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Tax differentials in intraregional firm location: Evidence from new manufacturing establishments in Spanish municipalities.

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ABSTRACT: This paper analyses empirically how differences in local taxes affect the intraregional location of new manufacturing plants. These effects are examined within the random profit maximization framework. We look at the location decision of more than 10,000 manufacturing establishments locating between 1996 and 2003 across more than 400 municipalities in Catalonia, a Spanish region. We find that local taxes on business and property deter new manufacturing establishments. It is necessary to restrict the choice set to the local labor market and, above all, to control for agglomeration economies to identify the effects of taxes on the location of new establishments.

Key words: local taxes, firm location, agglomeration economies, Poisson regression.

Jel Codes: R3, H32.

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Steuerdifferentiale bei den Standorten intraregionaler Firmen: Belege aus neuen Produktionsbetrieben in spanischen Gemeinden

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ABSTRACT:
In diesem Beitrag wird empirisch analysiert, wie sich Unterschiede bei lokalen Steuern auf den intraregionalen Standort neuer Produktionsbetriebe auswirken. Diese Auswirkungen werden im Rahmen der zufälligen Gewinnmaximierung untersucht. Wir untersuchen die Standortentscheidungen von mehr als 10.000 Produktionsbetrieben, die sich im Zeitraum von 1996 bis 2003 in mehr als 400 Gemeinden der spanischen Region Katalonien angesiedelt haben. Wir stellen fest, dass lokale Steuern auf Unternehmen und Eigentum neue Produktionsbetriebe abschrecken. Es ist notwendig, die Auswahl für den lokalen Arbeitsmarkt einzuengen; insbesondere jedoch muss auf Agglomerationswirtschaften kontrolliert werden, um die Auswirkungen der Steuern auf den Standort neuer Unternehmen zu identifizieren.

Key words:
Lokale Steuern
Firmenstandort
Agglomerationswirtschaften
Poisson-Regression
Jel Codes: R3, H32.

Diferencias impositivas en la ubicación de empresas intrarregionales: ejemplo de nuevos establecimientos de fabricación en municipios españoles.

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ABSTRACT:
En este artículo analizamos empíricamente de qué modo las diferencias en los impuestos locales influyen en la ubicación intrarregional de nuevas plantas de fabricación. Examinamos estos efectos en un marco aleatorio de maximización de beneficios. Estudiamos las decisiones de ubicación de más de 10.000 establecimientos de fabricación entre 1996 y 2003 en más de 400 municipios en Cataluña. Observamos que los impuestos locales en negocios y propiedades disuaden a los nuevos establecimientos de fabricación. Es necesario limitar las opciones al alcance del mercado laboral local, y sobre todo controlar las economías de aglomeración a fin de identificar los efectos de los impuestos en la ubicación de nuevos establecimientos.

Key words:
Impuestos locales
Ubicación de empresas
Economías de aglomeración

Regresión de Poisson

Jel Codes: R3, H32.

1.-Introduction

The effect of taxation on the location of economic activity is a topic that has interested scholars and policy makers alike. The extent to which firms respond to tax differentials is an issue of major concern for tax setting governments. In particular, governments may want to foresee the outflow of firms following a tax increase in order to assess how tax revenues and local employment are affected by changes in tax rates. A high degree of sensitivity to tax differentials on the part of firms can, thus, erode the tax autonomy of governments that may be engaged in tax competition processes[1].

Although initial attempts at quantifying empirically the impact of taxes on the location of economic activities date back some decades the question is still open. Besides, evidence from countries other than the U.S. is limited[2]. BRETT and PINKSE (2001) did not find strong evidence that local business property tax rates exert any effect on business location across municipalities in British Columbia. FELD and KIRCHGÄSSNER (2002) use differences in corporate and personal income tax across Swiss Cantons to provide evidence that taxes affect the location of firms and employment within this country. BUETTNER (2003) finds municipal capital tax rates to be a determinant of the local tax base using a panel of German municipalities. For Spain, SOLÉ-OLLÉ and VILADECANS-MARSAL (2003) examine local employment growth within the metropolitan area of Barcelona and report an elasticity of around -0.5 for local business and property tax rates, the main local taxes levied in Spain. DURANTON *et al.* (2006) conclude that municipal property taxes in the UK have a negative impact on firm employment growth but no effect on firm entry.

Analyzing empirically the extent to which taxes affect firms' location decisions is by no means straightforward, given the range of other factors underlying this particular decision. Moreover, tax rates are not exogenous in the sense that they respond to jurisdictions´ characteristics. This implies that any location determinant which turns out to be correlated with local tax rates is a potential source of bias if remains uncontrolled. BARTIK (1991a), in his review of the role played by taxes on the location of economic activities, points out that empirical studies conducted at the intrametropolitan level, as opposed to the intermetropolitan one, have generally found larger taxes´ effects. These findings may not be independent of the difficulties faced when seeking to measure interregional variation in key location factors such as wages, workforce characteristics, transportation facilities and the business climate[3]. When jurisdictions are defined at a spatial scale which is small enough, a natural control for this range of location determinants is to focus on the location of firms between jurisdictions that belong to the same city-level economic area. The reduced size of municipalities in the region of Catalonia (946 municipalities covering an area of 32 thousand Km^2) provides an appropriate institutional context to develop this empirical strategy. In particular, we will look at the location of firms within groups of municipalities that constitute 41 self-contained local labor markets. In this paper we study the location of manufacturing establishments. Since manufactured outputs are targeted at national or supranational markets, we can abstract from any local demand considerations that may affect the location decision of firms. Hence, the advantage of analyzing the location of manufacturing activities within local labor markets is that we can focus on a short number of firm location determinants, namely, local taxes, building rents and agglomeration economies.

Agglomeration economies refer to the advantages a firm obtains from locating close to other firms. In Figure 1 (Graphs 1 and 2), the partial correlations between tax rates (business and property tax) and manufacturing employment (a raw measure of agglomeration economies) for municipalities in Catalonia are depicted. These correlations are positive and large (in the 30-40% range). One explanation for these correlations has been provided in the literature concerned with the study of tax competition in the presence of agglomeration economies. In this setting, firms may be willing to pay a higher tax bill in order to locate close to other firms. This means that some governments may be able to set a high tax rate while hosting large amounts of economic activity[4]. There are, however, other plausible stories that can explain the positive correlation between tax rates and agglomeration economies. For instance, the cost of providing public services may be particularly high in urban agglomerations and this may translate into higher tax rates. Regardless of the mechanism driving these correlations, taking into account the benefits firms obtain when they co-locate in space may be important in order to identify the effect of tax rates on the location of economic activities. A feature that distinguishes this paper from other studies analyzing the effect of taxes on the location of economic activities is that we measure agglomeration economies more accurately. We jointly consider a measure of the advantages firms obtain from locating close to firms within the same industry (so called localization economies), a measure of the advantages firms obtain from locating close to firms of other industries (urbanization economies) and a measure of the advantages firms obtain from the sectoral diversity of the local economy (diversity effects).

[Insert Figure 1]

Most studies examining the role of taxes in the location of economic activities have focused on either employment levels or employment growth. However, as BARTIK (1991b) points out, it might be preferable to study a particular location decision rather than to model employment levels and changes. By focusing on a particular decision, rather than modelling the aggregate result of the creation, closure, expansion and contraction of plant processes, it should be possible to impose greater structure on the analysis and, hence, yield more precise estimates of the effects that are of interest to us. We adopt the random profit maximization framework to analyse the location decision of new establishments. This empirical strategy has at least two advantages. First, SCHMENNER's (1982) study reveals that managers will first decide whether or not to start-up a new establishment and only then will they take a decision regarding the location that best suits their needs. This means we can focus on an establishment's location decision in isolation of any consideration of the processes underlying the decision to start-up. Second, it enables us to consider the explanatory variables as being pre-determined.

