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ABSTRACT

Is There Regional Tax Competition? Firm Level Evidence for Belgium*

This is the first Paper that looks at regional tax competition within one single country. In many countries in Europe, regions within a country differ substantially in their economic development and attractiveness to firms. Belgium is a typical example of a country where the economic situation of its three regions is very different. Our findings are indicative of regional tax competition, with a lower Effective Tax Rate (ETR) in the peripheral region of Wallonia than in Flanders. In addition to location variables, our empirical model explaining firm level heterogeneity in ETRs includes firm characteristics, sector membership and variables capturing statutory tax breaks.

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1. Introduction

Closer economic integration in the EU has increased capital mobility and is considered responsible for the greater tax competition between countries. It has been argued that capital mobility will lead to a race to the bottom in corporate tax rates as countries compete with each other to attract firms (European Commission, 1998). To do so, governments have several tools at their disposal. They can either lower the Statutory Tax Rate (STR), or they can narrow the tax base for firms. Kind et al. (2003) show that economic integration makes the corporate tax base increasingly mobile and tax sensitive, with downward pressure on tax rates as a result. Governments may also target specific companies or sectors and offer them a preferential tax treatment or specific tax privileges (e.g., investment credits or tax rulings for foreign investors). Alternatively, they may also decide to alter the frequency and intensity of tax audits. More intensive tax auditing will make firms more aware of their income declaration and is likely to increase the tax base and the amount of taxes collected. This would show up in the “Effective Tax Rate” (ETR) which as opposed to “the Statutory Tax Rate” (STR), also accounts for the tax base. As we will explain below, the difference between the STR and the ETR is a reflection of the number of tax concessions a country provides.

In this paper we analyze the determinants of firm level ETR for large Belgian firms. While the Statutory Tax Rate is the same for all these firms, there is substantial heterogeneity in Effective Tax Rates.¹ Our analysis indicates that while tax concessions explain some of the variation in Effective Tax Rates, a large part of the variation can be attributed to other more political factors, such as the size of a firm and the region it is located in. Sector membership and the federal government in office also turn out to be important factors in explaining the heterogeneity in ETRs. These more political factors could reflect either negotiated tax concessions or certain political and economical objectives that a government is aiming to achieve through its tax system.

We find an average ETR of about 26%, which is 14% lower than the STR of 40.17% in that same period. While the STR did not change in the period we analyze, we do observe yearly changes in average ETRs. Our results suggest that the average ETR has steadily increased in the course of the nineties. Especially in the two years preceding the reduction in STR, we observe an increase in ETRs during the same government period. One possible explanation for this is that the government anticipated the strong reduction

¹ A few other studies have analyzed firm level ETRs using different data sets such as Buijink et al. (2002, 2000b), Huizinga and Nicodème (2003), Janssen (2003) and Nicodème (2002).

in STR it enacted in December 2002.² By widening the tax base in the years just before that reduction, the effect on the country's budget is at least partly offset and the impact on the budget dampened. In view of the Maastricht criteria and the Stability pact governments are forced to maintain budgetary discipline. Therefore when governments plan a lower tax rate, widening the tax base is one way to sustain the level of tax revenue. Hence, our results of increasing ETRs, especially at the end of the nineties, may pick up an anticipatory effect of the decrease in the STR in 2002.³ This is also confirmed by the macro-economic study of Baldwin & Krugman (2002). They find that while most European countries have lowered their STRs, the ratio of 'aggregate Tax income at the country level over GDP' did not change much over time. Despite the reduction in nominal tax rates the total tax income at the country level remained relatively stable, suggesting that most countries had also widened their tax base.

To the best of our knowledge, the issue of regional tax competition within a country has not been studied in the literature before. Although it is clear that in many countries in Europe, regions within a country can differ substantially in terms of their economic development and attractiveness to firms. Belgium is a typical example of a country where the economic situation of its 3 regions is very different. While the 3 regions Flanders, Wallonia and Brussels are relatively autonomous politically, their fiscal policy is still very much a federal issue. However, with an average unemployment rate of about 8% in Flanders compared to about 14% in Wallonia, the demand for an autonomous fiscal policy is growing. In a wider European context, economists have been arguing that more peripheral countries such as Greece and Portugal for example should be allowed to charge a lower corporate tax rate in order to differentiate themselves from the 'core' countries in Europe for the purpose of attracting firms within their country borders. This argument rests on the notion that firms in the core countries are more willing to pay higher taxes in return for better infrastructure, proximity to consumer markets, to suppliers and to other firms to benefit from agglomeration spillovers. Baldwin & Krugman (2002) for example have shown that tax revenue over country GDP has not converged in Europe between the so called 'core' and 'periphery' countries.

² Belgium recently lowered its STR from 40.17% to 33.9% from the year 2003 onwards. Many other EU countries have also lowered their STR. For example the STR of Italy was reduced from 52.20% in 1993 to 40.25% in 2002. For Denmark the STR decreased from 36% in 1993 to 30% in 2002 (KPMG, 2003).

³ Devereux et al. (2002) also find that tax-cutting and base-broadening reforms usually go hand in hand leaving the Effective Tax Rates fairly stable over time.

In this paper we examine whether *within* a country such as Belgium with large economic disparities between its regions,⁴ there is any evidence of regional tax competition where the expectation would be that the more peripheral region of Wallonia would have a lower Effective Tax Rate than the ‘core’ region Flanders.

From a statutory point of view, firms in Flanders, Wallonia and Brussels are subject to the same STR and the same rules for the determination of the tax base apply. However, tax audits and controls are decentralized. There are about one hundred and fifty four regional tax offices scattered across the country responsible for tax audits and controls. Previous research has shown that the efficiency of these regional offices tends to differ substantially. More in particular Moesen et al. (1994) used non-parametric techniques and developed an efficiency index for each regional office where ‘efficiency of tax controls’ was measured by a number of variables including ‘the number of files handled’, the ‘complexity of the file’ and the number of ‘visits on the premises’. The findings obtained in our paper suggest lower ETRs in Wallonia, compared to Flanders after controlling for sectoral composition and firm characteristics. This confirms the results by Moesen et al. (1994) but in addition points out that these efficiency differences mainly seem to occur along regional lines with lower efficiency and enforcement in the Walloon area. A possible explanation for that is the higher regional unemployment rate in Wallonia which puts this region in a weaker position vis-à-vis foreign investors and domestic firms, which may result in lower enforcement.

