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Taxes, agglomeration rents and location decisions of firms

by

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DISCUSSION PAPER

Taxes, Agglomeration Rents and Location Decisions of Firms

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Abstract

The goal of this paper is to analyse the impact of interactions between tax rates and agglomeration rents on location decisions of firms within Belgium. In the theoretical literature it is argued that both location determinants may weaken each other's impact. Using the number of new firms at the sector level for 43 Belgian districts, we show that local effective tax rates either have no or a negative impact on location decisions. Moreover, both types of agglomeration rents in a district are important for location decisions. The presence of firms in a district attracts new firms, while the presence of firms in the same sector deters firm entry due to competition. However, the interaction effect between taxes and agglomeration rents on firm entry is significant. We show that a higher effective tax rate in a district weakens the positive impact of the agglomeration rents on location decisions of firms.

JEL codes: H71, F21, R30

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1. Introduction

Location decisions of firms have been studied extensively – both theoretically and empirically – especially since the development of the New Economic Geography (NEG) theory at the beginning of the nineties. Different models developed in this NEG literature (a.o. Krugman, 1991; Venables, 1996) state that there are forces pulling firms towards a centre of economic activity and forces pushing them away.

The forces pulling firms towards the centre are what we call *agglomeration forces*. According to the Krugman-model, the main agglomeration force is market access. The closer one is to the centre of economic activity, the better the access to a market in order to sell the firm's goods. The intuition is that firms want to locate close to their workers - as workers constitute firms' consumers and therefore the market - and workers want to locate close to firms - as they will get a higher (real) wage in the firms' vicinity. According to the Venables-model, the main agglomeration force is not the closeness to consumers but rather the closeness to other firms that supply or demand intermediate goods. In case a firm is a final producer, it prefers to be close to its intermediate suppliers. If a firm is an intermediate supplier, on the other hand, it prefers to be close to final producers.

One force pulling firms away from the centre is the *competition effect*. Indeed, the closer firms are to each other in a certain region, the more they will suffer from severe competition and the less attractive that region will be. Crucial is therefore whether the competition effect (pushing firms away) outweighs the agglomeration effect (attracting firms) or rather the other way around[1] (De Bruyne, 2006).

Next to the determinants of location decisions of firms discussed in the NEG theories, there are many other location determinants. Government policy, for instance, also plays a large role. One such instrument of government policy is the corporate tax rate. De Mooij and Ederveen (2003) show that a decrease of 1 percentage point in the corporate tax rate leads to an increase in foreign direct investment (FDI) by 3.3%. Within Belgium, different effective tax rates across regions or districts are possible. Vandenbussche et al. (2006) provide empirical evidence that the effective tax rate of firms located in Belgium is significantly different across regions after taking into account firm and sector characteristics.

The aim of this paper is to determine the individual impact and the interaction of both corporate taxes ánd agglomeration rents on location decisions of firms in Belgium. Especially the interaction between these factors is recently a new research area. We would like to contribute to the limited number of empirical studies by

[1] According to the New Economic Geography (NEG) literature, this will depend on the level of transportation costs.

taking into account two different measures of agglomeration rents: a supply- and a demand-induced agglomeration rent. We count the number of new firms in two periods, one before the Belgian tax reform, 1999-2001, and one after the Belgian tax reform, 2004-2006. Using a Poisson estimation model, the results indicate that both types of agglomeration rents play an important role for location decisions in Belgium before the tax reform. Nevertheless, the role of supply-induced agglomeration rents alters depending on which level of aggregation agglomeration rents are measured. It seems that the presence of other firms in a district attracts firms, while they do not or even deter firm entry when we measure the presence of other firms at the sector-level. Moreover, we come to the conclusion that there is always an interaction effect playing between taxes and agglomeration rents. This means that regions with high tax rates can compensate for this with agglomeration rents, while regions with positive agglomeration rents must be careful not to eliminate this effect by setting too high tax rates.

The structure of the paper is as follows. We start with a literature overview in Section 2, focusing on both taxation and location literature on the one hand and the Belgian tax system on the other hand. Section 3 deals with the data sources and the descriptive statistics while section 4 tackles the methodology. Section 5 reports the empirical results and section 6 concludes.

2. Literature overview

2.1 Tax competition and agglomeration rents

In the taxation literature, several empirical studies have shown that corporate taxes have a negative impact on attracting FDI. According to a meta-study of De Mooij and Ederveen (2003), a decrease in the corporate tax rate with 1% point leads to an increase in FDI by 3.3%. Also, the impact of taxes on entrepreneurship - the formation of new businesses - has been studied before, although less than FDI. These studies find that a 10% point decrease in the tax rate increases the entry rate in a country by 0.88 to 1.3% points (Da Rin et al., 2008; Djankov et al., 2008). This negative correlation between taxes and FDI leads to countries lowering their corporate taxes in order to attract firms (Wilson, 1999). However, a clear race-to-the-bottom in corporate taxes in Europe has not been found in empirical research (Devereux e.a., 2002; Vandenbussche and Crabbé, 2005)

A possible reason why a fast race-to-the-bottom in tax rates has not observed is provided by the NEG literature. This strand of literature argues that increasing returns to scale and imperfect competition combined with transport costs may cause agglomeration. If firms locate in a few regions, this agglomeration generates benefits such as spillovers and the presence of suppliers and buyers of intermediate

goods, market access and so on (De Bruyne (2006)). The importance of market access for a firm's location decision was first put forward by Krugman (1991). Crucial in his model are the firm-consumer linkages. Venables (1996) argued that not market access, but rather the presence of other firms is important to a location decision. The idea is that intermediate suppliers want to be close to the firms that buy their goods and vice versa. Therefore, his model emphasizes the firm-firm linkages.

Summarizing, the literature states that corporate taxes deter firms and that agglomeration rents - caused by either market access or the presence of other firms - attract firms. Combining both insights, one might conclude that more agglomerated regions will be able to tax agglomeration rents without driving firms away. Several authors provide theoretical support for the existence of taxable agglomeration rents. Ludema and Wooton (2000) show indeed that as trade costs decrease, integration will attenuate tax competition. Andersson and Forslid (1999) show that mobile factors will not move if tax rates change only marginally, thus again indicating the existence of agglomeration rents. Kind, Midelfart-Knarvik and Schjelderup (2000) also show that tax competition depends on trade costs and pecuniary externalities. Baldwin and Krugman (2004) and Borck and Pflüger (2006), finally, developed a core-periphery model with taxation. The first paper is based on the core-periphery network, while the second one uses a model yielding partial stable agglomeration in addition to the core-periphery outcome. Both papers show that the tax differential between alternative locations is explained by the difference in their agglomeration patterns. The tax differential turns out to be a bell-shaped function of trade integration since agglomeration rents are a bell-shaped function of trade costs. Indeed, for respectively high and low trade costs one finds fairly low agglomeration rents. For intermediate trade costs, agglomeration rents turn out to be highest. Therefore, it is expected that the tax differential between the core of economic activity and the periphery is highest for intermediate trade costs. In other words, for these intermediate trade costs agglomeration rents in the centre are higher, implying that taxes can be set at a higher level in the centre compared to the periphery. Charlot and Paty (2007) confirm this theory empirically for France and Coulibaly (2008) for Switzerland. They estimate a derived tax-setting equation for the municipalities of respectively France and Switzerland. The authors confirm a positive and significant relationship between the tax rate and market access, which suggests there is a taxable agglomeration rent in French and Swiss municipalities.

The central question in this paper is whether agglomeration rents, taxes and their interaction have an impact on the location decisions of firms in Belgium. From the basic tax competition models, we know that higher corporate taxes as such act as a push factor for firms. In contrast, the NEG states that agglomerated regions have agglomeration rents that may act as a pull factor for firms - pulling firms to the

centre of economic activity. Finally, theory indicates that taxes and agglomeration rents may mitigate each other.

Several empirical studies have tackled the impact of tax levels ánd agglomeration rents on the location decision of firms. Devereux, Griffith and Simpson (2007) also studied the impact of agglomeration economies on the sensitivity to local fiscal incentives of firms' location choices in the UK. More specifically, the authors dig into the effect of grants on location decisions of firms. They find that grants have a small effect in attracting plants to specific geographic areas, but that firms are less responsive to subsidies in areas where there are fewer existing plants in their industry - again confirming the importance of agglomeration rents. Solé-Ollé and Jofre-Monseny (2007) show for Catalonia that taxes have a negative impact on location. They observe that omitting agglomeration variables leads to a severe underestimation of the negative effect of business taxes on location decisions. But the first paper to study the interaction effect of agglomeration rents and taxation on location decisions of firms is however by Brülhart, Jametti and Schmidheiny (2009). They find empirical evidence that firm births in Swiss municipalities on average react negatively to corporate tax burdens, but that the deterring effect of taxes is significantly weaker in sectors that are more spatially concentrated.

