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Does fiscal cooperation increase local tax rates ?

Sylvie Charlot

Sonia Paty

Virginie Piguet

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DOES FISCAL COOPERATION INCREASE LOCAL TAX RATES?

Sylvie CHARLOT
INRA-CESAER (UMR1041)
26 bd du Dr Petitjean
BP 87999, 21079 Dijon Cedex, France
E-mail: sylvie.charlot@dijon.inra.fr

Sonia PATY
CREM (University of Caen and CNRS) and EQUIPPE (Universities of Lille)
Faculty of Economics
Cité scientifique, USTL, 59655 Villeneuve d'Ascq, France
E-mail: sonia.paty@univ-lille1.fr

Virginie PIGUET
INRA-CESAER (UMR1041)
E-mail: virginie.piguet@dijon.inra.fr

Abstract:

The main purpose of this paper is to assess the effects of fiscal cooperation on local taxation in a decentralized country, using the French experience. We estimate a model of tax setting for local business tax using spatial and dynamic econometric techniques, for the period 1993-2003. We find first that reducing the number of municipalities is likely to limit tax competition and increase local business tax rates as a consequence. Second, we find that tax rates are higher when groups of localities set a single business tax rate rather than applying an additional rate of business tax, suggesting that horizontal tax competition constrains the level of tax rate increase generated by tax-base sharing.

Keywords: consolidation, tax competition, vertical externalities, local business tax

Classification JEL: H2 H3 H7

1. Introduction

Following the seminal papers of Zodrow and Mieszkowski (1986), Wilson (1986), Wildasin (1988) – see Wilson (1999) for a survey – many theoretical studies have emphasized that tax competition may result in inefficiently small levels of local public spending. The reason for this is that when tax bases are mobile, the fiscal action of a benevolent authority will affect the budget constraint of another jurisdiction, through a policy-driven flow of resources

between localities. Consequently, taxes may remain inefficiently low. The inefficiency is based on the fact that each jurisdiction sees capital flight as a cost and does not take into consideration the positive fiscal externalities generated for other localities. Local authorities perceive the marginal cost of public funds as being higher than the true cost to the economy as a whole.

Possible policy correctives for the undersupply of local public goods have been discussed extensively in the literature. Several alternatives have been proposed to correct for this inefficiency: a state (or a federal) intervention such as the imposition of minimum tax requirements on local authorities, an increase in revenue sharing or matching grants to lower the cost of local public services, the provision of local public goods by state (or federal) governments or the consolidation of local jurisdictions. In relation to this last, Hoyt (1991) demonstrates that limiting competition by reducing the number of the localities in a metropolis increases tax rates and welfare.

Consolidation can take different forms - from municipal mergers¹ to fiscal cooperation. As a means of limiting limit tax competition, its effects depend on several assumptions.

First, consolidation may be difficult to implement because of size differences among municipalities. In the literature on asymmetric tax competition, it has been shown that frequently small regions will undercut their larger neighbours. And small regions may even be better off under conditions of tax competition compared to a situation where jurisdictions coordinate their tax rates (Bucovetsky, 1991, 2009; Wilson, 1991; Kanbur and Keen, 1993).

Second, consolidation may not be desirable if governments act like Leviathans and set tax rates that are overly high (Brennan and Buchanan, 1980). In this case, consolidation may strengthen the predatory powers of governments (Edwards and Keen, 1996).

Finally, the effects of cooperation on tax rates may depend on the existence of vertical externalities. Co-occupation of a common tax base has been shown to result in overly high taxes (Flowers, 1988; Keen and Kotsogiannis, 2002). If the policy-maker raises the tax rate unilaterally, it ignores the loss in revenues due to the contraction of the common tax base that is induced, which will penalize other levels of government. Vertical externalities promote unhealthy tax rates, while horizontal externalities lead to tax rates that are too low. In decreasing tax rates, horizontal tax competition may counteract the upward pressure exerted

¹ Many European countries have implemented waves of municipal mergers: Austria and Sweden in the 1950s, Germany and Belgium in the 1970s, and more recently Greece, Denmark and Latvia.

by vertical externalities. On the other hand, cooperation will not restrain tax rates increases in multi-level governments.²

This paper aims to assess the effects of fiscal cooperation on local taxation based on the French experience. The French case offers a favourable setting for research on fiscal cooperation for several reasons.³

First, the structure of French local government is broadly four tiered. The two lowest tiers comprise 36,600 municipalities. The third tier consists of 96 departments. The top tier is the 22 regions of France. Each different layer of local government has large fiscal autonomy: each level sets its own tax rates on a common tax base, for a large range of local direct taxes, which account for 75% of local tax revenues.

Second, most French municipalities (about 90% in 2006) are grouped within larger jurisdictions (known as ‘Etablissements Publics de Coopération Intercommunale’ or EPCI in French). Together with municipalities, these jurisdictions have a large degree of autonomy to set the local business tax rate. They can set a single business tax rate (“Taxe Professionnelle Unique”) or apply an additional business tax rate. In the first case, a single tax rate applies to all jurisdictions that belong to the intermunicipal group, meaning that the municipalities cannot set their own business tax rates. This fiscal cooperation regime, therefore, acts to merge or consolidate the municipalities. In the case of an additional business tax rate, this introduces an additional level of local government allowing localities and intermunicipal jurisdictions to tax the same business base.

The main contribution of this paper is that it exploits an empirical setting that allows us to test the impact of fiscal cooperation in multi-level government. We estimate a model of tax setting for the local business tax, using spatial and dynamic econometric techniques, for the period 1993-2003. We find that fiscal cooperation is likely to limit tax competition and as a consequence increases local business tax rates, and that tax rates are higher when groups of localities set a single business tax rate than applying an additional rate of business tax, suggesting that horizontal tax competition restrains tax rate increases generated by tax-base sharing.

² In this case, if governments act like Leviathans, cooperation may not be desirable.

³ Ermini and Santolini (2007) investigate the impact of inter-jurisdictional agreements in Italy, although they focus on several local spending categories.

The paper is organized as follows. Section 2 describes the theoretical background and presents a simple model of capital taxation in the presence of an overlapping tax base. Sections 3 and 4 discuss the data and the empirical design. Section 5 presents the results for the estimations on the impact of consolidation and Section 6 provides some robustness checks. Section 7 concludes.

2. Theoretical background

2.1. Theoretical literature

Many models derived from the papers by Wildasin (1988) and Hoyt (1991) have the same theoretical foundations (see Wilson, 1999 for a survey). Local governments are assumed to be benevolent in the sense that their objectives are to maximize the welfare of their citizens. Households are assumed to be immobile and to consume both private and local public goods. The latter are financed by a tax on capital. Capital is assumed to be perfectly mobile across local jurisdictions. Consequently, when one government increases its tax rate, capital may choose to relocate. In a Nash equilibrium, each local government sets its tax rate in such a way that the marginal substitution rate between the public and the private good is higher than the marginal transformation rate between these two goods. In equilibrium, the local public good is under-provided. This inefficiency results from the fact that each jurisdiction considers capital flight to be a cost and does not take account of the positive fiscal externalities generated for other jurisdictions. Consequently, local jurisdictions perceive the marginal cost of public funds as higher than it is in reality for the economy as a whole.