The remainder of this paper is structured as follows: the next section gives an overview of related literature of the relevant statutory and accounting aspects of Belgian corporate taxation. Section 3 gives a brief review of the different measures of ETR. The collection and analysis of the data are discussed in Section 4. In section 5 we show some descriptive statistics. In section 6 we introduce the empirical model and in Section 7 we discuss the main results. Section 8 consists of some robustness checks. The last section concludes and summarizes the main results.

2. Statutory Framework

In this section we explain the determinants of the statutory tax base and the statutory tax concessions that applied in our period of investigation 1993-2002. The corporate income tax system in Belgium has a stepwise progressive tax rate system with rates

⁴ There are many other countries in Europe that consist of regions with very different economic growth rates i.e. Italy, Germany and the UK amongst others.

ranging from 28% up to 40.17%. All Belgian firms in our sample are large firms subject to the highest STR. By considering firms that fall within the same tax bracket, we control for the level of the STR in our analysis. Hence when we observe heterogeneity in ETRs between firms, other factors than the STR must be responsible for these observed differences.

While we do not observe the tax base in our data, we do observe the yearly reported income/profits by each firm, which is taken by the tax authorities as the starting point for determining the tax base. The statutory tax base is determined as follows. First, from the annual income/profit figures that firms report, the tax authority can reject a number of expenses, which are not deemed to be true expenses of the period. This would enlarge the tax base. Secondly, firms can get a tax privilege for dividends received from Belgian or foreign firms (EU or non-EU) to avoid double taxation of dividend income.⁵ Thirdly, they can get a tax break for losses reported in the past ('carry-forwards').⁶ And finally, statutory tax concessions are also granted for four types of investments: investments in patents, investments in Research & Development, investments in energy-saving technology and investments in the recycling of wrapping materials.⁷ The extent to which expenses are rejected by the tax authority, as well as some of the statutory or negotiated tax concessions a company enjoys can not be observed in our data. However, we do know the total corporate 'tax liability' of the firm in a particular year. A generally accepted way of measuring the Effective Tax Rate (ETR) is by relating the firm level 'Tax Liability' to the 'reported profits before tax' (Buijink et al, 2002). The extent to which the ETR differs from the STR is indicative of how the tax base differs from the reported 'profits before taxes' in our company accounts data. If the Effective rate lies below the Statutory rate, which on average is the case, the tax base is smaller than the reported earnings and the firm enjoys statutory or negotiated tax concessions and tax rulings.

⁵ When the dividend is at least 5% of the disbursing company's capital, 95% of the dividend revenue is free of Belgian corporate tax (Van Kerckhove and Heirewegh, 2003). For dividends between parent and subsidiaries (minimum participation of 25%) in the European Union, the EU Parent-Subsidiary directive applies (EU code of conduct, 2000).

⁶ The taxable income may be reduced with the losses of the previous periods. In Belgium only losses can be deducted from future profits, this is called carry-forward of losses (Van Kerckhove and Heirewegh, 2003).

⁷ For the period we analyze (1993-2002), the tax concession for each of these investments was 13.5% on the cost of the investment.

3. *Effective Tax Rates*

Effective Tax Rates can be computed in various ways. The measures used in the literature differ from each other in two respects: the aggregation level of the data (micro- versus macro data), and the historic versus future orientation of the methods. The somewhat older literature has looked at Effective Tax Rates based on *macro*-economic data by relating ‘tax revenue’ to a country’s ‘Gross domestic product’ (GDP). The downside of this approach is that with aggregate macro-economic data one cannot analyze firm- and sector-level heterogeneity in effective tax rates. More recent studies use more *micro*-level data and define the Effective Tax Rate at the firm level. In view of our access to financial statements data, our preferred approach in this paper is the micro-level one, allowing us to study firm and sector heterogeneity in the Belgian tax system.

The other difference in the use of Effective Tax Rates is the time orientation and the real-life nature of the data used. Backward-looking tax rates use historic real-life data to estimate the tax burden of a company while forward-looking tax rates consider the tax burden associated with future hypothetical investment decisions.⁸

While the advantage of a backward-looking Effective Tax Rate is that it is relatively easy to construct, its use does not only reflect a country’s tax incentives embedded in the law but also reflects a country’s enforcement policy (Nicodème, 2002). The forward looking method considers the tax burden on a hypothetical investment project. This approach was first developed by King and Fullerton (1984) and is particularly suited to investigate firms’ future incentives to invest given a particular tax structure. However, the use of forward looking rates is more complicated to implement empirically because its calculation relies on a hypothetical and specific type of investment, using a specific source of financing. Therefore the forward tax rate does not take on board all aspects incorporated in a country’s tax system.⁹ In view of the research questions we analyze in this paper and the data that we have at our disposal, we opted for the ‘micro backward looking’ Effective Tax Rate method where the Effective Tax Rate (ETR) is defined as the ratio of firm level ‘tax liabilities’ in a particular year over the ‘reported income/profits’ in that same year. This ETR will be used as the dependent variable in our empirical model, where the right hand side variables will consist of firm characteristics, sector dummies and location variables. A possible endogeneity problem

⁸ For a good discussion of the forward looking rates we refer to Devereux et al. (2002).

⁹ In Devereux et al (2002) the type of investment considered is on plant and machinery financed by equity.

that is inherent when using the backward-looking Effective Tax Rate will be overcome by lagging some of the firm level investment variables as explained in section 6.

