Taxes, Agglomeration Rents and Location Decisions of Firms

Karen Crabbé* and Karolien De Bruyne‡

Abstract

The goal of this paper is to analyze the individual impact of tax rates and agglomeration rents as well as their interaction on location decisions of manufacturing firms within Belgium. Theoretically, both location determinants may weaken each other's impact. Using a unique 10-year dataset concerning the number of newly setup manufacturing firms at the sector level for 43 Belgian districts, we show that local effective tax rates have a negative impact on location decisions. Moreover, location-specific supply-side agglomeration rents attract new firms and their impact appears to be even stronger for more spatially concentrated sectors. Finally, we show that a higher effective tax rate in a district does not necessarily deter new firms in more agglomerated districts, pointing to the existence of taxable location-specific agglomeration rents.

JEL codes: H71, F21, R30

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* LESSIUS Antwerpen and Catholic University of Leuven, Korte Nieuwstraat 33, 2000 Antwerpen

e-mail: karen.crabbe@kuleuven.be

‡ HUBrussel and Catholic University of Leuven, Warmoesberg 26, 1000 Brussel

e-mail: karolien.debruyne@kuleuven.be

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 center of economic activity as well as forces pushing them away.

The forces pulling firms towards the center are defined as agglomeration forces. According to the Krugman-model, the main agglomeration force is market access. The closer one is to the center 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, since workers constitute firms' consumers and therefore the market, while at the same time workers want to locate close to firms, since they will get a higher (real) wage in a firm's 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 – the so-called Input/Output linkages. If a firm is a final producer, it prefers to be close to its intermediate suppliers in order to buy its inputs at a lower price. If a firm is an intermediate supplier, on the other hand, it prefers to be close to final producers in order to obtain a higher price for its products. Forces pulling firms away from the center are among others competition effects, lower transport costs, high prices for labor, etc. (see a.o. De Bruyne (2006)).

Next to the location determinants discussed in the NEG theories, there are many other factors that influence location. Government policy, for instance, also plays a large role¹. 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 percent. Within Belgium, different effective tax rates across regions or districts are observed. Vandenbussche *et al.* (2006) provide empirical evidence that the effective tax rate of firms located in Belgium does indeed differ significantly 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 and agglomeration rents on location decisions of manufacturing firms within Belgium using detailed firm-level data. In particular, the interaction between these factors constitutes a new and challenging research area. We contribute to the existing (limited) number of empirical studies in four particular ways. *Firstly*, we focus on Belgium, a small country that attracts a large number of domestic and foreign new firms and that observes differences in effective tax rates and agglomeration rents between its districts. Moreover, agglomeration economies do exist even in a small country like Belgium (Konings and Torfs (2012)). *Secondly*, we explicitly take two different measures of agglomeration rents into

¹ Cfr Baldwin *et al.* (2003) for an elaborate discussion of the link between New Economic Geography and public policy.

account, namely supply- and demand-induced agglomeration rents. As such, we can determine the importance for Belgium of both the seminal NEG theories by Krugman (1991) and by Venables (1996). *Thirdly*, within the supply-side agglomeration rents, we explicitly differentiate between location- and sector-specific rents. We are thus able to analyze whether firms are more attracted to firms in a particular region as such or rather cluster because they belong to more spatially concentrated sectors. *Finally*, we discuss in detail the main interaction term(s) between taxes and agglomeration rents in order to determine whether they mutually mitigate or reinforce each other. We apply the meticulous method as discussed by Hilbe (2011). As such we are able to prove the existence of taxable location-specific agglomeration rents in Belgium.

In our empirical study, we count the yearly number of new manufacturing firms during the period 1999-2008. The major advantage of using the number of new firms as an explanatory variable is the large reduction in simultaneity between taxes and firm-location. Using a Poisson estimation for our count model, our results indicate that taxes, demand-induced and location-specific supply-induced agglomeration rents play an important role in location decisions in Belgium. The interaction effect playing between taxes and location-specific supply-side agglomeration rents however implies that higher taxes as such deter firms but less so in more agglomerated districts.

The structure of the paper is as follows. We start with a literature overview in Section 2, focusing on taxation and location literature on the one hand and on the Belgian tax system on the other hand. Section 3 deals with the data sources and section 4 tackles the descriptive statistics. The methodology is described in section 5, while section 6 reports the empirical results. Finally, section 7 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 effect on attracting FDI. According to a meta-study of De Mooij and Ederveen (2003), a decrease in the corporate tax rate of 1 percentage point leads to an increase in FDI by 3.3 percent. Also, the impact of taxes on entrepreneurship - the formation of new businesses - has been studied before, although less than the impact on FDI. These studies find that a 10 percentage point decrease in the tax rate increases the entry rate in a country by 0.88 to 1.3 percentage points (Da Rin *et al.* (2008), Djankov *et al.* (2008)). This negative correlation between taxes and firm entry encourages countries to lower their corporate taxes in order to attract firms (Wilson (1999)). However, in existing empirical research, there is no evidence of a clear race-to-the-bottom in corporate taxes within Europe (Devereux *et al.* (2002), Vandenbussche *et al.* (2005), Sinn (2007)).

A possible reason why a fast race-to-the-bottom in tax rates has not been observed was first provided by Bucovetsky (1991). He introduced asymmetric country sizes into the traditional tax competition literature. The crucial idea is that smaller countries have a higher marginal productivity of capital than larger countries and thus a higher elasticity of capital with respect to the tax rate. Smaller countries will set lower taxes and can be considered as tax havens. We however focus on a second – more economically oriented – explanation for the absence of a race-to the-bottom in corporate tax rates. This strand of literature – called NEG – argues that increasing returns to scale and imperfect competition combined with transport costs may cause agglomeration. If firms locate in a certain region, this agglomeration generates benefits such as spillovers and the presence of suppliers and buyers of intermediate goods, better 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 it is not market access, but rather the presence of other firms that is important for a location decision. The idea being that intermediate suppliers want to be close to the firms that buy their goods and vice versa. His model therefore emphasizes the firm-firm linkages.

