TAX DECENTRALISATION AND LOCAL GOVERNMENT SIZE

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Abstract

The aim of this paper is to re-examine the relationship between fiscal federalism and the size of local governments. Traditionally, the empirical studies have focused on the different accountability power of grants and local taxes, concluding that the former encourages the growth and the latter contributes to contain local public spending. Yet, the existing literature is more silent about the possibility that different types of tax autonomy may still have differential impacts on the expansion of the local public sector. The paper addresses this issue by arguing that tax decentralisation organised on tax bases used only by local governments (*tax separation*) would favour most the containment of local public expenditures, while that organised on tax base sharing (i.e. *piggybacking* mechanisms) is not expected to have a significant impact on the local government size. Using an unbalanced panel data set of OECD countries, we adopt the novel approach of disentangling the impact of local taxes - on income, property, and goods and services - on the size of the local public sector. In particular, property taxes only - mostly based on a "tax separation" scheme - seem to have a negative impact on the size of local government. Instead, both income taxes and general taxes on goods and services – often shared with central governments – have uncertain impacts on the size of local governments (and more frequently positive). We conclude that tax decentralisation is a necessary condition to contain local public expenditures, yet it is not sufficient, as a tax separation scheme would in fact be required.

JEL Classification: H71, H77, H2

Keywords: *Fiscal decentralisation; Tax sharing; Tax separation; Property taxes; Local government size.*

1. Introduction

The relationship between fiscal federalism and the size of the public sector remains an area of theoretical debate open to empirical investigations. On the one hand, the traditional theory of fiscal federalism (Tiebout, 1956; Buchanan, 1965; Oates, 1972) does not fully handle how decentralisation may affect government size. The key point of this approach is that a "benevolent" central policy maker can better take into account heterogeneous preferences in different local governments by decentralising the supply of local public goods. To some extent, the benevolent nature of both central and local decision-makers rules out politicians' misbehaviour, regardless of whether local governments are financed either by own taxes or by central grants. The main implication is that the expansion of the public sector will occur up to a point that is agreed on by individual preferences only.

On the other hand, more recent analyses of fiscal federalism - mainly attributable to Public Choice scholars - have highlighted that benevolent politicians are the exception rather than the rule. According to this theory, politicians misbehave and compete in various ways according to their own objective functions (see the standard models by Brennan and Buchanan, 1980; Salmon, 1987; Breton, 1987). These theories develop interesting implications concerning the relation between decentralisation and government size. For example, they usually favour fiscal competition among local governments (on both the tax and the expenditure side), in order to attract tax bases (e.g., Brennan and Buchanan, 1980). Furthermore, they suggest that the electoral competition would provide an incentive mechanism that would make policy-makers more accountable (e.g., Salmon, 1987). In all cases, a competitive mechanism would discipline potentially "bad" politicians (e.g. Besley and Case, 1995), in this way reducing both rent-seeking behaviour and the monopoly power of both central and local political agents.

As a consequence, these theories (often grouped under the heading of "*theories of competitive federalism*") would support smaller public sectors in decentralised countries, on the basis of the argument that local decision-makers are more accountable to local voters and therefore have few opportunities to misbehave. Yet, even though decentralisation may be necessary for responsible behaviour, it may not be sufficient. The existing literature suggests that the best way to enforce local responsibility is to assign significant tax autonomy to local governments; on the contrary, central government grants would facilitate local governments' misconduct and therefore an inefficient growth of local expenditures. The reason is intuitive. Local decision-makers are forced to use own resources better than they would use the *common pool* of national resources. One should therefore expect that different systems of local taxes and intergovernmental grants may affect local governments' attitudes and policy choices because of different fiscal incentives associated with financing sources (Weingast, 2009).

As argued by Shah (1999), "to ensure fiscal discipline, governments at all levels must be made to face financial consequences of their decisions." Other authors have suggested that sub-national governments that lack independent sources of revenue can never truly enjoy fiscal autonomy; and, similarly, that grants can make local governments less accountable for their fiscal decisions (Bahl and Linn, 1992; McLure, 1998). More recently, and for the Italian case, Boetti *et al.* (2010) show that more autonomous municipalities – i.e. local governments with a higher share of current spending covered by own taxes – exhibit less inefficient behaviours; furthermore, public services provided to citizens are more efficient and effective. As a result, there is widespread agreement in the literature on the fact that the size of the public sector can be smaller when decentralisation is funded by own taxes; and comparatively larger, when funding comes from central government grants.[1] This qualifies the general result that decentralisation entails lower local expenditures (and lower total spending) only when it is based on tax autonomy; while a decentralisation funded by grants would be ineffective in reducing the size of the public sector.

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[1] These findings are consistent with the broad argument developed by Brennan and Buchanan (1978, 1980) according to which responsive tax bases may help limit the growth of the public sector in the case of *Leviathan* governments, enhancing political accountability.

Quite surprisingly, however, while the different accountability content of grants and own taxes has been over time sufficiently explored, the existing literature is more silent about the possibility that different types of tax autonomy may still have differential impacts on the expansion of the public sector. Recent results obtained in Cassette and Paty (2010) show that decentralisation may unexpectedly increase sub-central government size even when financed by own tax revenues.[2] On the one hand, this result empirically supports previous theoretical evidence showing that when several government levels share the same tax base (even with some degree of autonomy), the aggregate equilibrium tax rate can be higher contrasted with the case where tax bases would be used by local governments only (e.g. Keen and Kotsogiannis, 2004). This may suggest that the equilibrium level of spending can also be higher. However, an analysis of what kind of local taxes are responsible for this result is still empirically lacking.

The observation of decentralised tax systems in OECD countries reveals that tax decentralisation may have different characteristics. Some taxes are decentralised through tax/revenue sharing or tax base sharing methods (usually income and consumption-type taxes), while other taxes are applied on a "tax separation" basis.[3] This latter scheme implies that a given tax base is exclusively used by one level of government only.[4] Now, while a certain agreement is achieved about the fact that tax/revenue sharing have effects that are strictly comparable to those produced by central grants, the possibility that sharing tax bases between local and central governments (also referred to as *piggybacking*) may entail a comparable effect is overlooked.

In fact, allowing local governments to piggyback on central tax bases may reduce the perceived competition among government levels, may insulate local jurisdictions from the responsibility of changing their tax bases (Zax, 1988) and may generate more local tax illusion to the extent that the consequences of central government tax policies on local tax revenues are not clearly disentangled and observed by citizens. In this case, as already argued by McKenzie and Staff (1978), local spending might increase. Thus, the fact that piggybacked taxes tend to grow with less political fuss than taxes based on a "tax separation" scheme suggests that increased reliance on these taxes for decentralisation purposes must be viewed with mixed feelings (Bahl and Bird, 2008) if the aim is to contain public spending. In other words, tax decentralisation may not necessarily shrink the size of local public sectors. In fact, there are reasons to believe that this latter outcome is more likely to occur when local taxes are applied on a "tax separation" scheme rather than on a tax base sharing method. Tax separation – in the sense of the local government exclusive use of a given tax base – would improve accountability, would better help disentangle local and central responsibilities and would make easier for voters to link what is spent for what (broadly, the application of the benefit principle of taxation).

In order to shed some light on this issue, this paper investigates the impact of tax decentralisation on the size of local public sectors by using the novel approach of disaggregating own local tax revenues into income taxes, property taxes and taxes on goods and services. This disaggregation is proposed for two reasons. The first is strictly empirical, as available data do not allow making recourse to a finer partition of local tax revenues. Yet – and this is the second reason – while income and consumption taxes are usually decentralised on a tax base sharing method, property taxes are mostly based on a tax separation scheme. Thus, by capturing the possible different impacts of these tax categories would allow us to capture the differential impact of different tax decentralisation schemes and to qualify the result obtained by Cassette and Paty (2010), that revenue decentralisation increases local government size. To make our study robust to conventional results (e.g. Rodden, 2003) – consistent with the *"common pool" hypothesis* and the *"flypaper effect"* – grants from higher levels of government are included into the analysis and expected to positively affect the size of local public sectors.

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[2] They also show that the increase of local government size is larger than the reduction of the central government size, thus leading to a larger aggregate government size.

