

THE IMPORTANCE OF LOCAL CORPORATE TAXES IN BUSINESS LOCATION DECISIONS: EVIDENCE FROM FRENCH MICRO DATA*

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Determinants of businesses locations are known to be multiple. Locations of partners and competitors are crucial, as well as the territory's local characteristics. To consider the importance of local taxes we build a Poisson model to explain the number of business creations observed in a given municipality. First results suggest that there are unobserved factors driving firm creation that are positively correlated with the level of local taxes. To deal with this potential source of endogeneity, we present an approach close to Regression Discontinuity Design. We find that, everything else being equal, higher local taxes actually tend to deter firms from setting up in a given zone but the effect is weak.

Is the impact of corporate taxes on business location decisions significant at a local scale? Understanding the factors involved in business location decisions is a key issue for regional policy and planning. The literature on this topic mainly emphasises the role of agglomeration effects. Guimarães *et al.* (2003), Crozet *et al.* (2004) or Cohen and Paul (2005) attempt to model and estimate these spillover effects: firms tend to set up plants in locations where other plants are already present as they expect positive externalities. Some works, e.g. Charlot and Paty (2006), even show that some local authorities benefit from these situations by increasing taxes in those locations where many plants have already set up: they call this phenomenon an agglomeration effects' taxable rent.

Depending on the geographical, economic, social and financial environment, a local authority sets the tax rate on plant activity and then accepts the consequences of this decision in terms of employment and tax revenues. Setting the appropriate tax rate to attain the optimal level of business activity is a crucial matter for most local authorities. France is divided into 36,707 municipalities.¹ Each of them is allowed to choose a specific tax rate that operates directly on a tax base. The 36,707 municipalities are grouped into 96 departments, which are themselves subdivisions of 22 regions. Both departments and regions have the right to raise taxes on the same base as muni-

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¹ Hereafter, we use the English term of 'municipality' for the French 'commune'. It is the smallest administrative unit to which some of the State's power is delegated. Notably, municipalities are allowed to raise taxes.

cialities. At each level, there is potentially some competition between the different authorities as they all generally aim at attracting new plants to their territories (both for employment and tax revenue reasons).

The goal of this article is to quantify the impact of local business taxes on firms' decisions to set up a new business. In 2004, local business taxes amounted to 9% of government tax income. Together with taxes on properties and inhabitants, such local taxes represent much more than 20% of the French tax income (social contributions excluded). Their economic effect is therefore far from negligible.

Empirical research on factors determining business location decisions started with personal interviews with business executives. In Katona and Morgan (1952) and Mueller and Morgan (1962), manufacturers were asked to list the local factors which influenced their choice of a particular business location. The factors most cited were labour cost and availability, proximity to markets and materials, and taxes. Even more interesting is the difference between the responses given for 'locating plant in Michigan' (the state in which the poll was conducted) compared to 'locating plant at particular site', which clearly separated out long-distance from short-distance determinants. First, the answer 'better tax situation' was hardly ever cited in the long-distance case, whereas it was more often cited in the short distance. Second, the tax situation is more important to firms possessing more plants. Third, the answers 'personal reasons', 'chance' and 'opportunity' represent more than half of the total answers.

Carlton (1983) and Bartik (1985) were two of the first econometric attempts to estimate local determinants of business location decisions. These early papers differed in their conclusions: the former suggesting that such factors are of limited significance, while the latter points to a strong impact of local business taxes on activity location. In the French context, the important study of Schneider (1997) gave an overview of the tax on plants and establishments and concluded that this tax did not play a notable role in firms' location decisions. Holmes (1998) dealt with the effects of state policies on manufacturing firms locations in the US. Interestingly, he used a regression discontinuity design to solve endogeneity problems. He found that manufacturing's share of total employment was significantly increased when one crossed the border from an anti-business state to a pro-business state. More recently, using UK micro-data, Durlanton *et al.* (2006) estimated the impact of local taxes on both local employment and business entries. They reach identification through spatial difference and instrumentation. Their results suggested that taxes have a significant negative impact on employment but no effect on entries.

A closely related and more abundant literature has tackled the impact of taxation of foreign direct investments. Hines (1996) offered a particularly convincing identification framework. Comparing investments from countries that provided foreign tax credits on FDI income with those that did not, he was able to control for local unobservable determinants of business location. Although somewhat fragile,² his results concluded that high state tax rates actually hindered local investment. Devereux and Griffith (1998) investigated the factors that influenced the location decisions of multinational firms by means of an estimated structural model. They found notable

² He admits that the estimates are no longer significant when the five zero-tax states are excluded from the sample.

agglomeration effects and also quantitatively significant effects of national business tax.³

In this article we demonstrate that a regression discontinuity design, combined with appropriate instrumentation, is needed to get rid of confounded factors and endogeneity of tax decisions. Using these methods, we show that local corporate taxes are important when it comes to plant location decisions and we quantify the impact of a tax differential between two close municipalities. We find that the effects of a higher tax rate are significant, such that increasing the tax rate differential by one percentage point will increase the probability of a firm setting up in the lower taxed municipality by around one percentage point.

