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Corporate Tax Policy, Entrepreneurship and Incorporation in the EU

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Corporate tax policy, entrepreneurship and incorporation in the EU

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Abstract:

In Europe, declining corporate tax rates have come along with rising tax-to-GDP ratios. This paper explores to what extent income shifting from the personal to the corporate tax base can explain these diverging developments. We exploit a panel of European data on firm births and legal form of business to analyze income shifting via increased entrepreneurship and incorporation. The results suggest that lower corporate taxes exert an ambiguous effect on entrepreneurship. The effect on incorporation is significant and large. It implies that the revenue effects of lower corporate tax rates – possibly induced by tax competition -- partly show up in lower personal tax revenues rather than lower corporate tax revenues. Simulations suggest that between 10% and 17% of corporate tax revenue can be attributed to income shifting. Income shifting is found to have raised the corporate tax-to-GDP ratio by some 0.2%-points since the early 1990s.

Keywords: Corporate tax; Personal tax; Entrepreneurship; Incorporation; Income shifting.

JEL Classification: H25, L26.

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1 Introduction

While corporate tax rates in the European Union have fallen since the early 1980s, the share of corporate tax revenue in GDP has increased during this period. Some explanations have been put forward for these diverging developments. For instance, policy reforms have been accompanied by a broadening of the tax base, which made up for the revenue loss from tax rate reductions. Yet, while base broadening policies may indeed explain part of corporate tax rate-revenue paradox, it is unlikely to be complete.

This paper explores other explanations for the broadening of the corporate tax base that has occurred parallel to the lowering of tax rates. In particular, the reduction in corporate tax rates may have encouraged a shift of income from the personal towards the corporate tax base. One such response is through increased entrepreneurship. Indeed, to the extent that a lower corporate tax rate encourages people to become entrepreneur instead of employee, income will be shifted from labour income towards entrepreneurial income. This may broaden the corporate tax base. A second type of income shifting occurs through the choice of legal form of companies. Entrepreneurs face a choice between a (closely held) corporation and other legal forms of doing business, such as the (sole) proprietorship. Lower corporate tax rates may have induced them to switch to the corporate form, which then broadens the corporate tax base.

US evidence suggests that income shifting between personal and corporate tax bases is indeed significant (Gordon and Slemrod, 2000; Gordon and MacKie-Mason, 1994; MacKie-Mason and Gordon, 1997; Goolsbee, 1998; 2004). For Europe, such evidence is scarce.[1] This paper contributes to the literature by empirically exploring income shifting in Europe. Thereby, we analyze the two channels of income shifting discussed above, i.e. the choice of entrepreneurship and the choice of legal form. We use panel data from Eurostat on indicators for entrepreneurship and the share of the corporate sector in total business activity. Data are available for 20 European countries, 60 sectors and a maximum coverage of six years between 1998 and 2003.

Income shifting between personal and corporate taxes may have important implications for corporate tax policy in Europe. In particular, policy-makers may not worry too much about tax competition as long as the decline in corporate tax rates does not lead to a

[1] An exception is Fuest and Weichenrieder (2002) who explore the share of corporate savings in total private savings in the OECD.

fall in corporate tax revenues. However, if income shifting between personal and corporate tax revenue is a major driving force for stable corporate tax receipts, then tax competition will not erode corporate but personal tax revenue. It would then imply that there *is* reason to worry about tax competition, since lower corporate tax rates do erode the financial basis of the public sector and of its redistributive policies in particular. Indeed, tax competition then erodes the role of the corporate tax as a backstop for the personal income tax, with important implications for total public revenue.

This paper is organized as follows. Section (2) elaborates in more detail on the paradox of falling corporate tax rates and rising corporate tax revenues in the European Union over the past decades. Section (3) formulates our predictions on income shifting between personal and corporate tax bases as an explanation for this paradox and elaborates on existing empirical evidence. Section (4) describes the data that we use to test our hypotheses on income shifting. Section (5) presents our empirical analysis and discusses the implications of income shifting for the corporate tax-to-GDP ratio. Finally, section (6) concludes.

2. The corporate tax rate-revenue paradox

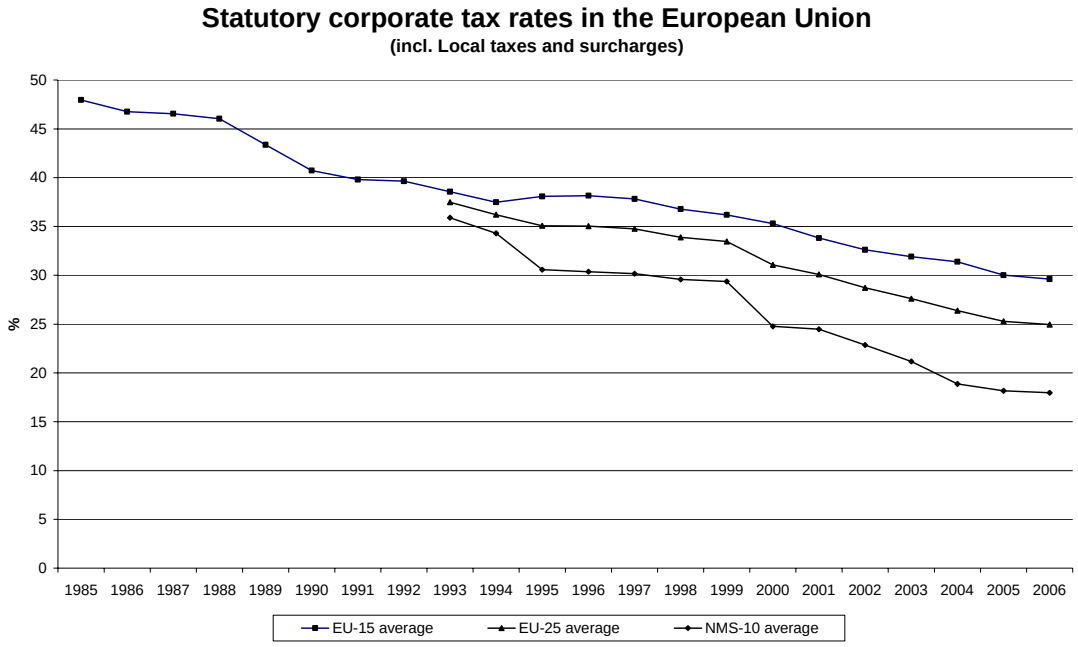
2.1 The negative relationship between corporate tax rates and revenues

During the past two decades, statutory corporate tax rates in Europe have fallen considerably. Figure 2.1 illustrates this. It shows the development of the average statutory corporate tax rate in the European Union between 1985 and 2006. We see that the average tax rate has dropped in the EU-15 from slightly below 50% in 1985 to 30% in 2006.

The decline in corporate tax rates has induced fears of a race-to-the-bottom in the European Union, i.e. a process in which competing governments successively undercut each others tax rates in order to attract mobile tax bases.[2] This could ultimately erode corporate tax revenues and impose a threat to the financing of the European welfare states. Such fears for tax competition have been reinforced recently by the accession of ten new Member States (NMS). Indeed, these countries apply corporate tax rates that have gradually reached levels of more than 10%-points lower than in the EU-15 countries (figure 2.1).

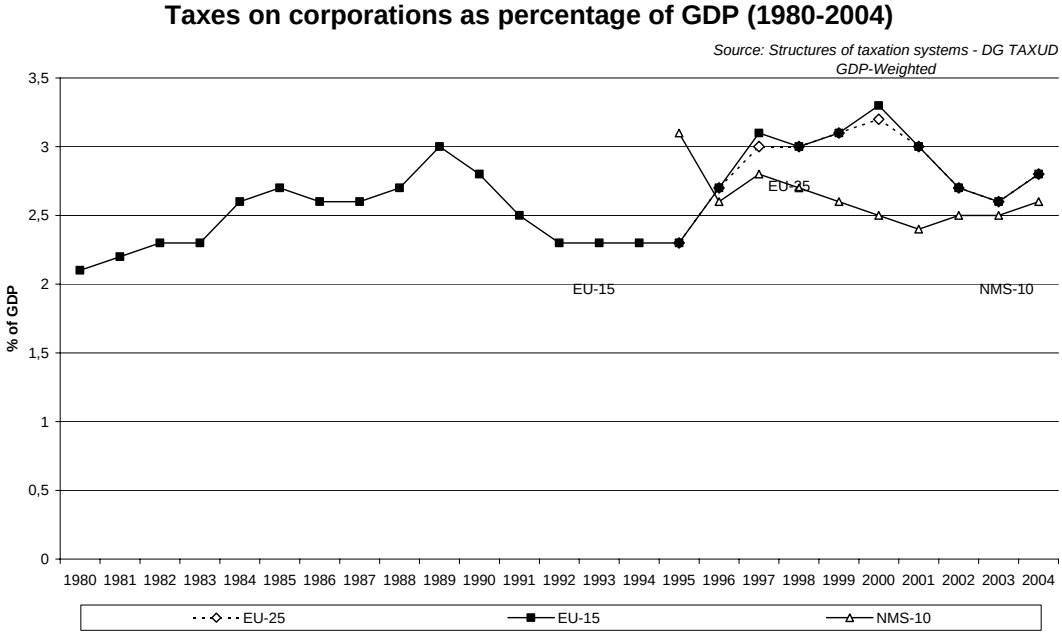
[2] See Nicodème (2006) for a review of the literature on tax competition. Note that the incentive for undercutting each others tax rates is counterbalanced by the incentive to export taxes in light of a growing share of foreign ownership of domestic firms, see Huizinga and Nicodème (2006).

Figure 2.1: Evolution of statutory corporate income tax rates in the European Union.



Source: European Commission. The rates include local taxes and applicable surcharges.

Figure 2.2: Corporate income tax in percentage of GDP.

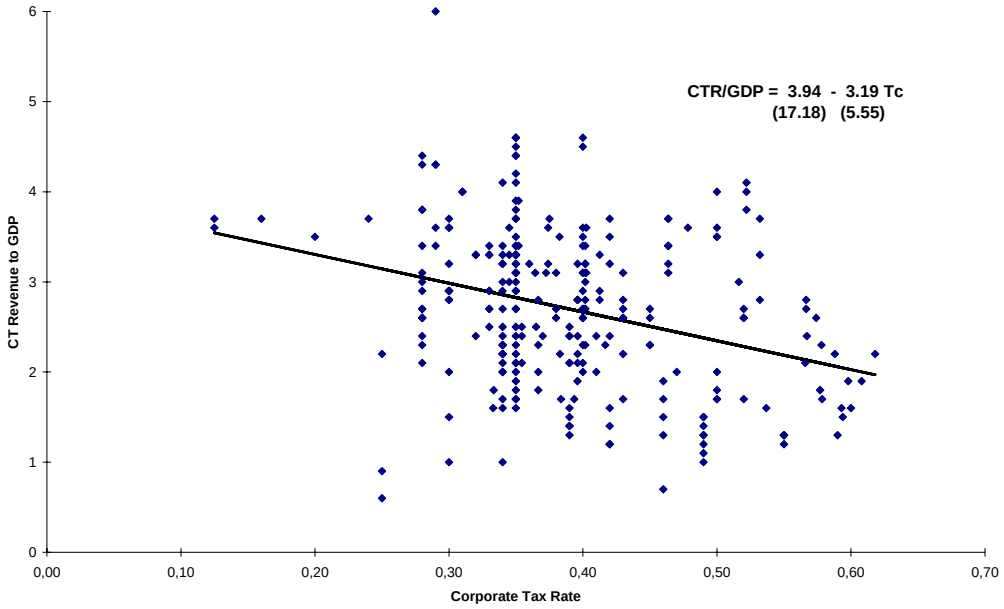


Source: European Commission. Measures are GDP-weighted.

Despite the reduction in corporate tax rates, corporate tax revenues have maintained remarkably stable over the past decades. Figure 2.2 shows the development of corporate tax

revenue as a share of GDP during 1980 and 2004 for the European Union. We see that this corporate income tax-to-GDP ratio is volatile as it is heavily influenced by the business cycle. The trend in figure 2.2 suggests, however, that the ratio has remained stable since 1980 for the EU-15 and actually increased somewhat during the last decade.

Figure 2.3: Relationship between corporate tax to GDP ratio and the statutory rate.



Source: European Commission and Structures of taxation systems.

While trends suggest an inverse relationship between corporate tax rates and corporate tax revenue over time, this relationship is also present in a cross-section of European countries. Indeed, countries featuring a relatively high corporate tax rate tend to collect relatively little corporate tax revenue.[3] Figure 2.3 plots pairs of the tax rate and the corporate tax-to-GDP ratio between 1985 and 2004 for 14 old EU Member States (EU-15 minus Luxembourg). A simple regression suggests that an increase in the corporate tax rate by 1%-point is accompanied by a fall in corporate tax-to-GDP ratio by 0.0319 (t-stats are reported between brackets).

[3] If we correlate for 14 EU countries (EU-15 minus Luxembourg) the statutory corporate tax rate with the corporate tax to GDP ratio, we find a negative correlation for most of the years between 1985 and 2004. On average for this period, the correlation is – 0.13.

2.2 A decomposition of the corporate tax-to-GDP ratio

The negative correlation points to a paradox between rate and revenue. Apparently, the corporate tax base has broadened, which made up for the revenue loss from rate reduction. A growing number of studies try to understand the origins of this base broadening (Devereux et al., 2004; Weichenrieder, 2005; Sørensen, 2006). Below, we follow this literature in describing trends in the components of the corporate tax base. In particular, we divide the corporate tax-to-GDP ratio into three components:

$$\frac{CTR}{GDP} = \frac{CTR}{TCP} x \frac{TCP}{TPE} x \frac{TPE}{GDP} \qquad (2.1)$$

The first term on the right hand side of (2.1) reflects corporate tax revenue (CTR) as a share of total gross operating profit of corporations (TCP). It provides a rough measure for the implicit tax on corporations. The second term measures total corporate profits as a share of total gross operating profit in the economy (TPE). It reflects the share of the corporate sector in the economy. The final term reflects total business income as a share of GDP. Figure 2.4 contains charts that describe for 12 European countries the development of the tax-to-GDP ratio and its three underlying components in (2.1).[4] These graphs reveal that the three components have evolved in diverse ways between countries.