Summarizing, the taxation and NEG literature state 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 pushing firms away. Several authors provide theoretical support for the existence of taxable agglomeration rents. Ludema and Wooton (2000) find 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 taxable agglomeration rents. Kind *et al.* (2000) also find that tax competition depends on trade costs and pecuniary externalities. Baldwin and Krugman (2004) and Borck and Pflüger (2006), finally, both developed a core-periphery type of 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 find 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 both 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 center are higher, implying that taxes could be set at a higher level in the center compared to the periphery without necessarily chasing firms away. Charlot and Paty (2007) confirm this theory empirically for France and Coulibaly (2008) and Luthi and Schmidheiny (2011) for Switzerland. They estimate a derived tax-setting equation for the municipalities of 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. Finally, Garretsen and Peeters (2007) find for 19 OECD countries that more capital mobility leads to lower tax rates – consistent with the standard tax competition literature - and that core countries have higher corporate tax rates – consistent with the NEG literature. The authors argue that the relationship between agglomeration, capital mobility and taxation depends on the particular NEG model and that further research in this area is certainly needed.

The central question we put forward 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. By way of contrast, the NEG states that agglomerated regions and/or sectors have agglomeration rents that may act as a pull factor for firms - pulling firms to the center 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 and agglomeration rents on the location decision of firms. Devereux *et al.* (2007) studied the impact of agglomeration economies on levels of 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 on attracting plants to specific 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 considerable underestimation of the negative effect of business taxes on location decisions. The first paper to study the interaction effect of agglomeration rents and taxation on location decisions of firms is by Brülhart *et al.* (2012). They find empirical evidence that firm births in Swiss municipalities on average react negatively to corporate tax burdens, but that the deterrent effect of taxes is significantly weaker in sectors that are more spatially concentrated. Our paper aims to contribute to this novel and interesting field of research by focusing on both a location-specific agglomeration measure as in Devereux *et al.* (2007) and a sector-specific measure of agglomeration in line with Brülhart *et al.* (2012). Introducing a location-specific agglomeration measure one can determine whether more agglomerated districts attract more new firms and whether this higher agglomeration compensates for a higher tax rate. Can more agglomerated districts set a higher tax rate (compared to less agglomerated districts) without necessarily deterring new firms? Introducing a sector-specific agglomeration measure as well, one can analyze whether the positive impact of location-specific agglomeration rents on attracting new firms is higher for firms in more concentrated sectors – i.e. sectors with substantial agglomeration rents. Moreover, it is possible to determine whether the deterrent effect of taxes is smaller for more concentrated sectors.

2.2 The Belgian tax system

In Belgium, corporate profit tax is a federal responsibility. This implies 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, based upon to the taxable income of the firm. Since 2003, Belgian corporate tax rates have decreased so that for Belgian companies with a taxable income up to 322500 EUR, the following progressive tax system is applied²:

	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 322500 EUR are subject to a uniform tax rate of 40.17 percent before 2003 and 33.99 percent since 2003 (Van Kerckhove and Heirewegh (2006)). It is therefore obvious that using the STR for our research question defeats our purpose. While the tax rates and rules are independent of a firm's location, however, the effective tax rate (ETR) in Belgium differs between the districts. 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 Belgian districts for several reasons such as tax rulings,³ differences in deductible local taxes⁴ and/or more tax evasion in districts with a less efficient local tax administration. There is evidence for the differences in efficiency of local tax administration within Belgium. Amez and Moesen (1994) for the business income tax and Moesen and Persoon (2002) for the personal income tax show large differences in efficiency between the different regional tax offices in Belgium. They define efficiency as the number of tax audits and number of corrections for under-declarations. Differences in efficiency can, according to their paper, be explained by organizational characteristics, managerial variables and the size of the tax office. They find that the average tax office is about 40 percent less effective than the most efficient tax office. Translating their findings to our results for the ETR in the Belgian districts, it appears that districts with less efficient offices – those that most likely do not correct for under-declarations - end up with a lower local ETR. The authors do not answer the question whether less efficient governments are 'lazy' or rather follow an active and deliberate tax policy. We come back on this point at the end of this section.

² For example a company that has a taxable base equal to 100000 will pay: $(25000 \times 24.98\%) + ((90000 - 25000) \times 31.98\%) + ((100000 - 90000) \times 35.54\%) = 30\,586$ EUR

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).

Another reason why ETR differs between the districts is related to the surcharge on the regional property tax. This is the most important local tax and although the base of this regional tax is defined at the federal level, the surcharge can be freely set by all 589 municipalities in Belgium. 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 A2.1 and numerical 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. Vandebussche *et al.* (2006) provide empirical evidence that the ETR of firms located in Flanders is significantly higher than the ETR of firms in Wallonia and Brussels when keeping all other firm and sector characteristics constant. Their study was carried out using large Belgian firms for the period 1993-2002.

Data on these varying reasons for tax differences are hard to come by⁵ and each reason taken separately is likely to be too small to influence the ETR. We therefore use the ETR to reflect the actual tax differences, thereby summing up all possible (small) causes for the tax differences.

Crucial for the use of ETR as an explanatory variable is however whether the tax policy is 'deliberate' or not. Tax exemptions and rulings, for instance, can be the result of an active tax policy or rather represent a 'lazy' government. In order to make sure that our ETR variable reflects deliberate tax policy, we perform t-tests between ETR on the one hand and two policy variables on the other hand. Since the policy variables are only available for 2000 and 2005, we perform the t-test for these two years. We assume both the number of roads per square kilometer⁶ and the surcharge on the regional property tax to be possible policy determinants of the ETR. Tables A3.1-A3.4 in Appendix 3 summarize the results of our t-tests. It is obvious for both years that districts with an above average ETR have a more extensive road network. As far as the surcharge on regional property tax is concerned, the results are less clear-cut, however. We therefore conclude that active policy influences taxes and that surcharges on regional property tax as such are not enough to explain differences in effective tax rates. Apart from the limited data availability, this is a second reason why we include ETR as our tax variable and not surcharges on regional property taxes.

