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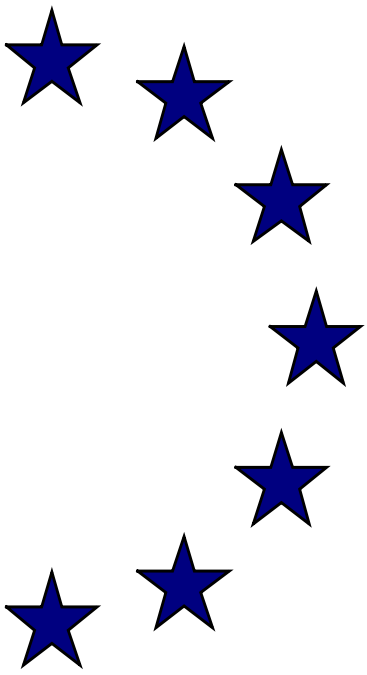

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Sector and size effects on effective corporate taxation

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Sector and size effects on effective corporate taxation.

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Abstract: The current debate in corporate taxation is focussing on leveling the tax playing field within the European Union in order to allow companies incorporated in different countries to face the same competitive conditions. However, various elements of corporate tax rules may discriminate against companies registered in the same country but having different sizes or operating in different sectors. Using the micro backward-looking approach to compute effective tax rates for eleven European countries, the US, and Japan, this paper shows that there could be some concerns regarding domestic tax discrimination since some sectors and sizes enjoy significantly more favorable tax burdens.

Keywords: Taxation, corporate taxation, effective taxation.

JEL Classification: E61, H21, H22.

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Introduction.

In October 2001, the European Commission issued a Communication on company taxation in the European Union[1], which explored various avenues to tackle tax discrimination of cross-border activities in Europe. The rationale behind this Communication is that the existence of tax obstacles may prevent the completion of the Single Market. Because of tax discrimination of cross-border activities, there is a credible threat that investment would be channeled based on tax consideration instead of on pure pre-tax economic returns. In its report, the European Commission confirmed the wide differences across countries in terms of effective taxation of different types of investment, using different sources of financing. As much as being a source of investment misallocation, differences in effective corporate tax rates are the symptoms of tax discriminations. This is because in a world without tax discriminations, effective tax levels should tend to converge under the effects of tax competition.

Whilst one should acknowledge the tremendous importance of cross-border discrimination issues, the debate would gain even more consistence by enlarging its scope to domestic discriminations. The complexity and diversity of tax rules, the variety in levels of enforcement, the tax incentives offered to some types of enterprises or the existence of special tax regimes are various elements that could cause discriminations at domestic level between firms operating in different sectors or having different sizes[2]. Although the 1992 Ruding report found that corporate taxation in the EU was mostly neutral with respect to companies' size, there is some evidence of an unbalanced distribution of the tax burden across different types of companies. In a pioneer study using financial statement information from companies located in Canada, Japan, the United Kingdom, and the United States, Collins and Shackelford (1996) found some evidence of differences in average effective taxation across different sectors, as well as between multinational and domestic-only companies. Focussing on the situation of Germany, Italy, and the UK, the European Commission (2001a, p. 264) found that, although specific tax rules for SMEs lower their effective tax rates, these companies bear a higher tax burden than multinationals investing

1 "Towards an Internal Market without tax obstacles", *COM(2001)582*.

2 Although the Report contained some measures of tax burden for different sizes of companies in selected countries, domestic discriminations were not specifically covered in the 2001 Communication, as the mandate of the European Commission was to focus on cross-border issues.

abroad. Nicodème (2001) computed effective corporate tax rates using individual accounts of companies for different sectors and sizes and found large differences across these two features within countries. Focusing on Belgium, Valenduc (2001) found that implicit tax rates generally increase with the size of the firm and varies across sectors of activity, but did not find a significant interaction between these two characteristics. However, these results may actually be dependent on the composition effects of the samples, and a more systematic and in-depth approach seems to be welcomed. The objective of this paper is to use information derived from financial statements to determine whether there are significant differences in the tax burden of companies having different characteristics. This paper also differ from previous studies as it uses harmonized financial accounts and a larger set of countries.

In the remainder of the paper, section one briefly presents the methodology used to compute effective corporate tax rates. Section two looks into tax measures discriminating against or in favor of some sectors or sizes, and presents effective corporate tax rates for 1999. Finally, section three uses pooled cross-sectors and time-series data to assess sector and size effects on effective corporate taxation. Conclusions follow.

1. Methodologies to compute effective corporate tax rates.

Following the classification used in Nicodème (2001), three main methodologies can be identified in the economic literature to compute effective corporate tax rates. The *macro backward looking* approach uses aggregated macroeconomic data to produce ratios of corporate tax burdens (see e.g. Mendoza et al. 1994, 1997). Because it uses aggregate ratios, this method generally does not offer in-depth analysis of specific sectors or of the role of size. The *Micro forward-looking* studies (see e.g. European Commission, 2001a) has the theoretical possibility to include elements of tax differentiation for sizes or sectors such as different tax rates. However, because of its theoretical approach, this method cannot take into account all the elements of the tax system without generating complicated models. In addition, it usually does not include specific elements such as tax enforcement, rulings, share-buybacks, the treatment of inventories, value adjustments, the carry of losses, and other specific tax regimes that may be more favorable for some types of companies. This is why the Communication of the European Commission (2001a) confers a role on *micro backward-looking* methodologies in order to approach the issue of

differences in effective taxation for different types of enterprises. This category of methods uses financial accounts of companies and incorporates the effects of the macro-economic context, the behavior of the company and of the tax authority, as well as all features of the tax system. Although fitted to differentiate the effective rates across sectors and sizes, these methods cannot however isolate specific characteristics of the tax system nor can they disentangle the interference of foreign and domestic tax systems on the tax burden. Nevertheless, they constitute a reasonable approach to assess what the Communication of the European Commission (2001a) has labeled "equity issues" across companies. In the third section of the paper, we use effective tax rates computed with such method to isolate these effects.

The choice of an appropriate indicator to compare effective corporate taxation across countries, sectors and sizes is not an easy task. The desired indicator should provide a measure of the tax burden that takes into account most of the characteristics of the tax system. In addition, the choice of the indicator should minimize any possible systematic correlation with a particular sector or a particular size. The obvious ratio would be the tax accrued on profit before taxes. This indicator does not seem to introduce major measurement errors linked to companies' characteristics. However, its informational content is relatively poor as it does not provide a measure of preferential tax treatments given via the computation of the tax base. At the margin, this indicator should be equal to the statutory tax rate. Therefore, the economic literature using micro data[3] includes other indicators in the analysis. The use of the turnover in the denominator allows to annihilate all differences in accounting practices. However, as noted by Collins & Shackelford (1996, p. 55), this rate implicitly assumes that the true profit margins are constant across countries, industries, and sizes. Using the gross operating profit in the denominator - that is the earnings before interest, taxes, depreciation and other value adjustments - has the advantages to take into account the effects of interest and depreciation on determining the tax base; to be relatively comparable across countries and companies; and to avoid having to assume similar profitability across firms. Nevertheless, it can introduce a bias toward capital-intensive sectors, which have a relatively large share of depreciation in the profit and losses accounts. Driven by these considerations, we present both the tax accrued on the gross operating profit and on profit before taxes.

[3] See for example, Collins & Shackelford (1996) or Buijink et al. (1999).