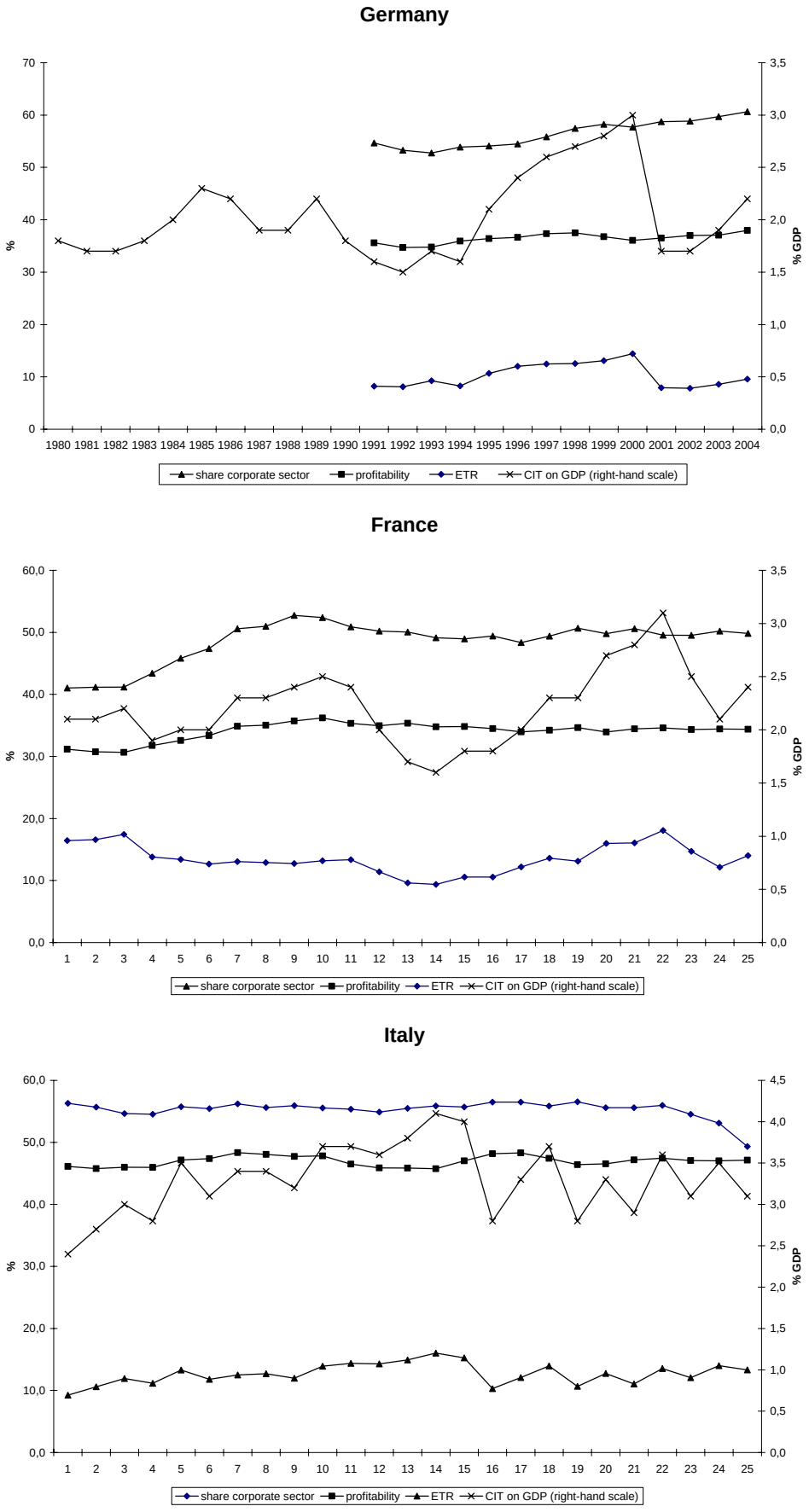
- The implicit taxes feature a fairly stable development in most countries. Exceptions are the UK and Poland, which show a decline; Spain and Finland show an increase.
- Most countries show a gradual rise in the degree of incorporation, including Germany, France, Belgium, the Netherlands, Austria, Finland, and Denmark. Italy and Spain show an opposite development.[5]
- The rate of total profit in the economy features a fairly stable development in most countries, although it has increased somewhat in France, Austria and Finland.

The diverse developments make it difficult to arrive at a single explanation for the rate-revenue paradox in corporate taxation in Europe. Below, we discuss each of the three components at the aggregate European level.

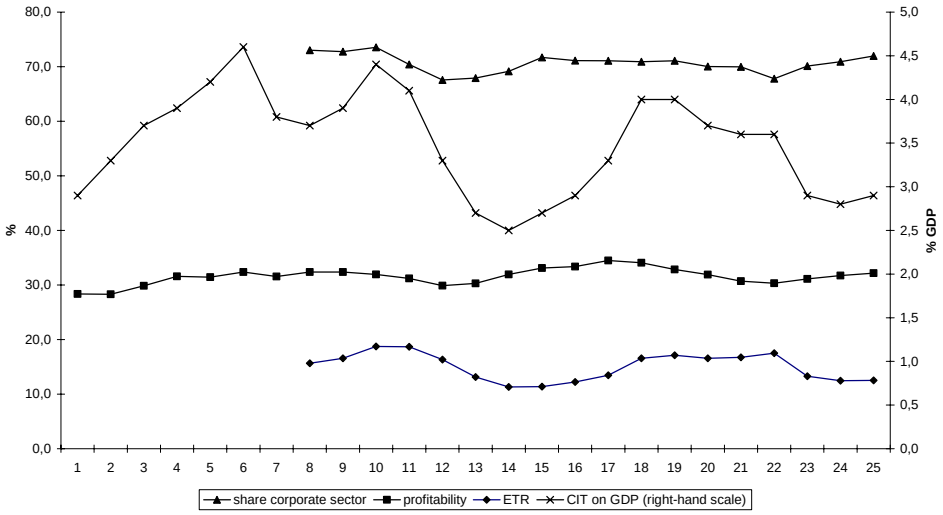
[4] Sørensen (2006) adopts a similar approach, but considers only seven European countries. Our source is the AMECO database from the European Commission.

[5] Weichenrieder (2005) shows longer time series for Austria and Germany. In Austria, corporate share increased from 50% in the mid 1970s to 75% today. In Germany, it rose from less than 40% to around 55%.

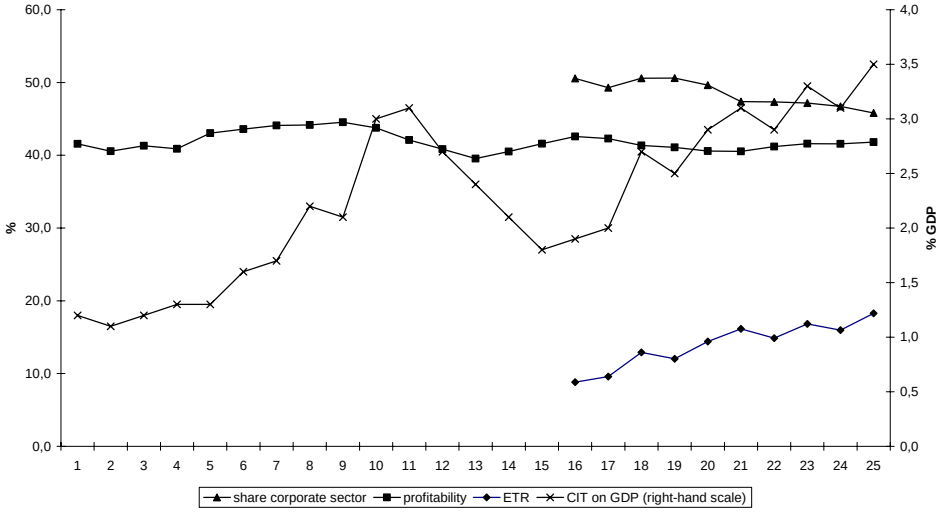
Figure 2.4: Corporate Income Tax on GDP and its components.