The literature provides extensive discussions on policy correctives for the undersupply of local public goods and proposes several alternatives to correct this inefficiency: a state (or a federal) intervention such as the imposition of minimum tax requirements on local authorities; an increase in revenue sharing or matching grants to lower the cost of local public services; provision of local public goods by state (or federal) governments; or consolidation of local jurisdictions. With regard to consolidation, Hoyt (1991) demonstrates that limiting competition by reducing the number of the localities in a metropolis increases tax rates and welfare. He assumes that identical jurisdictions finance their public services through a tax on capital that is freely mobile. The objective of these governments is to maximize the welfare in their jurisdictions. The effect of a tax increase in one jurisdiction on the others in the

metropolis, depends on its market power, and is inversely related to the number of jurisdictions affected. Hoyt shows first that, even when governments maximize welfare, the level of public services is inefficiently low due to wasteful tax competition for capital between jurisdictions. The trade-off between provision of the public good and private consumption favours the public good when the market power in each jurisdiction increases. A reduced number of jurisdiction reduces the externalities due to capital flow and therefore reduces the differences to the social optimum. In this model the optimal number of jurisdiction, therefore, is one. Nevertheless, for Hoyt, there is a trade-off between erasing horizontal fiscal externality by reducing the number of jurisdictions, and promoting taste stratification *à la* Tiebout based on a large number of jurisdictions.

However, the horizontal tax competition literature tends generally to ignore the possibility of vertical externalities arising from the existence of an upper level of government other than internalizing fiscal inefficiencies at the local level] (Keen, 1998). Vertical externalities can arise whenever the tax decisions of one level of government have an impact on the budget of another layer (Boadway and Vigneault, 1996). This applies especially in the case where several levels of government set their tax rates on a common tax base. Flowers (1988) focuses on the vertical externalities that arise from interactions among overlapping governments that share a common same tax base. The usual theoretical analysis assumes that each layer of government acts either as a Leviathan (see Flowers, 1988; Keen, 1995; Wrede, 1996; Flochel and Madiès, 2002; Keen and Kotsogiannis; 2004) or is benevolent (Keen, 1998; Keen and Kotsogiannis, 2002). These models show that the aggregated equilibrium tax rate of two overlapping governments, which share a common tax base, will be higher than a single, revenue-maximizing government tax rate (see e.g. Flowers, 1988).⁴ Horizontal tax competition at the local level will reduce the combined tax rate set by two overlapping governments: “as states compete more intensively against one another, setting lower tax rates, so the position of the federal policy maker becomes closer to that of an untrammelled monopolist” (Keen, 1998, p. 473).

More generally, when vertical and horizontal externalities are at work in a federation, they generally distort taxation levels in opposite directions (Keen, 1998). On the one hand, interjurisdictional or horizontal tax competition leads to tax rates being too low since each

⁴ It is straightforward to show that the global tax rate is increasing with respect to the number of vertically related governments.

local government ignores the fact that it is harming the others when it cuts its tax rate in order to attract a mobile base. On the other hand, co-occupation of a common tax base results in taxes being too high. When government introduces a unilateral tax rise, it ignores the loss in revenues due to the contraction in the common tax base that this action induces, which is harmful to the other levels of government. Keen and Kotsogiannis (2002) show that the relative strengths of vertical and horizontal externalities depend on the responsiveness of interest on the aggregated supply of savings and the state demand for capital, the extent to which immobile factors are taxed by states, and the strength of the preferences for federal and state public goods. Assuming that rents are not taxed, the vertical externality will dominate if “the effect of state tax changes on the federal tax base (the supply of savings), which determines the vertical externality, is large relative to the sensitivity of capital movements with respect to the interest rate, which shapes the horizontal externality” (Keen and Kotsogiannis 2002, p.369).

Flochel and Madiès (2002) capture both the vertical and horizontal externalities in a model that focuses on metropolitan jurisdictions. They assume that both federal and local governments, maximize their revenues, as in the models developed by Brennan and Buchanan (1980). Each level sets its own tax rates on the same tax base, i.e. capital stock that is imperfectly mobile. Flochel and Madiès show first that equilibrium tax rates and tax revenues are decreasing with respect to the cost of mobility. The combined tax rate of the overlapping governments is also shown to be increasing with respect to the number of vertically related governments. In the case of two levels of government, federation and local jurisdictions, it is assumed that firms will choose to locate in a federation and then to choose their local jurisdiction within this federation by perfectly observing the federal tax rate, but only the average local tax rate. The jurisdictions are symmetrically located on the circumference of a circle. Firms will choose a jurisdiction based on the local tax rate and the match between their needs and local features. The quality of the match is measured by the cost of the distance between the firm location and the available jurisdictions. Increasing the number of local jurisdictions reduces this distance and has two opposite effects. First tax competition increases, thereby decreasing the local tax rate. Conversely, increasing the number of local jurisdictions reduces the impact of each local tax rate on the average tax rate that firms observe and, therefore, reduces the incentive to set a low tax. The tax competition effect dominates the second effect when the number of local jurisdiction is large enough and local equilibrium tax rates are increasing with the distance between jurisdictions.

Flochel and Madiès (2002, p. 129) conclude that “interjurisdictional tax competition will reduce the combined tax rate set by both overlapping governments but is able to solve completely the vertical distortion problem, except when the number of local jurisdictions becomes infinite”. But, consolidation which reduces the number of jurisdictions, reduces tax competition thereby raising the local tax rate.

2.2. A simple model of tax setting in the presence of an overlapping tax base

This section presents a very simple framework, which enables us to capture the effect of consolidation on the tax rates in a decentralized country. The model combines the simultaneous existence of horizontal and vertical externalities.

We consider a very simple model of capital taxation with two layers of local government (municipality and region) co-occupying the same tax base. We suppose that the common tax base is the capital employed by a single, perfectly competitive, representative firm. This firm produces a homogeneous private good using two inputs: capital and labour. Labour is assumed to be fixed in production whereas capital is a variable factor. We can write the production function of the representative firm as $f(k)$ where k denotes the employed capital; f is increasing in k , with decreasing marginal production of capital ($f'' < 0$). The representative firm maximizes its profits with respect to k , yielding

$$f'(k) = p_k \tag{1}$$

Equation (1) implicitly defines the firm’s capital demand as $k(p_k)$ with $k' = 1/f''$, where $p_k = \rho + t_1 + t_2$ denotes the pre-tax return on capital, ρ is the exogenous post-tax return, and t_1 and t_2 respectively are the tax rates set by the upper (i.e. the region) and the lowest (i.e. the municipality) layers of government.