⁵ E.g. data on regional property tax are not available throughout the time period we consider.

⁶ Source: FOD Mobility and Transport

3. DATA

We study the impact of taxes and agglomeration rents on location decisions of manufacturing firms within Belgium. Belgium has 43 districts (NUTS3 level) - 22 in Flanders (Northern part of the country), 20 in Wallonia (Southern part of the country) and the last one is Brussels.⁷ We opt for districts and not municipalities in order to consider regions that are large enough to be economically meaningful, i.e. we do not want too many zeros for the number of firms.

For the purpose of our study, we use data from three different sources. First, we consult the Belfirst database which comprises annual accounts of 250000 Belgian firms for various years. From this database, we collect the yearly number of new manufacturing firms at the 5 digit sector-level (304 sectors) in each Belgian district for the 10 year period 1999-2008. Firms that went bankrupt in the year after setup are dropped from the sample. From Belfirst, we also collect yearly information about the pre-existing stock of firms in the 43 Belgian districts.

The second source of data is the regional accounts of the National Bank of Belgium (NBB) providing information on disposable income (for market potential) and gross investment (infrastructure) at district level. Finally, we assemble data on prices of building lots⁸ per square meter, data on the number of square kilometer per district (Economics Service; FOD Economie), and data on whether certain districts have industrial zones where firms receive fiscal benefits (Tailleu (2000)).

4. METHODOLOGY

In order to empirically test our research question, we model the location decision of firms. We consider the ‘footloose start-up’ model as discussed in Brühlhart *et al.* (2012) and therefore study firms that have already resolved to start up production and are now deciding upon their actual location.

We start from a general profit function of a firm in district d and sector s at time t :

$$\begin{aligned}\pi_{d,s,t} = & \beta_1 ETR_{d,t-1} + \beta_2 Aggl(D)_{d,t-1} + \beta_3 Aggl(S)_{d \text{ or } s,t-1} + \beta_4 ETR_{d,t-1} * Aggl(D)_{d,t-1} \\ & + \beta_5 ETR_{d,t-1} * Aggl(S)_{d \text{ or } s,t-1} + \beta_6 Aggl(S)_{d,t-1} * Aggl(S)_{s,t-1} + \beta' x_{d,t-1} + \varepsilon_{d,s,t}\end{aligned}\tag{1}$$

where ETR represents the effective tax rate; $Aggl(D)$ represents the indicator for demand-side agglomeration rents; $Aggl(S)_{d \text{ or } s}$ is the indicator for supply-side agglomeration rents, either location (d)- or sector-specific (s); and x represents a vector of the control variables determining the firm's profits.

⁷ See Appendix 1 for a list of the different districts.

⁸ All types of building lots combined.

A profit-maximizing firm naturally prefers to locate in the district where it obtains the highest profits. In order to gain an insight into the location determinants of firms, we therefore consider the probability of new firms setting up activity in that district. Estimating this probability implies a fixed-effect Poisson estimation of the following equation:

$$\begin{aligned}
E(n_{d,s,t}) = & \exp(\beta_1 ETR_{d,t-1} + \beta_2 Aggl(D)_{d,t-1} + \beta_3 Aggl(S)_{d \text{ or } s,t-1} \\
& + \beta_4 ETR_{d,t-1} * Aggl(D)_{d,t-1} + \beta_5 ETR_{d,t-1} * Aggl(S)_{d \text{ or } s,t-1} \\
& + \beta_6 Aggl(S)_{d,t-1} * Aggl(S)_{s,t-1} + \beta' x_{d,t-1} + \gamma' d_s)
\end{aligned} \tag{2}$$

The parameters of equation (2) can indeed be estimated by maximizing the (concentrated) loglikelihood function associated with the fixed effects Poisson model. In other words, the fixed effects Poisson model does not suffer from the incidental parameter problem. Obviously, inference should be based on panel-robust standard errors because the conventional standard errors of the Poisson fixed effects estimator considerably underestimate the sampling error of the parameter estimates owing to failure to control for overdispersion in our count data.

The dependent variable is the count of new manufacturing firms in a certain Belgian district d in sector s at year t , while d_s are the sector-specific fixed effects. Including both ETR and agglomeration rent measures separately as well as their interaction term enriches our results significantly. Indeed, by so doing we can analyze both the individual effects and the interaction effects.

Our main interest is in the coefficients of the interaction terms, β_4 and β_5 . If the coefficient of the ETR is significantly negative, we know that positive coefficients for the interaction terms imply that agglomeration rents can compensate for high corporate taxes.

Our explanatory variables consist of four categories: effective tax rates, agglomeration rents, interaction terms and control variables. The *effective tax rate* is, as stated before, the amount of taxes paid divided by the profit before tax. We calculate the ETR for each existing firm in each district. The ETR at district level is then constructed as the average ETR of all existing firms in the district. We argue that the ETR paid by the pre-existing stock of firms in a district is a good indicator of the tax rate that new firms have to pay.

