



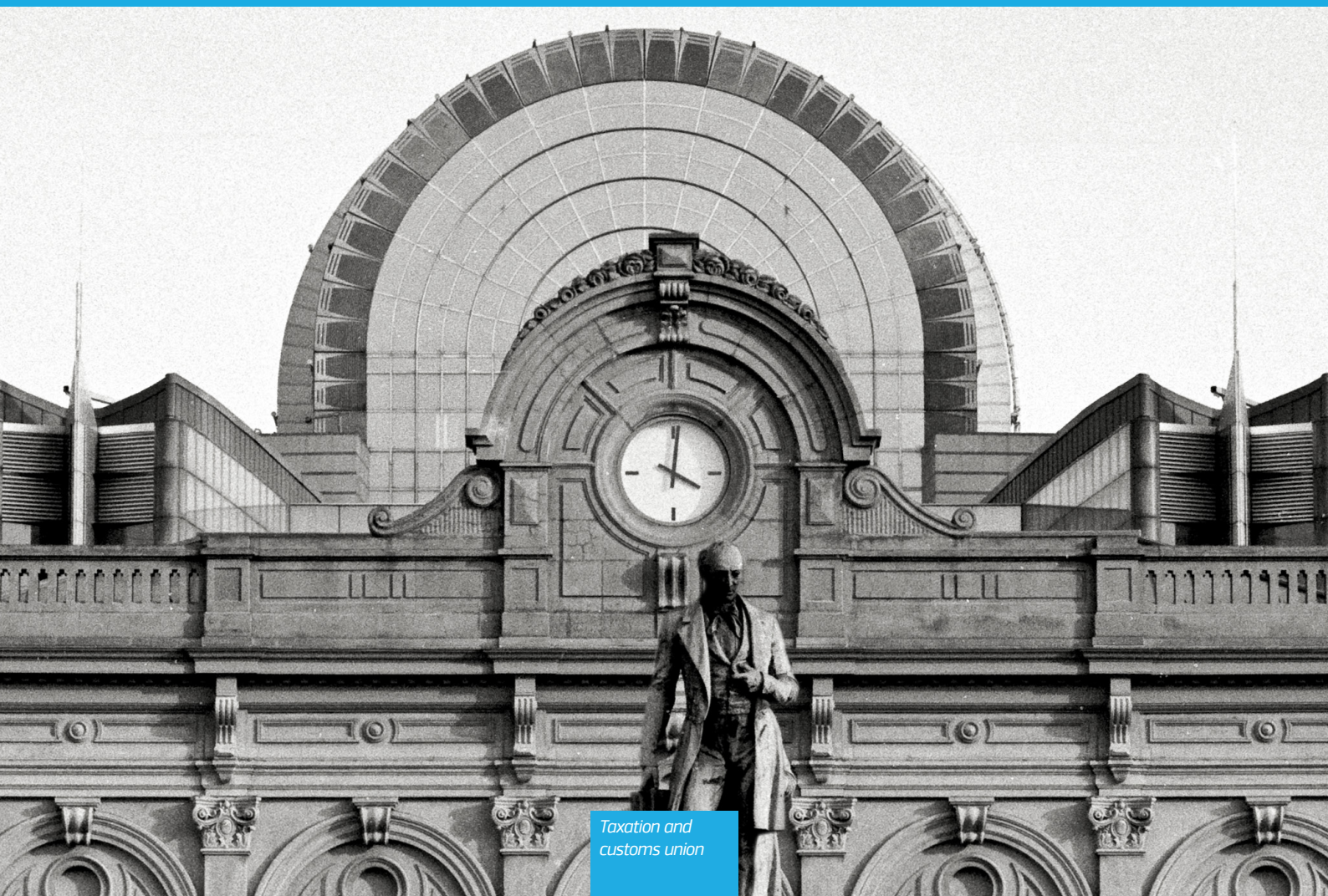
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Copenhagen Economics

Elasticities of Financial Instruments, Profits and Remuneration



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TAX ELASTICITIES OF FINANCIAL INSTRUMENTS, PROFITS AND REMUNERATION

REVIEW OF THE ECONOMIC LITERATURE | 11 SEPTEMBER 2012

| COLOPHON

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PREFACE

The financial sector was at the root of the financial and economic crisis. This has sparked several policy discussions as to whether there is a need to adapt tax systems to make the financial sector contribute in a fair and substantial way to public budgets.

Some EU Member States have already taken measures with regard to financial sector taxation. Especially the use of so-called bank levies has been adopted. At the same time the EU Commission highlights the importance of implementing such tax instrument in a coordinated framework. If not, different tax systems levied on diverging tax bases could create incentives for tax arbitrage and result in allocation distortions between financial markets in the EU. The emergence of uncoordinated national solutions could also lead to double taxation and fragmentation of the financial sector, hampering the proper functioning of the Single Market.

In order to carry out a debate on the basis of objective data, the European Commission has asked Copenhagen Economics to undertake a study on the tax elasticity and semi-tax elasticity of various tax bases that could fall under the taxation of the financial sector.

This study does not set out to discuss if there is a rationale for adapting the tax system to make the financial sector contribute in a fair and substantial way to public budgets. Also, the study does not intend to provide an in-depth study of the pros and cons of different types of taxation of the financial sector.

The study will be focused on bringing forward all empirical studies that have analysed how the financial sector responds to taxes. We look at responses in three broad areas: 1) their location, 2) their financial activities, and 3) their transactions.

EXECUTIVE SUMMARY

The economic and financial crisis has triggered a massive set of proposed and adopted regulatory measures targeting the financial sector, including higher compulsory contributions in the form of levies, taxes, obligatory insurance schemes etc. Leaving aside the issue of efficiency and effectiveness of such contributions, this study has a much more narrow focus: If tax rates are raised, how much can the targeted tax base, and thus effective revenues, be expected to be reduced? We carry out the analysis in three steps.

First, we summarise the existing, and not very comprehensive, literature on taxation of the financial sector focusing on the following issues:

Location: There is no strong empirical evidence suggesting that higher tax rates have historically affected the number of financial sector subsidiaries located in the higher tax countries, while the size of the capital allocated to such subsidiaries responds somewhat more.

Taxing profits: There is relatively good evidence showing that banks historically have been able to pass on higher taxes to their customers (e.g. in the form of high lending rates) keeping taxable profits relatively stable. An important exception is banks with substantial international operations, which, to a large extent, have been able to shift taxable profits from high tax regions to lower tax regions.

Taxing transactions: All evidence shows that taxes on specific products such as equities, bonds etc. lead to larger reductions of the tax base than taxes on total profits i.e. reduce the traded volumes of the taxed products. The most important reason is that the financial sector and its customers have a wide variety of means to avoid paying the taxes while continuing the activity in new ways such as packing together new products outside the scope of the tax or simply by moving trade with the existing product to other countries.

Second, based upon recent reviews and as well as other relevant studies on capital mobility more generally, we provide broader recommendations of tax proposals if the aim is to raise significant amount of revenues. Broadness of the tax base is a paramount concern. The tax base should (to the extent possible) cover all products with similar characteristics, be levied on all relevant institutions (not just banks) and should cover as many countries as possible to avoid “leakage” in a financial system that has been dramatically internationalised in recent years. Moreover, taxes on derivative products need to reflect the often wafer-thin profits that are associated with each trade: even tiny tax rates may make the financial activities unprofitable. The purpose may indeed be to achieve this effect, but the downside is of course that no serious revenues will be collected.

Third, one should be aware that some products with the same broad characteristics might in practice not be equally easy to tax. Derivatives traded on formal trading platforms, for example, are much easier to tax than bilateral over-the-counter products (OTC), implying that equal tax rates on the two types of products may drive trading towards OTC markets.

This is at odds with present financial market reforms that attempt to achieve precisely the opposite and that aim to improve transparency in financial markets.

Chapter 1 | MAIN FINDINGS FROM THE LITERATURE REVIEW

This report is about answering a straightforward question: If taxation of the financial sector goes up, what is the resulting impact on the tax base for the particular tax in question? In formal terms this is often referred to as the tax elasticity: A tax elasticity of one means that a 1 percent increase in the tax rate leads to a 1 percent reduction in the tax base. Alternatively, it may often prove useful to use the so-called semi-elasticity approach: A semi-elasticity of 1 implies that a one percentage point increase in the tax rate for example from 10 to 11 percent of the tax base, leads to a reduction of the tax base of 1 percent.

Answering this question is crucial for determining the tax revenues that may result from imposing new taxes on the financial sector. The report provides a review of the existing literature, which can be grouped into three strands according to the possible impact taxes may have on the underlying tax base:

The *first* strand of studies reviews how taxation of financial firms affects the location of their activities (Chapter 2). For example, if the corporate tax rate in the UK is reduced, to what extent will this lead to setting up more subsidiaries in the UK as well as more ingoing FDI to the UK? The answer to this question will allow us to assess what will be the likely increase in the UK tax base.

The *second* strand of studies reviews more directly how taxation on the financial activities affects the relevant tax base (Chapter 3). For example, if Germany increases taxes on banks' profits this may lead to a decline of the tax base as the combined result of:

- Higher funding costs for banks that lead to reduced demand for such services in Germany and therefore result in a lower tax base.
- Activities that are being shifted to domestic non-banking institutions, for example insurance companies, not subjected to the tax.
- Transfer pricing mechanisms that are being used to shift *reported* profits to other jurisdictions while the real underlying activity remains inside German banking sector.
- Underlying real activities being reallocated to other countries, along with the tax base.

The *third* strand of studies focuses on how taxation of individual financial transactions affects the volume of the transactions subject to the tax (reviewed in Chapter 4). For example, if a tax is imposed on financial derivatives traded on formal exchanges in Europe, the revenues from such a tax may be reduced as a result of:

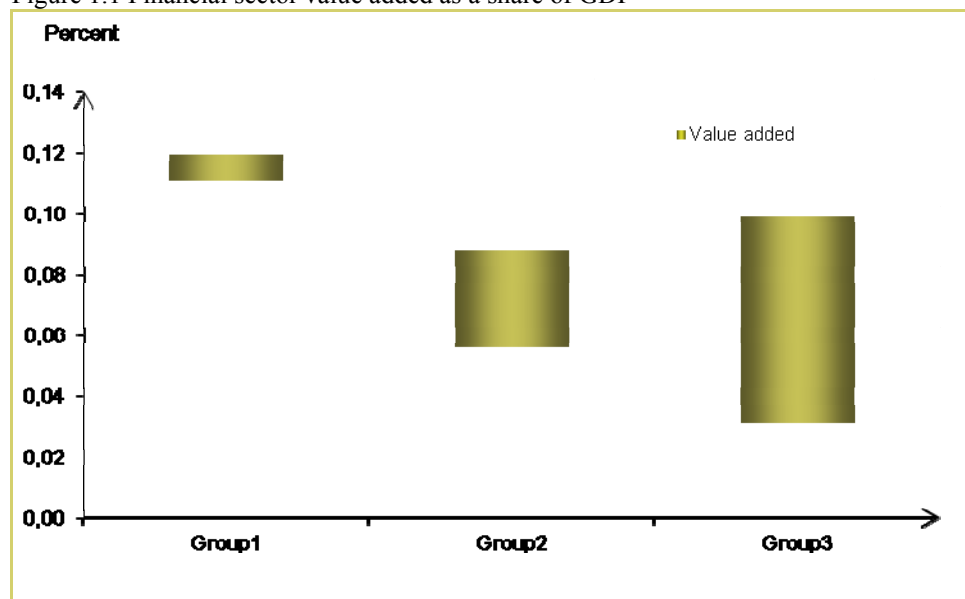
- Less consumer demand for such products.
- Financial innovation i.e. the taxed product being substituted with a “new” product with broadly the same use for the customer but that fall outside the scope of the new tax.
- Demand and supply for such products are pushed towards offshore markets or markets such as OTC products traded directly and bilaterally between the two parties of the transaction which make it more difficult to enforce the regulation of the financial sector.

In this chapter, we outline the overall results of our review along five dimensions: How important is the financial sector (Section 1.1), reported tax elasticities from the literature (Section 1.2), identification of major shortcomings in the literature (Section 1.3), learning points from broader studies of capital mobility (Section 1.4) and our overall conclusions (Section 1.5).

1.1. IMPORTANCE OF THE FINANCIAL SECTOR

To get a feeling for the potential gross revenue from taxing financial institutions and their activities, some stylised facts about the financial sector's relative importance in the overall economy is warranted. Measured by value added, the share of the financial industry varies across countries. The share in countries such as Cyprus and UK (in group 1) makes up app. 11-12 per cent of GDP, whereas it can be as low as 3-4 per cent in countries such as Slovenia and Hungary (in group 3) cf. Figure 1.1.

Figure 1.1 Financial sector value added as a share of GDP

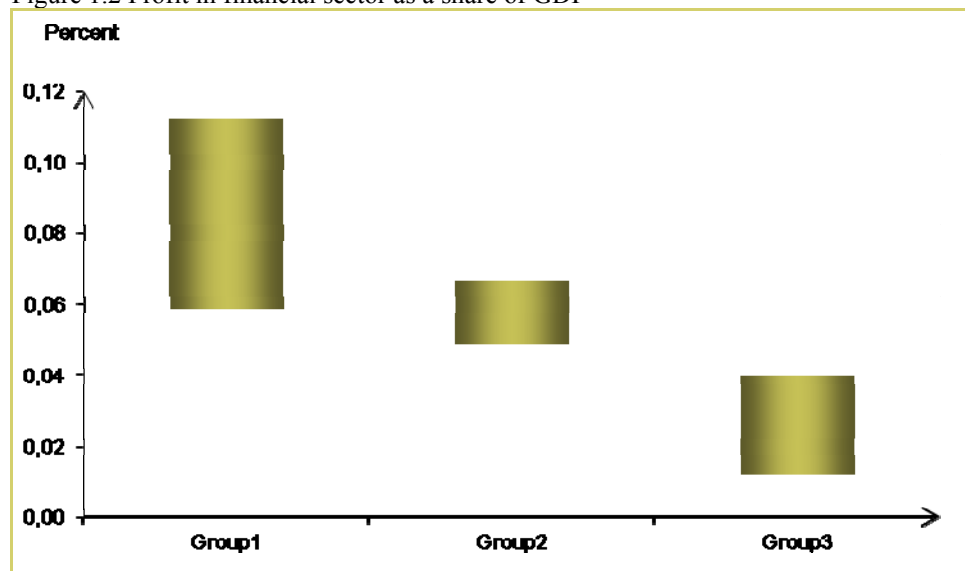


Note: Financial sector excluding insurance and pension funds. Group1 = Cyprus and the UK. Group 2 = the Netherlands, Denmark, Spain and Estonia. Group3 = Bulgaria, Italy, Portugal, Greece, Sweden, Finland, France, Lithuania, Belgium, Hungary and Slovenia.

Source: Eurostat.

The same pattern is reflected in the shares of gross financial profits as share of GDP, which is a proxy for the operating surplus of financial institutions cf. Figure 1.2. Variation across groups of countries can to a large extent be explained by the importance of financial centers in Luxembourg, the UK, Ireland and Cyprus. These financial centres provide services largely for non-domestic customers in such areas as investment banking and fund managements.

Figure 1.2 Profit in financial sector as a share of GDP



Note: Financial sector excluding insurance and pension funds. Variation in country groups between Figure 1.1 and Figure 1.2 is due to lack of available data. Group1 = Luxembourg, Cyprus and Ireland. Group2 = the Netherlands, Denmark, Spain, Latvia and Estonia. Group3 = Bulgaria, Italy, Portugal, Greece, Sweden, Finland, France, Lithuania, Belgium, Hungary, Slovenia and Austria.

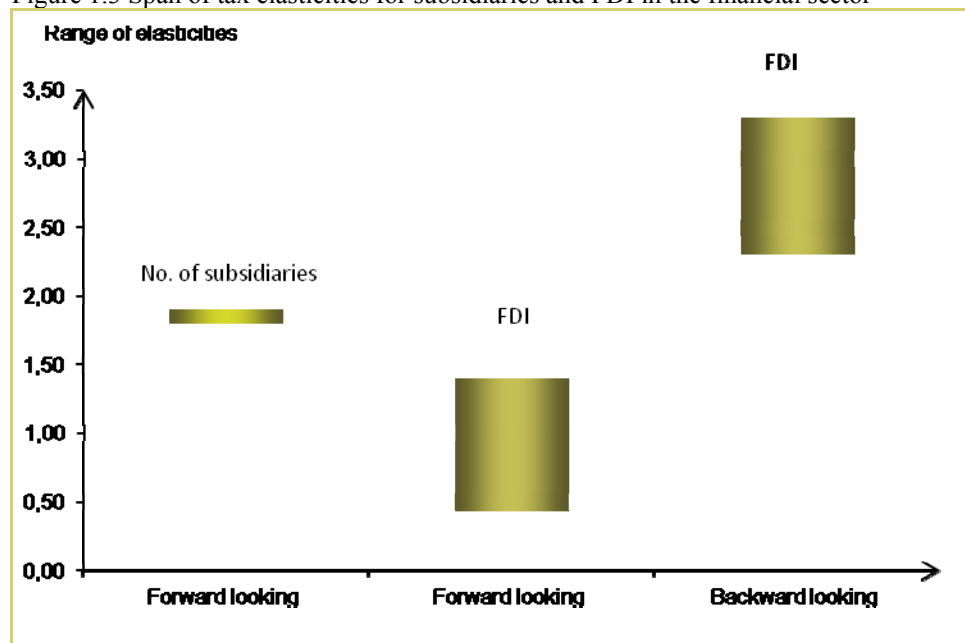
Source: Eurostat.