Naive methods may be used to study the link between local determinants of business location and business entries. Estimating a count data model on municipalities provides us with apparent estimates of the elasticity of the number of plant creations for each determinant. However, Baldwin and Krugman (2004) recall that the existence of agglomeration effects undermines the relevance of such a method. Because municipalities where industries are already settled are more attractive to new creations, they can afford to fix higher corporate tax rates. Thus, naive correlations between tax rates and plant creations are likely to be positive. Obtaining unbiased estimates requires more sophisticated methods. In this article, we use the institutional discontinuities to reach identification. Departments and regions are separated by boundaries across which corporate tax rates are discontinuous. Using a regression discontinuity design, we manage to isolate the impact of the sole corporate tax on the number of new businesses and to compute unbiased estimates.

The remainder of the article is structured as follows: Section 1 briefly evokes the theoretical context of our work. Section 2 provides some information about the French local corporate tax system and presents the data. Section 3 presents the results of a basic approach, estimating a count data model proxying for agglomeration effects and controlling for other factors. Section 4 discusses how using geographic discontinuities helps to identify tax effects and presents the results of a consistent estimation of the impact of local business taxes on the number of businesses creations. In Section 5, we present our conclusions.

1. Theoretical Context

Abundant theory has been developed on the plant-location problem. A plant should be sited close to its markets and also to its business partners. However, being a single entity only one spot can be chosen. Facing a plane where markets are geographically distributed, the location of the plant has to be chosen so as to minimise a weighted sum of distances to these markets. This problem, known as the Weber or Steiner-Weber problem, bred a rich and technical literature in the seventies and the early 1980s.⁴

³ However, this result is balanced by another one, according to which the effective average tax rate does not play any significant role in the choice between producing in Europe, as opposed to either exporting to Europe or not serving the European market at all.

⁴ See, for example, Wright (1971), Wendell and Hurther (1973) or Hansen *et al.* (1980). Also, see Francis and Goldstein (1974) for a selected bibliography.

In another strand of literature, McClure (1970) develops one of the first theories for the locational impact of tax policy. In his general equilibrium model, he assesses the impact of local taxation on production factors (capital and labour flows). He considers three different types of taxes: a production tax, a capital tax and a labour tax. He concludes that taxing production always repels capital, whereas taxing either labour or capital may attract the untaxed factor through substitution effects. The similarity between the approach of McClure's and that of the Weber-problem theorists' is remarkable: with both aiming to identify the impact of the environment (either strategic or fiscal) on plant location decisions.

These kinds of models have two main drawbacks. Firstly, no account was taken of other factors, such as labour availability, or labour cost. Moreover, taxes are omitted in the Weber problem and strategic interactions in McClure (1970). Secondly, their solutions are by nature out of equilibrium, as other agents may attempt to react to distort firms' decisions. However, as underlined by Ottaviano and Thisse (2004), modern location theories owe much to these classical approaches.

Two main strands of literature attempted to address these issues.

- The fiscal competition literature adopts the view that the local jurisdiction competes with its neighbours to attract business. For instance, Zodrow and Mierkowski (1986), Wildasin (1998, 1991), Wilson (1991) study the behaviour of neighbouring jurisdictions which aim at optimising their tax income in a non-cooperative game.⁵ The local tax generates an income which is used to finance the production of a public good. A decrease in the tax rate reduces the jurisdiction income but might lead to an increase in the tax base, as some firms might be attracted by this tax rate reduction. However, when a jurisdiction reduces its tax rate, neighbouring jurisdictions become relatively less attractive and are incited to cut tax rates as well. At the end of the day, these tax cuts may be harmful to the global welfare. The fixing of the whole set of jurisdictions' tax rates is then modelled as a Nash equilibrium. If the *ex ante* capital productivity or the labour endowment is not uniform across territories, the equilibrium spatial pattern of tax rates is likely to be uneven as well. The unevenness of tax rates thus reflects the irregular pattern of various factor productivities, as well as the location of fixed factors.
- The New Economic Geography emerges as an attempt to bring back agglomeration into the game. Seminal papers, e.g. Krugman (1991) and Venables (1996), emphasise the prevalence of agglomeration forces over other determinants. The presence of increasing returns and monopolistic competition à la Dixit-Stiglitz creates pecuniary incentives for firms to cluster. Endogenising agglomeration forces has a cost. Whereas the Weber problem was solved on the whole plane, New Economic Geography only models discrete choices, most often between two regions.

Finally, these two literature strands have tended to merge. Thus, Janeba (1998), Ludema and Wooten (2000), Andersson and Forslid (2003), Baldwin and Krugman

⁵ Houdebine and Schneider (1997) derive a similar model in application to the French situation.

(2004) or Borck and Pflüger (2004) gather elements of both strands:⁶ endogenous agglomeration effects are proved to prevail while endogenous reactions of local jurisdictions take into account firms' behaviour. As there is a rent for firms to gather, jurisdictions take advantage of it and raise local taxes.

In this article, we want to measure the impact of local taxes on plants' location decisions. Everything else being equal, what impact would altering a municipality's local business tax rate have on attracting business? What we learned from theory is that, because local jurisdictions react to business location decisions, agglomeration forces are likely to bias our estimates. In what follows, we will consider that at a large scale, the location choice is made, according to new economic geography principles, considering agglomeration effects, market power, factors endowments and factors costs. At a smaller scale, however, other determinants, like taxes, may be taken into account. Our strategy will therefore be to separate taxes from other determinants and notably from agglomeration effects.

