



**MINISTRY OF FINANCE**  
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**Effective tax rate and the size of the company in Belgium  
an empirical investigation on micro-data**

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*Abstract*

*This paper investigates how the effective tax rate for corporate income tax varies with the size of the company in Belgium. The concept of ETR that we use in this paper is an ex-post measure based on micro-data. The ETR is defined as the ratio of the assessed CIT to the “benchmark tax base”. We use a unique dataset, that merges data from the tax returns with published balance sheets and accounts. This enables us to observe directly the main determinants of any gap between the statutory tax rate and the effective tax rate (ETR).*

*It appears from the empirical investigation that there is no clear relation between the ETR and the size of the company. Dispersion of ETR is very high. In the final section of the paper, we use logistic models to explain the dispersion of ETR. It appears that the tax variables provide the largest part of the explanation of the dispersion in ETR. Among these variables, disregarded charges have the largest effect. Size may have an effect, but the magnitude and the sign of the effect remain unclear: the relationship between the ETR and the number of employees seems to be positive; the sign of the size variable “value added” is not robust and there is no clear relationship between the ETR and the total of the balance sheet*

Key words: Effective tax rates, tax policy, micro-data

JEL Codes: H20, H21, H22, H25.

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The authors only express personal views.

In this paper, we try to assess the effective taxation of companies in Belgium and to explain the dispersion of effective tax rates.

The measurement of effective taxation of companies is a difficult task. While it is clear that the nominal tax rate does not reflect the effective tax burden, the measurement of effective taxation is a less clear-cut issue. According to recent publications, tax burden indicators may be divided in two groups: macro and micro indicators

The implicit tax rate on corporations (ITR) makes part the first group. The ITR relies on national accounts: corporate income tax, as recorded by the national accounts is divided by the sum of net operating surplus and net financial income of corporations. Such an indicator is an ex-post one: it reflects past investment choices and the current taxation of the profits resulting from these investments. The ITR on corporations is one of the tax burden indicators that is included in the yearly publication of the European Commission on the structure of taxation systems (1). The main characteristic from the ITR on corporations is that the underlying concepts are those from national accounts and they are not taken from the tax legislation. On the one hand, this ensures comparability across countries and over time: differences in the definition of tax base do not affect the ITR but the ITR reflects their consequences on the effective tax burden. Others things being equal, exemption of profits, tax credits and extra-cost deductions will lower the ITR. On the other hand, the distance between national accounts concepts and the tax base may be so large that it might be difficult to link the changes in ITR to the tax policy changes. The way losses are treated illustrates this (2). In such circumstances, the ITR may be seriously ambiguous.

In previous publications, we used another macro-indicator: an effective tax rate based on tax statistics (3). This ETR is defined as follows: the CIT liability is divided by what the tax base should be in a benchmark tax system with no tax expenditures. It differs from the ITR on three aspects: we record the CIT liability, while the national accounts rely on CIT payments. Our ETR is fully accrual: profits are recorded when they occur and the tax liability is attached to the period in which the profits occur, while national accounts approximate "accrual" by time-shifted cash payments or refunds (4). Thirdly, the tax base is more close to the tax legislation but is defined so that tax expenditures reduce the effective taxation.

The second group of indicators includes the well-known marginal effective tax rates (METR) from King and FULLERTON and the average effective tax rates from DEVEREUX and GRIFFITH.

Each of these effective tax rates has advantages and drawbacks and none of them enables us to illustrate the dispersion of the tax burden. Macro-economic indicators are silent about the dispersion. METR and AETR, while giving some ideas about non-neutralities, are not able to capture the full dispersion of the effective tax burden, since they only incorporate some stylised facts and tax provisions.

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1 CF EUROPEAN COMMISSION (2007) for the last edition.

2 Losses are recorded in the national accounts when they occur while they do affect CIT payments when they become deductible. For the large majority of countries (including Belgium) that do not allow carry-back, this means that losses are carried forward and reduce CIT payments when firms recover. The effect of the national accounting treatment of losses is so that the ITR increase when companies are incurring losses, while it will decrease when companies will be able to reduce their tax payments by deducting previous losses. Consequently, an increase in the ITR does not necessarily mean an increase in the effective taxation of companies that are making profits.

3 See VALENDUC (1999) and (2002)

4 In the case of Belgium, corporations are obliged to make advance payments. CIT paid (or refund) on assessment is shifted back with a 2 months lag from the time of effective payment or refund. They are not shifted back to the period during profits occurred.

This paper uses the ETR based on tax statistics at the micro level. The tax burden indicator is an ex-post one, compared to the METR and AETR, but defining it the micro level enables us to investigate the dispersion of the effective tax burden among corporations and to look for the variables that explain this dispersion. Such papers are not numerous. Among the most recent studies, NICODEME (2002) and (2006) found that, for most countries effective taxation is negatively related to the number of employees but positively related to the total of the balance sheet. For Belgium, they however found a negative relationship between the effective taxation and both measures of company size.

Specific studies at the micro-level on Belgium are scarce. VALENDUC (2002) and OECD (2003) investigated the relation between the ETR and taxable profits but this explanatory variable does not necessarily reflect the size of the company. VANDENBUSSCHE e.a (2005) concludes that the effective tax burden is positively related to the number of employees, which conflicts with NICODEME (2002) and (2006) but VANDENBUSSCHE e.a (2005) only consider large companies. Moreover, the way they define the effective tax burden differ from the indicator used by NICODEME. VANDENBUSSCHE and TAN (2006) conclude that foreign ownership is associated with lower effective tax burden. The empirical literature is far from unanimous and the (scarce) papers that are available differ according the population subject to investigation and to the definition of the effective tax burden.

Our exercise use Belgian tax and accounting data from the year 2003.

This paper organises as follows. Section 1 briefly describes the main features of corporate taxation in Belgium. Section 2 turns to the methodological issues (database and the measurement of effective taxation). Section 3 summarises the main findings on effective taxation at the macro-level. Section 4 presents the descriptive analysis of the ETR at the micro-level. In section 5, we use logistic models to investigate the dispersion of effective tax rates at the micro level.

## 1. Main features of the Belgian Corporate income Tax

The notions of “taxable profits” and “financial profits” are quite different from each other (5). The profits and loss accounts, established according to accounting rules, serves as a basis for the computation of the tax base, but subject to several adjustments. Certain profits may be tax exempt and certain expenses that have lowered the financial results are not deductible from a tax point of view (Disregarded charges).

- Exempted reserves include capital gains on shares, provisions for risk and expenses and (since 2003) the investment reserve and the profits exempt under the tax shelter agreement for audiovisual work.
- Disregarded charges include non-deductible taxes (6), fines and penalties, interest payments to associate or directors, interest on loans subject to thin capitalisation rules, abnormal and benevolent advantages, gifts, expenses and charges exceeding professional needs to an unreasonable extent, 25% of private car expenses, 31 % of restaurant bills, 50% of business-related reception expenses and business gifts, employee equity participation and employee participation in profits and part of pension contributions (7).

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5 A more detailed description of the main features of corporate income tax can be found in HAULOTTE S., VALENDUC C. and DELODDERE E (2007).

6 These cover CIT itself, any withholding tax on income but also taxes, fees and public service charges due do the Regions.

7 The deduction of pension contribution is granted only to the extent that the whole amount of benefits, including the pay-as-you-go scheme and any personal pension plan, converted into an annuity, does not exceed 80% of the latest annual ordinary gross remuneration of a normal career.

The “gross taxable profit“ is defined as the sum of retained and distributed profits (exempt reserves excluded) and disregarded charges.