The difference between servicing mainly domestic and non-domestic customers has two important implications for potential tax revenues. First, the immediate potential impact of taxes on financial activities may differ substantially across countries. Second, it is highly unlikely that tax elasticities are equal across countries for the same broad category of taxes: the composition of banking services and other financial institutions in the UK and Luxembourg, for example, differs substantially from the composition in say Sweden or Italy. As discussed later in the report, investment banking and fund management are much more mobile activities. Hence, taxes on such activities are more prone to “leakage” in terms of dislocation of activities to other tax jurisdictions.

1.2. AVAILABLE EVIDENCE FROM STUDIES ON THE FINANCIAL SECTOR

The available studies on the location of financial companies suggest that the total flow of FDI is less responsive to tax changes than the number of subsidiaries within the financial sector. Both measures are a proxy for the location of companies. While the number of subsidiaries in a country increases by 1.8 to 1.9 percent by a 1 percent reduction in the forward looking tax rate, FDI increase by between 0.4 to 1.4 percent cf. Figure 1.3.

Figure 1.3 Span of tax elasticities for subsidiaries and FDI in the financial sector



Source: Copenhagen Economics.

However, the elasticity of FDI seems to be very dependent on whether the studies have used a forward or backward looking tax rate, cf. Box 1.1. The higher relative elasticity of FDI with respect to the backward-looking tax rate is perhaps not surprising given the discrete choice nature of the decision of firms with an international outlook. First, they decide on whether to set-up subsidiaries in a foreign country. Second they need to decide on how much capital to invest in such subsidiaries. A lower rate of taxes in a jurisdiction will hence lead to both more subsidiaries with a resulting increase in FDI in these new subsidiaries *and* more FDI injected into existing subsidiaries.

Box 1.1 Forward and backward looking tax rates

Forward looking rates are the (hypothetical) rates that firms are facing. The literature commonly uses statutory tax rates (STR) and effective tax rates such as the effective average tax rate (EATR) and the effective marginal tax rate (EMTR). Statutory rates can be interpreted as the “face value” that companies face. STR’s do not include e.g. tax base differences such as depreciation deductions, government tax compensations, etc. Effective rates take account of various available deductions and other tax base differences, and the tax rates are calculated as the net present value of tax payments as a share of the net present value of pre-tax income using tax rules. The EATR determines the impact on infra-marginal investment decisions whereas the EMTR measures the incentive at the margin of the investment. When it comes to firm localisation and the discrete investment decisions dealing with whether to invest abroad or not, the average effective tax rate is therefore probably the most relevant tax measure (see also Devereux and Griffith, 2003). On the other hand, for marginal decisions when investment is already in place, effective marginal rates are more appropriate.

Backward looking rates, such as the average tax rate (ATR) are based on firms’ actual tax payments and therefore include countries different tax base definitions. These measures, however, are based on past tax rates and do therefore not give a good picture of the actual decision facing the firms in respect to countries’ current tax system. Backward-looking rates are therefore used less frequently in the empirical literature.

Source: Copenhagen Economics.

Available evidence in the literature on financial activities suggests that taxes on profits are largely shifted on to customers, implying rather low tax elasticities. One study covering the US, the UK and the eight euro area countries in the period 1980-2003 shows that the costs

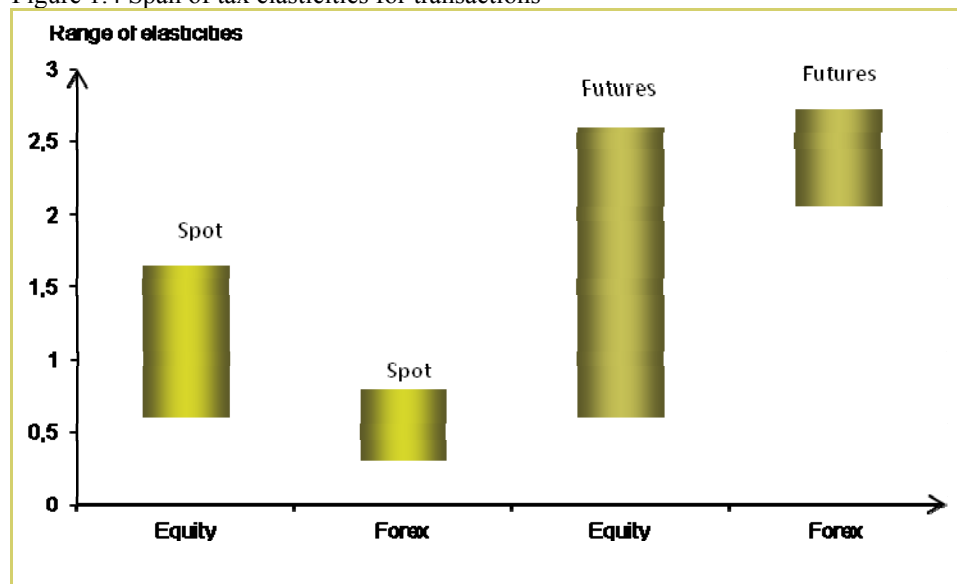
of higher taxes lead to a roughly 90 increase in pre-tax profits due to lower operation costs (partly lower service) as well as higher net interest. A recent overview study broadly confirms this picture. The implication in this context is that increased taxation of the financial sector is likely to make lending more costly.

However, there is also evidence that multinational banks tend to respond aggressively to taxes by shifting financial activities to other jurisdictions. This is likely to be associated with two factors. *First*, multinational banks have more potential for tax shifting in terms of reporting taxable profits in tax jurisdictions with beneficial tax regimes (transfer pricing). *Second*, the activities of multinational banks in a given tax jurisdiction cannot be compared with domestic banks primarily with a national focus, serving households, small and medium sized enterprises etc. Indeed, the main focus of international banks setting up subsidiaries in other countries is to offer more sophisticated products and services, wholly or partly “produced” by headquarter functions and hence more likely to be subjected to transfer pricing mechanisms.

Finally, the available evidence in the literature of financial transactions suggests that the highest elasticities are found for taxes on financial transactions particularly on futures transactions, cf. Figure 1.4. Assets such as equity or foreign exchange can be traded both on the spot market (where the transaction takes place immediately), and on the futures (or forward) market where a transaction in the future is agreed upon. There is evidence that the recent growth in futures trading, especially of foreign exchange, to a large extent is driven by arbitrage trading e.g. in the form of high frequency electronic trading such as algorithmic trading.¹ This type of trading, where profit opportunities, liquidity management or risk hedging are the goals of the transaction more than conducting a real economic activity, is expected to be more responsive to changes in transaction costs.

¹ See e.g. BIS Quarterly Review December 2010.

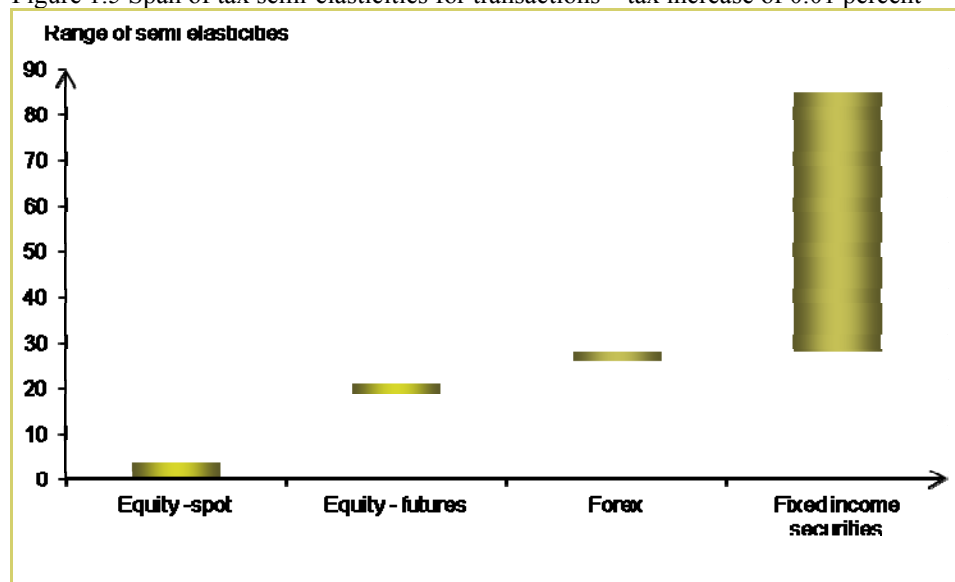
Figure 1.4 Span of tax elasticities for transactions



Source: Copenhagen Economics.

The level of financial transaction elasticities should also be held against the fact that most financial transaction taxes studied in the literature (especially on trading derivatives such as futures) are very low. A more precise picture can be achieved by looking at the semi-elasticities of transaction taxes. The potentially huge responses to transaction taxes become evident when semi-elasticities are studied cf. Figure 1.5. The literature highlights cases where even very small tax increases (a few basis points) have resulted in volume reductions of up to 85-98 percent.

Figure 1.5 Span of tax semi-elasticities for transactions – tax increase of 0.01 percent



Note: The semi elasticities in this figure measure the percentage decrease in volume as a response to a tax increase of 1 basis point (0.01 percent).

Source: Copenhagen Economics.

1.3. SERIOUS SHORTCOMINGS IDENTIFIED

It is hardly possible to overstate the shortcomings of the existing literature in terms of providing reliable and comparable revenue estimates from higher taxes on financial sector activities, cf. Table 1.1. A number of shortcomings are highlighted below:

- 1) There are only few studies that focus explicitly on financial sector issues especially in the literature of location and profits. In total, we have identified 18 studies of which only three cover the location of firms and two studies cover effects on tax shifting on profits.
- 2) Most studies are either quite old or consider time periods of little current interest, especially bearing in mind the transformation and globalisation of the financial sector over the last decades. There has been a large growth in certain kinds of products designed to exploit extremely small profit opportunities from arbitrage. These products, e.g. derivatives trading on electronic platforms, crucially rely on very small transaction costs, which have been driven down by the progress in IT. Yet very few studies have been carried out with data after 2000.
- 3) Only a few studies consider the possibility of changing elasticities due to time trends. As will be discussed below, other studies more broadly on capital mobility have identified a trend of increased capital mobility over time. Yet just three of the studies reviewed have attempted to identify such trends. This suggests that average estimated elasticities for the entire period underestimate the current size of the tax elasticity.

- 4) There is a problem with the functional form in most of the empirical work. Basically, the approach used almost forces the *measured* responsiveness of the tax base to be high when initial tax rates are low and vice versa. This has the effect that an increase in the tax rate from 1 to 2 percent often will be estimated to have a 10 times larger effect on the tax base than an increase from 10 to 11 percent. This appears highly counter intuitive in a number of cases.
- 5) Apart from studies on the number of subsidiaries, no studies focus on the possibilities of “discrete jumps”. Once a tax exceeds a certain threshold, dislocation/tax shifting is not marginal but complete. This means that the entire activity is moved abroad or discontinued. This may for example be relevant for taxes on arbitrage related trading of derivatives where profits per trade are wafer thin, hence tolerating only very low tax levels to remain profitable.
- 6) The used estimation methods often fail to capture longer-term effects. In particular, changes in relative tax rates between countries affect incentives to invest, but that will only be reflected in the capital stock over time as firms make new investment decision.
- 7) There is a shortcoming regarding the level of aggregation in the studies. Some studies review effects of taxes on the entire financial industry, not just banking, while none specifically review differences in the tax responsiveness across different segments of the banking industry. As suggested above, we would expect the tax responsiveness to be substantially larger for investment banking and fund management than for retail banking directed at households and smaller firms.

Table 1.1 Nine shortcomings in the existing literature on financial sector tax elasticities

Summary	Elasticity of location	Elasticity of pre tax profit	Elasticity of financial transaction
Number of studies	3	2	13
Time period analysed	Before 1980	0	1
	1980-1990	0	3
	1990-2000	3	7
	2000+	0	2
Explicit modelling of time trends in elasticities	0	1	2
Elasticity approach	3	0	13
Semi-elasticity approach	1	2	0
Explicit modelling of discrete jumps	0	0	0
Estimation methods ability to capture long-term effects	0	0	4
Explicit focus on banking sector	0	2	n.a.
Separation of retail, commercial, fund management and investment banking	0	0	n.a.

Source: Copenhagen Economics based on literature review.

1.4. LEARNING POINTS FROM SOME OTHER STUDIES

Bearing in mind the limitations of the specific literature on financial sector related activities, we have included in our study some learning points from other studies on capital mobility that do not consider the financial sector isolated:

- Recent meta-studies show that the responsiveness of FDI has risen over the last decades reflecting the same factors that have driven globalisation more generally. These factors are reduced costs of communications and transportation as well as trade liberalisation. Given the explosion in financial activity after 1995 this is a significant conclusion. As most of the studies on the financial sector consider a time period prior to this, we expect the responsiveness of the financial sector to be increasing over time.
- Historically, financial sector "innovation" (also known as regulatory arbitrage) has been quite effective in undermining the intended effects of financial market regulation. Indeed, this is one of the risks that have been highlighted in the context of the present discussion on reform of financial market regulation. If the costs of providing a financial transaction in any particular form become too high, activities will move to unregulated entities or other jurisdictions underlining the likely non-linear nature of the effects of taxes on the underlying tax base.

1.5. OVERALL ASSESSMENT

Our overall assessment on the responsiveness of the tax base to higher tax rates can be summarised in three main statements.

First, taxes on bank profits are largely borne by the customers in terms of higher funding costs and/or lower services, implying a relatively stable tax base and low tax elasticity. For financial centres, where a substantial part of total banking profits is derived from servicing

clients at regional/global level, the picture may be more complicated. The location of such activities is based on a larger assessment of the attractiveness of the location in terms of the underlying infrastructure, economics of scope and scale, quality of regulation, language as well as broader framework conditions. Indeed taxation of highly paid staff may be as important as taxation of profits. Minor changes in business taxation may not have substantial effects while larger changes may lead to a complete relocation to other potential financial centres.

Second, for transaction taxes, even though the estimated tax elasticities are quite large there are substantial reasons to believe that more than marginal increases in tax rates may have even larger effects. This is due to the shortcomings in the literature as discussed above. Rather than relying on a mechanistic use of old elasticities it may prove worthwhile to study the economics of any given increase in the tax rate more carefully especially in a modern financial setting.

Third, the broader the tax base is, the smaller the tax elasticity will be. This has several dimensions. The tax base needs to cover all products that are near substitutes as well as institutions that can produce such goods. The latter is important as a number of financial products can be provided by non-banks as well as non-financial institutions. The most obvious example is household credits, which are provided by a myriad of suppliers. Also, the tax base should be applied to as broad a geographical area as possible to avoid that the tax base shifts across borders.

Chapter 2 TAXES AND THE LOCATION OF FINANCIAL COMPANIES

Like any other investor, financial companies have to weigh the costs and risks of going abroad against the opportunities for making business at home. Financial companies may establish foreign subsidiaries to follow their customers and provide them with financial services abroad.² Financial companies may also expand abroad to seek new, local market opportunities and to increase profitability. High effective tax rates may affect that decision and make an investment location less attractive by increasing the required rate of return on the investment.

Financial companies also weigh the costs and risks of going abroad against other modalities to provide services across borders without establishing a fully fleshed local presence. Banks, for example, may do this by offering cross-border lending. New technological and IT advances have made financial companies increasingly able to provide many types of financial services across borders without needing to establish foreign branches (e.g. through the increasing use of net banking). Large tax differentials may therefore lead to a concentration of financial activities in low tax locations.

In essence, the choice of location of a financial institution is linked to the more general issue on how firms can slice up their activities and optimise all elements in their value chain: the optimal choice is affected by the underlying costs and benefits of trading at distance from the customers being served.

In this chapter we summarise the theoretical and empirical findings on the relationship between taxes and the location of financial companies. In Section 2.1 we sketch out how taxes may impact the location of financial companies, and we point out aspects of the location decision that need to be addressed in the empirical setup. In Section 2.2 we summarise the main findings in the empirical literature on the location decision of financial companies. In Section 2.3 we examine whether financial companies are more responsive to taxes than multinational companies in other sectors. In Section 2.4 we draw policy lessons from a broader set of empirical papers on FDI in other sectors, and in Section 2.5 we provide some concluding remarks.

The literature review draws mainly on empirical studies that are directly relevant for financial companies (such as the banking sector) but due to the lack of relevant studies we also draw on a broader set of studies including the tertiary and service sectors. We do not select individual studies that base their analysis on other sectors but we chose to include the findings in two recent meta-analyses with a broad coverage of sectors. We do so in order to close some of the gaps in the empirical literature.

2.1. HOW TAXES IMPACT THE LOCATION OF FINANCIAL COMPANIES

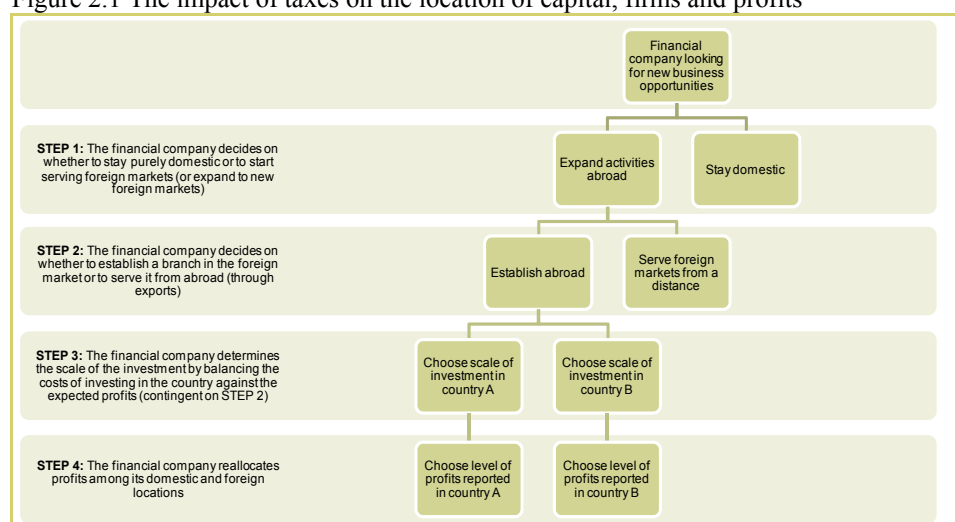
The decision of where to locate headquarters and foreign subsidiaries of a financial company can be characterised by a four-step procedure, cf. Figure 2.1.³ *First*, the financial company decides whether to stay purely domestic or to look for new business opportuni-

² See Claessens and Van Horen (2008) and references herein.