2. Institutions and Data

2.1. *Local Corporate Taxes*

In this study we use an exhaustive dataset of local business tax rates available from 1993 to 2004. Local business taxes were created in their modern form in 1975. Since then, several reforms have modified both the tax base and the tax rate decision rules. From the creation of the local business tax in 1975 to 1999, the tax base included both the value of tangible fixed assets and 18% of the gross wages. From 1999 to 2003, gross wages were gradually excluded from the tax base. The narrowing of the base was offset by an increase in tax rates so that it did not result in a drop in tax revenues.

For large establishments, the value of tangible fixed assets includes mainly the value of the machines used in the production process. Thus, the local business tax appears mainly (at least in the past few years) as a capital tax. Upper and lower limits, dependent on the firm's value added and turnover, were also enforced to bound the tax amount:

- 1 The tax amount must not exceed an upper limit (which is between 3.5 and 4.0% of the value added); the top rate depends on the holding sales turnover (3.5% for firms whose turnover is smaller than € 21 million, and 4.0% for a sale turnover larger than € 76 million net of taxes); this last rate has been standardised to 3.5% since 2006; the municipality tax rate variation is also much more constrained after 2004.
- 2 Since 2001, a threshold of 1.5% (versus 0.35% in 1998) has been fixed for the fraction of tax in the value-added for companies whose sales turnover is larger than € 7.6 million. The latter boundary is computed with respect to the tax base of the main establishment.

Local authorities may also grant a two-year tax exoneration for a specific new establishment, if the latter is located in a zone selected by the government to benefit

⁶ Riou (2006) builds on this literature and adds vertical competition between nested jurisdictions in a economic geography framework.

from this kind of policy. Eligible zones are usually economically depressed zones (suffering from high unemployment or low investment) where new plants are welcome.

Finally, it is important to mention the existence of an equalisation mechanism aimed at reducing competition among municipalities: if a municipality's tax rate is significantly lower than the national mean tax rate, then establishments located in that municipality must pay an additional tax to an equalisation fund. The product of the fund is shared according to the tax levels of the local authorities. Moreover, municipalities are allowed to tax inhabitants and may substitute the tax on establishments by inhabitant taxes. This possibility is strictly limited by a proportionality mechanism with respect to past rates.

The law of July 12th, 1999 allows municipalities to gather and share their tax policies by forming institutions called municipality associations. While municipalities devolve some powers to municipality associations, they are compensated by gaining higher decision-making power over urban or rural planning matters. They also benefit from increased bargaining power and are more credible actors on the local political scene.

A local corporate tax is raised at every level: municipality, department and region. The total tax rate is the sum of the municipal rate plus those of the department and the region. Figure 1 displays the total tax rate that affects establishments located at any given spot in French territory (after a kernel smoothing).

This map shows an interesting pattern: in some areas, such as the Central Eastern France, tax rates are very low, whereas in some others, like the Mediterranean coast, tax rates are higher. It also raises the issue of the spatial autocorrelation of the tax rate (taken as a spatial process): how spatially 'persistent' is the tax rate? The autocorrelation function for the municipality tax rate⁷ is strongly decreasing. At a distance of 4.4 km, which is the average diameter of a municipality, autocorrelation equals 0.13. At twice the distance, it falls to 0.05. Of course, adding region and department components to the municipality rate makes the total tax rate much more spatially persistent.

As the total tax paid by a company is divided into three components – municipality, department and region – one may wonder whether these parts are positively or negatively correlated. We find that, for all years, all these components are strongly correlated. On average, municipality and departmental tax rates are correlated with a coefficient of 0.34. Departmental and regional tax rates are even more strongly correlated, with a coefficient of 0.69.

These correlations can be explained in a number ways. Game theorists may interpret it as a behaviour of cooperation; see e.g. Jayet *et al.*, (2002). Proponents of new economic geography theories would see agglomeration as the driving force of the co-movement of all local authorities. Thus, where an area is exceptionally attractive, it is likely that the municipality, department and region will all take advantage of this situation to levy higher tax rates.

⁷ An isotropic autocorrelation function was computed for the municipality tax rate in 2002. Details of the method and additional results are given in Rathelot and Sillard (2006).