4. Data

We use a rich panel dataset of 12,197 large Belgian firms over a period of 10 years from 1993-2002, which results in more than 100,000 observations. These data were obtained from a commercial database *BELFIRST* which contains the population of Belgian firms. In view of the progressive nature of the corporate tax system in Belgium, we decide to include only the *large* firms in both manufacturing and non-manufacturing industries. Or, in other words, we included firms that are subject to an STR of 40.17% or above in the period we analyze.¹⁰ By only considering firms in the highest tax bracket we control for the level of STR. Any difference in Effective Tax Rates we observe in the data therefore stem from other factors than the STR. We excluded financial institutions such as banks and insurance companies, because they are subject to a different set of accounting rules and reporting standards. Our analysis is based on unconsolidated company accounts¹¹ and we do not include negative ETR observations and effective taxes higher than 100% as in Collins & Shackelford (2002). The regional composition of the data is as follows: 22.5% of the firms in our sample are located in Brussels, 16% in Wallonia and 61% of the firms is located in Flanders.

While the BELFIRST data set contains data for the years 1989 to 2002, the availability varies between years. Especially, the availability of data for the years 1989-1992 is very limited. Therefore, we decided to focus on the period 1993-2002 for our analysis.

5. Descriptive Statistics

In the literature the Effective Tax Rate (ETR) is referred to as a micro backward-looking measure of corporate tax pressure (Devereux et al., 2002). This variable will be our dependent variable in the regression analysis in the next section. Table 1 presents some descriptive statistics (mean, median, standard deviation) for the ETR per region. A first observation is that while the ETR for large Belgian firms is 26%, the median

¹⁰ According to the EU directive, a company is large when it has on average more than 100 employees or when it exceeds one of the following criteria: employees > 50, sales (VAT exclusive) > 6 250 000 euro, total assets > 3 125 000 euro.

¹¹ In Belgium there is no fiscal consolidation, hence the unconsolidated accounts are used to determine tax liabilities.

ETR is somewhat higher and lies around 29%. A study of Buijink et al. (2002) finds an average ETR for Belgium of 21.64%, which is pretty similar to our findings. Second, while in principle all large Belgian firms are subject to the same Statutory Tax Rate, the standard errors in Table 1 indicate that there seems to be substantial firm heterogeneity in ETRs.

Also, on the basis of Table 1 we would be inclined to conclude that the average ETR in Wallonia and Brussels is somewhat lower than for Flanders. The median ETRs are even more suggestive of regional tax differences. The very low median ETR for Brussels is probably due to the high number of co-ordination centers that are residing in Brussels:¹² 1.2% of the companies in Brussels are co-ordination centers, while this is only 0.61% and 0.38% of the companies in Flanders and Wallonia respectively. Therefore, at this stage in the analysis we can not exclude the possibility that these regional differences in Table 1 are due to co-ordination centers or to a different sectoral composition of the regions. In the regression analysis in section 7, we will test for significant differences in ETRs between regions in a more formal way.

Table 1: Average Effective Tax Rates by Region

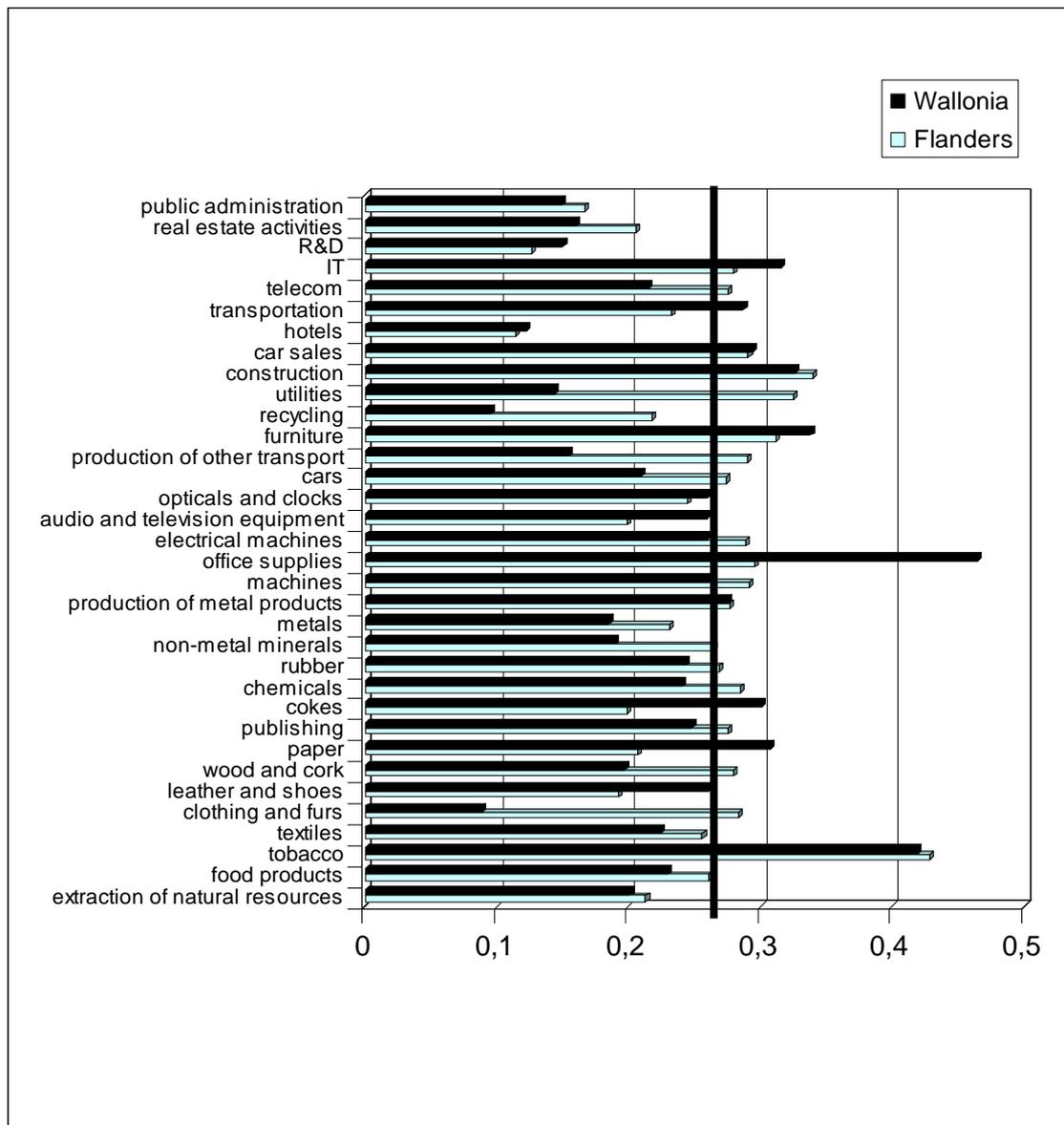
ETR1	Flanders	Wallonia	Brussels	Total
Mean	0.2699	0.2594	0.2402	0.2615
median	0.3239	0.2767	0.1579	0.2917
std. dev.	0.2537	0.2467	0.2583	0.2464
N° observations	58,816	15,406	21,546	95,768