[3] Tax sharing identifies a system where the central government pays local governments a fraction of the taxes that originate from the local territories. Revenue sharing, instead, identifies an alternative mechanism where the central government pays local governments a certain amount of a given central tax on the basis of indicator of needs.

[4] Even though "tax separation" between different tiers of government appears a more orderly approach (Musgrave, 1983), in practice models of "tax base sharing" – where the same uniform tax base is taxed by both the central and the regional or local governments – seem to prevail.

Results are very encouraging. While grants have the standard (positive) impact, new insights emerge from considering disaggregated taxes. In particular, property taxes only (mainly applied on a tax separation scheme) seem to play a negative impact on the size of the local public sector. Instead, both income taxes and general taxes on goods and services – that are often applied with either a tax sharing or a tax base sharing method – have uncertain impacts on the size of local governments (and more frequently positive). This outcome, combined with other available results on this topic, would lead towards the conclusion that tax decentralisation is a necessary condition to reduce the size of the public sector, yet it is not sufficient. According to our findings, a tax decentralisation based on a "tax separation" scheme would be necessary.

2. Fiscal federalism and government size: the testable hypotheses

There are several empirical contributions on the relationship between decentralisation and government size. Unfortunately, strict comparability among those studies is prevented by the different content of the hypotheses tested, by the different variables used and by the different period and country coverage. Nevertheless, an attempt can be made of distinguishing the empirical achievements according to the following testable hypotheses: a) Decentralisation Hypothesis (DH); b) Wallis Hypothesis (WH); c) Leviathan Hypothesis (LH); d) Fragmentation Hypothesis (FH); e) Collusion Hypothesis (CH); f) Fiscal Illusion Hypothesis (FIH).

In order to shed some light on the main findings of the various contributions analysed, table 1 reports a simplified summary of the corresponding outcomes, where it is noted that some studies actually test more than one hypothesis and that one important discriminatory factor is the concept of government used (total, central or local government).

The *"Decentralisation Hypothesis"* (DH) is perhaps the most popular hypothesis in the theory of fiscal federalism. According to it, fiscal decentralisation would lead to greater efficiency and a leaner public sector. In this case, by having local governments tailoring the optimal level of local public goods on local preferences, the risk of overexpansion of central government spending would be minimized, leading to a smaller size of the general government. Oates (1972) – who originally proposed this hypothesis – actually found a negative relation between decentralisation and total government (TG) size. A number of successive studies (still using TG) have confirmed this hypothesis (Marlow, 1988; Grossman, 1989; Ehdaie, 1994, who simultaneously includes tax and spending choices in the same decentralisation process). More recently, Prohl and Schneider (2009) have also tested the Oates's theorem and have shown that in countries where revenues and expenditure responsibilities are largely decentralised, a lower growth in total government size would emerge. Finally, while Zax (1989) has confirmed the same outcome for local government (LG) size, a couple of studies have tried to verify DH using different definitions of government size (TG, CG and LG). In one case (Jin and Zou, 2002), the impact of decentralisation would be to increase the size of LG and to reduce the size of CG, with a negative total effect on TG size. This would imply that the reduction at the central level outperforms the increase at the local level. However, in another case (Cassette and Paty, 2010), the increase at the local level seems to outperform the reduction at the central level, leading to a net increase of TG size. The only inconclusive study, among the set of those testing DH, is by Pereira (2000) for European countries. Rather, he suggests that the size of the public sector is affected only by the per capita income, and not by the degree of fiscal decentralisation.

Within the context of the traditional theory of fiscal federalism, the possibility of a positive relationship between government size and decentralisation is explicitly addressed by the *"Wallis Hypothesis"* (WH). The argument runs as follows. Fiscal decentralisation would increase the size of sub-national governments because local provision of public goods may increase local spending and encourage local governments to take on a wider range of expenditure functions and fiscal responsibility. As decentralised supply of public goods can better suit local preferences, it may also produce an increased demand for local public goods and, consequently, a higher level of local public spending. A number of studies has actually tested WH, confirming its validity when using local government size (Wallis and Oates, 1988; Forbes and Zampelli, 1989; De Mello, 2001; Jin and Zou, 2002) or, in one case, total government size (Shadbegian, 1999).

The *"Leviathan Hypothesis"* (LH) – mostly developed by Brennan and Buchanan (1980) – shares with DH the idea that decentralisation would lead to a smaller public sector. More precisely, LH predicts that the size of the public sector varies inversely with the extent of fiscal decentralisation. However, the mechanics of this outcome is different, compared with DH. On the basis of the assumption that central governments are revenue-maximizing Leviathans with monopoly power, LH concludes that fiscal competition among jurisdictions would limit the central government's excessive taxing power and reduce the tax burden of individuals. Following this logic, decentralisation would be efficient,[5] with a lower tax burden leading to a smaller public budget.[6] One often overlooked consequence of this hypothesis is that efficiency will be encouraged most if mobile tax bases are taxed most, a principle that is at odds with the traditional tax assignment principles developed by Musgrave (1983) and King (1984). The *exit* option that these tax bases may exploit in the case of "excessive" taxation (compared with the corresponding benefits) would indeed prevent local decision-makers from behaving as local Leviathans (Liberati, 2010). LH was the subject of several empirical analyses and different results have emerged. Among the studies using TG as the dependent variable, the outcomes mostly confirm the hypothesis (Marlow, 1988; Edhaie, 1994; Shadbegian, 1999; Rodden, 2003; Fiva, 2006; Ashworth *et al.*, 2009), with the exception of Stein (1999) – a positive sign – and Oates (1985), with no significant relation found (declaring Leviathan a "mythical beast"). Other studies test LH using local government size, with mixed outcomes. On the one hand, Nelson (1987) and Feld *et al.* (2003) find that decentralisation reduces LG size; while an opposite result is supported by Forbes and Zampelli (1989) and Rodden (2003). This latter study complements the analysis also investigating what happens at the central level, supporting a reduction of CG size. Oates (1985) again does not find any support for LH even considering LG in the United States.

A natural corollary of LH is the *"Fragmentation Hypothesis"* (FH) that suggests that *"the potential for fiscal exploitation varies inversely with the number of competing governmental units in the inclusive territory"* (Brennan and Buchanan, 1980). In other words, the higher the number of local governments, the lower the government size, with more binding competitive pressures among jurisdictions emerging more likely when they are similar in size and in economic power (Fausto, 1996). A test of this hypothesis cannot be traced in a large number of studies (only four in table 1). Nelson (1987) and Zax (1989) have actually found support to FH using the LG size, with some caveats. In particular, Nelson (1987) argues that the dampening effect of fiscal decentralisation on the size of the public sector may not solely depend on the (increasing) number of local units, but on their size and on the functions they perform. After distinguishing between general-purpose and specific-purpose local governments, he therefore finds a fairly robust support for FH only for general-purpose governments. Feld *et al.* (2003), instead, demonstrate that fragmentation has essentially no effect on the size of government revenue for Swiss cantons.[7] In this particular case, the reduction of government size would be imputable to the fiscal autonomy of sub-federal governments, and not to the competitive pressure that emerges from having many governmental units. Finally, Oates (1985) – using the number of local governments as a proxy for fiscal federalism – also show inconclusive results.

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[5] "Overall intrusion of government into economy may be smaller, the grater the extent to which taxes and expenditures are decentralized" (Brennan and Buchanan, 1980).

[6] In general, in the public choice perspective of "excessive government", tax competition reduces rents and, hence, a smaller public sector enhances overall welfare (Rodden, 2003). In other public economics models (Zodrow and Mieszkowski, 1986; Wilson, 1986), with benevolent despots in an optimal taxation framework, a similar connection between tax competition and smaller government has also established.