We suppose that each layer of government plays Nash relative to the other layer of government. Following Andersson et al. (2004), the utility function can be written such that municipal and regional public goods are not separable.⁵

⁵ To an extent, we allow both municipal and regional public services to be complements. Charlot and Paty (2010) provide some support for this assumption in the French case.

For municipal government, the maximization problem is:

$$\max_{t_2} v(w) + h_2(z_2 \cdot z_1^\delta) \text{ subject to } z_2 = t_2 k(p_K) \quad (2)$$

where $v(\cdot)$ and $h_2(\cdot)$ are strictly concave and $\delta \in [0,1]$ is an exogenous parameter capturing the extent to which municipal and regional public services are complements (complementarity is maximum for $\delta = 1$ and minimum for $\delta = 0$).

As capital owners are supposed to be outside the economy, the gross wage rate $w = f(k(p_K)) - k(p_K)f'(k(p_K))$ is assumed to be the only source of revenue for the representative citizen. z_1 and z_2 respectively are regional and municipal public goods.

The first order condition of the maximization problem is:

$$h_2' = z_1^{-\delta} / (1 + t_2(k'/k)) = MCPF \quad (3)$$

Assuming that the marginal utility of private consumption is equal to 1, the left side of equation (3) is just the marginal benefit (MB) of the municipal-provided public good while the right side is usually defined as the marginal cost of public funds (MCPF). In evaluating the MCPF, the municipal government only recognizes the erosion of its own tax base, induced by a higher tax rate. However, the true MCPF might also include erosion of the regional tax base. Municipal government underestimates the true MCPF and then sets a tax rate that is too high from a social point of view.

From the FOC (3), we obtain the municipal tax setting function:

$$t_2 = t(t_1, \rho, z_1, \delta) \quad (4)$$

As the tax reaction function cannot be signed unambiguously, it is necessary to conduct an empirical analysis to establish the direction of the vertical tax interaction.

The analysis above focuses only on the vertical interaction resulting from tax base sharing, thus it ignores the possibility of fiscal interdependencies due to tax base mobility among municipalities. For the sake of simplicity in dealing with tax competition among municipalities, capital is assumed to be costlessly mobile across N identical municipalities ($i = 1, \dots, N$), and relocates until it earns the same net return on capital in each of them, Thus:

$$f'(k_2^i) - t_1 - t_2^i = f'(k_2^j) - t_1 - t_2^j = \rho \quad \forall i \neq j \quad (5)$$

where t_1 is the regional tax rate, t_2^i (t_2^j) is the tax rate in the municipality i (j), and k_2^i (k_2^j) is the capital invested in municipality i (j). From (5), it is easy to show that

$$k_2^i = k(t_1, t_2^i, t_2^{-i}) \quad (6)$$

where $-i$ represents “the set of competing municipalities”. Note that we have $dk_2^i/dt_2^i < 0$ and $dk_2^i/dt_2^{-i} > 0$.

In order to analyse tax competition under the assumption of strategic interactions among identical municipalities, we assume also that the regional economy is closed so that $\rho(\tau_2^1, \tau_2^2, \dots, \tau_2^N)$ is implicitly defined by the following market-clearing condition:

$$NS(\rho) = \sum_{i=1}^N k_2^i(\rho + \tau_2^i) \quad (7)$$

where $S(\rho)$ is the supply of savings in each municipality and $\tau_2^i \equiv t_1 + t_2^i$ is the aggregated tax rate borne by capital in the municipality i . We then have:

$$\partial\rho/\partial\tau_2^i = \frac{1}{N} \left[\frac{k_2^i(\rho + \tau_2^i)}{S'(\rho) - k_2^i(\rho + \tau_2^i)} \right] \in (-1, 0) \quad (8)$$

The FOC of the maximization problem of a given municipality becomes:

$$h_2^i = z_1^{-\delta} \left[1 + \frac{t_2^i k_2^i}{k_2^i} \left(1 + \frac{k_2^i}{N(S' - k_2^i)} \right) \right]^{-1} = MCPF \quad (9)$$

Equation (9) shows that the MCPF increases with $\partial k^i / \partial t_2^i$, i.e. with the responsiveness of capital to differences in municipal tax rates. Moreover, the MPCF decreases with N . The lower the MPCF, the higher the equilibrium tax rate. Consolidation has a positive impact on the municipal capital tax rate.

Finally, from (9), we obtain the municipal tax setting function:

$$t_2^i = t(t_1, t_2^{-i}, \delta, N) \quad (10)$$

The tax rate chosen by a municipality depends not only on the tax rates set by the upper layer of government (see FOC (4)), but also on the tax rates of competing municipalities. However,

once again, the sign of horizontal tax interactions is ambiguous, since it depends on the effects produced on the MCPF and the marginal benefit.

3. Data

3.1. The French institutional context

The French local institutional context is characterized by three or four tiers of overlapping local governments. The lowest tier is made up of 36,000 municipalities; the middle-tier consists of 96 counties; and at the highest level of local government are 22 regions. Most of the municipalities are grouped (voluntarily) into intermunicipal jurisdictions or EPCI. Since the 'Chevènement' law enacted in 1999, these groups of municipalities are particularly favoured⁶ in France, and this structure is chosen by a growing number of municipalities (almost 30,000 in 2003). The municipalities and EPCI are responsible for local urban services, building, provision of nurseries and primary schools, and sport facilities, and maintenance of municipal roads and urban public transport. There are separate departments for administering social assistance, maintaining departmental roads and maintaining middle schools. Regions are responsible for provision of vocational training, economic development and building and maintenance of high schools.

Local revenues come from taxation (54%) and grants (23%). The local business tax (or "Taxe Professionnelle") is the major source of local governments tax revenue, accounting for approximately 45% of the revenue derived from direct local taxes.⁷ The tax base consists mainly of capital goods and is based on the rental values of buildings, and of equipment (assumed to be 16% of the cost of the equipment). The remaining fiscal revenues are collected from households in the form of residential tax ("taxe d'habitation"), property tax ("taxe foncière sur le bâti") and land tax ("taxe foncière sur le non bâti").