In this study we analyze the role of local taxes in determining the location of new manufacturing establishments across municipalities in the Spanish region of Catalonia using the random profit maximization framework. This analysis sheds some extra light on a topic that has not received a great deal of attention in the European context. The empirical application we carry out has two distinctive features. First, we analyze the location of new manufacturing establishments between municipalities that belong to the same local labor market. This enables us to control for city-level firm location determinants. Second, three different types of agglomeration economies are jointly considered, namely, localization, urbanization and diversity effects. Following this introduction, the rest of this paper is organized as follows. In Section 2, following on from this introduction, we present a model that sets up the location problem of the firm. Then, an empirical application follows. We describe the dataset and variables in Section 3.1 and then introduce and explain the econometric specification in Section 3.2. In Section 3.3, we discuss the results obtained. In Section 4, we present a summary and the main conclusions of this paper.

2-The model

The aim of a competitive firm belonging to industry *s* is to choose simultaneously a location and a level of inputs that yield the highest level of profits. There are *J* jurisdictions each firm can choose to locate in and, conditional on locating in *j*, the problem of the firm *i* is to choose the level of machinery (*K*), labor (*L*) and buildings (*N*) that maximize the following profit function:

$$\overline{P} \cdot Y_i - w_l \cdot L_i - \overline{r} \cdot K_i - R_j \cdot N_i - T_{sj}(L_i, K_i, N_i) \qquad (1)$$

The price of a manufactured output ($\overline{P}$) is assumed to be common for all firms in the region. The prices of the three inputs used by firms are expected to vary at different geographic levels due to different degrees of mobility. The rental price of machinery ($\overline{r}$) is assumed to show no variation within the region. Wages are assumed to vary across local labor markets (w_l), whereas the rent of industrial buildings (R_j) may differ from one location to another. The local tax bill (T_{sj}) depends on the level of all the inputs considered and the industry of the firm, *s*. Output is denoted by Y which is assumed to be obtained by the following Cobb-Douglas production function:

$$Y_{ij} = A_{sj} \cdot (L_i^{\alpha_1} \cdot K_i^{\alpha_2} \cdot N_i^{\alpha_3}) \cdot \exp(\mu_i) \cdot (\exp(\varepsilon_{ij}))^{\delta} \qquad (2)$$

where $k \equiv \alpha_1 + \alpha_2 + \alpha_3 < 1$ denotes the returns to scale of the production function in the priced inputs; A_{sj} is a Hicks' neutral productivity shifter capturing the agglomeration economies of site *j* for firms whose activity falls into industry *s*; μ_i is a hicks neutral establishment-specific productivity constant; ε_{ij} stands for an identically and independently distributed (*iid*) zero mean Weibull random variable that changes over firms and locations; and δ is a positive constant.

The problem of simultaneously choosing a location and the optimal level of inputs can be reduced through the profit function to one in which firms choose the location where the level of profits is the highest when inputs are chosen optimally. This is equivalent to choosing the location where the log of the profit function, scaled by $(1-k)/\delta$, takes its highest value:

$$\begin{aligned} \ln \Pi_{isj} \cdot (1-k)/\delta \equiv \pi_{isj} = \varphi_0 + 1/\delta \cdot \ln \overline{P} + 1/\delta \cdot \ln A_{sj} \\ + \alpha_1/\delta \cdot \ln(w_l + \partial T_{sj}/\partial L) + \alpha_2/\delta \cdot \ln(\overline{r} + \partial T_{sj}/\partial K) \\ + \alpha_3/\delta \cdot \ln(R_j + \partial T_{sj}/\partial N) + 1/\delta \cdot \mu_i + \varepsilon_{ij} \end{aligned} \qquad (3)$$

where Π is the profit function and φ_0 stands for a constant term. To accommodate expression (3) into the random profit maximization framework, the following normalizations are carried out. Notice that the units of machinery can be set in such a way that the price is unity (i.e., $\bar{r} = 1$). Given that $\ln(1+\lambda) \approx \lambda$ for low values of λ, it must be that for low tax rates, as is the case here, $\ln(\bar{r} + \partial T_{sj} / \partial K)$ approaches $\partial T_{sj} / \partial K$ if K is set at the appropriate scale. We assume that within a region, wages do show variation but within certain limits. Hence, by choosing the appropriate scale for the units of labor, the wage can be redefined as one plus a wage premium ($w_l = 1 + \tilde{w}_l$). The same reasoning can be applied to the rents of buildings ($R_j = 1 + \tilde{R}_j$). After these normalizations, expression (3) can be expressed as:

$$\begin{aligned} \pi_{isj} \approx \varphi_0 + 1/\delta \cdot \ln \bar{P} + 1/\delta \cdot \ln A_{sj} + \alpha_1/\delta \cdot w_l + \alpha_3/\delta \cdot R_j \\ \alpha_1/\delta \cdot (\partial T_{sj}/\partial L) + \alpha_2/\delta \cdot (\partial T_{sj}/\partial K) + \alpha_3/\delta \cdot (\partial T_{sj}/\partial N) + 1/\delta \cdot \mu_i + \varepsilon_{ij} \end{aligned} \qquad (4)$$

where $\varphi_1 = \varphi_0 - 2$. Expression (4) is a conditional logit model whose parameters can be estimated, up to a $1/\delta$ scale, by maximum likelihood. MCFADDEN (1974) shows that given the assumption regarding ε_{ij}, the probability that firm *i* locates in *j* is given by:

$$p_{ij} = exp(\pi_{isj} - \varepsilon_{isj}) / \sum_j exp(\pi_{isj} - \varepsilon_{isj}) \qquad (5)$$

where the variables that do not show variation across locations (i.e. $\varphi_1, \bar{P}, \mu_i$) drop out of the analysis[5].

3.-Empirical exercise

3.1.-Data and variables

The empirical analysis is carried out using a rich dataset containing information on the universe of new and relocating manufacturing establishments settling in the Spanish region of Catalonia between 1996 and 2003[6]. This dataset, the Industrial Establishments Registry, contains information on the establishments created including data concerning employment, location and activity. The level of sectoral desegregation considered is the 2-digit industry classification yielding 18 manufacturing industries[7]. In the first row of Table 1, we report the number of establishment entries and the number of municipalities for which data are available. Roughly speaking, we are dealing with municipalities with more than 1,000 inhabitants hosting some type of industrial activity[8]. The municipal data sources, variable definitions and summary statistics are provided in Table 2.

[Insert Table 1 and Table 2]

<u>Local taxes</u>**:** Local governments in Spain are moderate in size (their expenditure represents 13% of total public expenditure), with only a third of local government budgets being funded by intergovernmental grants. More than half of their own revenues are raised by taxes, while the remainder consists of user charges. The property tax (*Impuesto sobre la propiedad immueble*) is the main source of collected tax revenue (half of all revenues), although it is small in comparison to the U.S. Whereas an average U.S. property owner is charged around 0.75% of the market value of their property[9], in Spain this falls to about 0.14%[10]. The local business tax (*Impuesto sobre actividades económicas*), the second largest source of revenue (18% of local tax revenue), is the largest local tax firms have to bear. To indicate the relative size of these two taxes we compute the average tax bills per unit of establishment surface for Catalonia. The business tax is equivalent to 4.5€/m^2, while this measure falls to 2.25€/m^2 in the case of the property tax[11]. Manufacturing establishments average 790 m^2 in our sample. For such an establishment, this yields bills of around 1,800€ and 3,600€ for property and business taxes, respectively. Three other taxes complete the picture of local taxation: a tax on vehicles, a tax on building activities, and a tax on the sale of land and buildings[12]. Although the revenue raised by these three taxes is not negligible, it should be noted that only a share of them is borne by business activities.

