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Economic and Political Foundations of Local Tax Structures:  
An Empirical Investigation of Flemish Municipalities' Tax  
Mix<sup>\*</sup>

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**Abstract**

Building on the revenue structure theory developed by Hettich and Winer (1984, 1988, 1999), this paper is the first to investigate the economic and political determinants of *local* tax mix choices. We thereby use panel data on 289 municipalities in the Flemish region of Belgium (period 1995-2002), where local governments enjoy extensive fiscal autonomy and have a wide choice of available tax instruments. Estimating a system of five reduced-form equations for the five central revenue sources (income, property, business, user fees and other own revenues), our results show that economics plays a significantly more important role than politics in shaping the local tax mix. Moreover, supporting theoretical predictions about marginal cost equalization across available tax instruments, absolute reliance on each revenue source increases as the overall revenue requirement gets larger (a 'scale-effect').

**Keywords:** Tax mix; local government; decentralization; fiscal policy.

**JEL-codes:** H71, H77, H20.

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## **1. Introduction**

The past 25 years have witnessed a major shift in the discourse on decentralisation, with the ‘economic’ discourse (i.e. motives of equity and efficiency) gaining increasing importance relative to ‘identity’ and ‘good governance’ arguments (for a detailed analysis, see Rodriguez-Pose and Sandall, 2008). Using such discourse, decentralisation becomes increasingly “synonymous with allowing territories to adapt to changes in the economic environment” and becomes “the means to an end, a technical solution to the problem of economic organisation” (Rodriguez -Pose and Sandall, 2008, 58). This trend towards economic arguments to support further decentralisation efforts not only raises questions concerning the economics effects of further decentralisation (e.g., on income inequality; see Costa-Font, 2010), but also regarding the ‘optimal’ governance and finance structure of local governments. Indeed, “local governments which deliver a wide range of services need a mix of revenue sources that reflects the mix of services they provide” (Bird and Slack, 2007, 738), requiring scholars to analyse in more details how such finance structure decisions are de facto taken at the local level.

Yet, most empirical research on decentralized tax-setting policies to date is based on the single-equation econometric models aimed at identifying the determinants of “the” local tax rate, be it a property, income, business or consumption tax (see, e.g., reviews in Brueckner, 2003; Revelli, 2005). While some recent papers consider more than one tax instrument at once (Heyndels and Vuchelen, 1998; Ashworth *et al.*, 2006; Fiva and Rattsø, 2007; Van Parys and Verbeke, 2007),

systematic empirical analyses addressing the setting of the overall local tax mix are, to the best of our knowledge, unavailable to date.<sup>1</sup>

This lack of attention is surprising for various reasons. First, local governments around the globe can typically manoeuvre more than one revenue instrument, ranging from the choice between tax revenues and user fees (e.g., Bel and Miralles, 2010) to the decision to generate revenues from different tax bases (e.g., property *versus* income; with reference to the US case, see Nechyba, 1997; McGuire, 2001; Oates and Schwab, 2004). In addition, they can often influence more than one element of the tax skeleton: i.e., tax base, rate structure and special provisions. Moreover, understanding what factors drive local governments' reliance on different tax sources is of key importance both for the implementation of an effective grant allocation mechanism (Inman, 1999; Bird and Smart, 2002) and the evaluation of the efficiency and equity consequences of currently ongoing decentralization processes (Goodspeed, 1994; see also above).

Our paper bridges this gap by focusing on local tax setting decisions in Flanders and, building on the theory of revenue structures developed by Hettich and Winer (1984, 1988, 1999), aims at investigating the roles of economic and political forces in shaping the local tax mix (see also Bird and Zolt, 2008).<sup>2</sup> The Flemish case is thereby of special interest for two reasons. First, Flemish municipalities have a very large number of available tax instruments, ranging from surcharges on federal personal income tax and regional property tax revenues to over 120 different purely local taxes, fees and user charges. Second, Flemish local governments are virtually free to

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<sup>1</sup> Explorations of the tax mix at the national level are likewise scant. Exceptions include Winer and Hettich (1991), Volkerink and De Haan (1999) and Kenny and Winer (2006).

<sup>2</sup> The Hettich and Winer framework is more appropriate than, for example, a median voter model (e.g., Sjoquist, 1981) given that the institutional design of our empirical setting (i.e. Flanders) concerns a Parliamentary system with proportional representation and extensive coalition formation.

set tax rates and fee levels, as well as to define tax bases, for all purely local taxes. For the limited number of surcharge taxes, local governments can independently set the tax rate while the tax base is defined by the higher-level government setting the tax upon which the surcharge is levied (more institutional detail is provided in section 3 below). Hence, local governments in Flanders enjoy *both* extensive fiscal autonomy *and* have a wide choice of available tax instruments.

The empirical analysis based on a panel dataset on 289 Flemish municipalities observed along an eight-year time period (1995-2002) – and following the empirical approach employed by Kenny and Winer (2006) when analysing the tax structure in a large sample of countries – provides three main insights on the determinants of the *local* tax mix. First, state grants and local tax base sizes play a major role in determining the relative weight of tax instruments in local budgets, while governments’ political traits do not. This lends support to the hypothesis that the observed tax structure reflects the political costs of raising taxes, irrespective of government ideology and composition. Second, the empirical evidence presents strong support for Kenny and Winer’s (2006) ‘scale effect’ hypothesis; larger tax revenues are obtained from each tax source as the size of the public sector grows. Finally, there is no evidence of inter-municipal dependence in the determination of the local tax mix *after controlling for the economic and political determinants of local tax setting*.

The rest of the paper is organized as follows. Section 2 discusses the theoretical framework underlying our empirical analysis, while section 3 presents the institutional structure of local government in Flanders. Section 4 illustrates the empirical approach and the results from estimating a system of reduced-form tax

share equations. Section 5 verifies the scale effect hypothesis, section 6 tests for spatial dependence in local tax mix choices, and section 7 concludes.

## 2. Theoretical background

Our empirical investigation of the local tax mix is guided by the revenue structure theory developed by Hettich and Winer (1984, 1988, 1999). Hettich and Winer model taxation as part of a broader political equilibrium in which political parties compete for the support of a heterogeneous group of voters by choosing the tax structure that minimizes the political costs (in terms of electoral support) associated with the different tax sources exploited. The political costs of taxation derive both from voters' loss in disposable income due to taxation as well as the welfare loss resulting from the costs incurred in avoiding or evading taxes. The basic set-up for the determination of the tax mix in a competitive political equilibrium is represented in Figure 1, where we consider a stylized balanced-budget two-tax case that can easily be extended to a multiple-tax environment.

[Figure 1 about here]

The marginal cost curves for the two tax instruments ( $MC_1$  and  $MC_2$ ) reflect the government's expected marginal vote loss from raising revenues from the two taxes respectively, taking into account the costs of administration, monitoring, enforcement and tax compliance.<sup>3</sup> The marginal cost curves are upward-sloping, reflecting the idea that taxation becomes increasingly electorally costly when the size of revenue raised

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<sup>3</sup> The depiction in Figure 1 assumes that marginal political costs are independent across revenue sources (see Hettich and Winer, 1984, 70). While necessary to draw Figure 1, this assumption is relaxed in the empirical analysis below.

increases.<sup>4</sup> Summing the marginal cost curves horizontally leads to the overall marginal political cost of raising revenues MC.