There might be cases where competitive pressures are inhibited by the behaviour of local governments. To this regard, the *"Collusion Hypothesis"* (CH) suggests that when sub-central governments collude, they may be able to increase their own total revenues and spending beyond the level that would otherwise be attained in a competitive environment. The direct consequence is that when fiscal decentralisation does not foster competition among local governments, local expenditures may increase rather than fall.[8] Many studies actually support this hypothesis, as reported in table 1, regardless of the specific definition of government size, with the exception of De Mello (2001) for LG. But how is it that decentralisation does not foster competition? Some studies explicitly testing this hypothesis (Grossman, 1989; Grossman and West, 1994; Jin and Zou, 2002; Rodden, 2003; Cassette and Paty, 2010) show that when decentralisation is funded by grants or shared revenues and controlled for by the central government, it may have opposite effects than it could otherwise have if own local taxes were used. In short, central government grants would have a positive effect on the growth of public expenditures, while fiscal autonomy of sub-national governments would have a negative impact.

That fiscal decentralisation may increase the size of government is then explicitly stated by the *"Fiscal Illusion Hypothesis"* (FIH) developed by Winer (1983) and Dollery and Worthington (1996). When decentralisation is based on grants from higher levels of government, rather than on own local revenues, taxpayers in the recipient jurisdiction may perceive public provision as being financed by non-residents. A similar effect can be obtained in the case of "tax exporting" (Feld *et al.*, 2003).[9] The potential problem arising from exporting the tax burden to other jurisdictions is the same as it occurs with revenue sharing methods, i.e. both reduce the perceived tax-price of local services, allowing sub-national governments to increase spending above levels otherwise tolerated by voters/taxpayers. In particular, De Mello (2001) has tested FIH in Moldova in 1998 and has found that the vertical imbalance variable – as a proxy of fiscal illusion – is negative and statistically significant for sub-national government size.

It is worth noting that other studies have highlighted the role of vertical imbalance in shaping the size of the local, national and aggregate size of the public sector upward (Edhaie, 1994; Stein, 1999; Ebel and Yilmaz, 2002; Jin and Zou, 2002; Rodden, 2003; Fiva, 2006; Prohl and Schneider, 2009; Cassette and Paty, 2010). However, while it is standard to focus on the potential different impact of grants (positive) and all own local taxes (negative) on government size, it is virtually absent any consideration about the fact that not all taxes may have the same impact. In other words, the "*quality*" of tax decentralisation is mostly disregarded in the treatment of all previous hypotheses. Yet, the way in which taxes can be used by local governments is of crucial importance for the control of local public spending. To this purpose, we propose a new testable hypothesis, that we call the *"Tax Separation Hypothesis"* (TSH), by which tax decentralisation organised on tax bases used by local governments only would favour most the containment of local public expenditures. At the same time, we maintain that tax decentralisation organised on a tax base sharing is not expected to have a significant impact on the local government size.

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[7] Only with respect to the tax structure two notable effects can be found: tax revenue from income taxes is negatively affected by fragmentation, even though only marginally significant, while capital tax revenue is significantly positively influenced.

[8] Moreover, Keen and Marchand (1997) show that fiscal competition may lead not only to inefficient levels of aggregate public expenditures, but also to systematic inefficiencies in the composition of public expenditures.

[9] In their contribution, tax exporting is measured by the number of tourist nights per capita. The idea is that tax exporting possibilities relax the pressure that exit and voice exert on fiscal authorities. Hence, tax exporting leads to higher tax revenue.

3. Local taxation trends

Recent statistics (OECD, 2009a) show that the average shares of sub-central governments (SCG) tax revenue in the OECD countries, in 2005, is 11.6 percent of GDP, covering just above 33 percent of the general government tax revenue. Compared with the figures of a decade earlier (1995), there has been an increase of 2.1 percent of GDP and 1.8 percent of total tax revenue. For many countries, the changes have been negligible, with the most notable exceptions being Japan (+6.9 percent of GDP), Spain (+6.8 percent of GDP), Korea (+4.6 percent of GDP), and Poland (+3.8 percent of GDP). This slight increase of SCG tax revenue has been only a partial answer to the increase of the degree of expenditure decentralisation. As reported by OECD (2009c), the vertical fiscal gap has indeed increased, which means that the use of grants has also increased across countries. Decentralisation has therefore become more asymmetric, with countries approaching the vertical fiscal gap with different strategies; for example, between 1995 and 2005, Spain, Australia, Italy, the Czech Republic, and Ireland have mainly strengthened local tax powers, while Mexico, Turkey, Poland, and the Slovak Republic have intensified the recourse to grants. At the same time, changes for many OECD countries have been negligible. As reported by OECD (2009c), "[a]pparently, the revenue composition of sub-central government seems to be very country specific, quite stable and determined by history and institutions rather than policy choice".

Looking at the first two columns of table 2, reporting data for the countries that will be included in our analysis (on which see below), one can share the same impression with regard to the share of sub-central tax revenue over GDP. Indeed, with Spain the only notable exception, the evolution of tax autonomy between 1995 and 2005 is significantly slow when measured over GDP. The same outcome is obtained when looking at the fraction of local taxation over general government tax revenue (again Spain the only exception, not reported in table) and at the fraction of grants over GDP, whose change between 2000 and 2006 has been negligible for most countries. Observing the composition of SCG revenues in 2005, it is possible to note that, on average, around half of their revenue is covered by own taxes and half by intergovernmental grants, without deep changes over time but with some wide differences among countries, with the extremes of Iceland, covering 90 percent of SCG revenues through taxes, and Netherlands, covering just about 13 percent (OECD, 2009c).[10] However, only a fraction of tax revenue allocated to SCG is generally under their control. Indeed, their power to set and change tax rates and the tax base is often restricted. In many federal countries and some unitary ones, SCG take part in tax sharing arrangements where the tax revenue allocated to a single local government is either determined by all sub-central governments together or by central government.

In this sense, particularly important also for the following analysis – perhaps more than the indicators on the size and composition of local revenues – is how taxes are assigned to local governments. More specifically, it is here suggested that a degree of tax autonomy based on a separation scheme may be more effective than tax sharing methods, including tax base sharing (i.e. piggybacking). To this purpose, it is worth concentrating on the three main taxes available to local governments: income, consumption, and property taxes.

Overall, these taxes account for about 95 percent of SCG tax revenues. In particular, from 1995 to 2005, taxes on income, profits and capital gains (IT) have increased over time from about 38 to 42 percent of total sub-central revenues; while taxes on property (PT) seem to have experienced a gradual decline in many countries, from 34 to 31 percent; finally, the share of consumption-type taxes has also increased (GST), although a large part of this effect is due to new tax sharing arrangements where SCG have little taxing power (OECD, 2009c).

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[10] Moreover, federal countries allocate a slightly higher tax share to SCG than unitary countries.

To summarise, local property taxes have slowly given way to sharing arrangements of consumption taxes, while the income tax has retained its predominant role.

The distribution of IT appears to be quite uniform between unitary and federal countries, with the exceptions of Germany and Switzerland where sub-national governments collect over 50 percent of current revenues through IT. These taxes are also the predominant sub-central tax source in Scandinavian unitary countries (Denmark, Finland, Iceland, Norway, Sweden), a feature that marks a difference with most English-speaking countries, where property taxes account for the overwhelming part of local tax revenues.[11]

The predominant role of income taxes among SCG sources in many countries is likely due to the fact that central governments usually cede a part of income taxation to SCG either through a pure tax-sharing formula or through the introduction of a proportional surcharge on national figures (tax base or tax liability) with discretion on rates and reliefs. Such piggybacking mechanisms (letter *b*) are adopted in several countries among those reported in table 2 (in 2005, Belgium, Canada, Denmark, Finland, Iceland, Italy, Norway, Spain, Sweden, Switzerland and the United States), while the other countries usually make recourse (with small variations over time) to pure tax sharing formulas (letter *d* in table 2). In any case – crucial for our analysis – the IT are almost never assigned exclusively to sub-central governments, i.e., they do not follow a tax separation scheme. At the best, local governments apply a local tax in coexistence with a national tax on the same tax base; thus, to enhance revenue autonomy, local governments may be only allowed discretion in setting tax rates - between minimum and maximum levels - which are nationally legislated.

Quite the same reasoning can be done with regard to taxes on goods and services (GST). On average, they account for a smaller share of total tax revenues in the sample of table 2 – 19 percent – with a large variability in their use, with the peak achieved in large countries, like the United States and Canada, where they provide about 1/3 of total local revenues. These two countries, in 2005, are also the only ones assigning wide responsibility of taxation of goods and services at the local level. Indeed, unlike the IT, there is a large number of cases where pure tax sharing formula prevail (letter *d*) in all years and for government levels of various size.[12] In short, this form of revenue-sharing does little to enhance revenue autonomy or accountability among SCG.