2. Tax treatment of different sectors and sizes.

Levying taxes to finance government expenditures is a main activity of the State and it requires difficult political arbitrage. In this context, it is not surprising that tax policy might, here and there, aim at favoring some categories of taxpayers for efficiency or equity reasons. This section reviews a non-exhaustive list of examples of tax measures intended for some sectors or sizes, or whose implementation leads to equivalent effects.

Measures intended for specific sizes.

There are multiple reasons why companies of different sizes may bear different tax burdens. As pointed by Buijink et al. (*1999, pp. 28-29*), small and medium size companies are major contributors to employment in developed economies[4]. As a consequence, promoting entrepreneurship through start-up companies has increasingly become a major objective for the EU Member States, in the context of the objectives set in 2000 in Lisbon to make the EU the most competitive economy in the world. To that aim, favorable tax treatment for small companies is therefore plausible.

The most obvious preferential tax treatment linked to size is the existence in some countries of *progressive corporate taxation systems*. For instance, statutory rates vary in Belgium from 28% to 41%, depending on the level of profit[5]. Luxembourg has adopted a similar system. In other occasions, such measures can also be used as part of *regional development policies*, as in Portugal where corporate taxation is reduced for companies that accept to relocate to the center of the country, provided that their turnover is inferior to 30 million escudo. The incentives based on tax rates are often accompanied by *specific tax deductions for investment* made by SMEs, as is for example the case in both Belgium and Portugal. As a last example, capital allowances are offered by the United Kingdom for SMEs' expenditures on plant and machinery.

Large companies, because they may have sizeable economic influence, may however have more power to negotiate favorable tax treatment, either alone or through professional unions. In the Netherlands, it is for instance possible for investors to obtain *tailor-made rulings* with the tax authorities when they operate on

[4] In the EU, SMEs account for 99.8% of companies, 66% of total employment, and 54% of turnover (European Commission, 2001e, p.16)

[5] Subjected to restrictive conditions (among others on ownership and on dividend policy).

an international basis and invest more than 10 million Gulden (about € 4.5 million) in the Dutch economy.

Measures with implicit effects on specific sizes.

Rulings and tax bargaining with fiscal authorities, before or after the determination of the tax liability, are not exceptional events. The practice of rulings is common in the Netherlands, and the Belgian government makes it an essential element of its current corporate tax reform. If large companies would a priori seem in a better position to bargain with tax authorities, such activity may however not always be beneficial as firms that bargain may be imposed larger-than-necessary *tax compliance costs* if they fail to conclude an initial agreement. Slemrod and Blumenthal (1993) estimated tax compliance costs in the US to be around 3.2% of tax revenue in 1993. From a survey of existing literature, the European Commission (2001a, pp.74-76) estimates tax compliance cost for large EU companies to be between 2 and 4% of tax revenue. There is also evidence that these costs relative to tax paid decrease with the size of the company but increase with the level of foreign activities[6]. A positive relationship between company's size and tax compliance costs is seen as a 'regulatory failure' (see OECD 1994). Such a relationship, documented in European Commission (2001a, p.739), gives a rationale for measures favoring SMEs. Ideally, tax compliance costs should be taken into consideration when assessing the tax burden. Taxpayers with identical revenues but with different estimates of tax compliance costs may bear different tax burdens if their different perceptions of the worthiness of pursuing tax engineering lead to different decisions with regards to these practices. It is also sometimes argued that large companies might suffer from higher tax burdens because tax authorities more closely watch their actions. The issue of *tax enforcement* may clearly play a role in the level of effective taxation. In 1999, a new regulation (Law 549/95) came into force in Italy, which required taxpayers whose income laid below the sector's standards to justify these discrepancies. This new rule is said to have considerably ameliorate tax collection for self-employed and SMEs.

The multiplication and complexity of tax rules give also ways to possible tax loopholes. Because they don't always have the abilities to deploy fiscal engineering

[6] Some empirical evidence from Belgium also indicates SMEs may bear a comparatively higher tax administrative burden than large companies. Taxation represents on average about 32% of total administrative burden for Belgian companies (Bureau du Plan, 2000).

resources to avoid taxation, small companies probably suffer most from multifaceted tax regulations. As they involve countries with different tax rules, cross-border operations fall into this category of activities with tortuous tax implications. The multiplicity of tax rules and practices provides companies operating at international level with possibilities to legally decrease or avoid taxation. However, in the same time, the lack of cooperation between some tax authorities may as well put additional burden on these companies by double taxing some activities. The European Commission (2001a) has identified a number of rules and practices in tax systems that may emerge as obstacles to cross-border activities because they introduce additional tax or compliance burden.

The existence of fifteen different sets of rules in the European Union faced by companies operating in more than one country is clearly one of these. More generally, whereas most trade agreement are multilateral, double tax conventions are in most cases, if not all, bilateral (Whalley, 2001). This raises the problem of inconsistency across countries or, in some cases, the absence of provisions to avoid double taxation. Tax treaties usually focus on providing relief from double taxation of dividends, interest, and royalties payments by ways of exemption or imputation. In the European Union, payments of interest and royalties between associated companies located in different Member States are still potentially subject to taxation, as the proposal for a directive on a common system of taxation is still pending[7].

Cross-border payments of dividends is covered by the "Parent-subsidiary directive"[8], which exempts from withholding tax the distributed profit from a subsidiary to its foreign parent, provided that this latter directly holds a minimum of 25% of its capital. The Member State of the parent company should either exempt the dividend from corporate taxation or offer a tax credit to the parent company. Although the opinion of EU companies on the Directive is positive, the European Commission (2001a, p.303-5) notices that its narrow scope in terms of legal incorporation of companies that may benefit from the system as well as in terms of holding threshold necessary to qualify for the exemption, may restrict the beneficial effects of the

[7] After the 1996 ECOFIN meeting in Verona, the Tax Policy Group chaired by Mario Monti decided to link this issue to those of the taxation of savings and the code of conduct on business taxation. This "tax package" should ease the negotiation process as the multiplicity of issues offers more rooms for compromises between Member States. The proposal is to exempt these interest and royalties payments from taxation when the parent has a direct or indirect holding of at least 25% in the subsidiary.

[8] Directive 90/435/EEC.

directive. The report of the European Commission also points out problems related to a lack of consistency in its implementation, as it seems that some Member States subject the availability of tax exemption to conditions that are not contained in the Directive.

Similar problems arise with the application of the merger directive[9], which provides for the deferral of corporate taxation on cross-border restructuring operations. The existence of a threshold in terms of holding has *per se* the potential to create discrimination between companies. It is not obvious to draw a direct relationship between these provisions on holding and the size of companies. However, the level of the threshold and the nature of these operations suggest that the rules may be more likely to concern large companies. These latter have indeed the capacity to ensure, if necessary, a substantial enough holding in order to benefit from the tax exemptions. This would be detrimental for small companies as, below the threshold, the dividend may be taxed, exempted, or imputed depending on each Member State's legislation. As indicated by the European Commission (2001a, p. 376), the technique of imputation may actually disadvantage small companies because, under the threshold, tax credit will usually only apply to dividends distributed at the domestic level. Large companies can bypass this by pursuing relatively complicated practices such as dividend stripping[10], which are not easily available for small corporations.

Among obstacles to cross-border activities, the limits on cross-border loss relief may be burdensome for multinational corporations, since although all countries allow carrying forward (or carrying back) losses at the domestic level, such relief remains problematic at the international level[11]. The existence of loss relief is particularly important for new companies, which are likely to suffer losses the first years of operation. Such possibility is therefore presumably particularly welcomed by SMEs, if the assumption that new firms have a smaller size turns out to be true.