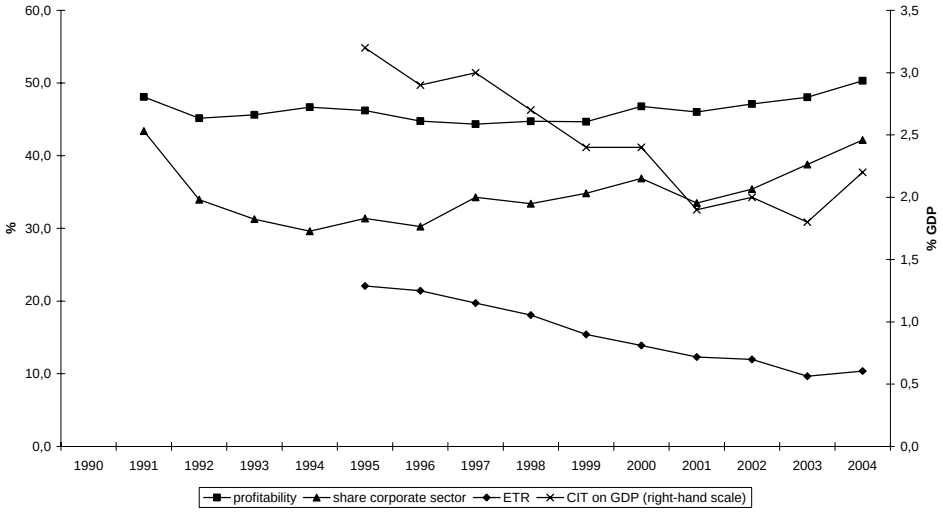
United Kingdom



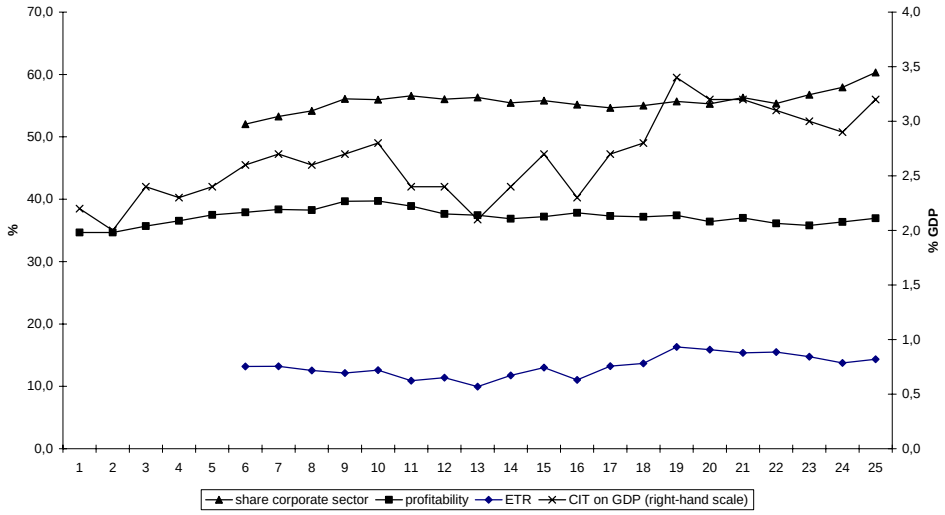
Spain



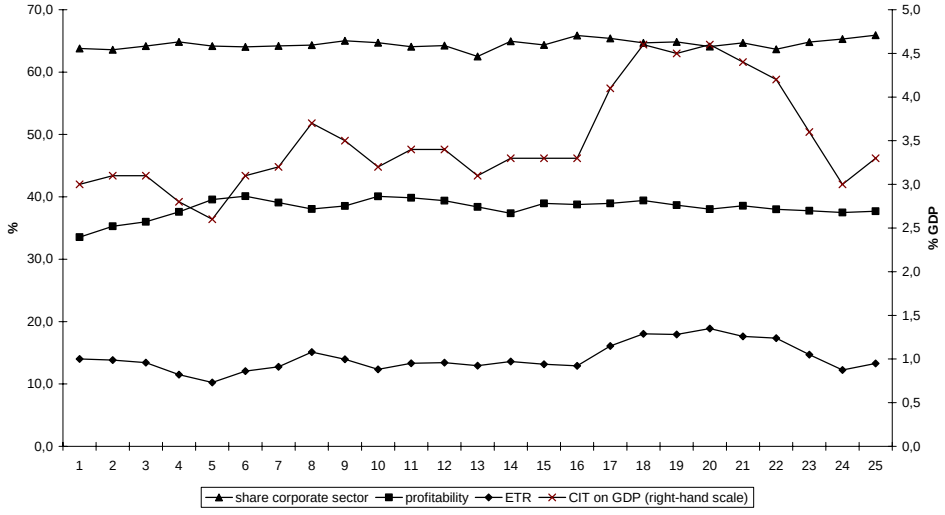
Poland



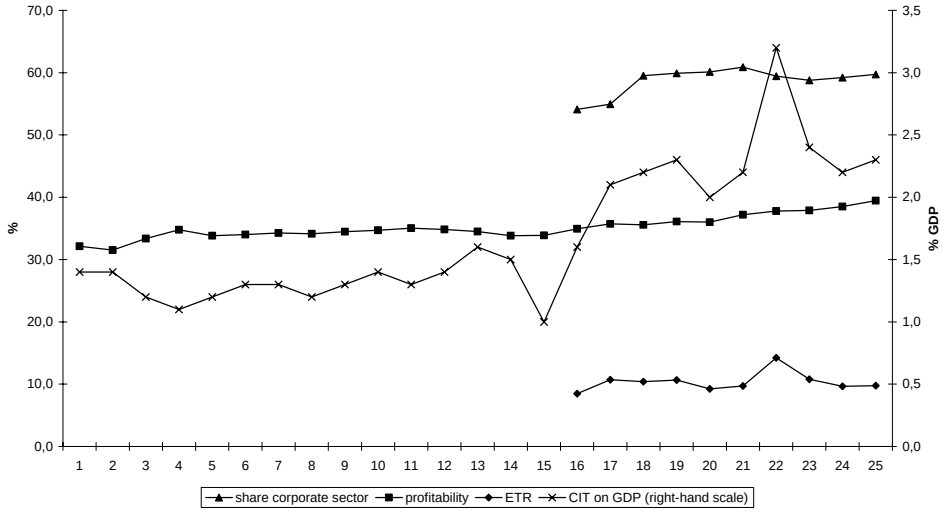
Belgium



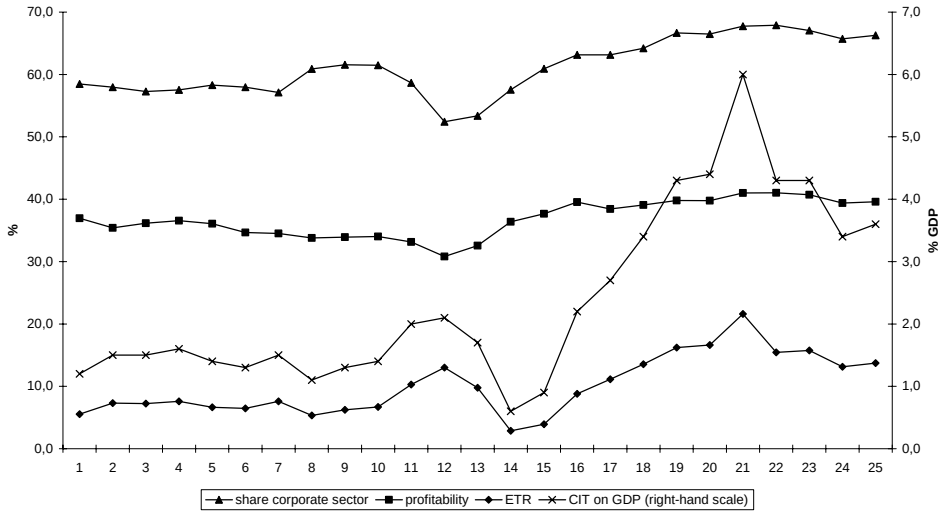
The Netherlands



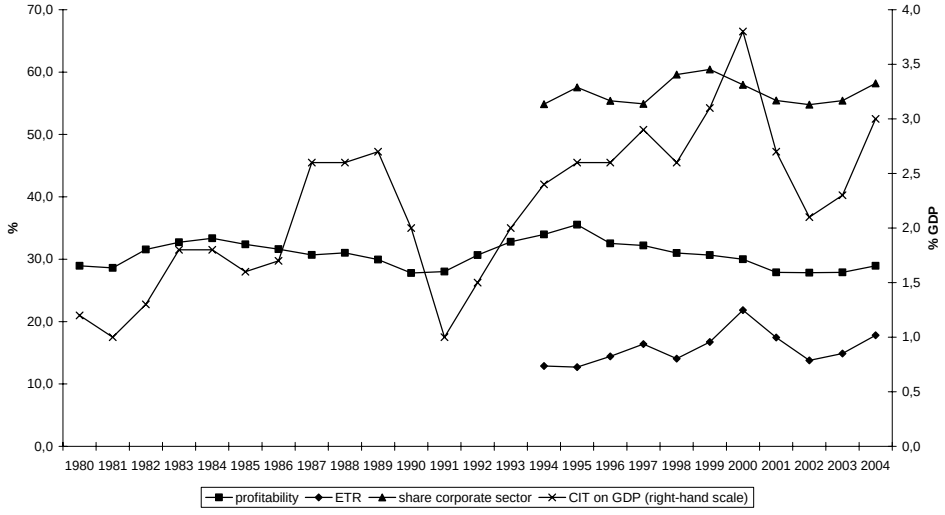
Austria



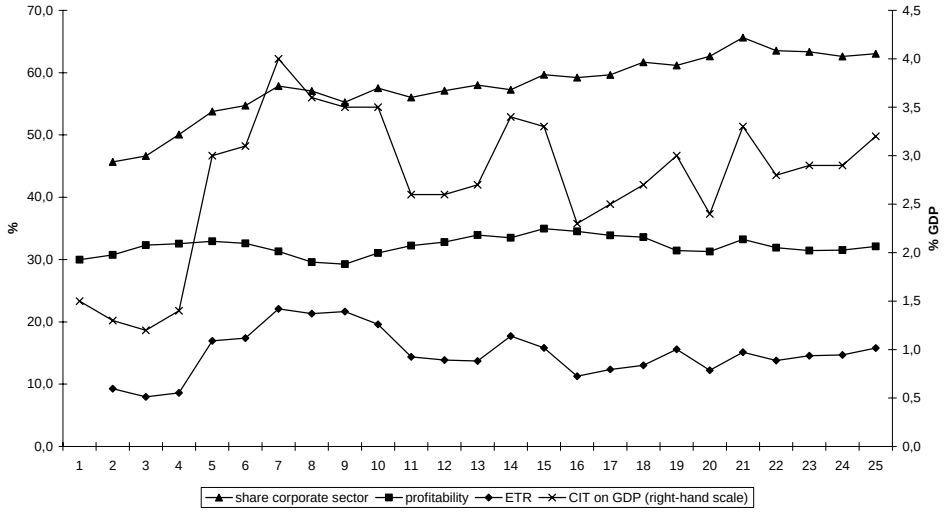
Finland



Sweden



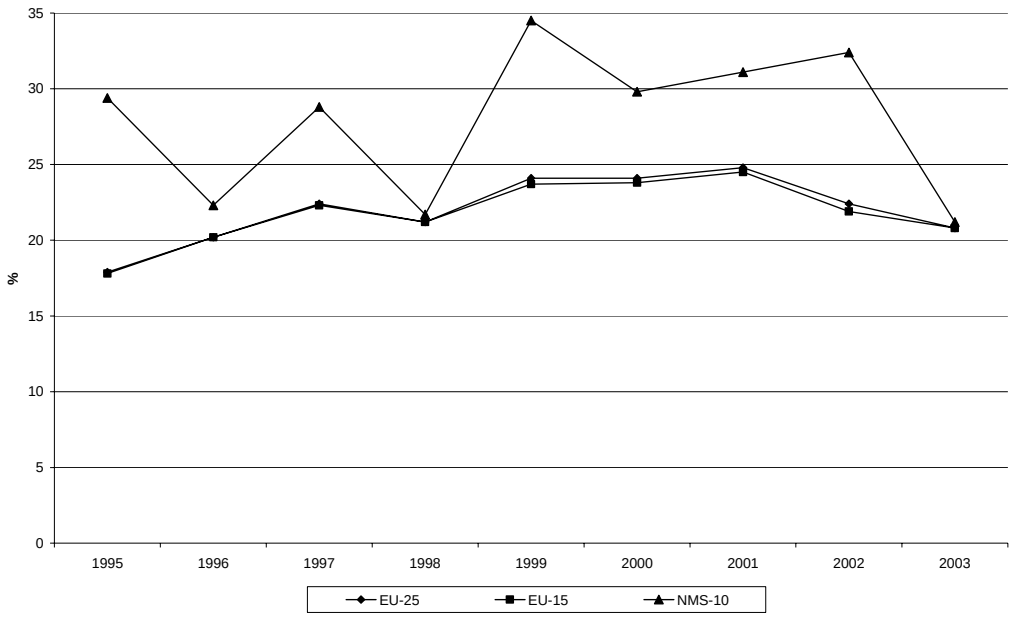
Denmark



2.3 Base broadening policies

The first term in (2.1) stands for the implicit tax on corporate income. Figure 2.5 shows its development according to the European Commission based on revenue statistics. The figure presents the GDP-weighted average for the EU between 1995 and 2003. We see that the implicit tax on corporate income in the EU-15 has increased between 1995 and 2001, but declined in 2002 and 2003. The development in the new member states was more volatile.

Figure 2.5: Implicit tax rate on corporate income.



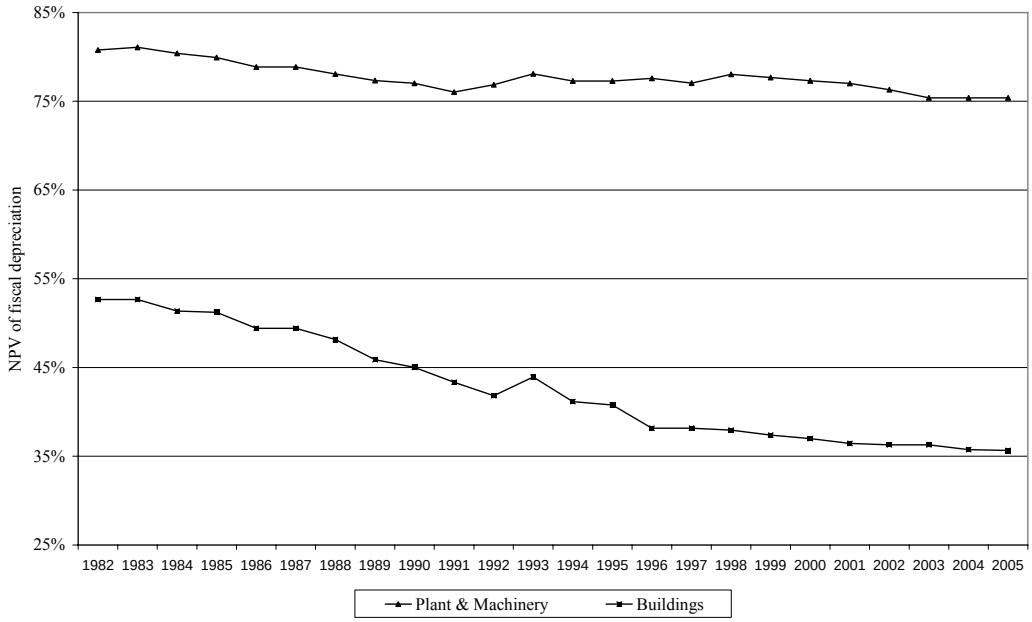
Source: Structure of taxation systems. Slovakia excluded from average for NMS-10. GDP-weighted averages.

One reason for the stable development of implicit tax rates observed in Figures 2.4 and 2.5 is that corporate tax rate reductions have been accompanied by base broadening policies in most countries, e.g. by means of reduced investment tax credits, loss offset rules, interest deductibility and fiscal depreciation[6]. Figure 2.6 provides ground for this latter policy development. It shows the arithmetic mean for 13 European countries (EU-15 minus Luxembourg and Denmark) for the net present value (NPV) of fiscal depreciation allowances

[6] In the US, Auerbach (2006) examines the role of losses in explaining the rise in the implicit tax rate on corporations.

in terms of the price of investment.[7] The figure reveals that fiscal depreciation rules have indeed become less generous during the past two decades, especially for buildings.[8]

Figure 2.6: Net Present Value of Fiscal Depreciation in the European Union.



Source: http://www.ifs.org.uk/data/internationaltaxdata.zip

NPV measures as arithmetic mean for 13 EU countries (base case for plant & machinery).

The question is whether policies of base broadening provide a complete explanation for the negative correlation between corporate tax revenue and corporate tax rates. We argue that this is unlikely. To show this, we consider the development of effective tax rates, which can be computed along the lines of King and Fullerton (1984).[9] The IFS has computed both the effective marginal (EMTR) and average (EATR) tax rates on corporate investment.[10] If policies of base broadening and rate reduction would have been revenue-neutral ex-ante, we expect the EMTR to rise and the EATR to fall for more profitable investments. The reason is that fiscal depreciation rules and other measures determining the tax base typically apply to the margin of new investment but not to the extraordinary profits. In contrast, the corporate

[7] These computations are carried out by the IFS (see e.g. Devereux et al., 2002; Griffith and Klemm, 2004). If investment could be expensed against corporate profits (as under a cash-flow tax), the measure of NPV would be 100%. It is lower than 100% if fiscal depreciation rules are less generous, which is what figure 2.6 reveals.

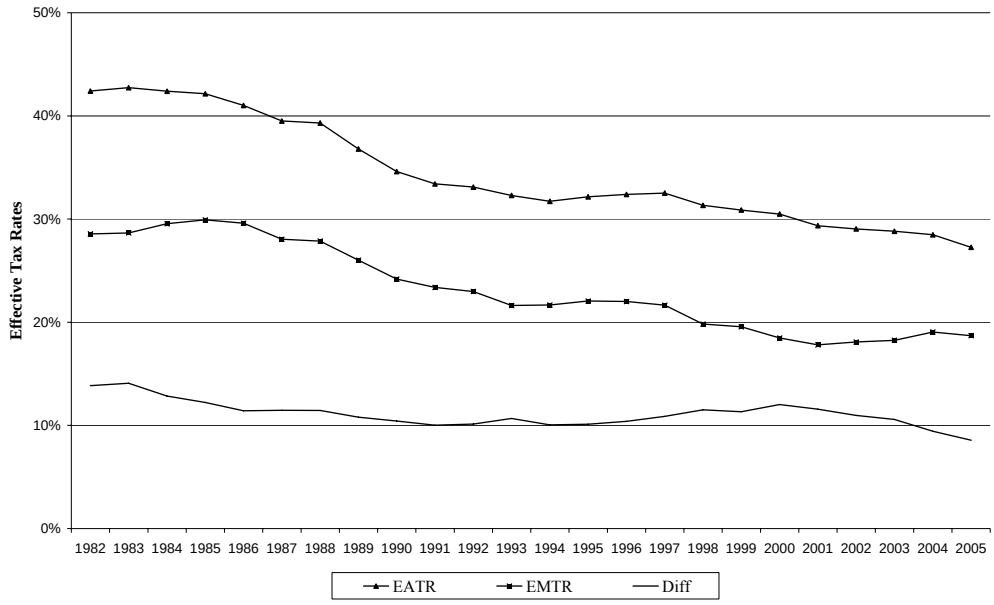
[8] Also in a cross-section of countries, we observe a negative correlation between the tax base and the tax rate. Indeed, the correlation between the statutory tax rate and the NPV-measure for plants and machinery suggests an average correlation of 0.17 for the years 1982 – 2005 (a higher NPV-measure denotes a narrower base).

[9] See Nicodème (2001) and Sørensen (2004) for an overview of different effective tax rate measures.

[10] The EMTR measures the tax burden at the margin of new investment, i.e. with a return that matches the cost of investment. The EATR measures the tax on investments that earn an above normal return, i.e. an economic rent.

tax rate applies to both the normal return and the profit. Hence, a revenue-neutral reform characterized by base broadening and rate reduction comes down to a shift from a tax on extraordinary profits towards the marginal return on investment. This will reduce the EATR but raise the EMTR. Figure 2.7 shows developments of the EATR and the EMTR between 1982 and 2005.

Figure 2.7: Evolution of Effective Marginal and Average Tax rates in Europe.



Source: http://www.ifs.org.uk/data/internationaltaxdata.zip
Arithmetic mean of EMTR (base case) and EATR (with 40% economic rent) for 13 EU countries

We observe that the EATR has gradually declined in Europe during the past two decades, in line with the fall in statutory rates. At the same time, the EMTR has fallen as well, albeit less substantially due to base broadening.[11] This suggests that base broadening is unlikely to have been sufficient to make up for the ex-ante revenue losses from rate reduction. Indeed, base broadening has probably only compensated partly for the revenue effects from rate reduction. Therefore, other explanations for the corporate tax rate-revenue paradox need to be explored.

[11] Base broadening through the less generous accelerated depreciation implies that corporate tax is collected earlier. The structural revenue gains show up in reduced interest payments, rather than higher corporate tax revenue. This provides further doubt on the effects of base broadening on the corporate tax-to-GDP ratio.

2.4 The size of the corporate sector

The second term on the right hand side of (2.1) reflects the corporate share of total pre-tax profit in the economy. The developments of these shares for individual European countries in the graphs of Figure 2.4 suggest that a growing degree of incorporation may well explain part of the broadening of the corporate tax base in Europe.

An important question from a tax-policy perspective is whether this growth in the corporate share of business income has been caused by reductions in the corporate tax rate, or that other non-tax factors are responsible for it. Indeed, if the shifting from personal to corporate income would be the result from lower corporate income tax rates (induced by tax competition), the revenue consequences of this will not show up in corporate tax revenues but in personal tax revenues. This will shed new light on the tax competition debate as the adverse revenue implications of tax competition can be more severe than when only corporate tax revenues are considered. It also relates to the fundamental reason for the existence of the corporate tax, which is to serve as a backstop for the personal income tax (see e.g. De Mooij (2005), Weichenrieder (2005), Sørensen (2006)). To the extent that tax competition drives down corporate tax rates, it undermines this backstop function.

