1.4%
HU	11.7%	1.5%	0.4%	1.2%	0.2%	1.4%
MT	8.2%	2.8%	0.6%	2.1%	0.3%	2.5%
NL	7.7%	1.4%	0.3%	1.1%	0.2%	1.2%
AT	8.8%	1.7%	0.4%	1.3%	0.2%	1.5%
PL	9.5%	3.3%	0.6%	2.7%	0.3%	3.1%
PT	9.9%	3.3%	0.6%	2.7%	0.3%	3.1%
RO	16.6%	0.8%	0.1%	0.7%	0.0%	0.8%
SI	9.2%	2.1%	0.4%	1.7%	0.2%	2.0%
SK	11.0%	0.1%	0.0%	0.1%	0.0%	0.1%
FI	10.3%	1.4%	0.3%	1.2%	0.1%	1.3%
SE	9.8%	1.6%	0.4%	1.2%	0.2%	1.4%
UK	8.6%	2.0%	0.5%	1.5%	0.2%	1.7%
Average		1.6%	0.3%	1.3%	0.2%	1.5%
Median		1.6%	0.4%	1.3%	0.2%	1.4%

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.

Legend: Scenarios 3a and 3b: Comp. = compensation to 1st+2nd and 1st quintile(s) of households, respectively.

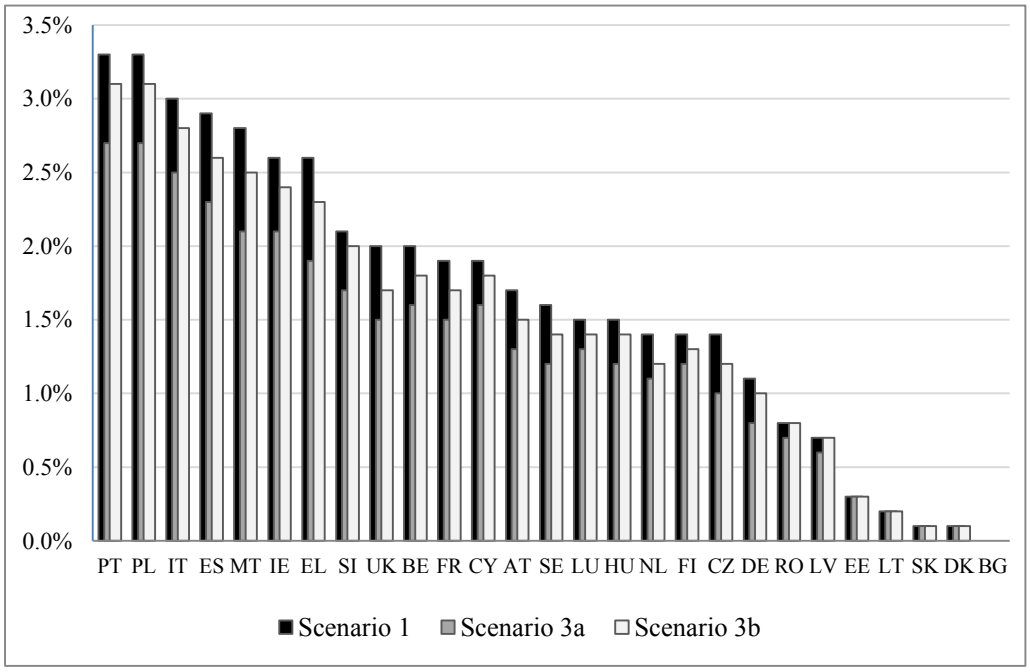
Table 27: Revenue effects and compensation, scenarios 1 and 3 (Million Euros)

Country	Baseline VAT Liability	Scenario 1 Increase	Scenario 3a		Scenario 3b	
			Comp.	Increase	Comp.	Increase
BE	30,612	7,391	1,381	6,010	624	6,767
BG	4,001	9	1	8	0	8
CZ	15,481	2,241	615	1,626	331	1,910
DK	26,112	342	103	239	41	301
DE	219,804	28,106	7,070	21,037	2,925	25,181
EE	1,694	51	8	43	4	48
EL	24,813	5,453	1,490	3,963	695	4,757
ES	72,315	31,024	6,874	24,151	3,007	28,017
FR	175,004	37,817	7,395	30,423	3,204	34,613
IE	10,831	4,152	754	3,398	335	3,817
IT	133,938	46,722	7,428	39,294	2,786	43,937
CY	1,422	345	64	281	25	320
LV	2,340	148	26	122	12	136
LT	3,805	76	11	65	4	72
LU	3,281	644	87	557	36	608
HU	11,630	1,542	354	1,188	160	1,382
MT	541	183	43	140	18	165
NL	46,146	8,340	1,976	6,364	1,020	7,320
AT	26,349	5,093	1,309	3,784	635	4,458
PL	35,241	12,381	2,314	10,067	979	11,402
PT	16,892	5,694	1,023	4,671	469	5,225
RO	21,789	1,032	114	917	42	990
SI	3,319	764	149	616	57	707
SK	7,573	85	23	63	10	76
FI	19,465	2,736	550	2,186	245	2,492
SE	38,067	6,057	1,480	4,577	694	5,363
UK	149,809	34,309	8,564	25,745	3,867	30,442
Average		8,990	1,896	7,094	823	8,167
Median		2,736	615	2,186	331	2,492

Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.

Legend: Scenarios 3a and 3b: Comp. = compensation to 1st+2nd and 1st quintile(s) of households, respectively.

Figure 4: Increase in VAT liability (percent of GDP)



Source: WIOD, EUROSTAT, IBFD, European Commission, Communications from national authorities and own calculations.

3 General equilibrium effects of VAT reforms

To assess the effects of different VAT reform scenarios on sectoral production and employment for task 4, we use the WorldScan Computational General Equilibrium (CGE) model. Section 3.1 summarises the main features of the WorldScan model, the inputs and adjustments necessary to run the general equilibrium scenarios are described in section 3.2, while section 3.3 summarises the results of these scenarios.

3.1 Methodology: The WorldScan model

WorldScan is a recursively dynamic CGE model (Lejour et al., 2006). The model fits into the tradition of applied general equilibrium models: it builds upon neoclassical theory, has strong micro-foundations and explicitly determines simultaneous equilibrium on a large number of markets. WorldScan is a multi-sector, multi-region

model that draws on the GTAP-database (Narayanan et al., 2012), which covers a total of 57 sectors and 129 countries. As any standard CGE model, WorldScan is an extensive macroeconomic model capable of dealing with trade and trade protection, production, consumption, taxation, labour and capital markets, government finances, growth and dynamic calibrations.

One of the main features of CGE models is that the behavioural responses of all economic agents are directly built into the model. In other words, the model is constructed to automatically take into account how different economic agents react to policy shocks. Our CGE structure allows us not only to take the consumption responses to VAT rate changes into account, but also to incorporate how these VAT rate changes affect all relative prices in the model. These relative price changes in turn affect production, consumption, trade, tax revenues and governmental transfers – among other endogenous variables in the model.[87]

It is important to note, however, that standard CGE models are developed for the analysis of medium-term questions that involve inter-regional and inter-sectoral effects. That is, CGE models are designed to assess the likely macroeconomic consequences of policy changes that affect more than one country at the same time, and can have varying effects on different economic sectors. For instance, CGE models are routinely used in the fields of international trade, economic integration and climate change. In addition, CGE models are mainly concerned with the "real economy" effects of certain economic policies, which include the effects of policy shocks (e.g. changes in taxes and/or tariffs) on the efficient allocation of resources between sectors and countries, and how this affects sectoral production, trade, employment and overall macroeconomic indicators such as GDP and consumption. Since the scope of CGE models is limited to medium to long-term effects of policy shocks on the real economy, they do not incorporate features that can assess short-term effects (e.g. how labour markets adjust in the short term to policy shocks). In particular, CGE models do not model some features that are important for short-term adjustments, like inflation, nominal interest rates and nominal exchange rates fluctuations; therefore, it is not possible to model monetary policy. Although the model includes relative prices, a broadly defined real interest rate, real exchange rates and terms-of-trade, these are defined as long-term perfectly flexible equilibrium values, and thus are not suitable to account for the short-term variations and adjustment paths of the policy shocks.

[87] Such as labour and capital market outcomes, international capital flows and terms-of-trade.

Thus in the context of the present study WorldScan is a valuable instrument to analyse the medium-term economic impact of a VAT reform that incorporates the behavioural reactions of consumers and producers to VAT rate changes. In particular, it can show how consumption and production changes within sectors (given that the scenarios involve changing VAT rates at the sectoral level), how the EU-wide reform affects sectoral trade flows and it can forecast the (expected) real effects of the reform on GDP, consumption and employment.

In what follows we highlight the features of the WorldScan model that are most relevant to the VAT scenarios.

Labour market

To capture changes in the labour market, we use the WorldScan labour market module from Boeters and van Leeuwen (2010). There are two main labour types: low- and high-skill workers. Labour demand for both labour types is determined by the production process (see below). The main feature of the model extension from Boeters and van Leeuwen (2010) is that the labour market features endogenous labour supply, unemployment and collective wage bargaining. The model incorporates endogenous labour supply at two margins: participation and hours of work. Involuntary unemployment is captured through a collective bargaining set-up. The bargained wage is set at a too high level, for which labour supply exceeds demand, causing structural unemployment. WorldScan distinguishes five types of households: employed low and high skilled workers, unemployed low and high skilled workers and a residual household (earning capital income and receiving income transfers). Households are assumed to be homogeneous with respect to their labour-leisure choice (intensive margin of labour supply), but they differ with respect to their participation decision. Non-participating individuals face a higher fixed cost of taking up work than participating individuals, which makes taking up work less attractive for them (extensive margin of labour supply). Of the four worker households, employed high/low skilled workers receive wage income, and unemployed workers receive unemployment benefits. It is important to note that the unemployment benefits included in WorldScan are price-indexed, meaning that unemployed households are automatically compensated for price increases – for instance, for final price increases associated with VAT rate increases.

The labour market module of WorldScan is calibrated to use 2004 as its base year and runs until 2020, when the full general equilibrium effects of policy shocks are realized.

Moreover, this version of the model uses a particular aggregation of 30 regions and 9 sectors, for which the labour market data components were calibrated.[88] Thus, we have sectoral data for each of the 27 Member States plus the USA, other OECD countries and the Rest of the World (ROW). The precise sectoral aggregation is shown in Annex A.6, together with an intermediate GTAP aggregation of 36-sectors that was required to map the effective VAT rates for households and non-households to the WS 9-sector aggregation.

Taxation

From the input-output tables implicit in the GTAP database we have information on the consumption of intermediate and final goods and services. All taxes on goods and services are captured by effective tax rates, that is, the wedge between producer prices (before taxation) and user prices (after taxation), such that:

$$P_s^c = P_s^m(1 + t_s^c),$$

where P_s^c is the user price for sector s, P_s^m is the market price and t_s^c is the effective tax rate for that sector.

Final consumer prices and taxes are defined separately for households and the government, while production (Intermediate Consumption) input prices and taxes are estimated as a wedge between production at market and user prices at the sectoral level. Thus, changes in the effective tax rate will affect final consumption both directly through the effective tax rate, but also indirectly through changes in the tax rate of intermediate goods and services.

Consumption and production

Any empirically relevant consumption demand system needs to be non-homothetic (expenditures do not change proportionally with income). It is a well-known fact from the empirical consumption literature, that with rising income the budget share spent on necessary goods becomes smaller, while the share spent on luxury goods becomes larger. Therefore, in WorldScan, the household demand for final goods and services is specified as a Linear Expenditure System (LES). This demand structure includes a "subsistence level" or "basic consumption" that is satisfied first. Any remaining budget

[88] We added WorldScan-specific data that are not present in the GTAP database, such as data on the R&D input/production structure, and projections on demographic, growth and investment variables.

is then distributed across all consumption goods according to their marginal budget shares. This implies that the income elasticities are not equal to one.[89] The demand system is calibrated to mimic the empirical consumption structure for each country.

The production technology is modelled as a nested structure of constant elasticities of substitution (CES) functions. Each nest combines production factors that are considered to be substitutes for each other (i.e. national and international intermediate inputs; labour and capital) and have nest-specific elasticities of substitution. A nesting structure reflects views on substitution and complementarity between inputs. It allows complementarity between certain factors, but precludes complementarity between others. As is standard in CGE models, the same production structure is assumed for all sectors and regions. The values of the substitution parameters reflect the degree of substitution between inputs. These values may differ across sectors, reflecting the different degrees of substitution of (factor) inputs. There is one representative firm per sector within any region.[90]

Savings and investment

Given the relevance of ageing in developed countries, WorldScan uses an estimated relation between savings, demographics (which include the projected ageing process), and national income (cf. Lejour et al., 2006). The estimated macroeconomic savings rate in the model is thus determined by the demographic composition of the country in a given year, and this rate expresses savings as a share of the endogenously determined national income.

Investment is then determined by the fact that demand has to be matched by supply on a regional capital market. In a closed economy, domestic savings equal domestic investment. In WorldScan it is assumed that all regions are linked not only by trade in goods and services but also by international capital mobility. This implies that regional savings and investments can diverge. Therefore, savings have to be equal to investment only at the global level. In view of the incomplete integration of regional capital

[89] In a non-homothetic demand system a 1 % increase in income is not associated with a 1 % increase in all consumption categories.

[90] The model cannot capture firm organisational issues, such as the decision to produce inputs internally or contract them to another firm. Thus, we are not able to analyse changes in firm size and sectoral coverage that may arise from different VAT rates for intermediate inputs.

markets, we assume that there is imperfect international capital mobility.[91] The precise bilateral capital barriers are estimated using gravity equations (cf. Lejour et al., 2006), and using these estimated barriers it is possible to balance the international capital market.

Government behaviour

As is common in CGE models, WorldScan does not model the government in a detailed way. The main modelling constraint is that it is not feasible – in a CGE framework – to endogenously determine government decisions at any given administration level: regional, national, nor international. In other words, the political process involved in the endogenous decision to tax, consume, invest and borrow by governments is too complex to include in a CGE model. Therefore, the common practice is to assume that government-related variables, such as tax and subsidy rates, transfer shares, and regulations are fixed and the decisions to change these variables are exogenously determined. Moreover, most CGE models specify changes in these variables to simulate policy shocks – e.g. changes in tariffs, taxes, subsidies, and/or transfers – and construct what-if scenarios. In particular, in our simulations we will exogenously change the EU VAT rates calibrated in the model in order to analyse *what* are the expected macroeconomic changes in each EU Member State *if* the VAT rates were actually changed.

In WorldScan the government collects taxes on trade, production and consumption. It then spends tax income on transfers, subsidies and consumption. Tax revenue is automatically determined in the model: tax rates are fixed, unless the rates are changed as part of the policy shock, and the collected tax revenue is then simply calculated as the base (trade, production or consumption) multiplied by the tax rate. The same automatic mechanism applies to subsidy payments (e.g. with a fixed subsidy rate, subsidy payments change in proportion to the change in the activity level on which the subsidy is given).

There are two types of transfers: general transfers to the residual household (these are related to pensions and welfare payments) and unemployment benefits (which are paid to both the low- and high-skill unemployed households). We estimate base-year transfer levels from the GTAP database and the model assumes that the real value of these

[91] Even though the elimination of capital controls and other barriers have stimulated international capital mobility since the 1980s, there are still many international capital flow barriers that do not allow the equalization of returns on investment between countries.

transfers is maintained in every period. For instance, unemployed benefits are price-indexed and therefore maintain their real value over time.

Government consumption is then determined as the (positive) difference between tax revenues and the sum of subsidy payments and transfers.[92] Government consumption is assigned by sector using the base year calibrated shares (i.e. the shares of public consumption by sector) and the same LES demand system applied to household consumption, which takes into account relative prices and price elasticities of goods and services provided by each sector. This means that the actual consumption of the government and households by sector is different (as determined by initial base year calibrated values), but that government and households make their consumption decisions in the same way. For example, if the relative price of a final good rises due to a tax increase, both the government and households will substitute their consumption away from that final good towards relatively cheaper ones.

Finally, there is no explicit government budget constraint. The government and all five households are aggregated into what is called the "regional household". In WorldScan, each EU Member State has a "regional household", and thus, for each Member State a country-wide budget constraint holds: total income of the regional household equals total expenditure plus savings. This means that when, for example, tax revenues increase exogenously (as in scenario A following the elimination of zero and reduced VAT rates), the additional income is first assigned to the regional household. This income, in turn, is then distributed between savings and consumption (following the mechanism explained above). The income share that remains for the regional household consumption is then used to maintain the real (price-adjusted) value of governmental transfers and any remaining income is consumed by the government.

This modelling structure is common to CGE models, and it is usually assumed that in the baseline the government's budget is balanced.[93] It can then be simulated that tax revenues remain equal to their baseline values in the presence of external shocks, so

[92] This implies that tax revenues need to be always greater than subsidy payments and transfers.

[93] Alternatively, it can be assumed that the private households of that country hold all domestic public debt. So the "regional household" balanced budget can be associated with government deficits or surpluses that are exactly compensated by private domestic household holdings of domestic public debt. The distinction is usually not made, because CGE models are only concerned with medium and long-term effects of policies, and not with short-term fluctuations in public deficit/surplus that may affect inflation and/or interest rates.

that a balanced budget is maintained after implementing the scenario. This will be the case for the scenarios B and D simulations.

Baseline scenario and adjustment mechanisms in GE models

Since WorldScan is a recursively dynamic CGE model, first we need to construct a "baseline" or "business-as-usual" scenario. This provides a time-trend of our variables between the year 2004 and 2020. This baseline scenario is effectively a stylized extrapolation of the calibrated values in the base-year provided by the GTAP database. The baseline is constructed using demographic projections from United Nations and a series of assumptions concerning expected growth and investment levels (cf. Lejour et al., 2006).