Figure 1 gives an overview of the average ETRs per Nace-Bel 2-digit level sector and per region.¹³ The bold vertical line in Figure 1 represents the overall average ETR across sectors. We note that there is a lot of heterogeneity between sectors within one region. Also within one sector there is substantial variation in ETR depending on the region the firm is located in. Flanders has relatively low taxes in sectors such as Tourism (hotels), Recycling and Research & Development (R&D), while sectors such

¹² A co-ordination centre is part of a multi-national and involve activities such as financial or business support services and get a lower tax rate than domestic firms.

¹³ Nace-Bel is the industry classification for Belgium. The complete list of names, Nace-Bel codes and a split of the observations per sector and per region are given in the Appendix Table A.1.

Figure 1: Sector Heterogeneity in average Effective Tax Rates



as Tobacco have a higher than average rate. In many sectors the Effective Tax Rate (ETR) in Wallonia is lower than the one in Flanders (telecom, real estate, metals, cokes, clothing, chemicals, rubber...). But notably in IT, furniture, utilities, transportation and office supplies, the ETR is higher in Wallonia than in Flanders.

While in some cases the below average ETR can be a reflection of the statutory tax concessions that firms in these sectors enjoy, like in the case of the recycling-sector, it is far less easy to explain the average ETR level in other sectors. One possible explanation is that the government through the tax system is either encouraging or discouraging certain activities. In the regression analysis in section 7 we will include 33 sector

dummies to control for sector effects in addition to firm characteristics to explain the variation in firm level ETRs.¹⁴

6. The Model and Variable Definitions

The empirical model we introduce in this section closely follows the literature by including firm characteristics and sector dummies to explain firm level ETRs (Huizinga & Nicodème, 2003; Nicodème, 2002; Gupta & Newberry, 1997 and Buijink et al., 2000b, 2002). In addition to this literature we also include year dummies, location dummies and statutory tax concessions. The empirical specification we test has the following general form,

$$\text{ETR}_{it} = \beta_0 + \beta_1 \text{FIRM SIZE}_{it} + \beta_2 \text{STATUTORY}_{it} + \beta_4 \text{REGION}_i + \beta_5 \text{YEAR} + \beta_6 \text{SECTOR}_i + e_{it} \quad (1)$$

where the dependent variable, ETR, is the Effective Tax Rate of firm i in year t .

In the literature FIRM SIZE has predominantly been measured by the log of total assets. According to Gupta & Newberry (1997) there are two opposing theories regarding the effect of firm size on firm level ETRs. On the one hand, the ‘political cost theory’ argues that large firms have a higher visibility which means they are more scrutinized which may result in higher tax burdens. As a consequence larger firms face higher ETRs. On the other hand there is ‘the political power theory’ that argues that larger firms have greater resources to influence the political process and therefore larger firms are expected to face lower ETRs. Nicodème (2002) uses ‘turnover’ as a SIZE variable. Theoretically he derives a positive relationship between a firm’s turnover and its tax liability, suggesting that bigger firms would pay more taxes. However, empirically he finds a negative relationship between size variables and tax liabilities, suggesting that larger firms pay lower taxes. In view of the ambiguous results for the different SIZE variables in the literature, we will proxy size by using both the log of total assets and the log of total employment (EMPLOYM) as different proxies for SIZE in our specifications.

¹⁴In the regressions in section 6, we include 33, 2-digit NACE-BEL sector dummies where we drop the ‘Optical & Clockworks’-sector, because its ETR is exactly the average ETR across all sectors. The sector dummies should therefore be interpreted relative to the average ETR in ‘optical & clockworks’.

We further include a set of variables accounting for a number of statutory tax breaks (STATUTORY) such as: capital intensity (CAP), Long term leverage (Ltleverage) and R&D expenses (R&Dintens). The capital intensity (CAP) of a company is defined as the ratio of fixed tangible assets over total assets. This variable can affect ETR through the tax treatment of depreciation¹⁵ or through the tax breaks for investments (see footnote 7). Long-term leverage is defined as the ratio of long-term debt over total assets. One reason for including this variable is that interest payments on debt are fully deductible as long as the creditor is a financial company institution (Van Kerckhove and Heirewegh, 2003). As discussed above, there is also a tax concession for R&D investments and patents. This is the main reason for including the R&Dintens variable which is defined as the ratio of intangible fixed assets over total assets. Another variable controlling for statutory tax concessions is a dummy variable with a value of 1 if a firm is a co-ordination center (COCEN). All variables in the STATUTORY- group are expected to lower the Effective Tax Rate of the company.

To control for regional differences in ETRs we include two regional dummies. One with a value of 1 if a firm is located in Brussels and zero otherwise and one with a value of 1 if a firm is located in Wallonia and zero otherwise (Flanders is the reference variable).

To analyze the yearly evolution of ETRs over the period we include 9 year dummies (y1994-y2002) with 1993 as the reference year.¹⁶ Finally to control for sector heterogeneity we include 33 sector dummies at two-digit Nace-Bel level. We also include an error term (ε_{it}) to control for white noise. In the next section we report the results of an Ordinary Least squares (OLS) regression where we take into account that firm observations in consecutive years are not independent observations which may result in autocorrelation. Therefore we use a cluster estimation technique that clusters firm observations over time using a unique company identifier. ‘Clustering’ controls for the possible autocorrelation of firm observations over time. In addition we use a ‘robust’ regression technique to control for potential heteroskedasticity.¹⁷ This renders the standard errors into robust standard errors. As a robustness check in section 7, we will use a fixed effects specification where we allow for a firm-specific intercept. This implies that in expression (1), β_0 is replaced by β_i where subscript i refers to an

¹⁵ Depreciation is an expense of the period and lowers the tax base.

