Tax mimicking and electoral control: an empirical analysis of local tax setting in Spain*

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ABSTRACT:

Do local governments mimic the tax rates set by other governments? Which groups of governments are used as a yardstick? Does this behaviour arise as a result of political considerations? In this paper we try to find answers to these questions, testing the mimicking hypothesis on a sample of Spanish municipalities during the period 1992-99. With this purpose we estimate equations that pick up the determinants of the main municipal tax rate choices (i.e., property, vehicle and business taxes), including the tax rates set by other municipalities. The estimation is carried out by instrumental variables, using as instruments some of the determinants of neighbour's tax rates. The link of tax mimicking and political factors is tested by introducing in the equation measures of the electoral margin faced by the incumbent and interactions among these variables and the tax rates set by other municipalities. The empirical results confirm the relevance of the mimicking behaviour in the choice of property and vehicle tax rates. An increase in each of these tax rates in a municipality prompts a positive response in the tax rates of its neighbour's. The results also suggest that political forces play a role in the explanation of the mimicking behaviour of local officials, since tax rates are higher and the reaction to tax increases in other municipalities is lower when the electoral margin faced by the incumbent is high.

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1. Introduction

Taxes and local politics go hand in hand. And perhaps the biggest reason of this link is that elected officials believe a significant portion of the public uses taxation issues as voting clues. But, although the politicians' fear that tax issues can put an untimely end to its careers is healthy, the electoral consequences of a tax increase may vary by circumstance. In fact, they may depend on both the voter's perceptions on the need to raise taxes and on the a priori electoral margin faced by the incumbent.

The perceptions voters have about the justification of a given tax increase depends on a variety of factors, ranging from the particular tax raised, to the ability of the politician to link the revenue with a popular expenditure program, or to the timing of the tax increase (McManus, 2000, p.87). But in a decentralised tax system, a particular effective way to convince voters that the tax increase is necessary is by showing that taxes are higher elsewhere. Many authors have suggested that voters may use tax rates set in other jurisdictions as a yardstick against which to evaluate the fiscal performance of their own government (see, e.g., Salmon, 1987, Ladd, 1992, and Besley and Case, 1995a). By threatening to punish at the polls those local officials imposing tax rates out of line with those in other jurisdictions, voters force incumbents to look at other localities taxing behaviour before raising taxes, setting the stage for the tax mimicking behaviour.

But this explanation ignores some basic facts of local electoral politics, mainly that incumbents may not be equally worried by the political costs of taxation in all the stances. As Besley and Case (1995a, 1995b) pointed out, incumbents facing binding term limits may be insensitive to neighbours' tax behaviour. Although there are no binding term limits in the Spanish case, local officials facing high a priori re-election chances will probably not care much about the votes lost by raising taxes, as Caplan (2001) has recently shown in the case of the U.S. states. This suggests that the ability of yardstick comparisons to discipline incumbents may depend on the specific workings of the local electoral system analysed. For instance, the links between local taxation, voter's perception, and electoral results are much more uncertain in the proportional, multiparty systems that tend to characterise local politics in Europe. As a result of that, features as, for example, the electoral margin or the government's cohesion (i.e., unified vs. coalition) may have some effects both on tax levels and on the strength of mimicking behaviour.

The purpose of this paper is to provide a test of the tax mimicking hypothesis, paying special attention to the electoral basis of such behaviour. With this aim we combine data on tax rates set by more than a hundred Spanish municipalities during the period 1992-99, with the electoral results obtained by the parties in the local government in the elections of years 1991 and 1995. With this data set we estimate tax-setting equations for three different local taxes (i.e., property, vehicle and business taxes), controlling for the tax rates set by neighbouring municipalities and for the specific features of the government in charge (e.g., electoral margin, unified vs. coalition, ideology). We provide results regarding differentiated tax mimicking behaviour by these kinds of local governments. We also check the robustness of neighbourhood definitions, using both distance-based and political and economic similarity criteria, in order to gain insight regarding the relative evaluation process carried out by voters.

This paper is related to a small but growing empirical literature that tests the tax mimicking hypothesis. The main papers in this tradition are those of Besley and Case (1995a), Case (1993), Ladd (1992) and Heyndels and Vuchelen (1997)[1]. The first three papers employ U.S. data while the last two focus on European experiences. We believe that the current paper presents some improvements. First is the focus on local taxation instead of a broader geographical one. Second is the use of information on tax rates instead of more amorphous measures like tax burdens, as we will explain later on. Third, the consideration of the political environment in which local governments operates, including interactions by government type in the tax-setting equation. And finally, the use of different definitions of the jurisdictions used as a yardstick.

The results obtained are in line with those of the literature. We find evidence on tax mimicking in the choice of property and vehicle tax rates. An increase in each of these tax rates in a municipality prompts a positive response in the tax rates of its neighbour's, with coefficients similar to the ones obtained by Besley and Case (1995a) and Heyndels and Vuchelen (1997). However, the results show a non-homogeneous behaviour across government types: governments with wide electoral margins tend to copycat less than those facing thigh a priori re-election races, while governments on the left tend to copycat more than other types. We also find that yardstick municipalities are those that are close but similar (i.e., same size or economic status), although similar but distant jurisdictions also seem to play a role in the relative evaluation process.

The paper is organised as follows. The next section develops a simple theoretical model based on the Leviathan tradition with the simple purpose to set the stage for the empirical implementation of the tax-mimicking test. Section three provides a brief description of the local tax and political system operating in Spain, describes the data set and econometric procedure used to perform the empirical analysis and presents the main results obtained. Finally, the last section offers the main conclusions.

2. Theoretical background

Although the yardstick competition model of Besley and Case (1995a) advances this idea using a sophisticated information-theoretic framework, the essence of the approach can also be illustrated using a simple model. Following an approach similar to other papers (e.g., Gordon and Wilson, 2001, and Bodenstein and Ursprung, 2001), we will not model the microeconomic fundamentals of the mimicking behaviour. Instead of this, we will simply assume that the representative voter will throw out the local official if the utility loss derived from local policies (relative to the one that would arise if the policies of other local governments were applied) is higher than a given value. Also, we will model the local official

[1] This kind of analysis can be embodied in a broader set of papers devoted to the empirical test of strategic interactions among local governments. As Brueckner (2001) points out, there are various stories that could be invoked to justify the analysis of local interactions, being that of yardstick competition or tax mimicking just one of these. Some recent papers that look at interactions for evidence on tax competition are, for example, Brett and Pinske (2000), Büettner (2001) and Brueckner and Saavedra (2001). See also Saavedra (1999) for evidence on welfare competition and Case *et al.* (1993) for evidence on interactions due to expenditure spillovers.

as having preferences for own consumption financed out of revenues collected, but that also cares for being re-elected[2]. This simple approach will suffice to provide a sound base to the empirical equations to be estimated later on.

The workings of the model are described as follows. First, we present the objective function of the representative voter[3], and posit the voting rule she uses in the evaluation of the performance of the local government. Second, we describe the behaviour of the local official[4], considering that she faces a dynamic trade-off among taxes raised in the present and re-election chances in the future. Third, we solve the model and present its comparative static.

Representative voter

To simplify, we consider that the private decisions of residents do not depend on the policies enacted by the local government. Thus, local taxes are a lump-sum transfer from the residents to the government. This assumption allows us to write the individual's indirect utility function in jurisdiction i as $u(y-t_i) + m(e_i)$, where y_i is exogenous income, t_i is the amount of tax paid, e_i is expenditure in public services, and where $u' = \partial u/\partial(y-t) > 0$, $m' = \partial m/\partial g > 0$, $u'' = \partial u'/\partial(y-t) < 0$ and $m' = \partial m'/\partial g < 0$. For reasons that will become evident later, the levels of taxation and benefits enacted by the local official in charge (t_i^o and e_i^o) may differ from those preferred by the representative resident (t_i^r and e_i^r). The utility loss due to the divergence between real and desired fiscal policies will be the indicator this resident uses to evaluate incumbent's performance. This utility loss may be expressed as $u^i = u'(t_i^r).(t_i^o - t_i^r) + m'(e_i^r).(e_i^r - e_i^o)$.

However, because the voter has less information than the official regarding different types of budget shocks (e.g., a tax base drop or an increase in the cost of providing the service), she is not able to distinguish which part of this utility loss is justified and which part is not. In this setting, many authors have shown the optimality of voting clues based on retrospective strategies, as for example, throwing out the incumbent if this utility loss exceeds some critical level (Ferejohn, 1986 and Rogoff, 1990). This level must be chosen in order to put some pressure on the incumbent but not incurring in too high probabilities of throwing out "good" politicians, meaning that even in this case local officials will be able to obtain some rents.