The simulations in our scenarios are then "counterfactual" experiments on how the projected values of economic variables change with respect to the "baseline" values after a policy shock (the experiment) has been implemented. For our current VAT scenarios, which are associated with a permanent policy shock (i.e. a country/sector-specific change in VAT rates in 2013), we only present the difference between the baseline values and the scenario values for 2020. We take the 2020 changes as representative of the medium-term effect of the VAT reforms. As explained before, CGE models are not suitable for analysing short-term effects and short-term adjustment, since many of the adjusting mechanisms in the model work unrealistically quickly. For example, CGE models usually assume that workers are highly mobile between sectors and thus, sectoral employment changes can take as little as one year, while in reality the adjustment (workers changing jobs to firms in other sectors) usually is only fully realized after several years.

The main adjustment mechanism in any CGE model is provided by changes in relative prices. Most policy experiments that are implemented in CGE models are directly associated with changes in the price of certain goods and services, which in turn will change the *relative* price of that good or service with respect to all other goods and services. For instance, an increase in the VAT rate in a particular sector in a particular country will increase the final price paid by consumers of the good or service produced by that sector in that country. In turn, this will increase its *relative* price. Based on the underlying neoclassical micro-foundations of the model, when consumers face higher relative prices, they will substitute away to other goods and services and purchase more of relatively cheaper goods and services (i.e. the substitution effect). The price increase will also decrease their real income and therefore also reduce the consumption of all

goods and services (the income effect). The exact substitution and income effects are driven by the underlying parameters in the LES consumption function: the elasticities of substitution, subsistence levels and initial consumption shares.[94]

However, in a general equilibrium model this is only the initial adjustment effect, which is followed by second-round adjustments that are necessary to bring all markets into equilibrium again. Using our example above, the reduction in the consumption of the good that has a higher VAT rate will decrease the domestic production (or imports) of that good. This in turn will require fewer workers, capital and intermediate inputs to produce the good, and this implies that workers have to move to other sectors, which can also be associated with changes in wages, and overall employment levels. Moreover, the change in the relative price of that particular good can also have effects on the amount of the good that is exported and/or imported. The precise changes in trade are related to comparative advantages (differences in technology, productivity) and trade barriers between countries.

In our VAT reform scenarios, where several sector/country-specific VAT rates are changed simultaneously, the relative prices, all initial adjustments and the subsequent general equilibrium adjustments are quite complex. The main function of a CGE model as WorldScan is to have a reliable and micro-founded framework that can mix the different specifications of the model to obtain the medium to long-term impact of the policy shock.

3.2 Implementation of status quo and reform scenarios

In order to analyse the economic impact of changes in the VAT rates, a series of adjustments have to be made to the core WorldScan model. First, we need to calibrate the effective VAT rates provided for households and non-households into the current tax rates in the WorldScan model. In particular, these are:

- VAT paid by households by consumption category using the UN COICOP (codes at different aggregation levels (i.e. 2, 3, and 4-digit level)). The application of the VAT rates follows information provided by TAXUD (European Commission, 2011a) and national legislations.

[94] Note that since the substitution and the income effect reduce the consumption of that good, then the expenditure share of that good relative to total income will be reduced. Therefore, the percentage reduction in real income associated with the VAT rate increase in a particular good is usually less than the percentage VAT rate increase. For example, a 10 % VAT rate increase in a particular good, will usually represent a real income reduction of less than 10 %.

- VAT paid by non-households by production category using the EUROSTAT CPA codes at the 2-digit level. The application of the VAT rates is based on information provided by TAXUD and IBFD.[95]

Unfortunately, there exists no direct link between the 57 GTAP sectors with the COICOP or CPA-2002 classifications. Thus, we start by calibrating the VAT rates with the following procedure:

1. We map the COICOP and the CPA-2002 classification codes into a 36-GTAP sectoral aggregation. These 36 sectors are more easily mapped than the total 57 sectors in GTAP, in particular, with respect to the production sectors from CPA.
2. We then map these 36 sector rates to the 9 sectors we use in WorldScan. Using the consumption/production shares by sector we obtain weighted average VAT rates for our final 9 sectors.
3. We then need to distinguish these sectoral VAT effective tax rates from other consumption taxes (e.g. excise taxes on fuel, alcohol and tobacco) in t_s^c (the current total tax rate in GTAP). This implies an equation for final consumption prices:
$$P_s^c = P_s^m(1 + t_s^c + t_s^v)$$
where t_s^v is the VAT average effective tax rate, and t_s^c will then include all other taxes.
4. From the analysis on households and non-households we know about effective VAT rates for 2011 and for scenario 1 (all taxable supplies taxed at the standard rate). We then compare these 2011 VAT 9-sector rates (t_s^{v2011}) with the consumption tax rates for households and non-households from GTAP ($T = t_s^c + t_s^v$). Since these GTAP rates (T) implicitly include VAT plus other taxes (t_s^c), we need to separate the VAT component from other consumption taxes in GTAP.
5. So we calibrate the tax rates using this procedure:
    a. $t_s^c = T - t_s^{v2011}$ if $T > t_s^{v2011}$. In this case we are assuming that the implicit VAT rates in GTAP in 2004 are equal to the rates in 2011 (t_s^{v2011}), and thus there is no change in VAT rates between 2004 and 2011.
    b. However, t_s^{v2011} is not always smaller than T. Thus, in these cases we have a two-stage adjustment. First, we estimate the VAT rate differential: $td_s^v = t_s^{v2011} - T$ and we assume that $t_s^c = 0$. Then, in year 2004 we have that $T = t_s^{v2011} - td_s^v$, or equivalently $t_s^{v2004} = t_s^{v2011} - td_s^v$. The implicit GTAP rates in 2004 are lower than the 2011 rates. The second step is then to adjust the rates in year 2011 so we have $T = t_s^c + t_s^{v2011}$ and the rates in

[95] For a description on how effective VAT rates were obtained both for households and non-households please refer to section 2.1.

WorldScan from 2011 onwards are calibrated to the values provided by our partners.

c. Then we run WorldScan with this baseline VAT rates for the period 2004-2020, and these outcomes are taken as our reference baseline values. The scenarios – explained below – are simulations where changes in the VAT rates (t_s^v) are applied in the year 2013.

It is important to note that in the GTAP database most sectors in the EU-27 countries have negative production tax rates (i.e. subsidies), while only some country-sector combinations have positive rates (e.g. the energy sector). This contrasts with the final consumption effective rates in GTAP that are generally in line with the VAT rates applied in the EU-27. We therefore assume that the GTAP database includes no explicit VAT taxes for intermediate inputs and the VAT rates are applied *exclusively* to final consumption. Hence, the VAT rates from the GTAP data at the final consumption stage are, in principle, a weighted average of the different VAT rates for intermediate inputs in the whole production supply chain together with the VAT rates applied to the final sectoral output.

We simulate five reform scenarios where we abolish zero and reduced rates (resulting in all taxable supplies being taxed at the standard rate). Depending on the scenario, the standard rate either remains the same or decreases such that VAT revenues remain constant. However, since we take into account exempted goods and services when calculating sector-specific (effective) VAT rates, sector-specific VAT rates can differ from the single standard rate. In other words, the sector-specific VAT rates depend on the relative importance of exempted sub-sectors and therefore, rates vary by sector.

We first calibrate the sector-specific VAT rates (t_s^v) for the base scenario for every country, and then run five scenarios[96]:

- Scenario A: Zero and reduced rates are increased to the level of the standard rate. We set t_s^v in 2013 to the new sector/country-specific VAT rates, taxing all taxed supplies at the standard rate, but taking into account exemptions[97]

[96] Note that scenarios A and B are similar, but not identical, to scenarios 1 and 2 in previous sections. The CGE model by construction already includes the behavioural reaction of consumer and producers to the tax changes, and therefore, the results of both sets of scenarios are not directly comparable and are conceptually different. Specifically, note that the additional tax revenues in scenario A are automatically transferred back in the economy, while scenario 1 does not specify how the additional funds are used.

[97] Recall that the unemployment benefits included in WorldScan are price-indexed and automatically compensate unemployed households for the price increases associated with higher VAT rates. Therefore,

- Scenario B: We abolish zero and reduced rates and calibrate t_s^v to find a new standard rate that is budget neutral – *after* behavioural responses – for each EU-27 Member State. To achieve this we endogenise the sector-specific VAT rate t_s^v such that it is budget neutral: the total tax revenue from the government is kept constant at its baseline value.[98]
- Scenario C: Abolishing the zero and reduced rates and tax all (non-exempt) supplies at the standard rate is expected to reduce the administrative burden associated with VAT collection. In this scenario we explore the economic effects of simplifying the VAT compliance and administration associated with the use of country-specific standard VAT rates on all taxed supplies. The expected efficiency gains associated with a simplified VAT rates system are then applied to the same VAT rates changes as in scenario B.
- Scenario D: The VAT increase caused by the abolition of zero and reduced rates is compensated by an endogenously calculated decrease in the capital-investment tax that assures that overall tax revenue remains constant as in scenario B.[99]
- Scenario E: The same as in Scenario A, but the additional tax revenues associated with the VAT increase are transferred to both low-skilled households (employed and unemployed).

3.3 Results

Scenario A

To implement scenario A, we substitute the VAT rates previously calibrated until 2011 (which still include zero and reduced rates) for the sector- and country-specific VAT rates calibrated without zero and reduced rates in 2013, and run the WorldScan model until 2020. However, it is important to keep in mind that sector-specific VAT rates will still differ among sectors due to VAT exemptions.

scenario A is more related to scenario 3 than to scenario 1 in the static analysis. The definitions of households, however, are different in both scenarios and thus, they are not entirely comparable.

[98] Note that this is more intricate than just keeping the VAT revenues constant. Our CGE structure allows us not only to take the consumption responses into account, but also other tax revenues are affected. In addition, we used an alternative specification where the total tax revenue is kept constant as a percentage of real GDP, but our results do not change.

[99] As with scenario B, endogenous means that the model automatically finds the tax level (in this case the capital-investment tax) that balances the budget by maintaining tax revenues in the scenario equal to the baseline values.

Once we apply the new VAT rates in 2013 we find that average VAT rates increase in all countries, in particular for the following sectors: agriculture (AGO), low-tech manufacturing (LTM, mainly through increases in the rates on processed food), transport (TRA, for non-households) and other services (OSR); see the first four columns in Table 28.[100]

Table 28: Scenario A, changes in VAT rates and sectoral output, simple EU-27 averages

Sector	Households		Non- households		Output share change
	VAT baseline	VAT scenario A	VAT baseline	VAT scenario A	
Agric. & mining	11.60%	20.70%	10.20%	19.00%	-0.07%
Energy	19.60%	20.70%	18.90%	19.90%	0.00%
Low tech. manuf.	15.70%	20.70%	16.10%	19.80%	-0.22%
Medium-low tech.	20.70%	20.70%	19.80%	19.90%	0.01%
Medium-high tech.	20.70%	20.70%	18.50%	19.80%	0.06%
High tech. manuf.	20.70%	20.70%	19.90%	19.90%	0.03%
Transport	19.30%	20.50%	8.40%	12.60%	-0.02%
Commercial serv.	18.60%	18.80%	15.20%	16.20%	0.11%
Other services	9.30%	14.00%	5.40%	6.90%	0.10%

Source: Own estimations using the WorldScan model.

This pattern of sectoral VAT increases is reflected by changes in sectoral output. In the last column of Table 28, we present the medium-term changes in the sectoral shares of total output between the baseline and scenario A in the EU-27 average (Table 30 contains sectoral output share changes by Member state).[101] We observe that those sectors for which VAT rates increase the most are those sectors that experience decreases in relative terms. The exception is the sector other services (OSR), which increases its relative production share even though VAT taxes for this sector rise. This is caused by the general equilibrium effects of the tax shock: the reduction of production in one sector releases production factors that are then used by other sectors, in accordance with the changes in relative prices and ultimately in sector profitability (i.e. the interaction of relative changes in input costs and final prices). For instance, the decrease in the relative output of the low tech manufacturing sector (LTM; mainly

[100] Due to the dimensions of the data (27 countries and 9 sectors) we only present simple EU-27 averages in Table 28. Moreover, we also show sectoral output share changes by Member State for scenarios A to D. Additional Country/sector specific results for each scenario are available in the scenario specific spreadsheet annex (sheet "All").

[101] Note that these changes in output shares are percentage point differences in production composition and all changes must sum up to zero, i.e. the changes must exactly compensate each other.

caused by changes in the production of processed food) frees resources, and therefore output increases in other sectors as those resources are re-employed, in this case by services sectors (OCS and OSR). However, these changes in production composition remain relatively small (less than a quarter of a percentage point decrease for LTM, for instance).

The changes in the main economic indicators for scenario A are presented in Table 29. First, we analyse the EU-27 as a whole and we observe that following the abolition of zero and reduced rates, overall macroeconomic indicators experience relatively small changes. For instance, GDP decreases by around a third of a percentage point.[102] These changes in GDP are in line with reductions in consumption, which we would expect following an increase in a consumption tax. Following the GDP decrease, employment decreases slightly with low-skill workers losing more jobs than high-skill workers. Unemployment rates (see the spreadsheets) remain unchanged, while changes in labour demand are also reflected in a small increase in wage inequality (low-skill wages decline relative to high-skill wages). Finally, we observe that the abolition of zero and reduced rates also reduces international trade. The changes in relative prices triggered by the new VAT rates, which initially change the composition of sectoral production, are also responsible for changes in trade flows.

These overall changes in the EU-27 are broadly reflected by the changes for each individual Member State, with some exceptions. GDP decreases for most countries, with the exception of Cyprus and Latvia. Consumption decreases for all countries except for Latvia. Trade volumes also decline for all countries but Hungary. Finally, employment decreases in all countries.

In general, economic activity declines due to the tax increase associated with the abolition of zero and reduced rates. On the other hand, the very few exceptions can be explained by general equilibrium adjustments where initial decreases in consumption and GDP can be later reversed by the changes in output composition and increases in trade volumes within the EU-27 and with its main partners. We would expect that a more uniform VAT would induce a more efficient allocation of resources towards productive sectors, but the changes in relative prices can also create export

[102] Since the population data remain unchanged in both the baseline and the reform scenario, percentage changes in GDP and GDP per capita are equivalent. The same applies to consumption and consumption per capita.

opportunities as well as more import competition for particular sectors.[103] However, note that in this scenario we are not taking into account potential administrative/compliance efficiency gains that are expected from the introduction of a uniform VAT rate on all taxed supplies. These administrative efficiency gains will be analysed in scenario C.

To sum up, the abolition of zero and reduced VAT rates in each Member State should induce a less distorted sectoral resource allocation. At the same time, however, the overall tax revenues increase, and this results in less economic activity. Thus, it is interesting to analyse what happens in scenario B when zero and reduced rates are abolished but in addition the standard rate is lowered such that tax revenues remain constant.

[103] For example, the country-specific increases in the different sector-specific VAT rates can result (as part of the general equilibrium mechanism) in different relative price changes for a particular sector in two different member countries. This price change will in turn make it more attractive for the country with the lower relative price to export to the country with the higher relative price in that particular sector. Therefore, differences in relative prices between countries can result in changes in trade flows.

Table 29: Scenario A – percentage changes in main economic indicators, relative changes with respect to baseline values in 2020

Country	GDP	Consumption	Export volume	Import volume	Employment total	Low-skilled	High-skilled	Wage low as % of wage high-skill
BE	-0.62	-0.95	-0.90	-0.65	-0.71	-0.90	-0.48	-0.23
BG	-0.02	-0.06	-0.26	-0.30	-0.01	-0.01	0.00	-0.02
CZ	-0.14	-0.56	-0.35	-0.25	-0.38	-0.48	-0.21	-0.42
DK	-0.07	-0.13	-0.27	-0.38	-0.05	-0.06	-0.04	-0.06
DE	-0.27	-0.49	-0.59	-0.46	-0.42	-0.61	-0.17	-0.32
EE	-0.07	-0.16	-0.23	-0.27	-0.06	-0.07	-0.04	-0.05
EL	-0.38	-0.70	-1.00	-0.36	-0.48	-0.60	-0.24	-0.75
ES	-0.32	-0.91	-0.78	-0.36	-0.54	-0.66	-0.30	-0.21
FR	-0.60	-0.91	-0.96	-0.58	-0.72	-0.96	-0.38	-0.23
IE	-0.26	-1.10	-0.26	-0.19	-0.68	-0.80	-0.51	-0.59
IT	-0.14	-0.43	-0.67	-0.49	-0.28	-0.37	-0.15	-0.39
CY	0.01	-0.27	-0.33	-0.34	-0.20	-0.28	-0.04	-0.58
LV	0.29	0.00	-0.57	-0.31	-0.01	-0.04	0.05	-0.35
LT	-0.24	-0.34	-0.26	-0.27	-0.11	-0.12	-0.10	-0.07
LU	-0.50	-0.87	-0.26	-0.15	-0.62	-0.74	-0.48	-0.22
HU	-0.40	-0.69	0.10	0.07	-0.45	-0.48	-0.41	0.17
MT	-0.32	-0.63	-0.63	-0.52	-0.64	-0.89	-0.29	-1.13
NL	-0.24	-0.53	-0.82	-0.71	-0.42	-0.56	-0.27	-0.55
AT	-0.40	-0.98	-0.35	-0.13	-0.63	-0.69	-0.52	-0.32
PL	-0.54	-1.08	-1.20	-0.58	-0.81	-1.11	-0.29	-0.79
PT	-1.09	-1.64	-2.15	-0.94	-0.91	-1.10	-0.47	-0.69
RO	-0.07	-0.26	-0.20	-0.28	-0.08	-0.08	-0.08	0.05
SI	-0.32	-0.79	-0.76	-0.48	-0.30	-0.37	-0.17	-0.44
SK	-0.04	-0.13	-0.01	-0.10	-0.06	-0.08	-0.03	-0.03
FI	-0.54	-0.86	-0.47	-0.23	-0.64	-0.74	-0.50	-0.27
SE	-0.33	-0.54	-0.55	-0.38	-0.42	-0.54	-0.28	-0.48
UK	-0.54	-0.89	-0.94	-0.43	-0.57	-0.75	-0.32	-0.49
EU-27	-0.37	-0.71	-0.69	-0.45	-0.49	-0.65	-0.26	-0.36

Source: Own estimations using the WorldScan model.