³ See Devereux (2007) for more details.

ties in foreign markets (or in new foreign markets if the financial company has already establishments abroad). *Second*, conditional on choosing to establish abroad, the company must decide where to locate its foreign affiliate (country A and country B in the example). The first two steps are therefore discrete location choices, where taxes (and other location factors) may have an impact on the number of foreign establishments in country A and country B. *Third*, foreign companies face a flow decision on how much to invest in the two countries. Here, the impact of taxes will be recorded in the amount invested and therefore in the stock of inward FDI in the financial sector in country A and country B. And, *fourth*, the company has a choice of where to locate its profits (if any). This will be discussed further in the next chapter.

Figure 2.1 The impact of taxes on the location of capital, firms and profits



Source: Copenhagen Economics adapted from Devereux (2007).

It is important to keep in mind that the responsiveness of financial companies to taxes may be different in the two decisions, and this is an aspect, which should be taken into consideration in the specification of the empirical model.

First, the dynamics is likely to be different in the two steps since it will take longer to adjust the location of foreign affiliates to tax changes compared to adjusting the amount of money to be invested in a particular location. The responsiveness of the number of foreign establishments may therefore be higher in the long run than in the short run, whereas no major difference is expected in the way FDI flows respond to taxes in the short and the long run.

Second, the impact of taxes on the location of financial companies is likely to depend on the type of services the company provides since some types of financial activities are more mobile than others. For retail banking, *on the one hand*, location of branches close to customers is often required, and tax changes may therefore have a relatively low impact on location of such branches.⁴ Capital fund management and investment banking activities, *on*

⁴ This is very much in contrast to manufacturing companies where exports typically account for a very large share of revenues and, consequently, local cost conditions are relatively more important than the local market potential.

the other hand, are less dependent on being located close to the client. Instead, location is very much driven by supply economics (such as economics of scope and scale, taxation levels of employees and wider scope of relevant support services being provided such as strong legal and accountancy environment). Such activities are typically concentrated in financial centres and large financial companies, and the tax base is expected to be relative insensitive to small tax changes but very elastic to large tax changes (relative to competing financial centres). Examples of such financial centres within the EU are London for investment banking and Luxembourg for fund management. Also, technological advancements have made it easier to serve customers in more distant markets, which will tend to make such financial activities more responsive to taxes over time.

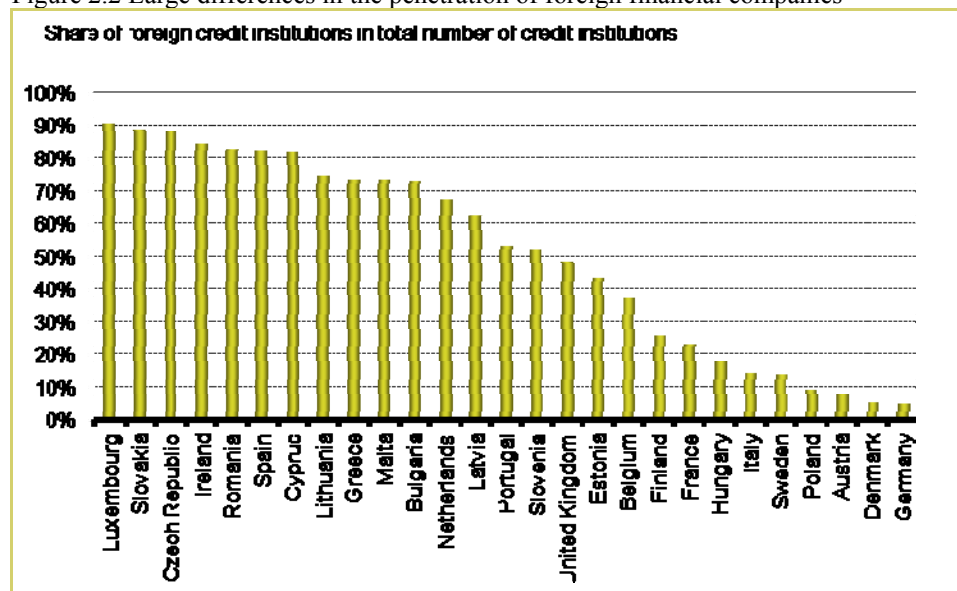
2.2. IMPACTS OF TAXES ON THE LOCATION OF FINANCIAL COMPANIES

In the empirical literature examining the impact of taxes on the location of financial companies, location is either proxied by the number of foreign companies located in a particular country or by the amount of inward FDI flowing to a particular location. Before moving on to the empirical findings we shortly provide some descriptive statistics on the two dependent variables applied in the literature.

FDI in EU countries

The penetration of foreign companies in the financial sector varies very much across countries. Luxembourg, Ireland, Cyprus and Malta have a high share of foreign subsidiaries in the financial sector (proxied by the number of credit institutions), cf. Figure 2.2. In Ireland, an explanation for the high number of foreign subsidiaries could be that FDI in the secondary and tertiary sectors has historically been taxed at a lower corporate tax rate than investments in the primary sector. The arguments put forward are that there are large technological and knowledge spillovers from these sectors. Some of the new Member States also turn out to have a high penetration of foreign financial companies who have established themselves during the last decade and have therefore contributed to the expansion of the financial infrastructure in these countries. Financial companies in Germany and Denmark face the least competition from foreign subsidiaries.

Figure 2.2 Large differences in the penetration of foreign financial companies

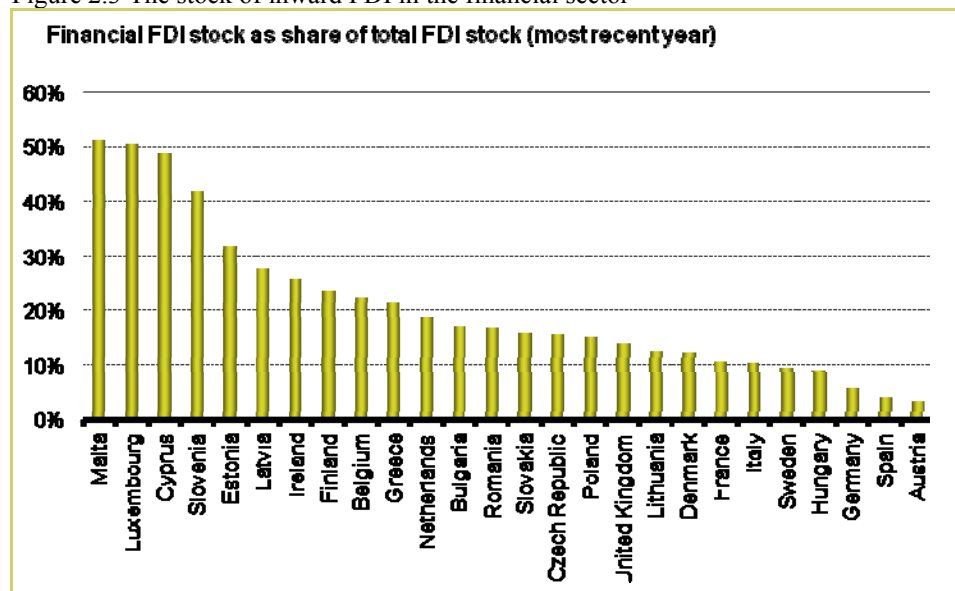


Note: Data is from 2010.

Source: European Central Bank, Statistics on Consolidated Banking Data.

We also find that the countries that host many financial companies are also the countries that have a large share of their inward FDI stock stemming from the financial sector. Around half of the inward FDI stock in Malta, Luxembourg and Cyprus has been invested in the financial sector, cf. Figure 2.3.

Figure 2.3 The stock of inward FDI in the financial sector



Note: The financial sector is defined as financial intermediation, except insurance and pension funding (NACE code K64). The data are from the most recent year, which is 2009 for most countries except for Belgium, Bulgaria, Czech Republic, Germany, Estonia, Greece, Spain, Luxembourg, Hungary, Slovakia, Sweden (year is 2008) and Italy, United Kingdom (year is 2007). Portugal is missing due to lack of data on FDI in the financial sector.

Source: Eurostat, Balance of Payment statistics.

Learning point 1: Financial companies are very responsive to taxes

In this section we summarise the response of the location of financial institutions to changes in taxation. To the extent possible we report both semi-elasticities and elasticities. The elasticity measures the percentage change in FDI in response to a 1 percent change in the tax rate, e.g. a decline from 30 percent to 29.7 percent. The semi-elasticity measures the percentage change in FDI in response to a 1 percent point change in the tax rate, e.g. a decline from 30 percent to 29 percent. It is defined as $\partial \ln(\text{FDI})/\partial t$. Transforming elasticities into semi-elasticities requires data on the mean value of the FDI variable. Moreover, transforming elasticities into semi-elasticities requires data on the mean value of the tax rate. This data is not always available in which case we only report the measure provided in the paper.

Optimally, we are looking for studies that estimate the tax elasticity of the location of *financial companies*. However, only few studies have looked specifically at the financial sector, and we therefore broaden our scope to the tertiary/service sector, which has been the focus of a larger range of studies. Besides financial services, the tertiary/service sector also involves transport, distribution, sales activities and the provision of other services. Since the focus is on people interacting with people and serving the customer rather than transforming physical goods we find that this approximation seems reasonable. Details of the papers (methodology, tax measure, sectors, elasticities and conclusions) can be found in Table 2.1. The key findings are summarised underneath.

Table 2.1 Impact of taxation on the location of financial companies

Study	Methodology	Tax measure	Elasticity in the financial sector	Elasticity in other sectors	Conclusions
Overesch and Wasmer (2009)	Poisson regression using count data on the number of German outbound FDI in 30 EU countries in 2005	STR and EATR	STR (EATR) elasticity of -1.8 (-1.9) and a semi-elasticity of -5.8 (-6.6) in the financial sector	STR (EATR) elasticity of -0.8 (-0.7) and a semi-elasticity of -2.5 (-2.4) across all sectors	FDI is inversely related to tax rates and the effect is asymmetric across sectors
Stöwhase (2005a)	Panel data regression on bilateral FDI from eight EU countries to Germany, the Netherlands and the UK during the period 1995-1999	EMTR	STR (EATR) elasticity of -2.3 (-0.4) in the tertiary sector	No tax response in the primary sector. STR (EATR) elasticity of -1.4 (0.3) in the secondary sector	Irrespective of the tax measure, the tax elasticity of tertiary sector is 20% to 30% above the average elasticity
Stöwhase (2005b)	Count data regression on the number of German MNEs in Austria, Belgium, France, Ireland, Italy, the Netherlands, Spain and the UK during 1991-1998	STR and EATR	STR elasticity of -6.6 in the service and finance sector. No response to EATR	EATR elasticity is -2.0 in the production sector. No response to STR	Separation of different types of FDI has an impact on the tax elasticities, where the STR affects service and finance while EATR affects production sector

Note: *ATR*=Average tax rate, *ETR*=Effective tax rate, *EMTR*=Effective marginal tax rate, *EATR*=Effective average tax rate and *STR*=Statutory tax rate. When possible, missing elasticities and semi-elasticities have been calculated using mean tax/FDI data across the sample countries and years.

Source: Copenhagen Economics.

In the *first* group of studies the location choice is defined as a discrete choice where the investor decides where to establish a foreign subsidiary. The elasticity in this case measures the percent change in the number of foreign subsidiaries when the tax rate is cut by 1 percent. Irrespective of the tax measure applied, we find that the number of subsidiaries drops when the tax rate increases, cf. Table 2.2. When the tax rate increases by 1 percent, the number of foreign subsidiaries drops by an average of 2 percent irrespective of whether the tax measure being used is the statutory tax rate (*STR*) or the calculated effective average tax rate (*EATR*). This elasticity transforms into a semi-elasticity around 6 percent. In the UK, for example, using a tax semi-elasticity of 6 percent causes the number of foreign subsidiaries in the financial sector to drop from 89 to around 84 if the tax rate increases one percent point.

Table 2.2 Elasticity of the location of financial companies

FDI location indicator	Tax rate measure	Elasticity	Semi-elasticity
Number of subsidiaries	Forward looking STR	-1.8	-5.8
	EATR	-1.9	-6.6
Bilateral FDI flows	Forward looking ETR	-0.43; -1.4	
	Backward looking ATR	-2.3; -3.3	

Note: *STR*=Statutory tax rate, *ETR*=Effective tax rate, *ATR*=Average tax rate, *EATR*=Effective average tax rate and *EMTR*=Effective marginal tax rate.

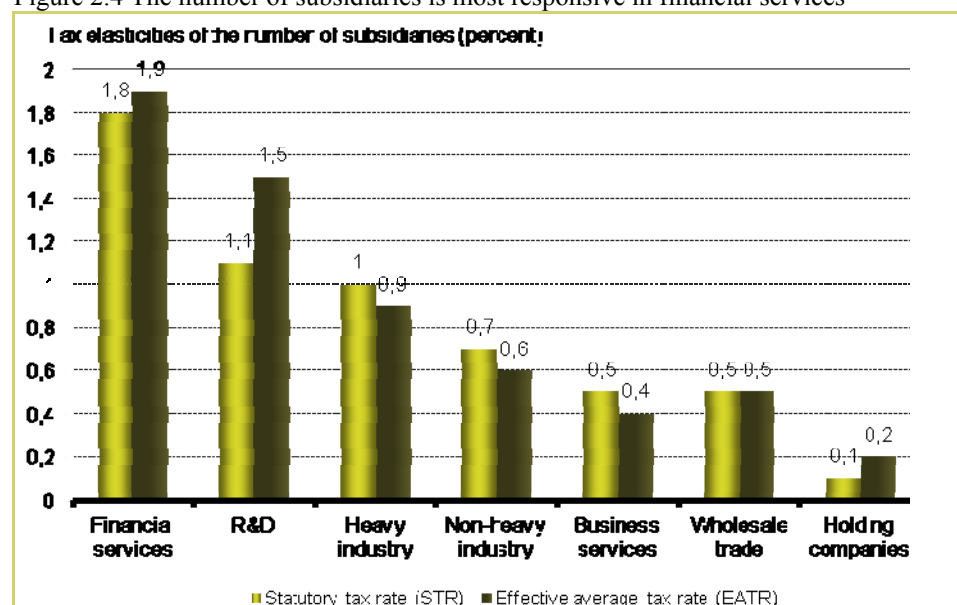
Source: Stöwhase (2005a, b) and Overesch and Wamser (2009).

In the *second* group of studies, the location decision is defined as a continuous choice where the investor decides on how much to invest in a particular country. The elasticity in this case measures the percent change in the amount of bilateral FDI when the tax rate differential increases by 1 percent. We find that inward FDI responds negatively to higher tax differentials between the host and the home country but the size of the impact depends on the applied tax measure. We find that bilateral FDI on average decreases between -0.4 and -1.4 percent when the measured effective tax rate (ETR) difference drops by 1 percent. The drop in bilateral FDI flows is around -2.3 and -3.3 percent when the average tax rate (ATR) difference drops by 1 percent, cf. Table 2.2.

Learning point 2: Financial companies are more sensitive to taxes than non-financial companies

Financial companies also appear to be much more responsive to taxes than companies in a broad set of other sectors, cf. Figure 2.4. The tax elasticity in financial services is around -2, which is almost twice as high as the tax elasticity in the second most responsive sector (R&D) and almost 10 times as large as the tax elasticity in the least responsive sector (holding companies). The implication is that empirical papers using a broad set of sectors tend to underestimate the tax responsiveness of companies in the financial sector.

Figure 2.4 The number of subsidiaries is most responsive in financial services



Note: The dependent variable in these regressions is the number of subsidiaries in seven sub-sectors. Source: Overesch and Wamser (2009).

Shortcomings in the empirical literature on the location of financial companies

There are a number of shortcomings in the empirical literature that should be kept in mind:

- **Number of studies:** The limited number of studies is in itself a problem since it puts a limit to the number of comparative analyses and firms conclusions one can

draw from these studies. To our knowledge, there are only three empirical studies that are directly applicable to financial sector taxation.⁵

- **Time period:** Tax elasticities in the financial sector may not be constant over time (e.g. due to technological advantages) which would indicate that regressions may be prone to structural breaks and time dependent elasticities. Most studies use data stemming from a period before 2000, and this should be kept in mind when such tax elasticities are extrapolated and used in regulatory impact analyses.
- **Dynamics:** Financial companies may in some cases take time to adjust their location to tax changes. This may particularly be the case in the discrete location decision. The empirical methodologies referred to in this chapter do not distinguish between short and long-term responses but only reflect annual changes in location.
- **Composition of activities:** The elasticities reported are for the financial sector as a whole (or in some cases for the tertiary/service sector) but different activities can be expected to respond differently to tax changes (e.g. retail banking vs. capital fund management). This has at least two implications. *First*, tax elasticities may not be uniform across countries even in the absence of other influencing factors as a whole since individual countries have different financial sector composition. *Second*, tax elasticities may not be uniform across financial companies but will depend on the exact activities carried out in the companies and possibly also on the size of the company. None of the empirical papers summarised in this report provide the necessary level of detail in this regard.
- **Composition of countries:** The samples used in the empirical literature include only a small number of countries (typically old EU Member States), which provides very little variation in the attractiveness of the different investment locations. When there is little variation across observations it becomes difficult to draw inference based on statistical analysis.