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[2]The model is in the Leviathan tradition (Brennan and Buchanan, 1981), but introducing bounds to the behaviour of local governments derived from electoral constraints, as in Bodenstein and Ursprung (2001). Although the government is not constrained by the mobility of residents, we recognise that in the long run these considerations may be also important. See Gordon and Wilson (2001, section 2) for a join treatment of a Leviathan government bound by electoral results and the mobility of factors.

[3] By assuming a representative voter we rule out the possible redistributive motivations of taxation that may be important in the real world. This has been done in order to simplify the model and reinforce the view of elections as a politician's control device.

[4] The theoretical model assumes that the local government is a unitary actor. Therefore, we will use in this section local government, local official or incumbent as equivalent terms, although in the empirical part we will account for the effects of divided government teams on tax policies.

But in a decentralised system there appear other possible (and more efficient) voting strategies to be used. Suppose this resident can gather information about the utility loss in the event she has inhabited jurisdiction *j*: $\mu^j = \mu'(t_i^r).(t_j^o - t_i^r) + \mu'(e_i^r).(e_i^r - e_j^o)$. Then the voter evaluates the relative performance of the incumbent comparing these two utility losses: $\Pi^i = \mu^j - \mu^j = \mu'(t_i^r).(t_i^o - t_j^o) + \mu'(e_i^r).(e_i^o - e_j^o)$. Of course, for this comparison to make sense, the voter has to be able to gather comparative information on these variables and believe that the shocks affecting the budgets of governments *i* and *j* are similar. In order to simplify the analysis we will abstain from considering comparisons regarding service levels[5]. We may suppose that they pick only exogenous cost factors and, therefore, do not depend on decisions made by the official (i.e., $e_i^r = e_i^o$ and $e_j^r = e_j^o$), or that the voter has not enough information to suspect they are differ from municipality to municipality (i.e., $e_i^o = e_j^o$). If this is the case, relative performance evaluation reduces to $\Pi^i = \mu'.(t_i - t_j)$, where we set $\mu' = \mu'(t_i^r)$ and dropped the *o* superscript in order to simplify notation.

We consider that a voter will re-elect the incumbent only if the relative performance is higher than a critical level ($\Pi^i > \varepsilon$). This means that the fiscal gain obtained from voting for the incumbent has to be higher than the bias this representative voter has against it and in favour of the challenger. This bias may arise for ideological reasons or represent the level of tolerance of this representative voter in front of tax increases[6]. The common procedure in this kind of literature is to suppose that the parameter ε has a distribution $F(\varepsilon)$ and density $f(\varepsilon)$. Thus, the probability of re-election is:

$$F_i = F(\Pi^i) = F\left(\mu'.(t_j - t_i)\right) \qquad (1)$$

Local official

The local official obtains utility from "perks" (s_i); that is, from own consumption of resources instead of it being devoted to public good provision[7]. The more resources devoted to own consumption, the more taxes should be raised in order to finance public services. This trade-off is exemplified in the following budget constraint:

[5] This is standard practice in yardstick competition models (see, e.g., Besley and Case, 1995a or Feld *et al.*, 2001). However, these models could be also solved assuming that service levels are endogenous, giving raise to empirical specifications were tax rates react to changes in both taxes and expenditures of other municipalities. We will take this into account in the empirical section.

[6] This specification is common to the probabilistic voting literature (Couglin, 1986, and Lindbeck and Weibull, 1988) and amounts to accept that taxation issues may play (in some stances) only a limited role in the voting decision of individuals. This is, precisely, the assumption that allows to differentiate situations where elections will be highly contested and, therefore, tax increases may have profound effects on the votes obtained form those elections with results unaltered independently of the tax policy.

$$s_i = t_i - (e_i - g_i) \qquad (2)$$

where g_i are grants received by jurisdiction i from other levels of government and other exogenous resources. We assume that the official's utility in office equals $V^i \circ \sigma^i + \phi^i(s_i)$, where $\phi' = \partial\phi/\partial s > 0$ and $\phi'' = \partial\phi'/\partial s < 0$; we include a super-index i because we want to denote that there are potentially different types of politicians in each jurisdiction, good or bad, characterised by the utility they derive from perks. The local official also derives utility from being in government per se (σ^i), but this utility does not involve any use of resources for own consumption (one can think in some type of psychic utility from participating in public affairs).

When deciding the level of taxation, the local officials takes into account the utility she obtains while in charge, but also the utility foregone in the event she would be fired. The dynamic trade-off between raising taxes today (and thus obtaining more perks) and increasing the probability of electoral defeat (and thus not being able to obtain perks in the future) can be expressed by means of the following dynamic trade-off:

$$V_t^i = \max \left\{ \sigma^i + \phi^i(s_i) + \beta^i \left(F_i . E(V_{t+1}^i) + (1 - F_i) . E(V_{t+1}^{n,i}) \right) \right\} \qquad (3)$$

Where β^i is a discount factor, $E(\bullet)$ is the expectations operator, V_{t+1}^i is the utility achieved by the local official in $t+1$ if re-elected, and $V_{t+1}^{n,i}$ is the utility in the alternative relocation of the local official if not re-elected. Note that this expression links the voter's decisions (entering through F_i) with those of the local official.

Choice of taxes

The local official chooses t_i by maximising (3) subject to the budget constraint (2) and the expression of F_i (1). We assume that the local official takes as given the taxes set in jurisdiction j (i.e, she behaves Nash). In this case, the first order condition of the problem is:

$$\Gamma = \phi_i' - f_i . \left(\mu' + \mu'' . (t_j - t_i) \right) . \beta^i . E(\Delta V_{t+1}^i) = 0 \qquad (4)$$

where $\Delta V_{t+1}^i = V_{t+1}^i - V_{t+1}^{n,i}$. This expression states that the local official equates the marginal benefit provided by "perks" (ϕ') with the marginal political cost of raising taxes. The marginal political cost of

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[7] Perks need not come exclusively from pocketing extra cash, a fact that we may assume can largely be prevented by residents. They may refer to any reported expenses that go beyond what is needed to produce the observed public good (e.g., fancier offices, official trips, lunches, hiring relatives and friends, etc).

raising taxes is equal to the marginal loss of votes provoked by a tax increase, $f_i.(\mu'+\mu''.(t_j-t_i))$, times discount factor β^i, and the expected differential utility of being in charge again, $E(\Delta V^i_{t+1})$ [8].

Tax setting equation

Comparative static analysis of expression (4) allows us to write the following tax-setting equation:

$$t_i = \hat{O}(t_j;\ g_i,\ e_i;\ f_i;\ \sigma_i,\ f_i',\ \beta^i.E(\Delta V^i_{t+1})) \qquad (5)$$
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That is, the level of taxation in jurisdiction *i* depends on the level of taxation (t_j). It also depends on the level of grants at disposal of the local government (g_i), on other cost or demand factors that influence the level of services (e_i), on the electoral productivity of raising taxes (f_i)[9], and on characteristics of the incumbent like her taste for being in office (σ_i) and "perks" (f_i'), or the expected value of holding office ($\beta^i.E(\Delta V^i_{t+1})$). Note that f_i is higher the more contested is expected to be the election race. Therefore, expression (5) says that although the Leviathan will try to raise the tax rate as much as she can, she is constrained by her expected electoral margin.

As is apparent from expression (5), the results of the comparative static provide clear predictions for all the variables to the exception of those that measure the interactions with the policies of jurisdiction *j.* But these are precisely the parameters of interest in order to test the tax-mimicking hypothesis. Note, however, that although the sign of the reaction is indeterminate, the sole fact that the reaction is different from zero means that voters use this information in order to evaluate local officials. By looking to the details of the reaction we may infer some additional clues to interpret the empirical results. For example, by total differentiation of expression (4), and assuming we are analysing changes from a symmetric equilibrium where $t_i=t_j$, we can obtain the sign of the reaction of taxes set by one jurisdiction (t_i) to the taxes set elsewhere (t_j):

$$\frac{\partial t_i}{\partial t_j} = -\frac{\partial \Gamma/\partial t_j}{\partial \Gamma/\partial t_i} = \frac{(f_i\mu''+f_i'.(\mu''/\mu')).\beta^i.E(\Delta V^i_{t+1})}{\partial \Gamma/\partial t_i} \qquad (6)$$

where $\partial\Gamma/\partial t_i<0$ by the second order condition, and the sign of expression (6) depends both on the sign of

[8] We assume ΔV^i_{t+1} to be positive in order to insure that the incumbent have some interest in remaining in office. If this is not so or the incumbent face binding term limits, the model poses no limit to the possibility of raising taxes.