When local taxes are considered as a whole, the burden that the business sector has to bear is significant. If we only consider business and property taxes, together they yield a local tax bill of around 0.45% of the market value of a firm's buildings (in the case of the remaining taxes, we are completely unaware of the share of revenue that the business sector has to bear). Although this level of local taxation is low in comparison to that of the U.S., the difference in the order of magnitude is not so great. Besides, municipal governments are given remarkable tax autonomy. Statutory tax rates can vary by a two to three-fold factor across municipalities. Bearing in mind that we are analyzing the location of firms in neighboring municipalities, we expect local tax differentials to be large enough to influence the location of new establishments. In this analysis we focus solely on the property and business taxes, the main local taxes paid by business[13]. Therefore, we can characterize the local tax liability of firm i of the s^{th} industry in municipality j as $T_{isj} \approx T_{isj}^{b} + T_{isj}^{p}$ where b and p stand for the business and property taxes, respectively. The business tax bill depends on all the inputs used by the firm whereas the property tax bill is only increasing in the usage of buildings. Therefore, we can write $\partial T_{sj} / \partial L$ as $\partial T_{sj}^{b} / \partial L$ and $\partial T_{sj} / \partial K$ as $\partial T_{sj}^{b} / \partial K$ while $\partial T_{sj} / \partial N$ decomposes as $\partial T_{sj}^{b} / \partial N + \partial T_{sj}^{p} / \partial N$.

The local business tax liability of each firm (T_{isj}^{b}) is based on a presumed level of profits that is established in accordance with the observed level of input usages and the economic sector of each firm[14]. This presumed level of profits is determined by national tax laws that do not make any distinction as regards location. This industry specific level of tax liability $(\phi_s^L \cdot L_i + \phi_s^K \cdot K_i + \phi_s^N \cdot N_i)$ is then modified at the municipal level by being multiplied by a coefficient set by local governments (τ_j^b)[15]. Hence, we can characterize the tax bill for a firm i belonging to industry s in municipality j as $T_{isj}^{b} \equiv \tau_j^b \cdot (\phi_s^L \cdot L_i + \phi_s^K \cdot K_i + \phi_s^N \cdot N_i)$ where ϕ_s^L , ϕ_s^K and ϕ_s^N measure the way in which national tax laws assess how profits in industry s increase differently with an extra unit of labor, machinery and buildings, respectively. Hence, it is possible to decompose $(\alpha_1 / \delta) \cdot (\partial T_{sj}^{b} / \partial L) + (\alpha_2 / \delta) \cdot (\partial T_{sj}^{b} / \partial K) + (\alpha_3 / \delta) \cdot (\partial T_{sj}^{b} / \partial N)$ into two terms, an industry-specific constant (i.e. $(\alpha_1/\delta)\cdot\phi_s^L + (\alpha_2/\delta)\cdot\phi_s^K + (\alpha_3/\delta)\cdot\phi_s^N$) times the municipal business tax rate, τ_j^b. Moreover, this constant captures the percentage squeeze on profit levels when the municipal business tax rate increases by one unit. If this share is similar across sectors (after all, the business tax is levied on a presumed level of profits for all industries), then this coefficient can be expected to be roughly the same for all sectors. The business tax rate can range from 0.8 to 1.9. There exists substantial cross-section variation in this variable. In 1999, a quarter of municipalities set a business tax rate below 1.1 whereas another quarter chose a rate that was above 1.4 (see Table 2 for descriptive statistics).

The local business tax was reformed by a law passed in 2002. From 2003 onwards, all self-employed and very small firms, with sales below 1 million €, became exempt from this tax. At the same time, the tax burden was partly shifted towards larger firms, for whom the tax burden increased by 30% on average[16]. Thus, the reform is expected to decrease the sensitivity of small firms to tax differentials and to increase the effect of taxes on the location of larger firms. We design two subsets of firms that we consider would be affected by the reform in a different manner: on the one hand, an establishment with 1, 2 or 3 registered employees is considered small, while an establishment with 4 or more workers is considered large[17]. The numbers of entries falling into these two categories are reported in the second and third rows of Table 1.

The property tax is charged to the owners of land and building structures and no distinction is drawn between industrial and residential usages. The property tax bill (T_{ij}^p) of firm i if located in municipality j results from the product of the property nominal tax rate (t_j^p) and the ratable value per unit of surface (v_j) times the surface of buildings used, i.e. $T_{ij}^p = t_j^p \cdot v_j \cdot N_i$. We are interested in measuring how the property tax bill increases when we increase the surface of buildings in one unit ($\partial T_{sj}^p / \partial N$). Therefore, in this analysis, the relevant measure of the property tax rate is obtained as the nominal tax rate times the ratable value per unit of surface of industrial buildings, i.e. $\tau_j^p \equiv t_j^p \cdot v_j$. Hence, we need a proxy of the ratable value of a representative unit of an industrial building. Unfortunately, this information is not available and, instead, we use the mean of the ratable value of all properties found in location *j*. Governments are free to choose a nominal tax rate between 0.4 and 1.1%. That is, property owners are asked to pay a share (between 0.4 and 1.1%) of the ratable value of their properties. There exists a great deal of heterogeneity across locations although low tax rates are generally preferred. For instance in 1999, a quarter of municipal governments set a property tax rate below 0.45 whereas another quarter chose a tax rate above 0.7. Differences in the average ratable value of properties across municipalities are great and further increase property tax bill differentials (See Table 2 for descriptive statistics).

Agglomeration economies**:** The term agglomeration economies can be used to denote any mechanism that causes economic activities to cluster in specific locations. At the intraregional level, the type of agglomeration economies we have in mind are technological externalities. In the presence of technological externalities, a firm's productivity comes to depend on the economic scale and composition of its economic environment (ROSENTHAL and STRANGE, 2004).

Agglomeration economies of the type we are looking at have been found to be of very limited geographical scope. ROSENTHAL and STRANGE (2003), using U.S. zip code level data, analyze the scope of agglomeration economies by estimating external effects between firms localized at various distances. These authors find that such external effects fall sharply after the first 1.6 km. VAN SOEST *et al.* (2006) analyse this same issue using data from the Netherlands where zip code areas are remarkably small, they average 5.65 Km^2. It is found that agglomeration economies in a zip code have little effects elsewhere in terms of employment growth and firm birth. In our dataset, the urban area of the municipalities averages 1.3 km^2 whereas the mean total surface is 34 km^2. Therefore, one can expect that external effects do not spill over municipal borders to a very large extent. In fact, VILADECANS-MARSAL (2004) finds that, for most industries, there is no evidence of external effects taking place between neighbouring Spanish municipalities[18].

Agglomeration economies for a firm of the s^{th} industry found in location j, A_{sj}, are expected to be summarized by the following expression:

$$A_{sj} \equiv K_0 \cdot O_{sj}^{\psi_1} \cdot M_{sj}^{\psi_2} \cdot SE_j^{\psi_3} \cdot D_j^{\psi_4} \qquad (6)$$

where K_0 stands for a constant; O_{sj} denotes the s^{th} manufacture employment in location j whereas M_{sj} captures the remaining manufacturing employment found in municipality j. This distinction is made in order to take into account the fact that the benefits for two firms from co-localizing in space may be larger between same industry firms than between two firms that belong to distinct activities. The non-manufacturing employment level, SE_{sj}, is introduced in order to capture the advantages manufacturing firms derive from locally provided services. The productivity gains derived from one's own manufacturing employment levels (O_{sj}) are known in the literature as localization economies. The benefits stemming from the remaining levels of employment ($M_{sj} + SE_{sj}$) are often called urbanization economies in a distinction that dates back to HOOVER (1936). JACOBS (1969) sustains that diverse economic environments favor the productivity of firms through the cross-fertilization of ideas. To test this last hypothesis we introduce the variable D_j, which accounts for the diversity of the productive environment and which amounts to the inverse of a Hirschman-Herfindahl index that can be defined as follows:

$$D_j = 1 / \sum_s share_{sj}^2 \qquad (7)$$

where $share_{sj}$ denotes the share of the overall employment in location j that is devoted to activity s (including both manufacturing and non-manufacturing activities). The larger the value of the index, the more diverse the described economic environment is. Equations (4) and (5) suggest that agglomeration economies should be considered in logs. We use *o*, *m*, *se* and *d* to denote the natural logarithm of *O*, *M*, *SE* and *D*.