In the absence of grants from higher levels of governments, the government's optimal budget size corresponds in equilibrium to the intersection of the MC curve and the curve representing the marginal benefit for the local community from public expenditures (MB). The MB curve is downward sloping to indicate that increasing amounts of government spending become progressively less desirable to the electorate, reflecting the conventional assumption of decreasing marginal utility from consumption of public services. At government size  $R_0 = R_1 + R_2$ , the marginal benefit of public spending funded by own tax revenues equals the marginal cost of raising revenues from each of the tax instruments, and the relative use of the two taxes depends on the position and slope of their respective  $MC_i$  curves ( $i = 1, 2$ ).

In the presence of grants ( $G$  in figure 1), the marginal benefit of local public spending funded by own sources of revenues shifts left-ward from MB to MB' by the size of grants  $G$ ; the local government sets the optimal level of own revenue at the intersection of the MC curve – representing the marginal cost of raising revenues from own tax bases – and the MB' curve capturing the marginal benefit of spending own revenues on public services when receiving grants  $G$ . The resulting new equilibrium is characterized by a higher level of total spending ( $S_0$ ), a lower level of own tax revenues ( $R'_0 < R_0$ ) and reduced reliance on both available tax instruments ( $R'_1 < R_1$ ;  $R'_2 < R_2$ ). The difference in slope of  $MC_1$  and  $MC_2$  implies that the relative reliance on the two taxes (i.e., the observed tax mix) might also change.

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<sup>4</sup> Each tax also has an underlying tax rate-revenue relationship (represented by the Laffer curve) that, for ease of exposition, is not drawn in Figure 1 (see Kenny and Winer, 2006).

In the more general case of  $K$  available tax instruments and a vector  $\mathbf{x}$  of exogenous variables reflecting the position and shape of curves  $MC_k$  (with:  $k = 1, \dots, K$ ) and  $MB$ , government's optimization must lead to equalization of the marginal costs of raising revenues across all  $K$  tax bases. This results in a vector of optimal tax revenues to be drawn from each tax source as a function of all exogenous variables in the model:  $\mathbf{R}^*(\mathbf{x}) = (R_1^*(\mathbf{x}), R_2^*(\mathbf{x}), \dots, R_K^*(\mathbf{x}))$ .

The straightforward tax mix solution deriving from the above stylized framework can be employed to assess how exogenous changes in the socio-economic, demographic and political traits of a community affect the level and distribution of revenues across the available tax instruments. In particular, the model provides empirical predictions of a twofold nature.

The first set of empirical predictions regards how the “relative” reliance on available tax instruments (i.e., the share of revenues from each tax instrument in total tax revenues) varies as circumstances change. Indeed, factors such as the sizes of the tax bases, as well as the administration and political costs of raising revenues determine equilibrium tax shares by affecting the position and slope of the marginal cost and benefit functions depicted in Figure 1 (see also Kenny and Winer, 2006). We explore such determinants in section 4.

The second prediction concerns the absolute reliance on each available tax instrument as circumstances change, and is known as the “scale effect” (Kenny and Winer, 2006). In particular, the model suggests that *all* available tax instruments should generate higher (lower) revenues as the total size of the budget increases (decreases), holding everything else constant. That is, even though the relative reliance on every available revenue source will differ depending on the relative marginal costs of extracting more revenue from these various sources, the model

predicts that more revenues will be extracted from each source. This result follows directly from the need to equalise marginal costs of taxation across revenue sources and is illustrated in Figure 1 through the shift in the revenue requirement from  $R'_0$  to  $R_0$  (or the other way around). Such shift indeed leads to an increase (decrease) in revenues extracted from both taxes, with the extent of this additional reliance depending on the steepness of their respective MC-curves. We empirically evaluate the scale effect hypothesis in section 5.

### **3. Local government and taxation in Flanders**

The local level of government in Flanders (and Belgium more generally) is organized according to a parliamentary system consisting of two main political bodies: the local council (the legislative body or ‘parliament’) and the College of Mayor and Alderman (the executive body or ‘government’). Council members are elected directly once every six years (and can be indefinitely re-elected) using a system of proportional representation. Following the election, the party (or parties in case a coalition is required) obtaining a majority of the seats in the council chooses which of its council-members are appointed as alderman and mayor.<sup>5</sup> As such, the College can be seen as that sub-section of the council concerned with the day-to-day running of the municipality (and is, like the council, headed by the mayor). Since all policy decisions, with few exceptions, are taken by majority vote in the council, political power clearly lies with those parties forming the majority government (note that minority governments hardly ever occur).

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<sup>5</sup> This is different from, for example, the Norwegian system where the composition of the College is a reflection of the composition of the council (cf. Tovmo, 2007). It implies, moreover, that, except in sporadic cases where mathematically superfluous parties are taken up in the ruling majority, all parties in the College are important to reach the necessary majority to pass legislation in the council.

As in most West-European countries, Flemish municipalities assume significant responsibilities in public administration, education, local infrastructure, public safety, social services (e.g., welfare, housing, ...), environment (including refuse collection) and cultural policies. While local governments have significant authority and autonomy in executing these tasks, the central (and regional) government defines the overall aims to be reached (placing Belgium in a “Southern-European”, Napoleonic tradition; see also John, 2001; Geys and Moesen, 2009).

Revenues to finance these expenditures mostly derive from two main revenue sources. First, intergovernmental grants constitute on average about 40% of local revenues. They are a complicated, though objective function of population size, fiscal capacity, indicators of ‘need’ (i.e. share of elderly), size of green areas and whether or not the municipality is considered a ‘pole of attraction’ for labour and education. While some conditional grants are also employed, the majority of grant revenue is unconditional. Second, tax revenues constitute approximately 40% of revenues on average. These mostly derive from surcharge taxes on the regional tax on immovable property (i.e. the local property tax) and on the federal tax on labour income (i.e. the local income tax), though numerous purely local taxes are also employed (see below). The remaining 20% of revenues comes from a variety of revenue sources such as dividends from municipal cooperations (e.g., in distribution of gas and electricity) and returns on financial investments.<sup>6</sup>

Important for our analysis, Flemish municipalities nowadays have an extensive degree of autonomy with respect to their tax policy (see also Ashworth *et al.*, 2006; Goeminne *et al.*, 2008). For one, they have considerable liberty to introduce new

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<sup>6</sup> Note also that legal limits on borrowing, the absence of bailout possibilities and the direct supervision of the provincial and regional government, imply that Flemish municipalities face a relatively hard budget constraint. See Lago-Peñas (2005) for a review and discussion of the effects of soft budget constraints and bailout expectations on regional and local government.

taxes. In a sense, local governments are only stopped by their own imagination – and interventions by higher-level governments – regarding the taxes they introduce. For example, taxes on private swimming pools, balconies, transportation of drunken persons, distribution of telephone books, dogs, boats, horses and so on are levied by at least one Flemish municipality (while a tax on wearing masks only recently became obsolete). Approximately 120 different purely local taxes exist, for which municipalities can set the tax base as well as the tax rate independently and fully autonomously (see also Goeminne *et al.*, 2008). Second, with respect to surcharges on higher-level governments' taxes, local governments can set any tax rate they desire, although the tax base is determined by the higher-level government. Specifically, the primary tax base for the local income tax is individual taxpayers' taxable income. From this, via application of the federal tax code, federal income tax revenue is calculated. This revenue forms the "secondary" tax base from which, by multiplication with the municipal tax rate, local income tax revenue is obtained.<sup>7</sup> For the local property tax, the same procedure applies, except that the underlying primary tax base equals the assessed net rental value of property. In 2002, the local income tax rate (i.e. the level of the surcharge) varied between 0% and 9.5% whereas the local property tax rate lay between 550% and 2250% (such that the bulk of property tax revenues goes to local governments).