The rest of this paper explores this question in more detail. In particular, we analyze to what extent a lower corporate tax rate induces a shift of business income from the personal tax base (applying to sole proprietorships) to the corporate tax base (applying to limited liability firms) by affecting the share of business that operates under the corporate legal form.[12]

2.5 The business income share

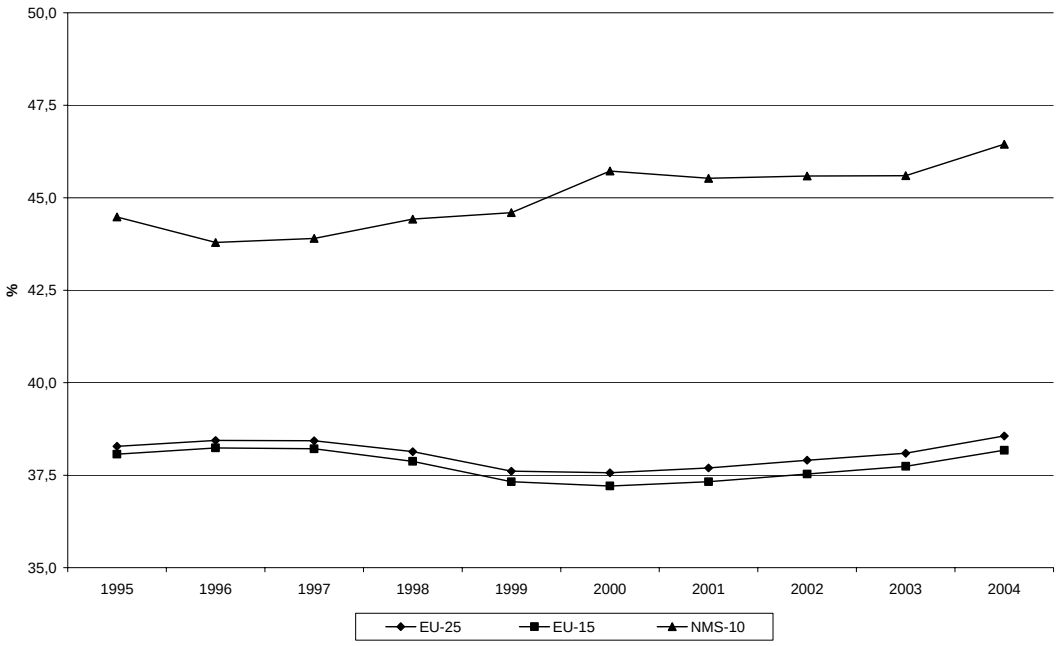
The third term on the right hand side of expression (2.1) stands for pre-tax profitability in the economy. The graphs in figure 2.4 suggest that this share has increased for some but not all countries. These diverse developments can have different backgrounds. For instance, for an individual country, a lower corporate tax rate may attract foreign direct investment and profits of multinational companies. This would endogenously broaden the corporate tax base. However, a broader tax base in one country should then be accompanied by a smaller tax base

[12] Devereux et al. (2004) and Auerbach (2006) mention the rising share of the financial sector in the economy as another potential explanation for the growing share of the corporate sector. This paper does not aim at explaining the rise in the corporate tax base, but focuses on the extent to which lower corporate tax rates have affected this share via entrepreneurship and incorporation. Therefore, we pay no further attention to sectoral restructuring.

in another country. On balance, we should thus observe a shift in profit income between countries, not a rise in overall business income.

What happened to profitability across-the-board? Figure 2.8 shows the development of profit income for the EU as a whole during the last decade. It shows a slight fall in profitability during the late 1990s, but an increase since 2000. As this is precisely a period of rapidly declining corporate tax rates (see Figure 2.1), it fuels suspicion that changes in business income may also be related to the corporate tax rate.

Figure 2.8: Evolution of profitability in the European Union.



Source: AMECO. Profitability is defined as the ratio of the gross operating surplus in the economy on GDP. Averages are GDP-weighted.

As with the degree of incorporation, the question is thus whether changes in the share of business income in the economy have been caused by corporate tax cuts or that other trends, such as ongoing economic integration, are responsible for it. We explore this question by analyzing the impact of corporate taxes on entrepreneurship. In particular, people in the workforce face a choice to undertake economic activities as an employee or as an entrepreneur. Wage income of employees is taxed under the personal tax, while business income can be taxed under the corporate tax if the entrepreneur chooses to incorporate. Thus, a positive impact of corporate taxation on entrepreneurship would cause a rise in the share of business income in the economy and, thereby, a broadening of the corporate tax base.

3. Corporate taxation and income shifting

This section develops a model in which individuals take two successive decisions. First, they choose whether or not to become entrepreneur, thereby leaving open the legal form in which they would do business. If they become entrepreneur, they decide in the second step about the legal form of doing business, i.e. the corporate or non-corporate form.

3.1 Taxation and entrepreneurship: theoretical predictions

Taxation may affect the choice of starting a business.[13] To understand this relationship, we develop a simple model of entrepreneurship. Suppose an individual can earn a certain income Y_e if he decides to occupy regular employment. This income will be taxed under the personal income tax (T_p), which can depend on the level of income, i.e. $\partial T_p / \partial Y > 0$. Utility at income $(1-T_p)Y_e$ equals:

$$U_e = u[(1-T_p)Y_e] \qquad (3.1)$$

The individual can alternatively become an entrepreneur. There are three major differences between the income as an employee and the income undertaken as a business:

- Self-employment income involves *more uncertainty* as entrepreneurship is more risky than other occupations.[14] The expected income of the individual as an entrepreneur is denoted by $E(Y_b)$, where Y_b has a density function $\varphi(.)$ between minimal income Y_b^0 and the maximum level Y_b^1.
- Entrepreneurial income may be *taxed differently*. If the company is organized as a sole proprietorship, income is taxed under the personal income tax T_p. If it organized as a (closely held) corporation, it is taxed under the corporate income tax, denoted by T_c. In principle, also T_c may depend on the level of income, Y_b, if the tax system is non-linear. A potential entrepreneur might not know ex-ante what the future legal form of

[13] Entrepreneurial activity may generate positive spillovers via the development of new technologies, new products and higher productivity in the economy. This can provide a rationale for subsidies on entrepreneurship through the tax system. This paper does not consider externalities from entrepreneurship as our focus is on income shifting, rather than other aspects of entrepreneurship.

[14] For instance, fixed wage contracts insure workers against shocks in productivity, e.g. due to business cycle developments. Indeed, Guiso *et al.* (2005) show that firms are an important vehicle of the insurance provision for the worker. The self-employed bear these risks themselves.

the business will be. For instance the entrepreneur may start non-corporate (so as to deduct losses against other incomes) and decide to incorporate at a later stage (to benefit from lower taxes in the corporate form). This option to incorporate should be taken into account when deciding about starting a business. We denote the expected business income tax as: $\alpha T_p + (1-\alpha)T_c$, where $\alpha = 1$ if the business would be run in the non-corporate form and $\alpha = 0$ if it were run in the corporate form. A value of $0 < \alpha < 1$ reflects the option value to incorporate. Expected after-tax income from business equals $[\alpha(1-T_p) + (1-\alpha)(1-T_c)]\, E(Y_b)$.

- Self employment can provide *tax sheltering opportunities*. For instance, it can be easier to underreport self-employment income than wage income. Moreover, there are usually legal opportunities to deduct business-related consumption from the tax bill. We assume that a business provides tax shelter for a fixed amount S. Hence, the entrepreneur saves $[\alpha T_p + (1-\alpha)T_c]\, S$ on her/his tax bill as compared to receiving wage income.

  The expected utility of the entrepreneur is equal to:

$$U_b = E\left(u\{[\alpha(1-T_p) + (1-\alpha)(1-T_c)]\, Y_b + [\alpha T_p + (1-\alpha)T_c]\, S\}\right) \quad (3.2)$$

Arbitrage implies that an individual will start a business if his expected utility from entrepreneurship in (3.2) exceeds the utility from employment in (3.1), i.e. $U_b > U_e$. Assume that utility is characterized by $u(Y) = Y^{\gamma}$, where $\gamma \leq 1$ denotes the coefficient of risk aversion. The individual will choose entrepreneurship if:

$$[(1-T_p)Y_e]^{\gamma} < \int_{Y_b^0}^{Y_b^1} \{[\alpha(1-T_p) + (1-\alpha)(1-T_c)]\, \varphi(Y_b) + [\alpha T_p + (1-\alpha)T_c]\, S\}^{\gamma} dY_b \quad (3.3)$$

In the absence of taxation ($T_p = T_c = 0$), entrepreneurship will be chosen by individuals whose expected utility from self-employment, $\int\{\varphi(Y_b)\}^{\gamma} dY_b$, exceeds that from an ordinary occupation, Y_e^{γ}. Risk plays an important role in this decision. In particular, if agents are risk neutral ($\gamma = 1$), they would simply compare the expected entrepreneurial income $E(Y_b)$ with the income from an occupation Y_e. If agents are risk averse ($\gamma < 1$), the expected utility from entrepreneurial income on the right hand side of (3.3) declines with the variance of Y_b. Accordingly, a higher risk of entrepreneurship reduces the likelihood that an individual

engages in self-employment. Indeed, the riskier entrepreneurship becomes, the higher is the risk premium that individuals require to engage in it.

Taxes can affect the decision regarding entrepreneurship in (3.3) in four different ways.[15]

- *Option to incorporate.* Unlike employees, entrepreneurs have the option to be taxed under the corporate regime, rather than the personal tax regime. If the corporate income tax is below the personal income tax, this option is valuable. It can thus affect the incentive for agents to engage in entrepreneurial activity since only business and not wage income can be shifted. Indeed, the larger is the personal tax relative to the corporate tax, the more attractive is entrepreneurship relative to other occupations.

- *Tax shelter advantage.* Entrepreneurship provides a tax shelter advantage (S), which induces incentives to engage in a business. This advantage rises with the tax that applies to the entrepreneurial income. Thus, a higher level of the personal or corporate income tax raises entrepreneurship.

- *Tax as an insurance device.* Taxes may affect entrepreneurship through their effect on risk taking. If households are risk neutral, a proportional income tax $T_c = T_p$ would have no impact on risk taking (see (3.3) with $\gamma = 1$). If households are risk-averse, taxes may encourage risk taking as they reduce the variance in the after-tax entrepreneurial income in (3.3) and therefore the risk premium (the Domar-Musgrave effect). Thus, high personal or corporate taxes could increase the incentive for people to start a business on account of an insurance effect of taxes.

- *Tax progression effect.* The positive effect of income taxes on risk taking might not apply if income tax systems are non-linear. For instance, if the income tax is progressive, losses can be offset at lower rates than business profits are taxed. Moreover, if income tax systems provide limits to loss offset (losses do not lead to negative taxes), successful companies face a higher effective taxation than unsuccessful ones. Such non-linearities lower the expected after-tax return from taking risk and will therefore discourage entrepreneurship.

[15] We ignore the effect of income taxes on hours worked. This is sometimes mentioned in the literature as a negative impact of taxation on entrepreneurship. The reason why we ignore it is that this effect applies to workers and entrepreneurs alike and, therefore, does not affect the decision to engage in an ordinary job versus self employment.

From (3.3), we can derive the share of entrepreneurs in the workforce, given the distribution of Y_b's among individuals (as entrepreneurial skills are heterogeneous). The model yields some predictions regarding the impact of taxation on the share of entrepreneurship, although these predictions are sometimes ambiguous due to offsetting effects. This holds in particular for the corporate tax, which is our main variable of interest. Moreover, all predictions from the model are valid for given $\varphi(Y_b)$ and Y_e. Yet, for the share of entrepreneurship, the levels of $\varphi(Y_b)$ and Y_e may depend on general equilibrium effects induced by tax changes. This can indirectly affect the incentives for entrepreneurship. For instance, corporate and personal taxes may affect large and small companies differently, especially because larger firms generally show a higher degree of incorporation. Hence, the difference between personal and corporate taxes may reduce self-employment as it creates a competitive disadvantage for small firms relative to larger companies. Such general equilibrium mechanisms render the impact of both personal and corporate taxes on entrepreneurship even more ambiguous. Empirical evidence should therefore guide us on which effect dominates.

3.2 Taxation and entrepreneurship: empirical evidence

In our empirical analysis, we will explore the effect of tax variables on alternative indicators for entrepreneurship (*ENTR*). In particular, we estimate:

$$ENTR = \alpha_0 + + \alpha_1 T_p + \alpha_2 RIP + \alpha_3 T_c + \alpha_4 X + \varepsilon \qquad (3.4)$$

Expression (3.4) contains the tax on personal income (T_p), the ratio of tax progression (*RIP*) and the tax on corporate income (T_c). The *RIP* is defined as $\frac{1-T_m}{1-T_a}$, where T_m denotes the marginal tax rate on personal income and T_a stands for the average tax on personal income. A smaller *RIP* thus implies a more progressive tax system. We also adopt various control variables (X) that can affect entrepreneurship, such as the functioning of the capital market, and the administrative costs of starting a business. Our main variable of interest is the corporate tax, i.e. the coefficient α_3.

The estimation of (3.4) fits to the empirical literature on taxation and entrepreneurship, which has primarily focussed on US data. We briefly discuss the main findings from this

literature.[16] First, there exists a large literature on the impact of personal income taxes on entrepreneurship, which is usually measured by the rate of self-employment, e.g. the number of self-employed in terms of the workforce. Some studies also use data on entrepreneurial entry (see e.g. Gentry and Hubbard, 2000; Bruce and Gurley, 2004; Fossen and Steiner, 2006). The earlier studies using time-series data generally conclude that higher personal income tax rates encourage entrepreneurship. This is explained by the tax shelter advantage of self-employment (Long, 1982; Blau, 1987; Parker, 1996; Cowling and Mitchell, 1997; Robson, 1998). Using individual data of personal income tax returns, Cullen and Gordon (2002) also report a positive effect, but find that this is especially due to the impact of taxes on risk taking. More recent studies, based on cross-sectional or panel data, have been less conclusive on the tax effect on entrepreneurship (Bruce, 2000, 2002; Gentry and Hubbard, 2000; Schuetze, 2000; Carroll et al., 2001; Parker and Robson, 2003; Bruce and Mohsin, 2006). In particular, some studies report positive and others negative effects. Georgellis and Wall (2006) and Garrett and Wall (2006) argue that the relationship between personal income taxes and entrepreneurship might in fact be U-shaped: small and high levels of income taxes encourage entrepreneurship. They indeed find evidence for this non-linear relationship, although results are not always significant. Overall, the literature leaves us with an ambiguous picture on the effect of personal income taxes on entrepreneurship. Less ambiguity is found for the degree of progression in the income tax schedule, which generally tends to discourage entrepreneurship (Robson and Wren, 1999; Gentry and Hubbard, 2000 and 2004). This is consistent with the theoretical predictions based on the risk taking effect.

The focus in our study is on the corporate tax. There are fewer studies considering the impact of corporate taxes on entrepreneurship than on personal income taxes. The available evidence on corporate taxes is also mixed. First, Robson (1998) uses time series data for the UK to explore -- among a large set of variables -- the impact of the small business' corporate tax rate on the rate of self-employment. He reports a positive but statistically insignificant effect. Cullen and Gordon (2002) use their individual data on self-employment to estimate the effect of corporate taxes. They find a positive effect on account of the risk-taking effect, which outweighs the negative impact via income shifting. Bruce and Mohsin (2006) use time series data for the US to explore the impact of corporate taxes on the rate of self-employment. They report a negative effect for some but not all indicators of entrepreneurship. The effect

[16] See Bruce and Schuetze (2004) for an overview. Some studies also analyze capital gains taxes and entrepreneurship (Poterba, 1989) or the role of wealth taxes (Hansson, 2005), which we ignore in our estimation.

for the corporate tax appears to be rather small though. Garrett and Wall (2006) use a panel for 50 US states during the 1990s to estimate the effect of corporate taxes on entrepreneurship, measured as the share of the working-age population in proprietorships. They report a large negative impact that is, however, not significant at the 5% confidence level. In section 5, we will present our regressions results for expression (3.4) to explore the relationship between tax variables and entrepreneurship in the EU.