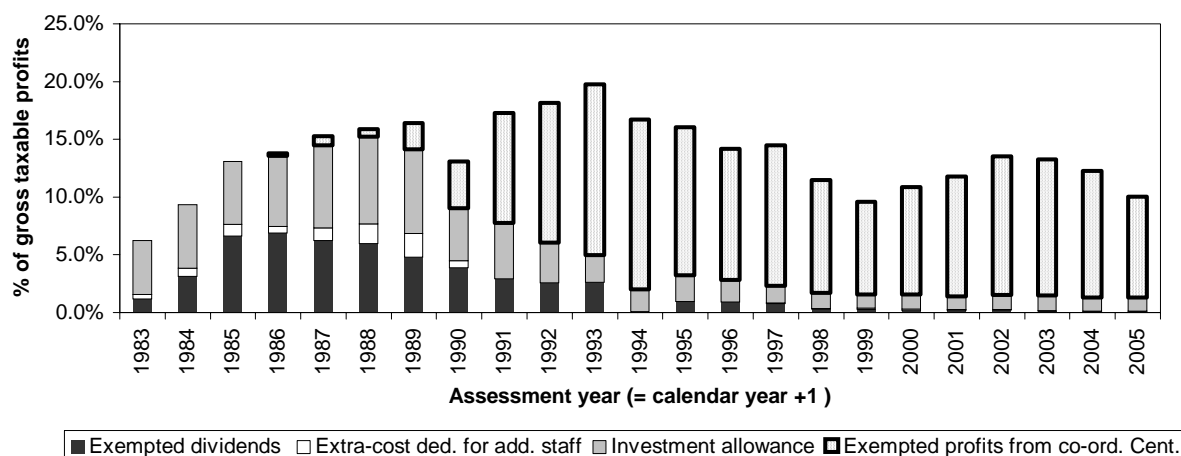
The following adjustments and deduction are then made.

- (a) Dividends that are exempted under preferential tax regimes are excluded from the tax base.
- (b) Profits from branches located in a country Belgium has a concluded a tax treaty with are excluded from the tax base.
- (c) Tax allowances are given for additional staff member assigned in Belgium to scientific research, additional staff member in SME’s and gifts made to qualified institutions and profits from the coordination centres are brought to their taxable part, by excluding from the tax base any profits in excess of the cost-plus base.
- (d) Dividends from subsidiaries that qualify for the participation exemption are deducted from the tax base.
- (e) Losses carried forward are deducted from the tax base.
- (f) The investment allowance is then deducted from the remaining taxable profits. The main qualifying investments are those made by SME’s (rate: 4,5%) and R-D, energy saving and “green” investment (rate: 14,5%).

Among these deductions (b), (d) and (e) are not considered as tax expenditures. Figure 1 illustrates how the allowances that are considered as tax expenditures have evolved over time. The gradual tax reform that took place during the nineties phased out most of the preferential tax regimes, apart from the coordination centre regime, and broadened the tax base (8). At the end of the period, the coordination centre regime forms the bulk of allowances that are considered as tax expenditures.

**Figure 1**

### Tax expenditures - C.I.T Deductions from the tax base



The nominal tax rate (33,99%) (9) applies to the net taxable profits. SME’s may qualify for reduced rates.

8 Cf. VALENDUC (1999), (2002) and (2004).

9 33% and a crisis surcharge of 3%.

**Table 1**  
**Reduced rates for SME's**

Brackets (Net taxable profit)	Rate (3% crisis surcharge to be added)
0 – 25.000	24,25%
25.000 – 90.000	31%
90.000 – 322.500	34,50%
322.500 and more	33%

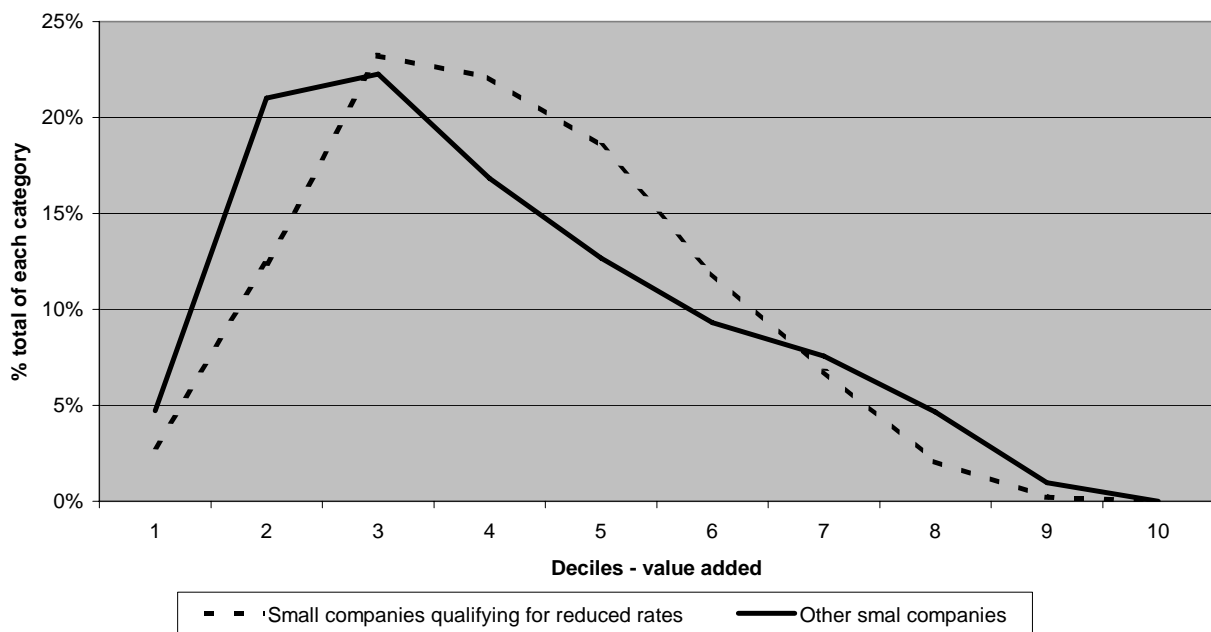
In order to qualify for these reduced rates, a company must however fulfil a number of additional conditions.

- (a) Companies of which one or more other companies hold 50% of the shares do not qualify.
- (b) The company is obliged to pay to one manager at least a remuneration which, if it is less than 33.000€, shall not be less than the company's taxable income.
- (c) Entitlement to reduced rates is also denied to companies that are part of a group to which belong a coordination centre
- (d) or when the rate of return of the registered capital exceeds 13% (d)

These conditions aim to prevent abuse (a), to limit tax shifting ((b) and (d)) or to prevent cumulative tax advantages (c).

**Figure 2**

**Reduced CIT rates and the size of the company  
(measured by value added)**



Companies that qualify for reduced rates are not necessarily “small”, as the criteria differ from those that are currently used to assess size (turnover, value added, balance-sheet total, workforce average).

Figure 2 (from HALLEUX, HAULOTTE and VALENDUC, 2006) illustrates this. Companies considered as “small” by the corporation code (10) are split into two groups: those who qualified for reduced rates and those who do not qualify. The companies that qualify for reduced rates are not “small among the small”. It is rather the opposite that prevails.

The Belgian tax system is not neutral vis-à-vis the organization form of the company. It includes incentives for incorporation. As a result of these, a large number of self-employed incorporated themselves over the past 10-15 years, which creates a large number of very small companies. This has to be kept in mind along our analysis.