A study by Konings and Torfs (2010) finds that agglomeration economies exist even in a small country like Belgium. They have three very detailed agglomeration measures (knowledge spillovers, input linkages and access to workers) and show that these agglomeration rents have a significant positive impact on the productivity of Belgian firms.

Our study contributes to this literature by analyzing the interaction of agglomeration rents and taxes for new Belgian firms and thus providing more insights in this topic. Moreover, we split up the agglomeration rents in a demand-induced agglomeration rent (Krugman) and a supply-induced agglomeration rent (Venables). We take into account the impact of taxes and both agglomeration rents simultaneously on firms' location decisions. In addition, the interaction between taxes and both types of agglomeration rents are included in order to determine whether they mutually mitigate each other.

2.2 The Belgian tax system

In Belgium, the corporate profit tax is a federal tax responsibility. This means that the nominal or statutory tax rate (STR) and the taxable income are set at the federal level and are therefore equal for companies in every district or region. The tax rate itself is progressive according to the taxable income of the firm. Since

2003, Belgian corporate tax rates decreased so that for Belgian companies with a taxable income up to 322500 euro, the following progressive tax system is applied[2]:

	STR before 2003	STR since 2003
0<=taxable income<25000	28.84%	24.98%
25000<=taxable income<90000	37.07%	31.98%
90000<=taxable income<322500	42.23%	35.54%

Companies with a taxable income of more than 322 500 euro are subject to a uniform tax rate of 40.17% before 2003 and 33.99% since 2003 (Van Kerckhove and Heirewegh (2006)). While the tax rates and rules are independent of a firm's location, the effective tax rate (ETR) can differ across firms. The ETR is defined as the ratio of firm level `tax liabilities' in a particular year over the `reported profits' in that same year. This definition is widely used and known as the micro-backward method based on firm-level, archival data (Gupta and Newberry, 1997; Nicodème, 2001 and 2002; Collins and Shackelford, 2002; Vandenbussche et al., 2006). In contrast to the STR, the ETR or real tax burden of a firm differs across districts because of several reasons such as tax rulings,[3] more tax evasion in districts with a less efficient local tax administration (Moesen et al., 1994) or differences in deductible local taxes.[4] The most important local tax is the surcharge on the regional property tax (the base of this regional tax is, however, defined at the federal level). The surcharge can be freely set by all 589 municipalities in Belgium. Although it is only a surcharge, this source of tax revenue accounts for 40 percent of municipal tax revenues (Heyndels and Vuchelen, 1998; Smolders and Goeminne, 2009) and varies quite substantially across municipalities (see Figure. 3 and example in Appendix 2). Since this extra tax can be deducted from the corporate taxes (Van Kerchove and Heirewegh, 2003), the average ETRs at the district level vary as well. Vandenbussche et al. (2006) provide empirical evidence that the effective tax rate of firms located in Flanders is significantly higher than the ETR of firms in Wallonia and Brussel when holding all other firm or sector characteristics constant. Their study was carried out using large Belgian firms for the period 1993-2002 (before the Belgian tax reform of 2003).

[2] For example a company that has a taxable base equal to 100000 will pay: (25000*24.98%)+((90000-25000)*31.98%)+((100000-90000)*35.54%)=30 586 euro

[3] Firms can ask for a formal tax ruling. This means that they can negotiate with the Belgian government about a particular element in their tax liability.

[4] For a list of local taxes see Smolders et al. (2005) and Jonckheere (2008).

3. Data and descriptives

3.1 Data

We study the impact of taxes and agglomeration rents on location decisions within Belgium. Belgium has 43 districts - 22 in Flanders (Northern part of the country), 20 in Wallonia (Southern part of the country) and the last one is Brussel. Figure 1 illustrates the location of all Belgian districts.[5]

For the purpose of our study, we use data from three different sources. First, we consult the Belfirst database which comprises annual accounts of 250 000 Belgian firms for various years. From this database, we collect the number of new firms at the 5 digit sector-level in each Belgian district for the years 1999-2001 (before the tax reform) and 2004-2006 (after the tax reform). This set of new firms contains both small and large firms. We however select the large firms because these firms are assumed to be more footloose and thus deal with location decisions. According to Baldwin and Okubo (2008) large firms are most likely to relocate for tax reasons compared to small firms. We choose only firms that have profits before tax larger than or equal to 322 500 euro in the year following their set up. Hereby, we make the assumption that new firms will not generate normal profits in their year of set up due to large investments and the introduction time of their product or service, but that these new firms will reach normal profits in the following year. This selection rules out any effect due to the progressive tax system since all firms in the dataset apply the same nominal tax rate as explained above in Subsection 2.2. Moreover, firms that went bankrupt in the year after setup are dropped from the sample. From Belfirst, we also collect information about the pre-existing stock of firms in the 43 Belgian districts.

[5] See Appendix 1 for a list of the different districts

Figure 1: A map of Belgium

The second source of data are the regional accounts of the National Bank of Belgium (NBB) providing information on GDP per capita and gross investment (infrastructure) for the districts. Finally, we assemble data on prices of building lots per square meter (m²) from the federal government (Economics Service; FOD Economie).

3.2 Descriptives

This section discusses the dependent and explanatory variables with a special focus on the taxation and agglomeration variables. For all variables we report on their mean, standard deviation, minimum and maximum. As far as the key variables (count of new firms, tax, agglomeration rents) are concerned, we pay special attention to their variation as well. Note that we use two indicators of agglomeration rents. The first one is demand-induced and refers to the Krugman (1991) model focusing on the market access. The second one is supply-induced and refers to the Venables (1996) model with intermediate suppliers. The number of firms per squared kilometer is an indicator of the closeness to other firms that may act as intermediate suppliers or that may spill over knowledge.

Tables 1 and 2 summarize the statistics of the dependent and explanatory variables for both time periods. Comparing both tables, we observe that the average number of new firms has increased while the average effective tax rate has decreased over the years. The decrease in ETR was to be expected given the 2003 tax reform mentioned in Subsection 2.2. The number of firms per squared kilometer (Aggl (S)), the market potential (Aggl (D)), the price per m² and investments on the other hand have increased.

Table 1: Descriptive statistics 1998-2000, averages per year

	New firms	ETR	Aggl (S)	Aggl (D)	Price m²	Infrastructure
Mean	2.477	0.313	10.291	10841.06	35.664	1146.005
Std dev	7.037	0.047	29.402	4075.962	29.652	1429.124
Min	0	0.002	0.384	6144	8.3	135.8
Max	68	0.485	210.106	27099	209.9	8289.4

Table 2: Descriptive statistics 2003-2005, averages per year

	New firms	ETR	Aggl (S)	Aggl (D)	Price m²	Infrastructure
Mean	4.651	0.275	14.385	12704.79	66.802	1317.135
Std dev	10.804	0.025	37.760	4674.035	51.705	1676.781
Min	0	0.160	0.744	7400	9	147.4
Max	74	0.344	268.603	30749	350	9324.1

Special attention goes to the variation in the key variables, namely the number of new firms, the ETR and the agglomeration indicators. Figures 2 to 4 illustrate for each variable the values for all districts in the period 2003-5. The Figures for period 1998-2000 are not included because they show the same variation in the variables considered. The absolute values are lower though as became clear from Tables 1 and 2.

As far as the number of new firms is concerned, Figure 2 shows a large variation between the different districts. A district like Brussel or Antwerpen - with the harbour – attracts most firms while districts in the South of the country like Aat and Aarlen only attract a very small number of firms.