3.3 Taxation and the choice of organisational form: theoretical predictions

Once the decision to start a business has been made, entrepreneurs face a choice of legal form, i.e. the corporate versus non-corporate form. Taxation can affect this choice. To understand this, we propose a simple model along the lines of MacKie-Mason and Gordon (1997) and Goolsbee (1998; 2004). In the model, an entrepreneur earns income Y_b by undertaking her/his economic activities. If she/he decides to run her/his business as a sole proprietorship, she/he will be taxed at the ordinary personal income tax T_p. Hence, net income will be:

$$Y_b^{nc} = (1 - T_p) Y_b \qquad (3.5)$$

If the entrepreneur runs her/his business as a (closely held) corporation, her/his income will be taxed under the rules of the corporate tax system. Effectively, the corporate tax regime consists of the corporate income tax (T_b) plus the income tax that applies to either profit distributions or realized capital gains (T_d), taking into account the possible double-tax relief. European countries adopt diverse regimes for dividend and capital gains taxation, which we will discuss in the next section. We denote the overall tax on business income in the corporate form by T_c, which equals $T_c = T_b + \beta(1 - T_b)\, T_d$, where $\beta < 1$ if a country provides double taxation relief through its integration system. In addition to income Y_b, a business organized in the corporate form may collect non-tax benefits, denoted by B (or non-tax costs if $B < 0$). The non-tax benefits can be related to the limited liability of incorporation, which reduces the individual risk of doing business. Indeed, limited liability means that the entrepreneur does not risk his individual assets or income when taking part in the firm, since he is only liable for the capital invested in the company. Moreover, corporate businesses may have an advantage in attracting capital due of the public trading of shares. Non-tax costs can be related to capital

requirements and legal obligations for companies in the corporate form.[17] The non-tax costs and benefits can be heterogeneous among companies. Assuming that the non-tax benefits or costs are untaxed, the overall net income from corporate business equals:

$$Y_b^c = (1 - T_c)Y_b + B \qquad (3.6)$$

An entrepreneur facing the choice of organizational form will compare the respective after-tax incomes and decides to incorporate if $Y_b^c > Y_b^{nc}$. [18] This condition boils down to:

$$B > (T_c - T_p)Y_b \qquad (3.7)$$

Hence, the entrepreneur will choose the corporate form as long as the non-tax benefits exceed the net tax loss of the corporate form. The tax differential $T_c - T_p$ thus measures the tax distortion on the organizational form of companies. From (3.7), we can derive the number of companies that will choose to incorporate. This will depend on the distribution of B across companies. In particular, if B would follow a uniform distribution across firms, then the relationship between the share of companies that chooses the corporate form and the tax difference would be linear. If B features a non-uniform distribution, then this relationship might be non-linear.

3.4 Taxation and the choice of organisational form: empirical evidence

In section 5, we estimate the following equation for the corporate share of business in the economy (*CORP*):

$$CORP = \beta_0 + \beta_1 (T_p - T_c) + \beta_2 X + \varepsilon \qquad (3.8)$$

We expect a positive sign for β_1. Apart from this linear equation, we will also explore alternative specifications.

The effect of taxation on the division of business in the corporate versus non-corporate form has been analyzed in previous research for the United States. Gordon and MacKie-

[17] See Mackie-Mason and Gordon (1997) for a discussion of the non-tax costs and benefits of incorporation.
[18] In practice, there can be several exceptions to this dichotomy between sole proprietorships and corporations. For instance, some firms may have limited liability, but are still taxed under the non-corporate form. We ignore these exceptions in our analysis.

Mason (1994) use data on US firms between 1970 and 1986 to explore the importance of tax and non-tax factors in the choice of organisational form. They conclude that non-tax factors are considerably more important than taxes, implying that the efficiency cost of the tax distortion is relatively small. MacKie-Mason and Gordon (1997) use data on the corporate share of capital between 1959 and 1986 for the US and find that the tax differential between personal and corporate taxes exerts a significant effect on the corporate capital share, but only for firms that make positive profits. On aggregate, they find a very small effect. Thus, MacKie-Mason and Gordon (1997) conclude that non-tax factors are likely to be dominant in the choice of legal form by companies, rather than tax factors. Using similar time series data for the corporate share of capital between 1900 and 1939, Goolsbee (1998) reports a similar effect as Mackie-Mason and Gordon (1997).

Goolsbee (2004) argues that the earlier US studies might have problems in identifying the impact of taxes on organizational form since the time series variation in tax rates has been limited. Moreover, at the same time when tax rates were modified, other components of the tax system changed as well, which renders it difficult to identify the impact of the tax on organizational form. To allow for more variation in tax rates, Goolsbee (2004) adopts cross-section data for US States and industries in the retail trade sector in 1992. He explores several indicators for the size of the corporate sector, including the share of companies, the employment share and sales. The estimates suggest a much larger impact of corporate taxes on the rate of incorporation: raising the corporate tax rate by .1 reduces the corporate share of firms by 0.25 and the corporate share of sales and employment by 0.07 to 0.15.

Studies for Europe are scarce. One exception is Fuest and Weichenrieder (2002), who explore the impact of corporate and personal income taxes on the division of interest income between the corporate and non-corporate sector for 17 OECD countries between 1985 and 1997. They find that the difference in tax rates exerts a significant and strong effect on the share of corporate savings in total savings. Alstadsæter (2003) explores income shifting under the Norwegian split model, which is part of the dual income tax system. She shows that the corporate organisational form serves as a tax shelter for high income entrepreneurs under the split model. While she provides time series evidence for Norway that is consistent with income shifting towards the corporate form, she does not explicitly estimate the impact of taxes on incorporation.

4. Data

This section demonstrates our data used in the estimations for entrepreneurship and legal form. The appendix provides more information on the precise data sources and definitions.

4.1 Entrepreneurship

To construct our indicators for entrepreneurship and entrepreneurial entry, we use data from Eurostat on business demography in Europe for 20 European countries, 6 years between 1998 and 2003 and 60 sectors on the number of active companies and the number of firm births (see Schrör, 2005, for a description). The active firms reflect all enterprises that carry out a business with a positive turnover and/or employment. A firm birth amounts to the creation of a new firm and excludes entries due to mergers, break-ups or a restructuring of an enterprise. Hence, a firm birth occurs when an enterprise starts an activity from scratch. The data are available for five categories of firm size. We use three measures of entrepreneurship:

- *The birth rate of new companies.* It is computed as the number of firm births relative to the number of active companies.[19] This indicator is derived per country, year, sector, and size category.
- *The share of self employment.* This is computed as the number of active firms with zero employees divided by total employment. It is derived per country and year.
- *The birth of self employment.* It is obtained by dividing the number of firm births with zero employees by total employment.

Previous empirical studies have primarily used measures of the share of self-employment in the labour force (our second measure), although dynamic measures on business entry have been used by some studies (our first and third measure). Table 4.1 shows the averages of these three indicators per country. The first column of Table 4.1 shows that the average birth rate was 9.6% per year. It differs widely across countries though, from a low average birth rate in Switzerland of 3.6% per year, to a high rate in Latvia of 16.0%. For most countries, the birth rate lies somewhere between 7 and 12%.

[19] For small countries and sectors with a small number of active companies, the reported births rates were sometimes extremely high. We eliminated observations for which the birth rate was more than the sample mean plus two times the standard deviation. In practice, this means a maximum birth rate of around 32%.

The second column in Table 4.1 reports the share of self employment in the economy. On average, it equals 6.3%, varying from 0.6% in Latvia to 15.0% in Czech Republic. The birth of self employment on total employment, reported in the third column of Table 4.1, is 0.7% on average. Lithuania displays the lowest rate with 0.1% and Czech Republic the highest with 1.4%. The two indicators on self employment differ from the birth rate in that they measure (entry in) small businesses, rather than entrepreneurial entry in all firms. The correlation between the three indicators is therefore weak: between the indicator for firm birth and the birth of self employment, it is only 0.28; between the birth rate and the share of self employment it is even negative (− 0.14).[20]

Table 4.1: Indicators for entrepreneurship and entry per country

	Birth rate	Self-employment share	Birth of self-employed
Belgium	7.4%	7.9%	0.6%
Switzerland	3.6%	n.a.	n.a.
Czech Republic	10.8%	15.0%	1.4%
Denmark	9.3%	5.7%	0.6%
Estonia*	13.7%	1.3%	0.4%
Spain	9.6%	9.4%	1.0%
Finland	8.1%	6.1%	0.6%
United Kingdom	12.3%	1.6%	0.2%
Hungary	13.1%	6.0%	1.0%
Italy	8.1%	13.0%	1.3%
Lithuania*	10.6%	0.7%	0.1%
Luxembourg	11.8%	4.6%	0.8%
Latvia*	16.0%	0.6%	0.2%
Netherlands	9.3%	2.8%	0.4%
Norway	11.1%	10.7%	1.0%
Portugal*	7.9%	5.0%	0.4%
Romania*	13.7%	0.9%	0.2%
Sweden	6.7%	7.7%	0.6%
Slovenia	7.4%	3.4%	0.3%
Slovakia	12.1%	5.4%	1.1%
Average	9.6%	6.3%	0.7%

The data on the birth rate of companies are for 1998-2003 (except CZ, EE, HU, LT, LV, RO, SI, SK: 2000-2003; CH: 2003; DK: 1998-2001; NL: 1999-2003). The average is the average across sector and time dimensions for each country. The birth rate of companies is the ratio of new companies to active companies. The self-employment rate is the number of active companies with zero employees on total employment in the economy. The birth rate of self-employed is the ratio of companies with zero employees on total employment in the economy. The data for the share of self-employed are for 1997-2003 (except BE: 1997-2000; IT, NL: 1998-2003; CZ, EE, HU, LT, LV, RO, SI, SK: 2000-2003; NO: 2000-2001; DK: 1997-2001). The data for the birth rate of self-employed are for 1998-2003 (except BE: 1998-2000; CZ, EE, HU, LT, LV, RO, SI, SK: 2000-2003; NO: 2000-2001; DK: 1998-2001; NL: 1999-2003). * For LT, LV (until 2002), EE, PT and RO only limited liability and partnership companies are included in firms with zero employee.

[20] In computing these correlations, we exclude countries for which data collection differs from the norm (i.e. Estonia, Latvia, Lithuania, Romania and Portugal).

The business demography data distinguish 60 sectors. The indicator on the rate of firm births uses this sector dimension. To show the sectoral variation in birth rates, Table 4.2 shows a more aggregated distinction into 12 broadly defined categories. We see that the birth rate runs between 5.9% for mining and utilities (electricity, gas and water) to 12.7% for the education sector. Overall, firm births tend to be relatively high in some the service sectors, such as the financial sector, hotels and restaurants and social activities. Table 4.2 also shows the birth rate for the five different categories of firm size. Size is measured here as the number of employees. Table 4.2 shows that the birth rate declines with size. The highest rate of birth is among firms without employees, where it equals 11.6%. The birth rate of companies with more than 20 employees is 1.3%.

Table 4.2: The birth rate of new firms per sector and company size

	Birth rate
Mining	5.9%
Manufacturing	6.9%
Electricity, gas, water	5.9%
Construction	10.9%
Retail	8.1%
Hotels and restaurants	10.0%
Storage and communications	7.9%
Financial	11.6%
Estate and business	12.2%
Education	12.7%
Health and social	7.8%
Other social activities	10.8%
Zero employee	11.6%
1 to 4 employees	8.5%
5 to 9 employees	4.6%
10 to 19 employees	3.4%
20 and more employees	1.3%
Weighted average	9.6%

See notes table 4.1

4.2 Degree of incorporation

A second set of the Eurostat data on business demography in Europe provides information on the degree of incorporation. In particular, it divides the number of companies in three legal forms:

- Personally owned firms that have no limit to personal liability. It reflects the sole proprietorships (SP).

- Private or publicly quoted joint stock companies with limited liability (LL) for those owning shares. This category captures corporations.
- Partnerships, which consists of personally owned limited and unlimited liability partnerships. Included are also other level forms such as co-operatives and associations.

To arrive at corporate shares, we divide the enterprises that are registered as limited liability (LL) companies by the sum of companies with limited liability (LL) and personal liability (SP), i.e. $CORP = \frac{LL}{LL + SP}$. Hence, we do not use the information about the partnerships, which is a hybrid category of companies that can be taxed under either the corporate income tax or the personal income tax.

The data contain information on the number of both active firms and enterprise births. Apart from the number of companies, there are also data on employment in each of the three legal forms, both for active and new firms. As indicators for the share of the corporate sector in the economy (*CORP*), we therefore look at:[21]

- The corporate share in the total number of active firms.
- The corporate share in the total number of new firms.
- The corporate employment share of active firms.
- The corporate employment share of new firms.

Table 4.3: Degree of incorporation per country

	Number of firms		Employment	
	(1) New	(2) Active	(3) new	(4) active
Switzerland	54.4%	43.2%	67.3%	76.1%
Czech Republic	12.1%	13.1%	35.0%	62.9%
Denmark	22.1%	28.6%	35.1%	78.4%
Estonia [a]	72.3%	82.7%	93.8%	96.8%
Spain	33.8%	33.5%	51.9%	75.5%
Finland	28.8%	47.2%	52.6%	92.5%
United Kingdom	61.0%	56.9%	73.0%	89.5%
Hungary	23.0%	25.9%	48.7%	72.5%
Italy	19.9%	17.3%	31.3%	64.3%
Lithuania [b]	45.0%	46.6%	70.9%	80.7%
Luxembourg	76.2%	69.3%	84.0%	91.4%
Latvia [c]	49.9%	65.0%	79.3%	92.3%
Netherlands	28.8%	41.4%	43.1%	87.2%
Norway	29.7%	49.0%	48.3%	87.7%
Sweden	25.9%	46.3%	35.8%	87.3%
Slovenia [d]	26.1%	34.3%	37.9%	73.2%
Slovakia	18.0%	20.7%	45.7%	71.8%
Weighted average	36.8%	35.7%	58.6%	81.8%

The data are for 1998-2003 (except CZ, EE, HU, LT, LV, RO, SI, SK: 2000-2003; CH: 2003; DK: 1998-2001; NL: 1999-2003). The average is the average across sector and time dimensions for each country. The degree of incorporation is the ratio of new (or active) companies which are incorporated on the total number of new (or active) companies. Alternatively, the share of employment is the ratio of the number of people employed in new (or active) companies which are incorporated on the number of people employed in all new (or active) companies. Sole proprietorships are not included in the data for Portugal (from 2001) and Romania and are therefore eliminated from the table. [a] For Estonia, only sole proprietorships with at least 20 employees are included. [b] In Lithuania, self-employed entrepreneurs that do not have employee are not covered by the dataset. [c] For Latvia, the natural persons are included from 2002. [d] For Slovenia, additional forms of natural persons are included from 2002.