As far as the agglomeration rents are concerned, we first distinguish between demand-side and supply-side agglomeration rents. We measure the presence of firm-consumer linkages – and thus the *demand-side agglomeration rents* – by calculating 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 particularly, 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 using a negative exponential function

of distance. The problem with this index is that the weights are reduced to zero very quickly. For example, a region that is 100 kilometers further has a weight of only $3,7 \text{ E-}44$. We therefore opt for the Harris (1954) definition of market potential. More particularly, we calculate market potential - or in other words the demand-side agglomeration rent - as follows:

$$Aggl(D)_{d,t-1} = Y_{d,t-1} + \sum_{j \neq d} \frac{Y_{j,t-1}}{distance_{dj}} \quad (3)$$

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 district d and neighboring districts. Note that the district d income has a weight of one while the other districts' incomes have a weight smaller than 1. Indeed, especially in a small country like Belgium, residents of neighboring countries are also important potential customers – especially for the large-scale new firms that we are considering. Therefore, besides all Belgian districts, we also included the districts in the neighboring countries of Belgium (France, Germany and the Netherlands) since more than 65 percent of Belgian exports is directed to these markets. A large firm is likely to choose the best location within Belgium with the best access to both local and export markets.

Supply-side induced agglomeration rents are calculated in two different ways. We analyze the importance of both a location-specific agglomeration measure as in Devereux *et al.* (2007) and a sector-specific measure of agglomeration in line with Brülhart *et al.* (2012). The location-specific measure consists of the number of existing firms per square kilometer in a district. The sector-specific measure is the Ellison-Glaeser index of concentration for each manufacturing sector at the 5-digit level. Both agglomeration rents interact with the effective tax rate, as well as with each other. The novel and interesting aspect of this distinction is that we are able to determine whether location- and/or sector-specific agglomeration rents can mitigate the negative impact of high taxes. Moreover, we can determine whether both types of agglomeration rents reinforce each other. In short, these *interaction terms* therefore allow us to answer three interesting research questions: (i) does the presence of more existing firms mitigate the negative impact of a high effective tax rate in a region? (ii) is the deterrent effect of high effective tax rates smaller for firms belonging to sectors with a higher concentration? (iii) does the presence of many existing firms attract more new firms in a sector if the sector considered is more concentrated?

Control variables are included in our estimation as well, the first one being the wage cost. The second control variable is the average price of building lots per square meter which reflects (part of) the cost of setting up a new firm. The third control variable is the gross investment in assets in the district, which is an indication of the current industrial development of that district. The size of a district is taken into account through the number of square kilometers of a district while a dummy variable captures the fact that certain districts have industrial zones where firms receive fiscal benefits⁹ (Taillieu (2002)). Finally,

⁹ Since 2002, the European Commission has forbidden these fiscal stimuli for particular areas.

sector-specific effects are included. These effects will account for the fact that some sectors in districts have already built up a large infrastructure network, as well as for other sector-related unobservable elements that explain firm entry in that district.¹⁰

We tackle the possible problem of endogeneity explicitly. Indeed, firm entry, tax rates and agglomeration rents can have issues of reversed causality. As in Brülhart *et al.* (2012) we measure firm entry at a very narrow sector level (5-digits NACE code) while tax rates and agglomeration rents are measured at the district level. This should diminish possible endogeneity between the variables substantially. Moreover, the independent variables are all lagged one year. This implies that yearly new firms in the period 1999-2008 are assigned to yearly control variables of the previous year (1998-2007). Therefore, we are confident that endogeneity is accounted for in our estimation. Note that our long timeframe is unique. By way of contrast to Brülhart *et al.* (2012) we use a 10-year instead of a 3-year period. Moreover, and again as distinct from Brülhart *et al.* (2012), we opt for yearly lagged explanatory variables instead of taking an average over three years. We strongly believe that matching the dependent variable with the one-year lagged variables enhances the robustness of our results.

5. DESCRIPTIVE RESULTS

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 (number of new firms, tax rate, agglomeration rents) are concerned, we pay special attention to their variation as well. Table 1 summarizes the statistics of the dependent and explanatory variables. We observe that on average 0.07 firms entered in a sector in a particular district, while the local tax burden was 30% and per district 5 firms are present per square kilometer. We also note that these variables show large differences across districts.

Table 1. Descriptive statistics 1999-2008

	firms _{d,s}	ETR _d	Aggl(D) _d	Aggl(S) _d	Aggl(S) _s -EG	Wage	pr m ² _d	Infr _d	km ²
Mean	0.07	0.30	12378	5.21	0.04	32.70	61.69	1124	710
Std dev.	0.40	0.07	4695	25.48	0.19	3.64	54.74	1195	402
Min	0.00	0.21	6144	0.00	-1.83	24.14	8.30	136	101
Max	21.00	0.46	33661	287.04	1.96	45.85	457.20	8329	2016
Obs.	1411996	130578	130578	143650	33431	130578	143650	771064	142757

¹⁰ We also estimated equation (2) including sector-district fixed effects as a robustness test. Our main findings remained the same.

Special attention is given to the variation in the key variables, namely the number of new firms, the ETR and the agglomeration indicators. Figures 1 to 5 illustrate for each variable the values for all districts in the period 1999-2008. As far as the number of new firms is concerned, Figure 1 shows a large variation between the different districts. A district like Brussel or Antwerpen - with the harbor – attracts most firms while districts in the South of the country like Virton and Aarlen only attract a very small number of firms.

Fig. 1 Average yearly number of new firms by district in Belgium 1999-2008

Fig. 2 Average ETR by district in Belgium 1999-2008

Looking at Figure 2 we can indeed conclude that the ETR varies between the districts ranging from a high of 32 percent (Hasselt) to a low of 27 percent (Ieper).

Figures 3 and 4 show that both location-specific 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 New Economic Geography theory, Belgian districts with a high number of firms per square kilometer or a high market potential are not necessarily the districts with higher effective tax rates. In other words, at first sight, Belgium does not appear to follow clearly the core-periphery theory such as, for example, Charlot and Paty (2007) found for France. Our estimation results in the next section will however not corroborate this preliminary finding.