Regions, departments, intermunicipal jurisdictions and municipalities have large autonomy in setting their tax rates on this tax base. Referring to "local tax varying power", meaning the proportion of local resources represented by tax revenue over which local authorities have some control, DEXIA (1997) shows that France is ranked second in the European Union for

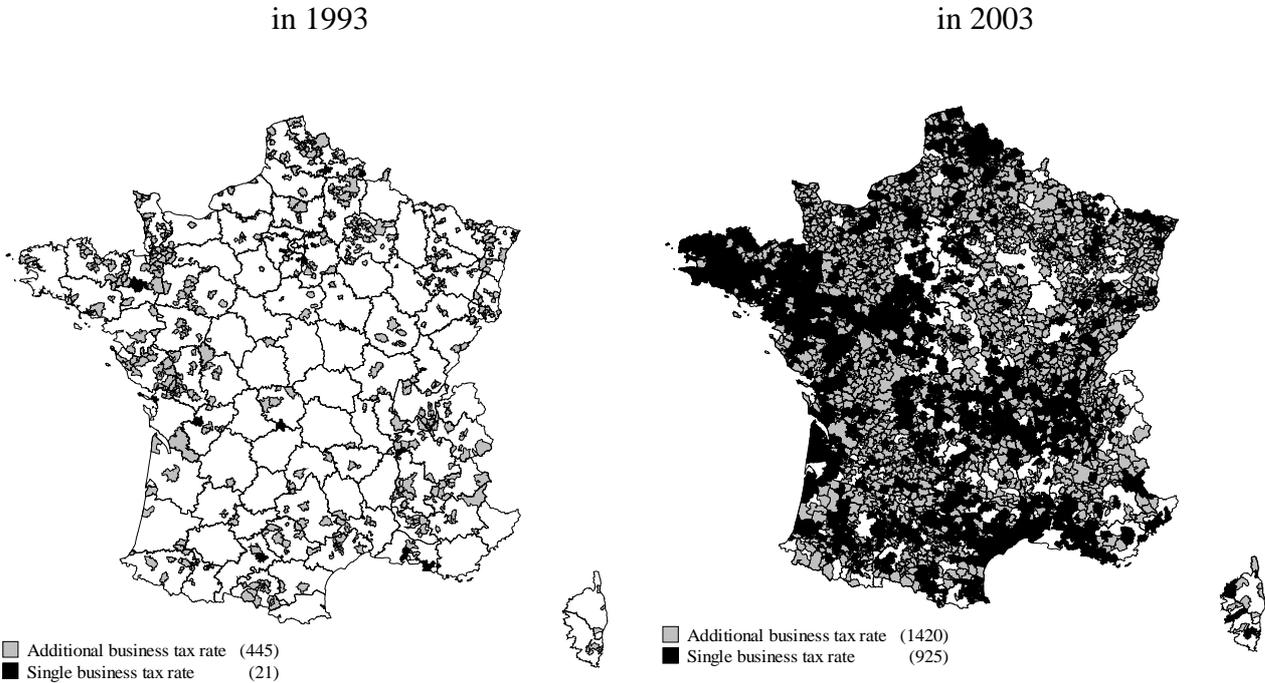
⁶ An extra state grant is awarded to intermunicipal jurisdictions that opt for the single business tax regime.

⁷ This tax will be removed in 2010 and will be replaced by a territorial economic contribution based on property and value added.

level of tax autonomy (54%), which compares favourable with 20% for Germany - a federal country, and 35% for Spain (35%) which is approaching federal country status, and 14% for the UK.

The EPCI can impose an additional business tax rate or apply a single tax rate or “Taxe Professionnelle Unique” (Single Business Tax). In the latter case, the municipalities lose the right to set their own tax rates. Map 1 shows that intermunicipal cooperation increased greatly during the period of study (1993-2003).

Map 1: Distribution of inter-municipal jurisdictions and their tax regimes



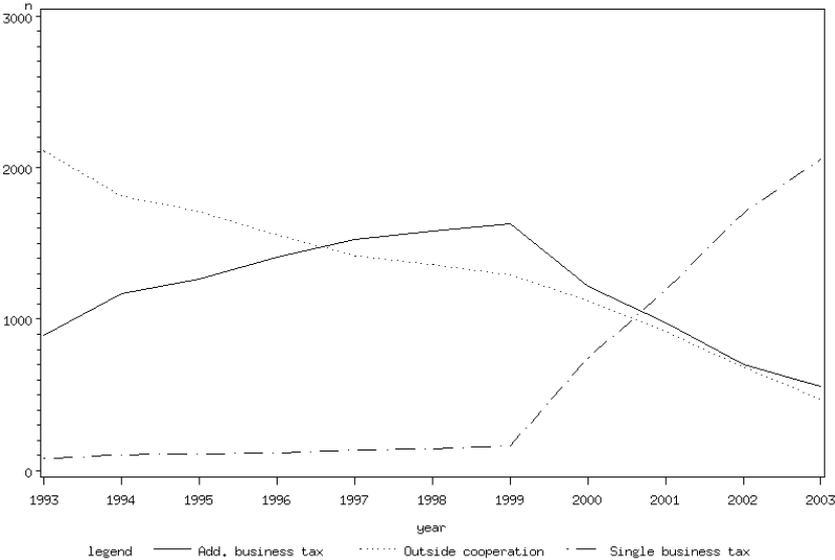
3.2. Urban municipalities and local jurisdictions

Here we are interested in municipalities that belong to urban employment centres, as defined by the French National Statistics Institute (INSEE).⁸ In 1999, metropolitan France had 354 urban centres of employment accounting for at least 5,000 jobs. These urban employment centres include 3,082 municipalities. Note that the French definition of an urban employment centre is quite broad and is similar to the US metropolitan areas except that the employment threshold is much lower (5,000 jobs compared to 100,000 inhabitants).

⁸ The choice of urban municipalities introduces a possible selection bias. However, tax rates are not available for all rural municipalities.

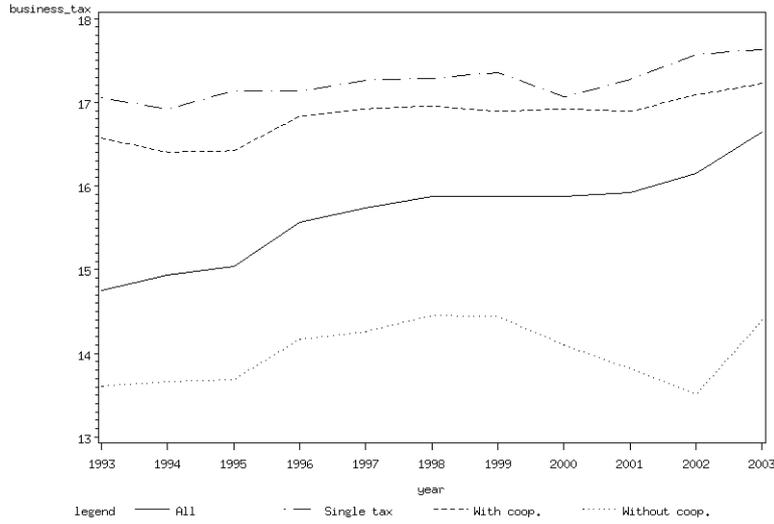
Our initial sample contains 3,082 urban municipalities. However, for all these municipalities we take into account possible interactions with neighbouring municipalities (located within a radius of 50 kilometres) whether or not they are included in our initial sample of municipalities. Fiscal data come from the Direction Générale des Collectivités Locales (DGCL, Ministère de l’Intérieur).