The rent of buildings**:** Unfortunately, we lack data on the rents of industrial buildings for the Spanish municipalities[19]. We circumvent this problem by looking at how pre-established firms use labor in relation to buildings. Since wages are assumed to be constant across a local labor market, the aggregate municipal ratio of buildings with respect to labor should provide us with information about the variation in the rent of buildings within local labor markets. However, we need to take into account the fact that different aggregate ratios of labor to square meters of buildings may not only be the result of differences in relative prices but could also respond to variations in the industry mix of municipalities[20]. If we measure the rent of buildings using the aggregate ratio of labor to buildings we may overstate its variation within a local labor market. The reason for this is that firms needing particularly large buildings will tend to gather in locations where buildings are relatively cheap. Therefore, we need to account for the aggregate ratio of labor to buildings while controlling for the sectoral composition of municipalities. That is:

$$R_j = \frac{1}{N_j} \cdot \left(\sum_s \kappa_s \cdot L_{sj}\right) \quad (8)$$

where N_j is the surface occupied by manufactures in municipality *j*, L_{sj} is employment of the s^{th} manufacture in *j* and the κ_s's are 18 parameters to be estimated. These should be high for sectors using large buildings intensively (high α_3/α_1 ratios) and low for sectors that have lower space requirements (low α_3/α_1 ratios)[21].

3.2.-Econometric specification

In the conditional logit framework the consistency of the estimates hinges on whether the so-called independence of irrelevant alternatives (IIA) assumption holds or not. In the context of the firm location problem, the IIA assumption is problematic since some unobserved location determinants are likely to be correlated across nearby municipalities. The empirical strategy we follow consists in conditioning the choice set to be the local labor market in which we finally observe the establishment settles. This enables us to condition out any location determinant shared by municipalities within local labor markets. The local labor markets we use are built on the basis of daily work commuting[22]. Thus, they reflect groups of municipalities which show high levels of interaction. Hence, we are not only conditioning out wages but also other city-level location attributes such as workforce characteristics, transportation facilities, climate amenities and crime rates.

In line with ROSENTHAL and STRANGE (2003), we assume that there exists a one-year time lag between a new establishment decides where to locate and we observe the establishment settles in this location. Hence, we are interested in location probabilities of the following type:

$$p_{ij/s,j\in l,t+1} = \frac{\exp(\beta_1 \cdot o_{sjt} + \beta_2 \cdot m_{sjt} + \beta_3 \cdot se_{jt} + \beta_4 \cdot d_{jt} + \beta_5 \cdot \tau^b_{jt} + \beta_6 \cdot \tau^p_{jt} + \sum_s \beta_s \cdot (L_{sjt} / N_{jt}))}{\sum_{j=1}^{J_l} \exp(\beta_1 \cdot o_{sjt} + \beta_2 \cdot m_{sjt} + \beta_3 \cdot se_{jt} + \beta_4 \cdot d_{jt} + \beta_5 \cdot \tau^b_{jt} + \beta_6 \cdot \tau^p_{jt} + \sum_s \beta_s \cdot (L_{sjt} / N_{jt}))} \quad (9)$$

where $\beta_k \equiv 1/\delta \cdot \psi_k$, for $k = 1, 2, 3$ and 4.; $\beta_5 \equiv (\alpha_1/\delta)\cdot\phi^L_s + (\alpha_2/\delta)\cdot\phi^K_s + (\alpha_3/\delta)\cdot\phi^N_s$;

$\beta_6 \equiv \alpha_3/\delta$; and $\beta_s \equiv (\alpha_3/\delta)\cdot\kappa_s, \forall s$.

These location probabilities resemble those of a nested logit model which is often seen as a conditional logit where decisions are made sequentially. In this particular case, firm managers would first choose the local labor market in which to locate and would then choose the municipality that they like best within the local labor market. It turns out that the estimates to be obtained by the estimation of expression (9) are precisely the same as those that would be obtained by estimating a nested logit model. At this juncture, we should make two comments in this respect. First, the approach we take enables us to control for the fact that different areas have different birth potentials. In other words, people are tied to a particular area and, hence, when an entrepreneur is looking where to locate a start-up, the additional advantages offered by a distant municipality may be offset by a personal preference for locations that are located more close at hand. Thus, not all jurisdictions are equal substitutes for each other. Given the fact that we observe more entrepreneurs in large cities with more agglomeration economies and higher tax rates, this statistical control may be important. In the second place, it might be that in the case of large and very mobile firms (e.g. multinational plants) the choice set we consider does not correspond to the actual choice set. Even if this were to be true, the consistency of our estimates does not rely on assuming that we are specifying the choice set correctly, since to obtain consistent estimates of the parameters of interest all that we require is that the independence of irrelevant alternative assumptions holds between each pair of alternatives being considered in our estimation.

GUIMARAES *et al.* (2003) shows that the conditional logit parameters in expression (9) can be equivalently obtained by estimating a poisson regression model whose mean and variance are given by the following expression[23]:

$$E(n_{sjt+1}) = Var(n_{sjt+1}) = \exp(\alpha_{stl} + \beta_1 \cdot o_{sjt} + \beta_2 \cdot m_{sjt} + \beta_3 \cdot se_{jt} + \beta_4 \cdot d_{jt} + \beta_5 \cdot \tau^b_{jt} + \beta_6 \cdot \tau^p_{jt} + \sum_s \beta_s \cdot (L_{sjt} / N_{jt})) \qquad (10)$$

where n_{sjt+1} accounts for the number of firms of the s^{th} industry that locate in jurisdiction j during period t+1 and α_{stl} denotes a time-sectoral-Local Labor Market specific constant term[24]. The exponential mean Poisson regression model does not suffer from the incidental parameters problem that generally affects non-linear models (CAMERON and TRIVEDI, 1998). This implies that the consistency of the slope parameters does not hinge on the number of constant terms that needs to be fitted.

3.3.-Results

Main results: The maximum likelihood Poisson estimates of the location determinants of new and relocating establishments are presented in Table 3. In the first column of Table 3, we present the preferred specification, specification [1], that corresponds to that of the location of manufacturing establishments outlined in expressions (11). Auxiliary results are provided in specifications [2] and [3].

[Insert Table 3]

The high number of statistically significant variables reported in specification [1] suggests that the model fits the data satisfactorily. A likelihood ratio test has been computed indicating that the model is statistically significant at any reasonable level. Moreover, the variables take the sign that theory predicts. That is, local taxes and the proxies used to capture the rent of buildings seem to discourage the arrival of firms, whereas agglomeration economies are an attribute that firms value at the time of looking for a location[25].

The two local taxes - the local business tax and the property tax - seem to be relevant determinants of the location of new manufacturing establishments. Both the business tax and the property tax coefficients are negative and statistically significant at the 1% level ($\beta_5, \beta_6 < 0$). Given that these variables do not enter the model in logs, the estimated coefficients do not tell us much about the dimensions of these effects[26]. Hence, we have computed the average elasticity for these two taxes. The estimated elasticity of the business tax rate is -0.52 whereas the elasticity of the property tax rate is -0.13. As mentioned, the list of papers we can compare our results with is extremely limited. Since the paper by SOLÉ-OLLÉ and VILADECANS-MARSAL (2003) focuses on employment growth, it is difficult to assess the degree to which these results are comparable. Our elasticities are in general smaller than those that they report, above all in relation to property tax. Nevertheless, the results we report are in the same range as those found by these authors. In particular, the elasticity we obtain for the business tax rate is close to the figure they report for the overall employment growth equation (-0.5) and, similarly, we found an elasticity for the property tax rate that is close to the one they provide for the growth in services employment (-0.18). These elasticities are also small in comparison to the average intrametropolitan result found in the U.S., which BARTIK (1991a) quantifies at -2. However, if we take into account the size of the taxes considered in this analysis, we deem our elasticities plausible.