## 2. Methodology

### 2.1 Database

Our database merges tax returns, balance sheet and profits and losses accounts. Exact merging is ensured by the fact the companies have to use the same identification number for tax and accounting purposes. The merging of tax and accounting information gives this database a comparative advantage compared to other databases (such as Belfirst and Amadeus for example) that only include information from the accounting side. The main advantage is that we have precise and detailed information on the tax base and the corporate income tax liability, while accounting data are silent about the tax base and just give a rough indication of the CIT liability. Consequently, we can find in our database explanatory variables for the gap between nominal and effective tax rates.

We use a stratified sample of the whole population of companies subject to CIT. Stratification is made according to the “gross taxable profits” (see above). We apply the NEYMAN optimal stratification procedure, with exhaustive sampling for large enterprises (for positive and negative results).

**Table 2**  
**The stratification procedure**

Stratum	Upper limit	Lower	Number of companies (Population)	Sampling rate	Number of companies (sample)
1	118 199 484	128 931	2 962	1	2 962
2	128 893	44 969	4 504	1/2	2 252
3	44 967	14 245	12 803	1/7	1 829
4	14 245	3 983	38 104	1/20	1 905
5	3 983	421	108 704	1/50	2 174
6	421	-2 665	171 373	1/30	5 712
7	-2 665	-28 051	18 990	1/8	2 374
8	-28 055	-69 903 606	3 022	1	3 022
			360 462		22 230

Our initial sample includes 22.230 companies. It drops to 17.239 after having excluded companies that do not published their accounts or of which the published accounts do not have the required quality standards. Companies that benefit from preferential CIT regimes are excluded. This means

10 According to the corporation code, a company may qualify as “small” if it does not exceed more than one of the following criteria in the last and last but one accounting periods: annual workforce average of 50, annual turnover, excluding VAT, of 3.700.000€ and balance-sheet total of 3.650.000€. Any company whose annual workforce average exceeds 100 falls beyond the scope of the definition.

that we exclude UCITS (Investment funds) and coordination centres. Bank and insurance companies are also excluded, due to the fact that the annual accounts that they publish are established according to specific rules.

## 2.2 The effective tax rate

The concept of ETR that we are using builds on the tax information included in our tax database.

The basic principle is the following: CIT liability (CITL) is divided by the taxable profits that should appear under a benchmark tax system with no tax expenditures.

$$[1] \quad ETR = CITL / NTB + A_{te} - DC^*$$

With NTB = Net tax base

$A_{te}$  = allowances that are considered as tax expenditures.

$DC^*$  = disregarded charges, excluding CIT.

The numerator is the CIT liability. Tax credits, including notional ones (11), are deducted as they lower the CIT liability.

The denominator is computed starting from net taxable profits. We then add allowances and exemptions that are considered as tax expenditures and we subtract disregarded charges that should be deducted according to the accounting standards. This means, for example,

- that any extra-cost deduction that is considered as a tax expenditure (an investment allowance for example) will be added to the denominator and will reduce the effective tax burden as recorded by the ETR,
- that any allowance that is not considered as a tax expenditure (the participation exemption aiming to prevent double taxation, or losses carried forward) will not affect the ETR,
- that the non-deductibility of expenses will increase the ITR.

The main provisions that are not considered as tax expenditures, while reducing the tax base are the participation exemption (dividends and capital gains), the deduction for losses carried forward and the profits from branches that are exempted under the application of tax treaties.

The main tax expenditures are: the investment allowance, the allowance for additional staff hired by SME's, the allowance for researchers, and the allowance for gifts to qualified institutions. Preferential tax regimes (coordination centres, investment funds) also result in tax expenditures and they should lower the ETR, but companies enjoying these preferential regimes have been excluded from the database.

The main disregarded charges have been listed above.

According to formula [1], the ETR may be negative or positive and range from zero to infinite in the specific case in which  $DC^* = NTB + A_{te}$ . We only consider companies for which the ETR is positive and does not exceed 200%.

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11 The most important case was the notional tax credit granted to companies providing debt or equity to the coordination centres. This provision was part of the preferential tax regime, with the cost-plus rules that were used to set the tax base for the coordination centres. The notional withholding tax, which acted as a notional tax credit, was gradually phased out starting from 1990-91, so that it only plays a minor role in 2003.

## 2.3 Consequences on the specificity of the approach

Papers using micro-data to assess the tax burden on companies usually rely on accounting data, as tax data are usually not accessible for research. Effective taxation is usually defined by the ratio of corporate tax to profits before tax or to the net operating surplus. Using a denominator like the NOS is not convenient, since it makes the tax burden dependant from the financing structure of the enterprise: interests are tax deductible while distributed profits are not. A ratio of corporate income tax to the NOS is an indicator of the tax burden on investment but is not an indicator for the taxation of profits. ETR based on the total of the balance sheet are less pertinent, since differences in profitability are factored in the indicator.

Our ETR concept differ from those currently use in the literature in two main aspects

- The numerator includes the exact CIT liability while ETR based on micro-data includes the estimation made by the company for the current year and CIT payments or reimbursements of past years that were not covered by the corresponding yearly provision.
- The denominator is the tax base under a benchmark tax system.

Another important point is that our database includes explanatory variables that allows us to explain the causalities behind the gap between nominal and effective tax rates. Papers based on accounting data cannot observe such variables. Most of these papers explain the ETR by an equation like

$$[2] \quad ETR = a + b_1 STR + b_2 SIZE + b_3 SECTOR$$

with STR = statutory tax rate and SIZE based on the total of the balance sheet, value added or the number of employees. Such an equation does not capture the true explanatory variables for the gap between nominal and effective taxation: it just indicates how the gap varies according to size or sectors. Most of the tax provisions that are the relevant explanatory variables are not necessarily linked to size, neither specific to sectors, but their effect may differ according to the size or the sector. Empirical evidence based on [2] highlights, but does not explain, the dispersion of ETR across firms.

## 3. Macro and sectorial evidence

Table 3 provides evidence on the ETR at the macro level. It relies on tax statistics that include companies with a positive net tax base. Companies qualifying for preferential tax regime are included, with among them coordination centres and investment companies.

**Table 3**  
**ETR macro economic evidence**

Years	2000	2001	2002	2003
Statutory tax rate (STR)	39%	39%	39%	33%
Idem, crisis surcharge included	40,17%	40,17%	40,17%	33,99%
ETR	34.9%	34.6%	34.9%	34.1%
- CIT liability/ net tax base	39.9%	40.4%	40.9%	37.8%
- tax expenditures / net tax base	26.4%	33.0%	32.9%	28.3%
- Disregarded charges/ net tax base	12.1%	16.3%	15.8%	17.1%

Source: Belgian Ministry of Finance - own calculations

The ETR is rather stable over the 2000-02 period but drops from 0.8 point in 2003. A tax reform, that reduced the tax rate from 40.17% to 33.99% and broadened the tax base, entered into force



on 1<sup>st</sup> January 2003. The reform was intended to be budgetary neutral. The drop in the ETR does not mean that the reform was not budgetary neutral, since some of the provisions that broadened the tax base have no effect on the ETR. This is for example the case of the tightening of the requirements for the participation exemption. Since the participation exemption is not considered as tax expenditure, the amounts deducted, including any changes, have no effect on the ETR.

Table 3 gives some preliminary indications about the factors driving the gap between nominal and effective taxation. Tax expenditures vary dramatically over time and may account for one third of the net tax base. Most of the amount and variations of tax expenditures comes from the exempted profits of the coordination centres. Disregarded charges exhibit an upward trend, raising from 12.1 of the net tax base in 2000 to 17,1% in 2003.