The last cross-border obstacle identified by the European Commission are the transfer pricing issues. Following international conventions (e.g. OECD Model

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9 Directive 90/434/EEC.

10 A "dividend stripping" is a transaction wherein the buyer buys a share just before the distribution of dividends, receives this dividend as tax-free income and resells the share at a lower value. The buyer receives a tax-free dividend and books a capital loss on the sale of the share, which decreases its taxable income.

11 All EU Member States authorize the carry-forward of losses, the number of years varying from five to an unlimited period. Six Member States – France, Germany, Ireland, The Netherlands, Sweden and the United Kingdom - offer some possibilities to carry-back the losses (see European Commission 2001a, pp.89-128).

convention), cross-border intra-group operations have to be based on the "arm's length principle" and "separate accounting principle"[12]. The rationale behind the concept of arm's length is to register operations between affiliated parties on the same basis as if these parties were independent. This should avoid profit-shifting strategies, for instance from high-taxed countries to low-taxed ones. Bartelsman and Beetsma (2002) found that, at the margin, more than 65% of the additional tax revenue from a unilateral tax increase is lost due to a decrease in the reported income tax base. Similarly, Altshuler and Grubert (2001) found evidence that US companies carry out profit-shifting activities through financial planning such as investment in passive assets, investment in high-tax affiliates, and the use of multiple tiers[13].

Transfer pricing is a complex topic. Broadly speaking, two problems of different nature arise. First, comparable transactions are not always available so that there is some latitude for accounting certain assets, such as intangibles. Rules and practices also differ from one country to another, leading to possible income shifting to countries with more favorable legislation. Second, tax authorities sometimes require onerous transfer pricing documentation, implying a high compliance cost for enterprises. To conclude on transfer pricing, large multinational corporations may have rooms to decrease their taxes provided that this income shifting is not offset by too high compliance costs.

The profit-shifting behavior can be part of a broad definition of tax planning if we don't stick to a 'negative' classification limited to tax evasion, be it illegal such as fraud, or legal such as channeling complex financial arrangements through financial intermediaries. There are reasons to believe that international tax planning or optimization is more easily available for large corporations than for small ones. Indeed, the conditions set to benefit from special regimes are often restricted to minimum levels of size or turnover, which makes these advantages *de facto* only reachable by large companies. For example, the favorable regime of coordination centers for headquarters under Belgian tax law was subject to restrictive conditions among which were the requirement to be part of a group of companies, to have a

[12] This latter means that "each affiliated company in a group is for tax purposes treated as a separate entity and taxed individually on the basis that it conducts business with other group members at arm's length" (European Commission, 2001, p. 332).

[13] See Grubert and Slemrod (1998) for a good review of literature and additional evidence on income shifting.

consolidated turnover of at least 10 billions Belgian francs (i.e. 250 million euro) and a consolidated capital of at least one billion BEF, and to be international[14].

Finally, there may also be a link between the size of enterprises and some tax measures for listed companies. For instance, Greece had in a recent past a different statutory corporate tax rate for listed and unlisted companies, respectively set at 35% and 37.5% in 2001 (Bronchi, 2001). Similarly, Italy offers a lower Dual Income Tax for newly listed companies, up to three years after being listed. If there is no clear direct relationship between being listed and the size, the main reason for being listed - raising additional funds - may be a characteristic of growing companies achieving a critical size.

Measures intended for specific sectors.

Targeted tax measures towards specific sectors are more difficult to implement, essentially because competition law normally precludes it. However, such measures related to direct business taxation may be allowed within the European Union if properly notified to and deemed compatible by the European Commission. Measures of technical nature (e.g. depreciation rules) or pursuing some worthy policy objectives (e.g. exemptions for R&D) may be considered as State aid[15] but benefit from a derogation and are therefore compatible with EU rules. In addition, some discretionary administrative practices or some benefits reserved for certain types of undertakings may well be considered as State aid. Tax measures considered as State aids fall into two categories[16] and can take the form of tax credits, tax allowances, tax exemptions, specific rates, or deferred tax provisions.

Table (1) indicates the tax measures considered as State aid by the EU authorities (European Commission, 2001c). The interpretation of these figures should be done cautiously since, first, they include multiple horizontal objectives as diverse

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[14] This last criteria was met when three cumulative conditions were fulfilled: at least four subsidiaries were located in four different countries abroad, at least 500 million BEF (or 20% if more) of the consolidated capital was registered in foreign subsidiaries, and at least 5 billion BEF (or 20% if more) of turnover was raised by subsidiaries abroad.

[15] Following the notice issued by the Commission (1998b), a tax measure will be termed 'State aid' - within the meaning of article 87 EC (formerly 92 EC) - if it meets four cumulative conditions: (a) it reduces the firm tax burden (by ways of reducing the tax base, the amount of tax to be paid, or by rescheduling the tax liability), (b) it is granted by the State or through its resources, (c) the measure affects competition between Member States, and (d) the measure is specific or selective as it favors certain companies or the production of certain types of goods.

[16] State aid is classified in four main categories labelled from A to D. A refers to aid transferred in full to the recipient; B concerns aids in the form of public intervention through equity participation; C

as the promotion of R&D, the protection of environment, support to SMEs, employment and training aids, and concern diverse sectors, and, second, they don't include favorable tax measures not considered as State aid. The third row of Table (1) indicates total State aid in the form of tax measures by adding tax State aid aimed at the manufacturing and services sectors to those offered to agriculture, fisheries, and regional aid objectives. Tax State aid varies from zero in Austria and Spain to .55 and .78 percentage point of GDP, respectively in Ireland and in Portugal. It is interesting to notice that State aid to SMEs in the form of tax measures is the exception rather than the rule. In the European Union, aid to SMEs actually most often takes the form of grants and subsidies given directly to the recipient, or offered as soft loans (i.e. with generous repayment terms). Furthermore, other measures undertaken in favor of small companies (e.g. lower rates for SMEs) may simply not qualify as State aid.

There are of course typical examples of tax measures directly targeted at some sectors. Greek shipping companies with Greek flags were exempted from corporate taxation. Ireland had a special 10% corporate tax rate for companies selling goods manufactured in Ireland. In other cases, similar measures were coupled with conditions on the location. It was for instance still the case in 2001 in the Greek prefectures of Attica and Thessaloniki, in the Shannon airport zone in Ireland, or in the free-trade zones of Madeira and the Azores. Such measures have been listed in the report of the Code of Conduct on Business Taxation. This code of conduct is a non-binding peer review by which Member States aim, at political level, at avoiding any measures involving harmful tax competition. The code includes evaluation and monitoring procedures and applies to measures having or being likely to have a considerable effect on the location of economic activities in the Community. Despite the absence of consensus on the final report, approximately 280 measures have been listed in the report as potentially harmful[17], among which 66 measures were designated as "most harmful". This peer review leads to a double process of standstill

relates to aid in the form of interest saving; finally, D covers guarantees. Tax measures fall into subcategories of A and of C.

[17] Potentially harmful measures are assessed in the light of five criteria: (a) whether the advantages are reserved to non-residents, (b) whether they are ring-fenced (i.e. they are specific to mobile activities), (c) whether they are granted in the absence of any real economic activity, (d) whether the rules to compute the tax base depart from generally internationally accepted principles, and (e) whether the measures lack transparency.