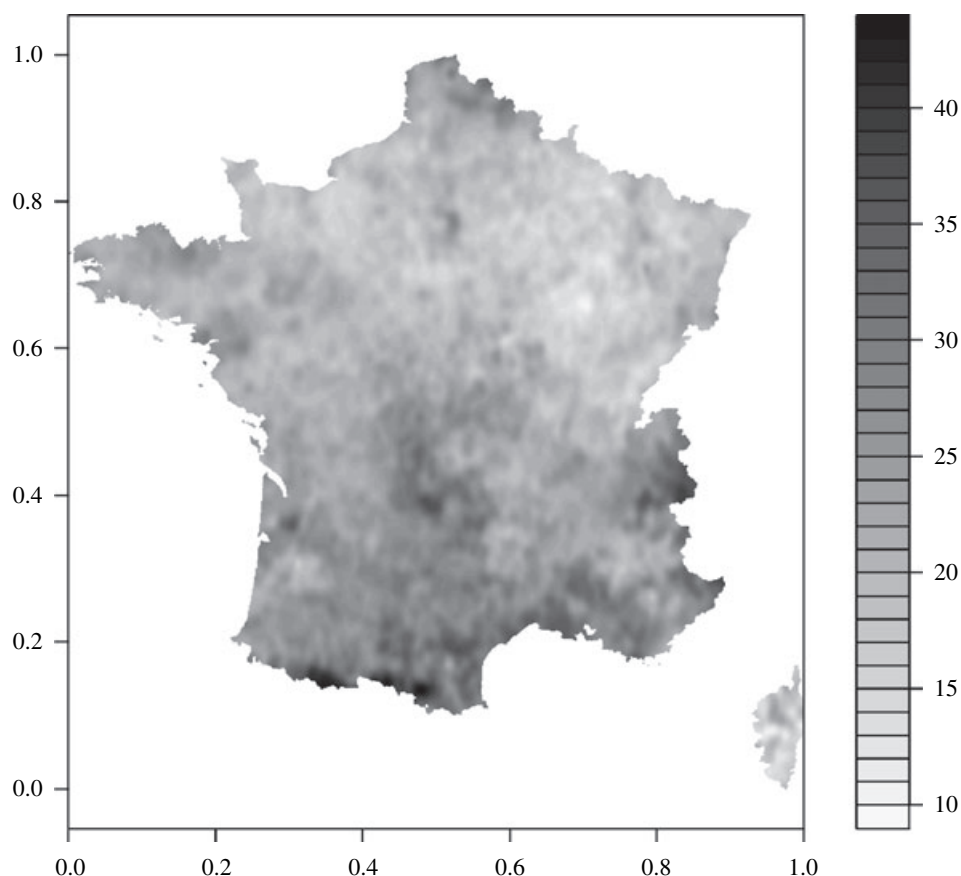


Fig. 1. *Smoothed Total Tax Rate*

Notes. This Figure shows the average total tax rate in a given municipality, smoothed with a 20 km-window kernel. The total tax rate is the sum of all components of local tax rates: the sum of the municipality, local association, departmental and regional tax rates. In the legend, tax rates are in percentage points. As indicated in the legend, the darker the area, the higher the average local tax rate.

2.2. *Firm and Plant Data*

In addition to such local tax data, we have merged individual information on plants and firms from the 'SIREN firms directory' database, available at INSEE, and the DADS ('Déclarations annuelles de données sociales'). The first database is the official register of French firms and establishments. For each establishment, it provides its national identification number (SIREN number), its relevant municipality, as well as its creation date. The DADS are administrative declarations used to record workers' pension rights. This database was developed to ease the collection of labour taxes. It contains information on employees: their wages, the establishment they work and the yearly amount of working hours. This database makes it possible to compute a yearly full-time equivalent number of employees per establishment accurately. The stock of establishments located in a given municipality as well as the number of creations are available each year between 1993 and 2004. We only considered existing establishments whose

Table 1
Summary Statistics

Variables	Values
Number of municipalities	36,707
Number of municipalities with at least one creation	22,248
Number of municipalities with at least one large plant creation	7,356
Total number of creations	390,747
Average number of creations per year	35,522
Total number of large plant creation	49,962
Number of creations per municipality and year (if some), Q1	1
Number of creations per municipality and year (if some), median	1
Number of creations per municipality and year (if some), Q3	3
Stock of plants per municipality and year (if some), Q1	7
Stock of plants per municipality and year (if some), median	24
Stock of plants per municipality and year (if some), Q3	66
Total tax rate, Q1	16.51
Total tax rate, median	20.26
Total tax rate, Q3	24.76
Department plus region tax rate, Q1	8.24
Department plus region tax rate, median	9.10
Department plus region tax rate, Q3	10.26

Notes. Q1 and Q3 are the first and third quartiles respectively. Large plants designate the plants whose number of employees is larger than 10 the year after the creation (full-time positions). Paris is excluded from the statistics.

number of employees is larger than zero, and creations whose number of employees is larger than zero one year after their creation. Holmes and Stevens (2004) emphasise that the plant size is an important characteristic to understand which determinants drive location decisions. We tested the robustness of our results, on establishment subsamples of different sizes and industries.

Table 1 provides some summary statistics for the main covariates.

3. Basic Approach

The standard approach to infer the effects of local determinants on the number of plants is simply to run the regression of the latter on the former. Because we deal with count data, we will not consider OLS but rather count data models, like Poisson or Negative Binomial models. N_{kt} is the number of plant creations and $\mathbf{x}_{kt}$ are observable determinants relating to municipality k during year t . The probability of N_{kt} being equal to $n \in \mathbb{N}$ is a function (depending on which count data model is considered) of the $\mathbf{x}_{kt}$ and on the coefficient vector $\boldsymbol{\beta}$ we wish to estimate.

$$\mathbb{P}(N_{kt} = n) = \mathcal{F}(\mathbf{x}_{kt}\boldsymbol{\beta})$$

The quality of the estimation of the $\boldsymbol{\beta}$ parameters depends on which variables are included in the regression. If one were able to observe perfectly every determinant of plant location and to isolate, for instance, agglomeration from taxes, the $\boldsymbol{\beta}$ would be consistently estimated. The problem is that it is very difficult to obtain more than a proxy for agglomeration forces and that some notable attractivity factors may be omitted. This induces a potential bias in our estimates.