As a result of this considerable autonomy, there is wide diversity in the use of various tax sources. Clearly, not all municipalities use all available tax instruments.

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<sup>7</sup> Given that the exact nature of how local governments can tax non-resident commuters' income as well as that of residents working in different communities has important effects on the use or non-use of local income taxes (e.g., Nechyba, 1997; Strumpf, 2001; Spry, 2005; Hall, 2006), it is important to note that in Belgium the federal government restricts local governments' ability to impose local income taxes to the incomes of residents. As actual implementation of such residence-based income taxes is strongly influenced by the extent of consumer mobility (i.e. fiscal competition for mobile residents; see Nechyba, 1997; Spry, 2005; Hall, 2006), we return more explicitly to spatial competitive forces in section 6 below.

Nonetheless, although on average approximately 80 percent of local tax revenues derives from surcharges on the federal income and the regional property tax, the average municipality levies no less than 17 different purely local taxes (out of the 120 currently in use). This diversity is illustrated in more detail in Table 1, where we present summary statistics concerning the revenue shares of available tax instruments after having grouped these into five areas for reasons of tractability and interpretation: taxes on income (the municipal surcharge on the federal personal income tax), taxes on property (including the surcharge on the regional property tax and municipal property taxation), taxes on business (including taxes on employment of personnel, commercial signs and use of motorised equipment), user charges (including waste disposal and fees for use of public facilities) and other own revenues (such as administrative duties). These revenue shares are the main dependent variables in the later analysis.

[Table 1 about here]

Table 1 shows that income and property taxes are, on average, the most prominent revenue sources. Fees are the third-largest group, but, in contrast to many other Western countries, have lost some importance over the period analysed. For all five groups, significant variation exists as regards their prevalence across the Flemish municipalities (as evidenced by the sizeable standard errors).

Finally, it is important to point out that municipal tax regulations have to be formally agreed upon by the local government every year while drafting the municipal budget. This formal agreement forms an important part of the revenue-estimation process within the budgetary negotiations. All components of the tax

system – including tax rates and/or bases – can in principle be adjusted at that point. Most often, however, changes are restricted to tax rates. For example, with respect to the surcharge on income and property taxes, municipal tax rates are adjusted (usually upwards) very regularly – though not in all municipalities every year. Consequently, it is reasonable to assume that changes in tax revenues and shares reflect purposeful adjustments of the local tax mix (and not just economic developments).

#### 4. A reduced-form tax revenue share system

##### 4.1. Empirical model

Following Kenny and Winer (2006), we estimate the system of equations (1), with the share of revenues from each tax source ( $r_{itk}/r_{it}$ ) as the dependent variable, where  $r_{itk}$  is total (real) revenues in jurisdiction  $i$  and year  $t$  from tax base  $k$  ( $k$ =income, property, business, user charges, and other), and  $r_{it}=\sum_k r_{itk}$ :

$$(r_{itk} / r_{it}) = \mathbf{x}_{it}' \delta_k + f_{ik} + m_{ik} + v_{itk} \quad (1)$$

The five revenue shares are regressed on a common vector of variables ( $\mathbf{x}_{it}$ ) intended to capture the effects of grants, tax base sizes, socio-demographic characteristics of the locality and political and ideological traits of local governments on the position and slope of marginal cost and benefit functions. Since all equations include the same vector of exogenous variables, the system (1) can be estimated by ordinary least squares (OLS).<sup>8</sup>

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<sup>8</sup> In fact, in such circumstances, OLS and GLS estimation of a system of seemingly unrelated regressions give identical results (Dwivedi and Srivastava, 1978).

For each tax share,  $f_{ik}$  and  $m_{tk}$  represent jurisdiction-specific and time-specific fixed effects. The  $f_{ik}$  effects control for time-invariant unobservable characteristics of a locality that might affect their tax mix choices and be correlated with included regressors; such effects can include geographical location, number of neighbours (which might influence the degree of fiscal competition), composition of the property tax base<sup>9</sup> and distance from borders or large urban areas. The  $m_{tk}$  effects capture common macroeconomic shocks as well as central government policies and electoral cycles.

First,  $\mathbf{x}_{it}$  includes central government grants as well as per capita income, per capita assessed net rental value of property, and the number of firms per inhabitant as measures of income, property and business tax revenue potential respectively. We should note here that one could argue that tax bases are endogenous because they are partly the result of fiscal policy. This, however, suggests a negative relation between tax base and reliance on that tax instrument (as high reliance on a tax would most likely lead to an exodus of the taxable base). As this goes against the prediction of the stylised theoretical model in section 2 – which suggests a positive relation in that a higher tax base lowers the associated tax instrument’s marginal cost function and increases the relative reliance on that instrument – any endogeneity concerns imply our estimates will provide a lower-bound of the true effect.

Second, a number of socio-demographic characteristics of the jurisdiction – population size and density, degree of income inequality (ratio of interquartile difference in income to the median value), rate of unemployment, and share of elderly (population over 65 as a percentage of total population) – are included to control for

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<sup>9</sup> Although the relative importance of residential and non-residential (i.e. mainly business) property can be an important factor affecting the relative reliance on property taxes (e.g., Blackley and DeBoer, 1987; Spry, 2005; Hall, 2006), the composition of the property tax base is likely to show considerable stability over time and its influence subsumed in our municipal fixed effects.

jurisdiction traits that are commonly expected to affect the political and administrative costs of raising revenues through different tax sources.

Finally, four political variables are included. A measure of the government's ideology evaluates whether parties' political suasion – and the associated potential difference in perceived political costs of different types of taxes – affects the local tax mix. We measure the ideological complexion of the local government as  $\sum_{i=1}^n (p_i \cdot Complexion_i)$ , where  $p_i$  is the seat share of party  $i$  in the College of Mayor and Aldermen and  $Complexion_i$  refers to the party ideological position on a Left-Right scale (from 0 to 10).<sup>10</sup> Second, we account for potential policy effects from the number of parties in the local government. This follows recent evidence showing that the size of local government coalitions significantly affects government decision-making in Flemish municipalities (e.g., Ashworth *et al.*, 2005, 2006; Geys, 2007; Goeminne *et al.*, 2008; Werck *et al.*, 2008). Third, an indicator of voter turnout – measured as the number of valid votes cast as a share of the total eligible population – is introduced to capture the degree of control of the electorate on governments' choices (Borge *et al.*, 2008). Finally, the share of women in the executive body of the municipality is included. This follows a number of recent studies indicating that gender is an important indicator of policy preferences (e.g., Lott and Kenny, 1999; Edlund and Pande, 2002; Funk and Gathmann, 2008) and that female representation often significantly affects policy outcomes (e.g., Pande, 2003; Chattopadhyay and Duflo, 2004; Svaleryd, 2009). All previous work on this issue, however, looks at the effect of female representation on the size of the public sector or the composition of

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<sup>10</sup> The data concerning a party's ideological position were obtained from Deschouwer (1996) and Rihoux (2001). They are based on a self-placement survey asking presidents and spokesmen of the parties in the municipalities to locate their party on an ideological scale between 0 (Left) and 10 (Right). The figures range from 2.6 (the Green party) to 6.1 (the Liberal party).

public spending. This is the first study assessing the role of female representation on the revenue side of the budget. Summary statistics of all variables are reported in table A1 in the Appendix.

#### *4.2. Results*

Table 2 reports the within-groups estimation results of the system of equations (1). Note that, given that we employ deviations from group means and that the five tax shares sum to one, the sum of the coefficients on each variable across the five tax instruments must equal zero.