The tax effects we report are only for new and relocating establishments. These establishments are already on the move and, for them, tax differentials do not have to overcome the cost of changing jurisdictions. Hence, our results could correspond to a setting where moving costs were zero. In this respect, our view is that the elasticities for tax rates that we report are upper bounds of the elasticities of the tax base with respect to tax rates.

The results also suggest that agglomeration economies play an important role as firm location determinants since all the coefficients of the variables of agglomeration economies are found to be positive and statistically significant at the 1% level. Since all these variables are measured in logs, the coefficients have an elasticity interpretation. The variable pinning down the localization economies (*o*) seems to play an important role in the firm's location decision, presenting an elasticity of around 0.40. The variables capturing the urbanization economies (*m* and *se*) have elasticities of 0.25 and 0.12, respectively. This suggests that localization economies outweigh the advantages resulting from the presence of employment in distant economic activities. The diversity of the economic environment also shifts the productivity of firms, becoming a valuable attribute for firms in search of a location. The elasticity lies around 0.22 supporting Jacobs' hypothesis. The results obtained for the relative importance of these location determinants are in line with the results reported in the literature[27]. We have also computed the average marginal effects that are implicit in our agglomeration estimates in order to contextualize our results more closely with other studies[28]. Our localization economies' estimate implies that 100 extra workers in a particular industry will increase the expected number of start-ups in the same industry by 0.097. In the case of urbanization economies, a 100-worker increase outside the industry increases the number of start-ups by 0.04 if these are manufacturing workers and 0.01, otherwise. These estimates are in the upper limit of the results reported by ROSENTHAL and STRANGE (2003). One possible explanation is that, unlike these authors, we hold rents and taxes at a fixed level.

In the second column of Table 3, specification [2], we report the results obtained when we do not restrict the choice set to the local labor market level. When the choice set is considered to be the entire region of Catalonia, some coefficient estimates do change, if not always dramatically. In particular, the coefficients (and the elasticities) of the business tax rate and the property tax rate drop by 55% and 22%, respectively. This suggests that the independence of irrelevant alternatives assumption does not hold at the regional level. This can also be tested statistically. The second row from the bottom in Table 3 reports the log-likelihood functions of the different specifications. Since specification [2] is obtained by keeping the sector-year-local labor market dummy variables equal regardless of the local-labor market of the municipality, a likelihood ratio test can be performed. The value this test takes is over 2,000, which clearly exceeds the critical value of a Chi-Square distribution with 1,378 degrees of freedom at the 1% level. Hence, our data seem to indicate that there are important location factors that show up in the local labor market or/and, for some entrepreneurs, not all municipalities are equal substitutes for each other. This supports our empirical strategy of restricting the choice set to nearby locations.

Specification [3], whose results are reported in the third column of Table 3, omits the agglomeration economies' variables. The point of running such a regression is to assess the consequences of failing to account for the benefits firms obtain from the economic scale and composition of different locations. The property tax estimate remains unchanged. In contrast, the business tax effect switches sign becoming positive (and statistically significant at the 1% level). Moreover, the implied elasticity is very large (exceeding 3). The fact that municipalities hosting large amounts of economic activities set higher tax rates and still be preferred by new locating establishments may explain this large bias. This finding shows the importance of controlling for agglomeration economies when estimating the effects of taxes on the location of economic activities.

Robustness checks and additional results**:** In this subsection, we first explore if the estimates are robust to several specification issues (Table 4). After, we conduct the analysis for small and large firms, separately (Table 4). The main point of this exercise is to confirm that the reform of the local business tax passed in 2002 has affected small and large firms in a very asymmetric manner.

To control for the level of some local public expenditures can be relevant for identification purposes (i.e. higher tax bills may be financing better services which are valued by firms). Unfortunately, we lack data on current expenditures in which we can identify the programmes that firms may put a value on. Hence, we are not able to address this question, empirically. However, we feel that this is not a major issue in our analysis for two reasons. First, in Spain, differences in tax capacity (i.e. tax bases per capita) do not enter the formula to distribute unconditional grants to municipal governments. As a result, the link between tax effort and total revenue is particularly week since differences in tax capacity are uncompensated[29]. Second, in Spain, municipal governments are not in charge of the provision of some publicly provided inputs firms may be particularly interested in. For instance, it is upper-level governments who are responsible to provide education and transportation facilities. As a robustness check, we have included the natural log of overall municipal public expenditure per capita in specification [4]. Although the expenditure per capita coefficient is positive, its elasticity is very small and statistically insignificant and, moreover, produces no major changes in the parameters of interest. The inclusion of the remaining local taxes (results not reported), namely the vehicle tax, the building activities tax and the tax on sales of land and buildings has also been considered. These taxes have been found to be statistically insignificant and to have no effect on our estimates of interest. This may be due to the fact that these taxes represent very light burdens.

[Insert Table 4]

As mentioned above, papers by ROSENTHAL and STRANGE (2003), VAN SOEST *et al.* (2006) and VILADECANS-MARSAL (2004) have found agglomeration economies to decay sharply with distance. As a robustness check, we include two different spatial lags of the agglomeration economies' variables considered in the analysis. The first set of spatially lagged variables for municipality *i* is based on employment found in municipalities within a 10 km band from municipality *i*. Likewise, the second set of spatially lagged variables is based on employment found in municipalities within a band ranging from 10 to 20 km [30]. Results are reported in the second column of Table 4, specification [5], and they can be summarized as follows. First, the estimates of the taxes' effects in terms of sign and order of magnitude are insensitive to the inclusion of the spatial lags of the agglomeration economies' variables. Second, the own municipality agglomeration economies' effects estimates are largely unaltered by the inclusion of their spatially lagged counterparts. Third, we find some evidence that firm locations decisions are not only affected by own municipality agglomeration economies but also by those of neighbouring jurisdictions. This evidence comes primarily from the up to 10 km band variables. The fact that agglomeration economies' variables are measured in logs makes own municipality variables and their spatial lags not directly comparable. The average employment level rises from 2,000 (municipal level) to 25,000 (up to 10 km band) and to 75,000 (10 to 20 km band), implying that spatial lags have, in terms of marginal effects, much smaller impacts than own municipalities' variables (See footnote 25).

Since, to the best of our knowledge, there are no papers that control for the rent of buildings by looking at how pre-established firms use labor with respect to buildings' surface, we estimate specification [1] using the density of the population as a proxy of building rents. This approach has been used in BARTIK (1985) and GUIMARAES *et al.* (2004), the rationale being that population and manufactures compete for the use of land. Density takes the correct sign if higher densities are to pick up higher building rents. Although some coefficient estimates experience non-negligible changes, the sign and order of magnitude of the estimates remain unchanged, providing our analysis with consistency.

As discussed in Section 3.2, from 2003 onwards, all self-employed and very small firms have become tax exempt, while the tax burden on larger firms has been increased. As such the reform is expected to decrease the sensitivity of small firms to tax differentials and increase the effect of taxes on the location of larger firms. We, therefore, estimate the model for small and large firms separately while specifying two different slopes for the business tax[31]. One slope is for firms entering the market in the time period spanning 1996-2002 when the pre-reform business tax law applied. The second slope is for establishments locating in 2003 when we expect most managers would have considered the new tax code, the final details of which were made known in October 2002. The results obtained for small and large firms are reported in the first two columns of Table 5 (specifications [7] and [8]).