Table 2
Spatial Poisson Regression

Covariates	Estimates – 1994–2004	
	(1)	(2)
Total tax rate	0.0103** (0.0003)	0.0063 (0.0005)
1994–2004 year dummies	yes	yes
Stock ($T-1$)	yes	yes
Municipal infrastructure inventory	yes	yes
Number of observations	81,582	21,660

Notes. **indicates 99%-significant. Standard errors are in parentheses. The stock variable is transformed into a Poisson intensity such that, if the distribution of new creations were the same as the one leading to the actual stock, all the other regression coefficients should be equal to zero. Its coefficient is constrained to be one.

Dependent variable: number of plant creations per year and municipality; (1): whole sample; (2): department boundary sample.

We observe the number of plant creations during each year between 1994 and 2004 in each French municipality. Therefore, the number of observations amounts to $36,707 \times 11 = 403,777$ for each regression. Some observations are lost as some explanatory variables are not available in every municipality for the whole period. However, we checked that none of the municipalities where a plant creation occurred between 1994 and 2004 had been removed.

Results of Poisson regressions are shown in Table 2. The first regression refers to the whole sample: every establishment creation in every French municipality. The second one focuses on a subset of municipalities which are located on the border of a department. The construction of this subsample is detailed in the next Section. Results of this subsample are presented here in order that they can be compared with additional analysis presented in the next Section.

In these regressions, we have introduced local tax rates and time dummies. Moreover, as municipalities are heterogeneous, it is necessary to control for their size. As a size proxy, the lagged count of establishments has been included in all the regressions. We have also introduced some additional variables to attempt to catch some of the heterogeneity present in municipalities' infrastructure: distance to the closest motorway entrance, existence of an enterprise zone, existence of a college, a sport centre, a library, a post-office, etc.

The results suggest that there is a positive and significant correlation between the total tax rate and the number of plant creations. This result is robust to sample changes: the whole sample and the subsample restricted to municipalities around the departments' boundaries both have this feature. This observation is predicted by theory, and shows that introducing proxies for agglomeration effects or infrastructure is not sufficient. We may draw two conclusions at this stage. First, classical Poisson regressions are clearly not the correct way to infer causal relationships between taxes and firms' behaviour. Secondly, a method attempting to tackle this issue must solve sound endogeneity problems, due to territories' unobserved characteristics and local authorities' reactions in front of an agglomeration rent.

4. Consistent Estimation of the Impact of Local Taxes on Plant Creations

4.1. Estimation Strategy: A Regression Discontinuity Design

Administrative boundaries are appealing discontinuities to attempt to deal with endogeneity. The framework presented in this subsection is close to the regression discontinuity design.⁸ Considering a boundary j separating two departments, we build a sample of municipalities belonging to a narrow ribbon S_j around boundary j .⁹ Figure 2 illustrates the construction of the ribbons for the Parisian region.

Table 3 shows some summary statistics relating to the sample of observations used in the RD framework.

Suppose that Π_{ik} is the profit firm that a firm can achieve through establishing its new plant i in municipality k . We assume it can be written as:

$$\Pi_{ik} = c + \tau_k \beta + X_i + A_k + \varepsilon_{ik} \quad (1)$$

The profit is the sum of a constant, a component relating to the total tax τ_k times an unknown coefficient β , a component intrinsic to plant i (X_i), a component relating to a composite factor – denoted A_k – including all other relevant local characteristics of location k , and finally, a random component corresponding to the cross dependency (i, k) excluding all effects already captured by previous components. All these variables depend implicitly on time through the date of the plant creation. The composite factor A_k can be split into parts: the municipal part A_k^m takes into account factors dedicated to

Table 3
Summary Statistics on the Sample Used in the RD Framework

Variables	Values
Number of municipalities	8,682
Number of municipalities with at least one creation	5,455
Number of municipalities with at least one large plant creation	17,051
Total number of creations	131,728
Average number of creations per year	11,975
Total number of large plant creations	17,051
Number of creations on the lowest total tax rate side	57,376
Total tax rate differential, Q1	2.09
Total tax rate differential, median	4.78
Total tax rate differential, Q3	8.16
Department plus region tax rate differential, Q1	0.63
Department plus region tax rate differential, median	1.24
Department plus region tax rate differential, Q3	2.44

⁸ Black (1999) used an application of the regression discontinuity design to estimate parents' valuation of elementary education quality. The regression discontinuity design has been further formalised in Hahn *et al.* (2001).

⁹ The ribbons and all the municipalities concerned are computed using a Geographic Information System (Map Info) and a geographic database (Route 500 from Institut Géographique National) containing all administrative contours of regions, departments and municipalities. Around each boundary j , we build a narrow buffer of width 1 km (thus 500 m inside each department). When the buffer intersects a municipality, the municipality is selected in the ribbon S_j . When the intersection of the 1 km-width buffer and a municipality is null, then this municipality is not selected in the subsample.