[9] For example, if we assume a symmetric single-peaked distribution, this happens as the distance from a vote-share of 50% decreases (see, e.g, Case, 2000, and Dhalberg and Johanssen,

$f_i.u''$ and that of $f_i'.(u''/u')$. Since $u''<0$ the effect of the first factor is positive. However, the effect of the second factor depends also on the sign of f_i'. If $f_i'>0$ the sign of the second factor is also positive and taxes are strategic complements[10]. Therefore, the general conclusion is that the sign of the reaction can not be theoretically determined and that empirical exercises are needed in order to ascertain if taxes set by different municipalities are strategic complements of substitutes. Another empirical hypothesis can be derived from expression (6) by noting that the size of the interaction increases with f_i. This suggest not only that f_i must appear as an explanatory variable in the tax-setting equation, but also that one may include and interaction between f_i and t_j. This interaction would provide a test of the hypothesis that incumbents facing low a priori re-election chances (high f_i) tend to copycat more the tax changes of other municipalities.

3. Empirical analysis

In this section we perform an empirical test of the tax mimicking hypothesis using the tax-setting equation (5). The analysis makes use of a panel of data for a set of Spanish municipalities (those in the region surrounding the city of Barcelona) during the 90's. In order to set the scene for the analysis we begin the section with a brief description of both municipal taxation and the local political system in Spain. Then we describe the variables used, and the econometric techniques employed in the estimation. Finally, we present the main results obtained.

3.1 *Local taxation and politics in Spain*

Spain consists of more than eight thousand municipalities, but most of them are quite small (i.e., 90% have less than five thousand inhabitants and represent no more than 5% of the Spanish population). Municipalities are multipurpose governments, being its major expenditure categories those corresponding to the traditional responsibilities assigned elsewhere to the local public sector (i.e., environmental services, urban planning, transportation, welfare, etc.) to the exception of education, a responsibility of the regional governments. Municipal responsibilities grow steadily with population size, a fact that is properly recognised by the financing system.

Own revenues account for more than 65% of municipal current revenues, the remaining 35% being covered by grants, most of them unconditional. Two thirds of own revenues come from five main taxes and the remaining one-third from plenty of user charges. The main taxes are the property tax, the local

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2000).

[10] However, if $f_i'<0$ the effect of this factor is negative, and tax complementarity is not warranted. The sign of f_i' depends on the shape of the density function, so it is quite difficult to make precise predictions about its effect. However, note, that if the distribution of ε is uniform, then $f_i'=0$ and the second effect disappears from expression (6). And in the case of a symmetric single-peaked distribution, $f_i'>0$ ($f_i'<0$) if the incumbent is located at the left (right) of the bliss point (i.e., if the re-election chances of the incumbent are lower/higher than 50%).

business tax and the local motor vehicle tax, accounting for 50%, 20% and 15% of tax revenues each[11]. These will be the three taxes considered in the empirical analysis. In the early years of democracy, Spanish municipalities did not have any tax power over these revenue sources. But in the second half of the eighties they were granted with the power to set the tax rates of the various local taxes up and above a threshold, and over completely harmonised tax bases. Minimum tax rates are the same for all the municipalities but maximum tax rates grow with population size. The tax setting capacity of Spanish municipalities is now considerable, since the bottom-top tax rate distance allow wide differences in tax liabilities between municipalities (from 200% to 300%, depending o the tax and population size). As a result of the use of this tax autonomy, disparities in tax rates among municipalities are now considerable (see Table A.1 in the Appendix). In addition to that, the use of tax room is expected to continue in the future, since only a few municipalities have reached the top tax rate.

The local electoral system in Spain is similar to most of the systems operating through Europe. Municipal elections are held simultaneously in all the municipalities at regular periods (four years). There is a unique local district, closed lists, and the electoral system is a proportional one, using a D'Hont formula with a minimum vote share of 5%. According to many authors "these rules provide incentives for sincere voting and promote a high degree of pluralism in the city councils" (Colomer, 1999). However, this feature also translates in a high proportion of divided governments, which tend to be more instable. For example, roughly a 40% of the municipalities in the analysed sample were coalition governments in 1992-95, and this figure raised to near 60% in the 1996-99 (see Table A.2 in the Appendix). In addition to that, most of the candidates are aligned along national party lines. In fact, the municipal political system is seen as a first step of the recruitment process of the regional and national political elite (see Magre, 1998).

There is also some informal evidence that municipal governments in Spain may encounter some opposition to raising local taxes, suggesting that research on the link between taxes and local elections may be fruitful. In fact, municipal taxation in Spain generates a great deal of popular discontent. Specific episodes revealing this fact are the postponement of the residential property value reassessments during the period 1991-96, or the protest of many professional sectors since the introduction of the new local business tax in 1992. The unpopularity of local taxes was initially due to the lack of confidence in the recently tax-empowered municipalities, but continues nowadays due to the peculiar characteristics of local taxes that make them relatively unfair[12]. Despite this situation, there are only few empirical papers analysing the fiscal decisions the fiscal decisions by Spanish municipalities and its links with political factors[13].

[11] The remaining tax revenue comes from a tax on land value improvements, a tax on building activities and other minor taxes.
[12] For example, the local business tax is not paid on profits, but is based on some "objective" factors (e.g., fixed quota, number of workers, retail surface, etc.).
[13] See, as exception, Bosch and Suárez (1993) and Solé-Ollé (1997, 2001).

3.2 *Empirical framework*

The database used to test the tax-mimicking hypothesis corresponds to only a subset of Spanish municipalities, covering all the municipalities with a population higher than 5.000 inhabitants in the region surrounding Barcelona. We have excluded the biggest city, Barcelona, because its policies are hardly comparable with any of the smaller localities in the sample[14]. These amount to 105 municipalities, representing a third of the municipalities of that area but more than 90% of the population. We feel this database is well suited to the study of tax mimicking. The main reason is the reduced land area of most of these municipalities, all of them concentrated in a area with radius less than 100 km. As Heyndels and Vuchelen (1997, p.92) state, mimicking and implied informational externalities are intuitively more appealing in a context of small-scale local governments, being geographic neighbours a straightforward choice of reference at this level. Another reason is that all the municipalities of our sample operate in the same institutional context. This does not happen, for example, in the inter-metropolitan studies performed with U.S. data, where the division of responsibilities among states and local governments tend to differ across states.

We use a panel of data for this set of municipalities covering the period 1992-99. This is probably the best period to analyse municipal tax behaviour in Spain, since it is not till 1992 that the reforms introduced in the 80's were completed with the introduction of the new local business tax. Also, this long and recent period allows us to use data on two electoral contests, those of 1991 and 1995. It would have been totally impossible to match tax and electoral data for previous elections.

The taxes analysed are the property tax, the local motor vehicle tax and the local business tax. Revenues of the first two taxes come mainly from the residential sector and, thus, are completely suited to the kind of analysis we will perform. Although the local business tax does not conform with this rule, it should be noted than in this case nearly 90% of taxpayers are small unincorporated business or professionals, with few workers and mostly with the owner residing in the municipality. Therefore, the political costs of raising this tax should not be a priori dismissed[15]. A clear advantage of the data set used is that the tax data available for these municipalities allows us to concentrate on tax rates instead of, for instance, per capita tax burdens, which depend on many other factors, like the evolution of the local economy. Also, as we have previously mentioned, tax bases of these taxes are identically defined for all the municipalities. Moreover, as they are very simple taxes, the tax bases are computed directly by the central government for each municipality[16]. This is an advantage from the empirical point of view since it allows us to concentrate in simple reliable indicators of the level of taxation. Moreover, this fact also makes the sample specially useful for the study of tax mimicking, since it facilitates intermunicipal comparison of taxes by individual voters and local officials.

[14] In fact, Barcelona's city officials tend to compare with Madrid or other big Spanish cities or even with other European metropolis.

[15] In this case arguments relating to the need to keep taxes in line with neighbours to avoid business migration and maintain business climate are also appealing, as Ladd (1992) notes.

[16] For example, in the case of the property tax, assessments are performed from time to time by

The empirical framework used to analyse the tax mimicking behaviour of Spanish municipalities consists of an implementable version of equation (5). The tax-setting equation for any of the three cited taxes can be expressed as:

$$t_{i,t} = a_1 . t_{j,t} + \sum_k a_{2,k} . x^k_{i,t-1} + \sum_l a_{3,l} . z^l_{i,t-1} + \sum_m a_{4,m} . w^m_{i,t-1} + a_{0,i} + a_{0,t} + e_{i,t} \qquad (7)$$

where $t_{i,t}$ is the tax rate of either the property tax, the motor vehicle tax or the local or business tax in the *i* municipality. The tax rate of the property tax is calculated as the nominal tax rate plus the equivalent per cent increase in per home value in the years following a reassessment (see the Appendix for definitions and sources). This procedure avoids having to deal with the usual decreases in nominal rates after reassessments, while effective rates are simultaneously raising. The tax rate in the case of the motor vehicle tax is the ratio of tax revenue to the overall tax base of the municipality; this procedure is necessary given that different kinds of vehicles (e.g., autos, trucks, etc.) bear different tax rates. The business tax rate is also computed as the ratio of tax revenue to the overall base. This has the purpose of accounting for the two different tax rates that are applied on the tax base in order to compute tax due: a general tax rate and a taxrate that varies depending on geographical location inside the municipality[17].