[Insert Table 5]

Our results suggest that small firms were more sensitive to business tax rate differentials than their larger counterparts during the pre-reform period. While the average elasticity implied by the coefficients for large firms approaches -0.32, the elasticity found for small firms stands at around -0.75. This suggests that, during this period, the business tax liability for a small firm represented a larger share of its profits than was the case for a larger firm. By contrast, the elasticity of the property tax rate appears to be equal for small and large firms, -0.14. As expected, our results suggest that the reform has reduced the sensitivity of small firms to tax differentials. In fact, the estimated coefficient for the post-reform period is not statistically different from zero. Results in the opposite direction are found for the subset of large firms. The reform has increased their sensitivity to business tax differentials. The elasticity of interest rises remarkably, from -0.32 to -0.82. Notice that this set of results corroborates the nature of the effects of the business tax and, therefore, enhances the consistency of this analysis.

Although the reform was passed in 2002, it constituted a cornerstone of the electoral campaign run by the conservative party that won the national election by a wide margin in March 2000. This means that establishments locating in 2001 and 2002 might have partly anticipated the effects of the reform. To determine whether this was the case, we split the pre-reform business tax slope into two different coefficients - one for firms entering the market in the time period spanning 1996-2000 (pre-election), and the other for new establishments in search of a location in 2001 and 2002 when managers might have anticipated the effects of the reform (post-election). Our results are shown in the third and fourth columns of Table 5 (specifications [9] and [10]). The estimates of the business tax for firms locating in 2001 and 2002 have been found to lie between the pre-election and post-reform period estimates for both small and large firms. This supports the idea that, during 2001 and 2002, the reform was partly anticipated.

In the case of agglomeration economies, there are relevant differences in how small and large firms value the characteristics of the economic environment of locations. Employment in services (se_j) and the diversity of the economic environment (d_j) seem to be two attributes small firms place considerable weight on (the elasticities are 0.24 and 0.34, respectively). By contrast, large firms seem to care less about these location features (the coefficients are, respectively, 5 and 2 times smaller). A possible interpretation of these results is that large firms are less dependent on external services and on tacit knowledge than small firms. Large firms seem to be fonder of manufacture employment than their smaller counterparts. This holds both for own industry (o_j) and other manufacturing employment (m_j). For the variable reflecting localization economies (o_j) the estimated elasticities are 0.43 and 0.34, respectively. In the case of other manufacturing employment (m_j), the elasticities are 0.31 and 0.15.

4.-Summary and conclusions

In this study we have focused on the role of local taxes in determining the location of new manufacturing establishments across municipalities in Catalonia, a region of Spain, during the period 1996-2003. This analysis sheds some extra light on a topic that has not received a great deal of attention in the European context. The empirical application we carry out has two distinctive features. First, we analyze the location of new manufacturing establishments between municipalities that belong to the same local labor market. This enables us to control for city-level firm location determinants. Second, compared to previous contributions to this literature, this paper provides a more accurate treatment of agglomeration economies. In particular, three types of agglomeration economies are jointly considered, namely, localization, urbanization and diversity effects.

Taxes do matter. The estimated tax elasticity for the business tax is close to -0.52. Significantly lower is our estimated elasticity for the property tax, which is around -0.13. The size of these effects is in the lower bound of the results reported by SOLÉ-OLLÉ and VILADECANS-MARSAL (2003) for Spain. Given the moderate quantitative importance of these local taxes in Spain, we consider our estimates to be reasonable. A reform of the local business tax that was implemented during our period of study shifted part of the tax burden from small to larger firms. Our results suggest that this reform has decreased the sensitivity of small firms to tax differentials, whereas the opposite is true for large firms. This enhances the consistency of our estimates.

Restricting the choice set to the local labor market and, above all, accounting for the presence of agglomeration economies is of paramount importance for identifying the role of local taxes in the location of economic activities. In particular, the omission of the variables of the agglomeration economies results in a severe underestimation of the negative effect of the local business tax on the location of manufactures. This can be explained by the fact that municipalities choosing high tax rates are also hosting large amounts of economic activities and, due to the existence of agglomeration economies, these are the preferred alternatives for new locating establishments.

Footnotes

[1] See WILSON (1999) for a review of the tax competition literature.

[2] The early literature for the U.S. case is reviewed in BARTIK (1991a) and HERZOG and SCHLOTTMANN (1991). These authors conclude that taxes affect the location of economic activities to some extent. More recent evidence from the U.S. has confirmed this result. See HINES (1996), GOOLSBEE and MAYDEW (2000), MARK *et al.* (2000) and HAUGHWOUT *et al.* (2004).

[3] HINES (1996) may be the most convincing exercise at showing the effect of taxes on the allocation of economic activity across U.S. States. For that purpose, he exploits the fact that some foreign investors receive home-country credits for taxes paid abroad while others do not. Investors from countries where tax payments made abroad are deductible at home are found to be over-represented in high-tax U.S. States.

[4] The seminal papers are LUDEMA and WOOTON (2000) and KIND *et al.* (2000). A review of this literature can be found in BALDWIN *et al.* (2003), chapters 15 and 16.

[5] Notice that although no firm-specific information aside from industry is used, the model accommodates heterogeneity across establishments in the form of a hicks neutral establishment-specific productivity term. The idea is that more productive firms make more profits but that leaves the location probabilities unchanged.

[6]Catalonia is a region of north-east Spain. In 1999, it had 6.2 million inhabitants living in 946 municipalities. This amounts to 15% of Spanish population. Catalonia can be considered as being relatively dynamic in terms of economic activity. In 1999, its share in the Spanish employment was 18% and its unemployment rate was significantly lower than that of the whole Spanish economy (10% vs. 15%). When it comes to industrial employment, Catalonia

was even more over-represented in 1999 (its share in the Spanish industrial employment was 26%).

[7] The Industrial Establishments Registry uses the 3-digit industry classification. However, data on local employment from the Social Security Register is only available at the 2-digit level. Therefore, the analysis is performed at this latter level of sectoral desegregation.

[8] There is a substantial increase in the number of municipalities for which data are available in year 2000. This is due to the fact that business tax rates are only available for those municipalities exceeding 1,000 inhabitants before this date.

[9] According to the U.S. Census of Communities 2005, the median home value in 2005 was 213,900 $ whereas the median real estate tax was 1,614 $.

[10] Data refer to 2003. The average home market value in Spain was 193,100 € while the average ratable value was 35,000 €. Data sources are the *Sociedad de Tasación*, a firm providing valuations of real estate properties, and the Property Assessment Office. The 0.14 percentage is obtained as (35,000/193,100)*0.0077, where 0.0077 is the mean (population weighted) of the nominal property tax rate.

[11] The business tax equivalent is the result of dividing total business tax revenue by the sum of the surface of all business establishments. To obtain an idea of the property tax bill per unit of surface is not so straightforward as the share of this tax revenue paid by business is unknown. We have aggregated the surface of residential and business properties to compute a measure of the property tax per unit of surface (assuming that businesses pay as much as home owners per unit of surface). On average, we obtain a property tax bill of 2.25€/m^2. Data Sources are the Catalan Institute of Statistics and the Ministry of Economics.

[12] Municipalities are under no obligation to levy the latter two taxes.

[13] In the results section (3.3), we address the role of the remaining local taxes. However, these are found to be statistically insignificant and their exclusion does not affect our results. Therefore, we focus solely on the business and property taxes.

[14] The business tax code proxies labor with the number of workers, machinery with power capacity and building surface area with m^2 of establishments.