Starting with the effect of grants, we find that the share of revenues from income taxation rises as grants increase, while the shares of all other tax instruments fall accordingly. Since higher grants mean that a lower overall share of public spending needs to be funded by own revenues, this result suggests that the marginal cost function for income taxes is steeper than the marginal cost functions for the other tax instruments; most likely due to the progressive federal personal income tax imposing a high burden on income-earners. An alternative explanation is that extracting revenues from mobile tax bases (such as individuals' income) may be more costly than relying on immobile revenue sources (e.g., property) in a competitive environment (Gordon, 1986; Bucovetsky and Wilson, 1991; see Eggert and Haufler, 1999, for a review).

[Table 2 about here]

In line with the stylised theoretical model in section 2, we also find that the share of the income tax rises with per capita income (a similar effect was observed in a cross-national sample by Bird and Zolt, 2008) and decreases with the property and

business tax bases. Moreover, the income tax share decreases with the rate of unemployment, the percentage of elderly residents and the degree of income inequality. The somewhat surprising income-inequality effect might be due to the limited redistributive impact of (proportional) local income taxation.

As for the political variables, they have no significant direct effect on the share of income tax revenues, except for the proportion of females in the executive body. The latter significantly fosters reliance on income taxes, mainly at the expense of revenues from the residual source of revenue (mostly administrative duties). One potential explanation follows the argument that women tend to be more egalitarian and socially aware (cf. Lott and Kenny, 1999; Edlund and Pande, 2002; Funk and Gathmann, 2008). Hence, they are more likely to see the provision of administrative services as basic necessities which should be free (i.e. paid from general tax revenues raised through income and property taxes), while being in favour of a higher tax burden on high-income earners (and property owners; see below).<sup>11</sup>

The revenue share of the property tax is strongly positively affected by the property tax base and negatively by the income tax base. In addition, population density and the proportion of elderly exert a positive effect on the property tax revenue share, due to the fact that higher population density involves higher housing needs, and older people are more likely to be home-owners.<sup>12</sup> Similarly to income taxation, female representation is estimated to have a strong, direct positive effect on the relative use of property taxes. In addition, there is also a positive effect of government fragmentation, suggesting that more fragmented governments rely to a

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<sup>11</sup> An alternative explanation is that women get voted into office more often in municipalities that have a more 'egalitarian-minded' population overall. As such, it might be differences in popular preferences (rather than women's policy preferences as such) causing both a higher share of female councillors and higher reliance on income and property taxes.

<sup>12</sup> Unfortunately, no direct time-varying measure of home-ownership was available for the period under study.

larger extent on property taxation. A potential explanation here lies in the fact that government fragmentation is often associated with indecision and gridlock (Roubini and Sachs, 1989; Ashworth *et al.*, 2005). In such a setting, it may be easier to agree upon taxing politically less costly (i.e., less mobile) tax bases. This interpretation is also consistent with the significant negative effect of the fragmentation index on the share of business taxation.

Reliance on business-related tax revenues increases with the number of firms in the jurisdiction (while decreasing with the income and property tax bases), once again illustrating the importance of the tax base. Otherwise, the contribution of business tax revenues to a municipality's budget appears most sensitive to political variables; it decreases with government fragmentation, voter turnout and female representation in the executive.

User charges make up a larger share of tax revenues in larger municipalities (while decreasing with the income and property tax bases). Given that such charges are mostly flat taxes, this is suggestive of a tax base effect, i.e., larger municipalities have more residents potentially paying the user charge, thus providing an economic rationale for its usage. The explanatory power of the business taxes and user charges equations, though, remains limited.

Finally, most of the included variables have little explanatory power in the rest category (including mainly administrative duties) equation, although there is evidence that left-wing governments and those that have a higher representation of women are less likely to get significant revenues from administrative duties. As mentioned above, left-wing parties and female politicians tend to have a more egalitarian attitude (Lott and Kenny, 1999; Edlund and Pande, 2002; Funk and Gathmann, 2008) and

therefore may want basic administrative services to be funded from general (income and/or property) tax revenues.

Overall, the reduced-form system estimation results provide a somewhat unexpected picture of the factors affecting the local tax mix. In general, it appears that economic variables – such as the tax base sizes, that play a crucial role in determining the slope of the marginal cost functions<sup>13</sup>, and grants, that proxy the overall need to raise own revenues to fund spending on local public services – are strikingly more important than political and ideological variables to explain variations in the local tax mix. The hegemony of economic factors in explaining the local tax mix is compatible with the prediction of Kenny and Winer's (2006) theoretical model that the observed tax structure reflects the political costs of raising taxes, irrespective of the composition and ideology of government.

Interestingly, the exception appears to be the share of female council-members. Such significant effect of female representation on the local tax mix supports previous work illustrating its effects on the composition of public spending (e.g., Pande, 2003; Chattopadhyay and Duflo, 2004; Svaleryd, 2009).

## **5. Testing the scale effect hypothesis**

According to the scale effect hypothesis (Kenny and Winer, 2006), the equalization of the marginal costs of raising revenues across all tax sources in equilibrium implies that an exogenous shock to the budget requirement directly affects all available tax instruments. More specifically, all revenue sources should be exploited more extensively when more funds are required (though to differing degrees depending on

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<sup>13</sup> The tax base effects are also consistent with a benefit taxation model. Indeed, extension of a given tax base (e.g., the property tax base) might imply that more services are required by the associated socio-economic group (e.g., property owners), which, according to benefit taxation, should be financed via 'their' tax base (e.g., property taxes).

their marginal cost function), and vice versa. To test this hypothesis, we follow Kenny and Winer (2006) in estimating the system of equations (1) with real per capita revenues in jurisdiction  $i$  and year  $t$  from each tax base  $k$  ( $k$ =income, property, business, user charges, and other) as the dependent variables.<sup>14</sup> Since, as shown in figure 1, changes in grants have the effect of shifting the marginal benefit function, the estimated coefficients on grants capture the scale effect and are expected to be negative in all revenue equations. Being based on exogenous and infrequently adjusted spending needs and fiscal capacity indicators (see above), grants can be seen as exogenous from the municipality's point of view and determine the overall size of required *own* revenues. Moreover, and crucially, given our fixed effects estimation strategy (as before, all variables are taken as deviations from the municipality means, thus leading to a standard within-groups estimator), they are uncorrelated with time-varying shocks to individual revenue sources and are orthogonal to the marginal cost curves. The estimation results testing the scale effect are reported in Table 3. To save space, only the key grant coefficients are reported.

[Table 3 about here]

The results indicate that grants have a negative and significant impact on all five sources of revenue. The total effect of an additional euro in grants is estimated to amount to around 0.19 euro of lower own tax revenues. This implies that an extra euro in grants raises spending by over 80 euro cents, suggesting the presence of a very strong 'flypaper effect' (see also Bastiaens *et al.*, 2001; Heyndels, 2001).

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<sup>14</sup> Similar results are obtained when using revenues from each tax instrument as a proportion of income in the jurisdiction.

Nonetheless, the strength of the scale effect varies considerably across the available revenue sources. In particular, and consistently with the revenue share results discussed above, property tax revenues are estimated to respond to changes in the budget requirement in a relatively elastic way, with a coefficient of around -0.10. The response of income taxes, business taxes, user charges and other sources of revenue is substantially smaller (around -0.02). In light of the fact that income tax revenues account for almost half of total own revenues (table A1), the income tax appears to be stickier and harder to manoeuvre than all other tax instruments.