The $t_{j,t}$ variable is the tax rate of each of these taxes in the set of neighbours or reference municipalities, *j*. The benchmark estimation of expression (7) uses a pure proximity definition of this set of municipalities. However, we provide also some extensions showing the results for other similarity criteria; we delay the definition of these different reference sets until the next section. We denote by $x^k_{i,t-1}$ the variables that measure the availability of exogenous revenues (i.e, unconditional grants per capita, $g_{i,t-1}$, size of the tax bases per capita, $b_{i,t-1}$, and a dummy indicating if there has been a property value reassessment that year, $a_{i,t-1}$). The dummy year of reassessment has been included because of the casual observation that property tax revenues and effective tax rates peak up in the year following the reassessment[18]. We denote by $z^n_{i,t-1}$ the variables that measure the demand for (or cost of) services in municipality *i* (i.e., personal income per capita, $y_{i,t-1}$, and population size, $p_{i,t-1}$). It is important to control for the size of the population since, as we have mentioned both the level of responsibilities and maximum

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a central agency. Also, tax base parameters of the local business tax for each type of business or professional activity (e.g., pta./worker in the auto industry) are set by the central government.

[17] That is, e.g., tax rates are higher in first class commercial streets. Although this second tax rate may be purely redistributive (e.g., raising taxes in first class sites but reducing taxes in other sites in order to keep revenues constant), in practice, municipalities tend to use it to increase taxes everywhere, mainly when they are near maximum general tax rates.

[18] Some authors that have documented this fact (Bloom and Ladd, 1982, and Ladd, 1991) attribute it to voter fiscal illusion (i.e., voters are more aware about increases in nominal rates than about similar increases in the tax base). However, recently, Strumpf (2001) has argued that this behaviour may be purely rational, since long reassessment delays may reduce the majority-

tax rates increase with municipality size. Note that all these variables are one year lagged; this makes sense, since tax rates are passed on the fall of the previous year; this procedure helps also to avoid possible endogeneity problems.

The variables that proxy for the political factors included in equation (5) are denoted by $w^{m}_{i,t-1}$. This set includes variables that account for characteristics of the local government that may be correlated with the electoral productivity of tax changes (f_i) and/or with the politician's preferences and rewards (s_i, f_i' and $b^{i}.E(\Delta V^{i}_{t+1})$). We have included in this set, first, a proxy of the electoral margin facing the incumbent (f_i). Following Case (2000), this is computed as the difference in absolute value between vote-share obtained by the government in the previous election and 50% ($w_{i,t-1}$)[19]; we expect tax rates to increase with $w_{i,t-1}$. Second, we have also included a variable that accounts for the effect of divided governments: a dummy equal to one in the case of a coalition government ($dcoa_{i,t-1}$). Since some authors have pointed out that divided governments may find more difficult to resist redistributive pressures (Alt and Lowry, 1994) we expect tax rates to rise in this case. Third, we have included also another dummy equal to one if some members of the coalition are 'independents' that do not belong to any regional or national party ($dind_{i,t-1}$). We believe this feature may have some effects on politician's preferences and rewards, since independents tend to have a shorter time horizon and, thus, do not fully consider the electoral costs of raising taxes. Fourth, we have included two variables that account for the ideology of the government: a dummy equal to one if the party or coalition in the government is on the left-wing spectrum of the political arena ($dleft_{i,t-1}$), and a dummy equal to one if the communists are in the government ($dleft2_{i,t-1}$). We expect that as governments move to the left they tend to enact higher tax increases. Finally, we include also interactions among $w_{i,t-1}$ and all the political dummies.

Finally, note that expression (6) also includes municipality ($a_{0,i}$) and time ($a_{0,t}$) fixed effects and a well-behaved error term ($e_{i,t}$). Municipalities fixed effects allow us to control specific circumstances of each locality that have an effect on the tax rate but that stay relatively constant during the period analysed (e.g., characteristics of the local political market, specific differences of the demand of public goods, etc). If some of these omitted variables were correlated with the reference tax rates, the obtained mimicking parameter would not be reliable. Time effects are introduced in order to control for shocks common to all the municipalities in the sample but changing from year to year. These shocks may account for changes in the national political environment or general economic fluctuations that affect municipal tax bases. They will also help to control for the effect of the electoral cycle that, as we have mentioned, is common to all the municipalities. By comparing the parameters of two time dummies corresponding to years in the same

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preferred tax rate so below its initial level that they tend to recover just after reassessment.

[19] Although we recognise that this way to proceed is only completely valid in the case of a symmetric single-peaked distribution, we have used it because its positive performance in

cyclical position we will be able to test the hypothesis that tax increases tend to occur in the years after the election is held.

The simple tax-setting equation of expression (6) is then expanded in order to test complementary hypotheses. The first one is to look for the possible interaction among municipalities in the setting of rates of different taxes. If municipalities use the different taxes up to the point where marginal political cost are equated for all of them (see, e.g, Hettich and Winer, 1988), then an increase in the political cost of raising one particular tax must prompt an adjustment in the use of all other taxes. In the same vein, we also look for a possible interaction between tax rates and service levels set by neighbouring governments ($e_{j,t}$). Variables e_i and e_j were treated as exogenous to the decision-making problem analysed in section 2, but they could have been considered endogenous as taxation levels are. In this case, the empirical prediction would be that taxes not only react to taxes in the neighbourhood but also to service levels therein. Although it is not clear that voters or local officials have access to sound information regarding this concept, we have decided to lay the data speak for itself. As we explain in detail in the Appendix we compute this variable from data on expenditures by function, but using only those categories deemed most related to the provision of services to residents, and excluding those assumed to be related with the "perks" concept[20].

The third expansion consist of interacting neighbour's tax rates with some political variables, accounting for the possible different reaction of municipalities with high a priori electoral margins. Selected variables include $dcoa_{i,t-1}$ and $dleft_{i,t-1}$, and the difference between the vote-share in the previous election and 50% ($w_{i,t-1}$). These variables can be justified by having a look at expression (6). Note for instance that the tax interactions is higher the higher is f_i and lower if $f_i' < 0$. Therefore, as f_i is proxied by $w_{i,t-1}$ (i.e., f_i decreases as increases $w_{i,t-1}$) we expect a negative coefficient for the interaction $t_{j,t-1}.w_{i,t-1}$. If the other variables are also predictors of electoral success, its interactions with $t_{j,t-1}$ may take into account the effects of f_i and f_i' over the size of the tax interaction.

Finally, the fourth expansion consists of looking for changes in the mimicking behaviour when changing the definition of the reference group to more sophisticated settings. We deal with this aspect just below.

3.3 *Econometric issues*

Neighbourhood

The first problem entailed by estimation of equation (7) refers to the definition of the set of municipalities that are used as a "yardstick" (i.e., the neighbour's or the reference set). Identification issues impede

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previous papers (Case, 2000 and Caplan, 2001) and the lack of other practical approaches.

[20] We exclude from this calculation, for example, expenditures on general administration (e.g., remuneration of politicians) and redistribution (e.g., welfare payments).

neither inclusion in the analysis of tax interactions for each pair of municipalities, nor that of the average tax rate in the sample [21]. Instead, an 'a priori' set of interactions has to be defined and tested. Although the most common procedure to define these interactions employs geographic proximity criteria, nothing precludes the use of other distance metrics (e.g., socio-economic similarity). But, as Anselin (1988) notes, there is some degree of arbitrariness in the definition of these criteria; this author recommends relying, when possible, on insights derived from the theoretical model. In our case, the model suggests that interactions derive from the relative evaluation of tax policies performed by voters. In order to be considered by voters, municipalities must comply with two prerequisites: (i) be those from which voters have access to the information on tax rates, and (ii) be considered by voters as roughly comparable to the municipality where they live.