Due to these shortcomings, the empirical tax elasticity will reflect an average of several elasticities that may lie in a broad interval. To cover some of these caps, we draw on a broader set of empirical studies of the location decision of foreign investors. However, one should keep in mind that the results may not be directly applicable to financial companies.

2.3. DRAWING LESSONS FROM A WIDER SET LOCATION STUDIES

Rather than going into details with individual studies of empirical tax elasticities, we draw mainly on the findings in two recent meta-analyses of FDI and taxation which we find relevant for the discussion of the location of financial companies, not the least to cover some of the shortfalls identified above, cf. Box 2.1.

⁵ The three studies are Stöwhase (2005a, b) and Overesch and Wamser (2009).

Box 2.1 Description of two meta-analyses of FDI and taxation

Meta-analysis is a research method to synthesise research results and can be used as a statistical way of reviewing and summarising empirical results. It provides a tool to compare and/or combine outcomes of different empirical studies with similar setups or setups that can be controlled for. Meta-analysis has two advantages that make it useful for our purposes:

- Systematic approach to analysing the sources of variation in existing empirical studies.
- Provides the possibility of investigating how research design, model specification and estimation technique impact on empirical results.

Some of the problems related to the meta-analysis are the risk of publication bias in the results, concerns about the comparability of estimated effects and the degree of independence between different empirical studies. The setup and main findings in the meta-analysis by Mooij and Ederveen (2006) and Feld and Heckemeyer (2009) are summarised in Table 2.3.

Table 2.3 Summary of findings from two meta analysis

Study	Meta-analysis setup	Main findings
Mooij and Ederveen (2006)	Covers 31 empirical papers including 427 semi-elasticities in EU countries, the US, Australia, Canada and Japan during the 1980s and 1990s	The median semi-elasticity is -2.9 where: <ul style="list-style-type: none"> ▪ Cross-section studies yield larger elasticities than discrete choice models ▪ Real investments in plants are more responsive to taxes than other forms of FDI ▪ FDI is more responsive to effective tax rates than statutory tax rates ▪ No significant difference between estimates for parents from tax exemption countries and estimates from tax credit countries ▪ The change in elasticities is non-linear (higher in the 1990s than in the 1980s) ▪ No systematic variation between small and large countries
Feld and Heckemeyer (2009)	Covers 45 empirical papers including 730 semi-elasticities in a broad selection of OECD countries during the period 1965-2005	The median semi-elasticity is -1.7 where: <ul style="list-style-type: none"> ▪ Studies using aggregate data produce higher elasticities than micro level analyses ▪ FDI is more responsive to effective rather than statutory tax rates ▪ Localisation of economic rents is less influenced by taxes than the marginal investment decision ▪ Allowing public spending to adjust to tax changes has no impact on tax elasticities ▪ Including time fixed effects reduces the significance of tax effects ▪ Agglomeration effects do not have any robust significant effect on estimated tax elasticities ▪ Tax elasticities are higher in studies including EU countries compared to the US

Source: *Copenhagen Economics*.

Learning point 3: Tax elasticities are non-linear over time

Increased international capital mobility and globalisation of production may suggest that multinational companies have become more responsive to tax changes and tax differentials over time. A study analysing the investment decisions of US multinational companies during 1984-1992 finds that the investment location choice has become more sensitive to differences in host country taxes during the 80s and early 90s.⁶ Also, the meta-analysis covering 31 empirical studies finds that tax elasticities were higher in the 1990s than in the 1980s but also that the rise in the responsiveness of capital seems far from linear across time.⁷ The policy implication is that calculations based on historical tax elasticities may overestimate the budgetary impacts of increasing taxes on multinational companies.

⁶ See Altshuler, Grubert and Newlon (2001).

⁷ See Mooij and Ederveen (2006).

Learning point 4: Investors respond differently to taxes across groups of countries

Due to the free movement of capital within the internal market, it is likely that companies are more responsive to taxes when they invest in the EU than in other regions. The empirical literature seems to provide supporting evidence for this. The meta-analysis covering 45 empirical studies finds that empirical studies including investments in Europe tend to find larger tax elasticities than studies including investments in other target regions.⁸ Also, a study on how tax differentials influence FDI flows from old to new EU Member States during 1995-2006 concludes that large tax differences have strong impact on flow of FDI from EU15 to the new Member States whereas the impact on intra-EU15 FDI flows is insignificant.⁹ A one percent increase in the tax differential leads to a reduction of FDI from EU15 to the new Member States of about four percent. The findings therefore suggest that the previous competition for FDI across old Member States has been replaced by competition from new Member States.

However, it may be the case that the tax responsiveness of investors is not uniform across EU Member States. The meta analysis covering 31 empirical studies, for example, make a distinction between peripheral and core EU countries and find a higher responsiveness of investments in peripheral countries than in core EU countries.¹⁰ The difference can be explained by agglomeration forces, which make the core EU countries relatively more attractive. However, the impact is not statistically significant. This study also finds that there is no systematic difference in elasticities across groups of small and large countries.

Learning point 5: Agglomeration effects do not seem to influence tax elasticities

Forces of agglomeration – the geographic clustering of economic activity – may also affect the level of FDI and the way FDI responds to taxes. Agglomeration is often grounded in a desire to facilitate knowledge spillovers, to provide a thicker market for specialised skills, or to provide greater opportunity for the development of specialised inputs and services. In the presence of such agglomeration effects, governments can tax the capital located in these agglomerations (such as financial centres) without inducing capital flight. Many empirical studies find strong agglomeration effects¹¹, but no empirical papers have analysed the presence of agglomeration forces in the financial sector. However, another study finds that agglomeration effects do not have any robust significant effect on estimated tax elasticities.¹² The implications is that governments in countries with strong financial centres should expect the same degree of capital flight as other countries if they start taxing the financial sector, and that their comparative advantage in the financial sector should not be taken for granted.

⁸ See Feld and Heckemeyer (2009).

⁹ See Hansson and Olofsdotter (2010).

¹⁰ See Mooij and Ederveen (2006).

¹¹ See for example Bobonis and Shatz (2006) as well as Head and Maier (2004).

¹² See Feld and Heckemeyer (2009).

2.4. CONCLUDING REMARKS

We have focused on the importance of host country taxation on the location of investments by financial companies. We find that financial companies respond to higher taxes by establishing less foreign subsidiaries and by investing less intensively in the high tax country. This is also the case in other sectors but the empirical literature summarised in this chapter suggest that the tax responsiveness of financial companies is larger than companies in other sectors.

There are a number of shortcomings in the empirical literature that should be kept in mind when using the elasticities reported in this paper for making impact assessments of changes in financial sector taxation. *First*, there are only a limited number of studies that are directly applicable in this context. *Second*, the empirical estimates of tax elasticities in the financial sector are based on relatively old data. This is a problem since empirical evidence on tax elasticities in other sectors suggests that investors may have become more sensitive to tax changes over time. *Third*, the empirical studies have so far ignored the dynamic response of investors and no distinction between short and long-term responses has been made. And, finally, the level of aggregation may be too crude since different activities carried out by financial companies may respond differently to tax changes.

As we will discuss in the next chapter, however, if there are widespread possibilities for profit-shifting (i.e. so that pre-tax profits can be reported in the country where taxation is the lowest) then corporate taxation may matter less in any cases.

Chapter 3 TAXES AND PROFITS IN FINANCIAL COMPANIES

In recent years, international financial markets have become increasingly integrated. However, the tax liability of financial companies remains within national tax authorities. In taxing a financial company, national tax authorities face many of the challenges and trade-offs inherent in taxing MNEs. Multinational financial companies have opportunities for reducing their tax burdens in high-tax countries by shifting reported profits towards the low tax location. One way to do this is through intra-firm transfer pricing. Also, the high level of mobility of international financial institutions may imply that taxes are relatively distortive and will largely be passed on to domestic customers or be avoided through tax planning activities. In assessing the budgetary impacts of increasing taxation of financial companies one therefore needs to take into account how taxes impact profits in financial companies. This is the main issue in this chapter.

In this chapter we are interested in the responsiveness of the tax base to a tax on financial activities - including the so-called Financial Activities Tax (cf. Box 3.1) - and we therefore summarise the theoretical and empirical findings on the relationship between taxes and profits in financial companies. In Section 3.1 we sketch out how taxes may impact profits in financial companies. In Section 3.2 we summarise the main findings in the empirical literature on the relationship between taxes and profits in financial companies. Here, we distinguish between the ability of financial companies to pass on taxes to their customers and the ability of multinational financial companies to shift profit to low tax locations. In Section 3.3 we examine the possible non-linearity of profit shifting tax elasticities. Tax elasticities may be non-linear due to different degrees of market competition, due to different sizes of the financial companies, and due to the existence of tax havens. In Section 3.4 we provide some concluding remarks.

Box 3.1 Motivations and content of different versions of a FAT

In recent time, there have been calls for a Financial Activities Tax (FAT). Two variants have been introduced, somewhat targeting different objectives.¹³ The FAT1 is essentially designed as a tax on value added in the financial sector (equal to gross wage costs and gross profits). The FAT1 is seen as a “repair” mechanism for a VAT system, which, by exempting financial service from VAT, provides a net advantage for the financial sector. FAT2 is designed to extract perceived economic rents in financial services. Proposed tax bases are, for example, gross income minus “normal” remuneration of staff and capital, implicitly implying additional taxes on very high profits and levels of staff remuneration.

As this study is not about optimal taxation of the financial sector, but about likely tax elasticities we will at this point just highlight two simple points. First, a FAT1 is by nature targeting the least mobile part of the broad income tax base in the financial sector, and as it involves staff costs including in the least mobile part of the banking sector, namely retail banking focused on household, small and medium sized enterprises etc. The FAT1 is dominant in most countries except small financial centres such as Luxembourg. The Danish FAT, for example, is a variant of the so-called FAT1.¹⁴

Second, a FAT2 is by nature targeting the most mobile part of the broad income tax base in the financial sector namely the capital and staff involved in securities trading, fund management, investment banking etc. These are the segments of the financial sector where above normal remuneration of capital and staff has motivated the FAT in the first place.

¹³ See for example Keen (2001), “Rethinking the Taxation of the Financial Sector”, CESifo Economic Studies, vol 57, Devereux (2011), “New Bank Taxes: Why and what will the effects?”, Oxford University Centre for Business Taxation and P.B. Sørensen (2011), “The Danish Experience with a Financial Activities Tax”, Brussel Tax Forum March 2011.

¹⁴ Since 1988 a Danish tax on the financial sector with FAT1 characteristics has been in place. While no formal evaluation has taken place, a presentation at the Brussels Tax Forum in March 2011, suggested that the tax was unlikely to have been largely passed on to consumers since the interest rate margin does not seem to have been affected by the introduction and subsequent increase in the FAT. This is in line with the logic outlined in the main text above see P.B.Sørensen (2011).

Hence, a FAT1 is likely to have lower – and a FAT2 substantially higher – elasticities with respect to reported bank profits. This is so because the FAT2 is designed to extract perceived economic rents in financial services and therefore takes on board proposed tax bases.

Source: Copenhagen Economics.

3.1. HOW TAXES MAY IMPACT PROFITS IN FINANCIAL COMPANIES

A higher tax on profits in financial companies is likely to be followed by at least three kinds of behavioural responses affecting the pass-through of tax rates on profits. *First*, companies will find that a higher tax rate increases their cost of capital. If market conditions allow it, they will attempt to recoup such costs by higher lending rates etc. *Second*, targeted companies may lose market shares (for example in consumer loans) to non-target companies such as large retailers, car dealers etc. *Thirdly*, profits may be shifted to other tax jurisdictions, by shifting reported profits towards low tax locations (e.g. by engaging in more intercompany transactions at the expense of arm's length transactions).

In the next section we will summarise some of the empirical studies of how taxes impact on profits in financial companies. There are only a few studies that look at profit and income shifting behaviour in financial companies, and many broader studies directly exclude the financial sector.¹⁵ To learn more about the empirical relationship between taxes and profits in financial companies, we also draw on papers that include other types of companies. However, it is important to keep in mind that (in the case of banks) the effects of corporate taxes are quite different since most financial companies are subject to specific regulation that may also influence their behaviour.¹⁶

3.2. IMPACTS OF TAXES ON PROFITS IN FINANCIAL COMPANIES

Income or profit shifting cannot be observed directly since this would require detailed information on intra-company transactions of the multinational firm. Here, we have reviewed four empirical studies that attempt to estimate such tax shifting behaviour by looking at selection of variables within the company that may be affected by such tax shifting. These papers have been summarised in Table 3.1 below and will be explained in more detail in the following sections.

Overall, available studies suggest that financial companies are able to pass on taxes to their customers. Profit before tax in the banking sector responds positively to changes in the statutory tax rate (STR) and even more so than other main components of banks' income statement, cf. Table 3.1. A one percent increase in STR increases profits before tax by 1.06 percent and net income in the banking sector by 0.09 percent. Also, we find that pre-tax profits reported by domestic and foreign-owned financial companies located in the same country respond differently to tax changes. When the STR (ATR) increases by one percent pre-tax profits as a share of total bank assets in domestic-owned financial companies will increase by 0.03 (0.04) percent. This is consistent with domestic financial companies passing on taxes to their customers. For foreign-owned companies the response is quite the opposite. When the STR or the ATR increases by one percent, pre-tax profits as

¹⁵ Examples are Mills and Newberry (2004) and Dwenger and Steiner (2009).

¹⁶ See, among others, Albertazzi and Gambacorta (2006).

a share of total bank assets in foreign-owned financial companies will drop by -0.02 percent. This underlines the importance of internationalisation of banks as a factor that affects the response to higher tax on reported bank profits.

Table 3.1 Summary of empirical findings on profit shifting

Indicator of profit shifting	Tax rate measure	Elasticity	Semi-elasticity
<i>Financial companies pass on taxes to their customers</i>			
Profit before tax in the banking sector	STR	1.06	2.50
Net interest income in the banking sector	STR	0.09	0.22
Other income in the banking sector	STR	-0.41	-0.96
Operating costs	STR	0	0
Provisions	STR	0	0
<i>Financial companies shift profits to low tax locations</i>			
Pre-tax profit in domestic-owned banks as a share of total bank asset	STR	0.03	
	ATR	0.04	
Pre-tax profit in foreign-owned banks as a share of total bank asset	STR	-0.02	
	ATR	-0.02	

Note: The elasticities are based on the consolidated findings in Albertazzi and Gambacorta (2006) and Demirgüç-Kunt and Huizinga (2001).

Source: Copenhagen Economics.

Details of the two studies are provided underneath.

Learning point 1: Financial companies pass a large part of their tax burden to their customers

Two studies on the ability of financial companies to pass on taxes to their customers finds that banks are able to shift at least 90 percent of their corporate income tax burden, depending also on the competitive pressure they face (see Box 3.2 for more details). This happens mainly through a reduction in operating costs and provisions while tax shift on net interest income is more likely to occur for low level of the CIT rate when the cost of equity due to regulation is low. The implication in this context is that increased taxation of the financial sector is likely to make lending more costly. One possible consequence of the increased costs is therefore that more lending shifts outside the banking sector where regulation is less strict. While this may intensify competition to the benefit of EU lenders, the risk of lending money will also increase. To our knowledge no empirical studies have attempted to quantify these impacts.

One serious limitation of the study is that the tax change is not specific to the banking sector. Rather, the bank's customers will also be affected so that the ability to shift the tax burden on to its clients is also affected by the change. What we are interested in is the asymmetric case where a special tax is levied on the financial sector but the other sectors in the economy do not face new or increased taxes. Intuitively, one would expect that the ability to shift taxes would be greater in the asymmetric case.

Box 3.2 Details of the two studies on the degree of tax shifting

The paper by Albertazzi and Gambacorta (2006) investigates how bank profitability is affected by the corporate income tax (CIT). The analysis is based on aggregate data on the banking sector in the main industrialised countries (the US, the UK and the eight euro area countries: Germany, France, Italy, Spain, the Netherlands, Austria, Portugal and Belgium) for the period 1980-2003. The paper makes two main contributions to the empirical literature. *First*, it takes into account that the CIT is not only levied on the banking sector so that changes in the tax rate may affect both the banks and their customers (borrowing firms). *Second*, the paper considers all main components of banks' profit and loss accounts: net interest income, interest expenses, non-interest income, operating costs, and provisions. This split allows the authors to disentangle the extent to which a bank is able to shift its tax burden forward to its lenders, depositors, and purchasers of fee-generating services.

The empirical analysis includes a number of control variables (GDP, inflation, money market rate, long term government bond interest rate, stock market capitalisation, total amount of bank loans, stock market volatility and total assets in the entire banking sector). The applied estimator is Generalised Methods of Moments (GMM) where lagged values of the dependent variable have been included to take into account that banks may not respond to tax changes overnight.

The paper finds that banks are able to shift at least 90 percent of their CIT burden but that the degree of tax shifting depends on the competitive pressure in the banking sector. Tax shifting mainly takes place through a reduction in operating costs and provisions and, though not for very high levels of the CIT rate, an increase of the net interest income. The authors also find that for sufficiently competitive banking sectors, tax shifting on net interest income takes place mainly through a rise in the interest rate on loans. To test the robustness of the results, the authors test for non-linearities by testing if tax elasticities are different in the sample period (1981-1992) compared to the period (1993-2003). This does not appear to be the case. Likewise, the authors test if the tax elasticities differ between the euro area and the Anglo-Saxon countries. This does not seem to be the case.

The paper by Huizinga, Voget and Wagner (2011) examines empirically the impact of international taxation on bank interest margins and pre-tax profitability in a sample of 39 countries, of which nine are non-European countries. For the sample restricted to EU banks, the study finds a full pass-through of international taxation into higher interest margins. For EU banks, non-resident dividend withholding taxation and parent company corporate income taxation are both found to be compounded into higher interest margins. The findings imply that banks are able to pass a share of 0.90 on to bank customers and other capita providers through higher net interest income.