Note, finally, that – viewing these results from a slightly different perspective – our findings also shed light on Flemish municipalities’ (dynamic) reactions to budget shocks; that is, they indicate to what extent, and how, municipalities replace lost grant revenue. Indeed, our results suggest that most lost grant revenue would not be replaced – but rather results in reduced spending (in line with evidence from the US, Germany and Spain, see Buettner and Wildasin, 2006; Buettner, 2007; Solé-Ollé and Sorribas-Navarro, 2009). Yet, and unlike previous studies, our results additionally indicate that revenues raised to (partially) replace lost grant income are disproportionately extracted from the property tax base. Hence, the replacement mix within Flemish municipal reactions to a budget shock appears heavily skewed towards immobile fiscal revenues.

## **6. Inter-jurisdictional dependence**

A sizeable recent literature (reviewed in Brueckner, 2003; Revelli, 2005) suggests that local governments might use their tax instruments strategically, leading to inter-municipal dependence in local tax-setting. As ignoring such spatial dependence might lead to biased inferences regarding the effects of exogenous variables on local tax

choices (Anselin, 1988), this section briefly evaluates the appropriateness of our non-spatial approach in sections 4 and 5 by testing whether local tax mix choices are indeed made independently (rather than exhibit spatial auto-correlation).<sup>15</sup>

To get a preliminary picture of the extent to which spatial dependence is an issue in our setting, we first compute the Moran statistic of spatial auto-correlation on the raw tax shares from each tax source ( $s_{itk}=r_{itk}/r_{it}$ ). Letting  $\Delta s_{tk}$  be the (289×1) vector of deviations from the mean tax share  $k$  in year  $t$ , the Moran statistic is computed as:

$$M_{itk}(s) = (\Delta s_{tk}' W \Delta s_{tk}) / (\Delta s_{tk}' \Delta s_{tk}) \quad (2)$$

where  $W$  is a (289×289) weights matrix that contains information on the location of municipalities. In particular, we use the conventional binary, contiguity-based and row-standardised matrix, meaning that the  $(i,j)$  element of  $W$  equals  $1/n_i$  if municipalities  $i$  and  $j$  share a border, with  $n_i$  the number of bordering municipalities of municipality  $i$ , and 0 otherwise.<sup>16</sup> The Moran statistic is asymptotically normally distributed (Anselin, 1988). Table 4 reports both the values taken by the Moran statistic in each of the eight years and the one based on the eight-year average.<sup>17</sup>

[Table 4 about here]

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<sup>15</sup> Previous work suggests significant spatial auto-correlation in the setting of local income and property tax *rates* in Flanders (e.g., Heyndels and Vuchelen, 1998; Richard *et al.*, 2005; Van Parys and Verbeke, 2007; Gérard *et al.*, 2010). Geys (2006) provides evidence of spatial auto-correlation in Flemish local government efficiency ratings (see Revelli and Tovmo, 2007, for a similar finding using Norwegian data).

<sup>16</sup> The results are qualitatively similar when employing distance-based matrices (details available upon request).

<sup>17</sup> Similar results are obtained when computing the Moran statistic on per capita tax revenues.

The results in Table 4 show that all tax shares, except for “other” sources of revenue, are highly positively correlated across space. Still, these results cannot be directly interpreted as evidence in favour of inter-jurisdictional dependence. In fact, the inter-municipal correlation observed in Table 4 may simply result from failing to control for socio-economic similarities between neighbouring municipalities. Indeed, since contiguous municipalities share common socio-economic structures, these may influence their tax mix choices in the same direction. Hence, we compute the Moran statistic on the residuals from the system of reduced-form share equations (1) (see also Egger et al., 2009):

$$M_{tk}(v) = (v_{tk}' W v_{tk}) / (v_{tk}' v_{tk}) \quad (3)$$

The results are reported in Table 5, again for each of the eight years separately and for the eight-year average. In sharp contrast to the results in Table 4, the residuals from system (1) reveal virtually no evidence of spatial dependence. Only five cells in Table 5 are statistically significant at the 5% level (two in 1995 and three in 1996), suggesting that the inter-municipal correlation observed in Table 4 plausibly derives from the fact that contiguous municipalities share common socio-economic structures influencing their tax mix choices in the same direction.

[Table 5 about here]

Of course, the similarity in the socio-economic environment of nearby localities might itself be the outcome of inter-governmental competition for tax bases, leading to agglomeration of economic activities as well as stratification of population based

on income and tastes. However, an evaluation of the extent to which municipal governments' policies could actually be responsible for such long-run localization processes reasonably seems to go beyond the scope of this paper.

## **7. Conclusions**

This paper has offered the first comprehensive investigation of the determinants of the local tax mix in the presence of multiple tax instruments using panel data on 289 Flemish municipalities over the period 1995-2002. Our analysis points to the predominance of economic over political factors in the determination of the observed tax mix. Indeed, the most powerful drivers of the local tax mix turn out to be the sizes of the respective tax bases as well as central government grants. Other socio-economic characteristics of the municipality – such as demographic composition, income distribution or population density – likewise influence the tax mix in a significant way, lending support to the prediction emerging from the theoretical model that the observed tax structure reflects the political costs of raising taxes. On the other hand, political variables capturing the strength, ideology and composition of the local executive turn out to play a negligible direct role in the determination of the local tax mix. Interestingly, however, and in line with recent research, we find that the share of female council-members significantly affects the chosen tax mix in a more redistributive direction.

Second, the evidence presented firmly supports the Kenny and Winer (2006) scale effect hypothesis. That is, all available tax instruments generate higher (lower) revenues as the budget requirement increases (decreases) exogenously. The strength of this effect varies considerably across the available revenue sources, with property tax revenues reacting in a significantly more elastic way than income tax revenues to

exogenous changes in the budget requirement. This suggests that the income tax displays the steepest marginal cost curve of the available tax instruments, which – being the most mobile tax base – is consistent with the view that extracting revenues from mobile tax bases is particularly costly in a competitive environment.

Overall, our results are compatible with the idea that local governments set the tax mix in order to minimize the political costs of raising revenues, with the latter being plausibly and chiefly affected by the economic characteristics of the locality (most importantly the size and distribution of tax bases). This occurs irrespective of the government's ideology: taxes entail a political cost, whoever raises them. In effect, the lack of evidence of spatial dependence among nearby authorities reinforces the idea that policymakers' tax mix choices are mostly responsive to internal economic determinants.

The above evidence arguably presents an indirect test of the functioning of the political cost minimization mechanism. A more direct test would involve verification of the impact on government popularity or electoral outcomes of manoeuvring the different ingredients of the available tax mix. While Geys and Vermeir (2008) find that such changes in the US tax structure (referred to as 'tax structure turbulence') affect the popularity of US presidents over and above the total tax burden imposed on the population, they do not evaluate the individual effects of different available tax mix ingredients. Extending this line of analysis to more directly assess the political costs involved in using certain tax sources rather than others and evaluate whether similar effects play at the local government level might prove to be a fruitful line of future research.