Graph 1 shows the number of municipalities in each type of fiscal cooperation regime, in the period 1993 to 2003. At the beginning of the period, most municipalities do not cooperate. At the end of the period, most urban municipalities are part of the cooperation regime, which, since 1999, qualifies them for an extra state grant if they apply a single business tax rate.



Graph 1: Distribution of municipalities in each fiscal cooperation regime

Graph 2 shows the evolution of the business tax rate with or without fiscal cooperation. Municipalities that belong to single business tax jurisdictions impose heavier taxes than municipalities that are outside jurisdictions. The average difference between these two fiscal choices is about 3 points.



Graph 2: Distribution of municipalities in and out fiscal cooperation

4. Empirical design

As the aim of this paper is to study the effects of fiscal cooperation on local taxation in a multi-level government context, we have to deal with horizontal and vertical tax interactions. To take account of possible horizontal tax interactions, we need to consider spatial dependence in a panel data framework. In line with the literature (see, e.g., Brueckner and Saavedra, 2001; Brueckner, 2003; Revelli, 2001, 2003; Solé-Ollé, 2003), we assume that a local policy reaction function can be written as follows:

$$t_{i,t} = R_i(t_{j,t}, T_i, X_{i,t}, Coop_{i,t}, Coop_{i,t}t_{j,t}) \quad (11)$$

where $t_{i,t}$ is the vector of tax rates in a municipality i at time t ,⁹ $t_{j,t}$ is the vector of tax rates in the set of the other municipalities j ($j \neq i$) at time t , T_i is the vector of tax rates applied by other tiers (county, region) in municipality i , $X_{i,t}$ is the vector of the economic features of municipality i at time t and $Coop_{i,t}$ is the fiscal cooperation regime (additional or single business tax rate) applied in municipality i .

⁹ The SBT rate or the municipal plus additional tax rate, if the municipality cooperates, the municipal tax rate if it does not.

4.1. Cooperation effects

Many theoretical studies emphasize that tax competition may result in inefficiently small levels of local public spending (for a survey, see Wilson, 1999). However, Hoyt (1991) demonstrates that limiting competition by reducing the number of the localities in a metropolis increases tax rates and welfare. To deal with this theoretical prediction, we use the French empirical setting where municipalities may or may not belong to a larger group of municipalities. $Coop_{i,t}$ is a fiscal cooperation dummy variable, taking the value 1 if the municipality i cooperates with other municipalities in a larger jurisdiction. The expected sign of $Coop_{i,t}$ then is positive.

We also investigate whether cooperation affects not only the municipal tax rate, but also the tax interactions with neighbouring municipalities, thus we include the interaction variable $Coop_{i,t} * t_{j,t}$. The aim is to check whether horizontal tax interactions are stronger or not if municipalities belong to intermunicipal groups. As the number of competing jurisdictions decreases in conditions of fiscal cooperation, the horizontal tax interactions should decrease. Tax competition should be weaker among groups of municipalities than among isolated municipalities. Furthermore, intermunicipal jurisdictions that set a single business tax rate carry more weight and may be less influenced by the tax decisions of neighbouring localities.

4.2. Spatial dependence

As suggested by Anselin (1988), an a priori set of interactions needs to be defined and tested. While a variety of weighting schemes could be applied, allowing different patterns of spatial interaction, a scheme that assigns weights based on Euclidean distance or contiguity is commonly used in the relevant empirical literature (Brueckner, 2003).

In line with this empirical literature, we chose a precise geographical definition of neighbourhood based on the Euclidean distance between jurisdictions. This scheme imposes smooth distance decay, with weights w_{ij} given by $1/d_{ij}$ where d_{ij} is the Euclidian distance between jurisdictions i and j for $j \neq i$. ($w_{ij} = 1/d_{ij}$ if $d_{ij} \leq 50$ kms, otherwise $w_{ij} = 0$). The weight matrix (W^{d50}) is standardized so that the elements in each row sum to 1. We replace the vector

$t_{j,t}$ with a weighted average, such as $\sum_j w_{ij} * t_{j,t}$, which implies that every municipality responds in the same way to the weighted average tax rates.

We also test an alternative and commonly used weight matrix, the contiguity matrix (W^{contig}). The contiguity matrix considers that two geographic units i and j are neighbours if they have a common border ($w_{ij}=1$, otherwise $w_{ij}=0$).

The presence of the dependent variable on the right-hand side of equation (11) raises two main econometric issues. First, if municipalities react to other's tax rates choices, then competing municipalities' taxation decisions are endogenous and correlated with the error term (ϵ). OLS (ordinary least squares) yields a biased estimate of parameter ρ (Anselin, 1988). Second, if neighbours' localities are subject to correlated shocks, we may find a correlation between the spending choices of jurisdictions. The omission of spatially dependent explanatory variables may generate spatial dependence in the error term, which is given by the following equation:

$$\epsilon_{i,t} = \lambda W \epsilon_{j,t} + v_{i,t} \quad (12)$$

If spatial error dependence is ignored, estimation of (11) may provide false evidence of strategic interaction. There are no problems if we use the instrumental variables (IV), two-stage least squares (2SLS) method, which yields consistent estimations even with spatial error dependence (Kelejian and Prucha, 1998). We need variables that are correlated with competing municipality tax choices, but are uncorrelated with the error term.

Again, we use the weighted average of some of the neighbour control variables as instruments.

Thus:

$$t_{i,t} = \alpha_i + Coop_{i,t} + \rho_1 W t_{j,t} + \rho_2 W t_{j,t} \times Coop_{i,t} + \beta X_{i,t} + \gamma T_i + \epsilon_{i,t} \quad (13)$$

α_i is the municipal fixed effect, taking into account all other municipal characteristics. Time dummies are included to capture common shocks.

4.3. Serial correlation

Serial correlation may arise because French municipal tax decisions may be persistent over time. To allow for possible serial correlation we include a time-lagged dependent variable (Devereux et al., 2007). This introduces correlation with the municipal fixed effect. To deal

with this, we instrument the lagged dependent variable by including the municipal property tax rate and the municipal residential tax rate.

The final specification we estimate therefore is:

$$t_{i,t} = \alpha_i + \beta t_{i,t-1} + \gamma Coop_{i,t} + \rho_1 Wt_{j,t} + \rho_2 Wt_{j,t} \times Coop_{i,t} + \delta TC_{i,t} + \chi TR_{i,t} + \phi Dens_{i,t} + \varphi Inc_{i,t} + \eta Young_{i,t} + \kappa Old_{i,t} + \gamma Time + \varepsilon_{i,t} \quad (14)$$

where α_i is the municipal fixed effect, $Coop_{i,t}$ is the fiscal cooperation dummy, $Wt_{j,t}$ is the weighted tax rate of neighbouring municipalities, $Wt_{j,t} \times Coop_{i,t}$ is the interaction variable between the weighted tax rate and the fiscal cooperation dummy, $TC_{i,t}$ is the county tax rate, $TR_{i,t}$ is the regional tax rate, $Dens_{i,t}$ is the municipal density, $Inc_{i,t}$ is the average municipal income, $Young_{i,t}$ is the share of people who are less than 14 years old, and $Old_{i,t}$ is the share of people in the municipality i who are more than 60 years old. $Time$ are year dummies.