¹⁶ We have also experimented with including the AGE of a firm, but this variable never turned out to be significant and was therefore dropped from the analysis.

¹⁷ In the ‘robust’ regression technique our statistical software package STATA uses the Huber/White/Sandwich estimator of standard errors.

individual firm. By including an intercept for each individual firm, we implicitly control for firms specific factors that are unobservable or not included in our analysis but that may affect the Effective Tax Rate and which is quite common to use in micro-econometrics using firm level data. Examples of firm level fixed effects are the ability of the manager, the quality of the auditor, the political clout of a firm, etc.

7. Empirical Results

In this section we discuss our main results. Table 2 reports the main OLS regression results for model (1), using all observations for the period 1993-2002. In column (1) we use the logarithm of total assets as a firm size variable, while column (2) gives the same regression but where we use the log of employment as a proxy for firm size. While the level of ‘employment’ consistently shows up with a positive and significant coefficient, this is less the case with ‘total assets’, where the sign and significance is much more sensitive to the type of specification used. In view of these ambiguous results, it is hard to draw strong conclusions regarding the relationship between firm size and the Effective Tax Rate. The only conclusion that is relatively robust is that Belgian tax incentives seem to go against the interests of labor intensive firms, since higher employment levels are associated with higher ETRs.

More encouraging is that all the ‘STATUTORY’ variables come with the expected sign. Highly leveraged firms with many interest expenses have lower ETRs, as well as firms that invest in R&D. Capital intensive firms have lower ETRs as a result of higher depreciations.

Also, we find evidence of regional tax competition. Both Brussels and the dummy for Wallonia are negative and significant, suggesting a lower average ETR in these regions than in Flanders. Note that this regional difference is obtained after controlling for sector composition and firm characteristics which may be different between the two regions. The results in Table 2 also confirm that firms in co-ordination centers have a lower ETR.

The year-dummies we included are all positive and significant. This suggests that corporate tax burden has been rising since 1993. The coefficients indicate that the strongest increase has occurred in the most recent years. More in particular in the three years before 2002, the year in which the STR was reduced to 33.99%,¹⁸ the Effective

¹⁸ The reduced STR applied from the fiscal year 2003 onwards.

Tax Rate rose substantially. From 1999 onwards, the year when a new government took office that promised tax rate reductions, the Effective Tax Rates rose most substantially. A possible explanation is that during that period, the tax base was widened gradually, to anticipate the large reduction in STR that the same government enacted at the end of its term in office in December 2002.¹⁹

One drawback of our approach is that there is potential endogeneity problem in the sense that low ETRs may give rise to lower levels of some of the firm level investment variables. The appropriate way to address this is to use instruments, typically the variable lagged by one year. In column (3) of Table 2, we run a specification where we use lagged values of total assets in the denominator for the right hand side variables possibly causing the endogeneity (CAP, LTleverage, R&Dintens). Both the regional effects (lower ETRs for Brussels and Wallonia than in Flanders) and the rising ETRs over time especially in the years prior to 2002, go through, suggesting that this potential endogeneity problem is not too serious.

Some authors have used a different definition of the Effective Tax Rate. Huizinga & Nicodème (2003) have used the ratio of 'Income Tax' over 'total Assets'. Column (4) of Table 2 shows the results of model (1) where we use this definition of ETR (ETR2). The firm size variable 'total assets' now becomes negative and significant, but most of our results are robust to the use of ETR2 as a dependent variable. However, the dummy for Brussels turns insignificant, while the dummy for Wallonia continues to be negative and strongly significant. In our view ETR2 is somewhat less suited to capture the extent of tax concessions, since there is no direct link between a firm's total assets and the tax rate it is subject to, which is why our preferred specification remains the ones with ETR1 as a dependent variable. Also the use of ETR2 can induce endogeneity problems as many right hand side variables of the model specification in (1) are also scaled by total assets. Again using lagged values of total assets in the denominator for the right hand side variables possibly causing the endogeneity (CAP, LTleverage, R&Dintens) did not change our main findings, but will not be reported here for brevity.

¹⁹ Also in other European countries reductions in STR have coincided with an enlargement of the tax base (Devereux et al, 2002).