Regarding the first condition, voters may gather information from various sources: directly (e.g., because they work there), from the mass media, or from local politicians. On the one hand, direct interactions occur the lower the distance is, and local fiscal issues are scrutinised mainly by the local media, covering specific sub-regions of the analysed area. Therefore, distance seems to be an appropriate criteria to account for informational interactions. But on the other hand, politicians tend to interact more with politicians belonging to the same party or with a similar ideology. Although there are some geographical clusters of governments of similar ideology in the area, a lot of information gathered by politicians comes directly from the party or related organisations and not from partisan peers in the neighbourhood[22]. Local officials also receive comparative information from higher levels of government[23]. These arguments suggests that some of the tax information used by voters and local officials came from comparable local governments in the region but outside the immediate neighbourhood. This fact leads us to the second condition. In order to consider that the tax rates of some municipalities convey useful information, this municipality must be similar to ours in the shocks its budget faces. These shocks may refer to the tax bases or resources available or to the demand for public services. Size is one of the first criteria to be considered, since municipalities with the same population tend to by affected similarity by scale economies or congestion costs, and have the same expenditure responsibilities and taxing possibilities. An another criterion consists of grouping the municipalities by a more comprehensive socio-economic indicator, or by and index of fiscal stress. This criterion will be more informative than size alone, since one can easily find, for example, two municipalities with the same population but one 'rich' and the other 'poor'.

Thus, both geographic proximity and similarity in other treats will be considered in the definition of the reference set. The basic results presented in section 3.4 use only the distance criterion (*distance)*,

[21] This is the so-called "reflection problem" by Manski (1993).

[22] In fact, the two existing associations of municipalities in the region are divided according party lines (right wing vs. left wing governments).

[23] For example, a higher tier of local government with jurisdiction in all the region (Diputación de Barcelona) submits every year to each municipality a survey of budgetary and fiscal data comparing its position with that of a broadly similar set of municipalities in the area. The groups are formed according the size and socio-economic criteria but not by distance.

neighbours being defined as municipalities located within a distance of 20 km[24]. However, we then present expanded results with weighting schemes based on other criteria. The first one uses weights based on size similarity (*size*), computed as the absolute value of the difference among populations for each pair of municipalities in the sample. The second one computes weights in the same fashion, but similarity is defined according to an index of fiscal stress (*economic*), that is defined as the ratio between an expenditure needs index and a fiscal capacity index[25]. The third one defines neighbours according to partisan lines (*political*): leftists are clustered with leftists and parties on the right wing are clustered with themselves. We also present results of weighting schemes combining the basic distance approach with each of the similarity criteria, defining neighbourhood as municipalities located within 20 km but weighting each neighbour with similarity in size (*distance & size*), fiscal stress (*distance & economic*) and partisanship (*distance & political*).

Endogeneity

Reference tax rates included in equation (7) are endogenous: tax rates in municipality *i* depend on those in *j*, but also tax rates in *j* depend of tax rates in *i*. Thus, to get consistent estimates of the tax-mimicking parameter a simultaneous estimation procedure is required. The available procedures are either maximum-likelihood (Anselin, 1988) or instrumental variables. We will use this latter approach, following the practice of an increasing number of papers (see, e.g., Besley and Case, 1995a, Heyndels and Vuchelen, 1997, Figlio *et al*., 1999, Brett and Pinkse, 2001, and Büettner, 2001). The instruments used will be some of the determinants of neighbour's tax rates: unconditional grants per capita, $g_{i,t-1}$, size of tax bases per capita, $b_{i,t-1}$, personal income per capita, and $y_{i,t-1}$, and population size, $p_{i,t-1}$). Instrumental variables estimation has the additional advantage of insuring that the correlation in taxes is not due to common exogenous shocks, since (as Kelejian and Prucha, 1998, demonstrate) IV estimates are consistent even in the presence of spatial error autocorrelation.

However, in the case of spatially autocorrelated error terms (i.e., $\varepsilon_{i,t} = \lambda\varepsilon_{j,t} + u_{i,t}$) estimates are no longer efficient. To check this possibility we have used the Anselin and Kelejian (1999) version of the Moran's I test (1950), that is appropriate to test for spatial autocorrelation in the presence of endogenous regressors. Spatial error autocorrelation has been rejected in all the cases when using the same weighting scheme than the one used to compute neighbour's tax rates. When using different weighting schemes there appears to be autocorrelation in some cases; however, this problem disappears once this weighting scheme is used to compute a definition of neigbour's tax rates that is additionally included in the tax-

[24] This definition of neighbourhood has a better fit than other weighting schemes based on distance that have been tested, as using other distances or weighting each neighbour by inverse distance. See the Appendix for details. Results are available upon request.

[25] Fiscal needs are the expenditure required to provide a given level of service quality in a given municipality, and are higher the higher the size of user groups, provision costs or expenditure responsibilities. Fiscal capacity is computed as the revenues that a municipality may raise from its tax rates by imposing an standard or average tax rate. Both indexes are taken from Solé-Ollé (2001) and correspond to the year 1996. See Appendix.

setting equation.

3.4 *Results*

The basic parameter estimates of the tax-setting equation are presented in Table 1. We have estimated both fixed and random effects versions of the model. However, for the different specifications we have tried, the hypothesis of no correlation between the fixed effects and the variables included in the model was rejected at the 99% confidence level. For this reason, we only report the results for the fixed effects model. We show also that *F* tests for the joint significance of individual and time effects are overcome. We have also performed a standard White test and a panel Durbin-Watson test to check the presence of cross-section heteroskedasticity and first order serial autocorrelation, respectively, rejecting these possibilities in all the cases.

[Table 1 about here]

We show the results corresponding to the OLS and IV estimates for each of the three taxes (property, vehicle and business). In the three cases, a look at the Hausman test corroborates the fact that OLS estimates seem to be biased; this test is overcome for equations (2), (4) and (6), showing the appropriateness of the IV technique. In the case of property and vehicle taxes, the IV coefficient on neighbour's tax increases is much higher that the corresponding OLS coefficient, although standard errors are also higher (in fact, in the case of the vehicle tax, the IV coefficient is statistically different from zero only at the 90% level). In the case of the business tax, IV estimation reduces the point estimates of the interaction parameter but increases its standard error, making the estimated coefficient statistically not significant.

From the results of Table (1) we can confirm the basic mimicking hypothesis advanced along the paper. First, there is a significant positive response of property and vehicle tax rates to changes in the tax rates of its neighbours. A 1 point change in the taxrates of the set of reference municipalities supposes an average change in the tax rate of the municipality of 0.389 (in the case of the property tax), and 0.333 in the case of the motor vehicle tax. Second, the signs and the magnitudes of the neighbour's coefficients in the business tax equation are also as expected; however, they are not statistically significant.

Third, the results regarding political variables corroborate that the model sketched in section 2 may be appropriate to explain municipal tax-setting behaviour. The main result in this case is the positive and significant effect of the electoral margin ($w_{i,t-1}$) on business and property tax rates. The magnitude of this effect is different for different types of governments, since the interactions of this variable with the ideological dummies ($w_{i,t-1} \times dleft_{i,t-1}$ and $w_{i,t-1} \times dleft2_{i,t-1}$) and the presence of independents in the government ($w_{i,t-1} \times dind_{i,t-1}$) are also significant. For example, a 10% increase in the margin of victory in the case of a government on the right and without independents supposes and increase of approximately 0.010 in the property tax rate and of 0.017 in the business tax rate. In the case of a government on the left and without independents these figures rise to 0.016 in the case of the property tax and remain the same for the business tax. If there are communists in the government, the increase in the

property tax is lower (0.005) but the increase in the business tax rate is much higher (0.031). Clearly, although these effects are not really high, they are of the expected sign and statistically significant.

The results obtained for the other political dummies are also of interest. The results show that (keeping the electoral margins constant) coalition governments tend to set lower property and vehicle tax rates (the coefficients are significant at the 90%). However, independents and parties on the left tend to raise all the tax rates, although the biggest effects appear in the case of the business tax (this is also the only case where coefficients are significant at the 95% level). In addition to that, governments with communists members tend to raise property tax taxes (and to a lesser extent, vehicle tax rates) more than other governments on the left. Comparing these results with those regarding the sensibility of various types of governments to electoral margins we find some interesting results: leftists tend to tax more heavily the three bases analysed, and when they feel electorally safe they increase slightly more the property tax rate, and communists tend to raise property and vehicle taxes more than other leftists but only increase business taxes when electoral margins are wide.

Fifth, the results obtained for the time effects are also informative. Note that in either of the three tax-setting equations, the dummies corresponding to 1995 and 1999 (the election years) show very low and insignificant coefficients. While this effect may be due to common economic or political shocks other than being in an election year, it suggests that political costs of tax increases are particularly high in those years.