Fig. 3 Number of firms per km² by district in Belgium 1999-2008 (Aggl (S)_d)

Fig. 4 Market potential by district in Belgium 1999-2008 (Aggl (D))

Figure 5 illustrates the EG index for all manufacturing sectors – i.e. the sector-specific supply-side agglomeration measure. It is obvious that the EG index differs substantially between the sectors. Among the sectors with a high index we find pulling threads (27340), the production of machines for digging and construction (29520), the production of precious metals (27410) and the production of transmitters for radio communication (32202). The production of machines for guarding industrial processes (33300), the production of hooks for hats (28754), the production of lamps (31501) and the production of lead, tin and zinc (27431) have a low value for the EG index.

Fig. 5 EG index by manufacturing sector in Belgium, averages for 1999-2008 (Aggl (S)_s)

In order to obtain a first glance of the relationship between the number of new firms and the ETR, we plot them against each other. Figure 6 illustrates that the effective tax rate on average is positively correlated with the number of new firms. This is at first sight very counterintuitive: districts with a high ETR attract more new firms in general. This indeed confirms our suspicion that a high ETR in a district can be compensated for by – among others – positive agglomeration rents.

Fig. 6 New firms versus ETR by district in Belgium, averages for 1999-2008

6. REGRESSION RESULTS

Table 2 summarizes the estimation results of equation (2) including year dummies to control for macro-economic shocks. Column (1) includes only the location-specific supply-agglomeration measure at district level, in other words the number of existing firms in district d , while columns (2), (3) and (4) also include the sector-specific supply-agglomeration measure (i.e. the EG index). The coefficients of the variables that we are most interested in are indicated in bold¹¹.

We perform a Poisson estimation with bootstrap and mean-centered effective tax rate and agglomeration variables. We estimate our results with bootstrap standard errors in order to correct for possible heteroskedasticity. Moreover, we mean-center the effective tax rate as well as the three agglomeration variables. The reason for this is twofold. Firstly, and most importantly, correlation between each multiplicative term and its constituent variables is lessened (cfr. Hilbe (2009)). Secondly,

¹¹ Note that the number of observations drops substantially when we include the EG index. This is due to the fact that the EG index is not available for all sectors since there are several firms (and therefore sectors) for which employment data are not available in the Amadeus database.

the interpretation of each interaction term makes more sense when values are related to the mean of the continuous predictor rather than to one that assumes a zero value. From Table 1, it is indeed obvious that none of our continuous predictors have a mean value of zero.

Our results in column (1) indicate that a higher tax rate repels new firms (ETR is negative and significant) while more existing firms in general attract new firms (location-specific supply-agglomeration at district level is positive and significant). The interaction term is positive and significant implying that the impact of a given increase in ETR is the less negative, the higher the location-specific agglomeration rents. In other words, a higher ETR as such does not necessarily deter firms in strongly agglomerated districts. This confirms the theory discussed in the literature section that more agglomerated districts are able to tax their agglomeration rents without losing (new) firms. One might therefore conclude – in line with the theoretical predictions - that more agglomerated districts in Belgium are able to tax agglomeration rents without pushing firms away. We will dig deeper into the impact of this interaction term after discussing the remaining results in Table 2.

Location-specific agglomeration rents therefore attract firms and lessen the deterrent effect of a high ETR. We are interested whether this is also the case for sector-specific agglomeration rents and we want to know whether these sector-specific location effects strengthen or rather weaken the location impact of location-specific agglomeration rents. Columns (2), (3) and (4) reveal that sector-specific agglomeration rents as such have no impact on location decisions and they do not lessen the negative impact of ETR on location outcomes neither. The interaction term of location- and sector-specific agglomeration rents is significant, however, indicating that the presence of existing firms as such attracts new firms and that this effect may be stronger for more concentrated sectors.

Finally, we can see that new firms are attracted by demand-side agglomeration rents ($Aggl(D)$ positive significant), and will locate in districts with higher prices for available building lots (price is positive significant) and with higher wages costs (wage cost is positive significant). These positive coefficients for available building lots and wage costs may seem odd at first sight and even point to reverse causality. We however argue that this is not the case for neither of the two control variables. As far as the wage variable is concerned, it is important to note that wages are correlated with education (correlation coefficient of 0.5), which may partially explain the positive coefficient because higher wages reflect a higher education. In other words, it is not higher profit opportunities that drive up wages but rather a highly educated labor force that attracts firms and therefore raises profit opportunities. We unfortunately were not able to include education as such as an explanatory variable because the data are not available at detailed district level for the entire time period. A second explanation for the positive coefficient of the wage costs refers to the New Economic Geography theory developed by Krugman. He indeed argues that firms prefer to locate in regions with higher wages as this implies ‘richer’ consumers to sell their goods to. The positive coefficient for prices of available building lots is not unexpected either. High prices of land can be due to an interesting location (measured by $Aggl(D)$), the attractiveness of being close to other firms (measured by $Aggl(S)_d$ or s_j),

infrastructure present (partly measured by *Infr*) and so on. The first two reasons for higher prices are already accounted for by the two agglomeration variables (indeed, the correlations between the price of land and $Aggl(D)$ and $Aggl(S)_{d \text{ or } s}$ are respectively 0.45, 0.66 (district level) and 0.22 (district and sector level)). As a measure of infrastructure, we included the gross investment in assets in the district as a control variable, which is an indication of the current industrial development of that district. We do realize that this variable not fully reflects the infrastructure of a region but it is the only measure of infrastructure that is available at our detailed district level. We therefore believe that the impact of the remaining (i.e. not-measured) part of the infrastructure is reflected in the price of available building lots. Hence we do not consider the positive sign of this coefficient as remarkable.

Finally, our results indicate that new firms prefer to locate in larger districts (area is positive significant) and in assisted areas (assisted is positive significant). *Ceteris paribus*, larger districts and districts receiving funding will therefore attract more new firms. The infrastructure variable, finally, has no significant impact on the location of new firms.