Figure 2: Average number of new firms by district in Belgium 2003-2005

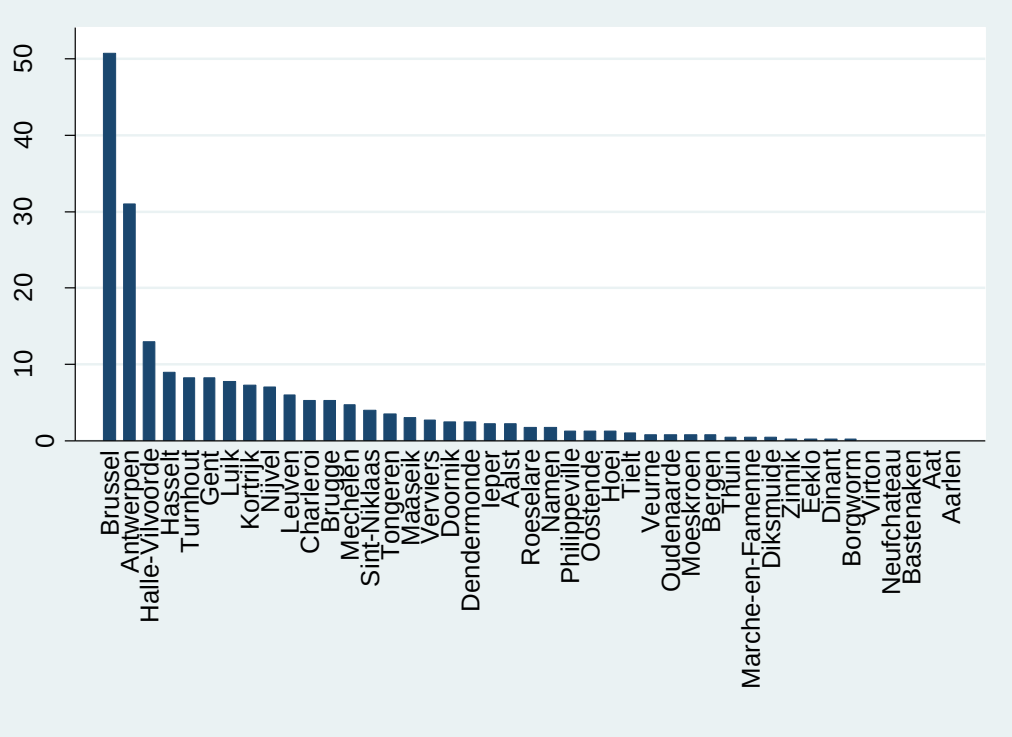
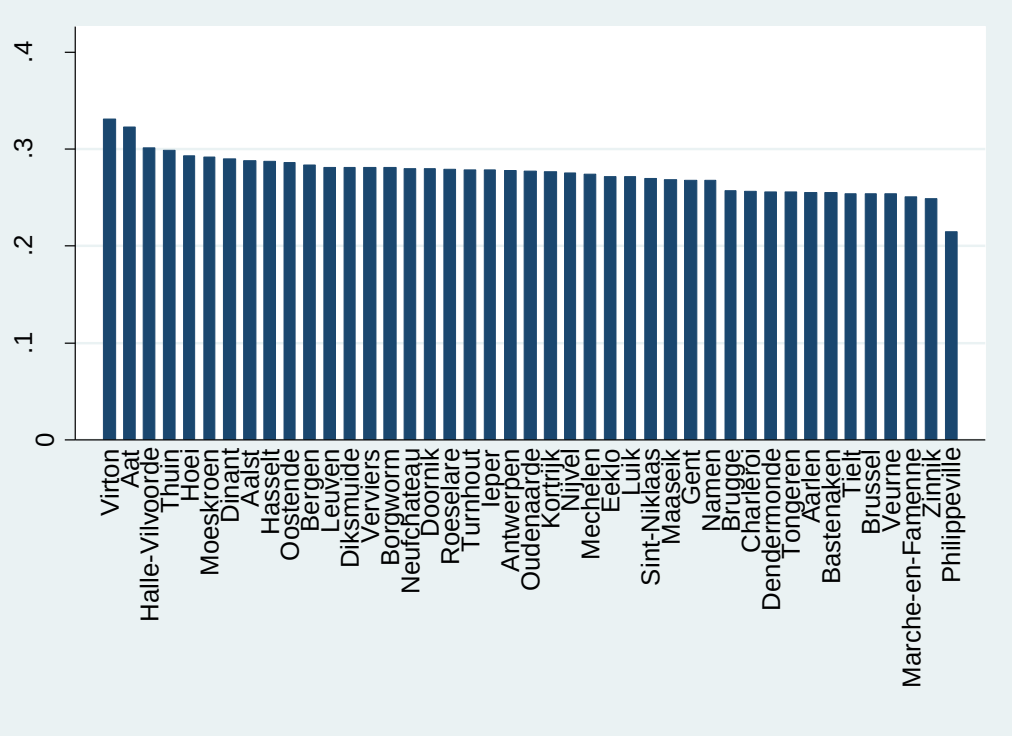


Figure 3: Average ETR by district in Belgium 2003-2005



Looking at Figure 3 we can indeed conclude that the ETR varies quite remarkably between the districts going from a high 33% (Virton) to a low 22% (Philippeville).

Figures 4 and 5 show that both supply- and demand induced agglomeration indicators vary substantially between the districts. The most agglomerated regions are situated in the North of the country (Flanders) while the least agglomerated regions are situated in the South (Wallonia). Note that in contrast to the theory, Belgian districts with a high number of firms per squared kilometer or a high market potential are not necessarily the districts with higher effective tax rates. This is also clear from the correlation matrix in Appendix 4 where both agglomeration rents show a negative correlation with the effective tax rates. In other words, Belgium does not follow the core-periphery theory like for example Charlot and Paty (2007) found for France.

Figure 4: Number of firms per km² by district in Belgium 2003-2005 (Aggl (S))