## References

- Anselin, L. (1988), *Spatial Econometrics: Methods and Models*, Dordrecht: Kluwer.
- Ashworth, J., B. Geys and B. Heyndels (2005), Government weakness and local public debt development in Flemish municipalities, *International Tax and Public Finance* 12, 395-422.
- Ashworth, J., B. Geys and B. Heyndels (2006), Determinants of tax innovation: The case of environmental taxes in Flemish municipalities, *European Journal of Political Economy* 22, 223-247.
- Bastiaens, E., B. De Borger and J. Vanneste (2001), Expenditure and Taxation Effects of Local Public Debt and Unconditional Grants: Evidence from Flemish Municipalities, *Cahiers Économiques de Bruxelles* 171, 77-89.
- Bel, G. and A. Miralles (2010), Choosing between Service Fees and Budget Funding to Pay for Local Services: Empirical Evidence from Spain, *Environment and Planning C: Government and Policy* 28, 54-71.
- Bird, R. and M. Smart (2002), Intergovernmental Fiscal Transfers: International Lessons for Developing Countries, *World Development*, 30(6), 899-912.
- Bird, R.M. and E. Slack (2007), An Approach to Metropolitan Governance and Finance, *Environment and Planning C: Government and Policy*, 25, 729-755.
- Bird, R.M. and E.M. Zolt (2008), Tax Policy in Emerging Countries, *Environment and Planning C: Government and Policy*, 26(1), 73-86.
- Blackley, P. and L. DeBoer (1987), Tax Base Choice by Local Governments, *Land Economics*, 63, 227-236.
- Borge, L.-E., T. Falch, and P. Tovmo (2008), Public Sector Efficiency: The Roles of Political and Budgetary Institutions, Fiscal Capacity and Democratic Participation. *Public Choice*, 136(3-4), 475-495.
- Brueckner, J. (2003), Strategic Interaction among Governments: An Overview of Empirical Studies, *International Regional Science Review* 26, 175-188.
- Bucovetsky S. and J.D. Wilson (1991), Tax Competition with Two Tax Instruments, *Regional Science and Urban Economics* 21, 333-350.
- Buettner, T. (2007), Equalization Transfers and Dynamic Fiscal Adjustment: Results for German Municipalities and a US-German Comparison, *IFIR Working Paper*, No.2007-07.
- Buettner, T. and D.E. Wildasin (2006). The Dynamics of Municipal Fiscal Adjustment, *Journal of Public Economics*, 90, 1115-1132.
- Chattopadhyay, R. and E. Duflo (2004), Women as Policy Makers: Evidence from a Randomized Policy Experiment in India, *Econometrica* 72, 1409-1443.
- Costa-Font, J. (2010), Does Devolution lead to Regional Inequalities in Welfare Activity? *Environment and Planning C: Government and Policy*, 28(3), 435-449.
- Deschouwer, K. (1996), Nationale Partijen en Gemeenteraadsverkiezingen, In J. Buelens and K. Deschouwer (Eds.), *De dorpsstraat is de wetstraat niet* (pp. 13-25). Brussels: VUBPress.

- Dwivedi, T. and K. Srivastava (1978), Optimality of Least Squares in the Seemingly Unrelated Regressions Model, *Journal of Econometrics* 7, 391-395.
- Edlund, L. and R. Pande (2002), Why Have Women Become Left-Wing? The Political Gender Gap and the Decline in Marriage, *Quarterly Journal of Economics* 117, 917-961.
- Egger, P., M. Larch, M. Pfaffermayr and J. Walde (2009), Small Sample Properties of Maximum Likelihood versus Generalized Method of Moments Based Tests for Spatially Autocorrelated Errors, *Regional Science and Urban Economics* 39, 670-678.
- Eggert, W. and A. Haufler (1999), Capital Taxation and Production Efficiency in an Open Economy, *Economics Letters* 62, 85-96.
- Fiva, J. and J. Rattsø (2007), Local Choice of Property Taxation: Evidence from Norway, *Public Choice* 132, 457-480.
- Funk, P. and C. Gathmann (2008), Gender Gaps in Policy Making: Evidence from Direct Democracy in Switzerland, University of Pompeu Fabra, *mimeo*.
- Gérard, M., H. Jayet and S. Paty (2010), Tax Interactions among Belgian Municipalities: Do Interregional Differences Matter? *Regional Science and Urban Economics*, forthcoming.
- Geys, B. (2006), Looking across Borders: A Test of Spatial Policy Interdependence Using Local Government Efficiency Ratings, *Journal of Urban Economics* 60, 443-462.
- Geys, B. (2007), Government Weakness and Local Public Debt Cycles: Evidence from Flemish Municipalities, *Local Government Studies* 33, 239-253.
- Geys, B. and W. Moesen (2009), Exploring Sources of Local Government Technical Inefficiency: Evidence from Flemish Municipalities, *Public Finance and Management*, 9(1), 1-29.
- Geys, B. and J. Vermeir (2008), Taxation and Presidential Approval: Separate Effects from Tax Burden and Tax Structure Turbulence?, *Public Choice*, 135(3-4), 301-317.
- Goeminne, S., B. Geys and C. Smolders (2008), Political Fragmentation and Projected Tax Revenues: Evidence from Flemish Municipalities, *International Tax and Public Finance* 15, 297-315.
- Goodspeed, T.J. (1994), Efficiency and Equity Consequences of Decentralized Government: An Application to Spain, *International Tax and Public Finance* 1(1), 35-54.
- Gordon, R.H. (1986), Taxation of Investment and Savings in a World Economy, *American Economic Review* 76, 1086-1102.
- Hall, J. (2006), Fiscal Competition and Tax Instrument Choice: The Role of Income Inequality, *Economics Bulletin*, 8(12), 1-8.
- Hettich, W. and Winer, S. (1984), A Positive Model of Tax Structure, *Journal of Public Economics* 24, 67-87.

- Hettich, W. and Winer, S. (1988), Economic and Political Foundations of Tax Structure, *American Economic Review* 78, 701-712.
- Hettich, W., Winer, S. (1999). *Democratic Choice and Taxation, a Theoretical and Empirical Analysis*. Cambridge University Press, Cambridge.
- Heyndels, B. (2001), Asymmetries in the Flypaper Effect: Empirical Evidence for the Flemish Municipalities, *Applied Economics* 33, 1329-1334.
- Heyndels, B. and J. Vuchelen (1998), Tax Mimicking among Belgian Municipalities, *National Tax Journal* 51, 89-101.
- Inman, R. (1999), On Designing Intergovernmental Transfers with an Application in the New South Africa, in: R. Schwab (ed.), *Essays in Honor of Wallace Oates*, Edgar Elger: Cheltenham.
- John, P. (2001), *Local Governance in Western Europe*, Sage: London.
- Kenny, L.W. and S.L. Winer (2006), Tax Systems in the World: An Empirical Investigation into the Importance of Tax Bases, Administration Costs, Scale and Political Regime, *International Tax and Public Finance* 13, 181-215.
- Lago-Peñas, S. (2005) Evolving federations and regional public deficits: testing the bailout hypothesis in the Spanish case, *Environment and Planning C: Government and Policy* 23, 437-453
- Lott, J.R. and L.W. Kenny (1999), Did Women's Suffrage Change the Size and Scope of Government? *Journal of Political Economy* 107, 1163-1198.
- McGuire T.J. (2001), Alternatives to Property Taxation for Local Government. In: Wallace E. Oates (ed.) *Property Taxation and Local Government Finance*. Cambridge, MA: Lincoln Institute of Land Policy, pp. 301-314.
- Nechyba, T. (1997) Local Property and State Income Taxes: The Role of Interjurisdictional Competition and Collusion, *Journal of Political Economy* 105, 352-383.
- Oates, W.E. and R.M. Schwab (2004), What Should Local Governments Tax: Income or Property? In: Amy E. Schwartz (ed.) *City Taxes, City Spending*. Edward Elgar, Cheltenham, pp. 7-29.
- Pande, R. (2003), Can Mandated Political Representation Increase Policy Influence for Disadvantaged Minorities? Theory and Evidence from India, *American Economic Review* 93, 1132-1151.
- Revelli, F. (2005), On Spatial Public Finance Empirics, *International Tax and Public Finance* 12, 475-492.
- Revelli, F. and P. Tovmo (2007), Revealed Yardstick Competition: Local Government Efficiency Patterns in Norway, *Journal of Urban Economics* 62, 121-134.
- Richard, J.F., H. Tulkens, H. and M. Verdonck (2005), Tax Interaction Dynamics among Belgian Municipalities 1984-1997, *CORE Discussion Paper* 2005/48.
- Rihoux, B. (2001), Iedereen naar het politieke centrum en voorstander van de Nieuwe Politieke Cultuur?: De ideologische positionering van de lokale partijafdelingen in België, *Tijdschrift van Dexia Bank*, 2001, 216, 7-18.