Finally, local property taxes (PT) are the second main local own source and this is particularly true for relatively smaller government levels within countries. The reason can be traced back to the principles of tax assignment formulated by Musgrave (1983) and King (1984) by which property taxes are a good source of local taxation for a number of reasons, including the fact that they secure enough tax revenue to local governments without fears of tax competition. Indeed, the tax base cannot migrate in response to tax rate changes (at least in the short run), there is usually no ambiguity about which authority is entitled to tax, and the tax base is relatively stable and predictable over economic cycles. Moreover, the property tax typically poses no significant problem of tax base competition with the central government, basically because this is not a tax that central governments tend to cover (Martinez-Vazquez, 2008), and, because it approximates the benefit principle of taxation, which is a desirable principle of local taxation.

Unlike IT and GST, the weight of PT has gradually decreased over time. At the same time, they represent the main source of the overall sub-central government financing in some countries (e.g. Australia and United Kingdom) and the main source of financing for most of smaller government levels that apply PT. A key point is that the property tax is hardly involved in pure tax sharing formulas (letter *d*). To our knowledge, in 2005, this only happens in Austria. In all other cases (letters *a* and *b*), the use of local property tax is associated to a tax separation scheme. This marks an important difference within the context of tax autonomy; in general, what is strongly required from the revenue assignment is accountability and political and fiscal responsibility for SCG officials. As a matter of fact, achieving a good level of tax autonomy has many benefits, including the imposition of hard budget constraints on SCG. Our maintained hypothesis, in what follows, is that a letter *b* associated with a tax separation scheme can produce a larger impact on local government spending. With a reasonable degree of approximation, this would imply that among the three big groups of taxes here considered, property taxes should be the most effective to control local spending, as they are contemporaneously characterised by both a large degree of autonomy and a predominance of tax separation schemes. This implies that even though the property tax is applied on the basis of a national scheme, the action of local governments can be more visible and more accountable. This feature appears to be consistent over time and across countries, at least for the countries and the period that will be considered in our analysis. To summarise, the degree of discretion given to local governments to manipulate the property tax may vary but the thinking that this tax belongs to local governments seems well entrenched (Martinez-Vazquez, 2008).

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[11] The preference for income taxes probably arises for their greater adherence to the ability-to-pay principle of taxation, and for their more effective role in reducing income inequalities, a role particularly important in the tax/benefit structure of Scandinavian countries.

[12] In general, the main difficulty for assigning GST to the sub-national level lies in the fact that the debiting and crediting of the VAT, for example, is likely to take place in different sub-central jurisdictions, which usually will imply an arbitrary apportionment of VAT revenues across jurisdictions. Another difficulty is that, in the European Union, VAT cannot be regionally differentiated.

4. The empirical strategy

4.1. Empirical specification, coverage and econometric issues

To verify whether tax decentralisation affects the size of the local public sector, we regress a set of explanatory variables on local government size. The basic specification for a cross-section (*i*) time-series (*t*) analysis is:

$$(1) \qquad Size_{it} = \alpha + \beta_1 IT_{it} + \beta_2 PT_{it} + \beta_3 GST_{it} + \beta_4 GR_{it} + \sum_{i=1}^{s} \gamma_i Cont_{it} + u_{it}$$

where all variables are expressed in logarithmic form. In detail: *Size* is local government size; *IT* denotes local income taxes; *PT* denotes property taxes; *GST* denotes taxes on goods and services; *GR* indicates current grants from other government levels. All these variables are normalised on what we call *aggregate local revenues*, given by the sum of local tax revenues and grants from other government levels.[13]

A set of control variables (*Cont*) is also included: *population*; *population below age 14*; *population above age 65*; *GDP growth*; the stock of *public debt*; *public deficit*; the *openness of the economy*; *unemployment rate*; *inflation*; *central government size.* We also take into account the *institutional system* of different countries, by including a dummy variable for *federal countries* and a dummy variable for *left-ruling political party*. Definitions and sources of all variables are reported in table 3.

Equation (1) is estimated using an unbalanced panel of annual data for a set of 19 OECD countries observed for a variable number of years until 2004 (exceptions are Australia and the United States) for a total of 345 observations. Table 4 gives details of the countries observed, of the coverage period, of missing years and about the total number of observations for each country. As anticipated before, the countries considered in this study differ with respect to their legal and constitutional settings and the organisational form of their governments. However, all of them have at least two levels of government. The only difference consists in the meaning of "local" governments for unitary and federal countries. In these latter countries, "State" also represents a "sub-central" (independent) political institution. We therefore refer to *local* (or *sub-national* or *sub-central*) *governments* as all tiers of government differing from the central one (state, provincial, regional and local governments). Fiscal data are mainly from the International Monetary Fund's (IMF) *Government Finance Statistics* (GFS), but other sources have been extensively used (e.g., OECD).

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[13] This definition excludes local non-tax revenues and local capital revenues, which are irregularly recorded.

Some econometric alternatives are used for the estimation of equation (1). First of all, the use of time series cross-section data entails the treatment of preliminary issues. In particular, we first reject the possibility of using OLS on pooled data through the rejection of the null hypothesis of equality of intercept. Among alternative panel estimators, a Feasible Generalised Least Squares (FGLS) method is initially used (Jin and Zou, 2002), which is usually thought to be more efficient than others, especially when having 10 to 20 panels and 10 to 40 time periods, which is basically the case of our dataset.[14] Estimation with FGLS is performed by taking into account heteroskedasticity, cross-sectional correlation and a country-specific AR(1) process. Indeed, as shown in table 5, the null hypothesis of no panel-level heteroskedasticity and that of no cross-sectional correlation are both rejected (at 1 percent significance level). Table 5 also reports the results of testing for autocorrelation within each country implementing the Breusch–Godfrey LM test. In this case, the null hypothesis of no autocorrelation is accepted only for Austria; in all other cases, the null hypothesis is rejected at 1 percent significance level (exceptions are only Norway and the United States both at 5 percent significance level). At the same time, FGLS allows us to introduce time invariant variables that may reflect important economic and institutional aspects of the model (e.g., federal or unitary States). To test the robustness of the results, fixed effects and a Prais-Winsten panel corrected standard errors (PCSE) estimations are also performed.[15]

This econometric analysis is then complemented by introducing some dynamics. For comparability of results with other studies and to take into account recent practices in the investigation of the relationship between fiscal decentralisation and government size (Rodden, 2003; Ashworth *et al.*, 2009; Cassette and Paty, 2010), both an Arellano and Bond (1991) method and an *Error Correction Model* (ECM) are used to identify short-run and long-run responses to tax decentralisation considering both levels and changes of the relevant variables. This is mainly motivated by the fact that a variety of factors might cause only a transitory impact on local spending.

4.2. Discussing variables

A brief discussion of the variable used in the econometric analysis may help interpreting results. With regard to the dependent variable (*Size*), it is worth noting that among studies investigating the relationship between fiscal decentralisation and the size of the public sector, a general agreement emerges on using the ratio between public expenditures and GDP.[16] This is mainly due to the fact that considering tax revenues only is likely to underestimate the actual government size since it would disregard all public spending and activities possibly financed by debt.[17] The main difference among empirical works using the ratio between expenditures and GDP is that some consider "local" governments (Wallis and Oates, 1988; Zax, 1989; Forbes and Zampelli, 1989; Shadbegian, 1999; De Mello, 2001; Feld et al. 2003); others refer to "total" or "aggregate" governments (Marlow, 1988; Grossman, 1989; Kneebone, 1992; Ehdaie, 1994; Grossman and West, 1994; Shadbegian, 1999; Stein, 1999; Fiva, 2006; Prohl and Schneider, 2009); a few focus on both (Jin and Zou, 2002; Rodden, 2003; Cassette and Paty, 2010). In this paper, we follow the standard approach and consider local public expenditures as a percentage of GDP to proxy the local government size.[18]

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[14] In this case a Prais-Winsten estimator can also be used, which – according to Beck and Katz (1995) – may perform more satisfactorily.