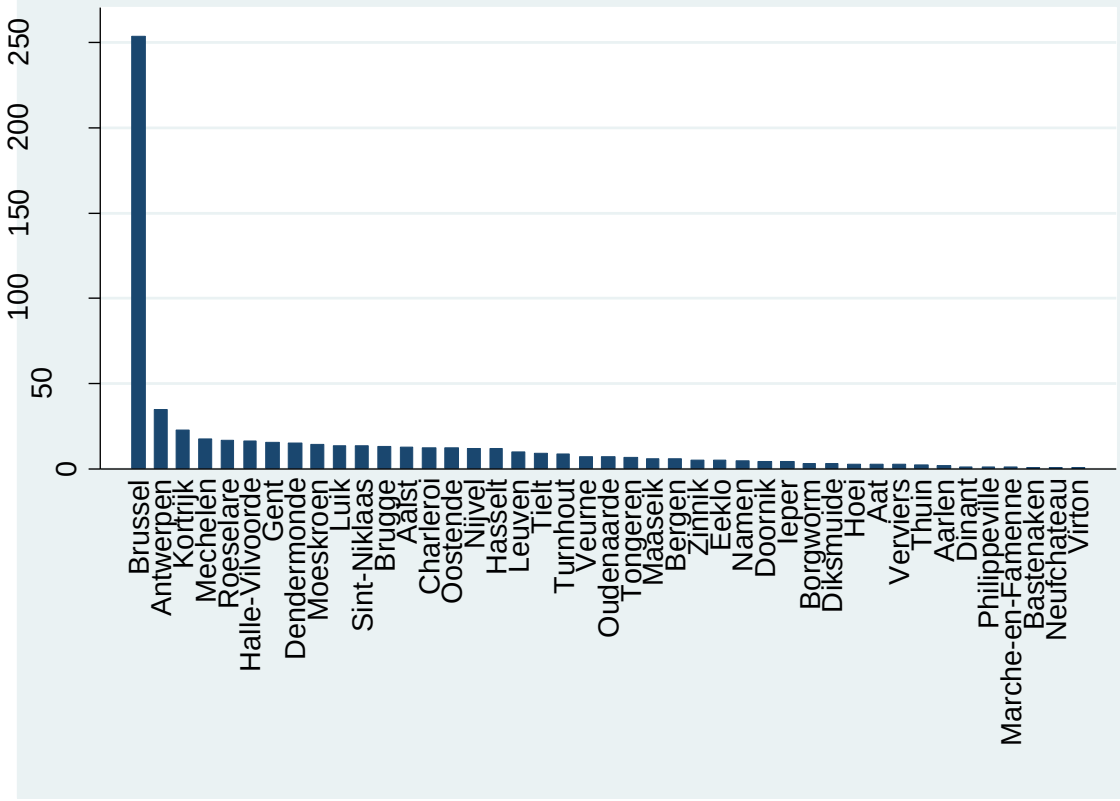
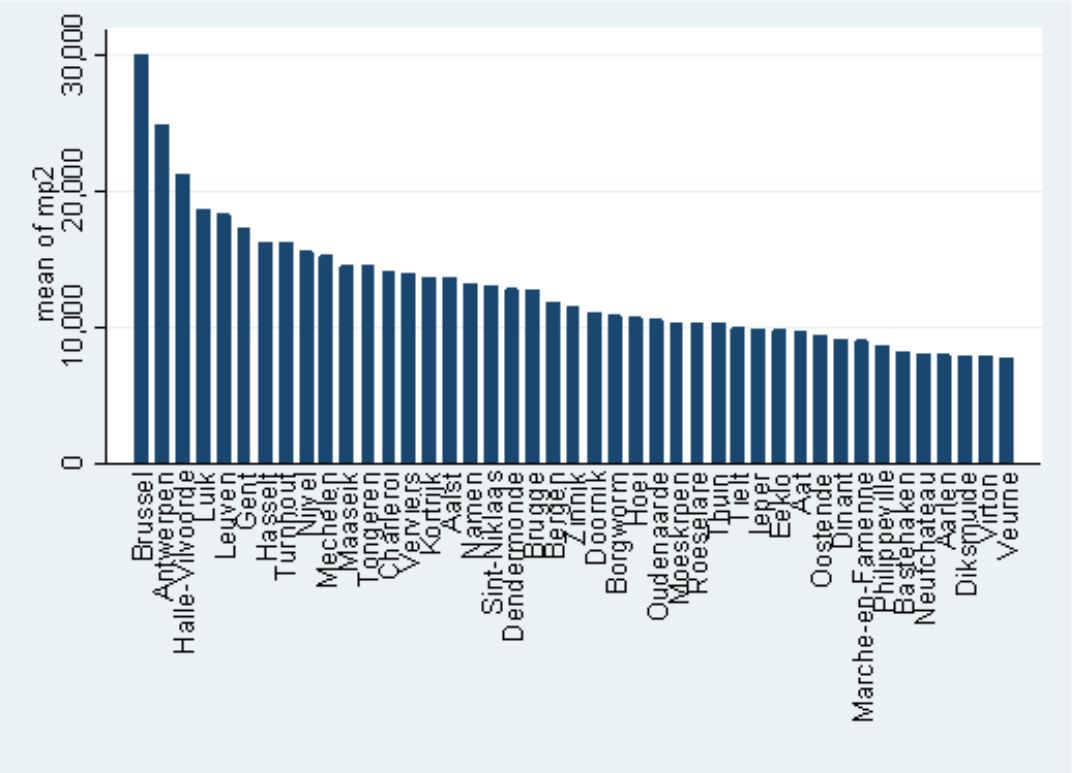
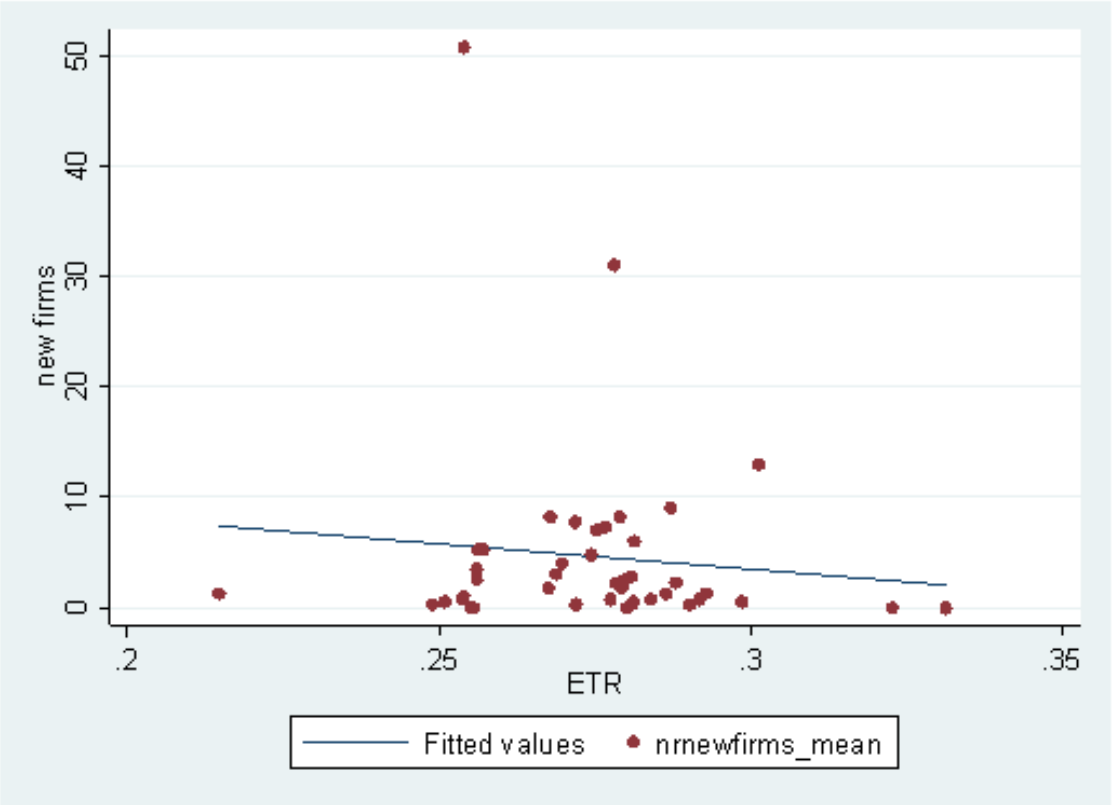


Figure 5: Market potential by district in Belgium 2003-2005 (Aggl (D))



In order to obtain a first glance of the relationship between the number of new firms and the ETR, we plot both against each other. Figure 6 illustrates that the effective tax rate on average has a negative effect on the location decision of firms. However, if we look at the district Halle-Vilvoorde for example, we observe from Figure 2 that this district attracts a lot of new firms, although it is amongst the districts with the highest ETR according to Figure 3. Therefore, we expect that other factors such as agglomeration rents can compensate for a high ETR.

Figure 6: New firms versus ETR by district in Belgium, averages for 2003-2005



Calculating the correlation coefficient between the ETR and the agglomeration indicators gives us a first insight in the possible impact of both types of variables on each other. The correlations between the ETR on the one hand and market potential and the number of firms per squared kilometer on the other hand are respectively -0.11 and -0.28 (cfr. correlation matrix Appendix 4). This indicates that in determining their taxes, Belgian districts do not appear to take agglomeration effects into account. A district with higher agglomeration rents will in other words not necessarily opt for a higher ETR. There must be other factors influencing the ETR like for instance budgetary reasons. Similar graphs are found if we drop the three outliers (Brussel, Antwerpen and Halle-Vilvoorde) and for, for example, four important sectors in Belgium, the results are reported in Appendix 3.

4. Methodology

To analyse our research question in a multivariate setting, we estimate the following regression (1).

$$number\ of\ new\ firms_{d,s,t} = \beta_0 + \beta_1 ETR_{d,t-1} + \beta_2 aggl(D)_{d,t-1} + \beta_3 aggl(S)_{d,(s),t-1} + \beta_4 (ETR * aggl(D))_{d,t-1} + \beta_5 (ETR * aggl(S))_{d,(s),t-1} + \beta_6\, price\ building\ lots_{d,t-1} + \beta_7\, gross\ investment_{d,t-1} + \alpha_d + \varepsilon_{d,s,t} \quad (1)$$

where the dependent variable is the count of new firms in a certain Belgian district d in sector s at year t. Two time periods are considered to evaluate the effects over time.[6] The independent variables are all lagged one year to rule out any potential endogeneity problem. This means that the new firms in the period 1999-2001 are assigned to control variables of 1998-2000 and new firms in the period 2004-2006 are assigned to control variables of 2003-5. The average effective tax rate is, as stated before, the amount of taxes paid divided by the profit before tax. We argue that the effective tax rate paid by the pre-existing stock of firms in a district may be a good indication of the tax rate that new firms might have to pay. Agglomeration is measured in two ways. First, we measure the presence of firm-consumer linkages by looking at the market potential of a district. Harris (1954) was the first to introduce the concept of market potential. He stated that the market potential of a region is the weighted sum of the income of all regions – where the weights are a negative function of the distance. More in particular, he divided the income of each district by the distance to that district. The income of a region close by therefore obtains a higher weight than the income of a region further away. In his paper, Hanson (2005) weighted the market potential incomes by a negative exponential function of distance. The problem with this index is that the weights go to zero very quickly. For example, a region that is 100 km further has a weight of only 3,7 E-44. We therefore opt for the Harris (1954) definition of market potential. More in particular, we calculate market potential as follows:

$$aggl(D)_{d,t-1} = Y_{d,t-1} + \sum_{j \neq d} \frac{Y_{j,t-1}}{distance_{dj}} \quad (2)$$

with $Y_{j,t-1}$ district j's disposable income at time t-1 and dist the distance in kilometers between the capital cities of district d and j. This definition includes the market potential of the own district d and neighboring districts because especially in a small country like Belgium, residents of neighboring districts can also be potential customers. Note that the own district's income has a weight of one while the other

[6] This allows us to concentrate on regional tax differences and not on tax shocks over time which is not the research question of this paper.

districts have a weight smaller than 1. Besides all Belgian districts, we also included the foreign neighbors of Belgium (France, Germany and the Netherlands) as more than 65% of Belgian exports goes to these markets.