- Rodríguez-Pose A. and R. Sandall (2008), From Identity to the Economy: Analysing the Evolution of the Decentralisation Discourse, *Environment and Planning C: Government and Policy*, **26**(1), 54-72.
- Roubini N. and J.D. Sachs (1989), Political and Economic Determinants of Budget Deficits in the Industrial Democracies, *European Economic Review* 33, 903-938.
- Sjoquist, D. (1981), A Median Voter Analysis of Variations in the Use of Property Taxes Among Local Governments, *Public Choice* 36, 273-285.
- Solé-Ollé, A. and P. Sorribas-Navarro (2009), The Dynamic Adjustment of Local Government Budgets: Does Spain Behave Differently?, *Department of Economics Working Paper*, E09/226, University of Barcelona.
- Spry, J. (2005), The Effects of Fiscal Competition on Local Property and Income Tax Reliance, *Topics in Economic Analysis and Policy*, 5, 1-19.
- Strumpf, K.S. (2001), Government Credibility and Policy Choice: Evidence from the Pennsylvania Earned Income Tax, *Journal of Public Economics*, 80(1): 141-167.
- Svaleryd, H. (2009), Women's Representation and Public Spending. *European Journal of Political Economy* 25, 186-198.
- Tovmo, P. (2007), Budgetary Procedures and Deficits in Norwegian Local Governments, *Economics of Governance* 8, 37-49.
- Van Parys, S. and T. Verbeke (2007), Tax Competition among Belgian Municipalities: A Multi-dimensional Battle?, paper presented at the Spatial Econometrics Conference, July 2007, Cambridge.
- Volkerink, B. and J. De Haan (1999), Political and Institutional Determinants of the Tax Mix: An Empirical Investigation for OECD Countries, SOM Working Paper No. 99-05.
- Werck, K., B. Heyndels and B. Geys (2008), The Impact of 'Central Places' on Spatial Spending Patterns: Evidence from Flemish Local Government Cultural Expenditures, *Journal of Cultural Economics* 32, 35-58.
- Winer, S.L. and W. Hettich (1991), Debts and Tariffs: An Empirical Investigation of the Evolution of Revenue Systems, *Journal of Public Economics* 45, 214-242.

Table 1: Tax revenue shares – summary statistics (N=289; period 1995-2002)

	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>
Income	44.73 (11.08)	44.07 (10.80)	44.02 (10.67)	44.25 (10.78)	44.97 (10.83)	45.92 (11.04)	45.99 (11.25)	45.41 (10.97)
Property	39.49 (8.97)	39.87 (8.79)	40.09 (8.73)	40.30 (8.82)	39.52 (9.04)	39.31 (9.09)	38.92 (8.92)	39.95 (8.67)
Business	2.63 (4.53)	2.62 (4.48)	2.46 (4.45)	2.50 (4.39)	2.47 (4.41)	2.43 (4.41)	2.55 (4.75)	2.65 (4.80)
Fees	8.39 (4.82)	8.73 (4.90)	8.47 (4.79)	8.33 (4.64)	8.10 (4.49)	7.91 (4.41)	7.82 (4.44)	7.45 (4.39)

**Note:** Unweighted averages across all municipalities; standard deviation between brackets.

Table 2: Reduced form tax revenue share system

	<i>income</i>	<i>property</i>	<i>business</i>	<i>charges</i>	<i>other</i>
Grants	0.008 *** (10.23)	-0.003 *** (4.17)	-0.001 *** (4.05)	-0.001 *** (0.65)	-0.003 *** (3.27)
Income tax base (,000)	8.330 *** (4.61)	-3.371 * (1.91)	-1.698 ** (1.98)	-0.435 (1.60)	-2.826 (0.36)
Property tax base	-0.022 *** (7.72)	0.030 *** (10.86)	-0.004 *** (3.14)	-0.005 ** (2.36)	0.001 (0.46)
Business tax base	-40.077 *** (3.31)	0.195 (0.02)	27.568 *** (4.43)	5.888 (0.59)	6.426 (0.50)
Population (,000)	-0.049 (0.30)	0.021 (0.13)	-0.150 * (1.75)	0.323 ** (2.36)	-0.144 (0.81)
Population density	0.006 (0.77)	0.022 *** (2.78)	-0.001 (0.34)	-0.027 *** (4.17)	0.001 (0.06)
Income inequality	-0.028 *** (2.62)	0.015 (1.43)	0.009 (1.56)	0.003 (0.33)	0.001 (0.12)
Unemployment	-47.570 *** (2.83)	11.477 (0.69)	-4.077 (0.47)	4.657 (0.34)	35.544 ** (2.00)
Old	-22.391 * (1.65)	56.101 *** (4.16)	-7.430 (1.06)	-17.974 (1.62)	-8.306 (0.58)
Index of fragmentation (number of parties)	-0.001 (0.00)	0.559 *** (3.39)	-0.199 ** (2.34)	-0.044 (0.33)	-0.314 * (1.78)
Index of executive ideology (0 (left) to 10 (right) scale)	-0.018 (0.10)	-0.263 (1.45)	-0.032 (0.34)	-0.173 (1.16)	0.487 ** (2.51)
Voter turnout	13.803 (0.97)	-17.604 (1.24)	-22.883 *** (3.12)	27.001 ** (2.31)	-0.316 (0.02)
Female representation	2.104 *** (3.63)	1.985 *** (3.45)	-0.863 *** (2.89)	-0.601 (1.27)	-2.625 *** (4.26)
Municipality effects	yes	yes	yes	yes	yes
Time effects	yes	yes	yes	yes	yes
R <sup>2</sup>	0.18	0.12	0.04	0.06	0.02
Observations (units)	2312 (289)	2312 (289)	2312 (289)	2312 (289)	2312 (289)

**Note:** Dependent variable = share of revenues from each tax source; *t* statistics in parentheses; \*\*\*, \*\* and \* significant at 1%, 5% and 10%.

Table 3: Scale effect hypothesis

	<i>income</i>	<i>property</i>	<i>business</i>	<i>charges</i>	<i>Other</i>
Grants	-0.026 *** (7.72)	-0.096 *** (15.65)	-0.017 *** (7.30)	-0.022 *** (7.80)	-0.028 *** (5.47)
Municipality effects	yes	yes	yes	yes	yes
Time effects	yes	yes	yes	yes	yes
Other controls	yes	yes	yes	yes	yes
R <sup>2</sup>	0.78	0.51	0.08	0.07	0.04
Observations (units)	2312 (289)	2312 (289)	2312 (289)	2312 (289)	2312 (289)

**Note:** Dependent variables = (real) per capita revenues in jurisdiction  $i$  and year  $t$  from each tax base  $k$ ;  $t$  statistics in parentheses; \*\*\*, \*\* and \* significant at 1%, 5% and 10%; Controls: population, population density, property value, number of firms per inhabitant, income, income inequality, unemployment, % old, fragmentation, ideology, turnout, female representation in the executive.