The 2003 tax reform brought the ETR close to the statutory tax rate. This does not necessarily means that it made the tax system more neutral. After tax reform, tax expenditures still account for 28.3% of the net tax base and disregarded charges for 17.1%. Compensation at the macro-level does not mean that the companies that enjoy tax expenditures are those who bear disregarded charges.

**Table 4**  
**ETR by sector - 1998**

Title	Effective rate
Agriculture, forestry and fisheries	37.3%
Energy minerals extraction	n.a
Non-energy minerals extraction	46.7%
Food, beverages and tobacco	42.7%
Textile	48.5%
Leather, shoes and clothing	42.9%
Other manufacturing industries	44.6%
Electricity and water	7.8%
Chemistry	38.6%
Machinery	42.7%
Building industry and civil engineering	43.8%
Trade and hotels and restaurants sector	47.4%
Transport and communications	44.8%
Banking sector	39.1%
Other financial services	37.4%
Holding companies	36.9%
Investment companies	7.8%
Insurance industries	44.9%
Other services	23.6%
<b>All sectors</b>	<b>36.1%</b>
<b>Nominal tax rate</b>	<b>40.2%</b>

Source: Belgian Ministry of Finance - own calculations

Table 4 gives the most recent macro-economic estimates at the sectorial level. The ETR is higher than the STR in most of the manufacturing sectors; transportation and retail while companies from service sectors have, on average, an effective tax burden that is lower than the nominal tax rate.

## 4. ETR on micro-data: descriptive analysis

### 4.1 Mean, median and dispersion

**Table 5**  
**ETR on micro data – 2003**  
**Mean and dispersion**

	Mean	Median	Minimum	Maximum	Dispersion (STD/Mean)
Zero results included					
All companies	19,19%		0%	199,5%	4,85
Small companies	19,17%		0%	199,5%	5,51
Other companies	19,71%		0%	177,6%	1,95
Reduced CIT rates	18,32%		0%	199,1%	5,92
Normal CIT rate	20,42%		0%	199,5%	3,99
Zero results excluded					
All companies	37,71%	33,99%	0,03%	199,11%	2,10
Small companies	37,59%	33,99%	0,03%	199,11%	2,48
Other companies	40,35%	35,22%	0,03%	198,00%	0,70
Reduced CIT rates	35,35%	30,87%	0,92%	191,45%	2,85
Normal CIT rate	41,41%	35,17%	0,03%	199,11%	1,85

Table 5 gives an overview of the ETR analysis at the micro level. As explained above, negative ETR and ETR above 200% have been excluded from the sample.

The mean of the ETR is 19,2% when measured on micro data, to be compared with 34.1% at the macro level. This however includes the zero results that are excluded at the macro level, since the tax statistics only include companies with a positive tax base. The rest of our analysis, including the logistic models presented in Section 5, excludes the zero results.

Excluding zero results brings the mean and median ETR just above the macro economic ETR. The latter is based on statistics that include the companies that enjoy preferential CIT regimes, like coordination centres and investment fund, while these are excluded from our sample. Preferential tax regimes result in a low ETR that push the macro result downward with no effect on the mean and median ITR computed on our micro-dataset.

Table 5 also splits companies according to two distinct criteria. The first one separates out companies that are considered as “small” by the corporation code from the medium and large companies. Small companies face a lower ETR but this difference is not large compared to what could be expected: the mean and median ETR are less than 3 points lower than the corresponding results for medium and large companies.

The second criterion relies on the tax code and separates out companies that qualify for reduced rates for SME’s. The mean and median ETR of companies enjoying reduced rates is 4-6 points lower than the corresponding figures for companies subject to the full CIT rate. The difference is not large, compared to the difference in nominal rates (24,25 versus 33, see Table 1).

The dispersion remains high (2.10). Dispersion is higher among small companies compared to large ones and among companies subject to reduced rates.

We also note that the mean is systematically above the median, indicating a right-hand side asymmetric distribution.

Comparing our results with other studies available, we note that VANDENBUSSCHE e.a (2005) found an average ETR of 26.15 and a median ETR of 29.17% for large companies. These results are far below our estimates, what might explained by differences in definition. Moreover, it is unclear if they include or exclude zero results.

## 4.2 ETR and gross taxable profits

Table 6 indicates how the mean, median and dispersion of the ETR vary along the strata of gross taxable profits. Gross taxable profit may not be considered as a proxy for size but Table 6 enables us to investigate how the ETR is related to the amount of profits.

From a conceptual point of view, CIT should be proportional. Redistribution, which requires progressivity, takes place between persons, not between companies. However, reduced rates (Table 1) should create some progressivity if there are not other factors acting in the opposite direction. The distribution of tax expenditures and disregarded charges may however also influence the relation between the ETR and gross taxable profits.

**Table 6**  
**Effective tax rate and gross taxable profits – 2003**

Stratum	Number Comp.	Of which Profits>0	Maximum	Minimum	ETR			
					Mean	Median	Maximum	Dispersion
1	2 347	1 941	118 199 484	128 931	36.28	34.79	187.64	0.25
2	3 956	3 490	128 893	44 969	35.74	34.64	170.49	0.33
3	11 571	10 339	44 967	14 245	35.46	34.50	134.59	0.55
4	35 000	30 500	14 245	3 983	35.49	33.78	198.00	1.70
5	94 300	72 200	3 983	421	38.38	33.88	199.11	4.21
6	91 020	11 160	421	-2 665	42.38	33.99	191.45	3.64
7	16 848	0	-2 665	-28 051	Zero or negative profits			
8	2 485	3	-28 055	-69 903 606				

The ETR exhibits a U-profile. This means that reduced rates do not dominate the effect of tax expenditures and disregarded charges. Otherwise, the ETR should be decreasing according to gross taxable profits. The dispersion of the ETR is clearly inversely related to gross taxable profits.

## 4.3 ETR and the size of the company

### 4.31 ETR and the number of employees

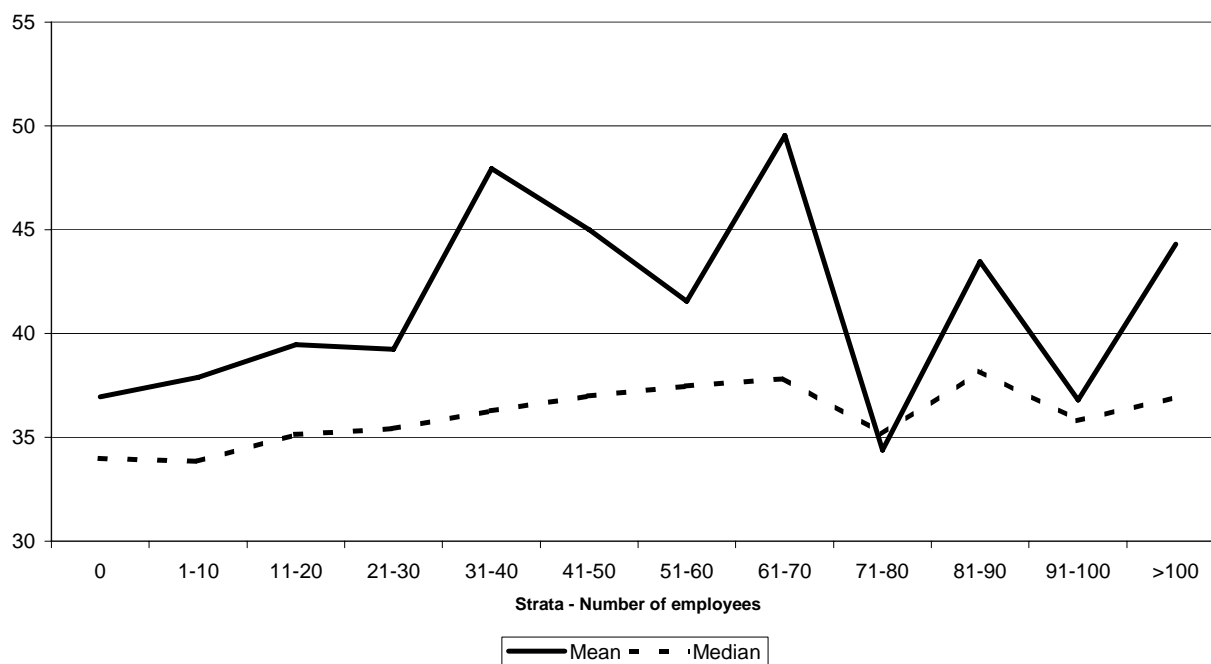
The number of employees may capture size, along others variables like value added or the total of the balance sheet. There is no clear relation between the ETR and the number of employees. The profile of the intra-stratum average of the ITR is unclear while the profile of the intra-stratum median is more regular, with an upward trend until 70 employees. The difference between mean and median values indicates the presence of highly positive values at the firm level. We may also notice that the intra-stratum dispersion of the ETR seems to be inversely related to size, captured by the number of employees.