(i.e. promise not to introduce new harmful measures) and rollback (i.e. eliminate harmful measures) of harmful tax measures[18].

Measures with implicit effects on specific sectors.

Finally, some measures that are not specifically targeted at some sectors may nevertheless have similar effects. For instance, the introduction of a tax credit for companies investing in new technologies may benefit most new sectors of the economy. More generally, sectors exhibit substantial differences in the structure of their assets so that depreciation rules are likely to have differentiated effects across different industries. The sector of transport, for instance, has a sizeable part of its assets in the form of tangibles such as vehicles. In the light of the report of the European Commission (2001a, pp.546-48), there are large differences in methods allowed (straight line or declining balance), as well as in the rates.

Effective corporate tax rates for different sectors and sizes.

These theoretical differences are confirmed by the real-life data. For example, Table (2) indicates 1999 effective corporate tax rates based on gross operating profit for different sectors for small and large companies respectively. As for small companies, the non-weighted average tax rate of the sample varied in 1999 from 13.7% for energy and water to 22.1% for services, whilst the rates for large companies went from 11.8% for the utilities up to 18.9% for the companies in the sector of trade. Comparing different sizes within the same sector also brings substantial differences in effective tax rates, which can be interpreted as an indication of implicit discriminations across firms with different characteristics.

To determine whether these dissimilarities were significant, we undertake statistical tests on differences in means over the period 1990-1999. The results are reported in Tables (3) and (4). As a first step, we compare the means in effective taxation between large and small companies operating within the same sector. In a second stage, we look at the differences in means across sectors for companies with comparable size. For the first test, the null hypothesis, which assumes that means are equal across sizes for a specific sector, can be rejected at 5%-level for the two sectors of 'transport and communications', and 'services' when using the effective tax rate

[18] The report should be finalized by the end of 2002, although some measures may run until end of 2005 when they should stop their effects. However, the ECOFIN agreed on a derogation stating that they may decide to extend the effects beyond 2005 on a case-by-case basis and under particular circumstances.

based on the gross operating profit, and for the sector of trade for the indicator based on profit. For the second test, the null hypothesis that means are all equals across sectors for a specific size can be rejected for both small and large companies with the first indicator but failed to be significant with the second, due to the extremely high dispersion of the rates in this later case.

Some caveats should obviously be made on the interpretation of these results. First, these differences are not consistently biased towards the same sector or the same size across countries. Second, although the hypothesis of equal average effective taxation is rejected in several cases, this exercise does not provide indications on the causes of such differences. Indeed, these can for instance be due to different effects of accounting practices across sectors - such as depreciation rules - because the structure of assets may differ from one industry to another. Alternatively, the differences in effective taxation may also be dependent on specific temporary sector conditions such as the economic cycle. To identify these causes, one needs to control for the structure of financial accounts. This analysis is the purpose of the last section.

Relationship between turnover, gross operating profit and taxes

From appendix A, we see that BACH database gives both the gross operating profit and taxes as a percentage of turnover. Schematically, the gross operating profit (*GOP*) is the turnover (*TURN*) minus some variable costs (*VC*) and some fixed costs (*FC*)[19]. Variable costs are linked to turnover via a positive relationship, modeled here as a coefficient α $(0 \le \alpha \le 1)$.

$$\boldsymbol{GOP = (1-\alpha)TURN - FC} \qquad \textbf{(1)}$$

Tax accrued (*TAX*) is computed by applying the statutory tax rate (*t*) on net profit before taxes, which is the difference between the gross operating profit and depreciation of fixed assets and interest payments (*DI*).

$$\boldsymbol{TAX = t(GOP - DI)} \qquad \textbf{(2)}$$

Dividing (1) by *TURN* and deriving by *TURN*, we find a positive concave relationship between the ratio of gross operating profit on turnover and turnover.

$$\frac{\partial\left(GOP/TURN\right)}{\partial TURN} = \frac{FC}{TURN^2} \ge 0 \quad ; \quad \frac{\partial^2\left(GOP/TURN\right)}{\partial^2 TURN} = \frac{-2FC}{TURN^3} \le 0 \qquad \textbf{(3)}$$

[19] Alternatively, one could consider fixed costs to be only reflected in depreciation and interest payments. In this case FC would simply be equal to zero and the only change would be equation (3) where no relationship between profitability and turnover would appear.

Substituting (1) in (2), and sequentially dividing and deriving by *TURN*, we find a similar relationship between the ratio of tax on turnover and turnover.

$$\frac{\partial\left(TAX/TURN\right)}{\partial TURN} = \frac{t(FC+DI)}{TURN^2} \geq 0 \quad ; \quad \frac{\partial^2\left(TAX/TURN\right)}{\partial^2 TURN} = \frac{-2t(FC+DI)}{TURN^3} \leq 0 \qquad \textbf{(4)}$$

More interestingly, a similar relationship exist between the ratio of tax on gross operating profit and turnover, indicating that large companies (i.e. with larger turnover) should normally bear a higher effective tax rate. This relationship should be stronger in sectors with high levels of depreciation and interest payments.

$$\frac{\partial\left(TAX/GOP\right)}{\partial TURN} = \frac{(1-\alpha)tDI}{GOP^2} \geq 0 \quad ; \quad \frac{\partial^2\left(TAX/GOP\right)}{\partial^2 TURN} = \frac{-2(1-\alpha)^2 tDI}{GOP^3} \leq 0 \qquad \textbf{(5)}$$

The relationship between the effective tax rate and *GOP* (measured in % of *TURN*) is quite similar. Profitability increases the ratio of effective taxation and this relationship is larger, the higher the level of depreciation and interest in percentage of turnover.

$$\frac{\partial\left(TAX/GOP\right)}{\partial\left(GOP/TURN\right)} = \frac{tDI}{TURN\left[GOP/TURN\right]^2} \geq 0$$

and

$$\frac{\partial^2\left(TAX/GOP\right)}{\partial^2\left(GOP/TURN\right)} = \frac{-2tDI}{TURN\left[GOP/TURN\right]^3} \leq 0 \qquad \textbf{(6)}$$

Turning to the effective tax rate on profit, its theoretical measure is *t*, the statutory tax rate, and is independent of both the turnover and the level of profit.

3. Domestic discriminations in corporate taxation.

This section examines the empirical relationship between effective corporate tax rates and different structural variables theoretically influencing the tax burden. The analysis of equity issues in effective corporate taxation starts with the following estimating equation:

$$ETR_{ijkt} = \alpha_t + \beta_{1ijk} CONTROL_{ijkt} + \beta_{2j} SECT_{jt} + \beta_{3k} SIZE_{kt} + \beta_{4i} C_i + \varepsilon_{ijkt}$$

where ETR_{ijkt} is the log of our measure of effective corporate taxation in country *i*'s, sector j and size k, for year t. Next, $CONTROL_{ijkt}$ are a set of control variables from the profit and loss accounts, some of them being in logs[20], which are included in some regressions. $SECT_{jt}$ and $SIZE_{kt}$ are zero-one dummies respectively flagging the sector and the size. Following the classification of the BACH database, six main sector classifications are estimated and the size of the companies can be 'small', 'medium', or 'large' depending on the turnover, the level of capital, or the total assets[21]. Sectors and sizes are being interacted in some regressions. Further, α_t is a set of time-varying constants, whilst C_i are the country dummy variables. Finally, the β's are vectors of coefficients, and ε_{ijkt} is an error term. All regressions use pooled cross-section data and include unreported time fixed effects. The sample period is 1980-1999.