Table 30: Scenario A – percentage changes in sectoral output share, relative changes with respect to the baseline values in 2020

Country	Agriculture, oil, minerals	Energy carriers	Low tech. manufactures	Medium-low tech. manufactures	Medium-high tech. manufactures	High tech. manufactures	Transport	Commercial services	Government and other services
BE	-0.03	0.01	-0.12	0.03	0.11	0.02	0.01	-0.02	0.00
BG	-0.04	0.01	-0.26	-0.01	0.07	0.00	-0.01	0.15	0.09
CZ	0.00	0.00	-0.04	0.02	0.02	0.00	0.00	0.01	0.00
DK	-0.24	0.02	-0.15	0.01	0.09	0.02	-0.02	0.13	0.15
DE	-0.07	0.02	-0.24	0.02	0.09	0.02	-0.01	0.12	0.04
EE	-0.03	0.00	-0.08	0.01	0.05	0.00	0.00	0.04	0.02
EL	-0.03	0.00	-0.24	0.00	0.05	0.01	-0.01	0.07	0.17
ES	-0.02	0.00	-0.12	0.02	0.05	0.01	0.00	0.05	0.01
FR	-0.04	0.02	-0.24	0.05	0.05	0.05	-0.04	0.14	0.00
IE	-0.07	-0.01	-0.27	0.01	0.06	0.01	-0.03	0.17	0.12
IT	-0.12	0.00	-0.32	0.01	0.02	0.01	-0.05	0.23	0.23
CY	-0.03	0.00	-0.08	0.02	0.11	0.03	0.02	0.08	-0.15
LV	-0.10	-0.01	-0.23	0.01	0.21	0.06	-0.02	0.02	0.07
LT	-0.07	-0.01	-0.30	0.02	0.04	0.01	-0.01	0.24	0.09
LU	-0.05	-0.02	-0.18	0.03	0.05	0.01	-0.04	0.04	0.16
HU	-0.01	0.01	-0.07	0.02	0.05	0.01	-0.02	0.03	0.00
MT	-0.08	0.00	-0.15	0.00	0.03	0.02	0.00	0.19	0.00
NL	-0.29	-0.07	-0.23	0.00	-0.04	0.33	-0.04	0.01	0.33
AT	-0.06	0.02	-0.25	0.00	0.05	0.00	-0.02	0.06	0.21
PL	-0.12	0.03	-0.50	0.03	0.13	0.01	-0.01	0.21	0.21
PT	-0.13	-0.01	-0.53	-0.02	0.01	0.01	0.00	0.30	0.37
RO	-0.01	0.01	-0.13	0.04	0.10	0.01	0.00	0.04	-0.06
SI	-0.01	0.00	-0.08	0.02	0.06	0.02	-0.01	0.00	-0.01
SK	-0.03	0.00	-0.33	0.01	0.06	0.02	-0.01	0.12	0.17
FI	-0.08	0.01	-0.27	0.02	0.06	0.00	-0.01	0.23	0.03
SE	-0.04	0.01	-0.25	0.01	0.09	0.00	-0.09	0.10	0.17
UK	-0.04	0.00	-0.32	-0.01	0.03	0.00	-0.03	0.16	0.20
EU-27	-0.07	0.00	-0.22	0.01	0.06	0.03	-0.02	0.11	0.10

Source: Own estimations using the WorldScan model.

Scenario B

To simulate scenario B in WorldScan we first need to change the core model to introduce a standard VAT rate on all taxed supplies that is endogenous while total tax revenues are fixed at the baseline levels. However, we still have different sector-specific VAT rates, which reflect deviations from the standard rate due to the sub-sectors that are VAT exempted. In particular, we use the deviation of each sectoral VAT rate from the standard rate in scenario A as a measure of these sectoral deviations in scenario B. Previously, the VAT rate was exogenous and total tax revenues were endogenously determined by changes not only in the VAT rates, but also by changes in economic activity.[104]

Table 31 compares the estimated new revenue-neutral standard VAT rates with the actual standard rates and the new standard rates as estimated in scenario 2 (chapter 2). As expected, the revenue-neutral rates estimated by WorldScan are lower than the actual standard rates. The extent of the reduction is related to the initial distribution of VAT rates across country-specific sectors (i.e. countries with effective VAT rates more distant from the actual standard rate can afford to have lower revenue-neutral standard rates when zero and reduced rates are abolished) and the general equilibrium effects that adjust the final VAT rates to incorporate changes in economic activity.

[104] Note that our endogenously estimated VAT rate assures that *total* tax revenue is equal to the baseline value and not only VAT revenues.

Table 31: Comparison of standard VAT rates (as of 2011), revenue neutral standard rates as obtained in scenario 2 and revenue neutral standard rates as obtained in scenario B

Country	Actual standard VAT rate	Scenario 2 revenue-neutral VAT rate	Scenario B revenue-neutral VAT rate
BE	21.0%	16.9%	17.8%
BG	20.0%	20.0%	20.0%
CZ	20.0%	17.5%	16.5%
DK	25.0%	24.7%	24.8%
DE	19.0%	16.8%	17.2%
EE	20.0%	19.4%	19.7%
EL	23.0%	18.9%	14.5%
ES	18.0%	12.6%	15.0%
FR	19.6%	16.1%	16.9%
IE	21.0%	15.2%	16.6%
IT	20.3%	15.1%	18.2%
CY	15.0%	12.1%	12.0%
LV	22.0%	20.7%	18.9%
LT	21.0%	20.6%	20.4%
LU	15.0%	12.5%	11.2%
HU	25.0%	22.1%	22.9%
MT	18.0%	13.5%	14.2%
NL	19.0%	16.1%	16.7%
AT	20.0%	16.8%	15.9%
PL	23.0%	17.0%	17.4%
PT	23.0%	17.2%	17.3%
RO	24.0%	22.9%	23.0%
SI	20.0%	16.3%	16.5%
SK	20.0%	19.8%	19.8%
FI	23.0%	20.2%	19.5%
SE	25.0%	21.6%	22.4%
UK	20.0%	16.3%	15.8%
EU-27	20.70%	17.7%	17.8%

Source: WIOD, EUROSTAT, IBFD, European Commission, Own Submissions and own calculations, own estimations using the WorldScan model.

The revenue-neutral rates estimated using WorldScan are in general comparable to those estimated for the static analysis (section 2.2). The differences can be explained by the fact that WorldScan estimates VAT rates that make *all* tax revenues equivalent to the baseline values and not only the VAT revenues. In addition, WorldScan takes into account the general equilibrium effects of changes in economic activity that affect the revenues of other taxes plus those of the VAT revenues itself. These effects include changes in overall consumption and production, sector-specific consumption, changes in trade flows between Member States and other trading partners. All the changes in these variables affect tax revenues in different ways. The different level of aggregation used in their estimation can explain additional differences between both rates.

Using these revenue-neutral VAT rates we find that the changes in sectoral production composition are very similar to those from scenario A (see Table 32, Table 34 contains output share changes disaggregated by Member State). The main difference is that the reduction in the production share of the low-tech manufacturing sector is less pronounced than in scenario A (-0.15% instead of -0.22%) and the service sectors develop somewhat differently. The share of commercial services expands by 0.15% (instead of 0.11% in scenario A), at the expense of a decrease in the share of other services by -0.08% (in scenario A, this sector increased by 0.05). This relative decrease in the service sectors reflects a more efficient resource allocation caused by the abolition of zero and reduced rates, accompanied by a simultaneous reduction in the standard rate. This more efficient resource allocation changes the relative importance of the various sectors.

The changes in the main economic indicators for scenario B are presented in Table 33. For the EU-27 as a whole we see that the new revenue-neutral standard VAT rates still reduce consumption, but to a much lesser extent than in scenario A. GDP remains unchanged, while we saw a small decrease in scenario A. The main difference between both scenarios, however, is that with the new standard VAT rates employment increases, and now employment gains are larger for low-skilled than for high-skilled workers. This relatively large increase in demand for low-skilled labour is also reflected in a reduction in wage inequality, as the wages of low skilled workers increase relative to high skilled workers. Unemployment is again unchanged (see the spreadsheets). Finally, export volumes expand while imports decrease.

Table 32: Sectoral output share for each scenario for the EU-27 as a whole, percentage changes with respect to the baseline

Sector	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E
Agric. & mining	-0.07	-0.06	-0.06	-0.16	-0.07
Energy	0.02	0.01	0.00	-0.05	0.02
Low tech. manuf.	-0.22	-0.15	-0.15	-0.34	-0.22
Medium-low tech.	0.02	0.02	0.02	0.05	0.02
Medium-high tech.	0.07	0.09	0.09	0.28	0.07
High tech. manuf.	0.03	0.01	0.01	0.51	0.03
Transport	-0.01	0.00	0.00	-0.15	-0.01
Commercial serv.	0.11	0.15	0.15	0.23	0.11
Other services	0.05	-0.08	-0.08	-0.36	0.05

Source: Own estimations using the WorldScan model.

With respect to the country-specific results, we observe that changes in economic activity are more heterogeneous now than in scenario A. Very few countries experience the same macroeconomic changes following the VAT reform as we observe in the EU-27 as a whole. For some countries there are increases in GDP and consumption, while others experience the opposite effects.

Even though the expected allocation efficiencies from a revenue neutral abolition of zero and reduced VAT rates are not realized, overall EU-27 macroeconomic values remain basically unchanged. This result reflects general equilibrium effects associated with the changes in relative prices, not only internally but also with respect to each country's main trading partners (most of which are within the EU-27). Although the VAT rate changes from scenario B harmonise sectoral VAT rates *within* EU Member States, there are still big differences *between* Member States, from a new standard VAT rate of almost 25 % in Denmark to 11 % in Luxembourg (see Table 31). For instance, a country that initially experiences an increase in GDP due to the efficiency gains of a uniform VAT system can in later rounds experience a reduction of sectoral output due to an increase in import competition from diverging international sectoral prices within the EU-27. Since the sectoral output and overall GDP changes are almost zero, the results can be driven by changes in production in a few or one single sector.

For example, Spain experiences a *reduction* in the relative producer prices with respect to EU-27 producer prices for almost all sectors (results in attached spread sheet files).

Thus, the overall changes in relative prices associated with the general equilibrium effects provide them with an international comparative advantage and this is reflected by an increase in exports of 0.2 %, which in turn spurs GDP that increases by 0.13 %. Moreover, the changes in relative prices that affect trade are also reflected by the changes in the sectoral production and consumption structure. In the case of Spain, decreases in the relative price of agriculture and other services are directly reflected by a decrease in the production share of those sectors. On the contrary, France experiences an *increase* in relative producer prices with respect to EU-27 prices and this yields an export decrease of 0.15 % and a GDP fall by 0.17 %. At the sectoral level this is translated into different export and import changes between sectors. For instance, France is exporting relatively more agriculture and low-tech manufactures, and less medium-, medium-high- and high-tech manufactures.

Therefore, the potential gains from an internally less distorted resource allocation following the introduction of a uniform VAT system *within* each Member State can be offset by the effect of an internationally (or within-EU) inefficient allocation due to the still divergent VAT rates *between* countries.[105] Since the VAT rates in *all* sectors are changing in scenario B (first by imposing a standard rate for those sectors that previously had zero or reduced rates, and second, by changing the standard rate to make the VAT reform revenue-neutral), the changes in relative prices in scenario B are larger than those in scenario A (where the VAT rates did not necessarily change in sectors that were not directly affected by zero or reduced rates). Nevertheless, as expected, the results from scenario B are more favourable than those from scenario A.

[105] For instance, a previous study to TAXUD (IFS et al., 2011), using WorldScan, found sizeable and positive GDP gains when VAT rates *between* EU Member States were harmonized. Divergent VAT rates between Member States result in significant distortions in relative input and production prices that affect the competitiveness between firms in different EU countries since there are no internal frontiers within the single European market. In addition, divergent VAT rates also result in higher compliance and administrative costs for firms that operate in more than one EU country.

Table 33: Scenario B – percentage changes in main economic indicators, relative changes in 2020 with respect to baseline values

Country	GDP	Consumption	Export volume	Import volume	Employment total	Low-skilled	High-skilled	Wage low as % of wage high-skill
BE	0.02	0.03	-0.04	-0.05	-0.01	0.00	-0.03	0.18
BG	-0.01	0.01	-0.05	-0.02	0.00	0.00	0.00	0.01
CZ	0.12	0.07	0.31	0.23	0.12	0.14	0.08	0.32
DK	-0.06	-0.05	-0.12	-0.11	-0.03	-0.03	-0.02	0.00
DE	-0.02	-0.01	-0.12	-0.08	-0.06	-0.10	-0.02	0.00
EE	0.00	0.00	-0.01	-0.01	-0.01	0.00	-0.01	0.03
EL	0.27	-0.19	2.56	0.40	0.73	1.02	0.12	2.67
ES	0.13	0.09	0.20	-0.01	0.10	0.13	0.04	0.34
FR	-0.17	-0.18	-0.15	-0.12	-0.14	-0.17	-0.10	0.14
IE	-0.04	-0.09	0.08	0.09	-0.02	-0.03	0.00	0.11
IT	0.09	0.06	-0.12	-0.27	0.03	0.04	0.02	0.18
CY	0.36	0.33	0.59	0.47	0.18	0.22	0.09	0.56
LV	1.02	0.98	0.76	0.26	0.34	0.42	0.19	0.54
LT	-0.16	-0.16	0.03	0.04	-0.04	-0.03	-0.06	0.08
LU	0.20	0.11	0.72	0.55	0.14	0.21	0.05	0.42
HU	-0.18	-0.28	0.41	0.32	-0.10	-0.06	-0.17	0.46
MT	0.00	0.00	-0.03	-0.03	-0.04	-0.09	0.02	-0.02
NL	-0.03	-0.03	-0.26	-0.24	-0.04	-0.06	-0.03	-0.03
AT	0.07	0.06	0.40	0.26	0.07	0.12	0.00	0.41
PL	0.06	-0.02	0.22	-0.01	0.04	0.03	0.05	0.40
PT	0.36	0.34	0.22	0.06	0.15	0.15	0.16	0.35
RO	0.05	0.02	0.18	0.04	0.05	0.07	-0.02	0.35
SI	0.24	0.18	0.57	0.37	0.16	0.19	0.12	0.35
SK	-0.03	-0.03	0.14	0.16	-0.02	-0.02	-0.02	0.04
FI	-0.02	-0.02	0.11	0.13	0.00	0.02	-0.02	0.17
SE	0.07	0.10	-0.10	-0.05	0.01	-0.02	0.05	-0.06
UK	-0.04	-0.07	0.11	-0.01	0.02	0.04	-0.01	0.28
EU-27	0.00	-0.03	0.04	-0.03	0.01	0.03	0.00	0.19

Source: Own estimations using the WorldScan model.

Table 34: Scenario B – percentage changes in sectoral output share, relative changes with respect to the baseline values in 2020

Country	Agriculture, oil, minerals	Energy carriers	Low tech. manufactures	Medium-low tech. manufactures	Medium-high tech. manufactures	High tech. manufactures	Transport	Commercial services	Government and other services
BE	-0.02	0.02	-0.04	0.03	0.09	0.00	0.04	0.06	-0.17
BG	-0.04	0.02	-0.18	0.02	0.08	0.01	-0.01	0.21	-0.10
CZ	0.00	0.00	-0.03	0.01	0.01	0.00	0.00	0.01	0.00
DK	-0.18	0.03	-0.05	0.01	0.11	0.01	0.02	0.24	-0.20
DE	-0.05	0.01	-0.15	0.03	0.11	0.01	-0.02	0.15	-0.08
EE	-0.03	0.00	-0.06	0.01	0.04	0.00	0.00	0.03	0.01
EL	-0.03	0.00	-0.19	0.01	0.05	0.00	0.00	0.11	0.03
ES	-0.01	0.01	-0.09	0.02	0.04	0.01	0.00	0.03	-0.01
FR	-0.04	0.02	-0.18	0.04	0.07	0.03	-0.03	0.21	-0.12
IE	-0.06	0.00	-0.20	0.01	0.07	0.00	-0.01	0.23	-0.05
IT	0.01	0.01	0.15	0.08	0.13	0.01	0.19	0.40	-0.98
CY	-0.02	0.01	-0.04	0.02	0.08	0.02	0.02	0.09	-0.19
LV	-0.08	0.00	-0.16	0.01	0.07	0.02	0.02	0.16	-0.03
LT	-0.05	0.00	-0.24	0.01	0.04	0.01	0.00	0.29	-0.05
LU	0.01	0.04	0.00	0.05	0.09	0.01	-0.03	0.16	-0.33
HU	0.00	0.03	-0.06	0.01	0.04	0.01	-0.02	0.03	-0.04
MT	-0.06	0.00	-0.08	0.04	0.04	0.02	-0.01	0.29	-0.25
NL	-0.24	-0.04	-0.13	0.00	0.08	0.09	0.01	0.20	0.03
AT	-0.05	0.01	-0.18	0.01	0.05	0.00	-0.01	0.15	0.02
PL	-0.10	0.02	-0.35	0.06	0.16	0.01	0.00	0.29	-0.09
PT	-0.10	0.01	-0.32	0.04	0.11	0.02	0.02	0.38	-0.16
RO	0.01	0.03	-0.09	0.04	0.09	0.01	0.01	0.05	-0.14
SI	-0.01	0.01	-0.06	0.01	0.06	0.01	0.00	0.00	-0.02
SK	-0.02	0.00	-0.13	0.04	0.11	0.01	0.01	0.15	-0.17
FI	-0.06	0.01	-0.16	0.02	0.08	0.00	0.01	0.26	-0.15
SE	-0.04	0.01	-0.19	0.01	0.06	0.00	-0.07	0.17	0.06
UK	-0.04	0.00	-0.20	0.02	0.08	0.01	0.00	0.28	-0.14
EU-27	-0.06	0.01	-0.15	0.02	0.09	0.01	0.00	0.15	-0.08

Source: Own estimations using the WorldScan model.