**Table 7**  
**ETR and the number of employees - 2003**

Number of Employees	Effective tax rate				
	Average	Median	Minimum	Maximum	Dispersion
0	36.96	33.99	0.03	199.11	2.43
1-10	37.89	33.85	1.21	191.50	2.59
11-20	39.46	35.14	0.13	165.22	1.48
21-30	39.25	35.43	1.06	148.10	0.92
31-40	47.95	36.28	5.09	182.25	1.27
41-50	45.00	36.99	5.15	149.26	0.91
61-60	41.55	37.46	5.18	114.14	0.84
61-70	49.55	37.83	19.14	142.38	0.93
71-80	34.38	35.16	5.37	63.34	0.32
81-90	43.47	38.19	7.86	70.31	0.45
91-100	36.80	35.80	18.78	65.59	0.18
> 100	44.31	36.92	1.21	198.00	0.68

**Figure 3**

**ETR and the number of employees**



These results conflict with NICODEME (2006) who found a negative relationship between the ETR and the number of employees. VANDENBUSSCHE (2005) only consider large enterprises, who belong to our last strata in Table 7 and Figure 3.

### 4.32 ETR and Value added

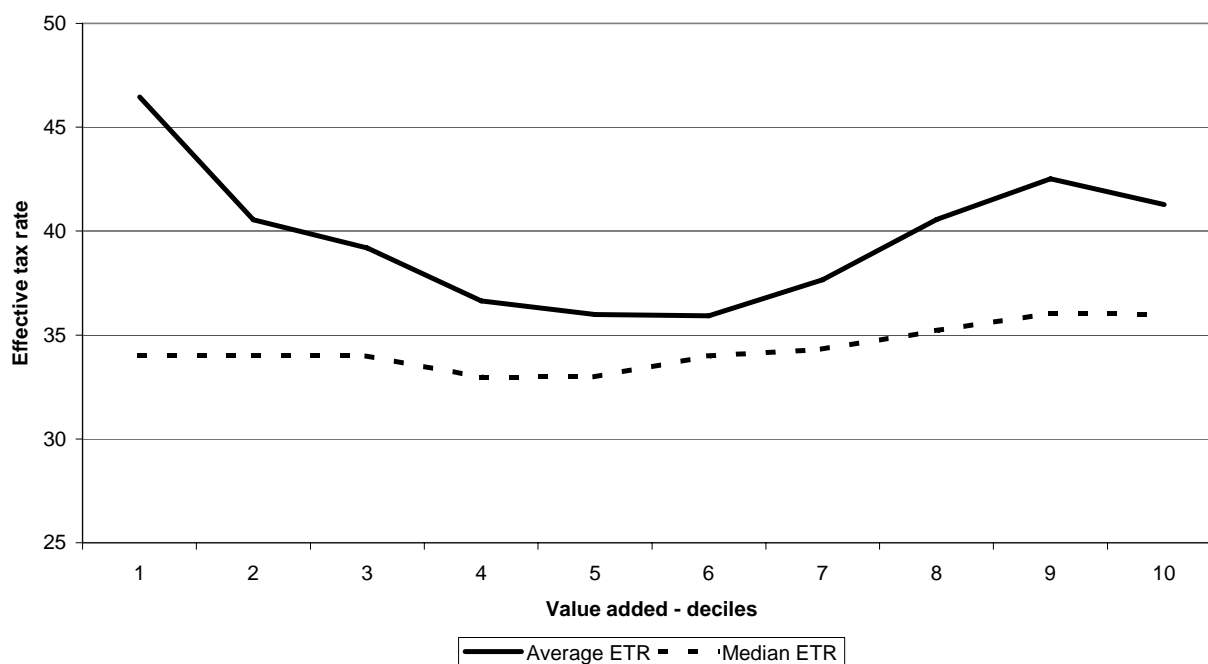
Table 8 and Figure 4 illustrate how the ETR vary with value added, which is our second proxy for the size of the company. The profile of the intra decile median value of the ITR is roughly flat or slightly U-shaped with a slightly more marked increasing trend at the right-hand side of the ETR distribution. The profile of the mean is more U-shaped but we know that averages are more sensitive than median to extreme (positive) values.

**Table 8**  
**ETR and value added - 2003**

Deciles Value added	Effective tax rate				
	Mean	Median	Minimum	Maximum	Dispersion
1	46.46	33.99	0.13	139.26	1.51
2	40.54	33.99	2.36	191.45	2.73
3	39.19	33.99	0.03	199.11	3.63
4	36.64	32.96	2.46	193.20	3.25
5	36.00	32.98	5.50	188.35	2.80
6	35.93	33.99	3.93	172.63	1.88
7	37.65	34.32	1.57	191.50	1.67
8	40.56	35.21	0.92	180.17	1.14
9	42.52	36.04	0.03	149.26	0.72
10	41.28	36.00	1.21	198.00	0.61