Source: Copenhagen Economics.

Learning point 2: Multinational financial companies are able to shift profits to low tax locations

Multinational financial companies have the opportunity to shift profits and income between branches in order to reduce the overall tax burden of the company. A study covering financial firms in 80 countries in the period 1988-1995, suggests that such income shifting can be substantial: Controlling for a number of other determining factors (see Box 3.3) the study finds that the profits of multinational banks with a local subsidiary reports lower than expected profits if tax rates in the country of the subsidiary are higher than the international average.

Box 3.3 Details of the study by Demirgüç-Kunt and Huizinga (2001)

Demirgüç-Kunt and Huizinga (2001) distinguish between home owned (national) and foreign owned (multinational) banks. Using a sample of 80 countries, the study finds significant differences in the pre-tax profitability as well as in the tax payments of national and multinational banks across countries. In their study, they analyse if there is a systematic relationship between the observed differences in profitability and tax rates across countries, and if this is the case, if this is consistent with income shifting. To do so, they estimate the pre-tax profitability of a bank in a specific country as a function of bank and country specific characteristics. While country characteristics control for heterogeneity across countries concerning the overall profitability of business, bank characteristics control for heterogeneity across banks and include information on whether the bank is national or multinational.

Estimation results indicate that bank characteristics (equity, loan, non-interest earning assets, and customer and short term funding) and macro indicators (GDP per capita, growth, inflation and real interest rates) are important in determining profitability. To account for taxes, the study employs statutory tax rates as well as a measure on the banks' average tax rate implicitly calculated from the balance sheet of the bank. For both these measures, estimation results show significantly positive coefficients implying that banking in high tax countries have larger pre-tax profits than banks in low tax countries. The authors interpret this as evidence that the tax burden of banks is to some extent passed on to bank customers. However, when distinguishing between national and multinational banks, estimation results do change: Interacting the tax rate variable with a dummy indicates whether the bank is national or multinational, we get the result that the pre-tax profitability of multinational banks instead is negatively correlated with the tax rate. This negative correlation is consistent with income shifting.

Having information on the tax payments of banks, the authors do also provide estimates on how these are affected by tax rates. It is found that increasing the statutory tax rate enlarges tax revenue collected from national banks. In the case of multinational banks, however, although in general these pay higher taxes than national banks, increasing statutory taxation will unambiguously reduce tax revenue collected.

Source:Copenhagen Economics.

A study comprising profits of 14,377 banks during the period 2001 to 2009 finds that the corporate income tax rate exerts a large, robust and significantly negative effect on taxable profits. The semi-elasticity lies between -5.98 and -8.51 implying that a 1%-point higher tax rate reduces reported fiscal profits by between 6 and 8.5 percent (see Box 3.4).

Box 3.4 Details of the study by IMF (2011)

IMF (2011) use Bankscope data of Bureau van Dijk, containing balance sheet and income statements for banks across the globe on the basis of annual reports. The study focuses on commercial banks, saving banks and cooperative banks and excludes other financial institutions (such as investment banks, holding companies or mortgage banks). The study also eliminates inactive banks from the sample and zooms in on unconsolidated accounts. 82 countries in Europe, Asia and the Americas were selected containing data for 14,377 banks (excluding banks with negative equity value or a negative capital ratio) during the period 2001 to 2009.

Two dependent variables have been used. First, the authors divide total tax payments by the statutory corporate income tax rate of the country to obtain gross fiscal profit. This is expressed in terms of either employment or total assets. Second, they consider reported profits as a share of total assets. The study finds that the semi-elasticity lies between -5.98 and -8.51.

Source:Copenhagen Economics.

3.3. THE NON-LINEARITY OF TAX ELASTICITIES

The findings in a number of empirical studies suggest that tax elasticities are unlikely to be homogeneous over markets and over time, cf. Table 3.2. More details of the conclusions can be found underneath.

Table 3.2 Summary of papers on the non-linearity of tax elasticities

Study	Methodology	Finding
Albertazzi and Gambacorta (2006)	Dynamic GMM on panel data from the banking sector in the main industrialised countries during 1980-2003	High profit shifting activity in the banking sector in response to a tax increase. The median semi-elasticity of profit before with respect to the tax is -2.5. Also: <ul style="list-style-type: none"> • Finds a non-linear relation ship between STR and net interest income • For lower level of STR banks tend to shift the tax burden to the lenders than depositors
Mintz and Smart (2003)	Difference in difference (DID) regression using six Canadian provinces in the time period 1986-1999	The median semi-elasticity of large subsidiaries with respect to the STR tax is -8.5 where: <ul style="list-style-type: none"> • Multi-jurisdictional firms operating through subsidiaries show income shifting behaviour to avoid substantial amounts of corporate taxes in Canada • Firms with large subsidiaries have higher elasticity of tax rates compare to firms with out subsidiaries (small firms)
Overesch and Wamster (2009)	Count data regression (non-linear Poisson regression) on German outbound FDI in 30 EU countries during 1989 to 2005	The elasticity of number of subsidiary with respect to the STR is -1.826 where: <ul style="list-style-type: none"> • Asymmetric tax elasticity across different business activities where the strongest effect has been found in financial services and R and D activities as they have highly mobile profits • An increasing internationalisation is associated with decreasing tax elasticities
Grubert and Slemrod (1998)	Tobit and Probit regression model (non-linear model) using a micro data on US subsidiaries in Puerto Rico during 1987	High income shifting advantages of US multinationals in Puerto Rico where taxes are lower. The study finds that tax elasticities are asymmetric due to different tax rate across countries (tax havens)

Source: *Copenhagen Economics*.

Learning point 3: There are asymmetries related to the degree of market competition. The tax elasticity may not be linear because the possibility for a bank to shift part of the tax burden to its customers is likely to depend on the competitiveness of the market in which it operates.¹⁷ One implication is that a solid empirical investigation of this issue should take into account the great changes due to the effect of deregulation of the financial sector over time. Another implication is the elasticity cannot be expected to be the same over the business cycle.¹⁸

Learning point 4: There are asymmetries related to the size of the financial company. The degree of internationalisation of the multinational company may also cause tax asymmetries. On the one hand, opportunities for income shifting will decrease the effective tax rate a firm has to pay in a particular country. On the other hand, to make use of income shifting strategies, a multinational enterprise needs an affiliate in a low tax country to which income can be shifted. Underneath we will discuss some of the studies, which deal with this issue. One implication is that the profit-shifting decision discussed in this chapter cannot be fully separated from the location decision discussed in Chapter 2.

A study of Canadian firms distinguishes between large firms which may engage in income shifting (operate in multiple jurisdictions), large firms where income shifting is not possible (operate in a single jurisdiction) and small firms which can not make use of income shifting

¹⁷ See Albertazzi and Gambacorta (2006).

¹⁸ See also the non-empirical study by Creedy and Gemmill (2008).

strategies at all.¹⁹ This distinction allows the authors to test both for national and international income shifting. While the effect of taxes is insignificant for small firms, the effect for large firms that may engage in income shifting is about two times larger than for those firms, which are not able to shift income. The evidence suggests that income shifting has pronounced effects on provincial tax bases. According to their preferred estimate, the elasticity of taxable income with respect to tax rates for “income shifting” firms is 4.9, compared with 2.3 for other, comparable firms. They interpret the observed dissimilarities to represent differences in real mobility as well as in mobility of income: While small firms are immobile across provinces, the observed effect for large non-shifting firms represents their opportunity to locate real economic activity in low tax provinces. The somewhat larger effect for shifting firms represents both, their opportunity to locate real activity in low tax provinces and their opportunities to shift income. So, the result that these firms, which are able to shift income, do reply more heavily to tax rates is taken as evidence for income shifting.

Another study shows that US multinationals with higher-than-average activities in R&D or advertising choose locations with extreme tax levels. Income derived from R&D based intangibles accounts for about half of the income shifted from high-tax to low-tax countries.²⁰ R&D intensive subsidiaries engage in a greater volume of intercompany transactions and, therefore, have more opportunities for income shifting. In addition, subsidiaries in locations with either very high or very low statutory tax rates, with a strong incentive to shift income in or out, also undertake a significantly larger volume of intercompany transactions. Finally, R&D intensive US parent companies respond to the opportunities for income shifting by investing in countries with either very high or very low statutory tax rates.

The results from a study on the number of German outbound FDI in 30 EU countries across all sectors suggest that tax elasticities depend on the multinationals’ opportunities to shift profits.²¹ If the multinationals are able to shift profits, local tax rates may be less relevant because effective tax payments are small or even zero. The opportunity to shift profits, however, is only available to firms with affiliates at several locations. Hence, tax effects can be expected to be higher for the location decisions of single-subsidiary multinationals compared to multi-subsidiary multinationals, because the latter are able to shift profits. The study finds that the elasticity with respect to the effective average tax rate of German multinationals is -5.68 for companies with multiple foreign subsidiaries and -2.20 for companies with a single foreign subsidiary.

Our reading of these studies suggests that financial services which tend to be one of the most globally oriented business with top layer firms in all developed countries having substantial investments in many tax jurisdictions and with high inherent mobility of assets may indeed be an industry with tax induced mobility.

¹⁹ See Mintz and Smart (2003).

²⁰ See the non-empirical study by Grubert (2003).

²¹ See Overesch and Wamster (2009).

3.4. CONCLUDING REMARKS

The empirical findings suggest that an increase in the tax rate leads to an increase in profit before taxes, which shows that national banks can shift at least part of the tax burden on to their customers.²² The way banks do this in practice is to shift towards buyers of fee-generating services for high tax rate levels. Multinational banks also have the opportunity to shift profits towards low tax locations and thereby reduce their tax burden. One implication is that a financial activities tax will mainly be borne by customers in the financial sector and by small financial companies who do not have the opportunity to shift profits across borders. While taxing rents could reduce the shift of tax burden to consumers such a tax could be prone to profit shifting if the tax rate is relatively high in comparison to other countries.

²² See Demirgüç-Kunt and Huizinga (2001) and Albertazzi and Gambacorta (2006).

Chapter 4 TAXES AND TRANSACTIONS IN FINANCIAL MARKETS

A financial transaction is a broad definition that covers several issues. In its broadest sense, a financial transaction is any payment of money (cash or transfer) between a buyer and a seller attached to the (contractual) transfer of an asset. The transferred asset can be a non-financial good or service as well as financial assets and instruments like equities, bonds, derivative contracts or currencies.

Transactions are at the heart of any market. For a market to function efficiently (or even exist) transactions need to take place. This is also the case for financial markets. A financial transaction will generally take place when the benefit to the market actors exceeds the cost of the transaction. There are both direct pecuniary benefits associated with a transaction in terms of a return but there are also indirect benefits from e.g. better protection against risk or improved liquidity management. Costs associated with a transaction are normally imposed by fees, taxes or premiums to intermediary traders.

In recent time there have been calls for a tax on financial transactions.²³ If properly enforced, such a tax will effectively raise the costs of conducting a transaction. When evaluating the effectiveness of such a tax and its revenue potential, the response of the tax base is of crucial importance. If a tax causes large incentive shift for market agents the tax base might be reduced considerably.

In this chapter we are interested in analysing the responsiveness of the tax base to a tax on financial transactions. More specifically we will study the tax elasticity associated with the volume of financial transactions. In Section 4.1 we sketch out why taxes may impact financial transactions. We describe features of financial transactions, summarise existing transaction taxes and discuss general design issues with respect to possible substitution alternatives. In Section 4.2 we summarise the main findings in the empirical and theoretical literature into a number of learning points.

4.1. HOW TAXES MAY IMPACT TRANSACTIONS IN FINANCIAL COMPANIES

Taxing financial transactions is not a new idea. Proponents of such a tax have argued for this mainly for two purposes. *First*, a tax can generate large revenues due to the large amount of financial transactions conducted. *Second*, a tax can stabilise financial markets by reducing the amount of short-term trading. These two arguments seem to go in opposite directions: if the tax succeeds in reducing the amount of transactions the revenue potential will be reduced.

The first recorded argument for a financial transaction tax seems to go back to Keynes (1936) who argued that a transaction tax might be useful to mitigate speculative activities. Tobin (1978) argued for a transaction tax specifically on foreign exchange transactions as a means to regulate capital flows. The use of transaction taxes as a second-best alternative to

²³ See e.g. the French priorities for their G20 presidency and European Parliament resolution of 10 March 2010 on financial transaction taxes.

well designed financial regulation has also been proposed.²⁴ More recent proponents of a transaction tax have been focusing more on the revenue raising possibilities of a transaction tax due to the large potential tax base.²⁵

A financial transaction tax has the potential nice property of being levied on a relatively broad tax base and can thus *potentially* generate significant revenue for even very small tax rates – under the important condition that the tax base is relatively stable.

In an efficient market almost any tax will distort optimal market behaviour and will lead to efficiency losses. In tax theory, a general principle is that the less effect a tax will have on behavioural decisions the less distortive it will be. Since a financial transaction tax affects choices in the production decisions it will, by this argument, be more distortive than e.g. a tax on profits or value-added. Moreover, a transaction tax might cascade through the production process thus burdening (arbitrarily) some sectors of the economy harder than others. In particular it will to a larger extent affect smaller firms that need to buy financial risk hedging products in the market as opposed to larger firms that can carry out financial hedging within the firm. A thorough discussion about potential distortions of a financial transaction tax is, however, beyond the scope of this report.

As mentioned in the introduction, a stable tax base is crucial for the revenue potential of a specific tax. Even though the volume of financial transactions is large, there are also readily available financial products to be substituted amongst in order to obtain a similar economic outcome. The more alternative products for substitution, the higher the risk is that the tax base will deteriorate. This places high demands on the design of a financial transaction tax. As an example of how flexible a tax base can be, consider Sweden in the mid-late 1980s. Here a 0.005-0.015 percent tax on transactions of fixed income securities and their derivatives lead to a reduction in the transaction volume of 85 percent. Moreover, a two percent tax on equity trading lead to a reduction of 60 percent in the trading volume of the 11 most actively traded Swedish shares. The trading simply migrated to London.²⁶

Existing taxes on financial transactions

In this paper a financial transaction tax is a broad measure of different types of transaction taxes. In the literature different types of transactions taxes are defined by other names. For example, a *Securities transaction tax (STT)* is a tax that is levied on the gross transaction volume of equity securities, debt securities and related derivative products including options, swaps, futures and forwards traded in exchanges and over-the-counter (OTC) respectively. Moreover, a *Currency transaction tax (CTT)* is a tax that is levied on the gross transaction volume of foreign exchange transactions in spot markets as well as in future and derivatives markets involving currency transactions. Other types of taxes are also used, cf. Figure 4.1.

Several countries have experimented with taxes on financial transactions and several countries have also removed these taxes again. Still a number of taxes are in effect today.²⁷

²⁴ See e.g. Stiglitz (1989) and Summers & Summers (1989).

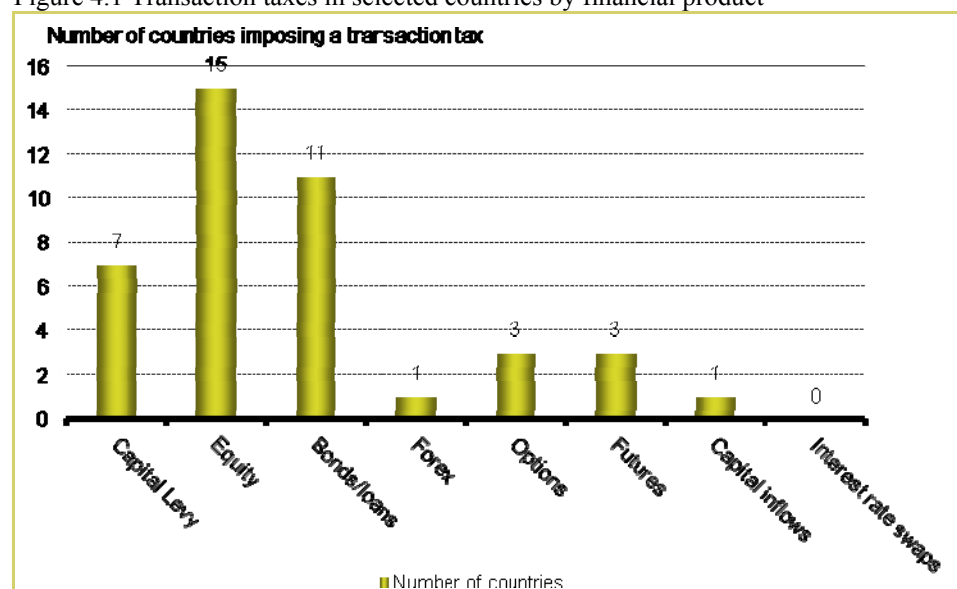
²⁵ See e.g. Schulmeister et al. (2008) and Schmidt (2007).

²⁶ See e.g. Umlauf (1993) and Campbell & Froot (1994).

²⁷ See Table 4.5 in Appendix for a full overview of taxes in G20 countries and major non-G20 financial centres.

The most common transaction tax among G20 members is a tax on transactions in equity and bonds (an STT). On the contrary only a few countries (the UK, India and Taiwan) impose taxes on derivative transactions such as options and futures, cf. Figure 4.1. Moreover, Brazil is the only country in our sample that levies a tax on foreign exchange transactions and capital inflows. So far no country has implemented a tax on interest rate swaps. These products are likely very responsive even small taxes (we discuss this in detail in the following sections). Even though the amount of these transactions is large (and growing) its potential as a reliable tax base is limited.