Second, agglomeration in terms of firm-firm linkages is measured as the number of firms per squared kilometer in a district. This agglomeration measure is also calculated at the three-digit sector level. Both market potential and the presence of firms are interacted with the effective tax rate in the analysis.

Firm entry, tax rates and agglomeration rents can have issues of reversed causality. As in Brülhart et al. (2009) we measure firm entry at a very narrow sector level (5-digits NACE code) and tax rates and agglomeration rents are measured at the district level. This should eliminate endogeneity between the variables already. Moreover, we computed the tax rates and agglomeration rents for existing firms in the district in the year before. Therefore, we are confident that endogeneity is not an issue here anymore.

A first control variable is the average price of building lots per square meter and reflects the cost of setting up a new firm. Note that this variable also captures the popularity of a district such as its geographic location. It might therefore be higher for locationally speaking more interesting districts. A second control variable is the gross investment in assets in the district which accounts for the current industrial development of a district. Finally, district specific effects are included. These effects will take into account the size, the fact that some districts already have built up a large infrastructure network, fiscally assisted regions in the years before 2002[7] and other district related unobservable elements that explain firm entry in that area.

Since our dependent variable consists of counts of new firms in a sector in a district, the appropriate approach is a Poisson model. However, there are three particular estimation problems to take into account. First, we observe that the variance is larger than the mean for all estimations we conduct[8] and second there are a lot of zero's for the dependent variable. Third, we want to take into account the district fixed effects. It is obvious that besides the explanatory variables we take into account, there are other unobserved district specific effects that may play a large role in the location decisions. We therefore want to correct for this by introducing district of sector fixed effects. In appendix 5 we also report the results of the

[7] Since 2002, the European Commission has forbidden these fiscal stimuli for particular areas.

[8] 3-digit 1999-2001: mean=0.04 < variance=0.35
3-digit 2004-2006: mean=0.06 < variance=0.52

estimation procedure as in Brülhart and Schmidheiny (2009): district or sector dummies and standard errors clustered by district-period or sector-period.[9]

5. Results

Table 3 summarizes the estimation results of equation (1). Panel (A) of Table 3 uses the variable supply-induced agglomeration rents measured at the district level ($Aggl(A)_{d,t-1}$) combined with district fixed effects (columns 1-2) and 5-digit sector fixed effects (columns 3-4). Panel (B) of Table 3 includes the variable supply-induced agglomeration rents measured at the 5-digit sector and district level ($Aggl(A)_{d,s,t-1}$) also combined with district (columns 1-2) and 5-digit sector fixed effects (columns 3-4).

The results show that the ETR is only significant in the second time period (2004-2006). This might indicate that the Belgian effective tax rate was too high to play a role in location decisions before 2003 (Vandenbussche and Crabbé, 2005), while after the corporate tax reform the tax rate became competitive. Comparing the two agglomeration variables, we find in Table 3 that the supply-side induced agglomeration rents are more often positive and significant than the demand-side induced agglomeration rents. In panel (B) of Table 3, the supply agglomeration rent variable is not significant anymore or is even negatively significant (column B.2). This result might suggest that firms at the 5-digit industry level are not attracted or even deterred by the competition of other firms in their sector in that district (panel B), while these firms are attracted by the presence of other firms in the district (panel A). In other words, agglomeration of firms at the sector-level leads to competition, while the presence of firms in general increases chances to find a supplier or buyer.

The interaction effect between agglomeration rents and taxes weakens these individual results. A positive agglomeration effect in a district is weakened when taxes are high in that district or a deterring effect of high effective tax rate in a district is compensated by agglomeration rents.[10]

[9] We also tried to include the death rate in the dependent variable (birth rate- death rate) and estimate equation (1), but this led to some negative dependent variables (death rate>birth rate). Since negative dependent variables are not allowed in a Poisson (or any count) model, we had to set these negative numbers equal to zero which decreases the variation, but also the number of observations. As a consequence, we do not find these results reliable and do not report them here.

[10] We tried these estimations with the dependent variable at the 3 digit sector-level as a robustness check. The main findings remain also here: tax rates are negative and significant only in the second period and interactions between taxes and agglomeration rents are significant.

As far as the control variables are concerned, we observe a positive impact of investments in the previous period. Furthermore, the price per square meter for building lots is positive and significant indicating that (ceteris paribus) firms invest in districts where prices are high. At first sight, this seems contradictory, but it is possible that prices are correlated with the district-specific effects or implicitly also measure a district's popularity.[11]

[11] Brülhart et al. (2009) also find this odd positive effect of housing prices in Switzerland on firm entry.

Table 3: Estimation results for firm-agglomeration (Aggl(S)) at the district level and sector level for both time periods; Poisson district and sector fixed effects for 5-digit sectors

	(A) Aggl(S) at district level				(B) Aggl (S) at sector level			
	district fixed effects		sector fixed effects		district fixed effects		sector fixed effects	
	(1) 1999-2001	(2) 2004-2006	(3) 1999-2001	(4) 2004-2006	(1) 1999-2001	(2) 2004-2006	(3) 1999-2001	(4) 2004-2006
Etr_{t-1}	32.06	-42.15**	17.53	-4.75	63.92	-39.82**	14.74	-20.51***
	(51.13)	(19.58)	(15.79)	(10.7)	(48.61)	(18.04)	(10.39)	(6.55)
$Aggl(D)_{t-1}$	0.002	-0.0001	0.001	0.0003	0.004***	0.0002	0.001***	-0.0001
	(0.002)	(0.0004)	(0.0004)	(0.0002)	(0.001)	(0.0004)	(0.0003)	(0.0001)
$Aggl(S)_{t-1}$	1.38*	0.01	0.37***	0.13***	22.49	-5.55***	3.75	-0.53
	(0.80)	(0.13)	(0.1)	(0.02)	(18.7)	(2.31)	(18.78)	(2.6)
$(etr*Aggl(D))_{t-1}$	-0.002	0.003	-0.001	-0.0003	-0.01	0.003**	-0.001*	0.001*
	(0.005)	(0.002)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.0004)
$(etr*Aggl(S))_{t-1}$	-4.97*	0.69	-1.35***	-0.55***	-80.37	21.8***	-13	1.38
	(2.64)	(1.03)	(0.34)	(0.1)	(65)	(9.04)	(64.84)	(10.08)
$Price_{t-1}$	0.08*	0.01***	0.02**	0.01***	0.02	0.01***	-0.003	0.001
	(0.05)	(0.004)	(0.01)	(0.001)	(0.02)	(0.002)	(0.003)	(0.001)
$Infr_{t-1}$	0.004	0.001***	-0.0002	-0.0001	0.002	0.001***	-0.0002	0.0001
	(0.003)	(0.0004)	(0.0002)	(0.0001)	(0.002)	(0.0004)	(0.0002)	(0.0001)
Observations	12352	16641	3333	7181	12352	16641	3333	7181
Loglikelihood	-782	-2277	-462	-1200	-784	-2281	-476	-1244

Note: standard errors are reported between brackets. Stars indicate the level of significance, *** is significant at the 1% level ** is significant at the 5% level and * is significant at the 10% level.