[15] This municipal tax rate can be raised or cut depending on the location of the firm within the municipality. Each local government can sort streets into a small number of categories. Then, a specific business tax rate is applied to the firms located in each of these street categories. Municipalities are also entitled to offer tax cuts to benefit new establishments during their first years of trading. However, municipal data on the business tax code other than the municipal tax rate are poor and not very informative. Therefore, we summarize the business tax burden in location *j* by means of the municipal business tax rate, τ_j^b.

[16] In the new tax code, local business tax rates vary according to sales' intervals.

[17] The effects of the reform differ with establishment sales rather than with employment. However, our knowledge of new establishment size is limited to the number of employees reported at the time of registering the establishment. To set an employment level that reflects 1 million € sales, we use the SABI database that contains more than 1 million Spanish firms. We extract all manufacturing firms in the region of Catalonia in 2002 (16,882 firms). On this sample, we run sales on number of employees (up to a 4^{th} order polynomial). The model fits the data remarkably well (R^2 is 0.90).4 employees gives the closest prediction to 1 million € sales.

[18] The robustness of our results to this specification issue is addressed below. In particular, we include spatial lags of the agglomeration economies' variables.

[19] Nor can the ratable value of the property tax be used as a proxy given that reassessments are not carried out simultaneously in all municipalities

[20] This acknowledges the point stressed by GYOURKO (1987) in his analysis of the between-cities variation in the aggregate ratio of labor to capital between cities. This author breaks the variation down into two phenomena: the economic sector composition of the city and the within industry factor intensity variation.

[21] Expression (8) can be derived using Hotelling's lemma. The analytical derivation is available from the authors upon request.

[22] The local labor markets to which we refer have been computed by ROCA and MOIX (2004). Municipalities are aggregated in groups according to commuting considerations. Broadly speaking, each local labor market is built to ensure people live and work within its boundaries. This methodology differs from the British Local Labor markets in that a municipality cannot in itself constitute a local labor market. We consider the 945 municipalities to make up 41 local labor markets. With this level of aggregation, approximately 75% of the people live and work in the same local labor market.

[23] This result also holds for Hessian standard errors.

[24] α_{stl} cannot be computed if, for industry *s* in time period *t+1*, there are no firms locating in any location within local labor market *l*. Hence, the number of observations changes over the specifications.

[25]The coefficients associated with the variables that proxy the rent of buildings have been omitted to save space given the difficulty in interpreting them.

[26] When a variable is interpreted in terms of its impact on the expected number of firms locating (n_{sjt+1}) its coefficient has an elasticity interpretation if the variable is measured in logs. If it is measured in levels, the average elasticity can be obtained by multiplying the coefficient by the sample mean of the regressor, $\beta \cdot \bar{x}_{sjt}$.

[27] See ROSENTHAL and STRANGE (2004) for a review of this literature.

[28] If the variable x_{sjt} is expressed in logs, the average marginal effect can be obtained as $\beta \cdot (\bar{n}_{sjt} / \bar{x}_{sjt})$ where $\bar{n}_{sjt}$ is the sample mean of the dependent variable.

[29] The correlation between overall expenditure per capita and the tax rates is around 16% and 24% for the business and the property taxes, respectively.

[30] Euclidean distances between the centres of activity of municipalities have been computed.

[31] See Section 3.1 for a definition of small and large firms.

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Table 1. Number of new establishments and municipalities by year.

Variable	1996	1997	1998	1999	2000	2001	2002	2003
New establishments (all)	1319	1664	1733	1065	1175	926	1127	1163
New establishments (small)[1]	567	620	716	432	441	392	380	368
New establishments (large)[2]	751	1,032	1,009	626	734	524	731	765
Municipalities	259	396	414	412	410	636	631	631

Notes: 1. Small (1-3 workers). 2. Large (≥ 4 workers). 3. Employment data is missing for those new establishments not included in either of the two categories.

Table 2. Definition of municipal variables. Data sources and descriptive statistics

Variable	Definition	Data sources	Mean (st. dev.) 1999	Mean (st. dev.) Increase 1995-2002[1]
Business tax rate; τ_j^b	Municipal coefficient to be applied to a presumed firm-specific level of profits	Ministry of economics[2]	1.357 (0.187)	0.074 (0.105)
Nominal property tax rate; t_j^p	Nominal property tax rate	Property Assessment Office	0.567 (0.154)	0.059 (0.100)
Assessed value per unit of surface; v_j	Mean of the ratable value of buildings	Property Assessment office	20.898 (14.388)	5.034 (5.711)
Property tax rate; τ_j^p	$t_j^p \cdot v_j$	Property Assessment office	12.145 (8.486)	4.097 (3.349)
Manufacturing employment; m_j	ln of workers employed in manufacturing activities	Social Security Register	4.128 (2.317)	0.213 (0.838)
Non-manufacturing employment; se_j	ln of workers employed in non-manufacturing activities	Social Security Register	4.462 (2.173)	0.596 (0.524)
Diversity index; d_j	ln of the inverse of a *H-H* index of sectoral concentration	Social Security Register	4.890 (2.957)	0.064 (1.789)
Manufacturing ratio of labor to buildings surface; L_j/N_j	Manufacturing workers over square meters of industrial buildings	Catalan Institute of Statistics & Social Security Register	0.053 (0.177)	0.019 (0.099)

Notes: 1. Changes in municipal attributes within municipalities between 1995 and 2002.

2. Municipal yearbooks (1995-1999) and database (2000-2002).

Table 3.-Location determinants. Poisson Maximum Likelihood estimates. Dep.Variable is the count of new establishments of industry s in municipality j and time period $t+1$ (n_{sjt+1}).

Variable	[1]	[2]	[3]
(i) Local tax rates			
Business tax rate: τ^{b}_{jt}	-0.387 (-4.67)***	-0.249 (-3.24)***	2.643 (36.39)***
Property tax rate: τ^{p}_{jt}	-0.011 (-4.90)***	-0.009 -(2.55)***	-0.012 (6.09)***
(ii) Agglomeration economies			
Own manufacture employment: o_{sjt}	0.403 (34.89)***	0.416 (41.06)***	-.- -.-
Manufacturing employment: m_{sjt}	0.248 (12.04)***	0.190 (11.09)***	-.- -.-
Non-manufacturing employment: se_{jt}	0.124 (7.29)***	0.135 (9.53)***	-.- -.-
Diversity index: d_{jt}	0.224 (5.36)***	0.261 (6.67)***	-.- -.-
Rent of buildings: $L_{sjt} / N_{jt}, \forall s$	Yes	Yes	Yes
Local Labor Market Dummies	Yes	No	Yes
No. Dummies ($s \times t \times l$)	1,520	142	1,520
Log-likelihood	-13,564	-14,585	-16,538
No. Observations	21,914	21,914	21,914

Notes: 1. Figures in parenthesis are *z*-statistics. 2. *, **, ***: statistically significant at the 90%, 95% and 99%, respectively.

Table 4.-Robustness analysis**.** Poisson Maximum Likelihood estimates. Dep.Variable is the count of new establishments of industry *s* in municipality *j* and time period *t+1* (n_{sjt+1}).