Figure 4.1 Transaction taxes in selected countries by financial product

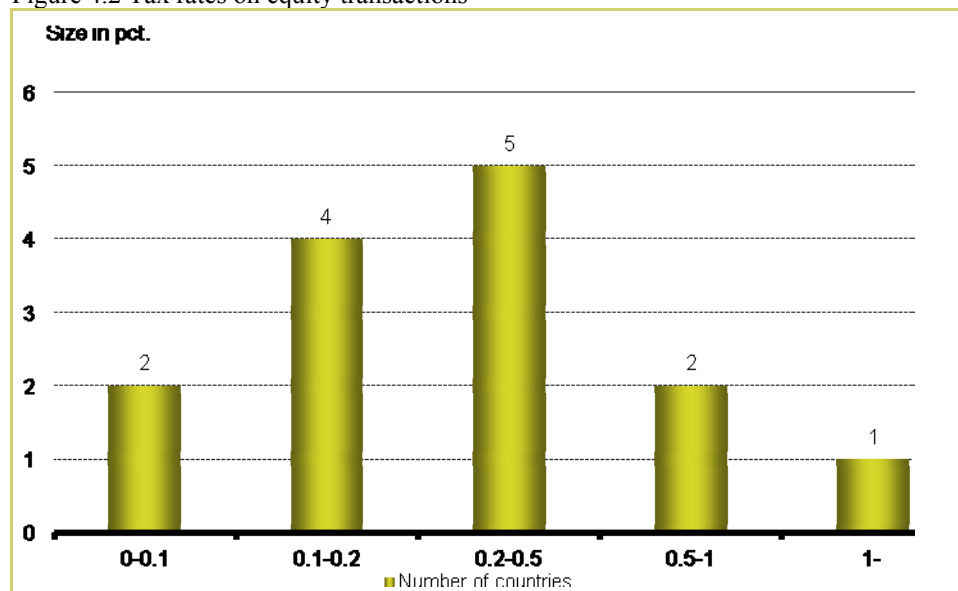


Note: Our sample includes G20 countries and Hong Kong, Singapore, Switzerland, Taiwan and Chile. See Table 4.5 in Appendix for a full overview of transaction taxes in place in the selected countries.

Source: Copenhagen Economics based on Matheson (2011).

The size of the taxes levied varies across countries. Tax rates on equity transactions are mostly levied in the range of 0.1-0.5 percent, cf. Figure 4.2. Few countries (Brazil, the UK and South Korea) impose a tax rate of 0.5 and above.

Figure 4.2 Tax rates on equity transactions



Note: 0-0.1: Italy, and the US, 0.1-0.2: China, Hong Kong, Indonesia and Turkey, 0.2-0.5: India, Singapore, South Africa, Switzerland and Taiwan, 0.5-1: South Korea and the UK, and 1-: Brazil.
Source: Copenhagen Economics based on Matheson (2011).

Two of the more prominent examples in the literature are the experiment in Sweden from 1984-1991 and the more permanent stamp duty in the UK. Table 4.1 highlights some of the features of these two cases. In the case of Sweden, several transaction taxes were imposed in the time period on equity spot trading and fixed income securities (both spot and derivatives). The stamp duty in the UK is only imposed on equity spot trading. The main difference in the observed market behaviour however can be explained by the difference in the exemption possibilities included in the tax. In short; Sweden taxed the use of Swedish brokers on both domestic and foreign stocks while the UK taxed only domestic stocks that were also traded abroad.

Table 4.1 Comparing the experience of Sweden and the UK

Feature	Swedish case*	UK case**
Period	1984 – 1991	1986 (in modern form) – present
Rate/Base	0.5-1.0 pct / equity spot trading 0.002-0.015 pct / fixed income securities and their derivatives	0.5 pct / equity spot trading (shift of property right)
Other features/exemptions	No tax on OTC trading Tax only applicable to Swedish registered securities	Intermediary transactions exempt
Substitution alternatives	Foreign investors could use non-Swedish brokers for trades in Swedish securities Foreign investors evaded Swedish brokers when trading in Sweden or traded Swedish securities in London or New York	Equity spot trading migrated to equity derivatives – no change of property right No geographic distortion since the UK equity taxed abroad

Source: * Campbell and Froot (1994), ** Matheson (2011).

The Swedish case also highlights some interesting issues with respect to the responsiveness of the tax base. *One example is*, the traded volume of fixed income securities (e.g. corporate and sovereign bonds) and their derivatives decreased massively in response to the rela-

tively small tax ranging between 0.002-0.015 percent. Estimates suggest that the volume of bonds and bond futures decreased by 80 and 98 percent respectively.²⁸ This is explained in the literature by a massive shift from futures traded on exchanges to OTC forward contracts that were exempt from the tax. *Another examples is*, the volume of equity transactions by foreign investors did not seem to change in response to the rather large tax increase of 0.5-1 percent on equity transactions. This can primarily be explained by the fact that foreign investors were able to evade the tax e.g. by moving the trades of Swedish equity to exchanges overseas.²⁹ The example also shows that even though the volume of equity transactions did not decline by much, the tax base still deteriorated.

Designing a financial transaction tax

To secure stable revenue of a transaction tax it is important to levy the tax on a large and inelastic tax base. The size of the potential tax base is not clear-cut. Several revenue estimates in the literature assume that a tax should be based on the notional value of a transaction. This may be appropriate for some financial transactions but may be just as inappropriate for other transaction types. We will discuss this below.

Even if it should be possible to design a large tax base, the base will normally be very flexible due to the sheer amount of alternative investment possibilities that can be used to generate a similar economic result.

Some products have more substitution possibilities than others. At the one extreme are risk neutral traders seeking rent. In this case only the potential profit and not the specific type of transaction is important. These types of transactions are very elastic. At the other extreme are e.g. products that are important as a production input or for consumption. Such transactions tend to be less elastic since there will be created value in addition to pecuniary rent. These extreme relationships are confirmed by empirical studies, which find that the tax elasticity of e.g. equity futures is significantly larger than agriculture futures.³⁰

For a tax to distort the tax base as little as possible it should be imposed on potential substitution alternatives as well as the originally intended tax base. In Table 4.2 we present a number of possible substitution alternatives to specific financial products and suggest how a potential tax should be designed to counter the substitution alternative.

²⁸ See Campbell and Froot (1994).

²⁹ See Campbell and Froot (1994).

³⁰ See Wang et al. (1997) or Wang and Yau (2000) that find elasticity of agriculture future and equity futures to be 0.1 and 0.7-2.0 respectively.

Table 4.2 Potential substitution alternatives to different tax bases

Substitution alternative	Potential tax
Risk and liquidity management can be conducted using different financial products (e.g. interest rate swaps, fixed income derivatives, commodities such as gold etc.)	Financial products with similar economic effect should be taxed similarly
Substitute from exchange based trade to OTC trade	OTC trade should be taxed similarly to exchange based trade
Substitute from spot trade to derivatives trade	Derivatives trade should be taxed similarly to the spot trading of the underlying security
Substitute from domestic based trading to trading abroad	The tax should be enforced multilaterally
Substitute from trading of domestic securities to foreign securities	A tax on domestic securities should be imposed multilaterally
Equity based corporate financing to debt based corporate financing and vice versa	Both issuance of corporate equity and debt should be taxed

Source: *Copenhagen Economics*.

Economic incentives suggest that innovative ideas will be developed to avoid increased taxation in general. This is also the case in the financial sector where the possibility of structuring financial products with basically the same economic properties is relatively large. This suggests that even taxes that have been well designed with respect to keeping a stable tax base might eventually erode the same tax base once new substitution alternatives have been developed.

Choosing the right tax base

Defining the value of a financial transaction and hence the appropriate tax base is not straight-forward. This is because that the notional value of financial transactions is not necessarily equal to the value derived from making the transaction. While the value of a stock transaction is the price paid for the stock (notional value), the value of derivatives such as futures and swaps are much less clear. These products are to a large extent used to hedge against risks (e.g. against currency depreciation) or manage liquidity. The value of such transactions is significantly lower than the underlying value of the value being swapped and is therefore a poor measure for the tax base. This spurs the discussion of what would be the right base to choose when imposing a transaction tax on a derivative transaction. Only a few countries have experience with taxation of derivatives and no countries have tried taxing interest rate swaps cf. Figure 4.1 above. We will elaborate on the appropriate tax base for options, futures and interest rate swaps in the following.

For *options* there are basically three taxable parameters 1) the spot price or notional value of the underlying security, 2) the strike price at which the option may be executed and 3) the premium of the option which corresponds to the initial market value of the option. A combination of these parameters can also be used in a tax. It has e.g. been argued that *the strike price* of an option should be taxed³¹ which e.g. is the case in the UK if the option is executed. Taxing the strike price may however be inconsistent with incentive and pricing structure of the market. If two options are based on the same underlying security but have different strike prices, the high-strike price-option does not involve a larger transfer of value since the likelihood is lower that such an option will be executed.³² Option transactions could also be taxed based on the *notional value* (depending on the spot price of the underlying security). It has been argued that option transactions should be taxed based on the

³¹ See e.g. Stiglitz (1989).

³² See e.g. Pollin et al. (2003).

premium paid to acquire the option ownership.³³ The premium is the market price of holding the option and will therefore incorporate an evaluation of the difference between the strike and the spot price, the price history of the underlying asset etc. This is the case in Taiwan, while India imposes both a tax on the premium and on the strike price if the option is executed.

For a transaction of *futures* there is not paid a premium. Instead transactions can be taxed based on e.g. spot or delivery price. The UK and India, for example, e.g. levy a stamp duty on equity futures, which are taxed based on their delivery price.³⁴ On the other hand, Japan used to tax (before 1999) future transactions based on the notional value of the underlying security. It has been argued that this approach is favourable since the tax rate is being set in proportion to the actual value of the asset being traded. Other options are however also conceivable:³⁵ Firstly, one could imagine a tax on the margin deposits that traders make with brokers since this is the only exchange that take place initially and until the underlying asset is transferred. This will however create an incentive to minimize margins, which represents some source of protection against traders' default risk. Secondly, a tax could be flat-rate pr. transaction (as was exercised in France and Hong Kong). This puts a larger relative burden on smaller sized transactions and thereby encourages larger sized contracts.

For *interest rate swaps* it has been argued that a transaction tax should be based on the underlying assets of the transaction since the swap corresponds to a transfer of ownership of the assets.³⁶ However, as an example consider two agents deciding to exchange interest flows. This could e.g. be with large private firms as state debt agencies often do. Governments typically benefit from a huge liquidity premium when issuing long-term debt and hence, even when adjusted for differences in default risks, it may face lower borrowing costs than private firms. The government may however want to keep duration of their debt at lower levels. The government then receives a premium when issuing debt with long duration while taking over the interest payments of the private firm with a shorter duration. The private firm issue short-term debt while overtaking the interest payments of the government. The overall conditions of the contract are then determined by expected average differences in short and long-term rates over the duration of the contract, counterparty risks etc. But as this is simply an exchange of payment flows, it is very difficult to establish an economic value apart perhaps from the fees and administrative costs associated with concluding the swap.

Moreover, regarding *interest rate swaps*, the benefits of conducting interest swaps are determined by the difference between the spread of the long term rate and the spread of the short term rate. By issuing long term debt and swapping for short term interest payments, most governments most of the time (not all governments and not all the time) will be able to reduce interest rate costs for a given duration of the government debt. The difference between the two spreads is in most circumstances very small (0-30 basis points, and can al-

³³ See e.g. Pollin et al. (2003).

³⁴ See e.g. Matheson (2011).

³⁵ See Pollin et al. (2003) for a discussion. It argues that a tax on the notional value of future transactions is favorable.

³⁶ See Pollin et al. (2003) and Matheson (2011).

so be negative). Even very small taxes on interest swap transactions (especially if the tax is levied on the underlying value of the debt) will therefore make a very large amount of these swaps unprofitable and therefore erode the tax base.

Revenue potential based on choice of tax base

The choice of the tax base of a transaction tax will significantly affect to potential revenue obtainable from such a tax. This can be seen in the literature where different studies suggest different revenue estimates depending on their choice of tax base. As discussed above, especially the tax base of derivatives is complicated. While taxing the notional value of equity spot trading is an appropriate measure of the value of the contract, this will not be the case for an option or an interest rate swap. Some studies in the literature finds very large revenue potentials by assuming that transaction taxes will be levied on the notional value of all instruments.³⁷ This will overestimate the revenue potential of a tax levied on options based on their premiums, which might be the more appropriate base.

Estimated semi-elasticities

Semi-elasticities are an informative tool to measure the sensitivity of the tax base in response to a tax on transactions. Some semi-elasticities can be derived from the empirical estimates of tax elasticities and some can be derived from descriptive statistics on past experiences with transaction taxes.

Semi-elasticities have the nice property of depicting the change in volume as a response to change in the tax rate in percentage points. As an example the Swedish tax on equity transactions of 2 percent resulted in a reduction in trading volume of 60 percent of the 11 most traded stocks. This corresponds to a semi-elasticity of 30.

The response of different financial products varies as a response to taxation, which is reflected in this size of the semi-elasticities. As a response to a tax increase of 1 basis point (0.01 percent) estimated semi-elasticities vary from a range of 0.5-4 on equity transactions to a whopping 28-85 on fixed income securities. The large estimates of fixed income securities are derived from the Swedish case where a tax of 1-3 basis points on these securities resulted in a reduction in transaction volume of 85 percent.

³⁷ See e.g. Schulmeister (2008).

Table 4.3 Semi elasticities of different financial products

Financial product	Range of semi-elasticities
Equity (spot)	0.3-4
Equity (future)	20.8
Foreign exchange	28
Fixed income securities (bonds)	28-85

Note: The semi-elasticities are measured against a tax increase of 1 basis point (0.01 pct.).

Source: Copenhagen Economics based on Baltagi et al. (2006), Liu (2007), Campbell & Froot (1994), Umlauf (1993), Chou & Wang (2006) and Schmidt (2007).

4.2. IMPACTS OF TAXES ON TRANSACTIONS IN FINANCIAL COMPANIES

In this section we will present some learning points that can be derived from both the empirical and theoretical literature regarding the impact of financial transaction taxes on the volume of transactions.

Learning point 1: Tax should be levied on products with few substitution alternatives

If there are obvious substitution alternatives to the financial product being taxed, the tax base will be very elastic. Some of these substitution alternatives are discussed in Table 4.2. As an example, if a developed OTC-market for a financial product exists, a tax on exchange based trading of the same product will give an incentive to shift from exchange based trading towards OTC trading. The Swedish example summarised in Table 4.1 showed that the volume of bond futures transactions decreased by 98 percent in response to a relatively small tax of about 0.002-0.015 percent. Several authors suggest that this was primarily explained by a large increase in the use of OTC based forward contracts, which has essentially the same economic characteristics as futures.

An obvious solution to this problem is to levy the tax on OTC trading as well as exchange based trading. However, OTC transactions are inherently more difficult to administer - as opposed to exchange based trading - since it relies on institutions self-reporting and not regularly updated statements from exchange houses.

Hence, the tax effects are highly dependent on present regulatory reform efforts that specifically focus on bringing OTC products to regulated exchanges. However, just as importantly, one could argue that the efforts to push OTC products to regulated exchanges could be undermined if OTC based trading is effectively taxed at lower rates.

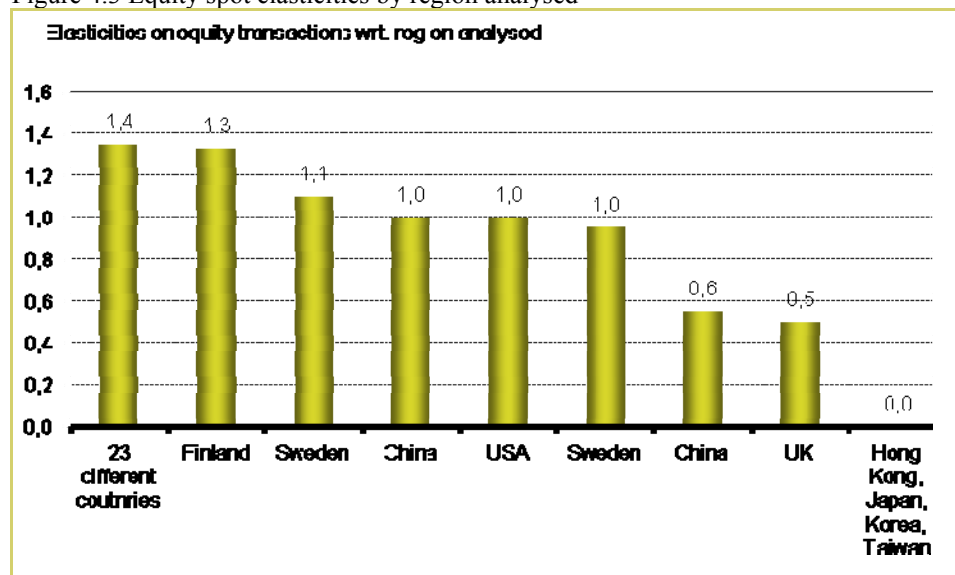
Learning point 2: Elasticity estimates may be very region-specific and should be extrapolated with caution

Elasticities can be very sensitive to the specific region and market analysed. The results in the literature should therefore be applied with caution and due respect of specific characteristics of the market (such as national regulation).

As an example, one of the lowest estimates of the elasticity of equity transactions in the literature is found analysing equity spot trading in China from 1991-2008, cf. Figure 4.3. This may be explained by the heavy regulation of financial trading in China, and we would ex-

pect the elasticity in other more liberalised regions such as the EU to be of a greater magnitude since the alternative possibilities for substituting to different products is higher.

Figure 4.3 Equity spot elasticities by region analysed



Note: The studies used are described in Table 0.4. The estimate for UK is derived from Jackson & O'Donnell (1984) cited by Matheson (2011).