6. Conclusion

This paper tackled the location determinants of new firms setting up activity in 43 different Belgian districts in the period 1999-2001 and 2004-2006. Literature has shown that taxes and agglomeration rents play a large role in a firm's location decision. Higher effective tax rates tend to deter firms while agglomeration rents are a centripetal force.

We analysed the impact of both taxes and agglomeration rents separately as well as their interaction. The effective tax rate shows a strong negative relation with firm entry after the tax reform (2004-2006), while it is not significant in the period 1999-2001. This might indicate that regional competition for firms became stronger after the tax reform in 2003. The results also show that the presence of firms or a high market potential can soften this negative effect of high taxes on firm entry.

As far as the agglomeration rents are concerned, we took both supply- and demand-induced indicators into account. Both the market access effect and the supply-side induced variable turn out to be important. The market access effect is only significant in the first time period. Supply-side induced agglomeration rents attract firms at the regional level. We can therefore conclude that agglomeration rents have a positive impact on location decisions of firms when they are measured at the regional level. The presence of firms in the same sector in a district deters firms to locate in that district because of a potential competition effect. In other words, agglomeration of firms at the sector-level leads to competition, while the presence of firms in general increases chances to find a supplier or buyer.

Finally, looking at the interaction between both location determinants, we note that a better market access can mitigate the negative impact of a high ETR on the location decisions of firms. As far as the supply-side induced agglomeration rents are concerned, we conclude that a higher effective tax rate weakens the impact of these positive agglomeration rents.

Our results provide useful insights in location determinants of firms which is of great importance for governments trying to attract firms. Moreover, this study shows that omitting the interaction between taxes and agglomeration rents can lead to incomplete conclusions and is therefore important for further research in this field.

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Appendix 1: Belgian regions and districts

Belgium has an area of 30 528 squared kilometers and a population of 10.4 million. It exists of 589 municipalities which have representative democracies taking care of their own expenditures and revenues. Municipalities levy on average 20 different taxes that account for more than 40 percent of local revenues where the surcharges on the federal income and property tax are the most important ones (Heyndels and Vuchelen (1998)). These municipalities are grouped into 43 districts for administrative and election purposes. Again these districts are grouped into ten provinces with their own provincial governor and the provinces themselves are divided into three regions with their own regional parliament: Flanders, Brussel and Wallonia. The analysis in this article focuses on the 42 districts in Flanders and Wallonia as illustrated in the following table as well as the district of Brussel.

Region	District
Flanders	Aalst
	Antwerpenen
	Brugge
	Dendermonde
	Diksmuide
	Eeklo
	Gent
	Halle-Vilvoorde
	Hasselt
	Ieper
	Kortrijk
	Leuven
	Maaseik
	Mechelen
	Oostende
	Oudenaarde
	Roeselare
	Sint-Niklaas
	Tielt
	Tongeren
	Turnhout
	Veurne
Wallonia	Aarlen/Arlon
	Aat/Ath
	Bastenaken/Bastogne
	Bergen/Mons
	Borgworm/Waremme
	Charleroi/Charleroi
	Dinant/Dinant
	Doornik/Tournai
	Hoei/Huy
	Luik/Liège
	Marche-en-Famenne\Marche-en-Famenne
	Moeskroen\Mouscron
	Namen\Namur
	Neufchateau\Neufchâteau
	Nijvel\Nivelles
	Philippeville\Philippeville
	Thuin\Thuin
	Verviers\Vérviers
	Virton\Virton
	Zinnik\Soignies

Appendix 2: Regional surcharges on property tax in Belgium, 2003-2005

The ETR or real tax burden of a firm differs across districts because of several reasons such as more tax evasion in districts with a less efficient local tax administration (Moesen et al., 1994), tax rulings or differences in deductible local taxes.

In this appendix we will give an example on how the surcharges on property tax can influence the ETR. The general property tax in Flanders is 2.5%, while the property tax in Wallonia and Brussel is 1.25%. Both the province and the municipality can ask a surcharge on this percentage. Our example is for the Flemish and Walloon municipalities with the highest and lowest surcharge in 2006. We assume the cadastral income of a building (2600 m^3) to be for example 7000 euro and calculate the difference in taxes paid. Note that the taxes that are paid can be deducted from the firm's taxable profit.

Flanders:

Regional property tax: 7000x2.5%= 175 euro

Lowest surcharge = 1250 in for example Diksmuide → 175x 12.50= 2188 euro
Highest surcharge = 2250 in for example Mol → 175x22.5= 3938 euro

Wallonia:

Regional property tax: 7000x1.25%= 87.5 euro

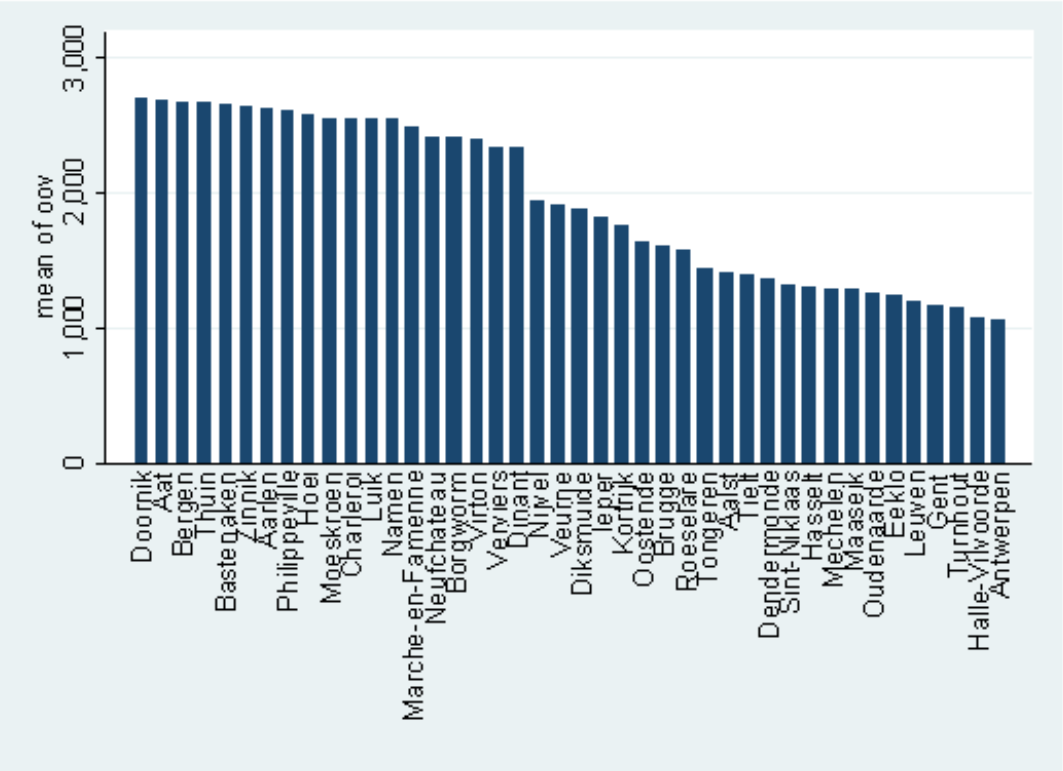
Highest surcharge in for example Huy= 3100 → 87.5x31=2713 euro

Lowest surcharge in for example Lasne =1200 →87.5x12= 1050 euro

These amounts can be subtracted from the taxable base for the corporate tax calculation and thus lowers the ETR.

The average variation in surcharges across districts is large according to Figure. A1. Note that on average the surcharges in Flanders are lower than in Wallonia. Because of the higher property tax in Flanders however this does not automatically imply a lower total property tax cost in Flanders.