The results of the regressions are reported in Table (5). Regressions (1)-(3) contain the effective corporate tax rate defined as tax accrued on gross operating profit as the dependent variable, whereas regressions (4)-(5) use the ratio of tax accrued on profit before tax instead. To correct for possible time mismatch in the allocation of tax accrued due to later corrections and carry-forward of losses, the dependent variable in regressions (3) and (5) is the ratio of the total tax accrued for year t to t_{+2} on the corresponding tax base for those 3 years. Their results confirm those of regressions (1) and (4). Furthermore, regression (2) includes the level of value adjustments - including depreciation- as well as interest paid, both in percentage of turnover. This is done to correct for the measurement error that could arise when using gross operating profit. Indeed, possible differences across sectors in terms of the structure of the costs may bias the indicator in favor of capital-intensive industries, even in the case of equal profitability. Finally, the regressions include sector and size dummies variables to identify the possible differentiated treatments. Table (6) contains comparable regressions with size and sector variables interacted.

The results suggest significant differences in effective corporate tax rates across sectors and sizes. An unreported analysis of the relative contribution of company characteristics in regressions (1) and (4) shows that sectors explain about 30% of the variance if gross operating profit is used in the denominator of the dependent variable,

[20] See appendix A for data sources and definitions and appendix B for summary statistics.

[21] See appendix C for a description of the database and the definitions of effective tax rate, sectors, and sizes.

whereas this proportion drops to 10% if profit is used instead. Whereas highly significant in both regressions, size dummies only contribute for about 2-3% in both cases. The lion's share in terms of explanatory power comes from the country dummies, which also capture the statutory corporate tax rate. These country fixed effects are all strongly significant[22] and give interesting insights as they actually provide a ranking of countries with regards to effective taxation, controlled for sector and size composition effects. It confirms that Japan, Italy and Germany are high tax countries, whilst corporations from Sweden and Austria have a significantly lower corporate tax burden. These results are consistent with other studies using the backward-looking methodology. It also seems that countries situated in the middle of the ranking are very close to one another, as shown by the coefficients.

Looking at sectors, 'Energy and water', 'Building and civil engineering', 'Transport and communications', and 'services' have, at first glance, significantly lower effective tax rates than the 'Manufacturing sector' used as the case base, whereas the opposite may be suggested for 'trade'. Interestingly, with a few exceptions, most sectors enjoying lower taxation share the common characteristic of being industries operating in domestic markets rather than on a truly international basis. Second, most of them involve a set of activities which are partly or in full conducted by the public sector and/or receive tax preferential treatment of any form. The sector of "energy and water" groups mining and extracting activities of coal, petroleum, natural gas and uranium, with the production, manufacture, and distribution of energy and water, as well as the collection and purification of water. From regressions in Table (5) and (6), we conclude that effective corporate taxation is lower in this sector, whatever the indicator used and the size of the companies. The high proportion of fixed assets leading to high levels of depreciation may be a candidate to explain the large negative coefficient when using the ETR based on gross operating profit. However, this coefficient remains large when profit before taxes is used for computing the effective tax rate, so that adjustment alone cannot explain everything. The mining and extracting activities actually include some loss-making industries, such as coal extracting activities. However, their weight in the total is probably quite small compared to those of utilities and, as indicated in Table (7), the

[22] The majority of (unreported) time dummies are significant at 5%-level but no clear pattern could be identified.

sector displays a relatively high profitability, possibly partly due to economies of scales in the sector. Following EU directives, electricity and gas industries in Europe are progressively being liberalized, but this legal process is not yet achieved in most countries, with a sizeable part of the market still being non-eligible for choosing freely its supplier. Furthermore, in most countries the incumbents have retained a high market share and effective competition is still unsatisfactory. Additionally, a lack of cross-border interconnection capacities and some discriminatory access to national networks leads to energy markets developing at regional level rather at a truly European level (European Commission, 2001d). The situation is comparable in the US with full liberalization of energy applying to a small number of States only. Because of their statute of former public utilities, these industries have secured in a large set of countries preferential tax treatment for a significant range of their activities. In most EU Member States, the distribution of energy is done through public-private partnerships immune from corporate taxation. These preferential treatments may well explain the low effective corporate tax rate on companies from the 'energy and water' sector, in particular for its large companies.

The financial accounts of the sector of 'transport and communications' bear a high proportion of assets which increases the weight of depreciation. In addition the sector is relatively indebted. This is revealed by a relatively higher gross operating margin coupled with a lower profitability before taxes. This category includes sectors that are often operated by public-owned enterprises or that receive State aid. Some of these industries display low effective competition such as Postal services or Railways, whilst some others face more intense competition such as transport by air or by water, radio and television broadcasting, telecommunications, travel agencies and other supporting activities. The sector shows lower effective taxation when measured on gross operating profit, especially for large corporations. When measured on profit, the effective taxation is only significant when the 3-years average is considered, which could be an indication of volatile ratios. The results are therefore mixed. One explanation for the lower tax burden found in some regressions could be, like ‘energy and water’, the presence of large public corporations in railways or public transport with favorable tax treatments, a high proportion of fixed assets and a lower profitability before taxes.

The sector of 'building and engineering' includes the construction works of buildings and roads, as well as the installation and completion of buildings. We

conclude from Table (6) that the lower tax burden in that sector only applies to large companies. This is consistent with the conjecture on the degree of competition. Small companies in this sectors are often locals operating within a restricted geographical area with few competitors. Large companies, on the other hand, are involved in public works that are subject to public tendering. This high degree of competition decreases profitability, and, subsequently, effective corporate taxation.

The sector of services is more difficult to analyze as it comprised industries as diverse as maintenance and repair of motor vehicles, real estate activities, research and development, legal activities, tax consultancy, public administration and defense, education, cultural activities, etc. Interestingly, the sector has the features of being relatively more profitable, more indebted, and with a higher proportion of fixed assets. The results suggest that the sector has a relatively lower tax burden, this advantage being reinforced the larger the size of the company. Once again, the structural variables alone cannot explain the tax pattern and the heavy presence of public bodies in the sample most probably weights on the results.

Turning to size, dummies suggest higher taxation the smaller the company. The estimated coefficient of 0.205 in column (2) of Table (5) suggests that being a small company rather than a large one increases effective corporate taxation by about 23 percent. This pattern seems to hold true in each sector. This is an important finding as theory normally finds a higher effective tax rate for large companies[23]. In addition, small companies have a higher leverage ratio and a higher implicit rate of interest on their debt. This is consistent with the hypothesis of a 'market failure' in the financing of small businesses activities due to asymmetric information and a possible short-sight of financial markets. However, size does not seem to influence the share of interest payments in percentage of turnover (and nor the level of adjustments). This situation could be explained by the large differences in Europe in terms of the structure of the debt (see European Commission 2001e). Hence, the results suggest that large companies might be in a better position to reduce their effective tax burden, possibly through profit shifting, tax planning, fiscal engineering, and/or rulings, as they may have more opportunities and resources at hand.

[23] The possibility of a sample bias should be diverted. Indeed, if a high share of SMEs are start-ups making losses in their early years, the aggregation of data will artificially inflate the ratios of effective taxation. However, the results do not suggest that size could influence profitability before taxes.