Table 2. Poisson estimation results with bootstrap and mean-centering; location-specific agglomeration rents measured at district-level

	(1)	(2)	(3)	(4)
$ETR_{t-1,d}$	-2.887** (1.239)	-3.487* (1.816)	-3.469* (1.946)	-3.480** (1.645)
$Aggl(D)_{t-1,d}$	0.0001*** (0.000006)	0.0001*** (0.0000009)	0.0001*** (0.0000009)	0.0001*** (0.00001)
$Aggl(S)_{t-1,d}$	0.003* (0.002)	0.006** (0.003)	0.006* (0.003)	0.006** (0.003)
$(ETR*Aggl(D))_{t-1,d}$	0.00002 (0.00003)	0.00004 (0.00005)	0.0004 (0.00006)	0.00004 (0.00006)
$(ETR*Aggl(S))_{t-1,d}$	0.089*** (0.027)	0.105** (0.048)	0.106* (0.059)	0.105** (0.048)
$EG_{t-1,s}$		0.029 (0.596)	-0.066 (0.499)	-0.035 (0.585)
$(EG*Aggl(S))_{t-1,d}$			0.036(*) (0.024)	0.036** (0.018)
$(ETR*EG)_{t-1,s}$				-1.444 (1.930)
$Wage\ cost_{t-1,d}$	0.033*** (0.008)	0.033*** (0.010)	0.033*** (0.010)	0.033** (0.011)
$Price_{t-1,d}$	0.002*** (0.0006)	0.002*** (0.0008)	0.002*** (0.0008)	0.002*** (0.0007)
$Infr_{t-1,d}$	0.00003 (0.00002)	0.00002 (0.00002)	0.00003 (0.00002)	0.00003 (0.00002)
$Area_{t,d}$	0.0003*** (0.00006)	0.0003*** (0.00007)	0.0003*** (0.00007)	0.0003*** (0.00006)
$Assisted_dummy_{t,d}$	0.177*** (0.032)	0.193*** (0.048)	0.194*** (0.043)	0.194*** (0.049)
Year dummies	Yes	Yes	Yes	Yes
Observations	102779	27758	27758	27758
Loglikelihood	-17716	-9359	-9356	-9355

Note: bootstrapped standard errors are reported between brackets. Stars indicate the level of significance, *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level and (*) is significant at the 20% level.

Our results thus confirm the existence of taxable location-specific agglomeration rents at the district level. Higher effective tax rates as such deter firms but the deterrent effect is smaller for districts with higher location-specific agglomeration rents. We do not find evidence of a significant impact of sector-specific agglomeration rents as such. We however observe a positive interaction between location- and sector-specific agglomeration rents. Higher location-specific agglomeration rents have an even higher positive impact on the attraction of new firm if these firms belong to a more concentrated sector.

As a last robustness check, we replace our location-specific agglomeration rents measured at the district level with location-specific agglomeration rents measured at the district-sector level. More in particular, we define the location-specific agglomeration rents no longer as the number of firms per square kilometer in a district but rather as the number of firms per square kilometer in a particular sector in a district. We are thus able to determine whether new firms prefer to set up activities in a district with a lot of same-sector firms – and not merely in a district with many existing firms as such. Our main conclusions remain the same: higher location-specific agglomeration rents attract firms, taxes deter firms and the deterrent effect of taxes is smaller for districts with a higher concentration of same-sector firms. The estimation results are summarized in Table A5.1 in Appendix 5. Measuring location-specific agglomeration rents in two different ways allows us to link our findings to the well-known literature regarding related and unrelated variety (see e.g. Frenken *et al.* 2007). In economic theory, one can distinguish between variety as a source of regional knowledge spillovers (related variety – within sectors), and variety as a portfolio protecting a region from external shocks (unrelated variety – between sectors). We are able to provide empirical evidence for the importance of both related and unrelated variety for location decisions of firms. We find that within the manufacturing sector, new firms are attracted by both the general number of firms per square kilometer as well as the number of new firms per square kilometer in the own sector. Manufacturing firms in other words like to be close to firms in general (between sectors) as well as to firms within the same sector (between sectors).

After our first general interpretation of the interaction term in Table 2, we would now like to dig deeper into its interpretation where we focus on the robust and mean-centered results of column (4). Indeed, as Ai and Norton (2003) prove, most applied researchers misinterpret the coefficient of the interaction term in nonlinear models. We therefore follow the meticulous technique of Hilbe (2011) to further – and more correctly - analyze the interaction term. Since we have two continuous predictors (ETR and $Aggl(S)_d$), in calculating the coefficients of the interaction terms, we could easily get lost in a morass of calculated slopes. We therefore treat one of our predictors – the ETR - as categorical variable and mean-center it.

We construct three categories of ETR: districts with a low ETR, with an intermediate ETR and with a high ETR, where each category contains 33.3% of the districts¹². The intermediate ETR-group is considered to be the reference group so that we are left with a high and a low-ETR category in our

¹² The mean-centered cut-off values are respectively -0.0326 and 0.0101

estimation. For both high- and low-ETR predictors we need to set up an interaction term and re-estimate our basic equation (2). Appendix 4 contains the results of this estimation, as well as the calculation of the incidence risk ratios (IRR). Indeed, given our new coefficients we can calculate IRRs. These ratios indicate how many more (or fewer) new firms one can expect in a high (low) ETR district compared to an intermediate ETR district – given the same value for the $\text{Aggl}(S)_d$ variable. Recall that the NEG literature argued that regions with high agglomeration rents could also afford to have a higher ETR without necessarily pushing firms away (or in our terminology, without necessarily attracting fewer new firms). We therefore focus our attention on the incidence risk ratio of having a high ETR compared to having an intermediate ETR¹³. We calculate this IRR for three different levels of the mean-centered $\text{Aggl}(S)_d$ variable: -6 (low $\text{Aggl}(S)_d$), 10 (intermediate $\text{Aggl}(S)_d$) and 30 (high $\text{Aggl}(S)_d$). Table 3 summarizes the results.