[15] Note, however, that fixed effects have a more problematic interpretation in our case, as the sample does not represent a closed and exhaustive set of units. Rather, it is mainly based on data availability. Furthermore, results are not necessarily expected to be in line with the use of FGLS, as fixed effects uses only variation *within* units and disregards variation *between* units (i.e., it gives *short-run* responses). In our case, however, the Hausman test rejects the random effect estimator.

[16] In some cases, data on tax revenues are used to proxy the size of government (Oates, 1972; Oates, 1985; Forbes and Zampelli, 1989; Zax, 1989); in some others both revenue and expenditure components are alternatively considered (Nelson, 1987; Wallis and Oates, 1988).

[17] Moreover, when studies focus on the effect of fiscal federalism only on the size of sub-national governments, without any interest for the central government functions, they sometimes adopt revenue measures to indicate the dependent variable (Oates, 1985; Forbes and Zampelli, 1989; Zax, 1989). However, the underestimation problem remains, given the possibility of borrowing - as source of financing local public expenditures - also for local governments.

With regard to the indicator of fiscal decentralisation, a reliable measure should quantify the activities of sub-central governments arising from their autonomous decisions.[19] To accommodate this issue, two decentralisation proxies distinguishing between financing sources are usually adopted (Jin and Zou, 2002; Prohl and Schneider, 2009; Cassette and Paty, 2010): a measure of tax revenue decentralisation (that should proxy the degree of tax autonomy attached to any local government); a measure of vertical imbalance quantified by intergovernmental grants (indicating the degree of dependence of local governments on the *common pool* of national governments). [20]

While the second indicator entails fewer problems, the first one may be overestimated for two reasons. The first is that some decentralised taxes finance spending decisions taken by the central government (as in the case of services entailing the provision of *minimum standards*, or in the case of expenditures that are classified as "local", but that can be mandated by the central government or spent on behalf of it, without any autonomous local spending decision). In this case, local governments cannot dispose of the corresponding tax revenues. Using these revenues to measure tax decentralisation would ignore that the correspondence between budgetary items and actual decision-making may be imperfect.[21] The second – and more relevant for our paper – is that the extent of local taxing power and autonomy may be misrepresented without distinguishing between locally determined taxes, taxes regulated by the central government, shared taxes and taxes levied as surcharges on national taxes.

To our knowledge, there is no attempt in the literature to investigate the differential impact of local taxes on government size. For this reason, equation (1) has been estimated using the three main local taxes on which data were available for all years and countries included in the analysis, i.e. *income taxes*, *property taxes* and *taxes on goods and services.* Through the use of this disaggregation, equation (1) will not only disentangle the contribution of each tax source to local government spending; it will also allow to get direct information on the importance of the tax assignment methods (tax sharing or "tax separation"). Just recall from paragraph 3 that PT are usually assigned on a tax separation basis, while both IT and GST are either piggybacked or involved in pure tax sharing formulas.

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[18] More recently, some researchers (Fiva, 2006; Ashworth *et al.*, 2009) focus their attention on how fiscal decentralisation may affect the public sector, distinguishing total size and its composition. In particular, how it may affect spending on social security transfers and government consumption (Fiva, 2006); and how it may influence different expenditure programs: health care, education and social security (Ashworth *et al.*, 2009).

[19] In general, it is quite difficult to represent and measure the degree of fiscal federalism as the concept itself is broad, and also complex in terms of both quantitative and qualitative indexes (World Bank, 2004). Prud'homme (1995) defines fiscal federalism through three simple criteria: i) the importance of local taxes relative to central taxes, (ii) the importance of local expenditures relative to central expenditures, and (iii) the importance of central subsidies to local own-source revenues.

[20] For countries like Germany, where sub-central governments have only limited autonomy upon taxation, a drastically lower degree of decentralisation is reported as compared to measures drawing on unadjusted revenue statistics (Stegarescu, 2005). Moreover, the previous OECD study (1999) reveals that some local government sectors do not determine tax bases and tax rates, although they collect a large amount of revenues. In order to take into account the various facets of decentralisation – given also some limits of quantitative data – different non-quantitative measures have also been proposed in the literature. In this vein, Prohl and Schneider (2009) explore DH also using a qualitative measure that considers the constitutionally and statutorily defined fiscal and administrative autonomy of sub-national governments. Ashworth *et al.* (2009) also introduce a vector of dummy variables that capture the degree of decentralisation of public expenditures to investigate LH.

[21] A system where sub-central governments have actual autonomy to determine the allocation of their expenditure or to raise own revenue is more decentralised than another system where local or regional government spending and revenue is determined by national legislation, even though the formal assignment of functions or revenues might be the same.

Finally, to ensure that any correlation between fiscal decentralisation and the size of the public sector is not due to the effect of the general macroeconomic environment, we include some control variables into the analysis, as also suggested by the existing literature on the growth and size of government. In this vein, we consider *population*, *population below age 14* and *population above age 65* to describe the effect of demographics on demand for public spending - for welfare spending in particular - and to capture economies of scale in the provision of public goods and services. The *growth of real GDP* (as a percentage change of previous year) is introduced to take into account the possibility of a "Wagner's law" effect, which suggests that government spending is income elastic. *Budget deficit* and *public debt* may also determine the growth of the public sector. Thus, we control for them building a dummy variable for the first item (coded as "1" = deficit; "0" = otherwise), and considering gross government debt as a percentage of GDP for the second item. To capture the prediction of the globalisation literature (Rodrik, 1998) and the consequences of international integration of national goods and service markets, the *"openness effect"* is introduced as the sum of exports and imports over GDP. Its impact on government size may be positive (Rodrik, 1998) or negative (Ferris and West, 1996). Other macroeconomic variables potentially affecting public spending are *unemployment rate* and *inflation.* The former is measured as a percentage of civilian labour force; the latter as annual averages of percentage change in the consumer price level. Finally, *the size of the central government* is introduced to control for possible shifting of spending competencies among government levels.

5. Tax decentralisation and government size: empirical results

5.1. Panel estimators

Table 6 describes the results of the econometric analysis when using alternative panel estimators. By considering the variables included below the heading of "*Independent variables*", which are the core of our analysis, interesting insights can be gained by using disaggregated tax items. With a FGLS estimation, support is found to the standard result that grants are positively related to local government size. This outcome is consistent with the "*common pool" hypothesis* (Brennan and Buchanan, 1980; Nelson, 1987; Grossman, 1989; Zax, 1989) and with previous empirical findings (Jin and Zou, 2002; Rodden, 2003; Prohl and Schneider, 2009). As discussed above, the justification of this result is rather standard and intuitive: decentralisation based on intergovernmental transfers enhances the growth of the local public sector since sub-national governments would spend any transfers (*other's people money*) more easily than they would spend local own tax revenues.

The most innovative results of the estimation relate to the sign of the disaggregated tax items: local GST would produce the same positive impact as grants (and even higher in magnitude); IT show a negative but not statistically significant sign; while PT show a negative and statistically significant sign that supports our maintained hypothesis. Indeed, this gives a first input to the impression that *not all taxes are the same* for tax decentralisation. Before discussing this result, it is worth considering the alternative panel estimators (fixed effects and PCSE). On the one hand, both the positive sign of grants and the negative sign of property taxes are robust to the change of the estimator; with fixed effects – mostly capturing short-run impacts – the coefficients are also larger in magnitude. On the other hand, the coefficient of IT is not statistically significant in all cases, while the coefficient of GST loses its significance with FE but not with PCSE.

We take this outcome as evidence that the power of IT and GST in reducing local government size is rather weak. In some cases, GST may even favour a bigger local government size. This can be explained, as noted in paragraph 3, by the fact that local GST are mostly organised either on a pure tax sharing scheme or on a piggybacking of central government taxes in several countries, which may allow some degree of tax illusion in the taxing and spending policy of sub-central governments (especially when the tax base is centrally determined and the impact of central and local policies not easily disentangled).[22]

The persistent negative sign of PT, instead, can be at least partially justified by the fact that these taxes are usually assigned on a *"tax separation"* basis and rarely shared (only in Austria in our sample). This implies that PT give local governments a larger degree of autonomy on both tax rates and tax bases, and contribute to reduce the opacity of a system of overlapping competencies. According to the theories of competitive federalism, more accountability would indeed be guaranteed by the absence of ambiguity about which authority is entitled to tax any given tax base; a greater autonomy in the administration of PT would thus imply a greater responsibility of the local policy makers in both collection and spending activities.