Scenario C

It is expected that the introduction of a uniform VAT system in each Member State without zero and reduced rates would simplify the administrative procedures associated with both VAT payments by firms and collection by tax authorities. These potential administrative efficiencies are different from the *allocation* efficiencies associated with the VAT reforms. In this scenario we simulate the macroeconomic effects of taking into account these administrative efficiency gains associated with a uniform VAT system.

To implement the reduction of administrative costs in WorldScan, we rely on Kox (2005) and Djankov et al. (2002) to assess the impact of reducing the administrative burden on firms. Kox (2005) combined detailed information on the administrative burden of government regulations for the Netherlands with data from Djankov et al. (2002) on inter-country differences in firm start-up costs. This approach provided a meaningful international comparison to obtain estimates of the administrative burden per country. Furthermore, this approach assumes that wages for workers that firms need to hire to comply with government regulations and to provide the government with information make up a large part of the administrative costs for firms. Reducing the administrative burden implies that some of these workers can contribute directly to production. The reduction therefore takes the form of an increase in labour efficiency: fewer workers are needed, while production is not directly affected.

These administrative costs can be sizeable. For the Netherlands in 2002, the administrative burden was equivalent to 3.7 % of GDP.[106] According to 2002 data for the Dutch labour income share, reducing this administrative burden by 25 % amounts to a labour-efficiency increase of 1.6 %. The administrative Dutch data also show that the burden associated with VAT compliance represented 9 % of the total administrative burden – i.e. around 0.33 % of GDP. The equivalent labour-efficiency increases for all EU Member States can be found in Kox (2005).[107]

For scenario C we begin with the VAT changes from scenario B and then assume that the abolition of zero and reduced rates will reduce the administrative burden associated with VAT compliance by 20%.[108] This leads to a labour productivity increase of around

[106] The equivalent figures for the EU estimated by Kox (2005) vary from 1.5 % in Finland, Sweden and the United Kingdom, to 6.8 % in Greece and Hungary.

[107] For the EU, the 25% reduction is associated with a 1.5% labour productivity increase, with country-specific effects ranging from 0.9% for the United Kingdom to 2.3% for Hungary.

[108] It is difficult to estimate the exact administrative efficiency gains of the proposed VAT reform. We use the 20 % value as an indicator of the potential gains of abolishing zero and reduced rates. However, we

0.12 % for the EU, where the country-specific values are those estimated by Kox (2005).

In Table 35 we present the results for scenario C. We find that GDP in the EU increases slightly, as do consumption, trade and employment. High-skill employment remains unchanged while the wage gap between low and high-skill workers decreases. These EU-wide results are mostly mirrored by individual Member States, with the exception of France and Hungary. These countries experience GDP decreases, but these are smaller than those associated with scenario B. The relative sectoral production share changes are very similar to those from scenario B (see Table 32, sectoral production share changes disaggregated by Member State are presented in Table 36).

In summary, including potential administrative efficiencies related to a simplified VAT structure produces small but positive GDP and employment increases in the EU.

regard this 20 % decrease as an upper bound value, since the overall administration of the VAT system remains largely unchanged (e.g. the administrative costs associated with exempted sectors remain in place). As a sensitivity test, we also ran the scenario with a 10 % decrease, and the resulting changes in GDP are roughly half of those resulting from a 20 % decrease.

Table 35: Scenario C – percentage changes in main economic indicators, relative changes in 2020 with respect to baseline values

Country	GDP	Consumption	Export volume	Import volume	Employment total	Low-skilled	High-skilled	Wage low as % of wage high-skill
BE	0.13	0.13	0.07	0.04	0.02	0.04	-0.01	0.20
BG	0.10	0.11	0.06	0.06	0.02	0.03	0.00	0.06
CZ	0.22	0.17	0.42	0.32	0.14	0.17	0.10	0.36
DK	0.02	0.03	-0.05	-0.04	-0.01	-0.01	-0.01	0.02
DE	0.09	0.11	-0.01	0.01	-0.03	-0.05	0.00	0.03
EE	0.14	0.14	0.12	0.09	0.02	0.03	0.01	0.07
EL	0.40	-0.08	2.69	0.46	0.75	1.05	0.13	2.71
ES	0.26	0.22	0.33	0.07	0.14	0.18	0.06	0.37
FR	-0.04	-0.05	-0.03	-0.03	-0.10	-0.12	-0.08	0.16
IE	0.04	0.01	0.14	0.16	0.01	0.00	0.02	0.14
IT	0.19	0.16	-0.02	-0.20	0.06	0.07	0.04	0.21
CY	0.48	0.45	0.70	0.55	0.20	0.25	0.10	0.62
LV	1.19	1.13	0.92	0.36	0.37	0.45	0.21	0.57
LT	0.00	-0.02	0.18	0.14	-0.01	0.00	-0.04	0.12
LU	0.30	0.20	0.82	0.64	0.16	0.24	0.06	0.45
HU	-0.03	-0.13	0.55	0.43	-0.06	-0.01	-0.15	0.51
MT	0.12	0.13	0.07	0.06	-0.02	-0.05	0.03	0.02
NL	0.07	0.07	-0.17	-0.17	-0.02	-0.03	-0.01	0.00
AT	0.21	0.19	0.53	0.37	0.11	0.16	0.02	0.45
PL	0.19	0.10	0.35	0.08	0.07	0.08	0.06	0.43
PT	0.52	0.49	0.39	0.16	0.19	0.20	0.19	0.38
RO	0.19	0.15	0.33	0.13	0.07	0.10	-0.01	0.40
SI	0.38	0.31	0.70	0.48	0.19	0.22	0.14	0.37
SK	0.11	0.10	0.28	0.27	0.01	0.02	0.00	0.07
FI	0.06	0.06	0.19	0.20	0.02	0.05	-0.01	0.19
SE	0.14	0.18	-0.02	0.02	0.03	0.00	0.06	-0.04
UK	0.03	-0.01	0.18	0.04	0.04	0.06	0.00	0.29
EU-27	0.11	0.08	0.14	0.05	0.04	0.06	0.01	0.21

Source: Own estimations using the WorldScan model.

Table 36: Scenario C – percentage changes in sectoral output share, relative changes with respect to the baseline values in 2020

Country	Agriculture, oil, minerals	Energy carriers	Low tech. manufactures	Medium-low tech. manufactures	Medium-high tech. manufactures	High tech. manufactures	Transport	Commercial services	Government and other services
BE	-0.04	0.01	-0.26	-0.01	0.07	0.00	-0.01	0.15	0.09
BG	0.00	0.00	-0.04	0.02	0.02	0.00	0.00	0.01	0.00
CZ	-0.07	0.02	-0.24	0.02	0.09	0.02	-0.01	0.12	0.04
DK	-0.03	0.00	-0.08	0.01	0.05	0.00	0.00	0.04	0.02
DE	-0.03	0.00	-0.24	0.00	0.05	0.01	-0.01	0.07	0.17
EE	-0.02	0.00	-0.12	0.02	0.05	0.01	0.00	0.05	0.01
EL	-0.12	0.00	-0.32	0.01	0.02	0.01	-0.05	0.23	0.23
ES	-0.08	0.01	-0.27	0.02	0.06	0.00	-0.01	0.23	0.03
FR	-0.07	-0.01	-0.27	0.01	0.06	0.01	-0.03	0.17	0.12
IE	-0.10	-0.01	-0.23	0.01	0.21	0.06	-0.02	0.02	0.07
IT	-0.07	-0.01	-0.30	0.02	0.04	0.01	-0.01	0.24	0.09
CY	-0.24	0.02	-0.15	0.01	0.09	0.02	-0.02	0.13	0.15
LV	-0.05	-0.02	-0.18	0.03	0.05	0.01	-0.04	0.04	0.16
LT	-0.01	0.01	-0.07	0.02	0.05	0.01	-0.02	0.03	0.00
LU	-0.08	0.00	-0.15	0.00	0.03	0.02	0.00	0.19	0.00
HU	-0.03	0.00	-0.08	0.02	0.11	0.03	0.02	0.08	-0.15
MT	-0.29	-0.07	-0.23	0.00	-0.04	0.33	-0.04	0.01	0.33
NL	-0.06	0.02	-0.25	0.00	0.05	0.00	-0.02	0.06	0.21
AT	-0.03	0.01	-0.12	0.03	0.11	0.02	0.01	-0.02	0.00
PL	-0.12	0.03	-0.50	0.03	0.13	0.01	-0.01	0.21	0.21
PT	-0.13	-0.01	-0.53	-0.02	0.01	0.01	0.00	0.30	0.37
RO	-0.01	0.01	-0.13	0.04	0.10	0.01	0.00	0.04	-0.06
SI	-0.03	0.00	-0.33	0.01	0.06	0.02	-0.01	0.12	0.17
SK	-0.01	0.00	-0.08	0.02	0.06	0.02	-0.01	0.00	-0.01
FI	-0.04	0.02	-0.24	0.05	0.05	0.05	-0.04	0.14	0.00
SE	-0.04	0.01	-0.25	0.01	0.09	0.00	-0.09	0.10	0.17
UK	-0.04	0.00	-0.32	-0.01	0.03	0.00	-0.03	0.16	0.20
EU-27	-0.06	0.01	-0.15	0.02	0.09	0.01	0.00	0.15	-0.08

Source: Own estimations using the WorldScan model.

Scenario D

An alternative policy option is to do a tax replacement exercise, where the increase in VAT revenue is exactly offset by a decrease in capital-investment tax revenues.[109] In scenario D we abolish zero and reduced VAT rates (as in scenario A) and keep the tax revenues constant (as in scenario B). However, instead of endogenously calculating a new revenue-neutral standard VAT rate in WorldScan, in scenario D we maintain the standard VAT rates from scenario A, but endogenously decrease the capital-investment tax rate such that the total tax revenues are equal to the baseline values.

In Table 37 we present the macroeconomic results for scenario D. For the EU-27 as a whole we find that GDP increases by half a percentage point. This significant increase is the result of a more efficient allocation of resources associated with the replacement of a distorting tax (capital investment tax) with a less distorting one (VAT). On the other hand, consumption and employment now decrease. We would expect this result, given that a reduction in the capital investment tax incentives more savings and investment, which in a general equilibrium setting need to be compensated by less consumption. Making capital more attractive increases the amount of capital per worker and decreases the demand for labour. The demand decreases more for low-skill labour, which tends to be a substitute for capital in many sectors.

The changes in the sectoral production shares are very different from the previous scenarios (see Table 32 and Table 38). This is what we would expect, given that the general equilibrium effects associated with the changing investment and production decisions following the reduction in the capital investment tax entails a series of additional adjustments in the model. Therefore, besides the changes in the VAT sector-specific rates, in this scenario we also have that the relative price of capital is decreasing after the reduction in the capital investment tax. This second round of effects is what makes the sectoral changes in this scenario different from previous scenarios. For instance, for the EU27 in Table 38 we observe an expansion in the medium-high and high-tech manufacturing sectors, both of which are capital intensive and thus, benefit more from the decrease in the relative price of capital. The relative increase in these capital-intensive sectors draws resources away from other sectors and this creates a general equilibrium effect where other sectors most reduce their relative production

[109] In WorldScan there are no corporate taxes as such. The profits of a representative firm in each sector are equal to the fixed costs of production associated with a monopolistic competition modelling framework. However, the tax on capital investments in WorldScan can be interpreted as an alternative to corporate taxes. Note that the capital-investment tax affects the flow and not the stock of capital.

(e.g. low-tech manufactures, and government and other services) to accommodate the expansion of the capital intensive sectors.

Although labour productivity increases with the amount of capital per worker --which in turn creates pressure for higher wages and more consumption-- this effect is dominated by the increased attractiveness of saving/investment as compared to consumption in this scenario. Thus it becomes relatively more attractive to save than to consume.

With some exceptions, individual Member States also experience a GDP increase together with consumption and employment decreases. The general equilibrium mechanisms in scenario D are more complex than in previous scenarios where the VAT changes were strongly associated with final goods prices. The change in the capital investment tax, however, also generates a direct effect on factor prices, namely: capital costs and wages, which has an impact on the production structure for each Member State, but also generates incentives for capital movements *between* Member States.

These results are in line with the main findings from Boeters et al. (2010). Using a CGE model for Germany they also find that the overall economic effects of a pure VAT reform is relatively small, while the introduction of a standard VAT rate in conjunction with a budget-neutral tax replacement can generate substantial positive economic effects.

Table 37: Scenario D – percentage changes in main economic indicators, relative changes in 2020 with respect to baseline values

Country	GDP	Consumption	Export volume	Import volume	Employment total	Low-skilled	High-skilled	Wage low as % of wage high-skill
BE	-0.32	-1.95	0.86	1.12	-0.73	-0.88	-0.55	0.11
BG	0.20	0.09	0.23	0.06	0.03	0.03	0.03	-0.01
CZ	1.84	-1.53	1.67	2.10	-0.37	-0.51	-0.15	-0.43
DK	0.17	-0.06	0.38	0.32	-0.01	-0.02	0.00	-0.06
DE	0.57	-0.88	0.58	1.14	-0.37	-0.54	-0.14	-0.27
EE	0.20	-0.18	0.28	0.20	-0.04	-0.05	-0.02	-0.04
EL	0.26	-1.43	0.40	0.66	-0.51	-0.58	-0.37	-0.25
ES	0.42	-1.82	0.55	1.02	-0.49	-0.58	-0.31	0.05
FR	0.30	-1.58	0.24	1.07	-0.66	-0.87	-0.36	-0.12
IE	1.45	-2.07	1.63	2.25	-0.63	-0.73	-0.47	-0.39
IT	0.37	-1.05	0.68	0.73	-0.31	-0.36	-0.22	-0.01
CY	1.36	-0.87	1.44	1.48	-0.16	-0.18	-0.12	0.09
LV	0.66	-0.98	1.37	0.98	-0.15	-0.13	-0.21	0.46
LT	-0.01	-0.40	0.52	0.36	-0.09	-0.09	-0.09	0.01
LU	-0.04	-2.22	1.76	1.84	-0.64	-0.70	-0.55	0.12
HU	0.44	-1.25	1.75	1.86	-0.40	-0.45	-0.32	0.10
MT	2.08	-1.90	2.44	2.72	-0.68	-0.91	-0.34	-0.56
NL	0.87	-1.12	0.45	0.85	-0.37	-0.49	-0.26	-0.34
AT	0.86	-2.17	1.39	1.79	-0.59	-0.65	-0.50	-0.18
PL	1.80	-2.95	1.48	2.61	-1.06	-1.40	-0.46	-0.27
PT	-0.05	-3.33	0.29	1.51	-0.98	-1.10	-0.70	0.11
RO	0.30	-0.50	0.81	0.53	-0.07	-0.06	-0.08	0.20
SI	0.58	-1.98	1.12	1.38	-0.37	-0.42	-0.29	0.03
SK	0.24	-0.04	1.01	0.93	-0.01	-0.02	0.01	-0.01
FI	-0.69	-2.07	-1.49	-0.03	-0.64	-0.68	-0.58	0.04
SE	0.53	-1.02	0.87	1.63	-0.38	-0.55	-0.18	-0.59
UK	1.04	-1.89	0.92	2.00	-0.51	-0.67	-0.28	-0.34
EU-27	0.56	-1.45	0.72	1.28	-0.48	-0.62	-0.27	-0.15

Source: Own estimations using the WorldScan model.

Table 38: Scenario D – percentage changes in sectoral output share, relative changes with respect to the baseline values in 2020

Country	Agriculture, oil, minerals	Energy carriers	Low tech. manufactures	Medium-low tech. manufactures	Medium-high tech. manufactures	High tech. manufactures	Transport	Commercial services	Government and other services
BE	-0.03	0.01	-0.15	0.12	0.27	0.03	-0.04	0.24	-0.45
BG	-0.03	0.03	-0.27	0.05	0.31	0.02	0.00	0.35	-0.45
CZ	0.00	0.00	-0.06	0.03	0.03	0.01	0.00	0.01	0.00
DK	-0.28	0.02	-0.17	0.04	0.33	0.06	-0.07	0.55	-0.46
DE	-0.09	-0.02	-0.34	0.09	0.33	0.09	-0.11	0.30	-0.24
EE	-0.04	0.00	-0.12	0.02	0.13	0.02	0.00	0.04	-0.03
EL	-0.04	-0.01	-0.27	0.03	0.15	0.05	-0.02	0.22	-0.12
ES	-0.03	-0.01	-0.21	0.04	0.16	0.00	0.01	0.06	-0.02
FR	0.08	0.09	0.00	0.19	-0.09	-0.63	0.00	0.63	-0.27
IE	-0.08	-0.01	-0.30	0.05	0.15	0.03	-0.04	0.47	-0.26
IT	-0.12	-0.01	-0.35	0.05	0.11	0.03	-0.05	0.50	-0.16
CY	-0.07	-0.02	-0.19	0.03	0.29	0.18	-0.02	0.09	-0.29
LV	-0.13	-0.03	-0.35	0.02	0.52	0.20	-0.05	0.08	-0.27
LT	-0.08	-0.01	-0.36	0.10	0.18	0.03	-0.01	0.38	-0.23
LU	-0.04	0.02	-0.08	0.13	0.23	0.06	-0.05	0.27	-0.55
HU	-0.02	0.01	-0.12	0.03	0.12	0.04	-0.02	0.04	-0.08
MT	-0.09	0.01	-0.17	0.06	0.15	0.10	0.00	0.55	-0.61
NL	-0.36	-0.09	-0.29	0.03	0.13	0.91	-0.10	0.09	-0.32
AT	-0.07	0.01	-0.26	0.04	0.22	0.02	-0.04	0.25	-0.17
PL	-0.18	-0.03	-0.64	0.13	0.61	0.06	-0.07	0.49	-0.36
PT	-0.13	0.00	-0.61	0.08	0.26	0.05	-0.03	0.92	-0.54
RO	-0.05	0.01	-0.19	0.06	0.24	0.02	-0.01	0.10	-0.20
SI	-0.03	-0.02	-0.18	0.03	0.18	0.10	-0.02	-0.02	-0.04
SK	-0.03	-0.01	-0.33	0.15	0.21	0.06	-0.02	0.33	-0.37
FI	-0.09	0.00	-0.31	0.07	0.17	0.02	-0.02	0.49	-0.32
SE	-0.03	0.03	-0.27	0.06	0.21	0.04	-0.12	0.28	-0.20
UK	-0.03	0.00	-0.30	0.06	0.20	0.07	-0.04	0.52	-0.47
EU-27	-0.16	-0.05	-0.34	0.05	0.28	0.51	-0.15	0.23	-0.36

Source: Own estimations using the WorldScan model.