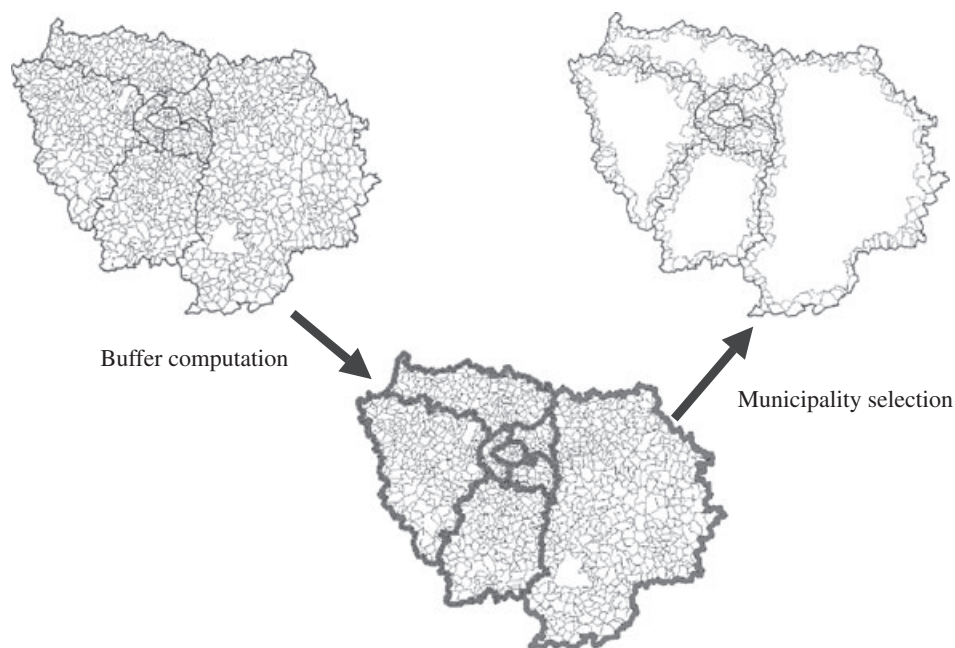


Fig. 2. *Ribbon Selection*

Example of a 1 km-width buffer computed around the department boundaries of the Parisian region and the subsequent selection of municipalities which intersect the buffer

firms setting up within the boundaries of the municipality (this may include facilities granted by the mayor. . .) whereas the local part A_k^l contains factors accessible from any municipality, provided they are close enough (road infrastructure, for instance). Considering two neighbouring municipalities k and k' , separated by a department boundary, the plant i will be set up in k if Π_{ik} exceeds $\Pi_{ik'}$. Let us consider the decision of a firm i to locate in either municipality k or municipality k' , the closest one on the other side of boundary j as presented in Figure 3.

We model this decision through a binary variable Z_{ik} which takes the value 1 if plant i chooses to setup in municipality k , where k designates the municipality where the tax rate is the smallest of the two rates involved in the considered couple.¹⁰ In a probit framework, the decision to locate in k is given by:

$$\mathbb{P}(Z_{ik} = 1) = \Phi[(\tau_k - \tau_{k'})\beta + (A_k^m - A_{k'}^m)], \quad (2)$$

where Φ is the – normal – cumulative distribution function of the random variable $\varepsilon_{ik} - \varepsilon_{ik'}$. In (2), there only remain two elements: the total tax rate and the factors driving business creation that are conditional on locating in the municipality.

Spatial difference eliminates some of the problems but not all of them. At this stage, estimating (2) consistently is still uncertain. First, A_k^m may be proxied but only imperfectly, as demonstrated in the previous Section. Thus, some unobserved factors may

¹⁰ This presentation is based on that of Duranton *et al.* (2006), even though our assumptions, as well as our identification strategy differ from that used by these previous authors.