Table 2: Main Regression Results

Dependent var	(1) etr1	(2) etr1	(3) etr1	(4) etr2
Assets	0.003* [0.002]	-	-	-0.002*** [0.003]
Employment	-	0.016*** [0.002]	0.017*** [0.002]	-
Ltleverage	-0.007*** [0.002]	-0.008** [0.004]	-0.00001** [4.78e-06]	-0.0006 [0.0006]
Cap	-0.05* [0.027]	-0.05* [0.028]	-0.00002* [0.00001]	-0.007* [0.004]
R&Dintens	-0.24*** [0.03]	-0.249*** [0.036]	-0.00004 [0.0001]	-0.023*** [0.004]
Cocent	-0.123*** [0.029]	-0.148*** [0.028]	-0.133*** [0.027]	-0.006*** [0.002]
Brussels	-0.017*** [0.007]	-0.019*** [0.008]	-0.021*** [0.01]	0.0002 [0.001]
Wallonia	-0.015** [0.007]	-0.017*** [0.007]	-0.019*** [0.007]	-0.003*** [0.001]
Y1994	0.014*** [0.006]	0.017*** [0.006]	0.018*** [0.006]	0.002*** [0.001]
Y1995	0.014*** [0.006]	0.015*** [0.006]	0.017*** [0.006]	0.003*** [0.001]
Y1996	0.018*** [0.006]	0.02*** [0.006]	0.022*** [0.007]	0.003*** [0.001]
Y1997	0.02*** [0.006]	0.022*** [0.007]	0.025*** [0.007]	0.004*** [0.001]
Y1998	0.028*** [0.006]	0.028*** [0.007]	0.031*** [0.007]	0.006*** [0.001]
Y1999	0.037*** [0.006]	0.035*** [0.007]	0.040*** [0.006]	0.007*** [0.001]
Y2000	0.037*** [0.007]	0.034*** [0.007]	0.041*** [0.007]	0.007*** [0.007]
Y2001	0.038*** [0.007]	0.035*** [0.007]	0.039*** [0.007]	0.007*** [0.001]
Y2002	0.046*** [0.007]	0.042*** [0.007]	0.048*** [0.007]	0.009*** [0.001]
Extr. nat. resource	0.009 [0.036]	0.003 [0.04]	0.006 [0.038]	-0.001 [0.005]
Food products	-0.026 [0.025]	-0.044* [0.026]	-0.042* [0.026]	-0.003 [0.004]
Tobacco	0.179*** [0.026]	0.16*** [0.026]	0.172*** [0.026]	0.049* [0.025]
Textiles	-0.063** [0.03]	-0.084*** [0.031]	-0.077*** [0.031]	-0.009** [0.004]
Clothing & furs	-0.023 [0.043]	-0.046 [0.046]	-0.034 [0.046]	-0.003 [0.008]
Leather & shoes	0.008 [0.079]	-0.008 [0.081]	0.006 [0.082]	-0.005 [0.012]
Wood & cork	-0.023 [0.038]	-0.024 [0.038]	-0.017 [0.039]	-0.016*** [0.003]
Paper	-0.012 [0.034]	-0.039 [0.034]	-0.032 [0.034]	-0.003 [0.004]
Publishing	-0.011 [0.027]	-0.025 [0.028]	-0.015 [0.028]	0.001 [0.004]
Cokes	-0.083 [0.059]	-0.111* [0.062]	-0.1 [0.063]	-0.004 [0.005]
Chemicals	-0.005 [0.026]	-0.022 [0.027]	-0.018 [0.027]	0.005 [0.004]
Rubber	-0.037 [0.028]	-0.058* [0.029]	-0.051* [0.03]	0.002 [0.005]
Non-metal prod.	-0.036 [0.028]	-0.052* [0.029]	-0.048* [0.029]	-0.002 [0.004]

Metals	-0.094***	-0.114***	-0.11***	-0.008
	[0.032]	[0.034]	[0.034]	[0.004]
Prod. metal prod.	-0.017	-0.03	-0.026	-0.002
	[0.027]	[0.028]	[0.028]	[0.004]
Machines	-0.009	-0.028	-0.018	-0.001
	[0.027]	[0.028]	[0.028]	[0.004]
Office supplies	0.007	-0.016	-0.002	-0.003
	[0.053]	[0.053]	[0.054]	[0.006]
Elec. Machines	0.024	-0.001	0.007	0.005
	[0.033]	[0.034]	[0.034]	[0.005]
Audio & TV equip.	-0.062*	-0.089**	-0.086*	0.003
	[0.036]	[0.039]	[0.041]	[0.006]
Cars	-0.021	-0.046	-0.045	0.007
	[0.036]	[0.037]	[0.038]	[0.007]
Prod. ot. Transport	-0.049	-0.08	-0.074	-0.001
	[0.058]	[0.058]	[0.062]	[0.006]
Furniture	0.011	-0.01	-0.003	-0.003
	[0.033]	[0.034]	[0.035]	[0.005]
Recycling	-0.129***	-0.127***	-0.124***	-0.008
	[0.041]	[0.041]	[0.042]	[0.007]
Elec. gas & water	-0.065	-0.078	-0.064	-0.002
	[0.059]	[0.063]	[0.063]	[0.007]
Construction	0.057***	0.048*	0.064***	-0.006*
	[0.026]	[0.026]	[0.027]	[0.003]
Car sales	0.021	0.014	0.027	0.0001
	[0.023]	[0.024]	[0.024]	[0.003]
Hotels	-0.12***	-0.141***	-0.144***	-0.01***
	[0.029]	[0.030]	[0.029]	[0.004]
Transportation	-0.02	-0.03	-0.024	-0.008**
	[0.025]	[0.026]	[0.026]	[0.004]
Telecom	-0.096**	-0.101**	-0.112***	-0.003
	[0.046]	[0.048]	[0.048]	[0.008]
IT	-0.013	-0.022	-0.014	0.004
	[0.028]	[0.029]	[0.03]	[0.005]
R&D	-0.119**	-0.141***	-0.147***	-0.015***
	[0.057]	[0.057]	[0.059]	[0.005]
Real estate	-0.039*	-0.018	-0.004	-0.007**
	[0.023]	[0.025]	[0.025]	[0.003]
Publ. admin.	-0.047*	-0.054*	-0.053*	-0.005
	[0.028]	[0.029]	[0.029]	[0.004]
Constant	0.228***	0.207***	0.176***	0.039***
	[0.028]	[0.250]	[0.025]	[0.004]
Observations	27290	25683	25656	27290
R ²	4.46%	4.88%	3.88%	3.82%
F-statistic	13.55	14.28	14.06	9.69
Prob>F	0.00	0.00	0.00	0.00

note: robust standard errors are between brackets; *= significance level at 10%, **= significance level at 5%, ***= significance level at 1%

8. *Robustness Checks*

Table 3 reports some robustness checks. We start in column (1) by reporting the outcome of a dynamic specification where we include the lagged value of ETR1 as an additional explanatory variable on the right hand side to control for possibly autocorrelation. However, our main variables of interest namely the regional effects and the time effects remain intact. In column (2) of Table 3 we report the results of a censored tobit regression that takes into account that ETR1 is a truncated variable.²⁰

Another common way to control for outliers is where we cut-off all ETR observations larger or smaller than twice the standard deviation of the mean ETR. The results of this regression are shown in column (3) of Table 3 but our results remain qualitatively the same.

In column (4) we control for carry-forwards of losses which applies under Belgian law, by including a variable (LOSS_1) to capture last year's losses. However, this variable is not significant in the regression and the other results go through.

The results of a fixed effect estimation is reported in column (5). Controlling for firm level fixed effects is very common in micro-econometrics. These fixed effects control for a number of unobservables at the firm level that may affect ETRs and that if not controlled for may introduce an omitted variables bias. The fixed effects estimation does not change the simple OLS results. All the firm level variables, regional and year effects continue to hold. We also experimented with a random effects model but the Hausman-test decided in favor of the fixed effects model as the most preferred specification. The variables capturing the regional tax competition in Belgium continue to be negative but the significance for Wallonia is stronger than for Brussels.