To this purpose, it is worth considering that property taxes have the appealing feature of being particularly close to the *"benefit principle"*, which is a long-standing and particularly suitable principle of local taxation, even though of hard practical application (see, recently, Liberati, 2010).[23] Oates (2001), for example, argues that the property tax is visible and transparent and therefore stimulates voters to be aware about the costs of local public programs. Our result sounds like an indirect proof that if revenue and expenditure decisions are not tied at the local level, the restraining effects of fiscal federalism on local and total spending are weak. We add to this result, by saying that a tight link between tax revenues and spending decisions appears to be best served when tax decentralisation is based on a tax separation scheme. An interesting insight seems therefore to emerge from this analysis: when taxes are assigned on a *"tax base sharing"* (or piggybacking) scheme, they do not significantly affect government size (or at least the outcome is very uncertain); they would instead do when assigned on a *"separation scheme"*.

Finally, some issues about control variables: table 6 shows that federal countries tend to have a smaller sub-national government (with FGLS), while left coalitions seem to positively affect the growth of the public sector at the local level (also with FE, but not with PCSE). When the real GDP grows, the size of local governments is smaller, while debt, deficit (general government) and openness do not significantly affect local government size (with the exception of debt when using FGLS). Also, controlling for central government size has an impact only when using FE (a negative relation with local government size, implying some degree of substitutability of public expenditures between government levels).

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[22] In order to verify whether the result depends on the presence of the United States where sales taxes are only applied by states, the same regression has been run excluding US. Results do not change. With regard to GST, Musgrave (1983) suggested that taxes on production and consumption with a large tax base - particularly as the general sales tax - should be treated differently depending on the production stage to which they are applied. In this vein, the assignment to sub-national levels is recommended only for taxes in the end-stage of the production/distribution process, unless local governments are too fractionated. Indeed, local authorities should be large enough to overcome the mobility issue (as in the United States and Canada). Indeed, where applied, state/regional governments rely more on taxes on goods and services (mainly sales taxes) than local governments do (OECD, 2009a).

[23] Tiebout (1956) discussed the beneficial effects of the property tax for local government. Because the value of public goods is capitalised into the value of local property, dependence on property taxation leads city managers to choose public goods that maximise local property values. Moreover, city managers facing intense interjurisdictional competition have incentives to maximise property values as a means of inducing scarce capital and labour to locate and remain in their jurisdiction. Because these taxes provide general incentives for local political officials to design policies that foster markets and attract capital and labour, property taxes are an important component of local government fiscal structure. Bahl and Linn (1992) provide one of the most comprehensive discussions of the property tax in decentralised systems. Fischel (2001) and Glaeser (1996) explain why property taxation leads local governments to focus on citizen welfare. In general, the normative suggestion was to assign the property tax to local governments, because it can work as a benefit tax and can be used to provide mobile economic units (like households and firms) with an efficient (and differentiated) level of local services (Oates, 2005; Boetti *et al.*, 2010).

5.2. Results with the Arellano-Bond estimator

In order to introduce some dynamics and to deal with potential endogeneity of explanatory variables, an Arellano and Bond (1991) methodology is applied. This implies estimating equation (1) in first differences (i.e. considering *changes* rather than levels) with some lag structure on both the dependent and the explanatory variables. Results are reported in table 7, where the explanatory variables (the variables describing the financing sources) are treated alternatively as endogenous or predetermined, while control variables are treated as truly exogenous. Whether endogenous or predetermined, explanatory variables are instrumented using a maximum of two lags. Furthermore, the lag of the dependent variable is introduced to capture the persistency of local government size and also instrumented with two lags. In both cases (endogenous or predetermined), the Sargan test of the null hypothesis of instruments validity is not rejected. Also the tests for autocorrelation of order 1 and 2 give the right sign, in this case suggesting that the structure of lags is consistent. Results are neat and findings confirm the previous estimation. In both cases, grants have a positive impact, while property taxes would support a lower local government size. Also in this case, income taxes do not seem to play any role in shaping local spending, while the positive impact of GST is confirmed with a magnitude slightly lower than that estimated for grants. It is also worth noting that local government spending has a certain degree of persistence (the coefficient of the lagged dependent variable is 0.65).

5.3. Results with the ECM

The previous methodology, however, does not consider long-run responses. The fact that local government size may either increase or decrease according to the composition of financing sources suggests that local expenditures may have a long-run target, i.e. an equilibrium level. This implies that financing sources may cause both short-run and long-run effects. The former will cause temporary deviations from the long-run equilibrium, the latter will affect the equilibrium level (Rodden, 2003; Ashworth *et al.*, 2009). Whether this distinction between long-run and short-run effects is meaningful is therefore an empirical issue that needs further specification beyond the Arellano-Bond estimation.

In order to deal with this problem, equation (1) can be transformed in an ECM. This amounts to expanding the equation used for the Arellano-Bond estimation to include the levels of the dependent variable and those of the explanatory variables. For simplicity, define $y_t \equiv \ln SIZE_t$; $x_t \equiv \ln IT_t$; $z_t \equiv \ln PT_t$; $k_t \equiv \ln GST_t$; $g_t \equiv \ln GR_t$, where the panel indicator i is omitted. Assuming one lag as the timing of adjustment, a disequilibrium relationship involving first-order lags of both endogenous and exogenous variables would give the following model (disregarding control variables), which is in fact an Autoregressive Distributive Lag (1,1) model:

$$(2) \qquad y_t = \alpha + \beta_1 x_t + \beta_2 z_t + \beta_3 k_t + \beta_4 g_t + \beta_5 x_{t-1} + \beta_6 z_{t-1} + \beta_7 k_{t-1} + \beta_8 g_{t-1} + \beta_9 y_{t-1} + u_t$$

Now, by subtracting y_{t-1} from both sides and adding and subtracting to the right hand side $\beta_1 x_{t-1}$, $\beta_2 z_{t-1}$, $\beta_3 k_{t-1}$ and $\beta_4 g_{t-1}$, after manipulation one has the following:

$$(3) \qquad \Delta y_t = \alpha + \beta_1 \Delta x_t + \beta_2 \Delta z_t + \beta_3 \Delta k_t + \beta_4 \Delta g_t + \theta_1 x_{t-1} + \theta_2 z_{t-1} + \theta_3 k_{t-1} + \theta_4 g_{t-1} + \lambda y_{t-1} + u_t$$

where: $\theta_1 = (\beta_1 + \beta_5)$; $\theta_2 = (\beta_2 + \beta_6)$; $\theta_3 = (\beta_3 + \beta_7)$; $\theta_4 = (\beta_4 + \beta_8)$; $\lambda = (\beta_9 - 1)$. After direct estimation of equation (3), which is suggested by Wickens and Breusch (1988) for small samples and by Banjeree *et al.* (1986) for multivariate models, β's coefficients will give short-run responses, while long-run responses ϕ, for each variable *s*, can be recovered by using

$\phi_s = -\frac{\theta_s}{\lambda}$.[24] The first advantage of equation (3) is that the dependent variable is differenced, which reduces the risk of estimating a spurious regression; the second is that it can be estimated with standard panel estimators; the third is that it provides an expansion of the Arellano-Bond estimation and an indirect test of robustness for the short-run responses of explanatory variables. Estimating equation (3) requires the series to be non-stationary in levels and stationary at some difference (if they were not, the distinction between short-run and long-run responses would be meaningless).[25] The non-stationarity of the series and the stationarity of their first differences are tested by a panel version of the Augmented Dickey-Fuller test as developed by Im *et al.* (1997).[26] Results are shown in table 8, where the average test shows that the null hypothesis of non-stationarity cannot be rejected for variables in levels, while it can be rejected for their first differences, with the tests violated in some cases, but not on average.