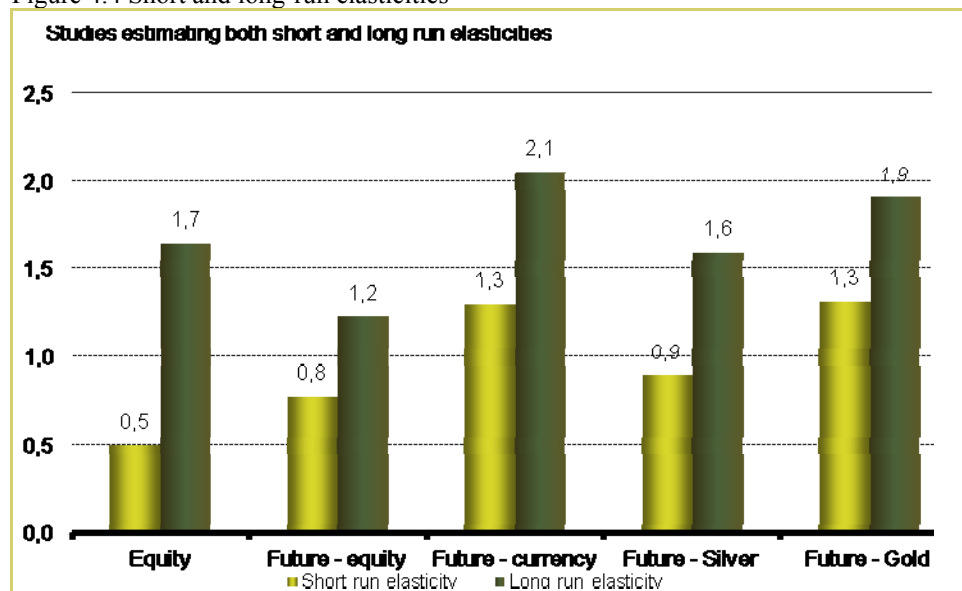
Source: Copenhagen Economics.

However, we would expect the elasticity to be lower in countries that host financial centres compared to other countries. There might be agglomeration effects of trading in a large stock exchange thus making it less attractive to shift the stock supply in response to a tax increase to a smaller stock exchange with smaller liquidity and demand potential. The available empirical evidence for this is not convincing but may be able to explain the relatively high elasticities estimated in Sweden and Finland and the large adverse reaction of the Swedish financial market observed in response to the introduction of different taxes on financial transactions around the 1990s. The low estimated elasticity on equity spot transactions in the UK might on the other hand be explained by the fact that the stamp duty in the UK grants a legal security with regard to the transfer of ownership. This makes the tax difficult to avoid in an investor indeed wants to own a UK-registered company. Transactions in the UK where transfer of ownership is not an issue we would expect a much larger elasticity.

Learning point 3: Long-run elasticities seem larger than short-run elasticities

Over time there will be a larger reduction in volume turnover than the immediate response. In fact, Figure 4.4 shows that long-run elasticities tend to be greater than short-run elasticities. According to the available empirical literature this holds true for different financial products e.g. equity spot transactions and future transaction of equity, foreign exchange and metal commodities respectively.

Figure 4.4 Short and long-run elasticities



Note: The studies used are described in Table 0.4. The estimate for equity spot is derived from Jackson & O'Donnell (1984) cited by Matheson (2011).

Source: Copenhagen Economics.

This suggests that if revenue estimates only consider studies that evaluate the immediate effect of a tax on volume turnover there might be an even larger deterioration of the tax base over time. We would expect the difference between short and long-run elasticities to be the higher in a liberalised financial market with few *obvious* substitution alternatives to a specific financial product. Over time the market may then develop such alternatives and the tax base will deteriorate further. This is in contrast to a market with obvious substitution alternatives where we would expect a high short run elasticity to internalise the immediate response.

Learning point 4: Foreign exchange transactions seem less elastic than equity transactions

From Table 4.4 it can be seen that the range of estimates of elasticities with respect to equity transactions are lower than the range of estimates with respect to foreign exchange trading. This indicates that the volume of equity transactions will decrease more rapidly as a response to a transaction tax than the foreign exchange transaction volume.

Table 4.4 Elasticity estimates on spot and future trading of equity and Forex

Financial product	Elasticity - Spot market	Average	Elasticity - Futures market	Average
Equity	0-1.65	(0.9)	0.6-2.0	(1.1)
Foreign exchange	0.3-0.79	(0.5)	0.5-2.7	(1.7)

Note: The studies used are described in Table 4.5 Appendix Table 0.4 and Table 0.5.

Source: Copenhagen Economics.

A possible explanation for this is that the alternative substitution options for a foreign exchange transaction are not as widespread as that for equity transactions. A stock of foreign

exchange is beneficial primarily as a means to make real investments in a foreign country and hedge against currency risk. In equilibrium, some real investments may be deterred by a modest currency transaction tax, but we would not expect this to cause a large shift in real investments from a country with a currency transaction tax to a non-taxed country.

This would suggest that a tax on foreign exchange transactions would give rise to a smaller reduction in transactions volume than a tax on equity transactions. A currency transaction tax would, however, involve some enforcement challenges.

Learning point 5: Elasticity of futures (on foreign exchange) is larger than elasticity of spot trading

Table 4.4 also shows that the literature analysing foreign exchange future contracts generally find a larger elasticity than the spot price contracts. Foreign exchange transactions can be used in relation to both real activity and to seek arbitrage. Individual firms will use foreign exchange transactions either to finance a specific exchange of goods with a foreign agent or to hedge against risk of currency fluctuations when there is a difference between production and payment period. Spot trades will mainly be used for the concrete trade of goods while future contracts will mainly be used to hedge against currency risk. We do, however, also expect that many participants in the futures market are speculators conducting arbitrage transactions.

There is a well-developed OTC market for foreign exchange derivatives. These so-called forward contracts serve as an almost equally attractive alternative to exchange based futures contracts. In response to a tax on future contracts we would thus expect a large shift from futures to forwards as was the case in the Swedish example, as discussed above.

This presents an isolated argument for either only imposing a tax on the spot trade of foreign exchange as opposed to derivatives trading and/or imposing a tax on both exchange based transactions and OTC based transactions. As discussed in Section 4.1, economic theory suggests that such a tax should be imposed on OTC and exchange based trade instead of an isolated tax on spot trades.

OTC transactions are, however, inherently more difficult to administer - as opposed to exchange based trading - since they rely on institutions self-reporting and not regularly updated statements from exchange houses. As argued above a tax on OTC cannot be seen in isolation from other efforts to push OTC trading towards formal exchange based trading.

One should also interpret the differences between spot and derivatives trading with caution. Another potential explanation for the rather low estimates obtained in the studies on foreign exchange elasticities is that they mostly assume a currency transaction tax to be levied on all four major currencies EUR, USD, GBP and JPY.^{*} This reduces obvious potential substitution alternatives and we would expect the elasticity to be higher if the tax was levied on only one currency. There do not however seem to be available studies on this.

^{*} See e.g. the section in Matheson (2011) on foreign exchange studies.

It is less obvious from the empirical estimates that equity future contracts have a higher elasticity than spot trading (the estimate range is higher, but the average of estimates is rather similar). A priori we would have expected that equity future elasticities were higher than equity spot trading. Spot trading is normally a longer-term transaction that involves an exchange of property right over a stock. However, equity future contracts are often constructed as stock market indices where transactions are mainly arbitrage driven by seeking small price differences compared to the value of the underlying assets. Unfortunately, this cannot be documented from the available empirical estimates.

Learning point 6: A tax on interest rate derivatives would target the largest tax base
Interest rate derivatives constitute the largest amount of financial transactions (app. 64 percent in 2007) and thus provide the largest tax base.³⁹ We would a priori expect the elasticity of interest rate derivatives to be relatively high, since these transactions are often used to manage cash flows and are characterised by being short term, low-profit margin and frequent which are characteristics particularly sensitive to transaction cost increases.

We have located a single study estimating the elasticity on transactions in US Treasury bond futures,⁴⁰ and this estimate does not confirm our a priori argument. The article finds an elasticity of 1.169, which is relatively similar to the estimates found for equity transactions, cf. Table 4.4

Learning point 7: High profit margin markets are less elastic than low profit margin markets.

In low profit margin markets there will be a larger share of transactions that will become unprofitable due to a tax and hence the reduction in volume will be greater and the revenue potential smaller.

High and low profit margin markets are linked with real activity and arbitrage possibilities respectively. Arbitrage trading involves seeking out small price differences in the market. This helps ensure efficient price formation. Such transaction types are typically very sensitive to small changes in transaction costs since the economic benefit of each transaction is very small. On the other hand, transactions linked to real activity are less elastic since financial transaction costs contribute with a lower share in the cost-benefit calculation.

There is evidence suggesting that arbitrage trading constitute a large and growing part of total transactions especially in foreign exchange.⁴¹ The growth is mainly due to electronic trading which has increased competition and lowered transaction costs and has given rise to algorithmic trading (particularly high frequency trading in spot markets of major currency pairs) where bids automatically are submitted in response to a particular algorithm. This high frequency strategy relies highly on low transaction costs, which suggest that the elastic-

³⁹ Copenhagen Economics based on data from BIS, WFE and IMF collected and kindly shared by Darvas and Weizsäcker (2010).

⁴⁰ See Wang et al. (1997).

⁴¹ BIS estimates that 85 pct of the increase in daily average turnover between 2007 and 2010 comes from "other financial institutions" where the main contribution within this category appears to come from high frequency traders, bank trading as clients of the largest FX dealers and retail investors trading online. See BIS Quarterly Review December 2010.

ity of the foreign exchange spot market should be increasing in response to the growing amount of high frequency trading taking place.

We have not found any empirical articles testing this hypothesis.

Learning point 8: Long term trading seem less elastic than short term trading

Markets with a lot of short term trading will tend to be more transaction-intensive and hence have a greater potential response to a tax increase. This also suggests that taxes imposed on arbitrage seeking transactions will lead to a larger reduction in transaction volume than a tax on transactions linked to real activity.

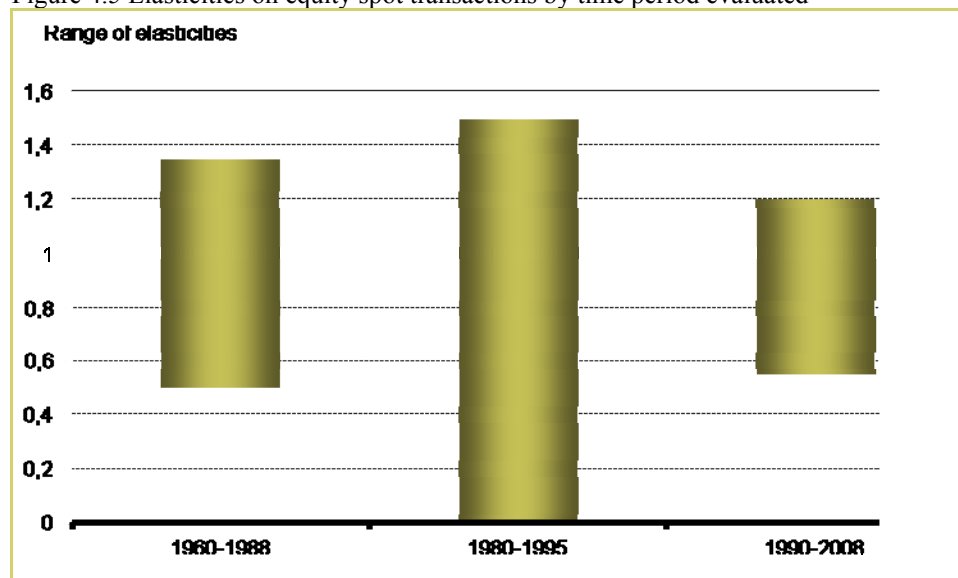
Learning point 9: Elasticities are expected to change over time

We would a priori expect elasticities to be increasing over time. This could be the case both as a response to the increased amount available financial instrument and therefore substitution alternatives but also because the transaction infrastructure has changed over time. As mentioned above, evidence suggests that high frequency (arbitrage) trading has grown significantly over time. Since this trading strategy is more sensitive to transaction costs we would expect the elasticity to be higher when high frequency trading constitutes a larger share of total transaction.

Automated electronic trading is more used in e.g. spot transactions when there is no counterparty credit risk associated with the transaction. In e.g. the foreign exchange swap market automated transactions have grown more slowly. This would also suggest that spot markets would see a higher growth in the elasticity over time than e.g. swap or future markets.

The available empirical evidence does not however; seem to provide convincing documentation for this argument. Figure 4.5 shows the range of available estimates divided into time categories. However, few studies use recent data and few studies control for potential time variation in the elasticity size.

Figure 4.5 Elasticities on equity spot transactions by time period evaluated



Note: The time periods overlap somewhat since the categories have been designed to allow for the best fit of the data used in the literature. The studies used are described in Table 0.4.

Source: Copenhagen Economics.

4.3. CONCLUDING REMARKS

The response of the tax base in reaction to a tax is of crucial importance for the tax revenue potential. This is of particular importance when considering taxation of financial transactions since financial markets can deliver innovative products with similar economic effect, thus providing available alternatives to the product, which the transaction tax is levied upon. In the context of designing a financial transaction tax, we have discussed obvious product substitution alternatives and argued that the revenue potential of a potential tax depends on whether it successfully can include these obvious substitution alternatives in the tax base. Moreover, to secure a stable revenue over time such a tax should include even less obvious alternatives which the market has incentives to create in order to bypass the tax. This is not an easy task.

By surveying the available empirical literature on financial transaction tax elasticities we have presented a number of learning points. All of these learning points are backed by the theoretical literature and some (but not all) can be confirmed by empirical elasticity estimates. In the cases where empirical estimates are available we have presented these. One of the learning points is that one should be careful in generally extrapolating elasticity estimates which can depend on the specific region analysed, the time period analysed and the estimation technique used. Moreover, several specific learning points in relation to taxing available substitution alternatives are extracted.

Table 4.5 Securities transaction taxes in G20 and selected other countries, 2010

Country	Capital Levy	Equity	Bonds/ Loans	Forex	Options	Futures	Capital inflow
Argentina	N.a.	Federal stamp duty on share transfers abolished 2001	Provincial stamp tax, usually at 1%, may affect bonds and debentures	N.a.	N.a.	N.a.	N.a.
Australia	N.a.	State-level taxes may apply to shares	State-level taxes may apply to loans and bonds	N.a.	N.a.	N.a.	N.a.
Brazil	N.a.	1.5% tax on equity issued abroad as depository receipts (reduced from 3% 2008)	1.5% tax on loans (reduced from 3% in 2008)	0.38% on forex; 5.28% on short-term forex (<90 days)	N.a.	N.a.	2% tax on capital inflows to stock and bond markets since 2009
Canada	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
Chile	N.a.		0.1-1.2% tax on bond issuance	N.a.	N.a.	N.a.	N.a.
China	N.a.	0.1% of principal	N.a.	N.a.	N.a.	N.a.	N.a.
France	N.a.	5% of capital contributions not subject to VAT	15-30 bps tax abolished 1/1/2008	N.a.	N.a.	N.a.	N.a.
Germany	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
Hong Kong	N.a.	10 basis points	N.a.	N.a.	N.a.	N.a.	N.a.
India	N.a.	0.25% on stock price; 0.025% on intraday transactions; local stamp taxes may also apply	Local stamp duties may apply		0.017% on premium; 0.125% on strike	0.017% of delivery price	Na
Indonesia	N.a.	0.1% on value of shares; local stamp duties may also apply	Local stamp duties may apply	N.a.	N.a.	N.a.	N.a.
Italy	N.a.	Euro 168 flat fee on share issuance; 3% on business purchases	0.01-0.14% of shares traded off exchange	0.25-2% on loan principal	N.a.	N.a.	N.a.
Japan	N.a.	Registration tax of 0.4% on mergers and trusts	N.a.	N.a.	N.a.	N.a.	N.a.
Mexico	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.

		Capital duty of 0.2% of value of new share issues, but not upon formation or IPO of company		Capital duty of 0.2% of value of new bond issues, but not upon formation or IPO of company	N.a.	N.a.	N.a.	N.a.
Russia								
Saudi Arabia	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
Singapore	N.a.	20 basis points	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
South Africa	N.a.	0.25% of value; new share issues excluded	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
South Korea	0.1-0.4% tax on capital formation	0.5% on value of shares in corporations or partnerships	N.a.	N.a.	N.a.	N.a.	N.a.	N.a.
Switzerland	1% on share issuance in excess of CHF 1 mill.	15 bps on domestic shares; 30 bps on foreign shares	6-12 bps on bond issuance	N.a.	N.a.	N.a.	N.a.	N.a.
							Up to 0.025 basis points on interest rate futures; up to 6 basis points on stock index and other futures	N.a.
Taiwan	N.a.	30 basis points	10 basis points on corporate bond principal	N.a.	10-60 basis points on premiums	N.a.	N.a.	N.a.
Turkey	Stock issuance charge 0.2%	Initial charge for obtaining stock market quote: 0.1%; annual maintenance charge 0.025%	0.6-0.75% bond issuance charge	0.1% tax on foreign exchange transactions by financial institutions eliminated 2008				
	N.a.	Stamp duty 0.5% on secondary sales of shares and trusts holding shares	N.a.	N.a.				N.a.
UK	N.a.	SEC fees on stock trading: 0.0013%; NY state tax: \$0.05 per share up to \$350 per trade	N.a.	N.a.	50 bps on strike price, if executed	50 bps on delivery price		
US								

Source: Matheson (2011).