**Figure 4**

### ETR and Value added



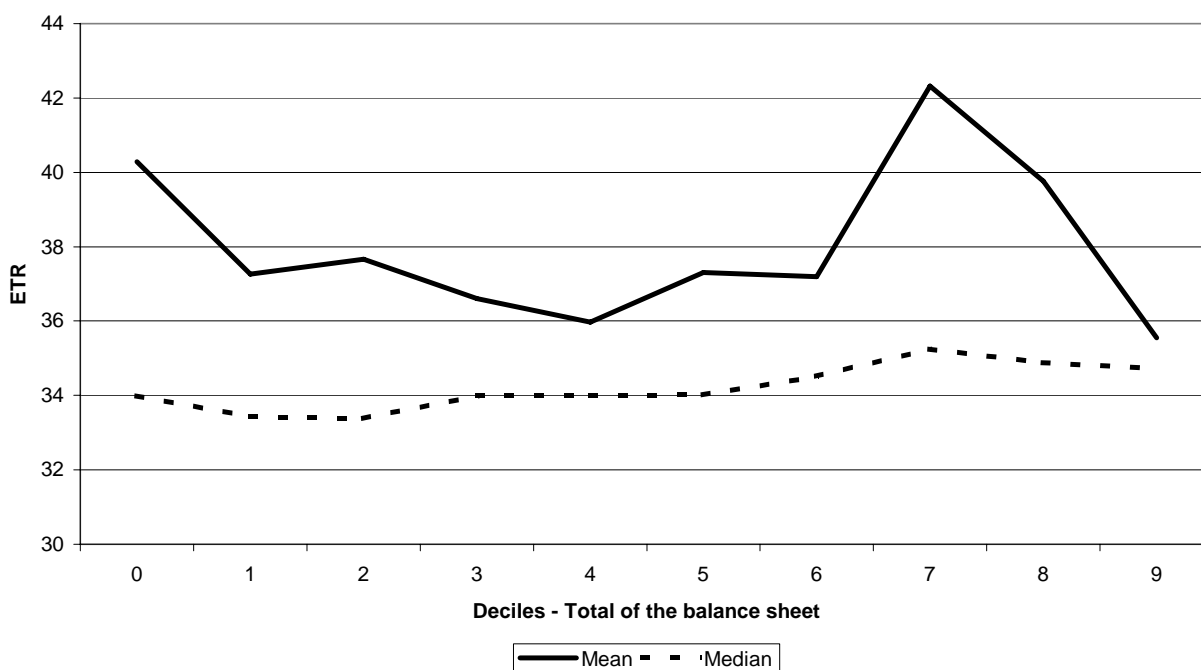
Previous work on the same database indicates that SME's that qualify for reduced CIT rates are not concentrated on the left-hand side of the distribution according to value added (See Figure 2. It is rather the opposite that prevails. Having this in mind, it is not surprising to have a non-decreasing relationship between the ETR and value added.

#### 4.33 ETR and the total of the balance sheet

The relationship between the ITR and the total of the balance sheet is unclear. The intra-decile median ETR exhibits a slightly upward trend while the profile of the intra-decile average ETR is unclear. Against, it must be kept in mind that averages are more sensitive to extreme values.

**Figure 5**

**ETR and the total of the balance sheet**



#### 4.4 ETR by sector

The macro analysis indicated that the ETR was on average higher in manufacturing sector, transportation and retail than in the service sector. The micro analysis leads to a different conclusion. Some of the manufacturing sectors exhibit an lower average (or median) ETR, compared to the "all sectors" average. This also holds for hotels and restaurants and retail trade. This is not surprising, since these sectors include a large number of companies that qualify for reduced rates.

Financial holding companies exhibit a high ETR. This might seem paradoxical but we have to keep in mind that the participation exemption is not considered as tax expenditure. Consequently, removing double taxation does not lower the ETR. The tax burden indicator only reflects the taxation of profits not accruing from participation. The ETRs of the banking and insurance sectors also deserves some explanations. The most important companies are not included in the database

due to the specific accounting rules they have (12). Most of the companies of the banking sector are managers of bank office that have incorporated themselves and most of the companies of the insurance sector are brokers.

Inter-sectorial of the ETR is rather small: most of the dispersion is intra-sectorial.

**Table 9**  
**ETR by sector - 2003**

Sectors		Effective tax rate				
		Average	Median	Min.	Max.	Dispersion
01	Agriculture, forestry and fisheries	38.93	33.99	5.87	193.20	2.11
02	Extractive industries	28.75	33.99	6.68	53.37	0.91
03	Agricultural and food industries	35.18	30.29	4.13	173.36	2.21
04	Textile and clothing	37.18	33.99	16.80	91.20	1.50
05	Chemical industries	40.15	35.21	22.10	114.14	0.73
06	Other manufacturing industries	36.49	33.99	5.86	184.69	1.46
07	Metallurgy and metalwork	32.61	33.11	10.61	77.61	0.85
08	Electricity, gas and water (*)	35.83	31.63	5.20	188.35	2.54
09	Building industry	37.45	33.99	1.57	191.45	2.04
10	Wholesale en retail trade	35.75	31.96	5.44	183.94	3.74
11	Hotels and restaurants	34.98	33.04	0.03	187.64	1.99
12	Transport, warehousing and communication	35.97	35.09	5.28	77.72	1.26
13	Banking sector and other financial intermediaries (**)	35.69	33.99	5.16	139.26	1.29
14	Other intermediaries and activities auxiliary to financial intermediation	34.85	33.99	32.28	99.98	0.31
15	Financial holding companies	46.31	37.17	23.05	186.89	2.74
16	Insurance and auxiliaries (**)	39.75	34.04	0.03	199.11	2.29
17	Real estate activities and services to enterprises	35.29	33.24	3.42	125.77	1.65
18	Other services	38.93	33.99	5.87	193.20	2.11
	All sectors	37.71	33.99			

(\*) Excl. Electrabel, the most important electricity company of Belgium.

(\*\*) Excl. those which have to file their accounts according to the BFIC's standards.

#### **4.5 Summary of the descriptive analysis**

The descriptive analysis concludes to a high dispersion of the effective tax rate, with a right-hand side asymmetry of its distribution. This appears in the comparison of median and average ETRs: whatever the category (sector, deciles of value added, classification according to the number of employees, strata of gross taxable profits), averages are in most cases higher than median values.

The profile of the ETR according to gross taxable profits is slightly U-shaped according, which seems to indicate that the distribution of tax expenditures and those of disregarded charges counteract the effect of reduced rates for companies making low profits.

12 They have to file their accounts according to the Banking Financial and Insurance Commission's standards.

There is no clear relationship between the ETR and the size of the company. Average values seem again to be very sensitive to high positive ETR. The profile of median ETRs are more clear-cut but with no common relationship with size's criteria. There seems a positive relationship between the ETR and the number of employees, a U-shaped profile according to value added and no clear trend in relation with balance-sheet total.

"Small companies" according to the corporation code have a median or average ETR slightly lower than large companies. Those qualifying for reduced rates exhibit on average a lower ETR, but the difference with those who do not qualify is lower than the difference in nominal rates.

Some of these preliminary conclusions tend to indicate that disregarded charges could play a major role in the dispersion of effective tax rates at the firm level. One of them is the right-hand side asymmetry of the distribution.

## 5. Logistic models

The final section of this paper investigates the factors explaining the dispersion of effective tax rates at the firm level. We use logistic models (SAS Software). The dependant variable is the ETR. More formally, logistic models aim to explain the probability for a given company to have an ETR positive and lower than 200% (upper bound of the distribution).

Explanatory variables fall in two distinct categories: tax variables and accounting variables.

- Tax variables include a dummy variable for reduced rates (1 if applicable, 0 if not) the amount of disregarded charges and the amount of the investment allowance (13)
- Accounting variables include sector, value added, a dummy variable for "small companies", the number of employees and the total of the balance-sheet.

We assume the absence of correlation between tax and accounting variables. Starting from a model with a constant and no explanatory variables, the LOGIT analysis then tests, with the Akaike's information criteria (AIC) (14) and Wald's tests, for the additional information coming from additional variables included in the model. Models are additive. Explanatory variables are selected with a step by step procedure, which indicates the change in the level of significance due to the last variable introduced.

### 5.1 Basic model

#### 5.11 Tax and accounting variables

The basic model includes all tax and accounting variables and the ETR as dependant variable. Table 10 gives the adjustment's statistics.

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13 This investment allowance is the main tax expenditure, taking into account that companies subject to preferential tax regimes are excluded from the database.

14 We use AIC rather than the  $R^3$ , because AIC does not depend from the type of relation (linear, non linear) between the dependant and explanatory variables.