On the basis of these results, we conclude that there is some evidence of effective corporate tax differences across sectors and sizes. In other words, even when controlling for the structure of the financial statements, tax burdens are shown to be more favorable for large companies and for specific sectors.

Conclusions.

Whilst the current debate in corporate taxation is focusing on obstacles to cross-border activities to level the playing field for companies operating from different countries, differences of treatment across enterprises operating from the same country but in different sectors or of different sizes has attracted lower attention. Domestic tax legislation contains provisions targeted at specific industries as well as at particular sizes. Furthermore, other measures applicable in a non-differentiated manner across companies have the potential to have a larger impact on some types of corporations. The tax obstacles identified by the report of the European Commission on company taxation are among those kinds of measures.

Using the microeconomic backward-looking approach, this paper computes effective corporate tax rates for eleven EU Member States, the USA, and Japan, for different sizes of companies and different sectors of the economy. These measures are based on individual accounts of companies harmonized in a standard format. The results from the pooled cross-section regressions show differences in tax burden, not only across countries as already identified by the report of the European Commission on company taxation, but also within countries for different types of companies. Broadly speaking, the results suggest that large companies bear a smaller tax burden compared to small enterprises. As size does not seem to significantly influence profitability before taxes nor the impact of depreciation and interest payment, it is suggested that large companies are more successful in avoiding taxes, possibly through tax planning and fiscal engineering. Similarly, the sectors of ‘energy and water’, ‘building and civil engineering’, and ‘services’ have smaller effective taxation than the manufacturing industry and the sector of ‘trade’. However, the differences across sectors could be explained by either a higher degree of competition that reduces margin or the presence in some of these sectors of public corporations immune from taxation. Finally, the paper exhibits a ranking of countries for effective

taxation controlled for the size, the sector, and the composition of companies' financial statements.

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Appendix A. Variables definitions and data sources

Balance sheet structural variables

The leverage variable is the log of the ratio between long term debt, and capital plus provisions.

The current on fixed assets variable is the log of the ratio of these two items.

Both variables are from BACH.

Profit and loss account variables

The effective tax rates are defined as in appendix C.

Staff costs variable is the log of staff costs (wages and social security contributions) in percentage of turnover.

Value adjustments variable is the log of the sum of value adjustments of fixed and current assets (including depreciation) in percentage of turnover.

Interest variable is the log of interest payments in percentage of turnover.

The Gross Operating Profit variable is the log of the Gross Operating Profit in percentage of turnover.

The profit is the log of the profit before taxes in percentage of turnover.

The implicit interest rate is the ratio of the interest paid on total debt.

All variables are from BACH.

Sector and size variables

Sector and size variables are zero-one dummies indicating whether the observed data relates or not to a specific size or a specific sector as defined in BACH.

Appendix B. Summary Statistics.

	Median	Mean	Maximum	Minimum	Std. Dev.	Observations
Regression (2)						
Effective Tax rate based on gross operating profit (%)	14.74	15.42	91.56	-52.83	9.89	2652
Value adjustments (%turnover)	4.62	6.21	183.94	-36.14	7.51	2652
Interest (%turnover)	2.87	4.46	137.87	0.00	5.84	2652
Energy and water		0.17	1.00	0.00	0.38	2652
Manufacturing		0.20	1.00	0.00	0.40	2652
Building and civil engineering		0.18	1.00	0.00	0.38	2652
Trade		0.16	1.00	0.00	0.37	2652
Transport		0.15	1.00	0.00	0.35	2652
Other services		0.14	1.00	0.00	0.35	2652
Small		0.32	1.00	0.00	0.47	2652
Medium		0.33	1.00	0.00	0.47	2652
Large		0.34	1.00	0.00	0.48	2652
Regression (4)						
Effective Tax rate based on profit before taxes (%)	35.40	30.38	3600.00	-7700.00	263.46	2656

Summary statistics for common sample. The negative minimum value for value adjustment is due to the possibility of appreciation of assets and other write-offs of former depreciation.

Appendix C. The BACH database.

Created in 1985 by the Directorate General for Economic and Financial Affairs, the Bank for the Accounts of Companies Harmonized (BACH) presents the financial structures of non-financial companies, aggregated at various sectors and sizes levels, in eleven Member States[24], the United States and Japan. Data are presented using a single accounting layout based on the one set in the Fourth Community company-law Directive (76/660/EEC). BACH data is a compilation of individual (as opposed to consolidated or group) financial statements of companies, presented in a structured form. BACH also offers a decomposition made of six main sector classes - Energy and Water, Manufacturing Industry, Building and Civil Engineering, Trade, Transport and Communication, and Other Services - based on revised NACE-2 digits classification.

Sectors	NACE 2DIGITS-REV1 sectoral codes
ENERGY AND WATER*	10+11+12+23+40+41
MANUFACTURING INDUSTRY	13+14+15+16+17+18+19+20+21+22+24+25+26+27+28+29+30+31+32+33+34+35+36
BUILDING AND CIVIL ENGINEERING	45
TRADE	50.1+50.3+50.4+50.5+51+52.1-52.6+55
Transport and communication	60+61+62+63+64
Other services	50.2+52.7+67+70+71+72+73+74+75+80+85+90+91+92+93+95

* Also including refining activities.

A distinction by size is made between three categories of companies except the US where only two size classes are available:

Size class	European countries Million EURO (ECU)	Japan Million YEN	USA Million USD
All Sizes	All Sizes	All Sizes	All Sizes
Small	Turnover < 7	Capital < 100	small and medium size Balance-sheet total<25
Medium	7 =< Turnover < 40	100 < Capital < 1000	
Large	Turnover >= 40	Capital =< 1000	Balance-sheet total>25

Definition of Gross Operating Profit

We have used the Profit and Loss account available in BACH (all items in %-age of net turnover) to compute effective tax rates. We have named variables in the following way.

[24] Are missing: Greece, Ireland, Luxembourg, and the United Kingdom.

	PROFIT AND LOSS ACCOUNT
OI	Net turnover. *(operating income)*
+ (1)	Change in stock finished goods and work in progress.
+ (2)	Capitalized production.
+ (3)	Other operating income.
= TOI	**Total operating income.**
- OC *(operating cost)*	Costs of materials and consumables. (*Raw materials and consumables + Other external charges).*
- (4)	Other operating charges and taxes
- EMPL (*employment*)	Staff costs. (*Wages and salaries + Social security costs).*
= GOP	**Gross operating profit.**
- DEPR	Value adjustments on non financial assets + Depreciation on intangible and tangible fixed assets + Other value adjustments and provisions
= EBIT	**Net operating profit** (Earnings before interest and taxes)
+ FININC	Financial income
+ (5)	Value adjustments on financial assets
-FINCH *(financial charges)*	Interest and similar charges (*Interest paid on financial debts(**INT**)+ Other Financial charges)*
= EBT	**Profit on ordinary activities before taxes** (earnings before taxes)
+ EXINC	Extraordinary income
- EXCH	Extraordinary charges
- T	**Taxes accrued on profit**
= NTP	**Profit or loss for the financial year** (net total profit)

Computing effective corporate tax rates

The first option retained as the measurement of effective taxation is the ratio of tax accrued on gross operating profit:

$$\tau_1 = \frac{T}{GOP}.$$

This ratio is similar to the one used in macro backward looking studies such as Martinez-Mongay (2000). The use of gross operating surplus is interesting because it give profit before depreciation. This is important to obtain a denominator whose definition does not differ too much from country to country. Indeed, depreciation rules differ not only in the straight versus declining balance dimension but also on whether the historical value or the market value of the asset is taken into account. Therefore, taking gross operating profit allows us to reduce some of the problems due to differences in accounting methods. Gross Operating Profit is more comparable between countries than profit on ordinary activities. This rate has been computed per country, size, industry and year.