Variable	[4]	[5]	[6]
(i) Local tax rates			
Business tax rate: τ^{b}_{jt}	-0.399	-0.388	-0.559
	(-4.127)***	(-4.350)***	(-6.888)***
Property tax rate: τ^{p}_{jt}	-0.009	-0.007	-0.022
	(-3.023)***	(-3.054)***	(-9.730)***
(ii) Own manufacture employment: o_{sjt}			
Own municipality	0.397	0.398	0.394
	(30.488)***	(34.079)***	(34.451)***
Up to 10 km	-.-	0.181	-.-
	-.-	(8.871)***	-.-
10 to 20 km	-.-	0.034	-.-
	-.-	(1.047)	-.-
(iii) Manufacturing employment: m_{sjt}			
Own municipality	0.261	0.285	0.184
	(11.145)***	(13.677)***	(9.825)***
Up to 10 km	-.-	-0.436	-.-
	-.-	(-11.660)***	-.-
10 to 20 km	-.-	-0.027	-.-
	-.-	(-0.407)	-.-
(iv) Non-manufacturing employment: se_{jt}			
Own municipality	0.115	0.106	0.148
	(5.938)***	(6.031)***	(8.780)**
Up to 10 km	-.-	0.153	-.-
	-.-	(5.435)***	-.-
10 to 20 km	-.-	-0.095	-.-
	-.-	(-2.515)**	-.-
(v) Diversity index: d_{jt}			
Own municipality	0.232	0.251	0.272
	(4.939)***	(5.872)***	(6.798)**
Up to 10 km	-.-	0.220	-.-
	-.-	(2.644)**	-.-
10 to 20 km	-.-	0.496	-.-
	-.-	(3.412)***	-.-
Ln of expenditure per Capita	0.026 (0.450)	-.-	-.-
Density of population	-.-	-.-	-5.677 (-2.497)**
Rent of buildings: $L_{sjt} / N_{jt}, \forall s$	Yes	Yes	No
Local Labor Market Dummies	Yes	Yes	Yes
No. Dummies $(s \times t \times l)$	1,295	1,520	1,519
Log-likelihood	-10,844	-13,426	-13,571
No. Observations	17,861	21,914	21,691

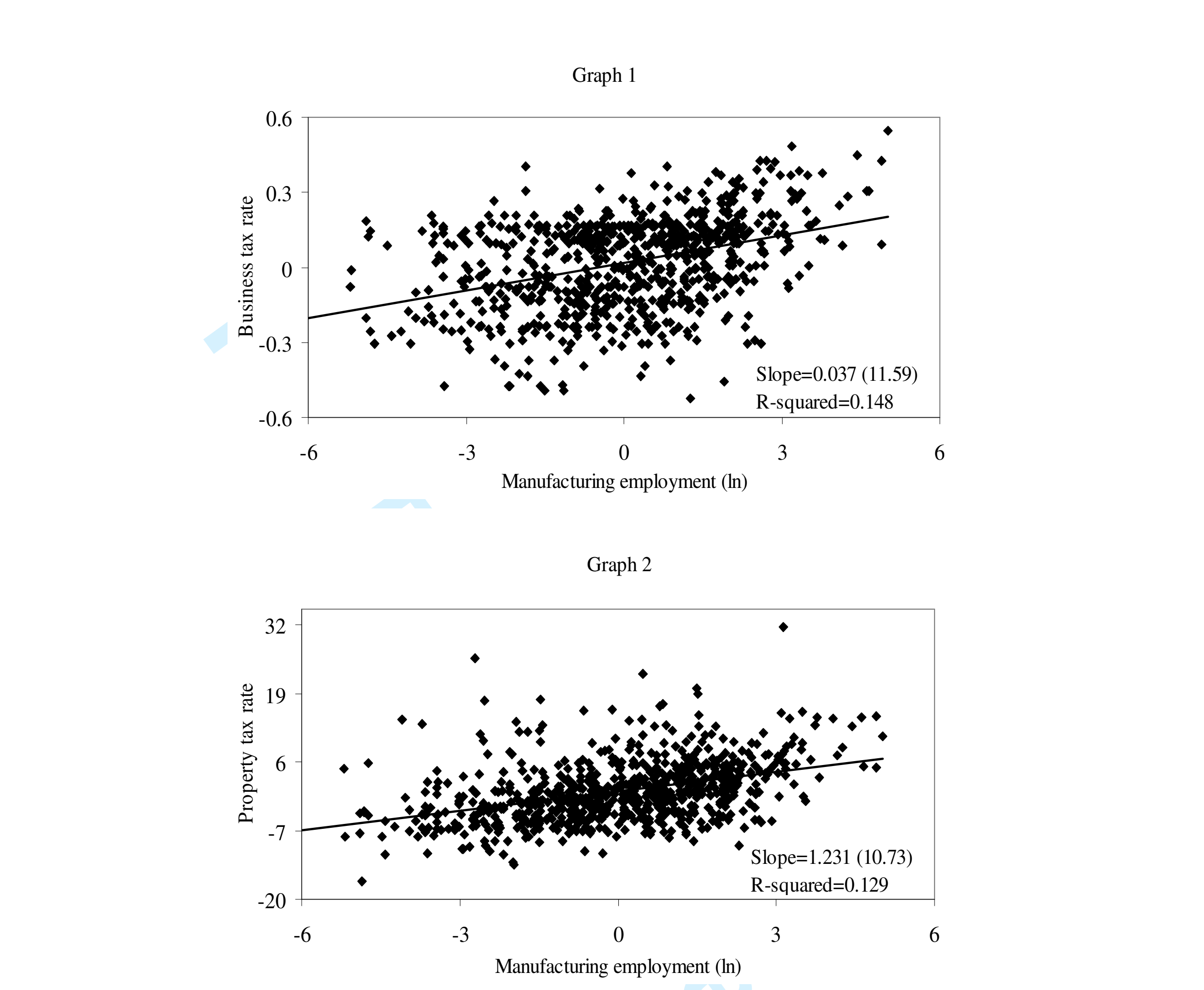
Notes: 1. Figures in parenthesis are *z*-statistics. 2.*, **, ***: statistically significant at the90%, 95% and 99%, respectively.

Table 5.-Location determinants for small and large establishments.
Poisson Maximum Likelihood estimates. Dep. Variable is the count of new establishments of industry *s* in municipality *j* and time period *t+1* (n_{sjt+1}).

Variable	Small [7]	Large [8]	Small [9]	Large [10]
(i) Local tax rates				
Business tax rate: τ^{b}_{jt}				
Business pre-reform (1996-2002)	-0.559 (-4.08)***	-0.237 (-2.13)**	-.-	-.-
Pre-election (1996-2000)	-.-	-.-	-0.599 (-4.06)***	-0.134 (-1.15)
Post-election (2001-2002)	-.-	-.-	-0.426 (-1.86)*	-0.562 (-3.12)**
Business post-reform (2003)	-0.332 (-1.02)	-0.607 (-2.82)***	-0.329 (-1.01)	-0.612 (-2.84)***
Property tax rate: τ^{p}_{jt}	-0.012 (-3.14)***	-0.012 (-4.16)***	-0.011 (-3.10)***	-0.012 (-4.25)***
(ii) Agglomeration economies				
Own manufacture employment: o_{sjt}	0.342 (17.93)***	0.437 (29.84)***	0.342 (17.93)***	0.437 (29.84)***
Manufacturing employment: m_{sjt}	0.146 (4.63)***	0.315 (11.51)***	0.146 (4.63)***	0.315 (11.52)***
Non-manufacturing employment: se_{jt}	0.245 (9.06)***	0.048 (2.14)*	0.244 (9.01)***	0.050 (2.22)**
Diversity index: d_{jt}	0.339 (4.95)***	0.165 (3.081)*	0.340 (4.96)***	0.164 (3.07)*
Rent of buildings: ($L_{sjt} / N_{jt}, \forall s$)	Yes	Yes	Yes	Yes
Local Labor Market dummies	Yes	Yes	Yes	Yes
No. Dummies ($s \times t \times l$)	1,022	1,140	1,022	1,140
Log-likelihood	-6,898	-9,693	-6,898	-9,691
No. Observations	18,010	19,558	18,010	19,558

Notes: 1. Figures in parenthesis are *z*-statistics. 2.*, **, ***: statistically significant at the 90%, 95% and 99%, respectively.

Figure 1. Correlations between tax rates and manufacturing employment.



Notes: Data are referred to year 2000 and variables are expressed in deviations from the local labor market mean.