Different panel estimators (FGLS, FE and PCSE) have been used to estimate equation (3) (table 9). As expected, the speed of adjustment (i.e. the coefficient of the lagged dependent variable) is less than one in absolute terms to guarantee the stability of the system. As also expected, being referred to variables under the control of the public sector, it is relatively slow (below 0.2 in all cases), which means that less than 20 percent of the adjustment towards the long-run equilibrium occurs in the first year.

Considering first *short-run* responses, again the main regularity is traced for grants (always positive) and property taxes (always negative). The positive sign of grants is consistent with the *"common pool" hypothesis*. Among taxes, only those on property seem to negatively affect the size of the local public sector in the short-run, with an impact that is not fully compensated for by the short-run increase of local government size due to intergovernmental grants. Hence, property taxation seems to work as a powerful disciplining device for local government at least in the short run. In this vein, results give further support to previous findings by Borge and Rattso (2008), where data indicate that property taxes embody mechanisms of cost control, and to their interpretation that having a visible and controversial local tax related to property stimulates voter interest in local government activities and thereby may help control costs.

Taxes on goods and services have instead a positive impact on local government size in two out of three cases, while the income tax is not found to affect local government size in any case. Therefore, at least in the short-run, our maintained hypothesis is supported: grants increase local government size, while only taxes based on a separation scheme (as PT) would be able to contain it.

With regard to *long-run* variables, however, things are slightly different, as all financing sources seem to be rather weak in slowing the growth of the local government. The only stable result of the ECM analysis is that grants have a non-negligible and positive impact also in the long-run. In principle, all taxes would have a similar positive effect (with the exception of GST in two cases); yet, the θ parameters are hardly statistically significant for IT, PT and GST, suggesting that tax decentralisation has no permanent effect on local government size. At 10 percent significance level, however, PT would have a positive impact on size comparable to that calculated for grants. It is worth noting that repeating the same analysis using an ECM transformation of an ADL(2,1), i.e. with two lags of the dependent variable, does not change results significantly (not reported in table). The coefficient of local government size at *t-2* is not significant (10 percent with FGLS); the coefficients of all taxes – and therefore the corresponding short-run and long-run impacts – are the same as in ADL(1,1); the only exception is for grants, whose impact in the long-run would be zero under FGLS and FE (but not under PCSE).

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[24] The long-run coefficient is obtained by the long-run equation (3), implying $\lambda y = -[\theta_1 x + \theta_2 z + \theta_3 k + \theta_4 g]$.

[25] But see Keele and De Boef (2004) for use of ECM with stationary data.

[26] This test is an average t-test of country-specific standard Dickey-Fuller tests.

6. Conclusions

A wide empirical literature has investigated the relationship between fiscal federalism and the size of the public sector. Some theoretical hypotheses have been tested by many scholars, stressing in most cases that the *"quality"* of decentralisation is a crucial issue to determine larger (or smaller) government size - i.e., the fact that the size of the public sector is likely to be smaller when decentralisation is funded by own taxes, and comparatively larger, when funding comes from central government grants (Grossman, 1989; Grossman and West, 1994; Jin and Zou, 2002; Rodden, 2003; Fiva, 2006; Ashworth et al., 2009; Prohl and Schneider, 2009; Cassette and Paty, 2010).

However, the distinction between taxes that sub-central governments apply on a tax separation basis or taxes that they apply following a piggybacking approach has been usually ignored. Indeed, while the different accountability content of grants and own taxes has been over time sufficiently explored, the existing literature is more silent about the possibility that different types of tax autonomy may have differential impacts on the expansion of the public sector, especially at the local level. In addition, more recently Cassette and Paty (2010) show that decentralisation may unexpectedly increase sub-central government size even when it is financed by own tax revenues, and they conclude pointing out the necessity to determine whether the nature of the taxes available to sub-national governments plays a role in this process. An analysis of what kind of local taxes are responsible for this outcome is still empirically lacking.

To this purpose, our paper adds to the empirical studies by using improved disaggregated data on tax revenue decentralisation to re-examine the relationship between fiscal federalism and the size of local government. This is done by introducing a new testable hypothesis - the *"Tax Separation Hypothesis"* (TSH) - according to which tax decentralisation organised on tax bases used only by local governments would favour most the containment of local public expenditures, while that organised on a tax base sharing is not expected to have a significant impact on the local government size.

In detail, we have focused on the three main pillars of local tax revenues - income taxes, property taxes and taxes on goods and services - and test their impact on the size of local government spending, applying a panel model, an Arellano-Bond estimation and an ECM to an OECD sample over the period 1980-2004. The preliminary observation of decentralised tax systems in these countries reveals that full tax decentralisation is more unusual than commonly thought. Moreover, any consideration about the fact that not all taxes may have the same impact on the size of the local public sector is virtually absent, while it is standard to focus on the potential different impact of grants (positive) and aggregate local taxes (negative) on government size.

To make our study robust to conventional results (e.g. Rodden, 2003) – consistent with the *"common pool" hypothesis* and the *"flypaper effect"* – grants from higher levels of government have been included into the analysis. While intergovernmental transfers have the expected (positive) impact on the size of the local public sector, new insights emerge from considering disaggregated taxes. In particular, property taxes only – mainly applied on a tax separation basis – seem to negatively affect the size of local governments. Instead, both income taxes and general taxes on goods and services – that are often applied with either a tax sharing or a tax base sharing method – have uncertain impacts on local government size. These results also remain valid when we use different estimation techniques.

Some old and new insights emerge from this paper. First, more traditionally, tax autonomy matters for the size of the public sector. When financed by grants, local government spending tends to grow. Second, if the aim of fiscal decentralisation is to contain (local) public spending, tax decentralisation may not necessarily shrink it, but it depends on the tax decentralisation scheme. According to our findings, tax decentralisation is a necessary condition to reduce the size of the public sector, yet it is not sufficient. Indeed, this is more likely to occur when local taxes are applied on a "tax separation" scheme rather than on a tax base sharing method, as indirectly proved by the estimated impact of property taxes. Third, the containment of local spending is more likely in the short-run. In the long-run, tax decentralisation does not seem sufficient to guarantee local spending control, even though its impact can still be more effective than that measured for grants. To some extent, while grants may have a positive long-run impact on local government size, decentralised taxes would be more neutral in shaping the equilibrium level of local spending.

References

Arellano, M., Bond, S. (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*, vol. 58, 277–297.

Ashworth, J., Galli, E., Padovano, F. (2009), *Government Decentralisation and Public Spending Programs*, paper presented at the XXI Italian Society of Public Economics.

Bahl, R., Bird, R. (2008), "Subnational Taxes in Developing Countries: The Way Forward", *Public Budgeting and Finance*, vol. 28, n. 4, 1-25.

Bahl, R.W., Linn, J. (1992), *Urban public finance in developing countries.* Oxford University Press, New York.

Banerjee A., Dolado J.J., Hendry D.F., Smith G.W. (1986), "Exploring equilibrium relationships in econometrics through static models: some Monte Carlo evidence", *Oxford Bulletin of Economics and Statistics*, vol. 48, 253-277.

Beck, N., Katz J.N. (1995), "What to do (and not to do) with time-series cross-section data", *American Political Science Review*, vol. 89, n. 3, 634-647.

Besley, T., Case, A. (1995), "Incumbent Behaviour: Vote-Seeking, Tax-Setting and Yardstick Competition", *American Economic Review* , vol. 85, n. 1, 25-45.

Boetti, L., Piacenza, M., Turati, G. (2010), *"Decentralisation and Local Governments' Performance: How Does Fiscal Autonomy Affect Spending Efficiency?"*, Working Paper No.11, Department of Economics and Public Finance "G. Prato".

Borge, L.E., Rattso J. (2008), "Property taxation as incentive for cost control: empirical evidence for utility services in Norway", *European Economic Review*, vol. 52, 1035-1054.

Brennan, G., Buchanan, J. (1978), "Tax instruments as constraints on the disposition of public revenues", *Journal of Public Economics*, vol. 9, 301-318.

Brennan, G., Buchanan, J. (1980), *The Power to Tax: Analytical Foundations of a Fiscal Constitution*, Cambridge University Press, Cambridge.