The county and the regional tax rates (T_i) may be endogenous. We instrument them with the county property tax rate and the regional tax rate respectively. We test the validity of the instrument sets using a standard over-identifying restrictions (Sargan) test. A large value of the partial R^2 in the first step confirms these instruments sufficient to explain the endogenous variables. We treat the remaining control variables as exogenous.¹⁰

All variables are log-transformed. Summary statistics are presented in Appendix Table 1.

5. Results

Table 2 shows the estimation results using the IV method with spatial dependence ($\rho \neq 0$). Columns 1 to 4 in Table 2 show the results of the IV estimation using the within transformed model¹¹.

¹⁰ We performed standard exogeneity tests for the control variables; there is no evidence of endogeneity.

¹¹ The estimates without taking account of the possible influence of the tax rates set by other jurisdictions ($\rho = 0$) are available upon request.

Table 2: Estimation results

Methodology	(1)	(2)	(3)	(4)
	IV	IV	IV	IV
	Within W^{d50}	Within W^{d50}	Within W^{contig}	Within W^{contig}
Lagged endogenous variable, $t_{i,t-1}$	0.752***	0.754***	0.713***	0.712***
Single Business Tax (SBT) jurisdiction dummy	0.011***	0.230***	0.008***	0.100***
Neighbour's tax rates, $W_{j,t}$	0.490***	0.398***	0.327***	0.330***
Neighbour's tax rates*SBT jurisdiction		-0.088***		-0.034***
County tax rate, t^C	0.037***	0.051***	0.036***	0.042***
Regional tax rate, t^R	-0.004	0.012*	-0.010*	-0.002
Density	0.081***	0.104***	0.091***	0.096***
Average income	0.006	0.011*	0.007	0.008
Share of under 14s	0.049***	0.043***	0.046***	0.045***
Share of over 60s	0.042***	0.033***	0.033***	0.029***
Adj. R^2	0.656	0.655	0.668	0.668
Weakness of instruments: Partial adj. R^2				
Lagged endogenous variable, $t_{i,t-1}$	0.357	0.358	0.356	0.358
Neighbour's tax rates, $W_{j,t}$	0.489	0.533	0.363	0.372
Neighbour's tax rates*SBT jurisdiction		0.192		0.222
County tax rate, t^C	0.710	0.718	0.702	0.705
Regional tax rate, t^R	0.998	0.998	0.998	0.998
Validity of instruments: Sargan test	4.67	6.05	4.32	11.21
Exogeneity test: Fisher test	17.52***	18.49***	18.54***	17.99***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

(1) Instruments: time lag of local property tax rate, county property tax rate, regional property tax rate, spatial lag of local property tax rate, spatial lag of average income, spatial lag of the share of under 14s

(2) Instruments: as (1), plus spatial lag of local property tax rate multiplied by the SBT jurisdiction dummy, spatial lag of average income multiplied by the SBT jurisdiction dummy, spatial lag of the share of under 14s multiplied by the SBT jurisdiction dummy

(3) Instruments: as (1), plus spatial lag of the share of over 60s

(4) Instruments: as (3), plus spatial lag of local property tax rate multiplied by the SBT jurisdiction dummy, spatial lag of average income multiplied by the SBT jurisdiction dummy, spatial lag of the share of under 14s multiplied by the SBT jurisdiction dummy, spatial lag of the share of over 60s multiplied by the SBT jurisdiction dummy

Below, we present the main results of our estimations. Table 2 shows that the lagged endogenous variable ($t_{i,t-1}$) is always significant and takes a positive sign in all the specifications. This result confirms the consistency of the autoregressive specification. As the coefficients of the lagged business tax rates provide an estimate of about 0.73, we can assume relatively high levels of persistency in the tax rates. As expected, local business tax rates are likely to change very slowly over time.

The estimation results also confirm the existence of tax interactions among and between jurisdictions.

First, the coefficients associated with neighbour's tax rate ($W_{t,j,t}$) is always significantly positive, implying the existence of horizontal tax interactions between French municipalities. The estimate takes a value of between 0.33 and 0.49. This implies that an average tax increase of 10% in neighbouring jurisdictions induces an increase of around 4% in the business tax rate. Note that this result is close to those obtained in studies of other countries (see e.g. Heyndels and Vuchelen, 1998; Brueckner and Saavedra, 2001; Revelli, 2001; Richard et al., 2002; Solé-Ollé, 2003).

Second, the tax parameter associated with the county tax rate (t^C) is significantly positive, while the regional tax rate (t^R) is not significant. The estimation of our spatial tax model with several levels of local government, leads us to reject the hypothesis of vertical tax interactions between French local jurisdictions and the regional government level. However, county and local business tax rates seem to interact (as in Charlot and Paty, 2010). Basically, county and municipal/intermunicipal business tax rates are likely to be strategic complements because counties and localities share the supply of local public services.

We now turn to the main estimation results associated with the fiscal cooperation parameter, which here is implementation of the SBT rate by the EPCI. We find a positive and significant sign for the parameter associated with this fiscal regime ($SBT_{i,t}$). We confirm the theoretical predictions in Hoyt (1991) that reducing the number of localities in a metropolis increases tax rates.

Result 1: Reducing the number of municipalities is likely to increase local business tax rates

We investigated more deeply the extent of tax competition by interacting neighbour's tax rates with the single business tax rate. We find a significant and a negative sign for the parameter associated with this interaction variable (-0.034) while the sign for neighbour's tax rates (0.33) is positive and significant, which suggests that applying a single business tax rate is likely to decrease the intensity of the horizontal tax interactions.

Result 2: Reducing the number of municipalities is likely to limit tax competition

In terms of the estimation results associated with the remaining explanatory variables, the coefficient associated with population density exhibits the expected positive sign: the larger the population of the municipality, the greater will be local public needs. The results holds for the share of young (under 14s) people and the share of elderly (over 60s) people: both population categories have specific public needs. Average income, included to measure the demand for public services at municipal level, is never significant.

6. Robustness checks

To check the robustness of our results, we first check the endogeneity of the variable SBT jurisdiction. Intermunicipal cooperation may be endogenous since municipalities that choose to cooperate certainly have common features that affect their tax rates, and which are not observable. Municipalities also may anticipate membership of a jurisdiction and modify their tax rate before joining. To test the exogeneity of fiscal cooperation, we estimate the model on a subsample of municipalities that do not cooperate in an SBT jurisdiction. We create a dummy variable “before SBT jurisdiction” that takes the value 1 the year before cooperation in an intermunicipal group with SBT rate (and 0 otherwise). Our aim is to verify whether municipalities that plan to cooperate in year t adopt a different tax behaviour in year $t-1$. If this is the case, the variable SBT jurisdiction should be considered endogenous. If we cannot confirm the existence of a different behaviour before cooperation in an SBT, we can consider “SBT jurisdiction” to be exogenous and can be confident about the estimation results in Table 2. The new estimation results are shown in Table 3.