Finally, the results regarding the economic controls included in the equation are consonant with the expectations. Higher per capita transfers and tax bases allow the municipalities to reduce tax rates in all the figures, although the coefficients are not always significant at conventional levels. Also, property tax rates do peak up in a reassessment year, a fact that may be interpreted either, as we noted in the previous section, as fiscal illusion or as pure rational behaviour of the representative voter facing an increase in the tax base. Interestingly, municipalities seem not to use this extra property tax revenue only to raise expenditure but also to reduce both vehicle and business tax rates. The results also show that higher per capita incomes and higher populations lead to higher property tax rates due, probably, to higher resident demands for public goods and to higher expenditure responsibilities. The signs of these variables in the case of vehicle and business taxes are also positive but not statistically significant.

Tables 2 and 3 presents additional estimates of the tax-setting equations, allowing from some extensions. Table 2 shows the results of allowing each tax rate to react not only in front of the tax rates set by neighbour's in the same figure, but to the rates they set in the other two taxes. The results obtained are presented in columns (1), (3) and (5) and show that the only statistically significant coefficients are those corresponding to the same tax rate. Thus, mimicking seems to be done on tax by tax basis; this result contrasts with that obtained by Heyndels and Vuchelen (1997) that found some cross-effects between property and income taxes in Belgium. Table 2 also presents the results obtained when including e_{jt} in the equation. In this case, an increase in expenditure on public goods in the neighbourhood prompts a negative and significant response in the property and motor vehicle tax rates of the municipality.

[Table 2 about here]

The other extension shown in Table 2 consists of allowing for possible different mimicking behaviours across types of government. With this purpose, we interact the neighbours' tax rate and expenditures with the main political variables (i.e., coalition governments, governments on the left, and electoral margin) and with a dummy equal to one for the electoral years (1995 and 1999). The results in columns (2), (4) and (6) show, first, that tax mimicking behaviour is lessened as the electoral margin increases. The sign of $t_{j,t-1} \times w_{i,t-1}$ is negative and significant in the three taxes; the estimated coefficients indicates that a 10% increase in the margin of victory by a right government reduces its response to a 1 point increase in the taxes of neighbours by 0.08, 0.01 and 0.02, in the case of the property, vehicle and business taxes, respectively.

Second, the results in Table 2 also show that, in the case of property and business taxes, the reaction of the governments on the left tend to be much lower than that of governments on the right, although the coefficient are significant only at the 90% level. Point estimates indicate that the average reaction is reduced in 0.11 and 0.22 in the property and business tax, respectively. Third, the coefficient on the interaction among neighbours' tax rates and the dummy electoral years is positive and statistically significant in the three cases (in the business tax case only at the 90% level). The size of the coefficient is high, indicating that the average reaction increases in election years by 0.119, 0.073 and 0.059, in the property, vehicle and business taxes, respectively.

The overall conclusion after analysing the results of Tables 1 and 2 is that tax mimicking behaviour seems to be a relevant feature of tax-setting in the case of Spanish municipalities, but that political features are also important both in explaining the level of tax rates and the intensity of the mimicking behaviour. Tax rates tend to be higher the wider the electoral margin of victory, when the government is on the left of the political arena and during non-election years, and tax mimicking behaviour is also lessened in all these situations.

[Table 3 about here]

Table 3 presents the results obtained when replicating the estimation of Table 1 with different definitions of neighbourhood. As we described in the previous section we use seven different definitions of neigbourhood: distance, similarity in size, economic conditions (fiscal stress) and political situation (same ideology), and a combination of distance with the other three criteria. Column 1 shows mimicking coefficients when each definition is entered separately in the equation. Note that, in the case of the property and vehicle tax rates, *distance* provides the best fit among the simple criteria, although the fit improves when combined with the *size* or *economic* criteria. In the case of the business tax rate, distance is not the best simple criterion, but the performance of *economic* and mainly *size* is much better.

Columns (2) to (4) show the results obtained when introducing simultaneously the neighbour's tax rates calculated both according to the *distance* criterion and each of the other simple criteria. In the property and vehicle tax cases the new neighbour's variables show positive mimicking parameters; however, point estimates are rather slow and statistically not significant. In the case of the business tax the coefficient on

distance remains insignificant (as in Table 1) and those on *size* and *economic* are statistically significant. Columns (5) to (7) show the results when combining the more sophisticated criteria with better fit in Column 1 (*distance & economic* in the property and vehicle taxes, and *distance & size* in the business tax case) with each one of the simple criteria. Note that now the coefficient on *economic* is statistically significant at the 90% level in the case of the property tax (in addition to *distance & economic*). However, the coefficient on *distance & economic* is much higher than that of *economic* (0.203 vs. 0.066). This suggests that yardstick municipalities in the case of property tax rates are those that face similar economic shocks and are located in the vicinity, and to a lesser extent, also those that are economically similar but are spread through the full region.

In the case of the business tax, *distance & economic* are statistically significant, in addition to *size*, and the coefficients of both variables are of similar size. This may mean that yardstick municipalities in the business tax are those that are located in the vicinity but also those of similar size located elsewhere. This result questions the validity of the tax mimicking hypothesis as the only explanation for business tax rate interactions, and suggest the operation of some mechanism related to traditional tax competition, where municipalities of the same rank compete for the location of economic activity (as Büettner, 2001, also suggests).

4. Synthesis and conclusions

In this paper we have tested the hypothesis that local governments tend to mimic the tax rates set by other jurisdictions on a sample of Spanish municipalities during the period 1992-99. With this purpose we have estimated equations that pick up the determinants of the main municipal tax rate choices (i.e., property, vehicle and business taxes), including the tax rates set by other municipalities. The paper has also tested the hypothesis that the tax mimicking behaviour is the result of political considerations. This hypothesis has been tested by including in the tax-setting equation measures of the electoral margin facing the incumbent, computed using data on the last two municipal elections for the aforementioned municipalities.

The empirical results confirm the relevance of the mimicking behaviour in the choice of property and vehicle tax rates. An increase in each of these tax rates in a municipality prompts a positive response in the tax rates of its neighbour's. We have checked the robustness of this results using different definitions of neighbourhood. The best fit in the case of these two taxes is provided by a weighting scheme that combines a distance criterion with the similarity in economic conditions, although the performance of this neighbour's definition is not much higher to the one that relies exclusively on distance. The results regarding the business tax are less in consonance with the tax mimicking hypothesis. When using the distance criterion alone, there is no evidence of tax interactions. However, interactions are found when weighting schemes based only on size similarity are used. This suggests that stories about traditional tax competition must complement the tax mimicking hypothesis in order to fully understand business tax interactions. We have also looked for the effect of various political variables, both on the level of tax rates and on the strength of tax interactions. We have found that tax rates are higher where electoral margins

are wider, where leftists governments are in charge, and in non-electoral years. In addition to this, tax interactions are less intense (although still present) in all these situations.

The overall conclusion of the paper is that local elections seem to play a role in disciplining the Leviathan and that relative evaluations of fiscal policies by voters increase the effectiveness of this control process. However, from the results obtained,it seems clear that the effectiveness of fiscal control through the ballot box varies from municipality to municipality. The incentives to keep taxes and expenditures under control depend ultimately on the electoral margin facing the incumbent. Wide margins may be common and appear because for various reasons as, for example, because some portions of the electorate are captive (they vote only because of ideological dimensions) or because other dimensions enter the local arena. Thus, although there exist some bounds to the activities of the local Leviathan, there is still some room for rent-extraction and, thus, we must not be entirely optimistic about the efficiency of local democracies.

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Appendix: Data sources, definitions and descriptive statistics

Local tax rates

The property tax rate has been calculated as the sum of the nominal tax rate and the corresponding % increase in tax liability resulting from reassessment occurred during the period. This % increase has been computed as the difference in assessed value per home after and before de reassessment. Nominal tax rates, assessed values and number of homes by municipality have been obtained from a database called SIEM (Municipal Economic Information System) developed by a higher tier local government covering all the analysed area (Diputación de Barcelona).

Expenditure on public services

This has been calculated as current expenditure per capita (i.e., salaries, purchases and transfers) in the relevant categories. The functions selected are those that contain the main public services provided to most of the residents (e.g., refuse collection and other environmental services, safety, urban planning and renewal, parks, cultural and sportive facilities, etc.). These expenditures are picked up in the categories 2, 4.3, 4.4, 4.5 and 5 of the budget. Categories considered to be related with the concept of 'perks' (e.g., salaries of politicians and managers, general administration) or with redistribution (e.g., welfare) have not been included in the calculation. The information needed to calculate this variable comes from the cross-tabulation of local budgets according both economic and functional classifications, and has been obtained from the SIEM database.

Revenue capabilities

The tax base per capita variable has been calculated as standardised revenues per capita in the main current revenue sources of municipal governments. We have considered the following sources: property tax, vehicle tax, business tax, tax on land value improvements, and tax on building activities. We have selected a measure of the tax base of each source and computed the standard revenues as the product for each municipality of this tax base and the average tax rate in the set of municipalities analysed. Measures of tax bases used have been: assessed value of property (property tax), and sum of real tax bases for all taxpayers (remaining taxes). The information also comes from the SIEM database.