Table 3. IRR for low, intermediate and high values of $\text{Aggl}(S)_d$ and corresponding confidence intervals – comparing high ETR to intermediate ETR

Level of $\text{Aggl}(S)_d$	-6	10	30
IRR	0.2715 (0.2688-0.2743)	0.3593 (0.3566-0.3620)	0.5100 (0.4989-0.5209)

Note: 95% confidence interval between brackets

Table 3 illustrates the existence of taxable agglomeration rents. First of all, we observe that whatever the level of $\text{Aggl}(S)_d$, high ETR regions attract fewer firms than intermediate ETR regions. This confirms the finding in the standard taxation literature. Comparing the different agglomeration levels, however, we obtain evidence of the existence of taxable location-specific agglomeration effects. Indeed, given a low value for $\text{Aggl}(S)_d$, high ETR regions attract 73% fewer firms than regions with an intermediate ETR. As the agglomeration rents increase however, the difference becomes significantly smaller: for high agglomeration rents, high ETR regions attract 49% fewer firms than an average ETR region. The fact that the difference in the number of new firms becomes smaller as $\text{Aggl}(S)_d$ increases is an indication of the existence of (taxable) agglomeration rents. We obtain a more complete picture when we calculate the IRR for all possible levels of $\text{Aggl}(S)_d$. Figure 7 summarizes our results.

¹³ We therefore do not focus on the incidence risk ratio of having a low ETR compared to an average ETR.

Fig. 7 Percentage of 'fewer new firms' in a high ETR region compared to an intermediate ETR region – given the same level of $\text{Aggl}(S)_d$

In Figure 7, we observe values less than 1 on the vertical axis, as well as a negative relationship between the $\text{Aggl}(S)_d$ indicator (horizontal axis) and the percentage of fewer new firms (vertical axis). This shows that fewer new firms are attracted to high ETR-regions as compared to intermediate ETR-regions, but that the difference decreases as $\text{Aggl}(S)_d$ increases – pointing to taxable location-specific agglomeration rents.

7. CONCLUSION

This paper tackled the location determinants of new firms in 304 different manufacturing sectors setting up activity in 43 Belgian districts in the period 1999-2008. The literature shows that taxes and agglomeration rents play a large role in a firm's location decision. Higher effective tax rates tend to deter firms while location-specific agglomeration rents constitute a centripetal force. Theoretically, researchers are already convinced of the interaction between taxes and agglomeration, but empirically this link has only been studied recently. Our paper wants to add empirical evidence to this literature.

We analyze the impact of both taxes and agglomeration rents separately as well as their interaction on the decision of – Belgian and foreign - firms to locate in one of the 43 Belgian districts. Our results indicate that the effective tax rate has a negative impact on firm entry. As far as the agglomeration rents are concerned, we took both supply- and demand-induced indicators into account. The supply-induced agglomeration measure is constructed as either the number of firms per square kilometer in the district (location-specific) or as an Ellison-Glaeser index (sector-specific), while the demand-induced agglomeration is defined as the market potential. Both supply- and demand-induced agglomeration rents turn out to be important. As far as the supply-induced agglomeration rents are concerned, we however observe a different impact from the location-specific agglomeration measure on the one hand and the sector-specific location measure on the other hand. The presence of firms as such in the district attracts firms and even more so if the new firms belong to a concentrated sector. Being a concentrated sector as such, however, does not imply the attraction of more new firms.

Finally, looking at the interaction between location-specific agglomeration rents and the effective tax rate, we see that more agglomerated districts are able to tax their agglomeration rents without losing (new) firms. This indeed points to the existence of taxable location-specific agglomeration rents.

Our results provide useful insights into location determinants of firms and this 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 an important area for further research.

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APPENDIX 1: Belgian regions and districts

Belgium has an area of 30528 square kilometer and a population of 10.4 million. It consists 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, of which the surcharges on the federal income and property tax are the most important (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, Brussels 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 Brussels.

Region	District
Flanders	Aalst
	Antwerpen
	Brugge
	Dendermonde
	Diksmuide
	Eeklo
	Gent
	Halle-Vilvoorde
	Hasselt
	Ieper
	Kortrijk
	Leuven
	Maaseik
	Mechelen
	Oostende
	Oudenaarde
	Roeselare
	Sint-Niklaas
	Tielt
	Tongeren
	Turnhout
	Veurne
Wallonia	Aarlen
	Aat
	Bastenaken
	Bergen
	Borgworm
	Charleroi
	Dinant
	Doornik
	Hoel
	Luik
	Marche-en-Famenne
	Moeskroen
	Namen
	Neufchateau
	Nijvel
	Philippeville
	Thuin
	Verviers
	Virton
	Zinnik

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), different tax rulings and 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 percent, while the property tax in Wallonia and Brussels is 1.25 percent. 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. For example, we assume the cadastral income of a building (2600 m³) to be 7000 EUR 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: $7000 \times 2.5\% = 175$ EUR

Lowest surcharge in for example Diksmuide = 1250 $\rightarrow 175 \times 12.50 = 2188$ EUR

Highest surcharge in for example Mol = 2250 $\rightarrow 175 \times 22.5 = 3938$ EUR

Wallonia:

Regional property tax: $7000 \times 1.25\% = 87.5$ EUR

Lowest surcharge in for example Lasne = 1200 $\rightarrow 87.5 \times 12 = 1050$ EUR

Highest surcharge in for example Huy = 3100 $\rightarrow 87.5 \times 31 = 2713$ EUR

These amounts can be subtracted from the taxable base for the corporate tax calculation and therefore lower 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.