Scenario E[110]

Finally, for scenario E we simulate a government policy where the increase in VAT tax revenue from scenario A is redistributed back to low-skilled worker households (both employed and unemployed).[111]

It is important to recall that in WorldScan all additional tax revenues – besides unemployment benefits – are implicitly transferred back to households. For unemployed households, the model specifies a payment of unemployment benefits and in the simulation of scenario A, these unemployment benefits are adjusted sufficiently to compensate for the VAT rate increases.[112] Therefore, in scenario E, the higher VAT revenues associated with the abolition of zero and reduced rates are used to pay for the price-indexed unemployment benefits, with the remainder being transferred to low-skilled households. Therefore, the real value of transfers to other households (high-skill employed and unemployed households and the residual household) and government consumption is lower in scenario E than in scenario A.

However, the results of scenario E are qualitatively and quantitatively very similar to those of scenario A. There is an overall small decrease in GDP, consumption and employment. The main difference is that the real income of both low-skill households increases, at the expense of the high-skill and residual households. This suggests a decrease in overall income inequality. However, since the residual household in the model includes both high-income households (who receive capital rents and pension transfers) and low-income households (who receive welfare and social security transfers), it is not clear that *all* low-income households will benefit in this particular scenario. Thus the actual inequality outcome is uncertain.[113]

Moreover, the aggregated consumption structure of scenario E does not differ from the consumption structure in scenario A, even though the model accounts for non-

[110] The results can be found in the annexed spread sheets.

[111] It is important to note that this scenario is conceptually different from a pure income distribution analysis, since in WorldScan, households are not divided into income groups. Recall that such a distributional analysis was performed in Scenario 3 in the previous section.

[112] This applies to both unemployment benefits present in the model: the "basic income" and the "wage-indexed benefits" payments. In other words, the real value of social benefits is automatically kept constant in the model. Moreover, we do not change these unemployment benefits in scenario E because this can generate additional effects on the household decision to work or not, which are not relevant to the VAT reform.

[113] The particular household classification of this version of WorldScan was chosen to model the endogenous decision of households to supply labour, but not to directly assess distributional issues.

homotheticity (i.e. that the consumption structure changes when income changes). The actual income changes that occur in scenario E are too small to significantly affect the aggregated sectoral consumption shares.

To sum up, Table 39 summarizes the main macroeconomic outcomes for each scenario for the EU-27.

Table 39: Summary of macroeconomic consequences for each scenario for the EU-27 as a whole, percentage changes with respect to the baseline

Scenario	GDP	Consumption	Export volume	Import volume	Employment total	Low-skilled	High-skilled	Wage low as % of wage high-skill
A	-0.37	-0.71	-0.69	-0.45	-0.49	-0.65	-0.26	-0.36
B	0.00	-0.03	0.04	-0.03	0.01	0.03	0.00	0.19
C	0.11	0.08	0.14	0.05	0.04	0.06	0.01	0.21
D	0.56	-1.45	0.72	1.28	-0.48	-0.62	-0.27	-0.15
E	-0.37	-0.71	-0.69	-0.45	-0.49	-0.65	-0.26	-0.36

Source: Own estimations using the WorldScan model.

4 Conclusions

This report compiles data on VAT liabilities for households and non-household entities (exempt sectors, governments or others entities who pay VAT on their intermediate consumption) in the EU-27 Member States. The objective of the study is to estimate VAT payments of different sectors in 2011, broken down by category of goods and services, and how VAT contributions vary across subgroups defined by various characteristics (such as household characteristics or sectors). We also analyse how the zero and reduced VAT rates currently in place in EU-27 countries influence VAT payments by simulating various reform scenarios that abolish these rates. We calculate the additional VAT revenues that would be generated by these reforms, and analyse the impact of changes in the VAT rates structure on important macroeconomic indicators.

To analyse the effects of changes in the VAT rates structure we take two different approaches. We use a static model to assess the effects of an abolition of zero and reduced rates on private households, non-households entities and VAT revenues. This static approach enables us to analyse the distributional effects of the differentiated VAT rates structure at one point in time, and estimate the additional revenues that could be raised by abolishing zero and reduced VAT rates. This analysis is purely mechanical – that is, we do not take into account behavioural reactions of households and non-households, although we would expect them to adjust their demand and supply in response to a change in relative prices, which would change the results. We also do not take into account that governments might not be able to collect all of the VAT liabilities we calculate. Nevertheless, static approaches are widely used, especially in the field of distributional analysis, as they enable a detailed insight into basic mechanisms and short-term effects.

We then use a comprehensive general equilibrium model (WorldScan) to analyse the medium term consequences of various VAT reforms on important macroeconomic aggregates. This dynamic model integrates important economic parameters (firms, households and governments) in the EU-27 countries and takes into account behavioural reactions. The complexity of the model precludes modelling each sector of the economy in great detail in order to preserve computability. Standard Computational General Equilibrium models like WorldScan are developed for the analysis of medium and long-term questions that involve inter-regional and inter-sectoral effects of policy shocks to the real economy, predicting changes in aggregates like GDP, consumption and employment. In general, these models do not incorporate features to analyse short-

term or monetary consequences like inflation, nominal interest rates and nominal exchange rates fluctuations.

Although we simulate similar reform scenarios in both parts of the analysis (we consider abolishing zero and reduced rates, or compute a new standard rate such that revenues remain neutral), the scenarios are not entirely the same. For example, the static analysis of scenario 1 (abolishing zero and reduced rates) does not specify how the government spends the additional VAT revenues. In contrast, the general equilibrium analysis automatically channels these revenues back into the economy to keep the budget balanced. The two approaches are complementary, in that each approach can tackle different aspects of the analysis of VAT reform: while the dynamic approach indicates how important economic parameters will change in the medium term following a change in the VAT rate structure, it cannot assess the distributional consequences of such changes; the static approach, on the other hand, can answer distributional questions, but is not capable of assessing medium term effects.

We find a very heterogeneous pattern of VAT rates structures across EU-27 Member States. Some Member States make very little use of zero and reduced rates (Bulgaria, Denmark, the Baltic states, Hungary, Romania and Slovakia), while others apply zero, super reduced, reduced or parking rates to a large number of supplies (Cyprus, Luxembourg, Ireland, and the UK among others). This differentiated picture makes it hard to draw general conclusions for the EU-27 as a whole. We nevertheless want to summarise some general results.

VAT is often believed to be a regressive tax, as households with a low income at a given point in time spend a higher share of their current income on VAT payments. However, the conclusion on whether VAT is regressive or progressive to a great extent depends on whether we believe the income or the expenditure distribution to be more indicative of economic inequality, and whether we look at VAT payments in proportion to income or in proportion to expenditures (Carrera 2010, Crossley et al. 2009, IFS et al. 2011). Given the available data we can only assess whether a VAT system is progressive, proportional or regressive based on the ratio between VAT payments and expenditures for different income classes; although it would be interesting to also have this information for different expenditure classes. However, we do not consider the fact that we do not have data on VAT payments in relation to income as a caveat of our study, because this is a misleading indicator of the progressivity of a VAT system according to IFS et al. (2011).

Using this measure we find that in about half of the EU-27 Member States, reduced rates, in combination with exemptions, achieve one of their main objectives – alleviating the VAT burden for lower income households. In these countries, the VAT rates structure is progressive, leading to a lower tax burden for low-income households relative to their expenditure. However, countries that have a progressive VAT system do not limit reduced rates to goods and services that are disproportionally consumed by poor households. For example, high-income households typically spend a larger share of their budgets on restaurants, accommodation services and books and newspapers than poorer households do; therefore, a lower tax burden on these supplies is not progressive. The remaining countries can be described as having a roughly proportional VAT system – on average, low- and high-income households pay about the same share of their expenditure in VAT. Hungary's VAT system is the only one we would classify as regressive.

The effect of abolishing zero and reduced rates differs between Member States. Unsurprisingly, countries with few supplies taxed at zero and reduced rates experience almost no change. But many countries could raise significant additional VAT revenues (amounting to up to 3.3 % of GDP) by abolishing zero and reduced rates. In most countries, increases in VAT liability are higher for households than for non-households paying non-recoverable VAT on their inputs. This is due to the fact that most zero and reduced rates apply to supplies consumed primarily by households. Nevertheless, certain sectors face a considerable increase in their VAT burdens; examples are the real estate, education and health sectors. For sectors that depend on subsidies, such as health or education, or non-profit institutions serving households, additional subsidies might be necessary to maintain the level of services provided; that is, part of the additional VAT revenues might have to be redistributed.

Regarding the impact on the income distribution, we find that in most countries, the abolition of zero and reduced rates hits lower-income households harder when we look at VAT payments as a fraction of total expenditure. In absolute terms, however, higher-income households suffer more. That is, in absolute terms, high-income households benefit more from the existing zero and reduced rates than low-income households. This points to the limits of the potential of zero and reduced VAT rates as a tool for redistribution. What is more, we find that if we grant low-income households a lump-sum transfer that enables them to purchase the same consumption bundle as before the reform, the additional VAT revenues generated by the reform are still substantial. The otherwise high additional burden that abolishing zero and reduced VAT rates would put

on low-income households could thus be avoided at a relatively low cost. The challenge would be to set-up and administer such a compensating benefit.

If we abolish zero and reduced rates, and, at the same time, decrease the standard VAT rate such that the reform is revenue neutral, we find that in most countries, VAT bills of private households increase, while those of non-households decrease. Within the household sector we show that this reform is regressive for most countries: as a fraction of expenditure, the additional burden is higher for low-income households than for households further up the income distribution. In some countries, this is the case even in absolute terms. For richer households, the lower standard rate compensates for the abolition of zero and reduced rates. By design, this reform does not change the wide gap in effective VAT rates between EU Member States – in countries that make heavy use of zero and reduced rates, the standard VAT rate decreases sharply, while in other countries there is hardly any change: Denmark's new standard rate is twice as high as Cyprus' or Luxembourg's new rate.

This variation in VAT rates across Member States might also be part of the explanation as to why the general equilibrium analysis only finds marginal effects of a revenue neutral abolition of zero and reduced rates on GDP in the EU-27 on average. While results differ across Member States, with some experiencing gains while others face losses following the introduction of a new uniform, budget neutral standard VAT rate, we hardly find the increase in allocative efficiency we would have expected. This is because, although the reform scenarios generate a uniform VAT rates system within each country, the exempt status of several sectors is kept in place, and because VAT rates continue to differ between Member States. On the other hand, employment increases, especially for the low-skilled, which could attenuate the negative distributional effects caused by the change in the VAT rates structure. Moreover, if we include potential administrative cost reductions associated with a simplified VAT system, we do find marginally positive effects on GDP for the EU-27 as a whole. When we increase zero and reduced rates to the standard rate and decrease investment capital tax revenues to keep overall tax revenues constant, we find a sizeable increase in GDP.

Although we believe our data to be generally sound, there are several issues, especially regarding the household analysis, which are caused by the fact that we have to work with aggregate instead of micro data. For some countries, there is no information on imputed rents, which could bias the results; we assume household income and expenditures not to be equivalised to account for household size; and we lack more detailed socio-economic and demographic information that might facilitate the

comparison of results between countries.[114] Furthermore, there is a significant time lag in the data delivery: the aggregate HBS data is from 2005, a newer wave (2010) is only expected to be released later this year.

Notwithstanding these limitations, this report presents a comprehensive overview of the distributional impact of the diversified VAT rates structure across the EU. It presents an estimate of the budgetary effects of abolishing this diversified VAT rates structure for each Member State, of the effect this would have on households and non-household entities before behavioural responses, and of the effects a more unified VAT rates structure within each Member State might have in the medium run on the economy in general.

[114] For example, our data do not allow us to answer basic questions, like: Are households in the first quintile disproportionately headed by an old or economically inactive person? Which income quintiles contain the most children?

A. Annex

A.1 Growth rates applied to HBS data

Table 40: Growth rates applied to HBS data (uprate from 2005 to 2011)

GROWTH RATES (2005 - 2011)	AT	BE	BG**	CY	CZ	DE	DK	EE	EL
CP01	14.3%	18.5%	45.6%	10.2%	44.1%	20.2%	15.9%	36.1%	11.8%
CP02	15.8%	7.9%	223.5%	26.3%	75.8%	6.4%	8.0%	43.4%	14.9%
CP03	10.1%	18.3%	57.5%	7.1%	0.3%	8.5%	11.2%	23.5%	-23.7%
CP04	20.4%	18.8%	42.9%	42.2%	64.8%	16.3%	22.4%	37.5%	41.0%
CP05	16.4%	15.3%	219.3%	3.6%	47.9%	8.0%	0.6%	3.4%	-11.2%
CP06	15.0%	24.2%	79.4%	30.8%	76.3%	26.5%	18.9%	9.0%	21.1%
CP07	21.4%	21.9%	58.8%	-6.4%	33.5%	13.9%	6.2%	40.7%	4.3%
CP08	-10.2%	-12.2%	58.0%	15.3%	39.9%	3.6%	-3.8%	38.5%	5.3%
CP09	19.8%	14.4%	146.1%	14.9%	27.7%	10.1%	8.2%	-9.8%	10.4%
CP10	7.6%	16.3%	79.4%	26.9%	47.7%	35.4%	33.0%	-27.0%	22.1%
CP11	28.1%	22.5%	17.2%	11.7%	50.8%	25.4%	20.7%	39.7%	-0.7%
CP12	20.0%	22.6%	111.7%	2.1%	64.5%	13.8%	12.3%	15.9%	3.7%
Total (NA)*	18.5%	18.1%	69.2%	14.1%	49.4%	14.9%	13.7%	28.1%	11.6%
Total (HBS)*	18.0%	18.3%	63.7%	16.0%	46.9%	15.0%	13.7%	29.5%	12.9%

GROWTH RATES (2005 - 2011)	ES**	FI	FR	HU	IE	IT	LT	LU	LV
CP01	8.8%	27.2%	12.0%	14.7%	1.3%	5.5%	64.3%	14.3%	57.7%
CP02	13.1%	19.5%	11.7%	34.4%	-4.2%	12.0%	80.3%	-10.7%	84.7%
CP03	0.8%	28.1%	-1.3%	-7.6%	-19.7%	1.0%	36.4%	25.8%	22.3%
CP04	32.1%	33.9%	18.1%	31.4%	-0.9%	21.7%	90.3%	22.9%	107.1%
CP05	-1.4%	25.4%	10.0%	-23.1%	-34.9%	4.4%	64.3%	7.5%	68.5%
CP06	12.2%	36.6%	21.5%	18.2%	21.1%	7.5%	61.1%	35.8%	73.8%
CP07	4.2%	11.2%	13.3%	-7.4%	0.5%	2.5%	68.4%	19.9%	112.7%
CP08	16.3%	-0.5%	4.7%	-1.6%	-19.0%	-3.2%	81.2%	6.4%	38.5%
CP09	0.5%	21.5%	5.9%	-4.1%	-8.1%	12.8%	59.1%	-2.7%	67.2%
CP10	8.3%	22.0%	31.8%	4.1%	66.3%	16.1%	112.0%	175.1%	23.5%
CP11	1.9%	19.2%	11.0%	19.2%	-11.7%	18.4%	61.1%	8.2%	56.9%
CP12	-2.0%	38.5%	16.6%	26.0%	-29.5%	7.2%	89.8%	18.1%	129.1%
Total (NA)*	8.6%	25.8%	13.0%	11.4%	-8.3%	9.9%	71.2%	13.9%	76.5%
Total (HBS)*	12.9%	26.1%	13.2%	11.0%	-7.4%	10.8%	69.8%	17.3%	73.9%

GROWTH RATES (2005 - 2011)	MT	NL	PL	PT	RO**	SE	SI	SK	UK***
CP01	18.6%	18.9%	30.2%	16.9%	40.0%	27.1%	30.9%	71.2%	-5.6%
CP02	18.9%	15.7%	41.6%	0.7%	74.8%	23.6%	44.9%	69.5%	-9.5%
CP03	-16.5%	10.9%	32.3%	13.1%	65.1%	24.6%	26.8%	67.2%	-4.4%
CP04	47.7%	15.5%	48.2%	21.1%	62.0%	24.1%	34.9%	77.0%	10.3%
CP05	4.3%	1.6%	48.4%	2.6%	51.8%	27.4%	35.5%	102.1%	-19.9%
CP06	42.5%	-44.1%	60.7%	33.3%	172.9%	26.3%	39.4%	118.5%	2.4%
CP07	25.3%	15.2%	65.9%	-1.7%	-4.4%	15.2%	29.5%	61.1%	-12.9%
CP08	14.9%	-5.5%	26.0%	9.5%	268.5%	16.3%	21.6%	81.8%	-7.3%
CP09	26.0%	5.7%	47.6%	7.4%	122.7%	21.4%	5.5%	94.9%	-16.2%
CP10	20.4%	28.2%	38.4%	33.2%	-15.8%	37.7%	42.4%	83.4%	-6.3%
CP11	38.2%	7.4%	43.8%	17.1%	-3.4%	39.9%	39.6%	44.8%	-12.1%
CP12	48.8%	-0.5%	54.2%	27.6%	160.2%	36.2%	42.3%	109.2%	-25.6%
Total (NA)*	26.1%	6.8%	44.9%	14.2%	51.7%	24.8%	31.2%	79.1%	-9.1%
Total (HBS)*	22.7%	9.2%	43.8%	15.6%	67.0%	24.2%	30.9%	77.6%	0.0%

Source: National Accounts Data (Eurostat), own calculations.