We find a positive but non-significant coefficient for the dummy “before SBT jurisdiction”. This outcome suggests that municipalities that cooperate in year t do not change their tax behaviour in year $t-1$, i.e. before joining the intermunicipal group. We can consider SBT jurisdiction as an exogenous variable and be confident in the previous estimation results.

Table 3: Estimation results (with dummy “before SBT jurisdiction”)

	(1)	(2)	(3)	(4)	(5)
Methodology	IV Within	IV Within W^{d50}	IV Within W^{d50}	IV Within W^{contig}	IV Within W^{contig}
Lagged endogenous variable, $t_{i,t-1}$	0.712***	0.687***	0.688***	0.647***	0.646***
Before SBT jurisdiction dummy	0.002	0.003*	0.030	0.001	0.005
Neighbouring tax rates, $Wt_{i,t}$		0.526***	0.516***	0.374***	0.373***
Neighbouring tax rates*before SBT jurisdiction			-0.011		-0.002
County tax rate, t^C	0.073***	0.039***	0.040***	0.047***	0.047***
Regional tax rate, t^R	-0.004	0.003	0.005	-0.005	-0.005
Density	0.040***	0.041***	0.043***	0.059***	0.059***
Average income	-0.003	-0.001	-0.001	-0.001	-0.001
Share of under 14s	0.013	0.007	0.007	0.021	0.021
Share of over 60s	-0.000	0.007	0.006	0.007	0.006
Adj. R ²	0.482	0.491	0.491	0.502	0.503
Observations	23 333	23 333	23 333	23 333	23 333

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

(1) Instruments: time lag of local property tax rate, county property tax rate, regional property tax rate, time lag of local residential tax

(2) Instruments: as (1), plus spatial lag of local property tax rate, spatial lag of the share of under 14s

(3) Instruments: as (1), plus spatial lag of local property tax rate, spatial lag of local property tax rate multiplied by the before SBT jurisdiction dummy, spatial lag of density multiplied by the before SBT jurisdiction dummy, spatial lag of average income multiplied by the before SBT jurisdiction dummy, spatial lag of the share of under 14s multiplied by the before SBT jurisdiction dummy

(4) Instruments: time lag of local property tax rate, county property tax rate, regional property tax rate, spatial lag of property tax rate, spatial lag of the share of under 14s, spatial lag of the share of over 60s

(5) Instruments: as (4), plus spatial lag of local property tax rate multiplied by the before SBT jurisdiction dummy, spatial lag of density multiplied by the before SBT jurisdiction dummy, spatial lag of average income multiplied by the before SBT jurisdiction dummy, spatial lag of the share of under 14s multiplied by the before SBT jurisdiction dummy, spatial lag of the share of over 60s multiplied by the before SBT jurisdiction dummy.

Second, we investigate fiscal cooperation more deeply, distinguishing between the two possible fiscal cooperation regimes: single business tax rate or the additional tax rate. We introduce two dummies: a fiscal cooperation (*Coop*) dummy that the value 1 if municipalities cooperates in the form of the additional or single business tax regime. We also introduce the dummy variable (*SBT jurisdiction*) to distinguish between municipalities that apply a SBT rate and those that apply the additional tax rate.

We want to check whether our results are robust to inclusion of the alternative form of fiscal cooperation. While the implementation of the SBT tax rate acts to merge municipalities, the additional tax rate regime, which is the alternative form of fiscal cooperation, is characterized by a stronger tax base sharing effect implying higher tax rates combined with a larger number

of competing municipalities, which is likely to decrease tax rates. The estimation results are given in Table 4.

We find a positive, but not significant sign of the parameter associated with the fiscal cooperation variable (*Coop*). This implies that fiscal cooperation in the form of an additional tax regime, has no impact on the level of local business tax rates. We can assume that horizontal tax competition between municipalities restrains the tax rate increase generated by tax-base sharing. The interaction variable (*fiscal cooperation*SBT jurisdiction*) has a positive and significant sign, suggesting that local business taxation is higher in groups of municipalities applying the single business tax rate than in jurisdictions setting an additional tax rate. Our previous results are confirmed, showing that implementation of a SBT rate acts to merge municipalities and increase tax rates.

Result 3: Local business tax rates are higher when groups of localities set a single business tax rate rather than applying an additional business tax rate, suggesting that horizontal tax competition restrains the tax rate increase generated by tax-base sharing

We find also that the coefficient of the interaction variable (*fiscal cooperation*neighbour's tax rates*) is not significant, suggesting that tax interactions between groups of municipalities are not significantly larger than the interactions between isolated municipalities. However, we check more deeply the extent of tax competition by interacting neighbour's tax rates with the fiscal regime (*SBT jurisdiction*). Our results are the same as in Section 5, i.e. a significant and a negative sign of the parameter associated with the SBT jurisdiction dummy (-0.057) and a positive and significant sign for neighbour's tax rates (0.367). This result confirms that applying a single business tax rate is likely to decrease the intensity of horizontal tax interactions.

Table 4: Estimation results (with additional tax regime)

	(1)	(2)	(3)
	IV	IV	IV
Methodology	Within	Within	Within
	W ^{d50}	W ^{d50}	W ^{d50}
Lagged endogenous variable, $t_{i,t-1}$	0.736***	0.736***	0.737***
Fiscal cooperation	0.036***	0.035***	0.002
Fiscal cooperation*SBT jurisdiction		0.004***	0.145***
Neighbour's tax rates, $W_{j,t}$	0.423***	0.428***	0.367***
Neighbour's tax rates*fiscal cooperation			0.014
Neighbour's tax rates*SBT jurisdiction			-0.057***
County tax rate, t^C	0.050***	0.049***	0.057***
Regional tax rate, t^R	-0.008	-0.008	0.001
Density	0.080***	0.081***	0.092***
Average income	0.003	0.003	0.006
Share of under 14s	0.039***	0.041***	0.036***
Share of over 60s	0.047***	0.047***	0.042***
Adj. R ²	0.573	0.576	0.577
Weakness of instruments			
<i>Partial adj. R²</i>			
Lagged endogenous variable, $t_{i,t-1}$	0.350	0.354	0.354
Neighbour's tax rates, $W_{j,t}$	0.477	0.487	0.514
Neighbour's tax rates*fiscal cooperation			0.096
Neighbour's tax rates*SBT jurisdiction			0.167
County tax rate, t^C	0.710	0.710	0.714
Regional tax rate, t^R	0.998	0.998	0.998
Validity of instruments: Sargan test (p.value)	0.787	0.851	0.290
Exogeneity test (F value)	6.81	7.94	9.67

t statistics in brackets * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

(1) Instruments: time lag of local property tax rate, county property tax rate, regional property tax rate, spatial lag of local property tax rate, spatial lag of average income, spatial lag of the share of under 14s

(2) Instruments: as (1)

(3) Instruments: as (1), plus spatial lag of local property tax rate multiplied by the fiscal cooperation dummy, spatial lag of local property tax rate multiplied by the SBT jurisdiction dummy.