Figure A1: Surcharges on property tax in 2006 in Belgium at district level



Appendix 3: Scatterplots for the 4 sectors with the largest number of new firms

Figure A2: New firms versus ETR by district in Belgium 2003-2005 without Brussel, Antwerpen and Halle-Vilvoorde

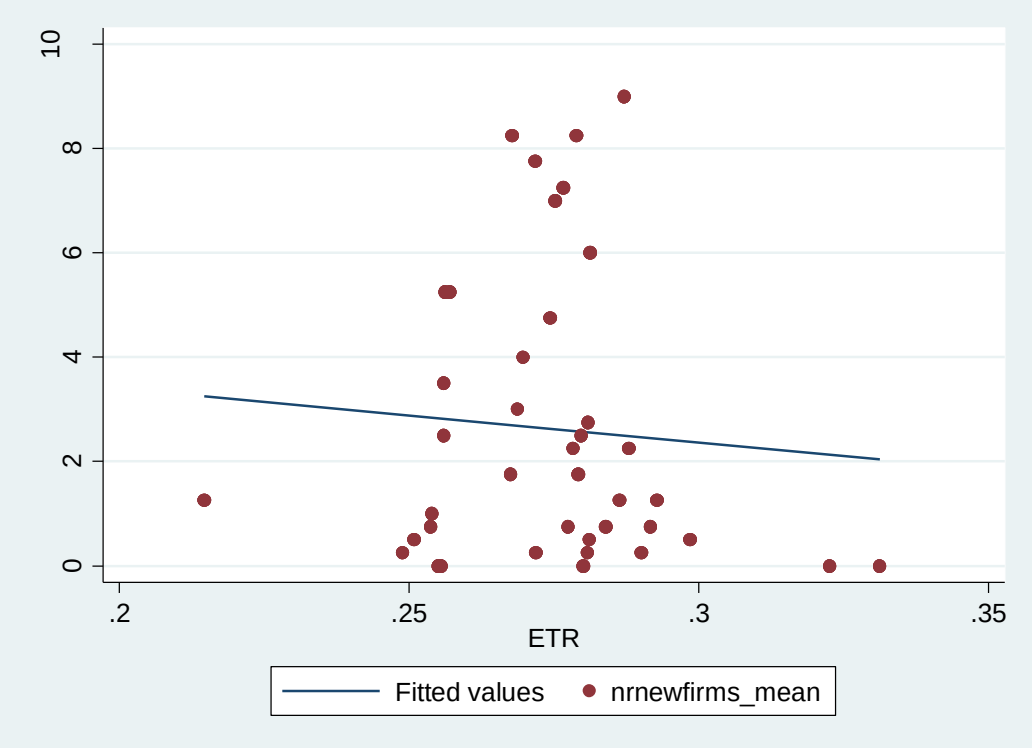


Figure A3: New firms versus ETR by district in Belgium 2003-2005 for the business service sector

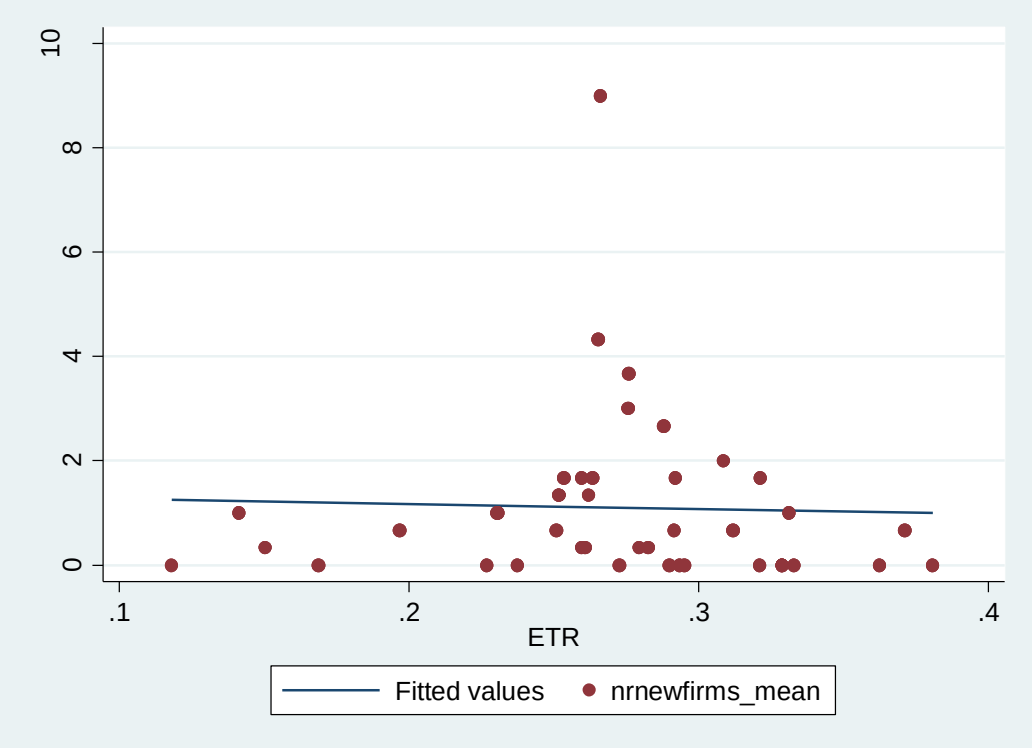


Figure A4 New firms versus ETR by district in Belgium 2003-2005 for the financial services sector

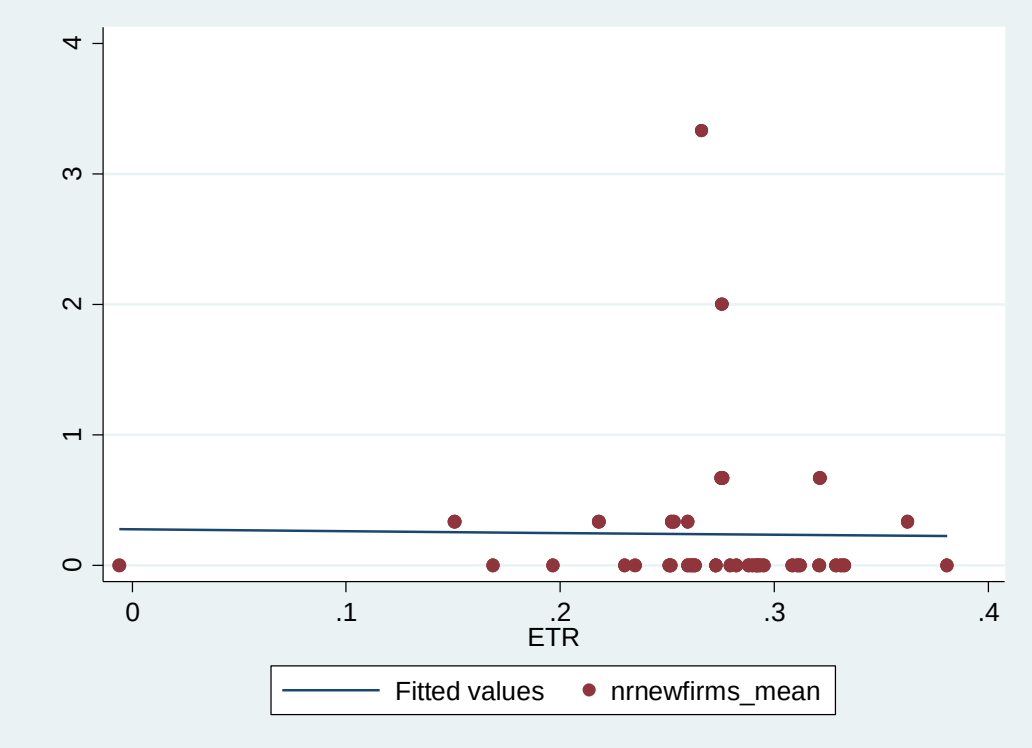


Figure A5: New firms versus ETR by district in Belgium 2003-2005 for the real estate sector