The second option is the ratio of tax accrued on profit before taxes (including extraordinary activities).

$$\tau_2 = \frac{T}{EBT + EXINC - EXCH}.$$

Table 1. Tax measures considered as State Aid in the European Union.

	AT	BE	DK	FI	FR	DE	EL	IE	IT	LU	NL	PT	ES	SW	UK	EU-15
Manufacturing / services																
Cat. A2	0	112.1	230.3	1.1	453.4	354.3	5.6	426.9	257.8	0	121.6	786.1	0.6	20.0	0	2,769.7
Cat C2	0	0	0	0	21.7	69.8	0	0	0	0	47.5	0	0	0	0	139.1
Of which: SMEs																
Cat. A2	0	0.16	0	0	0	203.3	0	0	10.2	0	0	0	0	0	0	213.7
Cat C2	0	0	0	0	0	69.8	0	0	0	0	0	0	0	0	0	69.8
Sum of tax State Aid	0	115.9	230.3	8.8	2221.1	1247.2	5.6	433.6	2061.7	1.8	169.2	788.8	0.6	65.4	26.8	7376.8
As % of Total Aid	.00	3.68	13.70	.44	12.46	4.67	.43	40.73	15.15	.83	5.36	51.40	.01	3.65	.35	8.21
As % GDP	.000	.051	.148	.008	.171	.065	.005	.549	.193	.011	.048	.781	.000	.030	.002	.096
Total State Aid to SMEs	67.5	149.7	13.2	69.2	268.3	1,267.8	13.5	4.2	688.5	10.1	21.7	22.6	240.7	37.1	303.3	3,177.2
As % of Total Aid	3.10	4.75	.79	3.47	1.50	4.75	1.03	.39	5.06	4.62	.69	1.47	3.95	2.07	4.01	3.53
As % GDP	.036	.066	.008	.060	.021	.066	.012	.005	.064	.059	.006	.022	.046	.017	.024	.042
Total State Aid	2,180	3,152	1,681	1,994	17,829	26,716	1,305	1,065	13,605	218	3,159	1,535	6,086	1,792	7,569	89,885
As % GDP	1.15	1.40	1.08	1.74	1.38	1.39	1.17	1.35	1.27	1.28	.90	1.52	1.15	.82	.60	1.18

Annual average in million euro for 1997-1999. Cat. A2 relates to tax credits, allowances, exemptions, reduced social security payments, and specific tax rates. Cat. C2 concerns deferred tax provisions. Other non-reported categories are agriculture, fisheries, and regional aid.
Source: European Commission (2001c), and author's calculations.

Table 2. Effective corporate tax rates for small and large companies in 1999 (based on GOP).

Effective Corporate Tax Rate (based on GOP)	Energy and Water		manufacturing industry		Building and Civil Engineering		Trade		Transport and Communication		Other services	
	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
Austria	8.5	0.5	6.6	14.6	7.6	9.8	7.6	14.0	4.0	19.2	18.7	6.2
Belgium	17.4	8.5	15.1	12.3	15.5	15.0	17.9	20.2	10.2	12.1	18.5	11.5
Denmark	9.7	12.4	11.5	26.7	7.8	13.9	10.1	19.9	3.8	19.9	13.9	18.7
Finland	5.8	16.1	26.4	20.8	17.4	21.2	23.1	20.9	15.1	13.4	24.6	29.8
France	16.7	2.5	18.2	17.4	20.5	7.4	20.3	19.4	16.2	0.6	15.1	12.6
Germany*	n.a.	n.a.	20.1	23.4	13.0	32.4	16.3	19.8	n.a.	n.a.	n.a.	n.a.
Italy	33.4	14.0	33.8	24.9	36.2	16.3	35.2	25.0	28.7	23.4	37.9	23.0
The Netherlands	n.a.	13.8	17.9	18.0	19.1	18.3	21.9	20.0	13.4	10.8	26.0	19.4
Portugal	10.6	18.8	11.1	18.0	14.9	14.1	18.0	20.6	10.0	15.6	n.a.	n.a.
Spain	6.4	17.6	16.3	15.6	18.6	13.0	18.4	17.6	21.8	5.4	23.6	n.a.
Sweden*	6.7	5.9	12.6	13.5	10.6	22.7	15.3	15.1	7.3	11.6	16.7	7.7
Japan	24.8	21.4	28.5	15.0	42.1	4.9	31.4	14.4	35.7	9.9	25.8	12.5
USA	11.1	9.9	8.9	22.9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

** 1998. Source: BACH and own calculations.*

Table 3. t-test of differences in means between small and large companies 1990-1999.

Differences across sizes *Ho: means are equal.*	Energy and Water	manufacturing industry	Building and Civil Engineering	Trade	Transport and Communication	Other services
Number of degrees of liberty	199	239	204	183	177	164
Theoretical t-stat (5% level)	1.972	1.970	1.972	1.973	1.973	1.975
ETR1 (GOP)						
Computed t-stat[25]	1.087	0.492	1.066	0.166	3.035	2.544
Decision	Do not reject	Do not reject	Do not reject	Do not reject	**Reject**	**Reject**
ETR2 (Profit)						
Computed t-stat	1.525	.664	.389	2.283	1.097	0.310
Decision	Do not reject	Do not reject	Do not reject	**Reject**	Do not reject	Do not reject

Source: 1990-1999 data from BACH and own calculations.

Table 4. F-test of differences in means across sectors 1990-1999.

Differences across sectors *Ho: means are all equal.*	Small companies	Large companies
Number of degrees numerator	5	5
Number of degrees denominator	579	587
Theoretical F-stat (5% level)	2.230	2.229
ETR1 (GOP)		
Computed F-stat[26]	4.903	14.378
Decision	**Reject**	**Reject**
ETR3 (profit)		
Computed F-stat	.810	1.082
Decision	Do not reject	Do not reject

Source: 1990-1999 data from BACH and own calculations.

[25] The t-stat is computed as $t_{n_1+n_2-2} = \frac{|\mu_1 - \mu_2|}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}(\frac{1}{n_1} + \frac{1}{n_2})}}$, where subscripts 1 and 2 designate the samples, μ the mean, S^2 the variance, and n the number of observations.

[26] The F-stat is computed as $\frac{\frac{1}{K-1}\sum_{k=1}^{K} n_k (\mu_k - \mu)^2}{\frac{1}{n-K}\sum_{k=1}^{K}\sum_{i=1}^{n_k} (x_i^{[k]} - \mu_k)^2}$, where n is the total number of observations, n_k is the number of observations in sample k, K is the number of samples, μ is the global average, μ_k is the average in sample k, and $x_I^{[k]}$ indicates an observation i in sample k.

Table 5. Determinants of effective corporate taxation.