The transfers per capita variable has been calculated by dividing the total amount of unconditional transfers received by each municipality by its population. These transfers come mainly from a unique transfer, funded by the central government. The information also comes from the SIEM database. Data on population also comes from the regional statistical office (Institut d'Estadística de Catalunya).

Income per capita comes from the estimation made by Arcarons *et al*. (1997) using municipal data on income tax revenues for the years 1992-1996. Income per capita for the years 1997-99 has been computed by applying to the figure of 1996 the rate of growth of per capita income tax liability in the municipality. This information also has been obtained from the regional statistical office (Institut d'Estadística de Catalunya).

Political variables

Political data used consists of a database containing the vote numbers and representatives of each political party in the 1991 and 1995 municipal elections and dummy variables indicating if the party is in the municipal government. The first information has been obtained from the regional statistical office (Institut d'Estadística de Catalunya). Information on government composition comes also from that source in the case of majority governments; in the case of divided governments, we used information provided by the regional government (SIAL, Dep. de Governació, Generalitat de Catalunya) and direct consultation with the municipality when necessary.

Weights matrix

The weights used to define the different neighbour's variables have been computed with Luc Anselins's Spatial Econometics package *Spacestat*. With that program we have elaborated binary matrices using euclidean distance (10km, 20km, 30km); we have also computed binary matrices but weighting each neighbour by inverse distance and inverse distance squared. The best-suited criterion was the one defining a binary matrix with a 20km distance. We have computed also distance metrics using other variables: population, dummy equal to one if the government is on the left, and fiscal stress index, and combining these with the geographic criterion. The fiscal stress index has been taken from Solé-Ollé (2001) and is equal to the ratio of two indices: a needs index and a fiscal capacity index. The needs index was calculated by regression methods with a 1996 cross-section of expenditure data for the same municipalities. The fiscal capacity index is, in fact, the standardised revenues used to calculate the tax base per capita variable.

Table A.1. *Descriptive statistics. Economic variables,* years 1992 to 1999.

Variable	1992	1993	1994	1995	1996	1997	1998	1999	1993-99
					Mean				
$t_{i,t}$ (*Property)*	0.874	0.890	0.919	0.941	0.977	1.008	1.024	1.023	0.969
$t_{i,t}$ (*vechicle)*	1.138	1.263	1.309	1.309	1.419	1.453	1.486	1.492	1.390
$t_{i,t}$ (*business)*	1.804	1.832	1.867	1.850	1.905	1.949	1.955	1.963	1.899
$e_{i,t}$	15,723	16,722	17,581	19,467	24,507	21,646	23,093	23,458	19,820
$g_{i,t}$	14,589	13,768	14,481	15,493	16,160	16,715	16,837	16,638	15,435
$b_{i,t}$	25,475	28,387	30,374	32,488	35,345	38,527	40,096	42,226	32,956
$a_{i,t}$	0.000	0.010	0.079	0.069	0.099	0.079	0.089	0.029	0.065
$y_{i,t}$ ($\times 10^3$)	1,218	1,313	1,377	1,508	1,655	1,695	1,737	1,780	1,500
$p_{i,t}$	27,275	27,396	27,524	27,661	27,807	27,990	28,172	28,407	27,689
					Standard Dev.				
$t_{i,t}$ (*Property)*	0.209	0.185	0.210	0.223	0.238	0.262	0.282	0.285	0.227
$t_{i,t}$ (*vechicle)*	0.156	0.190	0.166	0.192	0.185	0.183	0.185	0.210	0.158
$t_{i,t}$ (*business)*	0.535	0.454	0.431	0.482	0.426	0.448	0.461	0.458	0.413
$e_{i,t}$	7,433	7,265	7,398	7,145	8,354	7,537	10,079	10,112	6,854
$g_{i,t}$	2,600	1,726	1,442	1,732	2,045	2,229	2,257	2,529	1,641
$b_{i,t}$	8,193	9,453	10,024	10,116	11,356	14,574	12,944	14,567	10,290
$a_{i,t}$ ($\times 10^5$)	--.--	--.--	--.--	--.--	--.--	--.--	--.--	--.--	--.--
$y_{i,t}$ ($\times 10^3$)	299	300	318	362	412	427	446	472	362
$p_{i,t}$	43,563	43,244	42,932	42,626	42,328	42,101	41,880	41,922	42,658

Notes: $t_{i,t}$ (*Property*) is measured in % while $t_{i,t}$ (*vehicle*) and $t_{i,t}$ (*business*) are rough coefficients that multiply the tax base; $e_{i,t}$, $g_{i,t}$, $b_{i,t}$ and $y_{i,t}$ are measured in pta. per capita.

Table A.2. *Descriptive statistics. Political variables,* years 1992-95 and 1996-99.

Variable	1992-95	1996-99
	Sum	
$Dcoa_{i,t}$	40	65
$Dind_{i,t}$	21	13
$Dleft_{i,t}$	58	59
$Dleft2_{i,t}$	19	22
	Mean	
$v_{i,t}$	0.597	0.541
	Stamdard Deviation	
$v_{i,t}$	0.153	0.102

Table 1*: Tax-setting equations, basic parameter estimates; dependent variable* $t_{i,t}$, *nº obs.*= 740 *(*N = 105, T=7*)*

Variable	*Property tax*		*Vehicle tax*		*Business tax*	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
$t_{j,t}$	0.124 (2.667)**	0.389 (2.376)**	0.178 (2.441)**	0.333 (1.833)*	0.245 (2.110)**	0.182 (0.755)
$g_{i,t-1}$ ($\times 10^4$)	-0.045 (-1.888)*	-0.051 (-1.672)*	-0.066 (-1.665)*	-0.064 (-1.791)*	-0.036 (-2.014)**	-0.048 (-1.681)*
$b_{i,t-1}$ ($\times 10^4$)	-0.055 (-2.331)**	-0.068 (-1.820)*	-0.022 (-1.442)	-0.017 (-1.984)**	-0.040 (-1.554)	-0.045 (-1.320)
$a_{i,t-1}$	0.041 (2.161)**	0.040 (2.341)**	-0.030 (-2.336)**	-0.031 (-2.422)**	-0.015 (-2.055)**	-0.015 (-2.032)**
$y_{i,t-1}$ ($\times 10^6$)	0.124 (2.154)**	0.101 (2.114)**	0.025 (1.600)	0.028 (1.580)	0.012 (1.441)	0.016 (1.206)
$p_{i,t-1}$ ($\times 10^4$)	0.133 (2.021)**	0.116 (2.212)**	0.087 (1.657)*	0.035 (1.210)	0.018 (1.781)*	0.160 (1.351)
$w_{i,t-1}$	0.088 (2.266)*	0.099 (2.384)*	0.022 (1.354)	0.027 (1.504)	0.120 (2.291)**	0.169 (2.354)**
$dcoa_{i,t-1}$	-0.012 (-1.996)**	-0.016 (-1.689)*	-0.008 (-1.567)	-0.009 (-1.926)*	-0.014 (-1.055)	-0.014 (-1.227)
$dind_{i,t-1}$	0.007 (1.996)**	0.006 (1.689)*	0.004 (1.567)	0.003 (1.926)*	0.014 (3.055)**	0.013 (3.227)**
$dleft_{i,t-1}$	0.005 (1.957)*	0.011 (1.774)*	0.020 (1.524)	0.009 (1.887)*	0.044 (2.339)**	0.049 (2.588)**
$dleft2_{i,t-1}$	0.055 (2.998)**	0.054 (2.389)**	0.018 (1.669)*	0.024 (1.683)*	0.015 (0.117)	0.002 (0.059)
$w_{i,t-1} \times dcoa_{i,t-1}$	0.072 (0.967)	0.057 (0.422)	0.012 (1.225)	0.006 (0.361)	0.188 (2.568)**	0.240 (2.433)**
$w_{i,t-1} \times dind_{i,t-1}$	0.010 (1.550)	0.005 (1.675)*	0.001 (0.458)	0.001 (0.887)	0.009 (1.114)	0.010 (1.779)*
$w_{i,t-1} \times dleft_{i,t-1}$	0.070 (2.669)**	0.056 (2.678)**	0.047 (0.335)	0.044 (0.295)	0.060 (0.110)	0.073 (0.432)
$w_{i,t-1} \times dleft2_{i,t-1}$	-0.099 (-2.214)**	-0.073 (-2.577)**	-0.044 (-1.223)	-0.027 (-0.708)	0.158 (1.887)*	0.149 (2.435)**
$a_{0,94}$	0.055 (2.114)**	0.064 (2.067)**	0.005 (1.785)*	0.014 (2.385)**	0.038 (2.554)**	0.044 (2.209)**
$a_{0,95}$	-0.011 (-0.145)	-0.053 (-0.077)	0.005 (0.558)	0.014 (0.277)	-0.019 (-0.335)	-0.041 (-0.221)
$a_{0,96}$	0.112 (1.996)**	0.137 (2.109)**	0.088 (1.885)*	0.075 (2.347)**	0.055 (2.225)**	0.037 (1.801)*
$a_{0,97}$	0.156 (2.335)**	0.255 (2.594)**	0.200 (2.887)**	0.251 (2.672)**	0.142 (2.001)**	0.104 (1.875)*
$a_{0,98}$	0.210 (2.321)**	0.204 (2.412)**	0.189 (2.554)**	0.237 (2.617)**	0.254 (1.985)**	0.187 (1.998)**
$a_{0,99}$	-0.101 (-0.214)	-0.106 (-0.076)	0.230 (1.235)	0.179 (0.746)	0.198 (0.658)	0.033 (0.156)
Adjusted R^2	0.574	0.521	0.449	0.408	0.585	0.530
White (Heterosk.)	5.656	4.993	4.025	3.092	5.568	6.014
Durbin-Watson (Autocorr.).	1.985	2.112	2.014	2.001	2.224	2.016
F(C vs. C_i*), Ind. effects*	6.254**	5.203**	36.540**	37.221**	9.574**	8.744**
F(C vs. C_i*), Time effects*	8.811**	6.661*	12.271**	10.665**	7.984**	7.442**
c^2*(Hausman) Fixed vs.Rand.*	30.541**	33.134**	38.547**	44.220**	53.658**	61.301**
c^2*(Hausman), OLS vs. IV*	--.--	5.041**	--.--	6.739**	--.--	10.880**