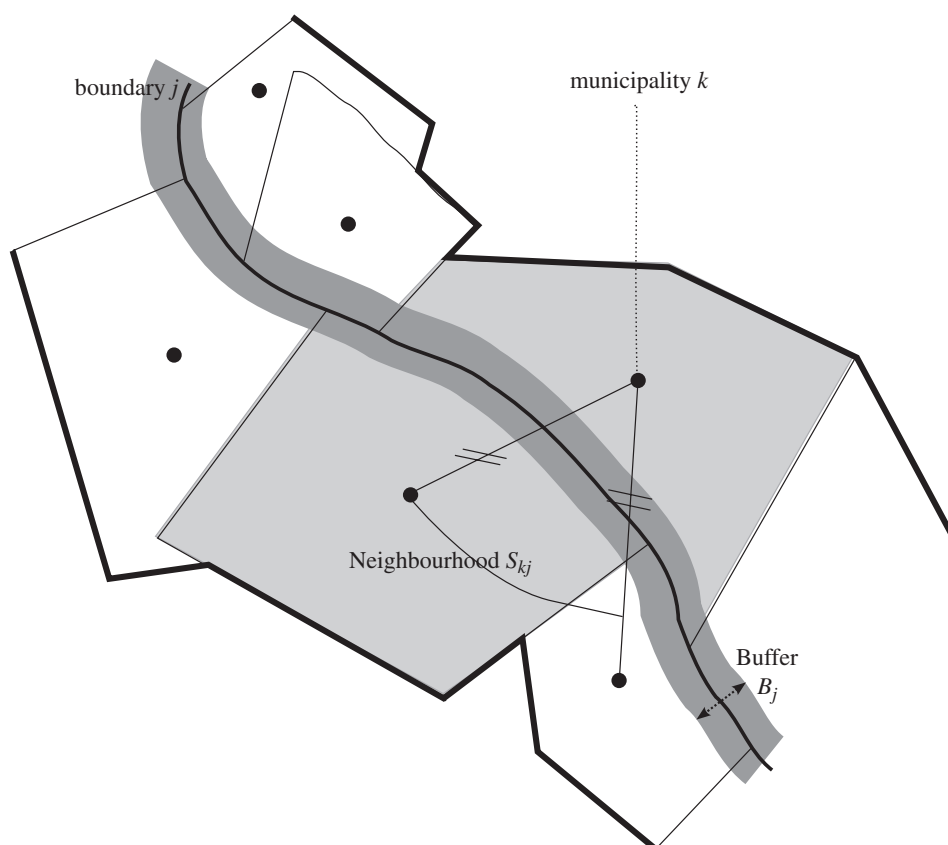


Fig. 3. *Regression Discontinuity Framework and Neighbourhoods*

Note: A 1 km-wide buffer is defined around a boundary j that separates two departments; this buffer intersects some municipalities on both sides of the boundary; considering municipality k , a neighborhood of municipality k is defined as the set containing municipality k and the closest municipality located on the other side of the boundary.

remain in the residual. Then, it is likely that the municipal tax rate decisions are influenced by these factors. In this case, endogeneity occurs and identification is not reached.

We solve this problem by instrumenting the total tax rate differential in (2) by the sum of departmental and regional tax rates. How good is this instrument? First, OLS regression reveals that a clear and significant relationship exists between the difference in the total tax rates across the boundary and the difference in the departmental and regional tax rates.¹¹ Thus, the instrument cannot be suspected of weakness. Then, because there are more than 300 municipalities in each department and more than 1000 in each region, we believe that departmental and regional tax rate decisions are exogenous to municipality-specific business-driving factors. These two properties make it a good instrument for the total tax rate. For the sake of efficiency, we estimated the model by full maximum likelihood, assuming joint normality in residuals.

¹¹ This fact is confirmed by the joint full MLE results; see next Section.

4.2. Results

The regression is of probit type, reproducing the binary decision taken by firm i to locate its new establishment on one side or the other of the boundary j . The observations are available for the whole period between 1993 and 2004 (index t).

Table 4 presents the estimation results. In the first two columns, point estimates and average partial effects are reported for the naive probit estimation. In the next two columns, point estimates and average partial effects are reported for the IV probit estimation, where total tax rates differential across the boundaries are instrumented by the sum of the department and region tax rates differential. For the sake of conciseness, coefficients corresponding to the instrumentation equation are not reported in the article. Depending on the specification, point estimates relating to the instrument vary between 0.8 and 1.1. Over all samples but a few corresponding to less numerous industry subsamples, these coefficients are statistically significant at the level of 1%. From these results, we can conclude on the strength of the instrument.

Table 4
Coefficients on the Total Tax Rate Differential

Sample	Probit		IV Probit		Number of creations
	Estimate	APE	Estimate	APE	
Whole sample	0.038** (0.001)	0.015** (0.000)	-0.030** (0.002)	-0.012** (0.001)	131,728
Manufacture of food products	0.038** (0.006)	0.015** (0.002)	-0.026 (0.015)	-0.010** (0.006)	2,241
Manufacture of consumers goods	0.043** (0.005)	0.017** (0.002)	-0.019 (0.013)	-0.008 (0.005)	3,598
Manufacture of capital goods	0.035** (0.005)	0.014** (0.002)	-0.053** (0.015)	-0.021** (0.006)	2,988
Manufacture of intermediate goods	0.030** (0.005)	0.012** (0.002)	-0.026* (0.013)	-0.010** (0.005)	4,339
Construction	0.042** (0.002)	0.016** (0.001)	-0.008** (0.004)	-0.003 (0.002)	26,119
Trade	0.039** (0.001)	0.015** (0.001)	-0.030** (0.003)	-0.012** (0.001)	37,075
Transport	0.039** (0.003)	0.015** (0.001)	-0.019** (0.007)	-0.007** (0.002)	6,950
Real estate activities	0.034** (0.005)	0.013** (0.002)	-0.054 (0.011)	-0.021** (0.004)	3,241
Services to businesses	0.037** (0.002)	0.015** (0.001)	-0.050** (0.004)	-0.020** (0.002)	24,194
Personal and domestic services	0.034** (0.002)	0.013** (0.001)	-0.031** (0.004)	-0.012** (0.002)	16,794
Education, health and social work	0.039** (0.004)	0.015** (0.002)	-0.030** (0.003)	-0.012** (0.001)	4,408

Notes. * 95% significance ** 99%-significance. Standard errors are in parentheses. In the first two columns, point estimates and average partial effects are reported for the naive probit estimation. In the next two columns, point estimates and average partial effects are reported for the IV probit estimation, where total tax rates differential across the boundaries are instrumented by the sum of the department and region tax rates differentials. The last column provides the number of observations used in the regressions. Full MLE is used for all estimation. For the IV Probit, the maximised likelihood is the one given in Wooldridge (2002), equation (15.50). Year dummies are included in all regressions. Results for industries with less than 1,000 creations were not reported.