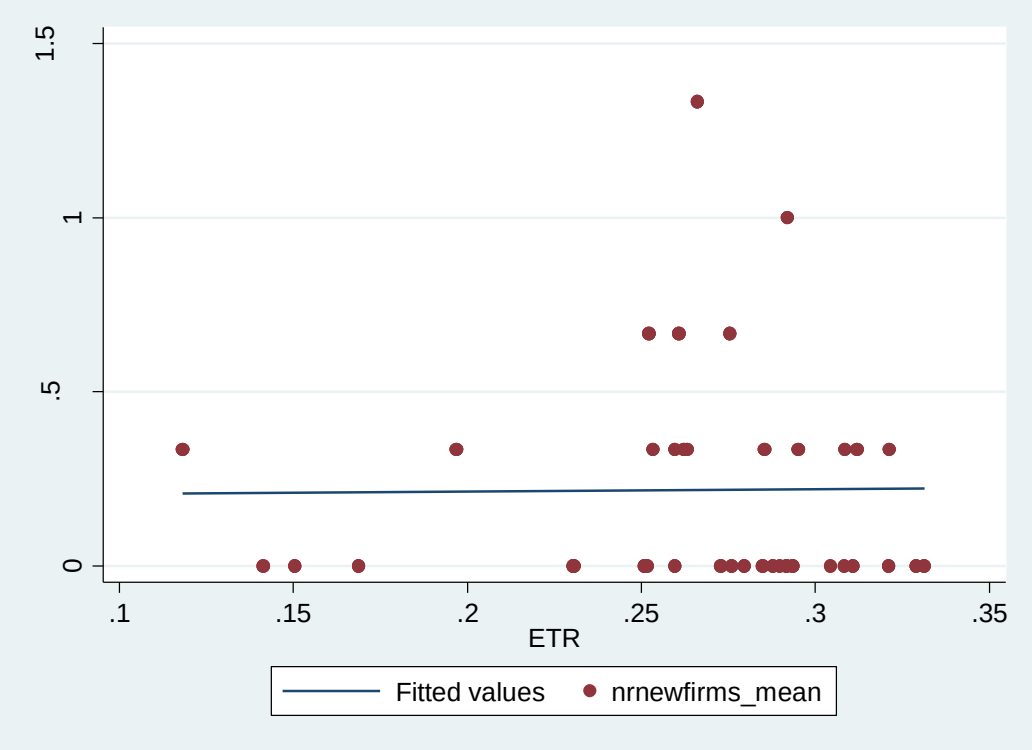
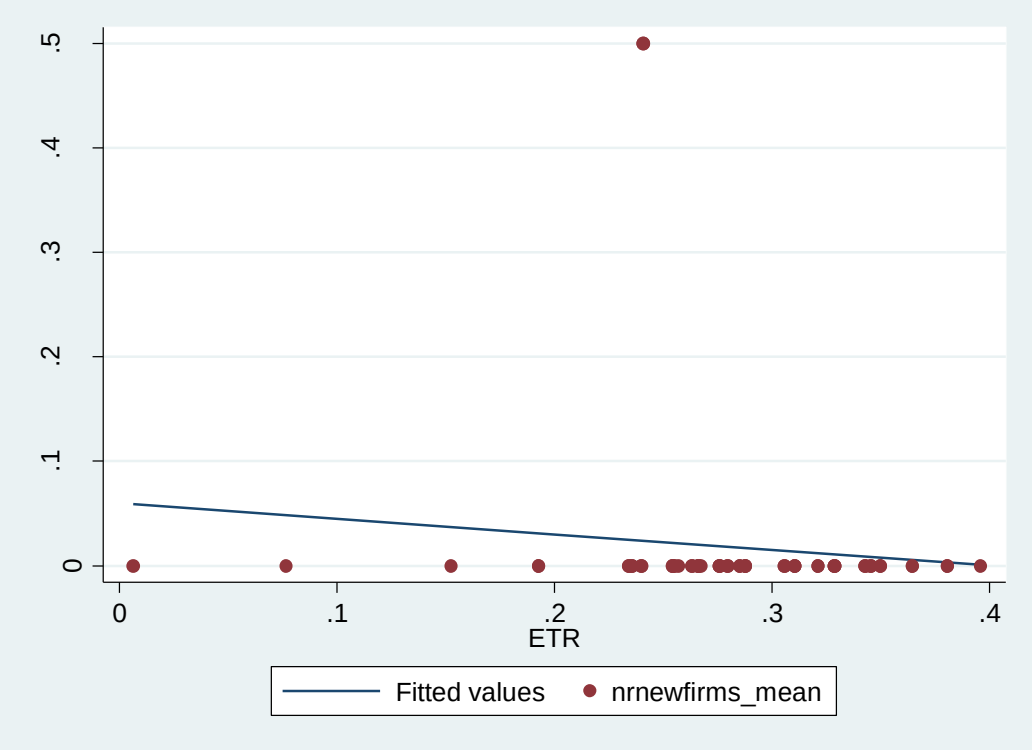


Figure A6: New firms versus ETR by district in Belgium 2003-2005 for the chemical sector



Appendix 4: Correlation matrix 1999-2001 and 2004-2006

	N° of new firms	Etr_{t-1}	$Aggl(D)_{t-1}$	$Aggl(S)_{t-1}$	$(etr*Aggl(D))_{t-1}$	$(etr*Aggl(S))_{t-1}$	$Price_{t-1}$	$Infr_{t-1}$
N° of new firms	1							
Etr_{t-1}	-0.015	1						
$Aggl(D)_{t-1}$	0.081	-0.092	1					
$Aggl(S)_{t-1}$	0.096	-0.237	0.589	1				
$(etr*Aggl(D))_{t-1}$	0.078	0.057	0.977	0.503	1			
$(etr*Aggl(S))_{t-1}$	0.097	-0.142	0.564	0.999	0.507	1		
$Price_{t-1}$	0.073	-0.158	0.692	0.753	0.643	0.754	1	
$Infr_{t-1}$	0.083	-0.142	0.956	0.659	0.926	0.661	0.802	1

	N° of new firms	Etr_{t-1}	$Aggl(D)_{t-1}$	$Aggl(S)_{t-1}$	$(etr*Aggl(S))_{t-1}$	$(etr*Aggl(D))_{t-1}$	$Price_{t-1}$	$Infr_{t-1}$
N° of new firms	1							
Etr_{t-1}	-0.046	1						
$Aggl(D)_{t-1}$	0.137	-0.092	1					
$Aggl(S)_{t-1}$	0.160	-0.137	0.589	1				
$(etr*Aggl(D))_{t-1}$	0.124	0.086	0.981	0.509	1			
$(etr*Aggl(S))_{t-1}$	0.161	-0.228	0.594	0.999	0.516	1		
$Price_{t-1}$	0.130	-0.236	0.701	0.667	0.671	0.644	1	
$Infr_{t-1}$	0.149	-0.141	0.943	0.666	0.670	0.906	0.793	1

Appendix 5: Estimation results for firm-agglomeration (Aggl(S)) at the district level and sector level for both time periods; district and 5-digit sector dummies included; standard errors clustered by district-period or sector-period.

	Aggl(S) at district level				Aggl (S) at sector level			
	District-period clustered		Sector-period clustered		District-period clustered		Sector-period clustered	
	(1) 1999-2001	(2) 2004-2006	(3) 1999-2001	(4) 2004-2006	(1) 1999-2001	(2) 2004-2006	(3) 1999-2001	(4) 2004-2006
Etr_{t-1}	32.06	-42.14	32.1	-42.14***	63.9*	-39.81	63.91*	-39.81***
	(37)	(47.52)	(37.12)	(17.74)	(38.88)	(50.6)	(33.78)	(15.83)
$Aggl(D)_{t-1}$	0.002*	-0.0001	0.002***	-0.0001	0.004***	0.0002	0.004***	0.0002
	(0.001)	(0.001)	(0.001)	(0.0004)	(0.001)	(0.001)	(0.001)	(0.0004)
$Aggl(S)_{t-1}$	1.38**	0.011	1.38***	0.01	22.49	-5.55***	22.49	-5.55
	(0.61)	(0.21)	(0.53)	(0.1)	(16.6)	(2.3)	(20.9)	(3.64)
$(etr*Aggl(D))_{t-1}$	-0.002	0.003	-0.002	0.003*	-0.01*	0.003	-0.01***	0.003***
	(0.004)	(0.004)	(0.003)	(0.002)	(0.004)	(0.005)	(0.003)	(0.001)
$(etr*Aggl(S))_{t-1}$	-4.97***	0.69	-4.97***	0.69	-80.37	21.8***	-80.37	21.8
	(2.02)	(1.69)	(1.8)	(0.83)	(57.94)	(9.09)	(72.34)	(14.21)
$Price_{t-1}$	0.1*	0.01***	0.08	0.01***	0.02	0.01**	0.02	0.01***
	(0.1)	(0.01)	(0.06)	(0.002)	(0.03)	(0.003)	(0.02)	(0.002)
$Infr_{t-1}$	0.004	0.001	0.004	0.001***	0.002	0.001*	0.002	0.001***
	(0.002)	(0.001)	(0.003)	(0.0002)	(0.003)	(0.001)	(0.002)	(0.0003)
Observations	14222	17446	14222	17446	14222	17446	14222	17446
Loglikelihood	-830	-2344	-830	-2344	-831	-2347	-831	-2347

Note: standard errors are reported between brackets. Stars indicate the level of significance, *** is significant at the 1% level ** is significant at the 5% level and * is significant at the 10% level.