And as a final robustness check, we introduce a specification where we replace the year dummies by dummies for three distinct periods in Belgian politics. While both the periods '93-94 and '95-98 coincide with a federal coalition of Christian Democrats and Socialists, the last period '99-2002 coincides with a coalition of Liberal Democrats and Socialists. For each of these different governments we introduce a separate dummy (labeled Gov1, Gov2, Gov3) with a value of 1 for years in power, and zero otherwise.

²⁰ The distribution of ETR1s is shown in Figure A.1 in the Appendix. The kernel density estimates for ETR1 is bimodal around 0 and 40.17%, suggesting that many companies do not pay positive taxes because they makes losses or zero profits and also that a substantial number of companies have an ETR equal to the STR.

Table 3: Robustness Checks

Dependent var	(1) ETR1	(2) ETR1	(3) ETR1	(4) ETR1	(5) ETR1	(6) ETR1
Etr1-1	0.545*** [0.007]	-	-	-	-	-
Employ	0.008*** [0.001]	0.033*** [0.002]	0.009*** [0.002]	0.016*** [0.002]	0.022*** [0.003]	0.015*** [0.001]
Ltleverage	-0.004 [0.003]	-0.016*** [0.003]	-0.002*** [0.001]	-0.008** [0.004]	-0.002 [0.002]	-0.008*** [0.003]
Cap	-0.025* [0.015]	-0.083*** [0.006]	-0.043* [0.024]	-0.047* [0.028]	-0.01* [0.005]	-0.047* [0.027]
R&D	-0.145*** [0.022]	-0.451*** [0.03]	-0.27*** [0.028]	-0.254*** [0.036]	-0.118*** [0.028]	-0.25*** [0.036]
Cocen	-0.074*** [0.015]	-0.11*** [0.025]	-0.115*** [0.021]	-0.148*** [0.027]	-	-0.147*** [0.027]
Loss-1	-	-	-	-0.001 [0.005]	-	-
Brussels	-0.003 [0.005]	-0.011* [0.06]	-0.02*** [0.007]	-0.004 [0.008]	-	-0.003 [0.008]
Wallonia	-0.007* [0.004]	-0.025*** [0.006]	-0.014* [0.007]	-0.016** [0.007]	-	-0.015*** [0.007]
Y1994	0.035*** [0.007]	0.026*** [0.011]	0.016*** [0.005]	0.016*** [0.006]	0.021*** [0.006]	-
Y1995	0.027*** [0.007]	0.024** [0.011]	0.021*** [0.005]	0.015*** [0.006]	0.016*** [0.006]	-
Y1996	0.032*** [0.007]	0.032*** [0.011]	0.028*** [0.006]	0.02*** [0.006]	0.023*** [0.006]	-
Y1997	0.031*** [0.007]	0.036*** [0.01]	0.028*** [0.006]	0.023*** [0.007]	0.024*** [0.006]	-
Y1998	0.033*** [0.010]	0.046*** [0.010]	0.040*** [0.006]	0.028*** [0.007]	0.022*** [0.005]	-
Y1999	0.042*** [0.007]	0.058*** [0.010]	0.042*** [0.006]	0.036*** [0.007]	0.025*** [0.005]	-
Y2000	0.036*** [0.007]	0.059*** [0.01]	0.042*** [0.006]	0.035*** [0.007]	0.021*** [0.006]	-
Y2001	0.038*** [0.007]	0.063*** [0.011]	0.042*** [0.007]	0.036*** [0.007]	0.019*** [0.006]	-
Y2002	0.036*** [0.007]	0.069*** [0.011]	0.042*** [0.006]	0.042*** [0.007]	0.02*** [0.006]	-
Gov2	-	-	-	-	-	0.013*** [0.004]
Gov3	-	-	-	-	-	0.028*** [0.005]
Sector-dummies	yes	yes	Yes	yes	yes	Yes
Constant	0.074*** [0.015]	0.074*** [0.019]	0.175*** [0.022]	0.207*** [0.025]	0.156*** [0.012]	0.215*** [0.024]
Observations	25683	26477	27162	25683	25683	25683
R ²	33.29%	6.01%	4.74%	4.88%	0.60%	4.8%
F-statistic	174.54		13.69	14.00	9.28	16.14

note: standard errors between brackets; * is significance level at 10%, ** is significance level at 5%, *** is significance level at 1%

The last column in Table 3 shows the results of this specification where we dropped the first period dummy Gov1; hence the coefficients on the two other dummies are relative to the first period in our data. Both Gov2 and Gov3 are positive and significant, with the magnitude of the Gov3 variable twice the size of the Gov2 dummy. This implies that the Effective Tax Burden has increased most under the last government, probably in anticipation of the large reduction in STR in 2002 that this same government enacted. To test whether the time effects are due to federal government policy and not to business cycle effects, we use a likelihood ratio- and an F- test. Both these tests could not reject the null hypothesis that the significant time effects are indeed due to federal policy measures²¹.

9. Conclusion

This paper is the first to investigate the determinants of Effective Tax Rates (ETRs) for Belgium using company level data for large firms for the period 1993-2002. We found evidence of regional tax competition between the Northern region and the Southern region of the country, with lower average Effective Tax Rates (ETR) in the peripheral region Wallonia compared to the more 'core' region Flanders. In addition, our findings indicate that Effective Tax Rates for large Belgian companies have steadily increased over the period 1993-2002. Especially at the end of the nineties, when a new government took office, the average Effective tax rate rose substantially. One possible explanation for this is that this government anticipated the strong reduction in STR it enacted in December 2002. By widening the tax base in the years just before that reduction, the effect on the country's budget is at least partly offset and the impact on the budget dampened. Hence, our results of increasing ETRs, may pick up an anticipatory effect of the decrease in the STR in 2002.