The Eurostat data on corporate shares have the same coverage as the entrepreneurship data distinguished with respect to firm size.[22] Table 4.3 reports the mean corporate share of business for the four indicators per country. It shows that the corporate share in terms of the number of companies (36% for active and 37% for new firms) is substantially smaller than the corporate share measured in terms of employment (82% for active firms and 59% for new firms). Hence, corporations on average employ more people than companies in the non-corporate form. This holds in particular for active companies. Across countries, the degree of incorporation differs widely. For instance, in terms of the number of active companies, it moves from 13% in the Czech Republic to 69% in Luxembourg. In most countries, the corporate share is somewhere between 20 and 50%. In terms of employment, the corporate

[21] Each pair of these four indicators shows a high correlation, with a minimum of 0.66.

[22] The subset that distinguishes legal form of companies does not report the size classes. Portugal and Romania do not report sole proprietorships and are thus eliminated from the sample. For Estonia, Latvia and Slovenia, the data contain a structural break in 2001 due to a different way of data collection. We control for this via dummy variables in the regressions.

share of active firms exceeds 60% in all countries and is even over 90% for Finland, and Luxembourg.[23]

Table 4.4: Degree of incorporation per sector

		Number of firms		Share of employment	
Sector	**NACE**	**New**	**Active**	**New**	**Active**
Mining	C	67.3%	66.6%	88.9%	94.9%
Manufacturing	D	40.6%	44.5%	77.5%	92.1%
Electricity, gas, water	E	69.0%	80.9%	91.0%	99.6%
Construction	F	29.4%	31.1%	51.4%	71.3%
Retail	G	31.9%	31.0%	50.2%	76.3%
Hotels and restaurants	H	26.2%	24.8%	46.2%	69.3%
Storage and comm..	I	30.9%	26.9%	56.8%	86.2%
Financial	J	38.6%	41.3%	69.5%	94.5%
Estate and business	K (excp. K7415)	49.2%	46.5%	66.4%	81.0%
Education	M	26.8%	35.9%	46.7%	90.7%
Health and social	N	20.6%	18.5%	53.2%	77.8%
Other social activities	O	31.0%	33.2%	56.6%	76.4%
Weighted average		36.8%	35.7%	58.6%	81.8%

See notes for table 4.3.

Table 4.4 presents the mean of the four measures for the degree of incorporation per sector. In general, we observe that the incorporation rate in terms of company numbers is relatively high in mining (67% of active firms) and in utilities (81%). It is small in construction and many service sectors (Hotels and restaurants, Health and social work, Social activities, Retail). In terms of employment, some of the service sectors show a higher corporate share, e.g. in education and financial.

4.3 Tax variables

The choice regarding entrepreneurship and legal form primarily applies to small firms. For most of these companies, the choice involves a discrete decision. Therefore, not the marginal tax on business, but the average effective tax burden will matter. As argued by Mackie-Mason and Gordon (1997), the statutory corporate tax on small business is a good approximation for the average tax burden if profits are large. As the income from entrepreneurial effort and the labour that an entrepreneur supplies to his company is generally included in the business income, profitability indeed tends to be high. Hence, the statutory corporate tax rate is likely to be a good approximation of the average effective tax burden on the income of small businesses.

[23] The rates for Estonia and Latvia are distorted by the data collection. See note to the table.

Table 4.5: Tax rates per country in 2003.

	(1) CT for small businesses	(2) Dividend relief system	(3) Dividend tax	(4) Top personal income tax	(5) Average income tax	(6) Progressivity index
Belgium	24.28%	DIT	15%	53.5%	20.4%	.58
Switzerland	21.74%	ITC	35%	40.46%	n.a.	n.a.
Czech Republic	31%	DIT	15%	32%	10.1%	.76
Denmark	30%	DTC	28%	59.7%	37.2%	.64
Estonia	0%	Exemption	26%	26%	14.5%	.87
Spain	30%	ITC	15%	45%	10.3%	.61
Finland	29%	DIT	29%	54%	22.7%	.60
United Kingdom	19%	2/8 ITC	0%	40%	14.6%	.70
Hungary	19.64%	DIT	20%	40%	14.1%	.70
Italy	38.25%	DIT	12.5%	45%	19.4%	.68
Lithuania	13%	None	15%	33%	16.1%	.80
Luxembourg	28.3%	DTC	20%	38.95%	11.0%	.69
Latvia	15.2%	DIT	0%	25%	14.4%	.88
Netherlands	29%	DTC	25%	52%	9.9%	.53
Norway	28%	ITC	0%	28%	20.2%	.90
Portugal	22%	50% exem.	15%	40%	9.9%	.67
Romania	25%	DIT	5%	40%	n.a.	n.a.
Sweden	28%	DIT	30%	55%	24.0%	.59
Slovenia	25%	60% DTC	25%	50%	10.9%	.56
Slovakia	25%	DIT	15%	38%	7.4%	.67
Average	24%		17.3%	41.8%	16%	.69

Source: Structures of taxation systems, IBFD and own calculations. The statutory rates include all local taxes and surcharges. The average tax excludes social security contributions. The progressivity index is computed as the ratio of (1-top rate)/(1-average rate), therefore a higher value indicates less progressivity. DIT: Dual Income Tax, ITC: Indirect Tax Credit, DTC: Direct Tax Credit.

Some countries adopt progressive systems for the corporate tax by applying reduced rates for low levels of profit. Since our focus is on small businesses, the reduced rates will probably have an important impact on the choice of legal form. We therefore use the reduced rates for Belgium, Latvia, Lithuania, Luxembourg, the Netherlands, Portugal, Spain and the intermediate rate (20% or 19%) for the UK as our measure for the corporate income tax; the other countries do not feature reduced rates. The corporate tax rate per country for 2003 is presented in the first column of table 4.5. We see that the mean corporate tax on small business is 24%. It ranges from zero for Estonia to 38.25% in Italy.

In most countries, the corporate tax is not the only tax that bears on equity income from corporations. For instance, under the classical system of corporate income taxation, the personal income tax (on profit after corporate tax) should be added to the tax levied at the corporate level. In Europe, countries adopt a variety of regimes to avoid such double taxation of corporate income, including dual income tax systems (with reduced rates on equity

income), indirect tax credits, direct imputation credits and full exemptions. The second column of Table 4.5 shows this for 2003. Still, it is unclear to what extend this tax on dividends affects the effective tax burden on the corporate form, since small companies usually have other ways to distribute profits. Mackie-Mason and Gordon (1997), for instance, determine the effective personal tax on equity income by a weighted average of the tax on dividends and the tax on capital gains, where the weight is determined by the average dividend payout ratio. The weight on the capital gains tax is adjusted as tax deferral and the tax exemption of some types of capital gains provide relief. Mackie-Mason and Gordon (1997) compute the accrual equivalent of these gains at more than ¾ of the capital gains. Hence, capital gains taxes hardly seem to play a role for the personal tax on equity income. Goolsbee (2004) argues that this means that a zero tax on equity income at the personal level is probably the most accurate since small businesses usually pay very few dividends. This is supported by recent evidence on dividend payout ratios of De Angelo et al. (2004). We therefore take the corporate tax as a benchmark indicator for the tax on the corporate sector in estimating equations (3.4) and (3.8). As a check on the robustness of this assumption, we also explore a regression in which the dividend tax is added to it. Thereby, we assume that 30% of net equity income (i.e. the average dividend payout ratio according to De Angelo et al., 2004) is taxed under the dividend tax as reported in the third column of Table 4.5. Thereby, we also take account of the dividend relief system.

For the personal income tax that applies to sole proprietorships, we follow Gordon and Mackie-Mason (1997) and Goolsbee (2004) by using the top personal income tax rate in regressions for organizational form. It is presented in the fourth column of Table 4.5. It ranges in 2003 from 25% in Latvia to almost 60% in Denmark. In the regressions on entrepreneurship, we make a distinction between the average tax burden and the degree of tax progression. As a measure for the average tax burden, we take the implicit tax on labour as obtained from *Structures of the Taxation Systems in the European Union*. Thereby, we exclude social security contributions, which often do not apply to the self employed. It is presented in the fifth column of Table 4.5. The final column in Table 4.5 presents the coefficient of relative income progression, which serves as our measure for tax progression. We see that tax progression ranged in 2003 from highly progressive in the Netherlands (0.53) to lightly progressive in Norway (0.90).

4.4 Control variables

In the regression on entrepreneurship, we control for a number of variables that possibly affect the self-employment rate or entry into business. The first variable is an indicator for the functioning of the capital market, defined as the ratio between the deposit and the lending rate. It is as taken from the *International Financial Statistics* published by the International Monetary Fund. A better functioning capital market (i.e. a lower ratio) is thought to raise entrepreneurship as it should be easier to get funds for setting up a business. The second variable is an index for the administrative hurdles to starting a business as perceived by entrepreneurs in a country. It is based on a survey reported in the annual reports on Economic Freedom of the World published by the Fraser Institute, which asks entrepreneurs whether administrative procedures are an important obstacle to start a new business. The third variable is the death rate of new companies, which is used as a proxy for firm turnover in the regression for the birth rate. In that regression, we also include the percentage change in employment in the economy to capture business cycle effects.

5. Empirical analysis

5.1 Taxation and firm birth

Table 5.1 presents regression results on the impact of taxation on three indicators of entrepreneurship according to equation (3.4). The first indicator is the birth rate of new companies. The regression uses the rate of firm births for the full panel of years, countries, sectors and size classes. It comprises almost 12,000 observations. Regression (1) includes dummies to capture industry fixed effects, the fixed effects for the size classes and some dummies to control for differences in data collection. Table 5.1 shows that the quality of the banking system, measured by the interest spread exerts a significant effect on company creation. In addition, the index for the ease of startup, the death rate and the change in employment all have a significant positive impact on firm entry, as expected. As to the tax variables, we see from Table 5.1 that both the corporate tax and the personal tax rate significantly reduce the birth rate. This provides ground for the claim that taxes exert adverse effects on entrepreneurial entry. The coefficient for the corporate tax is slightly lower than for the personal tax, which is consistent with the fact that new firms are in majority small and unincorporated. The indicator for tax progression enters with a positive sign, which suggests that more progression (i.e. a smaller value of the RIP) reduces entrepreneurial entry. This is

consistent with our theoretical predictions as well as previous empirical analysis on tax progression and entrepreneurship.[24]

The second and third columns in Table 5.1 explore alternative indicators for entrepreneurship. They reflect the rate of self employment and entry into self-employment rather than overall business entry. The indicators are defined on a more aggregate level than the birth rates, i.e. they do not differ per sector and size category but only per year and country. Accordingly, the number of observations is reduced to 54 and 52, respectively. The results for the alternative indicators differ from those for the birth rate. First, we see that the coefficients for the income tax variable and the degree of tax progression have the same sign in regressions (2) and (3), although their magnitudes in regression (3) are much smaller than in regression (2). This is due to the definitions of the dependent variables, as new firms make up about 10% of the active ones. Second, the results differ from regression (1) in that the corporate income tax exerts a significant positive impact (model (2)) or an insignificant effect (model (3)).

[24] We also explored alternative specifications for (3.4), such as log models and lags for the independent variables. This yields similar conclusions as the regressions in Table 5.1. Regressions with a squared tax term provide ground for a U-shaped pattern of taxes and firm births, as was also found by Garret and Wall (2006). Also when we add the dividend tax to the tax burden on corporate income, the results remain unaffected. We also test for random industry and size effects and found that a Hausman test does not reject this specification neither for industry (based on NACE sub-categories) nor for size. However, the Akaike Information Criteria suggest that the fixed effect model is a better specification in both cases (based on Maximum likelihood estimation). When estimating random effects, the corporate tax variable, the personal tax variable and the progressivity variable are relatively unaffected with respectively -.060, -.067 and 7.474 and are all significant at 1% level (except corporate tax which is significant at 5%). Finally, we correct for clustering effects, by allowing that error terms are more closely correlated within countries and industries or within countries and sizes than across individual observations. In the case of industry clustering, all tax variables remain highly significant and with the expected sign. The corporate tax variable, the personal tax variable and the progressivity variable become respectively -.157, -.082 and 6.495. In the case of size clustering, the respective values are -.201, -.075 and 8.962 but the personal income tax becomes insignificant. All clustering regressions use a compound symmetry structure for the covariance matrix and Huber-White robust standard errors.

Table 5.1: Regression results on taxation and entrepreneurship

	(1) Birth rate of new companies	(2) Rate of self employment	(3) Birth of self employment
Intercept	11.523*** (.998)	-8.935** (4.276)	-1.420* (.757)
Corporate tax rate	-.060*** (.019)	.149** (.059)	.007 (.008)
Average personal tax rate	-.067*** (.014)	-.167*** (.039)	-.025*** (.0067)
Progressivity	7.482*** (1.154)	16.262*** (6.057)	3.543*** (1.124)
Interest spread	-.594*** (.138)	1.938*** (.437)	.103 (.069)
Startup	.191*** (.040)	.071 (.164)	.018 (.016)
Death rate	.109*** (.026)		
Change in employment	.117** (.060)		
Adj-R^2	.361	.759	.669
Number obs.	11,891	54	52

Data is for 2000-2003. All regressions use a linear model. Regression (1) uses 'Birth rate' as dependent variable, which is the ratio of the number of new companies created in year t on the number of active companies in year t. Regression (2) uses the ratio of the number of active companies with zero employee on total employment in the economy as dependent variable. Regression (3) uses the ratio of the number of new companies with zero employees on total employment in the economy as dependent variable. All regressions include dummies to correct for country and time structural breaks in the data collection. Regression (1) also includes industry and size dummies. Detailed variable definitions and data sources are given in Appendix A. White Heteroskedasticity-consistent errors are given in parentheses. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

The regressions for the alternative indicators (2) and (3) are based on fewer observations than model (1). Moreover, their interpretation is somewhat different than model (1), as models (2) and (3) refer to (entry in) small businesses without employees, rather than entry of all companies. This can explain the different effect of the corporate tax. In particular, in many countries the limited liability form is only available for companies with a certain number of associates and a relatively high value of capital. Therefore, zero-employee companies are mainly sole proprietorships which are taxed at the personal income tax. A higher corporate tax rate improves the competitive advantage of these small firms relative to the large firms and thus acts as an incentive to small business, i.e. it increases the second and third (although not significantly in this case) indicator for entrepreneurship but not the first. As the different regression results suggest different responses by small and large companies to changes in the corporate tax rate, we explore this further by carrying out regressions of the

birth rate of new companies per size category. Table 5.2 shows the results from these regressions.