* Because the expenditure structure differs between HBS and NA data to begin with, applying the category specific growth rates from the NA data to the HBS data leads to different aggregate growth rates between the HBS and NA data.

** NA data not available for 2011 (we uprate to the latest year for which NA data are available, after that we uprate using GDP growth to 2011).

Note: Exchange rates of 1.956 Bulgarian levs, 24.590 Czech koruny, 7.451 Danish kroner, 0.706 Latvian lats, 3.453 Lithuanian litai, 279.370 Hungarian forints, 4.121 Polish zloty, 4.212 Romanian lei, 9.030 Swedish kronor and 0.868 British pounds to 1 Euro.

A.2 COICOP Classification

COICOP groups (two-digit level)
CP00 - Total
CP01 - Food and non-alcoholic beverages
CP02 - Alcoholic beverages, tobacco and narcotics
CP03 - Clothing and footwear
CP04 - Housing, water, electricity, gas and other fuels
CP05 - Furnishings, household equipment and routine maintenance of the house
CP06 - Health
CP07 - Transport
CP08 - Communication
CP09 - Recreation and culture
CP10 - Education
CP11 - Restaurants and hostels
CP12 – Miscellaneous

COICOP groups (three-digit level)
CP011 - Food
CP012 - Non-alcoholic beverages
CP021 - Alcoholic beverages
CP022 - Tobacco
CP023 - Narcotics
CP031 - Clothing
CP032 - Footwear including repair
CP041 - Actual rentals for housing
CP042 - Imputed rentals for housing
CP043 - Maintenance and repair of the dwelling
CP044 - Water supply and miscellaneous services relating to the dwelling
CP045 - Electricity, gas and other fuels
CP051 - Furniture and furnishings, carpets and other floor coverings
CP052 - Household textiles
CP053 - Household appliances
CP054 - Glassware, tableware and household utensils
CP055 - Tools and equipment for house and garden
CP056 - Goods and services for routine household maintenance
CP061 - Medical products, appliances and equipment
CP062 - Out-patient services

CP063 - Hospital services
CP071 - Purchase of vehicles
CP072 - Operation of personal transport equipment
CP073 - Transport services
CP081 - Postal services
CP082 - Telephone and telefax equipment
CP083 - Telephone and telefax services
CP091 - Audio-visual, photographic and information processing equipment
CP092 - Other major durables for recreation and culture
CP093 - Other recreational items and equipment, gardens and pets
CP094 - Recreational and cultural services
CP095 - Newspapers, books and stationery
CP096 - Package holidays
CP101 - Pre-primary and primary education
CP102 - Secondary education
CP103 - Post-secondary non-tertiary education
CP104 - Tertiary education
CP105 - Education not definable by level
CP111 - Catering services
CP112 - Accommodation services
CP121 - Personal care
CP122 - Prostitution
CP123 - Personal effects n.e.c.
CP124 - Social protection
CP125 - Insurance
CP126 - Financial services n.e.c.
CP127 - Other services n.e.c.

COICOP groups (four-digit level)
CP0111 - Bread and cereals
CP0112 - Meat
CP0113 - Fish and seafood
CP0114 - Milk, cheese and eggs
CP0115 - Oils and fats
CP0116 - Fruit
CP0117 - Vegetables
CP0118 - Sugar, jam, honey, chocolate and confectionery
CP0119 - Food products n.e.c.

CP0121 - Coffee, tea and cocoa
CP0122 - Mineral waters, soft drinks, fruit and vegetable juices
CP0211 - Spirits
CP0212 - Wine
CP0213 - Beer
CP0221 - Tobacco (ND)
CP0231 - Narcotics (ND)
CP0311 - Clothing materials
CP0312 - Garments
CP0313 - Other articles of clothing and clothing accessories
CP0314 - Cleaning, repair and hire of clothing
CP0321 - Shoes and other footwear
CP0322 - Repair and hire of footwear
CP0411 - Actual rentals paid by tenants
CP0412 - Other actual rentals
CP0421 - Imputed rentals of owner-occupiers
CP0422 - Other imputed rentals
CP0431 - Materials for the maintenance and repair of the dwelling
CP0432 - Services for the maintenance and repair of the dwelling
CP0441 - Water supply
CP0442 - Refuse collection
CP0443 - Sewerage collection
CP0444 - Other services relating to the dwelling n.e.c.
CP0451 - Electricity
CP0452 - Gas
CP0453 - Liquid fuels
CP0454 - Solid fuels
CP0455 - Heat energy
CP0511 - Furniture and furnishings
CP0512 - Carpets and other floor coverings
CP0513 - Repair of furniture, furnishings and floor coverings
CP0521 - Household textiles (SD)
CP0531 - Major household appliances whether electric or not
CP0532 - Small electric household appliances
CP0533 - Repair of household appliances
CP0541 - Glassware, tableware and household utensils (SD)
CP0551 - Major tools and equipment
CP0552 - Small tools and miscellaneous accessories

CP0561 - Non-durable household goods
CP0562 - Domestic services and household services
CP0611 - Pharmaceutical products
CP0612 - Other medical products
CP0613 - Therapeutic appliances and equipment
CP0621 - Medical services
CP0622 - Dental services
CP0623 - Paramedical services
(*CP063 - see above*)
CP0711 - Motor cars
CP0712 - Motor cycles
CP0713 - Bicycles
CP0714 - Animal drawn vehicles
CP0721 - Spares parts and accessories for personal transport equipment
CP0722 - Fuels and lubricants for personal transport equipment
CP0723 - Maintenance and repair of personal transport equipment
CP0724 - Other services in respect of personal transport equipment
CP0731 - Passenger transport by railway
CP0732 - Passenger transport by road
CP0733 - Passenger transport by air
CP0734 - Passenger transport by sea and inland waterway
CP0735 - Combined passenger transport
CP0736 - Other purchased transport services
CP0811 - Postal services (S)
CP0821 - Telephone and telefax equipment (D)
CP0831 - Telephone and telefax services (S)
CP0911 - Equipment for the reception, recording and reproduction of sound and pictures
CP0912 - Photographic and cinematographic equipment and optical instruments
CP0913 - Information processing equipment
CP0914 - Recording media
CP0915 - Repair of audio-visual, photographic and information processing equipment
CP0921 - Major durables for outdoor recreation
CP0922 - Musical instruments and major durables for indoor recreation
CP0923 - Maintenance and repair of other major durables for recreation and culture
CP0931 - Games, toys and hobbies
CP0932 - Equipment for sport, camping and open-air recreation

CP0933 - Gardens, plants and flowers
CP0934 - Pets and related products
CP0935 - Veterinary and other services for pets
CP0941 - Recreational and cultural services
CP0942 - Cultural services
CP0943 - Games of chance
CP0951 - Books
CP0952 - Newspapers and periodicals
CP0953 - Miscellaneous printed matter
CP0954 - Stationery and drawing materials
(*CP096 - see above*)
CP1011 - Pre-primary and primary education (S)
CP1021 - Secondary education (S)
CP1031 - Post-secondary non-tertiary education (S)
CP1041 - Tertiary education (S)
CP1051 - Education non definable by level (S)
CP1111 - Restaurants, cafés and the like
CP1112 - Canteens
CP1121 - Accommodation services (S)
CP1211 - Hairdressing salons and personal grooming establishments
CP1212 - Electrical appliances for personal care
CP1213 - Other appliances, articles and products for personal care
CP1221 - Prostitution (S)
CP1231 - Jewellery, clocks and watches
CP1232 - Other personal effects
CP1241 - Social protection services (S)
CP1252 - Insurance connected with the dwelling
CP1253 - Insurance connected with health
CP1254 - Insurance connected with transport
CP1255 - Other insurance
CP1262 - Other financial services n.e.c.
CP1271 - Other services n.e.c. (S)

A.3 Validation exercise: Comparison with results based on micro data

Since we are working with aggregated data, it is interesting to see how our analysis compares to an analysis that is based on household level data. As a validation exercise, we therefore repeat our simulations using micro data for a subgroup of countries for which we have access to disaggregated consumption surveys: Austria, Italy and the UK.

Validation with Micro-Data: Austria

We repeat our analysis for Austria using the Austrian Household Budget Survey 2005 as provided by Statistik Austria. This dataset contains detailed expenditure information on 8,400 households representative for the Austrian population; annual expenditure data are disaggregated to the COICOP 6-digit level. In accordance with the analysis using aggregated data, we uprate expenditure information using the specific growth rate of the 12 main COICOP expenditure categories from 2005 to 2011, disposable income is uprated using the wage growth rate 2005-2011.

If we were performing the analysis of this report based on this micro-data, we would adjust household expenditure to take household size into account. This is typically accomplished by dividing expenditure by the modified OECD scale[115], making expenditures comparable across differently sized households. When considering the impact of reforms of the VAT structure on income distribution, we would also adjust household income by household size before assigning households to income quintiles. Because the HBS data are apparently not equivalised, we work with unequivalised income and expenditure for the sake of comparability.

[115] The modified OECD scale gives a weight of one to the first member of each household, a weight of 0.5 to every additional adult member and a weight of 0.3 to every child living in the household. This approach assumes economies of scale in consumption. A family of two adults and one child would thus have to spend 1.8 times as much as a single person to be considered as having the same "equivalised" expenditure; see http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Equivalised_disposable_income [13/03/25]

Table 41: Comparison of estimates of VAT bills, in absolute values and as a percentage of total expenditure, by COICOP category, estimated on aggregate HBS data as in this report, and micro-HBS data, for Austria

COICOP (2-digit)	Absolute deviation from micro result (in €)	Deviation from micro result as a fraction of total VAT payments	Absolute difference in VAT paid per household expenditure
CP01	0	+0.0%	-0.0%p
CP02	0	+0.0%	-0.0%p
CP03	0	+0.0%	-0.0%p
CP04	-1	-0.1%	-0.0%p
CP05	0	-0.0%	-0.0%p
CP06	1	+2.0%	+0.0%p
CP07	66	+6.8%	+0.2%p
CP08	0	-0.0%	-0.0%p
CP09	23	+4.3%	+0.1%p
CP10	0	+0.0%	+0.0%p
CP11	20	+8.0%	+0.0%p
CP12	5	+2.0%	+0.0%p
Sum	**114**	**+2.8%**	**+0.2%p**

Source: Konsumerhebung 2004/05 (Statistik Austria), Household Budget Surveys, National Accounts (Eurostat), own calculations.

Table 41 shows the results of a comparison between the VAT paid by an average household, by the 12 main COICOP categories, as calculated from the micro- and aggregated data, respectively. These results show a very good correspondence between the two datasets: the biggest discrepancy in absolute VAT payments occurs in the category transport (CP07); the deviation as a percentage of average expenditure on this expenditure category is 6.8 %. In relation to total VAT payments, we observe the largest difference in the category CP11 "Restaurants and hotels", 8 %. Nevertheless, this analysis gives us confidence that our aggregated data is overall sound.

Comparing the more detailed results, differences between the results based on micro- and aggregated data emerge. Table 42 presents the deviations of the main results from the micro-data results in the same fashion as Table 41, but with VAT bills and expenditure disaggregated by income quintile.

From Table 42, it is clear that there are some problems with the association of households to income quintiles in the aggregated data. First, VAT paid is higher for the first income quintile than for the second income quintile, which could be justified by a

larger household size for lower income households, as households with children are often younger and therefore have less disposable income. However, this story is refuted by the micro-results, which show a steady increase of VAT paid by quintiles. Moving from the first income quintile to the second, the average VAT bill increases by about € 900, from the second quintile to the third, it increases by about € 800, moving from the third to the fourth it increases by € 1,200, while it only rises by about € 400 moving from the fourth quintile to the fifth in the results based on micro data. In the results based on the aggregated data, however, VAT paid is € 141 lower in the second quintile than in the first, increases moderately moving from the second to the third and from the third to the fourth income quintile (by about € 700 and € 600, respectively), and then rises sharply from the fourth to the fifth income quintile (about € 1,200). In comparison, this pattern of increase is much smoother in the results based on micro data.

Also, the expenditure categories do not quite seem to add up: for example, expenditure on category CP07 "Transport" is a category that sees rapid growth over the income quintiles. In the micro data results, households in the first quintile pay € 250 VAT for goods and services in that category per year, while households in the fifth quintile pay € 1,431. The average VAT rate for the lowest income quintile in this category is 17.2 %, while the richest households pay an average VAT rate of 18 %, suggesting a higher share of (standard rated) private means of transport as compared to (reduced rated) public transport in the highest income quintile. In the results based on aggregated data, however, households in the first quintile have a higher average VAT rate on transport goods and spend more on transport than in the second quintile. This suggests that individuals might be incorrectly sorted into income categories in the aggregated data.

Table 42: Comparison of estimates of VAT bills, in absolute values and as a percentage of total expenditure, by income quintile and COICOP category, estimated on aggregate HBS data as in this report, and micro-HBS data, for Austria

	First Income Quintile			Second Income Quintile			Third Income Quintile		
COICOP (2-digit)	**Absolute deviation from micro result (in €)**	**Deviation from micro result as a fraction of total VAT payments**	**Absolute difference in VAT paid per household expenditure**	**Absolute deviation from micro result (in €)**	**Deviation from micro result as a fraction of total VAT payments**	**Absolute difference in VAT paid per household expenditure**	**Absolute deviation from micro result (in €)**	**Deviation from micro result as a fraction of total VAT payments**	**Absolute difference in VAT paid per household expenditure**
CP01	144	+32.8%	-0.1%p	79	+18.3%	+0.2%p	17	+3.7%	+0.0%p
CP02	34	+22.2%	-0.1%p	3	+2.1%	-0.0%p	6	+3.8%	+0.0%p
CP03	111	+42.6%	+0.1%p	7	+3.2%	-0.0%p	38	+12.3%	+0.1%p
CP04	75	+13.6%	-0.7%p	40	+6.9%	+0.0%p	-52	-8.7%	-0.2%p
CP05	106	+36.4%	-0.0%p	33	+11.7%	+0.1%p	-6	-1.8%	-0.0%p
CP06	15	+41.8%	+0.0%p	-4	-8.5%	-0.0%p	7	+12.4%	+0.0%p
CP07	479	+65.7%	+1.1%p	41	+6.5%	+0.0%p	50	+5.5%	+0.1%p
CP08	24	+22.5%	-0.1%p	1	+1.2%	-0.0%p	8	+6.7%	+0.0%p
CP09	175	+44.8%	+0.2%p	-3	-0.8%	-0.1%p	35	+7.2%	+0.1%p
CP10	0	+0.0%	+0.0%p	0	+0.0%	+0.0%p	0	+0.0%	+0.0%p
CP11	55	+30.3%	-0.1%p	-7	-4.2%	-0.1%p	20	+9.2%	+0.1%p
CP12	32	+17.0%	-0.2%p	12	+6.5%	+0.0%p	-48	-22.2%	-0.1%p
Sum	**1,250**	**+37.6%**	**+0.0%p**	**204**	**+6.4%**	**+0.0%p**	**76**	**+2.0%**	**+0.2%p**

	Fourth Income Quintile			Fifth Income Quintile		
COICOP (2-digit)	**Absolute deviation from micro result (in €)**	**Deviation from micro result as a fraction of total VAT payments**	**Absolute difference in VAT paid per household expenditure**	**Absolute deviation from micro result (in €)**	**Deviation from micro result as a fraction of total VAT payments**	**Absolute difference in VAT paid per household expenditure**
CP01	-119	-26.2%	-0.1%p	-184	-39.9%	-0.4%p
CP02	13	+7.1%	+0.1%p	-47	-25.5%	-0.1%p
CP03	-106	-34.1%	-0.1%p	14	+3.4%	+0.0%p
CP04	-28	-4.1%	+0.2%p	24	+3.0%	+0.0%p
CP05	-104	-25.9%	-0.1%p	36	+6.9%	+0.1%p
CP06	1	+1.7%	+0.0%p	11	+13.4%	+0.0%p
CP07	-58	-5.1%	+0.2%p	38	+2.6%	+0.0%p
CP08	-15	-11.9%	+0.0%p	-19	-15.5%	-0.0%p
CP09	-128	-22.1%	-0.1%p	200	+24.3%	+0.4%p
CP10	0	+0.0%	+0.0%p	0	+0.0%	+0.0%p
CP11	30	+10.9%	+0.2%p	85	+21.8%	+0.2%p
CP12	-17	-7.3%	+0.0%p	102	+28.6%	+0.2%p
Sum	**-532**	**-12.0%**	**+0.3%p**	**260**	**+4.6%**	**+0.3%p**

Source: Konsumerhebung 2004/05 (Statistik Austria), Household Budget Surveys, National Accounts (Eurostat), own calculations.

While the results from the two data sources are roughly in line if disaggregated by number of active persons in the household, large differences emerge when disaggregated by household type. Average VAT paid per household is much more dispersed in the results based on micro data than in the results based on aggregated data. Here, it is worth re-emphasising that the calculation of VAT is performed without equalisation of any kind, that is, we calculate average VAT payments per household without considering household size; while when working with household level data, it is often customary to divide both household incomes and expenditure through EU-equivalence scales that make income and expenditure of households of different sizes comparable. One possible explanation for this discrepancy is therefore, that Eurostat already performed some equalization on household size in the data, generating more evenly distributed expenditure patterns across household types. This must have been done on the data disaggregated by household type and not on the data disaggregated by the number of household members who are active on the labour market.