²¹ We use a likelihood-ratio test and an F-test to test the null hypothesis that the coefficients of the time dummies within a government period are not significantly different from each other. The test statistic for the likelihood-ratio test equals 4.69, which is lower than the critical value at the 1% level of 15.086. The F-statistic, based on the R² of the two regressions, was equal to 0.216 (critical value at the 1% level = 3.78). As a result, both tests do not reject the null hypothesis that the coefficients of the time dummies within a government period are equal to each other. This implies that our results are due to the government in office during these years rather than to business cycle effects.

Our data consisted of large Belgian firms all subject to the highest Statutory Tax Rate (STR) of 40.17%. However, the average Effective Tax Rates (ETR) which takes into account the tax base, lies substantially below that and for the more than 12,000 firms in our sample averages around 26%. Moreover, ETRs differ substantially between firms, sectors and regions. Labor intensive firms pay relatively more taxes than capital intensive firms. Also, capital structure and R&D-intensity strongly affect the Effective Tax Rate. In terms of sectoral differences, we find 'socially desirable sectors' such as tourism, recycling and R&D to pay relatively lower taxes than less socially desirable sectors such as for instance the 'Tobacco' sector. Based on the findings in this paper we can conclude that Belgian corporate taxation is not neutral with respect to firm size, the source of financing and geographic location.

Appendix

Table A.1: Sectors, 2-digit level of Nace-Bel code

Sector	Nace-Bel code	Observations Flanders	Observations Wallonia
extraction of natural resources	10,11,12,13,14	647	376
food products	15	2822	680
Tobacco	16	80	10
Textiles	17	1461	186
clothing and furs	18	355	7
leather and shoes	19	17	10
wood and cork	20	499	162
Paper	21	551	149
Publishing	22	861	466
Cokes	23	87	28
Chemicals	24	1484	632
Rubber	25	1137	246
non-metal minerals	26	1477	586
Metals	27	423	382
production of metal products	28	2054	533
Machines	29	1440	477
office supplies	30	124	10
electrical machines	31	604	163
audio and television equipment	32	259	81
opticals and clocks	33	177	87
Cars	34	481	81
production of other transport means	35	122	59
Furniture	36	1048	106
Recycling	37	236	118
Utilities	40,41	52	30
Construction	45	3697	1279
car sales	50,51,52	19445	4738
Hotels	55	463	102
Transportation	60,61,62,63	5726	732
Telecom	64	59	14
IT	65,66,67,72	894	243
R&D	73	47	18
real estate activities	70,71,74	8521	2059
public administration	75,85,90,91,92,93,99	1015	431

Table A.2: Correlation Matrix

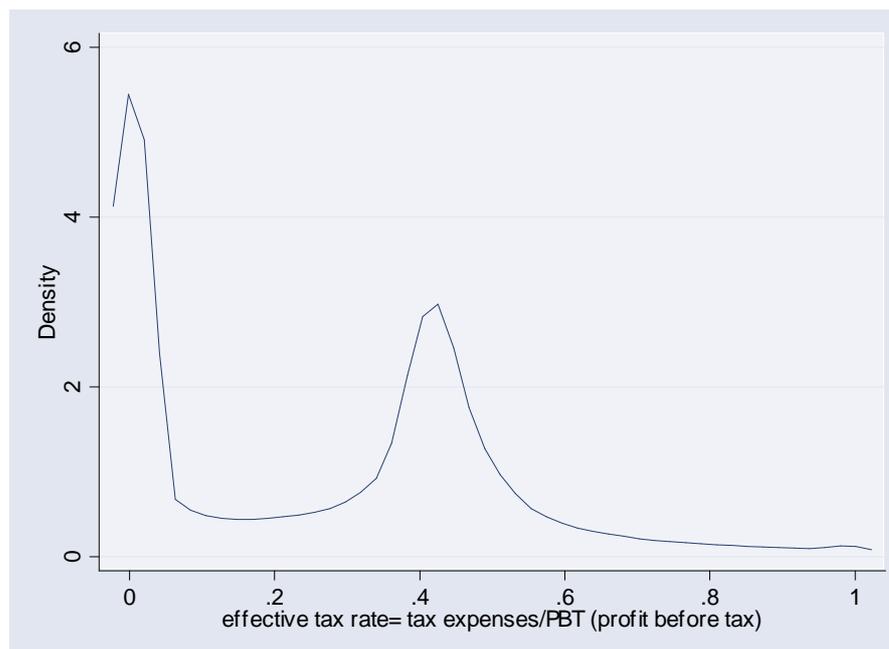
	ETR1	ETR2	ASSETS	EMPLOYMENT	LTleverage
Wallonia	-0.028	-0.034	-0.032	0.008	-0.003
Brussels	-0.02	0.002	0.044	-0.016	0.003
Cocen	-0.046	-0.038	0.156	-0.015	-0.002
R&Dintens	-0.078	-0.039	-0.095	-0.073	0.023
CAP	-0.098	-0.081	-0.001	0.014	0.060
LTleverage	-0.044	-0.023	-0.016	-0.029	1
EMPLOYM	0.082	0.017	0.653	1	-0.029
ASSETS	-0.015	-0.099	1	0.653	-0.016
ETR2	0.45	1	-0.015	0.017	0.017

Table A.3: Correlation Matrix

	CAP	R&D	Cocen	Brussels
Wallonia	0.052	-0.008	-0.02	-0.274
Brussels	-0.054	0.082	0.036	1
Cocen	-0.044	-0.030	1	0.036
R&Dintens	-0.049	1	-0.030	0.082
CAP	1	-0.049	-0.044	-0.054

Table A.4: Data-Appendix

ETR1	Corporate tax expenses/ profit before taxes
ETR2	Corporate tax expenses/ total assets
BRUSSELS	=1 if in Brussels, =0 otherwise
WALLONIA	=1 if in Wallonia, =0 otherwise
ASSETS	log(total assets)
EMPLOYM	log(employment)
CAP	tangible fixed assets/ total assets
LTLEVERAGE	total LT debt/ total assets
R&Dintens	Intangible fixed assets/ total assets
COCEN	=1 if coordination centre (Nace-Bel=74152), =0 otherwise
SECTORS	33 sector dummies at 2- digits Nace-Bel (=0 if optical and clocks sector)
Y1994 – Y2002	9 Year dummies (=0 if 1993)

Figure A.1: Kernel Density Estimates of ETR

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