Fig. A2.1 Surcharges on property tax in 2006 in Belgium at district level

APPENDIX 3: t-tests ETR/roads per km² and ETR/regional property tax for 2000 and 2005

Table A3.1. t-tests ETR/roads per km² - year 2000

Group	Obs	Mean	Std. Err.	[95% Conf. interval]	
0	22	3.03	0.20	2.61	3.45
1	21	3.88	0.35	3.15	4.62
Combined	43	3.45	0.21	3.03	3.87
Diff		-0.85	0.40	-1.66	-0.41
Diff = mean (0) – mean (1)				t=-2.1207	

Table A3.2. t-tests ETR/regional property tax – year 2000

Group	Obs	Mean	Std. Err.	[95% Conf. interval]	
0	22	1591.10	119.97	1341.61	1840.60
1	20	1920.63	159.43	1589.94	2254.31
Combined	42	1748.02	100.65	1544.74	1951.29
Diff		-329.52	197.28	-728.23	69.19
Diff = mean (0) – mean (1)				t=-1.6704	

Table A3.3. t-tests ETR/roads per km²; year 2005

Group	Obs	Mean	Std. Err.	[95% Conf. interval]	
0	22	3.08	0.20	2.66	3.49
1	21	4.04	0.35	3.31	4.77
Combined	43	3.55	0.21	3.12	3.97
Diff		-0.96	0.40	-1.76	-0.16
Diff = mean (0) – mean (1)				t=-2.4115	

Table A3.4. t-tests ETR/regional property tax – year 2005

Group	Obs	Mean	Std. Err.	[95% Conf. interval]	
0	22	1974.43	114.64	1736.02	2212.84
1	20	1889.62	148.32	1578.54	2200.70
Combined	42	1934.04	91.89	1748.46	2119.63
Diff		84.80	185.80	-290.70	460.32
Diff = mean (0) – mean (1)				t=0.4565	

APPENDIX 4: Calculation of Incidence Risk Ratios

We consider ETR to be our categorical variable and look at three categories: low, intermediate and high ETR. The intermediate ETR category is the reference and we therefore construct only two dummy variables. Variable ETR2 gets a value of 1 if we consider a low ETR district while variable ETR3 obtains a value of 1 if we consider a high ETR district. If both variables have a value of 0, we are therefore automatically considering an intermediate ETR district.

We re-estimate equation (2) as in column (4) of Table 2 including now two ETR-terms and two ETR/Aggl(S)_d-interaction terms:

$$E(n_{d,s,t}) = \exp(\beta_1 ETR2_{d,t-1} + \beta_2 ETR3_{d,t-1} + \beta_3 Aggl(D)_{d,t-1} + \beta_4 Aggl(S)_{d,t-1} \\ + \beta_5 (ETR * Aggl(D))_{d,t-1} + \beta_6 (ETR2 * Aggl(S))_{d,t-1} \\ + \beta_7 (ETR3 * Aggl(S))_{d,t-1} + \beta_8 Aggl(S)_{s,t-1} \\ + \beta_9 (ETR * Aggl(S)_{s,t-1}) + \beta_{10} (Aggl(S)_{d,t-1} * Aggl(S)_{s,t-1}) \\ + \beta' x_{d,t-1} + \gamma' d_s)$$

The estimation results for the coefficients we need in order to calculate the IRR are the following:

β_1	-0.1615
β_2	-1.1987
β_6	0.0181
β_7	0.0175

Finally, the IRR comparing high versus intermediate ETR districts is calculated using the following expression: $IRR = \exp(\beta_2 + \beta_7 * \text{value } Aggl(S)_d)$ where we allow $Aggl(S)_d$ to take on different values. The results of these calculations are to be found in Table 3 and Figure 7 in the main text.

APPENDIX 5: Results with location-specific agglomeration rents measured at district-sector-level

Table A5.1. Poisson estimation results with bootstrap and mean-centering; location-specific agglomeration rents measured at district-sector-level

	(1)	(2)	(3)	(4)
$ETR_{t-1,d}$	-3.253*** (-2.99)	3.627*** (1.608)	-3.629*** (1.841)	-3.634*** (1.598)
$Aggl(D)_{t-1,d}$	0.0001*** (0.0000008)	0.0001*** (0.00001)	0.0001*** (0.000001)	0.0001*** (0.0000009)
$Aggl(S)_{t-1,ds}$	3.006** (1.536)	4.407*** (1.821)	4.449*** (2.226)	4.367*** (2.091)
$(ETR * Aggl(D))_{t-1,d}$	0.00009** (0.0004)	0.0001*** (0.00005)	0.0001*** (0.00005)	0.0001** (0.00005)
$(ETR * Aggl(S))_{t-1,ds}$	48.540** (23.748)	75.125*** (31.537)	75.071*** (34.182)	73.61*** (34.24)
$EG_{t-1,s}$		0.022 (0.559)	0.009 (0.508)	0.037 (0.538)
$(EG * Aggl(S))_{t-1,ds}$			13.144 (56.871)	12.700 (63.101)
$(ETR * EG)_{t-1,s}$				-1.316 (2.952)
Wage cost $_{t-1,d}$	0.033*** (0.008)	0.032*** (0.009)	0.032*** (0.009)	0.032*** (0.012)
Price $_{t-1,d}$	0.002*** (0.0007)	0.002*** (0.0006)	0.002*** (0.0006)	0.002*** (0.0007)
Infr $_{t-1,d}$	0.00003* (0.00002)	0.00003 (0.00002)	0.00003* (0.00002)	(0.00003) (0.00002)
Area $_{t,d}$	0.0003*** (0.00005)	0.0003*** (0.00006)	0.0003*** (0.00007)	0.0003*** (0.00006)
Assisted_dummy $_{t,d}$	0.171*** (0.036)	0.188*** (0.046)	0.189*** (0.039)	0.189*** (0.046)
Year dummies	Yes	Yes	Yes	Yes
Observations	101526	27501	27501	27501
Loglikelihood	-17472	-9286	-9286	-9285

Note: bootstrapped standard errors are reported between brackets. Stars indicate the level of significance, *** is significant at the 1% level; ** is significant at the 5% level; * is significant at the 10% level and (*) is significant at the 20% level.