Validation with Micro-Data: Italy

For the analysis of the distributive impact of the VAT system based on micro-data for Italy, we use the 2005 Household Budget Survey. This survey contains detailed information on expenditure patterns, but lacks data on household income. We therefore have to impute disposable income into this dataset. This information comes from the Italian SILC for 2006, that contains income information for 2005, as well as socio-demographic data for 2006. Since the SILC does not contain any information on household consumption, any link between the HBS and the SILC would have to be based solely on demographic variables. We did not consider this to be sufficient to provide a consistent relationship between total household income and total expenditure. We therefore turned to the only survey that collects data on both income and total consumption in Italy, the Bank of Italy survey on household income and wealth, which is carried out every two years.

In this survey, we regress the log of total household consumption on disposable income, area of residence, profession and education of the household head, and number of children and adults. We use the coefficients of these regressions to impute total consumption into the SILC. The sole purpose of this imputation is to assign the households in the SILC to deciles of total imputed consumption. After also assigning the households in the HBS to deciles of total consumption, we match each household in the HBS to a household in the SILC that belongs to the same imputed consumption decile, using the STATA psmatch2 routine (Leuven and Sianesi, 2003). We use the

number of workers, number of family members, profession and gender of the head, tenure status and area of residence as covariates. Table 43 compares original and imputed incomes per equivalent income decile in the EU-SILC and HBS.

Table 43: Original and imputed incomes per equivalent income decile in the EU-SILC 2006 and HBS 2005.

Deciles	HBS 2005				SILC 2006 (2005 incomes)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
1	6,442	2,204	1	8,810	5,969	2,325	0	8,827
2	10,277	907	8,822	11,780	10,246	797	8,828	11,551
3	12,714	529	11,781	13,586	12,765	707	11,551	13,969
4	14,988	735	13,594	16,146	15,088	642	13,971	16,173
5	17,492	687	16,148	18,490	17,302	640	16,174	18,402
6	19,568	693	18,491	20,748	19,631	726	18,403	20,905
7	22,031	679	20,750	23,111	22,310	844	20,907	23,830
8	24,866	1,084	23,113	26,835	25,623	1,127	23,830	27,766
9	30,171	2,078	26,887	34,224	30,844	2,012	27,768	34,785
10	48,361	16,825	34,226	175,551	49,533	21,696	34,787	549,563
Total	**20,675**	**12,602**	**1**	**175,551**	**20,929**	**13,704**	**0**	**549,563**

Source: Italian Household Budget Survey 2005, Italian EU-SILC 2006, Bank of Italy Survey on Household Income and Wealth 2006, National Accounts (Eurostat), own calculations.

Table 44 shows the disparities of the overall VAT bill of private households in Italy according to aggregate HBS data and micro data, disaggregated to the COICOP 2-digit level. Although the deviation of the results based on aggregate data from those based on micro data do not seem too big when looking at the aggregate difference in estimated VAT bills in Euro, the differences do seem substantial as a proportion of VAT payments per COICOP category, although they even out as a sum (only 1.3 % difference in overall VAT payments). The biggest discrepancy emerges in the category CP04 "Housing, water, electricity, gas and other fuels" were the aggregate data estimate the VAT bill to be € 89, or 32 %, lower than the micro-data. The aggregate data also estimate VAT payments in the category CP09 "Recreation and culture" to be € 41, or 18 %, higher than the micro-data; also worth mentioning is the discrepancy in the category CP11 "Restaurants and hotels" (€ 21 or 14.1 % for the average household). The € 15 discrepancy in the category CP10 "Education" is due to small discrepancies in the assumptions about VAT exempted goods and services between the main analysis on aggregated HBS data and the micro validation exercise.[116] The absolute differences in

[116] There are some goods and services, like school excursions, which might be subject to VAT, although most goods and services belonging to the category CP10 "Education" are exempt from VAT. Because the aggregated data on education is of low quality for all Member States including Italy, and the goods and

the estimate of VAT bills as a fraction of household expenditure remain below 0.4 percentage points for all categories. We use the results based on the HBS micro data for Italy disaggregated by income quintiles in the main report, because the Italian HBS lacks income information (as discussed above). Because we base our main analysis on these data, we naturally cannot provide a micro validation for these.

The discrepancies between the results based on aggregate data are more accentuated when households are separated according to the number of members who are active in the labour market, and the discrepancies increase with the number of active household members. While the estimated household VAT bills are higher in the calculation based on micro data for all households with two active members or less (the discrepancy ranges between € 33 for households with no active member to € 67 for households with two active members), the micro result estimates a VAT bill that is € 1,015 lower than the estimate based on aggregate data for households with three or more active members. The bulk of this discrepancy comes from the category transport, but the categories CP09 "Recreation and Culture" and CP03 "Clothing and Footwear" also contribute to the difference. The fact that this discrepancy is concentrated on bigger households to such a degree points to problems with the aggregate data. In the results based on micro data, household VAT bills rise more smoothly with the addition of an active adult to the household (roughly € 1,000 per active adult from zero to two active members of the household, an additional € 500 for three active members or more). In the calculation based on the aggregate data, on the other hand, the VAT bill follows the same pattern, but jumps by nearly € 1,600 euros from the category "two active persons" to "three or more".

We observe the same (although less accentuated) pattern when looking at the discrepancies between the results based on aggregate and micro data, disaggregated according to household type. Households with three or more adults, but without dependent children, show the biggest difference between the calculations (the VAT bill estimated with micro data is € 112 higher). Discrepancies are biggest in the categories CP07 "Transport" and CP04 "Housing".

In addition to possible equalisation of household expenditures in the HBS data from Eurostat we are not aware of, which could tilt our results based on aggregate data, also the different aggregation of goods and services in the two analyses cause the differing

services that are likely to be subject to VAT only make up a small proportion of this category, we assumed the entire category to be exempt in our analysis of the VAT bills of private households.

results for Italy. The micro data for Italy, for example, distinguishes between used cars, that are zero rated, and new cars, that are taxed at the standard rate, while our most minute category is "Motor cars" which we assume to be taxed at the standard rate.

Table 44: Comparison of estimates of VAT bills, in absolute values and as a percentage of total expenditure, by COICOP category, estimated on aggregate HBS data as in this report, and micro data, for Italy

COICOP (2-digit)	Absolute deviation from micro result (in €)	Deviation from micro result as a fraction of total VAT payments	Absolute difference in VAT paid per household expenditure
CP01	2	+0.4%	+0.0%p
CP02	0	+0.0%	+0.0%p
CP03	23	+7.0%	+0.1%p
CP04	-89	-32.1%	-0.3%p
CP05	-11	-4.0%	-0.0%p
CP06	-2	-3.5%	-0.0%p
CP07	30	+5.5%	+0.1%p
CP08	0	+0.2%	+0.0%p
CP09	41	+18.3%	+0.1%p
CP10	-15		
CP11	-21	-14.1%	-0.1%p
CP12	6	+2.8%	+0.0%p
Sum	**-36**	**-1.3%**	**+0.1%p**

Source: Italian Household Budget Survey 2005, Italian EU-SILC 2006, Bank of Italy Survey on Household Income and Wealth 2006, Household Budget Surveys, National Accounts (Eurostat), own calculations.

Validation with Micro-Data: the UK

The micro-data validation exercise for the UK is based on the Living Costs and Food Survey (LCFS)[117] 2010; expenditure and income is uprated with the nominal GDP growth rate from the relevant reference quarter to the second quarter of 2011.[118]

To incorporate housing into our measure of total consumption, rents for owner occupiers and those living in (subsidised) social housing are imputed based on data on

[117] This is the same Household Budget Survey the aggregate data published by Eurostat are based on; however, the Eurostat data is from 2005, at which time the name of the survey was the Expenditure and Food Survey (EFS).

[118] 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.

rented unfurnished dwellings.[119] We exclude cash outlays on housing such as mortgage interest payments and capital payments from our measure of consumption, because we interpret these items as forms of investment rather than consumption. Instead, we use actual rent paid (for households renting privately) or imputed rent (for all other households). For owner-occupier households, we add the imputed rental value of their property to their income, and subtract mortgage interest payments, for occupiers of social housing, we also add imputed rent, and subtract actual rent paid. We include the rental income of private landlords into our measure of income; for those renting privately, no adjustment is needed.[120]

Regrettably, we do not know how Eurostat treat housing in their definition of both expenditure and income. That is, we have no knowledge of how rents are imputed and if, and how, imputed rent, actual rent and mortgage interest are included in the calculation of both income and consumption for different groups of households (owner-occupiers, private renters, those in social housing etc.). This is not straightforward conceptually, and Eurostat might have chosen a very different path from ours. Because housing is a very big component of both income and consumption, different approaches to incorporating it might well lead to very different results. Differences in the way imputed rent (and housing in general) is dealt with in our analysis based on micro data, and by Eurostat, is therefore a prime candidate for explaining the discrepancies between the results. We further discuss this point when comparing the results of this study to a previously published report dealing with the VAT system, IFS et. al. (2011), in the next subsection.

Unfortunately, we only have estimates on aggregate tax bills of private households, not on VAT bills by consumption category as in the cases of Austria and Italy.[121] According

[119] In the first stage of the two stage procedure, we run a linear regression on rent for privately rented unfurnished property from the 1978 to 2010 waves of the LCFS. We then predict a rental value for all households in the 2010 wave, drawing randomly from the (estimated) distribution of errors. For households that are not renting an unfurnished property, we impute a rental value by taking the actual rental value from the household with the smallest absolute difference in the predicted rental value. The covariates in the regression are geographical region, number of rooms, the level of the local (property) tax bill, and the education of the household head.

[120] The net income from housing is always the value a household gets from living in a property over and above the cash amount they pay for doing so. In the case of private renters, these are the same, and therefore net out to zero.

[121] The IFS tax microsimulation model TAXBEN is based on consumption categories that do not correspond to the COICOP classification. Mapping the consumption categories of this model to COICOP categories is not straightforward, and would imply rewriting a significant part of the code of the micro-simulation model.

to the micro-data, the average household in the UK pays € 2,827 of VAT per annum, € 218 or 8.4 % more than in the estimate based on aggregate data (€ 2,609). This is due to the higher average VAT rate in the calculation based on micro data: 8.6 % as compared to the estimate based on aggregate data, 8.0 %.

Table 45: Comparison of estimates of VAT bills, in absolute values and as a percentage of total expenditure, by income quintile, estimated on aggregate HBS data as in this report, and micro data, for the UK

	Absolute deviation from micro result	Deviation from micro result as a fraction of total VAT payments	Absolute difference in VAT paid per household expenditure	Absolute difference in average VAT rate
First Quintile	141	+11.2%	-0.5%p	-0.5%p
Second Quintile	79	+4.4%	-0.6%p	-0.7%p
Third Quintile	-146	-6.3%	-0.9%p	-1.1%p
Fourth Quintile	-239	-7.7%	-0.7%p	-0.8%p
Fifth Quintile	-929	-20.5%	-0.3%p	-0.4%p

Source: Living Costs and Food Survey (LCFS) 2010, Household Budget Surveys, National Accounts (Eurostat), own calculations.

Regarding VAT payments by income quintile, the micro results match the aggregate data quite well for households in quintiles two to four. For the lowest quintile, the estimate of average aggregate expenditure is significantly higher in the calculations based on aggregate data than in those based on micro data; the difference amounts to € 3,510 or 17.5 %. The divergence between the estimates of the average VAT bill for households in the lowest income quintile however is only € 141 (or 11.2 %); as a consequence, the average VAT rate is higher in the results based on micro-data. In the second quintile, the analysis based on aggregate data arrives at only 12.2 % higher mean expenditures than the micro data; while the estimates of the average VAT bill nearly coincide (with the results based on aggregate data only being € 79, or 4.4 %, higher than the results based on micro data), this results in a higher average VAT rate according to the micro data. Although the estimates for average aggregate expenditure based on aggregate data are closer to those based on micro data for the third and the fourth income quintile, the differences in the estimated VAT bills between aggregate and micro data are actually bigger. Estimates for average aggregate expenditure differ by € 1,624 and € 100 between the estimates based on aggregate and micro-data for the third and fourth income quintiles respectively. The differences in average VAT bills however are 6.3 % and 7.7 % of the estimate based on aggregate data, with average

VAT bills being lower according to this calculation. As a consequence, the estimates of the average VAT rates according to micro-data are higher than those based on aggregate data. There is a rather large deviation of estimated average VAT bills for the fifth income quintile; estimates based on aggregate data are € 929 lower than those based on micro-data. The main difference here is the strikingly lower estimate of aggregate expenditures: € 8,216 lower than the micro estimate (16.2 %). The average VAT rates are not so far apart, 9.8 % according to aggregate, and 10.2 % according to micro data. This of course implies a much steeper increase in estimated expenditure moving from the fourth to the fifth income quintile in the results based on micro data than in the results based on aggregate data.

Looking at the results by number of active persons in the household, we see the biggest discrepancies for households without an active member, the estimate of the VAT bill of households that fit this description are € 324 (or 22.9 %) higher based on the micro than on the aggregate data. For households with one, two or three active members, this discrepancy is lower (€ 2115 or 4.7 % and € 264 and 7.5 % higher VAT bills according to micro data for households with one and two active persons, respectively, € 145 or 3.0 % higher estimated VAT bill for households of three or more active persons according to micro data). Also here, the estimate of aggregate expenditure for households of three or more active persons (who will be classified as higher income households, especially without equivalisation of household income) is estimated to be significantly lower when the estimate is based on micro data (€ 2,264 or 4.4 %).

When comparing the results disaggregated by household type, no clear pattern emerges. The largest difference between the results occurs for households consisting of two adults without dependent children, where the estimate of the average VAT bill based on micro data is € 427 or 15.5 % higher than the corresponding estimate based on aggregate data.

Comparison with previous Results (IFS et al., 2011)

Making use of the results of IFS et al. (2011), we can also perform a limited validation exercise for those countries that are covered in this study: Belgium, Germany, Greece, Spain, France, Italy, Hungary, Poland and the UK. Because the definition of household types in IFS et al. (2011) is not comparable with the household type definition in our

analysis, we only compare VAT paid as a percentage of household expenditure by income quintile (which we calculate from the income deciles presented in the report).[122]

The degree of concurrence between our results and the results in IFS et al. (2011) varies between countries. For Belgium, we arrive at consistently higher estimates for the fraction of total household expenditure that accrues to VAT payments. The difference is the largest for the third income quintile, where it amounts to 1.5 percentage points (18 % of the fraction estimated in IFS et al. (2011)).

Our results for Germany coincide very well with the results in IFS et al. (2011). The fraction of total expenditure spent on VAT is the same in both studies for the third income quintile, and our results lie only between 0.1 and 0.3 percentage points below the results in IFS et al. (2011) (as a percentage of the estimated VAT liability in the cited study, the divergence is the greatest for the richest quintile of households, where it is 3.5 %, with our estimated fraction being lower).

There is quite a bit of divergence between our estimates of VAT payments as a percentage of expenditure and the percentages estimated in IFS et al. (2011) for Greece: our results show significantly less variation over the income distribution – we estimate households in the first income quintile to spend 10.4 %, and households in the fifth income quintile 10.5 % of their total expenditure on VAT, while in the IFS et al. (2011) study, the poorest households spend 12.5 %, and the richest households 13.5 % of their total expenditure on VAT. As a percentage of the fraction estimated in IFS et al. (2011), the divergence is greatest for the richest quintile of households, 21.9 %.

For Spain, our estimates of VAT payments as a fraction of total expenditure are consistently 0.6 to 0.8 percentage points below those published in IFS et al. (2011); the absolute deviation is highest in the richest income quintile (0.9 percentage points, or 11.8 % of the fraction estimated in IFS et al. (2011)).

For France, our results and the results in IFS et al. (2011) nearly coincide for the first income quintile (ours are 0.1 percentage point higher), but are between 0.7 and 0.9 percentage points above their estimates for income quintiles two to five. This is because we estimate the VAT liability as a percentage of expenditure to steadily increase with

[122] We do not compare our new budget-closing standard VAT rate from scenario 2 with its counterpart from IFS et al. (2011), because our estimate of this rate includes VAT payments from non-households, while IFS et al. (2011) only consider households.

income – from 7.6 % for the poorest quintile of households to 8.6 % for the richest – while IFS et al. (2011) arrive at a quite uniform fraction of VAT payments of total expenditures (around 7.5 %). The divergence is the greatest for the fifth quintile, where it amounts to 12 % of the estimated VAT ratio in IFS et al. (2011).

For Italy, our results are quite well aligned with the results published in IFS et al. (2011) (recall that for Italy, data on disposable income, and hence association to income quintiles, is imputed from the EU-SILC, and that we compare results based on micro data to those of the former study). In comparison to VAT bills as a percentage of total expenditures as estimated in IFS et al. (2011), we underestimate the average VAT bill in the first income quintile by 0.6 percentage points (8.3 % of the ratio published in IFS et al. (2011)), and overestimate the average VAT bill of households in the highest income quintile by 0.4 percentage points (4.7 % of the ratio published in IFS et al. (2011)). For quintiles two to four, we are very close to IFS et al. (2011) (the divergence being -0.1 %p, 0.2 %p and 0.3 %p respectively). Overall, VAT bills as a fraction of expenditure rise more steeply in our calculations, from 7 % for the first income quintile to 9.3 % for the fifth income quintile, while IFS et al. (2011) arrive at an estimation of 7.7 % for the first, and 8.9 % for the fifth quintile.

In the case of Hungary, we estimate a higher fraction of expenditure spent on VAT for households in income quintiles one to three (0.7 to 0.2 percentage points higher), and a lower fraction being spent on VAT for the deciles four and five (0.4 and 1.1 percentage points lower, respectively). As a percentage of the fraction estimated in IFS et al. (2011), the biggest divergence occurs in the richest income quintile (our results are 6.2 % lower than those in IFS et al. (2011)).

Our results for Poland differ quite substantially from the results published in IFS et al. (2011). We estimate consistently higher VAT payments as a fraction of total expenditure, the difference ranges between 1.4 percentage points for the first income quintile (17.1 % of the ratio estimated in the IFS et al. (2011) study) and 2 percentage points (22.6 % of the ratio estimated in the cited study) in the fourth income quintile.