Table 4: Moran test on raw tax shares

	<i>income</i>	<i>property</i>	<i>business</i>	<i>charges</i>	<i>other</i>
1995	0.353**	0.316**	0.211**	0.134**	0.081
1996	0.332**	0.303**	0.193**	0.147**	0.039
1997	0.334**	0.298**	0.191**	0.139**	0.024
1998	0.326**	0.300**	0.186**	0.131**	0.033
1999	0.322**	0.289**	0.189**	0.131**	0.030
2000	0.336**	0.290**	0.150**	0.132**	0.029
2001	0.341**	0.272**	0.122**	0.158**	0.047
2002	0.343**	0.340**	0.149**	0.132**	0.021
Average 1995-2002	0.351**	0.317**	0.189**	0.155**	0.061
Observations	289	289	289	289	289

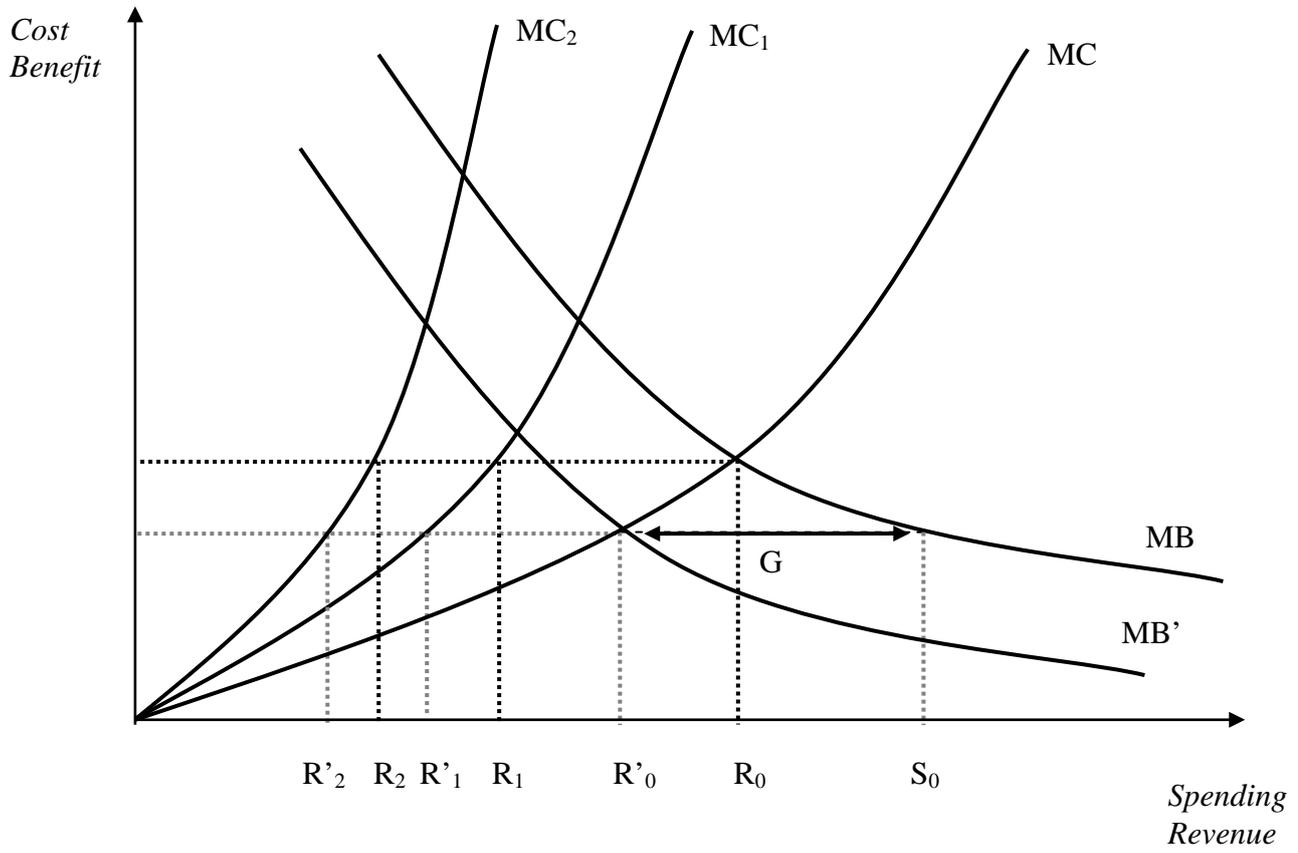
Note: \*, \*\* significant at 5%, 1%.

Table 5: Moran test on the residuals from system (1)

	<i>income</i>	<i>property</i>	<i>business</i>	<i>charges</i>	<i>other</i>
1995	0.098*	-0.028	-0.096*	0.013	0.008
1996	-0.007	0.085*	-0.071	0.091*	-0.103*
1997	-0.023	-0.027	-0.039	0.042	-0.023
1998	0.000	-0.039	0.002	-0.034	-0.024
1999	0.045	0.046	0.027	0.039	-0.025
2000	0.051	0.060	-0.060	-0.020	0.000
2001	0.032	0.012	-0.077	0.068	0.019
2002	-0.038	0.055	-0.070	0.017	0.041
Average 1995-2002	-0.011	0.049	0.058	0.006	-0.019
Observations	289	289	289	289	289

Note: \*, \*\* significant at 5%, 1%.

Figure 1: Optimal taxation with two tax instruments



## Appendix

Table A1: Summary statistics (2312 observations)

	<i>mean</i>	<i>st.dev.</i>	<i>min</i>	<i>max</i>	<i>Variable description</i>
Own revenues per capita	410.21	132.90	130.28	1286.36	Total revenues from local revenue sources, per capita, in €
Income tax per capita (share of own revenues)	175.81 (44.98)	45.28 (10.90)	26.03 (2.75)	412.30 (70.25)	
Property tax per capita (share of own revenues)	168.98 (39.59)	97.00 (8.74)	31.47 (12.86)	986.44 (76.68)	
Business tax per capita (share of own revenues)	12.39 (2.54)	26.04 (4.53)	0.00 (0.00)	253.32 (41.76)	
User fees per capita (share of own revenues)	34.29 (8.18)	30.09 (4.60)	0.00 (0.00)	275.46 (34.98)	
Other revenue per capita (share of own revenues)	18.74 (4.71)	20.56 (4.39)	1.26 (0.36)	429.16 (52.61)	
Income per capita	10,843	1,524	6,713	16,604	Personal taxable income, per capita, in €
Property tax base per capita	524.30	223.50	134.60	2038.72	Net assessed rental value of housing property, per capita, in €
Number of firms per inhabitant	0.11	0.15	0.01	2.05	Number of active firms registered in municipality, per capita
Population (,000)	19.67	31.53	0.96	459.07	Number of inhabitants (in 1000 individuals)

Population density	501.78	424.87	50.22	3223	Number of inhabitants per square kilometre
Income inequality	70.18	41.49	0	134.8	Ratio of interquartile difference in income to the median value
Unemployment	0.03	0.01	0.01	0.07	Number of unemployed as share of total population
Old	0.16	0.02	0.07	0.25	Population over 65 as share of total population
Fragmentation	1.79	0.73	1	5	Number of coalitions partners
Ideology	4.98	0.61	2.6	6.1	Index weighting seat share of each coalition party with its ideological stance (measured between 0 (left) and 10 (right))
Voter turnout	0.94	0.02	0.88	0.98	Number of valid and invalid votes cast as share of eligible population
Female representation	0.17	0.15	0	0.75	Share of female councillors