7. Conclusion

The objective of this investigation was to assess the effects of consolidation on local taxation based on the French experience. We exploited an empirical setting that allowed us to test the

impact of fiscal cooperation in a multi-level government structure. We estimated a model of tax setting for the local business tax using spatial and dynamic econometric techniques for the period 1993-2003. We found first that consolidation limits tax competition and increases the level of local business tax rates, and second that tax rates are higher when groups of localities set a single business tax rate than applying an additional rate of business tax, suggesting that horizontal tax competition restrains the tax rate increases generated by tax-base sharing.

References

Andersson, L., Aronsson, T., Wikstrom, M., (2004) Testing for Vertical Fiscal Externalities, *International Tax and Public Finance*, 11, 243–263.

Anselin, L., (1988) *Spatial econometrics: Methods and models*, Kluwer Academic Publishers, Dordrecht et al. (eds).

Boadway, R., Vigneault, M., (1996) The interaction of federal and provincial taxes on Businesses, Technical Committee on Business Taxation, Working Paper 96-11, Department of Finance, Ottawa, Dec. 1996, 29 p.

Brennan, G., Buchanan, J.M., (1980) *The power to tax: Analytical foundations of fiscal constitution*, Cambridge University Press.

Brueckner, J.K., Saavedra, L., (2001) Do local governments engage in strategic property-tax competition?, *National Tax Journal*, 54, 203-229.

Brueckner, J.K., (2003) Strategic interaction among governments: An overview of empirical studies, *International Regional Science Review*, 26, 175-188.

Bucovetsky, S., (1991) Asymmetric tax competition, *Journal of Urban Economics*, 30(2), 167-181

Bucovetsky, S., (2009) An index of capital tax competition, *International tax and public finance*, 16(6), 727-752

Charlot, S., Paty, S., (2010) Do agglomeration forces strengthen tax interactions?, *Urban studies*, forthcoming.

DEXIA, (1997) *Les finances locales dans les quinze pays de l'Union européenne*, Dexia Editions, 320 p.

Devereux, M.P., Lockwood, B., Redoano, M. (2007) Horizontal and vertical indirect tax competition: Theory and some evidence from the USA, *Journal of Public Economics*, 91(3-4), 451-479.

Edwards, J., Keen, M., (1996) Tax competition and Leviathan, *European Economic Review*, vol. 40, pp. 113-134.

Ermini, B., Santolini, R., (2007) Horizontal interaction on local councils' expenditures. Evidence from Italy.

Flochel, L., Madiès, T., (2002) Interjurisdictional tax competition in a model of overlapping revenue-maximizing governments, *International Tax and Public Finance*, vol. 9, pp. 121-141.

Flowers, M.R., (1988) Shared tax sources in Leviathan model of federalism, *Public Finance Quarterly*, 16, 67-77.

- Heyndels, B., Vuchelen, J., (1998) Tax mimicking among belgian municipalities, *National Tax Journal*, 51, 89-101.
- Hoyt, W.H., (1991) Property taxation, Nash equilibrium and market power, *Journal of Urban Economics*, vol. 30, pp.123-131.
- Kanbur, R., Keen, M. (1993) Jeux Sans Frontieres: Tax Competition and Tax Coordination When Countries Differ in Size, *American Economic Review*, 83(4), 877-92
- Keen, M., (1995) Pursuing Leviathan: Fiscal federalism and tax competition, *mimeo*, Université de l'Essex, Royaume-Uni.
- Keen, M., (1998) Vertical tax externalities in the theory of fiscal federalism, *International Monetary Fund Staff Papers*, vol. 45, pp. 454-485.
- Keen, M., Kotsogiannis, C., (2002) Does Federalism Leads to Excessive High Taxes ?, *American Economic Review*, 92 , 363-370.
- Keen, M., Kotsogiannis, C., (2004) Tax competition in federations and the welfare consequences of decentralization, *Journal of Urban Economics* 56, pp. 397-407.
- Kelejian, H.H., Prucha, I.R., (1998) A generalized spatial two-stage least squares procedure for estimating a spatial autoregressive model with autoregressive disturbance. *Journal of Real Estate Financeand Economics*, 17, 99–121.
- Revelli, F., (2001) Spatial patterns in local taxation: tax mimicking or error mimicking?, *Applied Economics*, 33, 1101-1107.
- Revelli, F., (2003) Reaction or interactions? Spatial process identification in multi-tiered government structures, *Journal of Urban Economics*, 53(1), 29-53.
- Richard, J.F., Tulkens, H., Verdonck, M., (2002) Dynamiques des interactions fiscales entre les communes belges 1984-1997, *Economie et Prévision*, 156 (5), 1-14.
- Solé-Ollé, A., (2003) Electoral accountability and tax mimicking: The effects of electoral margins, coalition government, and ideology, *European Journal of Political Economy*, 19, 685-713.
- Wildasin, D.E., (1988) Nash equilibria in models of fiscal competition, *Journal of Public Economics*, 35, 229-240.
- Wilson, J.D., (1986) A theory of interregional tax competition, *Journal of Urban Economics*, 19, 296-315.
- Wilson, J.D., (1991) Tax Competition with interregional differences in factor endowments, *Regional Science and Urban Economics*, 21, 423-451.
- Wilson, J.D., (1999) Theories of tax competition, *National Tax Journal*, 52, 269-304.
- Wrede, M., (1996) Vertical and horizontal tax competition: will uncoordinated Leviathans en up on the wrong side of the Laffer curve?, *Finanzarchiv*, vol. 3, pp. 461-479.
- Zodrow, G.R., Mieszkowski, P., (1986) Pigou, Tiebout, property taxation and the underprovision of local public goods, *Journal of Urban Economics*, 19, 356-370.

Appendix

Table 1: Summary statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Municipal tax rate	2.567	0.411	-1.277	3.418
Neighbour's tax rates (W^{d50})	2.419	0.242	1.596	3.052
Neighbour's tax rates (W^{contig})	2.539	0.311	0.469	3.297
County tax rate	1.906	0.222	1.295	2.593
Regional tax rate	0.679	0.315	-0.146	1.203
Density	6.132	1.230	2.833	10.110
Average income	2.740	0.275	1.755	4.522
Share of under 14s	2.948	0.146	2.237	3.602
Share of over 60s	2.917	0.292	0.822	3.846

Note: All tax rates are in percentages. Variables are log-transformed.