APPENDIX LITERATURE REVIEW OF TAX ELASTICITIES IN THE FINANCIAL AND NON-FINANCIAL SECTOR

Table 0.1 Tax elasticity and location in the financial sector

Study	Time	Geography	Dependant variable	Methodology	Tax measure	Elasticity in the financial sector	Elasticity in other sectors	Conclusions	Sectors
Overesch and Wasmer (2009)	2005	30 EU countries	Number of German outbound FDI in respective countries	Poisson regression using count data on the number of German outbound FDI in 30 EU countries in 2005	STR and EATR	Elasticity of financial sector wrt to STR (EATR) is -1.8 (-1.9) and semi-elasticity of financial sector wrt STR (EATR) is that of -5.8 (-6.6)	STR (EATR) elasticity of -0.8 (-0.7) and a semi elasticity of -2.5 (-2.4) across all sectors	FDI is inversely related to tax rates and the exact effect is asymmetry across sectors	All and divided in to manufacturing sector (heavy and non-heavy industry) and Non-manufacturing sector (Business service, wholesale, Financial services, Holdings, R&D and residual Group)
Stöwhase (2005a)	1995-1999	From 8 EU countries to Germany, the Netherlands and the UK	Bilateral FDI	Panel data regression on bilateral FDI from eight EU countries to Germany, the Netherlands and the UK during the period 1995-1999	EMTR	STR (EATR) elasticity of -2.3 (-0.4) in the tertiary sector	No tax response in the primary sector. STR (EATR) elasticity of -1.4 (0.3) in the secondary sector	Irrespective of the tax measure, the tax elasticity of tertiary sector is 20% to 30% above the average elasticity	Divided into Primary, Secondary and Tertiary sector (including financial intermediation)
Stöwhase (2005b)	1991-1998	8 host countries (Austria, Belgium, France, Ireland; Italy, the Netherlands, Spain and the UK	German Multinationals abroad	Count data regression on the number of German MNEs in Austria, Belgium, France, Ireland, Italy, the Netherlands, Spain and the UK during 1991-1998	EATR and STR	STR elasticity of -6.6 in the service and finance sector. No response to EATR	EATR elasticity is -2.0 in the production sector. No response to STR	Separation of different types of FDI has an impact on the tax elasticities, where the STR affects service and finance while EATR affects production sector	Divide FDI into two Production and Service, Finance and R & D

Note: EMTR-Effective marginal tax rate, EATR-Effective average tax rate, STR, Statutory tax rate, MNEs-Multinational enterprises and when only elasticity or semi-elastic is given in a study; we transform them to semi-elastic or elasticity using the given mean tax rate across the sample country and year.

Source: Copenhagen Economics.

Table 0.2 Tax elasticity and profit in the financial sector

Study	Time	Geography	Dependant variable	Methodology	Tax measure	Elasticity and semi elasticity	Conclusions	Sectors
Demirguc-Kurt and Huizinga (2001)	1988-1995	80 countries around the world	Pre-tax profits of the banking sector in domestic and foreign owned banks	Pooled OLS	STR and ATR	Elasticity of pre-tax profit in domestic owned bank wrt STR (ATR) is 0.03 (0.04) while foreign owned bank is that of -0.02(-0.02)	Higher tax rates increase tax revenue collected from national banks and decreases revenue collected from multinational banks, which is explained by the profit shifting activity of foreign banks	Banking Sector
Albertazzi and Gambacort (2006)	1980-2003	10 countries and 8 of them are Euro area countries (Germany, France, Italy, Spain, the Netherlands, Austria, Portugal and Belgium)	Income statement component of banking sector (such as net interest income, non-interest income, profit before taxes and others)	Dynamic panel data-GMM	STR	Elasticity of pre tax profit, Net interest income, other income, operating costs and provision in banking sector wrt STR are 1.06, 0.09,-0.41,0 and 0 respectively, While the semi-elasticity of pre tax profit, Net interest income, other income in banking sector wrt STR are 2.50,0.22 and -0.96 respectively.	Predicts non-linear relationship between tax and net interest income and high profit shifting activity in the banking sector for an increase tax.	Banking sector

Note: *EMTR*-Effective marginal tax rate, *EATR*-Effective average tax rate, *STR*, Statutory tax rate, *MNEs*-Multinational enterprises and when only elasticity or semi-elastic is given in a study; we transform them to semi-elastic or elasticity using the given mean tax rate across the sample country and year.

Source: Copenhagen Economics.

Table 0.3 Impact of taxation of on currency trading transactions

Study	Time	Geography	Dependant variable	Technique	Elasticity	Conclusions
Schmidt (2007)	Monthly data from Feb. 1986-Mar. 2006	USD, EUR, GBP, YEN	Forex trading volume	3 Stage Least Square	Elasticity of forex with respect to tax is -0.43	Currency transaction tax has negative impact on trading volume
Bismans and Damette (2008)	Nov. 2004-Nov. 2005	Four currencies traded	Forex trading volume	SUR and Panel estimation	The overall elasticity of forex volume with respect to transaction tax is -0.60	Forex trading volume could be significantly reduced by the Tobin tax. Nevertheless, elasticities are heterogeneous with respect to the currency pairs: the largest elasticities are the Euro/Dollar and Sterling/Dollar currency pairs that are the most traded exchange parities

Source: Copenhagen Economics.

Table 0.4 Impact of taxation on stock share trading

Study	Time	Geography	Dependant variable	Technique	Elasticity	Conclusions
Baltagi et al. (2006)	Nov. 1996-Nov. 1997	China	Stock trading volume	Bootstrap method (comparing the mean value of volume before and after the event)	Elasticity of trading volume (turnover) with respect to transaction cost is -1 and elasticity of turnover with respect to tax increase is -0.5	The trading activity response to a transaction tax could potentially be very large and the market becomes more volatile after an increase in tax
Yongyang and Zheng (2010)	1991-2008	China	Trading volume pre tax and post tax adjustment	Bootstrap method, GARCH	Elasticity of trading volume with respect to transaction cost is found to be -0.55 and -4 when transaction tax increase and decrease respectively	Large reaction of transaction volume of in response to a tax
Umlauf (1993)	1980-1987	Sweden	Return of shares	Measuring daily returns because of the change in transaction tax	1% TT announced results in reduction of return by -2.2% and an increase in TT to 2% results -0.8% reduction in return	A large proportion of trading activity migrated overseas to London when tax rate was increased to 2% in 1986
Liu (2007)	1987-1991	Japan	Stock trading volume	Simple regression	The reduction in the STT was associated with an increase in yen trading volume, after controlling for changes in stock price and volatility	Any public policy that helps to reduce transaction costs should boost market efficiency
Hu (1998)	1975-1994	Hong Kong, Japan, Korea and Taiwan	Stock trading volume	Test of equality of standard deviation of return and mean of turnover	Elasticity of market turnover with respect to tax rate is zero	On average, an increase in tax rate reduces the stock price but has no significant effect on market volatility and market turnover
Westerholm (2003)	1990-1993	Sweden and Finland	Stock trading volume	Pooled cross section regression with auto-distributive log model.	Long run elasticity of trading volume wrt. transaction costs is about 1 for Sweden and 1.3 for Finland	Changes in transaction taxes (STT's) have significant impact on the price level and the trading activity in Sweden and Finland
Ericsson and Lindgren (1992)	1980-1989	23 different countries	Stock market trading volume	Simple regression	Elasticity of trading volume wrt. transaction costs is between 1.2-1.5	A decrease in transaction taxes will lead to large increases in the turnover rate of stock exchanges

Source: Copenhagen Economics.

Table 0.5 Impact of taxation on transactions in future market

Study	Time	Geography	Dependant variable	Technique	Elasticity	Conclusions	Sectors
Aliber. et al. (2003)	1977-1999	Four currencies in US dollar- British pond, Deutsche Mark, the Japanese Yen and Swiss Franc	Trading volume (number of contracts)	Panel OLS and SUR	Elasticity wrt. transaction tax 0.5-1.25	The increase in transaction tax leads to a reduction in volume of trade	Forex market
Chou and Wang (2006)	1999-2001	Taiwan	Volume of equity futures	General method of moment (GMM)	Elasticity of trading volume with respect to transaction tax is 1.042	Trading volume will increase for a decrease in transaction tax, however price volatility has not increased with a reduction in transaction tax	Future market
Norden (2009)	2005-2007	Sweden	Volume of equity futures	Non-linear two stage least square	A 22% reduction in transaction tax results 19% increase in volume of trade which corresponds to an elasticity of 0.855	The exchange fee reduction has improved futures market liquidity at the cost of higher volatility. Moreover, the attractiveness and competitiveness of the futures exchange has increased relative alternative trading volumes, without a loss of revenues in the process	Future markets
Wang et al. (1997)	1990-1994	US	Transaction volume of various future products including Treasury bonds, equity, foreign exchange, agriculture commodities and metal commodities	2-SLS and OLS	Elasticity of futures differs with respect to the underlying security. Estimates vary from 0.1 on agriculture commodities to 2.72 on foreign exchange futures	Trading volume has a negative relationship with transaction tax	Future markets
Wang and Yau (2000)	1990-1994	Chicago Mercantile Exchange (CME) and Deutsche mark futures (DM)	Transaction volume on various future products including equity, foreign exchange and metal commodities	GMM	Elasticity of CME and DM with respect to TT is -0.776 and -1.301 in the short run and -1.230 and -2.058 in the long run respectively	The Imposition of transaction tax will reduce the trade volume	Future markets

Source: Copenhagen Economics.

Table 0.6. Tax elasticity in the non-financial sector

Study	Time	Geography	Dependant Variable	Technique	Tax measure	Elasticity and semi elasticity	Conclusions	Sectors
Riedl and Rocha-akis (2009)	1982-2005	17 OECD countries	Corporate income tax (CIT) base per capita i.e. the amount of firm's profits to the nominal corporate income tax rate	Fixed effect estimations	A forward looking Effective average tax rates (EATR)	Long run CIT base elasticity to be -0.71 for unilateral CIT rate reduction while they find elasticity of 0.134 for each country if all 16 countries reduce CIT tax rate by 1% at the same time	A unilateral increase in CIT might reduce the corporate profit in the long run, but this might not be the case if countries coordinate and increase their CIT together	All
Weichenrieder (2009)	1996-2003	German inbound and outbound FDI to and from the EU	Winsorised return on total assets	Fixed effect estimations	Corporate tax rate	Semi elasticity (elasticity) of rate of return on assets of German inbound FDI with respect to tax rate of parent country is 0.049 (0.017)	Find an empirical correlation between the home country tax rate of parent and the net of tax profitability of its German affiliate that is consistent with profit shifting activity	Affiliates in the banking and insurance industries are excluded
Overesch and Schreiber (2008)	1996-2005	Firm-level data on German outbound FDI in 36 countries and 29 of them are in European countries	Stock of fixed assets (PPE)	-	STR	Semi-elasticity of -0.622 of investment in fixed assets to STR in the short run and -1.65 in the long run	Suggest that the negative effect of an increasing STR on investment can be eliminated if the country R&D intensity is high in the country	Sum up different sectors
Buettner and Wamser (2007)	1996-2004	German multinationals which has more than one country affiliates (in total 79 countries)	The share of internal debt related to loans from other, non-German affiliates	Fixed effect estimations	STR of corporate income tax (they have used the tax rate differential within company group)	Semi-elasticity and elasticity of internal debt ratio as 0.64 and 0.068 respectively to a one percentage point increase in tax-rate difference to the specific group	The higher the tax rate differences in two German Multinationals abroad, the higher will be the profit shifting activity through internal loan from higher tax rate to lower tax rate German subsidiaries	All
Huizinga and Laeven (2008)	1999	32 European countries	Earning before taxes and interest	OLS, IV estimations	STR	The average semi elasticity and elasticity of pre-tax profits to STR are found to be -1.33 and -0.45 respectively. Larger EU countries such as German have lower elasticity compare the smaller countries	There is a substantial profit shifting activity in Europe from high tax to low tax rate countries. This profit shifting leads to a significant redistribution of national corporate revenue with German lost the highest revenue through profit shifting	Manufacturing sector

Swenson (1994)	1979-1991	US as a host country and the rest of the world as a source	FDI in different industries in US	OLS and GLS	Average tax rate and effective tax rate	Elasticity of FDI to average tax rate is 0.9278 to all industry together, 0.7723 to manufacturing sector and 1.0453 to (Finance and real estate sector together), where as elasticity of FDI to effective tax rate is -1.118 to all sectors and 0.0271 to manufacturing and -1.66 to financial and real-estate sector	An increase tax in US in 1980's increases inward FDI in industries and states that this superior performance of the then tax rate is probably caused by the predominance of mergers and acquisitions in foreign investment	The regression is based on all industries (18) Manufacturing and financial and real estate (together)
Hansson and Olofsdotter (2010)	1995-2006	EU27 and EU15	Net FDI outflows investing to host country	Heckman estimation technique is used as there is many zero values in the FDI	The difference between host and investing corporate tax rates in the EU27 captured by STR and EMTR	Semi elasticity of -3.736 and -4.716 to STR and EMTR respectively when FDI flows from EU15 to new member states (excluding Malta and Cyprus). However, they have not found significant elasticity when FDI flows within EU27 or within EU15. And further suggested that FDI in manufacturing sector is deterred by higher taxes but no such effect seemed to be found in service sector	Large tax rate differences have strong impact on flow of FDI from EU15 to the new Member States	All sectors and divided into manufacturing and service sectors
Mills and Newberry (2004)	1987-1996	US	Foreign controlled corporation taxable income affiliates in the US at company level	Panel data technique	The difference between US STR and average foreign tax rate of foreign multinationals	Semi-elasticity of 0.12 in use of debt among foreign held affiliates with respect to US tax rate	Foreign multinationals with relatively low average foreign tax rates report less taxable income and use more debt in their foreign controlled corporations than those with relatively high average foreign tax rates	Manufacturing sector
Dwenger and Steiner (2009)	1998-2001	Germany	Corporate tax base which is captured by Adjusted Gross Income (AGI)	Instrumental approach as average effective corporate tax rate (ETR) can be endogenous and pseudo panel data- OLS and 2SLS	Backward-looking measure of the (ETR)	Elasticity of over all AGI wrt ETR is -0.53. And elasticity of AGI wrt ETR is -0.6 and -0.38 in manufacturing and primary plus tertiary sectors, respectively	Find negative relation ship between AGI and ETR. And this relationship is more pronounced in manufacturing sector than primary plus tertiary sector. Such result came from profit shifting activity than other	All sectors and divide into manufacturing (secondary), primary plus service sector (tertiary sector)

Mintz and Smart (2003)	1986-1999	Canada's six province	Real taxable corporate income per capita	Difference in difference method	STR	Elasticity of larger subsidiaries wrt net tax rate is found to be 4.9 and semi-elasticity of tax rate is to be -8.5	Multijurisdictional firms operating through subsidiaries are able to use income shifting activity to avoid substantial amounts of provincial corporate tax in Canada	Primary, Construction, Manufacturing, Transportation, Communications and Utilities and others. Financial corporations are excluded
Hines and Rice (1990)	1982	59 host countries	Non-financial income of US MNEs	Cross sectional data	STR	Semi-elasticity of foreign tax rate to be -3.2	An increase tax rate in host country will reduce US outbound FDI	Non-financial sector
Bartelsman and Beetsma (2003)	1979-1997	22 OECD countries	Value added reported and non reported	OLS based on production function	STR	65% of additional revenue from a 1% point increase in the local tax is lost due to transfer pricing	A substantial share of the revenues from a unilateral increase in the STR is lost because of a decline in reported income	Manufacturing sector
Clausing (2003)	1997-1999	US	Import and export prices of US based firms	Simple regression	STR	Semi-elasticity of -2 and 2 for import and export prices in intra-firm trade respectively with respect to foreign tax rate	Controlling for other variables that affect trade prices, as country tax rates are lower, US intra-firm export prices are lower, and US intra-firm import prices are higher - confirming tax motivated income shifting behaviour	All
Ramb and Weichenrider (2005)	1996-2002	Germany	Foreign held affiliates in Germany	Panel data technique -FE	STR	Semi-elasticity of intra-company loans wrt German tax rate is found to be -0.14	Corporate tax rate of the foreign parent has no significant impact on the financial structure of a German subsidiary. However, among subsidiaries that are directly held by a foreign investor those firms that on average are profitable react more strongly to changes in the German corporate tax rate than this is the case for less profitable firms	Non-financial sector
Grubert and Slemrod (1998)	1982	US corporations in Puerto Rico	After tax profit	Tobit and probit model	STR	Not explicitly given	Income shifting advantages are the predominant reason for US investment in Puerto Rico	Manufacturing sector
Grubert and Rauh (2005)	1960-2003	US	Corporate taxable income	IV	METR	Elasticity of corporate tax base wrt EMTR is -0.2	Corporate tax base is responsive to the marginal effective tax rate	All

Buettner et al. (2006)	1996-2004	24 countries, most of them are from EU	German outbound, represented by debt/asset ratio	Fixed effects	STR	Semi-elasticity varies from 0.34 to 0.44	Sensitivity of investment to STR is found to be higher in countries where a thin-capitalization rule is imposed (a rule which deny interest deductions on intercompany debt if debt-equity ratio exceed certain thresholds)	All
Clausing (2007)	1979-2002	29 OECD countries	Corporate tax revenue/GDP	Simple regression	STR	Parabolic relationship between tax rates and revenue with revenue maximizing STR of 33% for the whole sample	The revenue maximising rate is found to be decrease as economies are smaller and more integrated with world economy	All
Brill and Hassett (2007)	1980-2005	29 OECD countries	Corporate tax revenue/GDP	Simple regression	STR	Parabolic relationship between tax rates and revenue with revenue maximizing STR of 26% for the whole sample	The revenue maximising rate is found to be decrease as economies are smaller and more integrated with world economy	All
Grubert and Mutti (1991)	1982	US real capital controlled by MNCs in 33 countries	After tax profit	Simple regression	EATR and STR	Not explicitly given	US appears both to import more from and export more to low-tax countries where MNC investment is greater	Manufacturing sector

Note: EMTR-Effective marginal tax rate, EATR-Effective average tax rate, STR, Statutory tax rate, MNEs-Multinational enterprises and when only elasticity or semi-elastic is given in a study; we transform them to semi-elastic or elasticity using the given mean tax rate across the sample country and year.

Source: Copenhagen Economics.

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