**Table 10**  
**Basic model – Adjustment's statistics**

R <sup>2</sup>	0.9468
% concordant cases	0.726
% discordant cases	0.258
AIC (constant = 387 954)	363 121

The R<sup>2</sup> is significant and the AIC criteria confirms that the tax and accounting variables bring additional information.

Concordant cases are defined as these for which the estimated and observed ETR have the same ranking. The percentage of concordant cases is satisfactory.

**Table 11**  
**Basic model with tax and accounting variables**  
**Step by step procedure.**

Explanatory variables		Degrees of freedom	$\chi^2$ Wald	Pr > $\chi^2$
Tax variables				
Reduced rate (1 if applicable)	CI	2	15 475	<0.001
Disregarded charges	DC	1	3 948	<0.001
	DC <sup>2</sup>	1	2 169	<0.001
Investment allowance	IA	1	209	<0.001
Accounting variables				
Sector	SNACE	16	2 932	<0.001
« Small company code »	SCC	1	16	<0.001
Value added	VA	1	1 839	<0.001
	VA <sup>2</sup>	1	957	<0.001
	VA <sup>3</sup>	1	737	<0.001
	VA <sup>4</sup>	1	641	<0.001
Number of employees	N_EMP	1	26	<0.001
Balance-sheet total	BS	1	12	<b>0.0538 NS</b>

Table 11 gives the results of the “step by step” procedure for the inclusion of explanatory variables. The Wald's test indicates that tax variables are more significant than accounting variables. Among tax variables, disregarded charges exhibit the highest values for the Wald's test. Value added and sectors are the most significant among the accounting variables. The total of the balance sheet is insignificant.

Table 12 details the estimation of the coefficients of the explanatory variables with the maximum likelihood function procedure.

**Table 12**  
**Basic model with tax and accounting variables**  
**Coefficient estimated by the maximum likelihood function**

Explanatory variables		Degrees of freedom	Estimated coefficients	Pr > $\chi^2_i$
Tax variables				
Reduced rate (1 if applicable)	CI	2	6.68	<0.001
Disregarded charges	DC	1	-0.00002	<0.001
	DC <sup>2</sup>	1	1.08 E-11	<0.001
Investment allowance	IA	1	1.45 E-6	<0.001
Accounting variables				
Sector	SNACE	16		<0.001
« Small company code »	SCC	1	0.12	<0.001
Value added	VA	1	0.0002	<0.001
	VA <sup>2</sup>	1	-988 E-12	<0.001
	VA <sup>3</sup>	1	1.33 E-15	<0.001
	VA <sup>4</sup>	1	-535 E-24	<0.001
Number of employees	N_EMP	1	-0.00049	<0.001
Balance-sheet total	BS	1	4.821 E-7	<b>0.004</b>

*A negative sign means that higher the explanatory variable, lower of the probability to have an ETR lower than 200%. A negative sign thus indicates a positive relationship between the explanatory variable and the ETR. As the ETR is a log variable, linearity translates in a value of zero for the coefficient of the explanatory variable.*

The tax variables enter in the model with the expected sign.

- The variable “reduced rates” has a positive sign: the probability for (ETR<200%) is higher for companies subject to reduced rates.
- Disregarded charges have a negative sign, which is consistent with their effect on the ETR: they reduced the denominator and increase the ETR. The relation between DC and ETR seems close to linearity, but we have to keep in mind that ETR are expressed in percentages in a [0;2] band while disregarded charges are included in nominal values.
- The investment allowance has a positive sign, indicating that it reduces the ETR.

Among the accounting variables, the number of employees enters with a negative sign, which indicates a positive relationship between size and the ETR. This also holds for value added. The total of the balance sheet has the opposite sign, but we know from the Wald's test that the variable is insignificant. The “small company” code has a positive sign, which indicates that they face, ceteris paribus, a lower ETR than large companies.

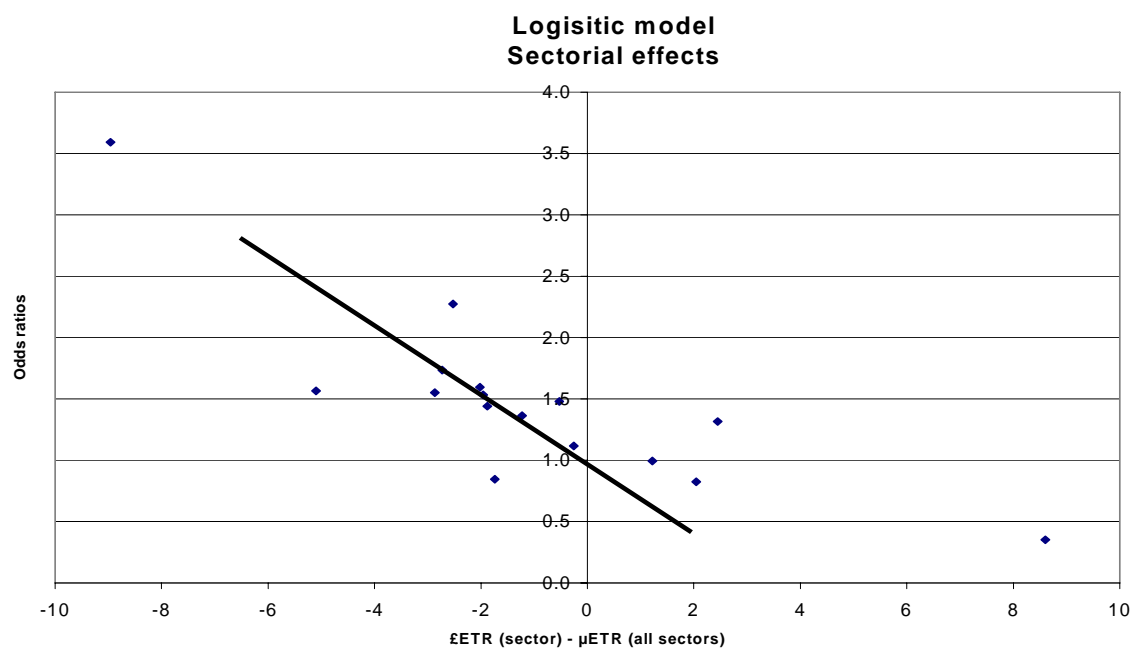
We use odds ratios to investigate the sectorial effects. A high odds ratio indicates a high probability to have an ETR lower than baseline. We use two alternatives definitions for baseline “other services” (sector 18) and “other manufacturing industries” (sector 6).

A high odds ratio should be associated with a ETR lower than baseline (Figure 6). The odds ratios of Table 12 indicates that extractive industries (3.593) and agricultural and food industries (2.275) have those with the lowest ETR, compared to “other services” as baseline. The banking sector and real estate and insurance companies seem to have an ETR higher than baseline. Changing the baseline leads to similar results.

**Table 13**  
**Basic model with tax and accounting variables**  
**Odds ratios**

	Sector	Baseline	
		18	6
01	Agriculture, forestry and fisheries	0.993	0.940
02	Extractive industries	3.593	7.851
03	Agricultural and food industries	2.275	1.157
04	Textile and clothing	1.478	1.102
05	Chemical industries	1.314	1.478
06	Other manufacturing industries	1.364	Baseline
07	Metallurgy and metalwork	1.564	0.862
09	Electricity, gas and water (*)	1.440	1.496
10	Building industry	1.116	1.105
11	Wholesale en retail trade	1.532	1.269
12	Hotels and restaurants	1.735	1.062
13	Transport, warehousing and communication	0.844	0.998
14	Banking sector and other financial intermediaries (**)	1.595	0.887
15	Other intermediaries and activities auxiliary to financial intermediation	1.551	0.561
16	Financial holding companies	0.352	0.839
17	Insurance and auxiliaries (**)	0.824	0.837
18	Real estate activities and services to enterprises	Baseline	0.919

A Odds ratio of 2.275 (Agricultural and food industries) indicates that, compared to baseline, a companies of the corresponding sector has a probability 2,275 times higher than a company of the "baseline sector" to have an ETR lower than the average of the baseline sector



**Figure 6**

### 5.12 Alternative model with accounting variables only

Table 14 gives the adjustment's statistics of an alternative model that only includes accounting variables and compares them with those from the basic model, which includes tax and accounting variables.