As for the UK, the distributional effect of VAT is more progressive in our results than in IFS et al. (2011): according to our results, VAT payments as a percentage of average expenditure rise fairly smoothly from 6.3 % in the first quintile to 8.9 % in the fifth quintile; whereas in IFS et al. (2011), they are almost constant over the income distribution, with VAT payments per expenditure ranging between 8.6 % in the first income quintile and 9.1 % in the fifth, see Table 46. IFS et al. (2011) worked with both

equivalised income and expenditures, while the micro results in this section use raw data not adjusted for household size. We are not sure whether the aggregated HBS data provided by Eurostat is equivalised, but do not assume it is. As can be seen from Table 46, if we equivalise income and expenditures in the micro data, UK's VAT structure seems to be less progressive – especially for the first quintile, VAT bills as a percentage of expenditure increase considerably. The micro results are furthermore based on reported income, while IFS et al. (2011) use modelled income. Re-running our micro-validation exercise with modelled income and equivalisation, the results look much more like IFS et al. (2011). That is, the definition of income and equivalisation alone can lead to a quite different overall assessment of the VAT structure in the UK (proportional with equivalisation and modelled income, progressive without equivalisation and self-reported income). As mentioned above, we think that using equivalised data is more appropriate for distributive analysis, while the choice of income concept is less straightforward. However, this comparison is instructive as it clearly shows the importance of choices made regarding data preparation and presentation; that we do not have information about these choices made by Eurostat is a severe limitation of this study.

Table 46: Comparison of estimates of VAT bills as a percentage of total expenditure, by income quintile, as in IFS et al. (2011), estimated on aggregate data and micro data, taking into account different concepts of equivalisation and income definition

Quintile	IFS et al. (2011)	Micro results (this report)	Aggregate results	Micro results with equivalisation	Micro results with modelled income and equivalisation
1	8.6%	6.8%	6.3%	7.6%	8.5%
2	8.3%	7.8%	7.1%	8.1%	8.3%
3	8.6%	8.7%	7.7%	8.8%	8.3%
4	8.6%	9.0%	8.4%	9.0%	9.0%
5	9.1%	9.2%	8.9%	8.9%	8.8%

Source: IFS et al. (2011), Living Costs and Food Survey (LCFS) 2010, Household Budget Surveys, National Accounts (Eurostat), own calculations.

The conclusion we draw from this validation exercise is, that overall, our data appear to be of sound quality, especially when looking at coarse categories of goods and services. For finer sub-categories, our data becomes less reliable, and the association with the appropriate VAT rates becomes problematic. This is especially the case if key features of the data collection, aggregation and presentation are not known. We could not find out whether and if so, how, the HBS data were adjusted by household size by Eurostat.

Having said that, very detailed categories of goods and services might be especially prone to measurement error, also in the best of micro datasets. This is because even the highest quality household surveys question households only for a limited period of time, and then impute expenditures over the year. Even if households are asked specifically about more infrequent purchases, this information is less reliable than expenditures that are recorded on a daily basis. This is especially problematic for specialised items that are not consumed at all by a large fraction of households, and consumed rarely by those who do consume them.

A.4 VAT reductions on expenditure categories potentially in conflict with other EU policies

The second guiding principle of the review of the current VAT rates structure calls for an "Abolition of reduced rates on goods and services for which the consumption is discouraged by other EU policies. This could notably be the case for goods and services harmful to the environment, health and welfare" (European Commission 2011b, p. 11). Categories that have been identified to be both containing products and services that are eligible for reduced VAT rates and are potentially in conflict with other EU policies trying to reduce or change their consumption are Water, Energy products, Street cleaning, refuse collection and waste treatment and Housing. Table 47 shows the average increase in VAT payments of private households in the EU-27 countries, if all products and services that fall into these categories and are currently taxed at a zero or reduced rate were taxed at the standard rate, while reductions were kept in place for all other expenditure categories. Put differently, Table 47 shows the contribution these specific categories make to the overall VAT increases in scenario 1 (abolition of all zero and reduced rates). For ease of comparison, average VAT bill increases in scenario 1 can also be found in the table. To estimate the additional VAT burden of private households, we included the following categories:

CP0432 - Services for the maintenance and repair of the dwelling[123]
CP0441 - Water supply
CP0442 - Refuse collection
CP0444 – Other services relating to the dwelling n.e.c[124]
CP0451 – Electricity
CP0452 - Gas.
CP0454 – Solid fuels
CP0455 – Heat energy

[123] Renovation and repairing of private dwellings can be taxed at a zero or reduced rates, if materials do not account for a significant part of the value of the service (see the VAT directive, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:347:0001:0118:en:PDF [2013/10/7], Annex II, category (10a). Because high value materials are not eligible for reduced rates, including this category means that additional VAT payments for private households might be overestimated (the estimated additional payment is an upper bound).

[124] The average VAT rate on this category is only in Austria significantly lower than the standard rate (10 % vs. 20 %).

Note that not all of these categories are eligible for reduced VAT rates in their entirety. In the category Gas, only natural gas is eligible for a reduced rate; in the category Solid fuels, only firewood may be taxed at a reduced rate; and in the category Heat energy, only district heating may be taxed at a reduced rate. Here we assume the same fraction of goods and services that is eligible for a VAT rate reduction within each category as we do in the household analysis in section 2of this study; for the specific assumptions see the Addendum delivered with this report (section 29).

Table 47: Abolition of zero and reduced rates for the categories Water, Energy products, Street cleaning, refuse collection and waste treatment, Housing

Country	VAT bill (in % of expenditure)			VAT bill in €		
	2011	Scenario 1	Increase due to Water, Energy etc.	2011	Scenario 1	Increase due to Water, Energy etc.
BE	10.0%	+2.7%p	+0.1%p	3,735	+1,156	+32
BG	12.9%	+0.1%p	+0.0%p	639	+3	+0
CZ	12.1%	+2.4%p	+0.2%p	1,275	+294	+28
DK	13.3%	+0.1%p	+0.0%p	5,035	+41	+12
DE	9.2%	+1.7%p	+0.1%p	3,078	+631	+28
EE	12.7%	+0.3%p	+0.0%p	1,139	+35	+0
EL	11.5%	+2.6%p	+0.5%p	3,521	+925	+165
ES	7.2%	+3.1%p	+0.1%p	1,914	+920	+37
FR	8.3%	+3.5%p	+0.6%p	2,767	+1,311	+210
IE	8.9%	+3.6%p	+0.3%p	3,684	+1,719	+122
IT	8.6%	+3.3%p	+0.5%p	2,682	+1,175	+180
CY	6.8%	+2.3%p	+0.2%p	2,417	+903	+67
LV	15.3%	+0.5%p	+0.0%p	1,595	+57	+0
LT	14.7%	+0.5%p	+0.0%p	1,275	+53	+0
LU	6.2%	+2.9%p	+0.3%p	3,841	+2,006	+170
HU	17.5%	+1.1%p	+0.0%p	1,303	+96	+0
MT	10.0%	+4.2%p	+0.3%p	2,321	+1,122	+77
NL	7.7%	+2.6%p	+0.1%p	2,548	+957	+24
AT	11.4%	+2.8%p	+0.2%p	4,089	+1,164	+95
PL	10.6%	+4.8%p	+0.4%p	988	+528	+43
PT	9.0%	+4.3%p	+0.6%p	1,827	+1,002	+137
RO	17.8%	+0.8%p	+0.0%p	853	+45	+0
SI	10.5%	+2.5%p	+0.2%p	2,426	+656	+53
SK	13.7%	+0.3%p	+0.0%p	1,591	+37	+0
FI	11.0%	+2.1%p	+0.0%p	4,105	+926	+0
SE	11.7%	+2.2%p	+0.0%p	4,355	+958	+0
UK	8.0%	+3.0%p	+0.7%p	2,609	+1,108	+242
EU-27	11.0%	+2.2%p	+0.2%p	2,504	+734	+64

Source: Household Budget Surveys, National Accounts (Eurostat), own calculations.
Note: Exchange rates of 1.956 Bulgarian levs, 24.590 Czech koruny, 7.451 Danish kroner, 0.706 Latvian lats, 3.453 Lithuanian litai, 279.370 Hungarian forints, 4.121 Polish zloty, 4.212 Romanian lei, 9.030

A.5 WIOD Classifications of products and sectors

Table 48: WIOD Classification of sectors

CPA code	Description
A01	Agriculture, hunting and related service activities
A02	Forestry, logging and related service activities
B05	Fishing, fish farming and related service activities
CA10	Mining of coal and lignite; extraction of peat
CA11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
CA12	Mining of uranium and thorium ores
CB13	Mining of metal ores
CB14	Other mining and quarrying
DA15	Manufacture of food products and beverages
DA16	Manufacture of tobacco products
DB17	Manufacture of textiles
DB18	Manufacture of wearing apparel; dressing and dyeing of fur
DC19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
DD20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
DE21	Manufacture of pulp, paper and paper products
DE22	Publishing, printing and reproduction of recorded media
DF23	Manufacture of coke, refined petroleum products and nuclear fuel
DG24	Manufacture of chemicals and chemical products
DH25	Manufacture of rubber and plastic products
DI26	Manufacture of other non -metallic mineral products
DJ27	Manufacture of basic metals
DJ28	Manufacture of fabricated metal products, except machinery and equipment
DK29	Manufacture of machinery and equipment n.e.c.
DL30	Manufacture of office machinery and computers
DL31	Manufacture of electrical machinery and apparatus n.e.c.
DL32	Manufacture of radio, television and communication equipment and apparatus
DL33	Manufacture of medical, precision and optical instruments, watches and clocks
DM34	Manufacture of motor vehicles, trailers and semi-trailers
DM35	Manufacture of other transport equipment
DN36	Manufacture of furniture; manufacturing n.e.c.
DN37	Recycling
E40	Electricity, gas, steam and hot water supply
E41	Collection, purification and distribution of water
F45	Construction

G50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
G51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
G52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
H55	Hotels and restaurants
I60	Land transport; transport via pipelines
I61	Water transport
I62	Air transport
I63	Supporting and auxiliary transport activities; activities of travel agencies
I64	Post and telecommunications
J65	Financial intermediation, except insurance and pension funding
J66	Insurance and pension funding, except compulsory social security
J67	Activities auxiliary to financial intermediation
K70	Real estate activities
K71	Renting of machinery and equipment without operator and of personal and household goods
K72	Computer and related activities
K73	Research and development
K74	Other business activities
L75	Public administration and defence; compulsory social security
M80	Education
N85	Health and social work
O90	Sewage and refuse disposal, sanitation and similar activities
O91	Activities of membership organizations n.e.c.
O92	Recreational, cultural and sporting activities
O93	Other service activities
P95	Activities of households as employers of domestic staff

Table 49: WIOD Classification of products

WIOD sector codes	Description
AtB	Agriculture, Hunting, Forestry and Fishing
C	Mining and Quarrying
15t16	Food, Beverages and Tobacco
17t18	Textiles and Textile Products
19	Leather, Leather and Footwear
20	Wood and Products of Wood and Cork
21t22	Pulp, Paper, Paper , Printing and Publishing
23	Coke, Refined Petroleum and Nuclear Fuel
24	Chemicals and Chemical Products
25	Rubber and Plastics
26	Other Non-Metallic Mineral
27t28	Basic Metals and Fabricated Metal
29	Machinery, Nec
30t33	Electrical and Optical Equipment
34t35	Transport Equipment
36t37	Manufacturing, Nec; Recycling
E	Electricity, Gas and Water Supply
F	Construction
50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
H	Hotels and Restaurants
60	Inland Transport
61	Water Transport
62	Air Transport
63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
64	Post and Telecommunications
J	Financial Intermediation
70	Real Estate Activities
71t74	Renting of M&Eq and Other Business Activities
L	Public Admin and Defence; Compulsory Social Security
M	Education
N	Health and Social Work
O	Other Community, Social and Personal Services
P	Private Households with Employed Persons

A.6 GTAP and WorldScan Classifications and Aggregations

Table 50: GTAP sectors and WorldScan intermediate and final sectoral aggregations

	GTAP Code	GTAP Description	WS 36	Intermediate 36-sector aggregation	WS 9	Final 9 sector aggregation
1	**PDR**	Paddy rice	**AGR**	Agriculture	**AGO**	Agric. & mining
2	**WHT**	Wheat	**AGR**	Agriculture	**AGO**	Agric. & mining
3	**GRO**	Cereal grains nec	**AGR**	Agriculture	**AGO**	Agric. & mining
4	**V_F**	Vegetables & fruits	**AGR**	Agriculture	**AGO**	Agric. & mining
5	**OSD**	Oil seeds	**AGR**	Agriculture	**AGO**	Agric. & mining
6	**C_B**	Sugar cane	**AGR**	Agriculture	**AGO**	Agric. & mining
7	**PFB**	Plant-based fibers	**AGR**	Agriculture	**AGO**	Agric. & mining
8	**OCR**	Crops nec	**AGR**	Agriculture	**AGO**	Agric. & mining
9	**CTL**	Bovine cattle	**AGR**	Agriculture	**AGO**	Agric. & mining
10	**OAP**	Animal prods. nec	**AGR**	Agriculture	**AGO**	Agric. & mining
11	**RMK**	Raw milk	**AGR**	Agriculture	**AGO**	Agric. & mining
12	**WOL**	Wool	**AGR**	Agriculture	**AGO**	Agric. & mining
13	**FRS**	Forestry	**FRS**	Forestry	**AGO**	Agric. & mining
14	**FSH**	Fishing	**FSH**	Fishing	**AGO**	Agric. & mining
15	**COA**	Coal	**COA**	Coal	**ENG**	Energy
16	**OIL**	Oil	**OIG**	Oil and gas	**AGO**	Agric. & mining
17	**GAS**	Gas	**OIG**	Oil and gas	**ENG**	Energy
18	**OMN**	Minerals nec	**OMN**	Other mining	**LTM**	Low tech. manuf.
19	**CMT**	Bovine meat prods.	**PFD**	Processed food	**LTM**	Low tech. manuf.
20	**OMT**	Meat products nec	**PFD**	Processed food	**LTM**	Low tech. manuf.
21	**VOL**	Vegetable oils & fats	**PFD**	Processed food	**LTM**	Low tech. manuf.
22	**MIL**	Dairy products	**PFD**	Processed food	**LTM**	Low tech. manuf.
23	**PCR**	Processed rice	**PFD**	Processed food	**LTM**	Low tech. manuf.
24	**SGR**	Sugar	**PFD**	Processed food	**LTM**	Low tech. manuf.
25	**OFD**	Food products nec	**PFD**	Processed food	**LTM**	Low tech. manuf.
26	**B_T**	Beverages & tobacco	**B_T**	Beverages & tobacco	**LTM**	Low tech. manuf.
27	**TEX**	Textiles	**TEX**	Textiles	**LTM**	Low tech. manuf.
28	**WAP**	Wearing apparel	**WAP**	Wearing apparel	**LTM**	Low tech. manuf.

29	**LEA**	Leather products	**LEA**	Leather products	**LTM**	Low tech. manuf.
30	**LUM**	Wood products	**LUM**	Wood products	**LTM**	Low tech. manuf.
31	**PPP**	Paper prods. & publ.	**PPP**	Paper prods. & publ.	**LTM**	Low tech. manuf.
32	**P_C**	Petroleum & coke	**P_C**	Petroleum & coke	**ENG**	Energy
33	**CRP**	Chemical & plastic	**CRP**	Chemical & plastic	**MHM**	Medium-high tech.
34	**NMM**	Mineral products nec	**NMM**	Mineral products nec	**MLM**	Medium-low tech.
35	**I_S**	Ferrous metals	**BMT**	Basic metals	**MLM**	Medium-low tech.
36	**NFM**	Metals nec	**BMT**	Basic metals	**MLM**	Medium-low tech.
37	**FMP**	Metal products	**FMP**	Metal products	**MLM**	Medium-low tech.
38	**MVH**	Motor vehic. & parts	**MVH**	Motor vehic. & parts	**MHM**	Medium-high tech.
39	**OTN**	Transport equip. nec	**OTN**	Transport equip. nec	**MHM**	Medium-high tech.
40	**ELE**	Electronic equip.	**ELE**	Electronic equip.	**HTM**	High tech. Manuf.
41	**OME**	Mach. & equip. nec	**OME**	Mach. & equip. nec	**MHM**	Medium-high tech.
42	**OMF**	Manufactures nec	**OMF**	Manufactures nec	**LTM**	Low tech. manuf.
43	**ELY**	Electricity	**ELG**	Electricty & gas	**ENG**	Energy
44	**GDT**	Gas manuf. & distr.	**ELG**	Electricty & gas	**ENG**	Energy
45	**WTR**	Water	**WTR**	Water	**OSR**	Other services
46	**CNS**	Construction	**CNS**	Construction	**OCS**	Commercial serv.
47	**TRD**	Trade	**TRD**	Trade	**OCS**	Commercial serv.
48	**OTP**	Transport nec	**OTP**	Transport nec	**TRA**	Transport
49	**WTP**	Water transport	**WTP**	Water transport	**TRA**	Transport
50	**ATP**	Air transport	**ATP**	Air transport	**TRA**	Transport
51	**CMN**	Communication	**CMN**	Communications	**OCS**	Commercial serv.
52	**OFI**	Financial services nec	**OFI**	Financial services nec	**OCS**	Commercial serv.
53	**ISR**	Insurance	**ISR**	Insurance	**OCS**	Commercial serv.
54	**OBS**	Business services nec	**OBS**	Business services nec	**OCS**	Commercial serv.
55	**ROS**	Recreat. & other serv.	**ROS**	Recreat. & other serv.	**OSR**	Other services
56	**OSG**	Public services	**OSG**	Public serv.	**OSR**	Other services
57	**DWE**	Dwellings	**ROS**	Recreat. & other serv.	**OSR**	Other services

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