Table 5.2: Regression results on taxation and firm birth per size category

	(1) 0 employee	(2) 1 to 4 employees	(3) 5 to 9 employees	(4) 10 to 19 employees	(5) 20 and more employees
Intercept	5.130**	5.494***	.376	1.648	-1.670**
	(2.578)	(1.640)	(1.845)	(1.729)	(.717)
Corporate tax rate	-.078	-.138***	-.014	.006	-.018
	(.055)	(.033)	(.037)	(.034)	(.018)
Average personal	-.248***	-.024	-.059*	-.065***	-.011
tax rate	(.045)	(.029)	(.032)	(.023)	(.014)
Progressivity	17.553***	6.667***	6.245**	4.413*	6.208***
	(5.309)	(1.852)	(2.756)	(2.482)	(.926)
Interest spread	-.408	-1.036***	-.749***	-.981***	-.442***
	(.416)	(.255)	(.261	(.221)	(.107)
Startup	.569***	.017	.285***	.055	.053
	(.126)	(.079)	(.086)	(.072)	(.035)
Death rate	-.064	.113	.030	.136**	.061**
	(.049)	(.071	(.041)	(.058)	(.025)
Change in	.008	.250**	.167	.166	-.063
employment	(.182)	(.113	(.116	(.112)	(.151)
Adj-R^2	.341	.302	.155	.108	.092
Number obs.	2,432	2,467	2,378	2,290	2,324

Data is for 2000-2003 The dependent variable 'Birth rate' is the ratio of the number of new companies created in year t on the number of active companies in year t. All regressions use a linear model and include size dummies, industry dummies as well as dummies to correct for country and time structural breaks in the data collection. Detailed variable definitions and data sources are given in Appendix A. White Heteroskedasticity-consistent errors are given in parentheses. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

Table 5.2 reveals that the corporate and personal income tax variables tend to reduce the rate of firm birth. The magnitude and sign of the tax variables differs among size classes though. In particular, we find that the coefficient for the personal tax is the highest for companies with zero employees. The corporate tax appears insignificant for this category. Hence, entry of these companies is affected more by personal than corporate taxes as most of them probably enter as sole proprietorships. Tax progression exerts the largest impact on small firms, although this effect appears to be robust among the different size classes. Hence, risk factors seem to carry more weight in the decision of small entrepreneurs to enter into business. For companies with 1-4 employees, we observe a different effect of corporate relative to personal taxes. Indeed, while the corporate tax is now significant and large, the personal tax is smaller and only significant at the 5% level. Accordingly, entry of somewhat larger companies is affected more by corporate taxes and less by income taxes, probably because more firms enter in the corporate form. For companies with more than 4 employees, the tax coefficients are mixed but often insignificant. It suggests that entry of these firms is not heavily influenced by tax factors.

Overall, the regressions for entrepreneurship mimic previous research findings in that they give a somewhat mixed picture of the tax effects. Personal taxes and tax progression seem to significantly reduce the rate of firm births, the rate of self-employment and entry into self-employment, although only firm birth in small companies is significantly affected. The corporate tax exerts mixed effects, i.e. it reduces firm births, raises the rate of self employment and exerts an insignificant impact on the birth of self employment. This suggests that corporate taxation affects entrepreneurship in small businesses very differently from larger firms. This is confirmed by our estimates for different size classes.

5.2 Taxation and organizational form

Table 5.3 shows our regression results for the degree of incorporation according to equation (3.8). In the regressions, we include sector dummies and country or year dummies if structural breaks have been reported in the data. The table shows the impact of the difference in the personal tax and the corporate tax on the four indicators for the degree of incorporation.

Table 5.3 Regression results on taxation and incorporation

	(1) ***Degree of incorporation of new companies***	**(2)** ***Share of incorporated companies in total employment created by new companies***	**(3)** ***Degree of incorporation of active companies***	**(4)** ***Share of incorporated companies in total employment in active companies***
Intercept	.322***	.561***	.346***	.771***
	(.013)	(.016)	(.012)	(.013)
Difference in taxes	.594***	.615***	.932***	.673***
	(.055)	(.084)	(.050)	(.070)
Adj-R^2	.423	.344	.451	.331
Number obs.	3,354	2,412	3,671	2,098

The data are for 1997-2003. The degree of incorporation is the number of firms in limited liability form divided by the number of firms in limited liability or in sole proprietorship form. All regressions use a linear model and include industry dummies as well as dummies to correct for country and time structural breaks in the data collection. The difference in taxes is computed as the difference between the top marginal personal income tax rate and the statutory corporate tax rate applicable to small companies. Detailed variable definitions and data sources are given in Appendix A. White Heteroskedasticity-consistent errors are given in parentheses. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

We see from Table 5.3 that the coefficient for the tax difference is positive and significant at the 1% confidence level for each indicator. This is consistent with income shifting from the personal to the corporate tax base in response to a lower corporate tax relative to the personal tax. The first two columns refer to the incorporation rate of new companies. They show that the magnitude of the tax effect is very similar for the firm and

employment shares in the corporate sector. Apparently, taxes do not affect large and small newly created firms differently in their organizational form choice, possibly because most newly created firms are small. The third and fourth columns of Table 5.3 refer to active companies. These coefficients are larger than for the new firms, which suggests that existing firms are more responsive in their legal form choice than are newly created companies (which may start as small proprietorships and later change into the corporate form). For active companies, the coefficient for the company share is larger than for the employment share. Hence, small active firms are more responsive to taxes than large active firms. The latter probably do not always consider the non-corporate form due to large non-tax benefits of incorporation.

To better understand what the marginal coefficients in Table 5.3 imply for corporate tax policy, we compute the elasticity of the corporate tax base. The underlying assumption is that the corporate shares of (new or active) firms or employment serve as good indicators for the corporate share of total business income. As larger firms are more likely to be incorporated than small firms, the employment share probably better serves this purpose than the number of firms.[25] To obtain the semi-elasticities of the tax base, we divide the marginal coefficients for the tax variable in Table 5.3 by the respective sample means of the corporate income share, as reported in Table 4.3. The resulting semi-elasticity measures the percentage change in the corporate tax base in response to a 1%-point change in the tax differential between corporate and the non-corporate sector. If we do this, we find the following semi-elasticities of the corporate tax base: 1.6 for the number of new firms; 2.6 for the number of existing firms; 1.0 and 0.8 for the employment shares of new and existing firms respectively.

[25] Goolsbee (2004) reports corporate shares of sales and employment and finds that these are very similar.

Table 5.4. Regressions on degree of incorporation per sector.

	(1) Mining	(2) Electricity. gas. water	(3) Manufact.	(4) Construct.	(5) Retail	(6) Storage and communications	(7) Financial	(8) Estate and business	(9) Computer	(10) Research and Development	(11) Professions	(12) Social
Intercept	.636***	.543***	.356***	.130***	.202***	.355***	.441***	.475***	.243***	.067	.248***	.183***
	(.056)	(.061)	(.024)	(.029)	(.019)	(.048)	(.091)	(.051)	(.027)	(.050)	(.024)	(.031)
Difference	-.014	1.334***	.378***	.645***	.360***	.527**	1.311***	.594**	.866***	1.975***	.641***	.585***
in taxes	(.311)	(.292)	(.118)	(.142)	(.093)	(.228)	(.413)	(.250)	(.131)	(.259)	(.121)	(.162)
Adj-R^2	.180	.238	.370	.831	.552	.315	.119	.262	.362	.420	.425	.401
Number obs.	81	87	745	57	559	319	154	159	378	55	444	316

The data are for 1997-2003. The degree of incorporation is the number of firms in limited liability form divided by the number of firms in limited liability or in sole proprietorship form. All regressions use a linear model and include dummies to correct for country and time structural breaks in the data collection. The difference in taxes is computed as the difference between the top marginal personal income tax rate and the statutory corporate tax rate applicable to small companies. Detailed variable definitions and data sources are given in Appendix A. White Heteroskedasticity-consistent errors are given in parentheses. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

Table 5.5. Robustness regressions on degree of incorporation.

	(1) Semi-log model	(2) Log-log model	(3) Squared tax	(4) Alternative tax	(5) Lead tax	(6) All dummies	(7) Dividend tax	(8) Random industry effects	(9) Clustering
Intercept	-1.476*** (.046)	-.502*** (.043)	.212*** (.016)	.307*** (.013)	.330*** (.014)	.040 (.038)	.379*** (.012)	.345*** (.039)	.144*** (.036)
Difference in taxes	2.343*** (.204)	.287*** (.019)	3.083*** (.219)	.616*** (.048)	.535*** (.054)	3.170*** (.142)	.374*** (.055)	.594*** (.057)	.751*** (.117)
Square difference in taxes			-8.608*** (.739)						
Adj-R^2	.322	.350	.446	.432	.465	.480	.412		
Number obs.	3,311	3,269	3,354	3,354	2,379	3,354	3,354	3,354	3,354

The data are for 1997-2003. The degree of incorporation is the number of firms in limited liability form divided by the number of firms in limited liability or in sole proprietorship form. The difference in taxes is computed as the difference between the top marginal personal income tax rate and the statutory corporate tax rate applicable to small companies. All regressions use a linear model, except for regressions (1) and (2). All regressions also include industry dummies as well as dummies to correct for country and time structural breaks in the data collection. In addition, regression (6) contains all time and country fixed effects. Regression (3) also includes the squared value of this variable. Regression (4) uses use the ratio of the difference between these two rates on one minus the corporate tax rate as independent variable. Regression (5) uses the lead of this difference in taxes variable. Regression (7) uses the difference between the top personal income tax rate and the effective tax rate on distributed profit, taking into account taxation at both the corporate and personal level. Regression (8) looks at random effects for industry and is estimated via Maximum Likelihood. Finally, regression (9) is also estimated via Maximum Likelihood and uses a compound symmetry structure for the covariance matrix to correct for country and industry clustering effects and Huber-White robust standard errors. Detailed variable definitions and data sources are given in Appendix A. White Heteroskedasticity-consistent errors are given in parentheses. *, ** and *** indicate significance levels of 10, 5 and 1 percent, respectively.

The semi-elasticity of the tax base can be compared to previous studies. For instance, Goolsbee (2004) adopts the same specification as we do and considers alternative indicators for the corporate share of business, including firms, employment and sales. His basic results suggest a tax base elasticity of 1.1 for the number of firms and 0.4 for employment and sales. This is somewhat smaller than our elasticities. They are consistent in the sense that it finds a smaller response for the employment share than for the firm share. MacKie-Mason and Gordon (1997) use a slightly different specification in that they scale their tax term by (1-*Tc*). Moreover, they consider the share of corporate assets. With a corporate share of 2/3, their semi-elasticity would be somewhere between 0.03 and 0.2, which is smaller than what we find. Gordon and Slemrod (2002) consider income shifting in the US. Their findings suggest that a 1%-point increase in the tax differential between corporate and personal taxes increases reported labour income by 3%. Fuest and Weichenrieder (2003) conclude that a 1%-point reduction in the corporate tax rate increases the fraction of corporate savings in total private savings by some 2.6%. Our estimates are slightly smaller than these latter estimates.

Table 5.4 presents regression results on legal form choice per sector for the number of new firms. Again, we control for structural breaks in the data through dummies. Significant positive coefficients (at the 5% level) are reported for all sectors but mining. The coefficients for utilities, financial firms and R&D are large, suggesting that these firms are relatively responsive to taxes.

Table 5.5 explores the robustness of our findings for alternative specifications, again for the number of new firms. The regressions include single and double log specifications, a squared tax term, and an alternative tax term that divides the tax difference by (1-*Tc*) as was done by MacKie-Mason and Gordon (1997). Each of the regressions suggests a positive and significant impact of the tax term. Computing the associated semi-elasticity of the tax base evaluated at sample means yields values of 1.2 for the log model, 2.3 for the semi-log model and 1.7 for the alternative tax. This fits well with semi-elasticity of 1.6 for the linear model. The tax base elasticity in the model with the squared tax term is extremely sensitive to the tax differential, but equals 0.8 at the sample means. The fifth column presents the lead of tax variable, which captures possible anticipation effects. It yields a positive but slightly smaller coefficient for the tax term than the original regression in Table 5.3. If we introduce country and year dummies, the sixth column of Table 5.5 shows that the tax term remains significant and positive but the value becomes implausibly large. As the dummies take away much of the

cross-section variation that is meant to identify the impact of taxes on legal form, we do not prefer this specification.[26] Column 7 of Table 5.5 considers an alternative tax measure for corporate firms where we add the personal tax on dividends (see section 4). Including the personal tax reduces the magnitude of the tax term by forty percent, but the tax term remains significant at the 1% confidence level. Next, we test for random industry effects. Because we have three dimensions (countries, year and industry) and that industry is an aggregate of several NACE categories, we have more than one observation per country and industry. Therefore, our statistical package does not allow directly carrying out a Hausman test. We go around this problem in two ways. First, we estimate random effects based on the sub-categories of industry (NACE). With a p-value of .999, the test does not reject random industry effects. In addition, we estimate two models with respectively fixed and random industry effects via maximum likelihood estimation. The results of the random effect model are reported in column 8. The coefficient for the difference in taxes is unchanged compared to fixed effects and highly significant. The comparison of the Akaike Information Criteria suggests that the fixed effects model is a better one. Finally, in regression (9), we correct for cluster effects within country and industry pairs. The coefficient of the tax variable considerably increases. A likelihood ratio test (not reported) indicates a significant improvement over the null model consisting of homogeneous residual errors.

5.3. Implications for corporate tax policy

We now infer what our estimates imply for the impact of tax policies for corporate tax revenue and the corporate tax-to-GDP ratio. Thereby, we focus on the channel of income shifting through the choice of legal form, since the impact on entrepreneurship appears to be less robust than the effect on incorporation.

Corporate tax revenue (R) equals the corporate tax rate (T_c) times the tax base (B). In terms of changes, denoted by Δ, the impact of corporate tax on corporate revenue can be written as:

$$\Delta R = \Delta T_c B + T_c \Delta B = \Delta T_c B[1 + \frac{T_c}{\Delta T_c}\frac{\Delta B}{B}] \qquad (5.1)$$

[26] We also analyzed other control variables that differ across countries and years, such as the interest spread and the startup costs. These do not significantly contribute to the explanation of corporate share variations.

In (5.1), the term $\Delta T_c B$ reflects the ex-ante revenue effect from a change in the corporate tax rate. The ex-post revenue effect would be equivalent to this if the tax base would remain constant (i.e. if $\Delta B = 0$). If the corporate tax base responds to changes in the corporate tax rate, the term between square brackets on the right-hand side of (5.1) reveals that the ex-post revenue effect (ΔR) differs from the ex-ante effect ($\Delta T_c B$). We use the semi-elasticity of the corporate tax base, $\frac{\Delta B}{B}$, from the regressions on the degree of incorporation to determine the ex-post revenue effect of corporate tax relief, taking account of income shifting. As we argued before, the employment share is a better indicator for the corporate share of business income than the firm share. We therefore take the semi-elasticity of 0.8 for the employment share of existing firms in our computations. According to (5.1), we need to multiply the semi-elasticity by the corporate tax rate. This is reported in Table 4.5. Imputing the mean corporate tax of 24% in expression (5.1) and considering a reduction in the corporate tax rate by 1%-point (i.e. $\Delta T_c = -1$), the term between square brackets equals 0.82. It means that an ex-ante reduction in the corporate tax rate equivalent to one €, will cost only 82 €-cents in terms of corporate tax revenue lost ex-post. Hence, 18 €-cents are regained through income shifting from the personal to the corporate tax base. This regain in corporate tax revenue comes at the expense of a decline in personal tax revenue (which is likely to exceed the regain in corporate tax revenue).