**Table 14**  
**Alternative model with accounting variables only**  
**Adjustment's statistics**

	Tax and accounting variables	Accounting variables only
R <sup>2</sup>	0.947	0.436
% concordant cases	0.726	0.540
% discordant cases	0.258	0.337
AIC (constant = 387 954)	363 121	382 709

The adjustment has a lower quality. Accounting variables in fact reflect the information coming from the tax variables but we know from the definition of the ETR that the causalities come from the tax variables.

This indicates that accounting variables, while they seem to explain the dispersion of the ETR, hide the information coming from the tax variables. They just highlight how the effect of the tax variables is distributed according to size or among sectors. There is no interest for going on with accounting variables alone.

### 5.2 Alternative model using ratios for the explanatory variables.

It has been mentioned above that the ETR is expressed as a percentage while most of the explanatory variables are expressed in absolute amounts. Differences in scale make difficult to test for non-linearity in relation between the ETR and some of the tax and accounting variables. In this second model, tax variables are expressed as a percentage of gross taxable profits and accounting variables are expressed as percentage of the balance-sheet total.

**Table 15**  
**Model with ratios**  
**Adjustment's statistics**

	Basic Model	Model with ratios	
		Tax variables	+ accounting variables
R <sup>2</sup>	0.9468	1.000	1.000
% concordant cases	0.726	n.d	0.925
% discordant cases	0.258	n.d	0.065
AIC (constant = 387 954)	363 121	180 332	178 723

Using ratios for explanatory variables clearly improves the performance of the model and confirms the major role of tax variables.

- Most of the reduction in the AIC criterion comes from tax variables and the inclusion of accounting variables does not improve the R<sup>2</sup> coefficient once tax variables have already been introduced.
- The model improves the percentage avec concordant cases from 72,6% to 92,5% and reduces the percentage of discordant cases from 25,8% to 6,5%.

**Table 16**  
**Model with ratios**  
**The AIC criterion and the step-by-step procedure.**

Variables	AIC	% reduction in AIC	% explanation from this variable
Constant	387 954.73		
Idem, + Ratio DC	310 857.48	19.87%	36.85%
+ Code for reduced rate	244 529.29	21.34%	31.70%
+ Ratio IA	192 329.89	21.35%	24.95%
+ Ratio DC <sup>2</sup>	182 141.86	5.30%	4.87%
+ Ratio DC <sup>4</sup>	180 331.66	0.99%	0.87%
+ Sectorial codes	179 644.53	0.38%	0.33%
+ « Small company » code	179 331.70	0.17%	0.15%
+ Ratio DC <sup>3</sup>	179 041.53	0.16%	0.14%
+ Ratio VA	178 979.66	0.03%	0.03%
+ Ratio VA <sup>2</sup>	178 887.01	0.05%	0.04%
+ Ratio VA <sup>3</sup>	178 805.68	0.05%	0.04%
+ Ratio VA <sup>4</sup>	178 723.48	0.05%	0.04%
All variables		69.74%	100.00%

Table 16 gives the results of the step-by-step procedure. Column 2 gives the value of the AIC criterion, column 3 the percentage reduction at each step and column 4 indicates the explanatory percentage of each variable.

These statistics again confirm that most of the explanation comes from the tax variables. Among them, disregarded charges and reduced rates dominate. The relation between disregarded charges and the ETR is quadratic.

Table 17 details the estimation of the coefficients of the explanatory variables with the maximum likelihood function procedure.

**Table 17**  
**Model with ratios**  
**Coefficient estimated by the maximum likelihood function**

Explanatory variables		Degrees of freedom	Estimated coefficients	Pr > $\chi^2_i$
Tax variables				
Reduced rate (1 if applicable)	CI	2	4.1301	<0.001
Disregarded charges	DC	1	-11.26	<0.001
	DC <sup>2</sup>	1	-42.54	<0.001
Investment allowance	IA	1	21.57	<0.001
Accounting variables				
« Small company code »	SCC	1	-0.6189	<0.001
Value added	VA	1	-1.0778	<0.001
	VA <sup>2</sup>	1	0.8511	<0.001
	VA <sup>3</sup>	1	-0.1974	<0.001
	VA <sup>4</sup>	1	0.0124	<0.001

Tax variables enter the model with the expected sign: DC is negatively signed: a high ratio from DC to gross taxable profits reduce the probability of having an ETR lower than the upper limit of 200%. This indicates a positive relationship between ETR and DC. Inversely, the coefficients for the investment allowance and for reduce rates are positive.

The coefficient for “small companies” indicates that they have on average lower ETR. The coefficient of value added is negative, while it was positive in the basic model. This confirms that the relation between the ETR and the size of the company is unclear and that results lack from robustness.

## Conclusions

Our analysis of the effective tax rate at the firm level indicates a very high dispersion of the effective tax burden of companies. The convergence of effective and nominal taxation at the macro level hides a great dispersion in effective taxation at the micro level.

The main factors for the dispersion of the ETRs come from the tax variables and among them, apart from reduced rates, disregarded charges play a major and predominant role.

Tax variables enter the various models with the expected sign: reduced rates and the investment allowance have a negative effect on the ETR while disregarded charges have a positive effect. The major outcome of the analysis is the evaluation of the explanatory power of each variables in the dispersion of ETRs, with the predominant role of disregarded charges.

The relation between the ETR and accounting variables is less clear-cut and lack from robustness. Apart from the fact that companies qualified as “small” by the corporation code face lower ETRs than large companies, there is no undisputable result on the issue of the relationship between effective taxation and the size of the company. The descriptive analysis does not lead to a unique conclusion and the two logistic models deliver opposite results on the relation between effective taxation and size, captured by value added.

Accounting variables may hide the true determinants of the dispersion of ETR, that lies in the tax code.

Our results diverge from those of Nicodème (2002,2006) and Vandebussche (2005).

This micro-level analysis highlights factors for the explanation of the dispersion of effective tax rates that cannot be captured when the tax burden is assessed by using ex-ante indicators, like METR from King and Fullerton and AETR Devereux and Griffith. As indicated at the beginning of this paper, these indicators only incorporate some of the key parameters of the tax system. They focus on financing arrangements, on the differences between tax and economic depreciation and on tax incentives for investment. Their conclusions on disparities arising from financing arrangements, depreciation rules and tax incentive are undisputable but they do not tell the whole story about the dispersion of effective tax rates.

The predominant role of disregarded charges raises at least two issues. The first one relates to the 2003 corporate income tax reform. Reducing the tax rate and broadening the tax base is usually considered as a move to a more neutral tax system. In the specific case under review, this seems highly questionable, since a significant part of the broadening of the tax base came from additions to disregarded charges, which are proved to be the major determinant of the dispersion of effective tax rates. The second one is more fundamental: when disregarded charges account from 17% of the taxable profits and when it appears that they are one of the main factors driving the dispersion of effective tax rate, may the corporate income tax be still be qualified as an income tax?

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