Notes: (1) t statistics are show in brackets; *, significantly different from zero at the 90% level and **, Significantly different form zero at the 95% level, (2) Individual effects included in all specifications.

Table 2*: Tax-setting equations, extensions* (i)*;*
dependent variable $t_{i,t}$*, nº obs.*= 740 *(N* = 105, *T*=7*)*

Variable	*Property tax*		*Vehicle tax*		*Business tax*	
	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV
$t_{j,t}$ (*Property)*	0.323 (1.975)**	0.296 (2.364) **	0.019 (0.478)	--.--	0.063 (0.784)	--.--
$t_{j,t}$ (*Vehicle*)	0.129 (1.012)	--.--	0.324 (1.986)**	0.246 (1.887)*	0.163 (0.312)	--.--
$t_{j,t}$ (*Business*)	0.078 (0.512)	--.--	0.167 (1.172)	--.--	0.174 (1.500)	0.316 (1.604)
$e_{j,t}$ ($\times 10^5$)	-0.264 (-1.724)*	--.--	-0.148 (-1.966) **	--.--	-0.098 (-0.866)	--.--
$t_{j,t} \times w_{i,t-1}$	--.--	-0.804 (-2.244)**	--.--	-0.105 (-2.156)**	--.--	-0.220 (-1.889)*
$t_{j,t} \times dcoa_{i,t-1}$	--.--	0.010 (0.008)	--.--	0.007 (0.074)	--.--	-0.012 (0.004)
$t_{j,t} \times dleft_{i,t-1}$	--.--	-0.112 (-1.639)*	--.--	-0.018 (-0.200)	--.--	-0.233 (-1.926) *
$t_{j,t} \times (a_{0,95} + a_{0,99})$	--.--	0.119 (2.151)**	--.--	0.073 (2.401)**	--.--	0.059 (1.628)*
Adjusted R^2	0.521	0.506	0.411	0.397	0.547	0.531
White (Heterosk.)	6.993	4.887	4.563	3.117	6.578	7.029
Durbin-Watson (Autocorr.).	1.967	2.098	2.104	2.112	2.003	2.344
F(C vs. C_i*), Ind. effects*	5.908**	6.156**	28.103**	31.009**	7.169**	7.098**
F(C vs. C_i*), Time effects*	6.653*	5.111*	8.111**	8.098**	6.001**	5.112**
c^2*(Hausman) Fixed vs.Rand.*	30.119**	32.101**	44.334**	42.118**	57.128**	62.998**
c^2*(Hausman), OLS vs. IV*	6.678**	6.154**	7.780**	7.772**	10.390**	12.110**

Notes: (1) t statistics are show in brackets; *, significantly different from zero at the 90% level and **, Significantly different form zero at the 95% level, (2) Individual effects included in all specifications, (3) Includes the same covariates than Table (1).

Table 3*: Tax-setting equations, extensions* (i)*;*
dependent variable $t_{i,t}$*,* *nº obs.*= 740 *(N* = 105, *T*=7*)*

Variable	(1) IV	(2) IV	(3) IV	(4) IV	(5) IV	(6) IV	(7) IV
	Property tax						
$t_{j,t}$ (*distance*)	0.389 (2.376)**	0.379 (1.825)*	0.401 (1.806)*	0.379 (1.982)*	--.--	--.--	--.--
$t_{j,t}$ (*size*)	0.169 (1.158)	0.081 (0.985)	--.--	--.--	0.057 (1.522)	--.--	--.--
$t_{j,t}$ (*economic*)	0.188 (1.569)	--.--	0.079 (0.703)	--.--	--.--	0.066 (1.675)*	--.--
$t_{j,t}$ (*political*)	0.131 (0.714)	--.--	--.--	0.071 (0.558)	--.--	--.--	0.035 (0.411)
$t_{j,t}$ (*distance & size*)	0.474 (2.794)**	--.--	--.--	--.--	--.--	--.--	--.--
$t_{j,t}$ (*distance & economic*)	0.254 (2.827)**	--.--	--.--	--.--	0.211 (2.331)**	0.203 (2.447)**	0.247 (2.181)**
$t_{j,t}$ (*distance & political*)	0.020 (0.244)	--.--	--.--	--.--	--.--	--.--	--.--
	Vehicle tax						
$t_{j,t}$ (*distance*)	0.333 (1.833)*	0.313 (1.348)	0.313 (1.347)	0.313 (1.434)	--.--	--.--	--.--
$t_{j,t}$ (*size*)	0.145 (1.494)	0.079 (0.446)	--.--	--.--			
$t_{j,t}$ (*economic*)	0.119 (1.484)	--.--	0.109 (1.330)	--.--	0.072 (1.340)	--.--	--.--
$t_{j,t}$ (*political*)	0.178 (0.366)	--.--	--.--	0.058 (0.616)	--.--	0.078 (1.575)	--.--
$t_{j,t}$ (*distance & size*)	0.230 (1.904)*	--.--	--.--	--.--	--.--	--.--	0.048 (0.411)
$t_{j,t}$ (*distance & economic*)	0.233 (2.336)**	--.--	--.--	--.--	0.200 (2.132)**	0.189 (2.309)**	0.231 (1.997)**
$t_{j,t}$ (*distance & political*)	0.064 (0.488)	--.--	--.--	--.--	--.--	--.--	--.--
	Business tax						
$t_{j,t}$ (*distance*)	0.182 (0.755)	0.188 (0.747)	0.252 (0.664)	0.180 (0.748)	--.--	--.--	--.--
$t_{j,t}$ (*size*)	0.157 (1.996)**	0.138 (1.668)*	--.--	--.--	0.114 (1.779)*	--.--	--.--
$t_{j,t}$ (*economic*)	0.186 (1.781)*	--.--	0.188 (1.783)*	--.--	--.--	0.146 (1.775)*	--.--
$t_{j,t}$ (*political*)	0.256 (1.437)*	--.--	--.--	0.180 (1.386)	--.--	--.--	0.155 (1.411)
$t_{j,t}$ (*distance & size*)	0.152 (1.401)	--.--	--.--	--.--	--.--	--.--	--.--
$t_{j,t}$ (*distance & economic*)	0.165 (0.949)	--.--	--.--	--.--	0.150 (1.688)**	0.145 (1.607)	0.169 (1.404)
$t_{j,t}$ (*distance & political*)	0.133 (0.808)	--.--	--.--	--.--	--.--	--.--	--.--

Notes: (1) t statistics are show in brackets; *, significantly different from zero at the 90% level and **, Significantly different form zero at the 95% level, (2) Individual effects included in all specifications, (3) Includes the same covariates than Table (1), (3) Statistics available upon request, (4) Column 1 shows the results obtained after entering each neighbour's definition separately in the equation; columns 2 to 4 show results obtained after entering simultaneously various definitions of neighbourhood.