As showed by the results in the first two columns, differencing is not enough to get rid of endogeneity. There is still a positive significant relationship between tax rates and probability to locate in the highest taxed municipality. Therefore, even though the local determinants are eliminated by spatial differencing, the presence of unobserved municipality-specific factors in the residual induces a bias in the estimation.

However, when total tax rates differentials across the boundaries are instrumented by the sum of department and region tax rates differentials, the coefficient signs switches. As reported in columns 3 and 4 in Table 4, higher taxes deter firms from setting up. Point estimates and average partial effects are significant. However, the value of average partial effects shows that, even though significant, the impact of local business taxes on plants location decision is far from primary. If the tax gap increases by 1 percentage point, the probability for the plant to set up on the lowest taxed side increases by about 1 percentage point.

To assess the internal validity of our results, we ran these regressions on subsamples, fragmented by size, subperiods and industries. We found that point estimates for subsamples of firms of less than one employee, 1–5, 5–10, 10–20, 20–50, and more than 50 employees are not significantly different from each other.¹² There is also no significant difference between estimates for the subperiod 1993–8 and 1999–2004. In contrast, segmenting by industry displays some heterogeneity in the results. Real estate activities and services to businesses are significantly more sensitive to tax differentials while construction firms are less.

5. Concluding Remarks

Direct spatial Poisson regressions might provide an insight into the elasticity of plant creations with respect to the tax rate. However, these results may be biased due to untreated endogeneity. First, there are some factors driving business creation that are unobserved. Next, municipality tax rates are likely to be correlated with these unobserved factors, as theory warns us that tax decisions are also based upon the presence of agglomeration forces. The best way to deal with this issue is to adopt a framework close to Regression Discontinuity Design (RDD). Departments and regions offer jurisdictional boundaries that may be used for identification. Selecting municipalities around this boundary, we may then enquire as to the reason why a plant choose to set up on one side rather than the other. Because departments and regions also contribute to the total local business tax rate and are larger actors than municipalities, we assume that their decisions are exogenous. Thus we use the sum of departmental and regional tax rates as an instrument for the total tax differential across the boundary. Instrumentation makes the coefficient relating to tax switch sign in the regressions. Finally, we found that when the tax differential is increased by one percentage point, the probability of a firm setting up on the lowest taxed side is increased by one percentage point.

Clearly, our results depend crucially on the validity of our assumptions. It might be argued that the sum of departmental and regional tax differential is uncorrelated with the residual of the main equation. For instance, let us assume, by analogy with Holmes (1998), that some departments are pro-business and others, anti-business. This creates

¹² The whole set of sensitivity results are not reported here but are available on request from the authors.

another discontinuity on the boundary that jeopardises our estimation. However, there are no formal elements that suggest that this is the case. Another assumption concerns our model specification. Effects are assumed to be linear, as instrumentation can only be done in this case. However, it is likely that decreasing a tax rate by ten percentage points is different from decreasing it ten times by one point. Our estimation strategy does not allow us to investigate this point.

Interpreting our results in terms of fiscal policy is problematic. One should not infer from our results that the best fiscal policy for a municipality is to 'race to the bottom', that is, to cut taxes infinitely. On the contrary, local authorities must find an equilibrium between tax revenues and infrastructure. We do not argue whether this equilibrium has to be 'high-tax high-infrastructure' or 'low-tax low-infrastructure'. What we actually measure is the extent to which, all infrastructure and agglomeration effects being equal, changing the tax rate in a given zone affects plants' creation in this zone. In other words, we measure the impact of a tax drop on establishments' locations, assuming that implied tax losses do not weigh on local authorities balance sheets.

In addition, our study provides some insights into fiscal zoning policies.¹³ Typically, the cost of such a policy is not carried by the municipality, so that lower taxes would not bring about lower investments in local infrastructure. Our study concludes that zoning policies may have a significant and positive effect on plants' creation, but that this effect may be weak. Furthermore, this effect is likely to be local: plants created in a low-tax zone might have been created nearby (but maybe not in the low-tax zone) even without a zoning policy. Our model predicts that this type of policy improves the situation in the zones where tax rates are lowered to the detriment of those in which the tax rates are maintained unchanged. As a priority, this analysis needs to be developed further and an explicit evaluation of these fiscal zoning policies should be undertaken.

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¹³ Many zoning policies have been implemented over the last years in France ('Zones Franches Urbaines' (ZFU), 'Zones de Revitalisation Urbaine' (ZRU) ...). These policies, similar to UK Enterprise Zones, all aim at encouraging firms to invest in depressed areas by lowering tax rates – or even exempting newly created plants from taxes.

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