Dependent variable: effective corporate tax rate	On gross operating profit			On profit before taxes	
	(1) ETR1	(2) ETR1	(3) ETR1 3 years (t to t+2)	(4) ETR2	(5) ETR2 3 years (t to t+2)
Value adjustments		-.077*			
		(.034)			
Interest		-.236**			
		(.030)			
Sectors and sizes					
Energy and water	-.632**	-.465**	-.622**	-.408**	-1.022**
	(.044)	(.044)	(.035)	(.046)	(.057)
Building and civil engineering	-.030	-.143**	-.022	-.117**	-.119**
	(.024)	(.027)	(.034)	(.031)	(.044)
Trade	.137**	-.073*	.140**	-.034	.522**
	(.021)	(.037)	(.035)	(.026)	(.043)
Transport	-.552**	-.424**	-.560**	.056	-.174**
	(.031)	(.034)	(.037)	(.040)	(.056)
Other services	-.140**	.024	-.111**	-.346**	-.937**
	(.033)	(.038)	(.037)	(.045)	(.066)
Small companies	.153**	.205**	.156**	.166**	.292**
	(.027)	(.025)	(.026)	(.031)	(.042)
Medium companies	.191**	.185**	.216**	.205**	.276**
	(.026)	(.025)	(.025)	(.028)	(.039)
Country fixed effects					
Japan	3.418**	3.834**	3.423**	4.477**	4.745**
	(.104)	(.087)	(.087)	(.081)	(.103)
Italy	2.940**	3.419**	2.926**	4.420**	4.698**
	(.111)	(.097)	(.092)	(.088)	(.127)
Germany	2.995**	3.318**	3.028**	4.141**	4.583**
	(.112)	(.092)	(.102)	(.084)	(.109)
Portugal	2.527**	3.071**	2.513**	4.084**	4.023**
	(.121)	(.105)	(.104)	(.104)	(.140)
France	2.644**	2.967**	2.623**	3.837**	4.157**
	(.114)	(.094)	(.093)	(.087)	(.111)
Spain	2.532**	3.028**	2.571**	3.623**	3.451**
	(.112)	(.097)	(.093)	(.093)	(.118)
United States	2.999**	2.939**	2.970**	3.495**	4.195**
	(.128)	(.114)	(.108)	(.100)	(.130)
The Netherlands	2.700**	3.044**	2.669**	3.489**	3.687**
	(.111)	(.091)	(.091)	(.087)	(.118)
Belgium	2.599**	2.985**	2.586**	3.456**	3.520**
	(.112)	(.096)	(.097)	(.100)	(.133)
Finland	2.716**	3.027**	2.707**	3.433**	3.620**
	(.122)	(.102)	(.124)	(.092)	(.142)
Denmark	2.689**	3.014**	2.706**	3.322**	3.832*
	(.120)	(.104)	(.106)	(.101)	(.116)
Austria	2.080**	2.513**	2.095**	3.252**	3.606**
	(.113)	(.093)	(.089)	(.085)	(.109)
Sweden	2.374**	2.801**	2.303**	2.980**	2.872**
	(.120)	(.104)	(.101)	(.109)	(.134)
Adj. R^2	.453	.498	.497	.431	.532
No. of obs.	2626	2491	2237	2460	2120
F-stat	58.256	62.708	62.330	49.981	67.961
Prob (F-stat)	.000	.000	.000	.000	.000

*Detailed variable definitions and data sources are given in Appendix A. Heteroskedasticity consistent standard errors are given in parentheses. All regressions include unreported time dummies. * and ** indicate significance levels of 5 and 1 percent, respectively.*

Table 6: Determinants of effective corporate taxation (cont.).

Dependent variable:	(6) ETR1 (gross operating profit)	(7) ETR1 (gross operating profit)	(8) ETR2 (profit before taxes)
Profit and loss account variables			
Value adjustments		-.065	
		(.036)	
Interest		-.236**	
		(.032)	
Sectors and sizes interacted			
Energy and water - small	-.506**	-.234**	-.441**
	(.072)	(.059)	(.104)
Energy and water - medium	-.535**	-.374**	-.299**
	(.073)	(.072)	(.067)
Energy and water - large	-.834**	-.681**	-.485**
	(.074)	(.072)	(.055)
Building and Eng. - small	-.202	-.081**	-.023
	(.029)	(.030)	(.041)
Building and Eng. - medium	.123**	.001	-.036
	(.035)	(.038)	(.045)
Building and Eng. - large	-.191**	-.318**	-.289**
	(.043)	(.045)	(.050)
Trade - small	.059*	-.054	.056
	(.029)	(.036)	(.040)
Trade - medium	.196**	.009	-.001
	(.023)	(.040)	(.034)
Trade - large	.150**	-.134**	-.153**
	(.035)	(.051)	(.034)
Transport - small	-.351**	-.247**	.140*
	(.035)	(.035)	(.058)
Transport - medium	-.447**	-.381**	.106
	(.041)	(.041)	(.062)
Transport - large	-.846**	-.630**	-.076
	(.063)	(.067)	(.070)
Other services - small	-.022	.262**	-.430**
	(.055)	(.063)	(.066)
Other services - medium	-.156**	-.007	-.177**
	(.040)	(.042)	(.055)
Other services - large	-.229**	-.151*	-.442*
	(.064)	(.070)	(.090)
Adj. R^2	.467	.484	.430
No. of obs.	2626	2491	2460
F-stat	71.225	55.227	57.508
Prob (F-stat)	.000	.000	.000

Detailed variable definitions and data sources are given in Appendix A. Heteroskedasticity consistent standard errors are given in parentheses. Unreported time and country dummies are included. * and ** indicate significance levels of 5 and 1 percent, respectively.

Table 7: structural variables and companies characteristics.

Dependent variable:	(9) Gross operating profit (% turnover)	(10) Leverage	(11) implicit interest rate	(12) Interest (% turnover)	(13) Current on fixed asset	(14) adjustment (% turnover)	(15) Profit before taxes
Sizes							
Small	-1.052**	.363**	.067**	.056	.363**	-.035	-.007
	(.322)	(.030)	(.019)	(.029)	(.023)	(.021)	(.037)
Medium	-.659*	.061*	.007	.003	.280**	-.033	.003
	(.280)	(.028)	(.016)	(.052)	(.021)	(.022)	(.034)
Sectors							
Energy and water	9.202**	.446**	-.087**	.526	-1.217**	.703**	.312**
	(.558)	(.045)	(.025)	(.040)	(.032)	(.023)	(.051)
Building and civil	-2.954**	.105**	-.500	-.270**	.813**	-.479**	-.299**
engineering	(.174)	(.037)	(.023)	(.026)	(.024)	(.021)	(.039)
Trade	-4.865**	.082**	-.094**	.354**	.482**	-1.062**	-.585**
	(.167)	(.029)	(.019)	(.035)	(.019)	(.021)	(.034)
Transport	5.155**	.521**	-.001	.354**	-.972**	.592**	-.285**
	(.431)	(.034)	(.022)	(.035)	(.031)	(.024)	(.051)
Other services	3.845**	.428**	-.087**	.534**	-.387**	.481**	.433**
	(.365)	(.040)	(.022)	(.042)	(.031)	(.033)	(.050)
Adj. R^2	.409	.371	.463	.522	.750	.725	.316
No. of obs.	2658	2654	2521	2521	2655	2651	2468
F-stat	74.987	64.213	88.317	111.676	319.184	281.645	47.161
Prob (F-stat)	.000	.000	.000	.000	.000	.000	.000

Detailed variable definitions and data sources are given in Appendix A. Heteroskedasticity consistent standard errors are given in parentheses. Regression concerns 1980-1999. Unreported time and country dummies are included. * and ** indicate significance levels of 5 and 1 percent, respectively.