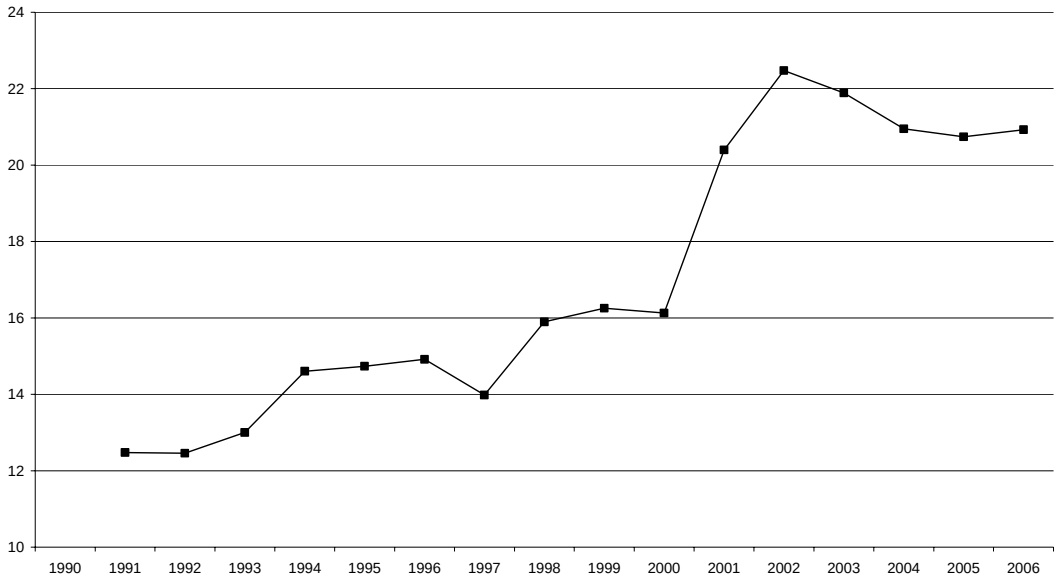
Income shifting is not the only behavioural effect of corporate tax changes that affects the corporate tax base. De Mooij (2005) discusses several other effects, such as distortions in investment, the financial structure of companies, international investment location and the profit allocation by multinationals. He uses expression (5.1) to assess the revenue gains associated with corporate tax relief through these mechanisms. In particular, on the basis of a review of the empirical literature on various tax base elasticities, he finds that the largest revenue effects are related to the channels of foreign direct investment (revenue gain of 12 €-cents for an average EU country) and international profit allocation (revenue gain of around 30 €-cents for the Netherlands). Our estimates for profit shifting between the personal and the corporate tax base are of a similar magnitude as these other, international distortions imposed by corporate taxes.

5.4 Implications for the corporate tax-to-GDP ratio

The semi-elasticity of the corporate tax base of 0.8 implies that the difference between personal and corporate taxes affects the corporate tax-to-GDP ratio. To illustrate this, we take the average tax differential between the top personal tax and the reduced corporate tax in the EU-15 between 1991 and 2006. This so-called tax gap is equal to 17%. With a semi-elasticity of 0.8, this implies that the corporate tax base would on average be 13.5% broader than without such a tax gap. With an average corporate tax-to-GDP ratio in the EU-15 of 2.7% in 2004, the tax gap is responsible for a revenue share of around 0.4% of GDP. Hence, without the tax gap the tax-to-GDP ratio is expected to fall from 2.7 to 2.3%. We call this difference the *corporate tax gain from income shifting*.

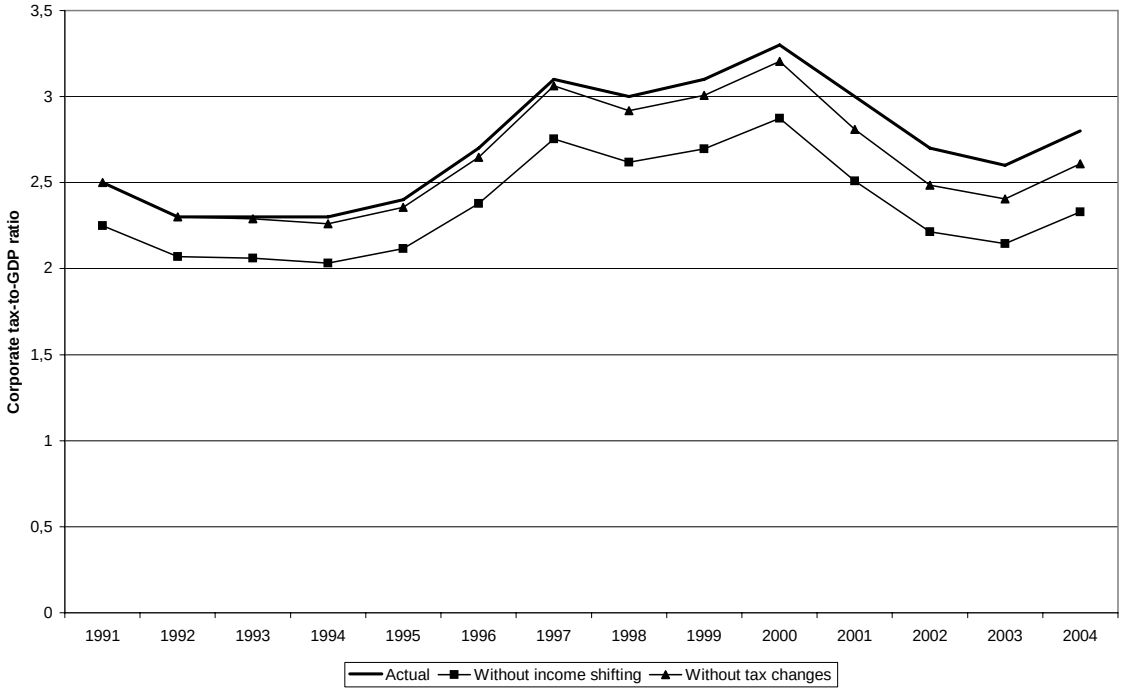
Figures 5.1 and 5.2 demonstrate the development of this corporate tax gain from income shifting in the EU-15 over time. In particular, Figure 5.1 demonstrates the development of the average tax gap between the top personal tax rate and the reduced corporate tax rate between 1991 and 2006. We see that this tax gap increased from around 12%-points in the early 1990s towards more than 20%-points in recent years. This is primarily the result of decreasing corporate tax rates, which fell from an average of 41% to 27%.

Figure 5.1: Difference between the personal income and reduced corporate tax



GDP-weighted average of top personal tax minus reduced corporate tax in the EU-15
Source: IBFD and own calculations

Figure 5.2: Actual and simulated developments of the corporate tax-to-GDP ratio



The impact of the rising tax gap on corporate tax revenue is shown in Figure 5.2. It demonstrates three alternative developments of the tax-to-GDP ratio in the EU-15 between 1991 and 2004. The first is the development of the actual corporate tax-to-GDP ratio ('Actual'). The second line in Figure 5.2 ("Without income shifting") represents the simulated development under the assumption that the tax gap would have been zero in all years between 1991 and 2004. It is constructed by subtracting the corporate tax revenue associated with income shifting (i.e. the tax base elasticity of 0.8 times the tax gap in each year) from the actual corporate tax-to-GDP ratio. The difference between the two lines can be interpreted as the corporate tax gain from income shifting. We see from Figure 5.2 that this corporate tax gain rose from around 0.25%-points of GDP in the early 1990s to 0.47%-points in 2004. Hence, income shifting can indeed explain part of the stabilization of corporate tax revenue since the early 1990s. The third line in Figure 5.2 ("Without tax changes") shows the same development in an alternative manner. In particular, it demonstrates the simulated development of the corporate tax-to-GDP ratio if the tax gap between personal and corporate taxation would have remained unchanged since 1991. It is constructed by subtracting the additional income shifting induced by the rising tax gap since 1991 from the actual tax-to-GDP ratio. The difference between this line and the actual corporate tax-to-GDP ratio yields direct insight in change of the corporate tax gain from income shifting. We see from Figure 5.2 that this gain has gradually increased over time to around 0.2%-points in recent years. The

rising tax gap thus explains 0.2%-points of the stabilization of the corporate tax-to-GDP ratio since the early 1990s.

6. Conclusions

In the policy debate on tax competition in the European Union, the paradox of declining corporate tax rates and rising tax-to-GDP ratios casts doubts on how serious is the threat of tax competition for the public finances of Member States. This paper argues that simply looking at corporate tax-to-GDP ratios can be misleading as part of the revenue consequences of corporate tax relief shows up in lower personal tax revenue, rather than lower corporate tax revenue. Indeed, we explore two channels of income shifting from the personal towards the corporate tax base, induced by corporate tax cuts. One is increased entrepreneurship; the other is an increase in the degree of incorporation of companies.

The results suggest that the impact of corporate taxes on entrepreneurship is ambiguous: while the corporate tax is found to reduce the rate of firm births, especially of medium sized companies, it exerts opposite effects on indicators for the degree of self-employment. Hence, entry of small companies (with zero employees) is affected differently by corporate taxes than are larger companies. We find that the tax gap between personal and corporate tax rates exerts a significant positive effect on the degree of incorporation. This result is robust for alternative indicators and specifications.

The estimates on incorporation suggest that the impact of income shifting in response to a larger tax gap is sizeable. Indeed, a one € ex-ante tax relief in corporate taxes costs only 82 €-cents in terms of corporate tax revenue ex-post if the shifting of income towards the corporate tax base is taken into account. As lower corporate taxes may also broaden the corporate tax base through other channels such as investment, financial restructuring or the attraction of multinational profits, they may come along with higher corporate tax revenue. This suggests that countries may have passed the top of the Laffer curve in their corporate tax. Yet, we argue that this may be partly due to income shifting from the personal to the corporate tax. The Laffer curve may then not apply to aggregate revenue since the rise in corporate tax revenue comes at the expense of lower personal tax revenue. This qualifies the Laffer-curve effect and strengthens the case for a corporate tax as a backstop for the personal tax.

Assessing the revenue consequences of tax competition by looking at corporate tax revenues is misleading as the revenue effects of lower corporate tax rates partly show up in

lower personal tax revenues. Our results can help explaining the part of the corporate tax rate-revenue paradox, as the tax gap between personal and corporate tax rates has grown since the early 1990s. Using our regression results, we find that around 10% of the corporate tax-to-GDP ratio was due to income shifting in the early 1990s but this share has grown to 17% in recent years due to the growing tax gap. Accordingly, income shifting has contributed to the stabilization of the corporate tax-to-GDP ratio by around 0.2%-point since the early 1990s.

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Appendix (A): Variable definitions and data sources

Variable	Definition	Source
Birth rate of companies	Number of companies born in year t on the number of companies active in year t for a specific country, year and sector (or aggregation of sectors). A birth is defined as the creation of production factors with the restriction that no other enterprises are involved in the event. Birth do not include entries into the population due to mergers, break-ups, split-off or restructuring of a set of enterprises. It does not include entries into a sub-population resulting only from a change of activity. A birth occurs when an enterprise starts from scratch and actually starts activity. An enterprise creation can be considered an enterprise birth if new production factors, in particular new jobs, are created. If a dormant unit is reactivated within two years, this event is not considered a birth. Sole proprietorships are not included in the data for Portugal (from 2001) and Romania. In Estonia, only sole proprietorships with at least 20 employees are included. In Latvia and Slovenia, natural persons are included from 2002. An enterprise is active if it had either turnover or employment at any time during the reference period.	Eurostat's harmonized data collection on business demography.
Self-employment rate (or birth)	Number of active (or new) companies with zero employee divided by total employment. Employed persons are persons aged 15 and over who during the reference week performed work, even for just one hour per week, for pay, profit or family gain or were not at work but had a job or business from which they were temporarily absent because of, e.g., illness, holidays, industrial dispute and education or training. Persons carrying out obligatory military service are not included	Eurostat's harmonized data collection on business demography. And Eurostat's New Chronos database.
Corporate tax rate	Statutory corporate tax rate applicable to small companies.	European Commission and Office of Tax Policy Research.
Average personal tax rate	Implicit personal income tax rate on labour.	European Commission and own calculations.
Progressivity	Ratio of one minus the top personal income tax rate on one minus the average personal income tax rate	European Commission and own calculations.
Interest spread	Ratio of the deposit interest rate on the lending interest rate.	International Financial Statistics (IMF). Lines 60.
Startup	0-10 index taking higher values when administrative procedures become less of an important obstacle to starting a new business.	Freedom of the World (Fraser Institute). Data are for 2000-2003
Death rate	Number of companies exiting business in year t on the number of companies active in year t for a specific country, year and sector (or aggregation of sectors). A death amounts to a dissolution of a combination of production factors with the restriction that no other enterprises are involved in the event. Deaths do not include exits from the population due to mergers, take-overs, break-ups or restructuring of a set of enterprises. It does not include exits from a sub-population resulting only from a change of activity. An enterprise is included in the count of deaths only if it is not reactivated within two years. Equally, a reactivation is not counted as a birth.	Eurostat's harmonized data collection on business demography.
Change in employment	Percentage change in employment on year-on-year basis.	Eurostat's New Chronos database.

Variable	Definition	Source
Degree of incorporation of companies.	Number of companies in limited liability form divided by the number of companies in either limited liability of sole proprietorship form. This ratio can be computed for new or for active companies, as well as in number of companies or in number of employees.	Eurostat's harmonized data collection on business demography and own calculations.
Difference in taxes	Difference between the top personal income tax rate and the statutory corporate tax rate applicable to small companies.	European Commission, Office of Tax Policy Research and own calculations.
Sectors	Based on NACE-4digit classification, the have the following 12 large sectors and 60 sub-sectors: 1. mining (C): mining of energy (CA), mining except energy (CB); 2. Manufacturing (D): food and beverage (DA), textile (DB), leather (DC), wood (DD), paper (DE), coke (DF), chemicals (DG), rubber and plastics (DH), non-metal minerals (DI), metals (DJ), machinery and equipment (DK), electrical and optical (DL), transport equipment (DM), manufacturing NEC (DN); 3. utilities (E): energy supply (E40), collection and purification (E41); 4. construction (F): construction (F45); 5. retail (G, H): motor vehicules (G50), wholesale except motor (G51), retail non-specialised stores (G521), retail of food in specialized stores (G522), retail in specialized stores (G523-G525), retail not in stores (G526), repair of personal goods (G527), hotels and campings (H551-H552), restaurants and bars (H553-H554-H555); 6. storage and communications (I): land transport (I60), water transport (I61), air transport (I62), support to transport activities (I63), post (I641), telecommunications (I642); 7. financial (J): financial except insurance and pension (J65), insurance and pension (J66), support to financial activities (J67); 8. estate and business (K70-K71): real estate (K70), renting of machinery (K71); 9. computers (K72): hardware computer (K721), software computer (K722), data computer (K723), database activities (K724), repair of computers (K725), other computer activities (K726); 10. R&D (K73); 11. professions (K74): accounting and auditing (K741), architecture and engineering (K742), technical testing (K743), advertising (K744), labour recruitment (K745), investigation and security (K746), industrial cleaning (K747), business NEC (K748); 12. social (M,N,O): education (M80), health and social work (N85), sewage, disposal and sanitation (O90), membership organizations (O91), cultural and sport activities (O92), other services (O93).	Eurostat's harmonized data collection on business demography and own aggregations.
Gross Operating Surplus	Gross Value added minus compensation of employees minus taxes on import and production plus subsidies on production (for total economy or for corporate sector).	AMECO Database