Breton, A. (1987) "Towards a theory of competitive federalism", *European Journal of Political Economy*, vol.3, n. 1-2, 263-329.

Buchanan, J.M. (1965), "An Economic Theory of Clubs", *Economica*, vol. 32, 1-14.

Careaga, M., Weingast, B.R. (2003) *"Fiscal federalism, good governance, and economic growth in Mexico"*, in D. Rodrik (ed.), *Search of Prosperity: Analytic Narratives on Economic Growth*, Princeton University Press, Princeton.

Cassette, A., Paty, S. (2010), "Fiscal decentralisation and the size of government: a European country empirical analysis", *Public Choice*, vol. 143, n. 1-2, 173-189.

De Mello, L. (2001), "Fiscal Federalism and Government Size in Transition Economies: The Case of Moldova", *Journal of International Development*, vol. 13, 255-268.

Dollery, B., Worthington, A. (1996), "The empirical analysis of fiscal illusion", *Journal of Economic Surveys*, vol. 10, 261-267.

Ebel, R.D., Yilmaz, S. (2002), *"On the measurement and impact of fiscal decentralisation"*, Policy Research Working Paper No. 2809, World Bank.

Ehdaie, J. (1994), *"Fiscal Decentralisation and the Size of Government"*, Policy Research Working Paper No.1387, World Bank.

Fausto, D. (1996), "Il federalismo fiscale: un falso rimedio nel caso italiano", *Economia delle scelte pubbliche*, n. 2-3, 175-196.

Feld, L.P., Kirchgässner, G., Schaltegger, C.A. (2003), *"Decentralisation taxation and the size of government: evidence from Swiss State and Local governments"*, CESifo Working Paper Series No. 1087.

Ferris, J.S., West, E.G. (1996), "Testing theories of real government size: US experience, 1959–1989", *Southern Economic Journal*, vol. 62, 537–553.

Fischel, W.A. (2001) *"The Homevoter Hypothesis: How Home Values Influence Local Government Taxation"*, School Finance and Land-Use Policies. Harvard University Press, Cambridge.

Fiva, J.H. (2006), "New evidence on the effect of fiscal decentralisation on the size and composition of government spending", *FinanzArchiv/Public Finance Analysis*, vol. 62, 250-280.

Forbes, K.F., Zampelli, E.M. (1989), "Is Leviathan a Mythical Beast?", *American Economic Review*, n. 3, vol. 79, 568-577.

Glaeser, E.L. (1996) "The incentive effects of property taxes on local governments", *Public Choice*, vol. 89, 93–111.

Gordon, R.H. (1983), "An optimal taxation approach to fiscal federalism", *The Quarterly Journal of Economics*, vol. 98, n. 4, 567-586.

Grossman, P.J. (1989), "Fiscal Decentralisation and Government Size: An Extension", *Public Choice*, vol. 62, n. 1, 63-69.

Grossman, P.J., West, G. (1994), "Federalism and the Growth of Government Revisited", *Public Choice*, vol. 79, n. 1-2, 19-32.

Inman, R.P., Rubinfeld, D.L. (1996), "Designing tax policy in federalist economies: an overview", *Journal of Public Economics*, vol. 60, 307-334.

International Monetary Fund, (2008), *Government Finance Statistics*, Washington, DC.

Im, K.S., Pesaran, M.H., Shin, Y. (1997), *"Testing for unit roots in heterogeneous panels"*, Working Paper, University of Cambridge, December.

Jin, J., Zou, H. (2002), "How does fiscal decentralisation affect aggregate, national, and subnational government size", *Journal of Urban Economics*, vol. 52, 270-293.

Keele, L., De Boef, S. (2004), *Not Just for Cointegration: Error Correction Models with Stationary Data*, Nuffield College Working Papers in Politics n. 2005-W7.

Keen, M., Kotsogiannis, C. (2004), "Federal tax competition and the welfare consequences of decentralization", *Journal of Urban Economics*, vol. 56, 397–407

Keen, M., Marchand, M. (1997), "Fiscal Competition and the Pattern of Public Spending", *Journal of Public Economics*, vol. 66, 33-53.

King, D. (1984), *Fiscal Tiers - The Economics of Multi-level Government*, Allen and Unwin, London.

Kneebone, R.D. (1992), "Centralisation and the Size of Government in Canada", *Applied Economics*, vol. 24, 1293–1300.

Liberati, P. (2004), *"Trade Openness, Capital Openness and Welfare Assignment"*, SIEP Working Paper n. 320.

Liberati, P. (2010), ""Which Tax" or "Which Tax for What"? Tax Assignment in the Theory of Fiscal Federalism", *Public Finance Review*, forthcoming.

Marlow, M. (1988), "Fiscal Decentralisation and Government Size", *Public Choice*, n. 56, vol. 3, 259-269.

Martinez-Vazquez, J. (2008), "Revenue assignments in the practise of fiscal decentralization", in N. Bosch and J.M. Durán (ed.), *Fiscal federalism and political decentralization: lessons from Spain, Germany, and Canada*, 27-55, Edward Elgar, Cheltenham.

McKenzie, R.B., Staff , R.J. (1978), "Revenue sharing and monopoly government", *Public Choice*, vol. 33, n. 3, 93-97.

McLure, C.E. (1998) *"Tax assignment problem: Conceptual administrative considerations in achieving sub-national fiscal autonomy"*, Paper presented at the Intergovernmental Fiscal Relations and Local Financial Management Course, Vienna, Austria, March 16–27 1998.

Mueller, D.C. (1991), *Public Choice II: A revised edition of Public Choice*, Cambridge University Press, Cambridge.

Musgrave, R. (1983), *"Who Should Tax, Where and What?"*, in C.E. McLure (ed.), *Tax Assignment in Federal Countries*, 2-19, Centre for Research on Federal Financial Relations, Canberra: Australian National University.

Nelson, M.A. (1986), "An empirical analysis of state and local tax structure in the context of the Leviathan model of government", *Public Choice*, vol. 49, 283-294.

Oates, W.E. (1972), *Fiscal Federalism*, Gregg Revivals, Aldershot.

Oates, W.E. (1985), "Searching for Leviathan: An Empirical Study", *American Economic Review*, vol. 75, n. 4, 748-758.

Oates, W.E. (1999), "An Essay on Fiscal Federalism", *Journal of Economic Literature*, vol. XXXVII, September, 1120-1149.

Oates, W.E. (2001), *"Property Taxation and Local Government Finance"*, Essays in Honor of C. Lowell Harriss, Lincoln Institute of Land Policy, Cambridge.

Oates, W.E. (2005), "Toward a second-generation theory of fiscal federalism", *International Tax and Public Finance*, vol. 12, 349-373.

OECD (1999), *"Taxing Powers of State and Local Government"*, OECD Tax Policy Studies No.1, Paris.

OECD (2002), *"Fiscal Decentralisation in EU Applicant States and Selected EU Member States"*, Report prepared for the Workshop in *"Decentralisation: Trends, Perspective and Issues at the Threshold of EU Enlargement"*, Paris.

OECD (2009a), *"The Fiscal Autonomy of Sub-Central Governments: An Update"*, Network on Fiscal Relations Across Levels of Government, OECD, Paris.

OECD (2009b), *"Explaining the Sub-National Tax-Grants Balance in OECD Countries"*, Network on Fiscal Relations Across Levels of Government, OECD, Paris.

OECD (2009c), *"Tax and Grants: on the revenue mix of sub-central governments"*, Network on Fiscal Relations Across Levels of Government, OECD, Paris

Olson, M.J. (1969), "The Principle of 'Fiscal Equivalence': The Division of Responsibilities among Different Levels of Governments", *American Economic Review*, vol. 59, n. 2, 479-487.

Pereira, P. (2000), "Fiscal Decentralisation, Public Sector Size and the Wealth of Nations", *Economia Pùblica Regional e Local*, APDR, Coimbra.

Prohl, S., Schneider, F. (2009), "Does Decentralisation Reduce Government Size? A Quantitative Study of the Decentralisation Hypothesis", *Public Finance Review*, vol. 37, n. 6, 639-664.

Prud'Homme, R. (1995), "The dangers of decentralisation", *World Bank Research Observer*, vol. 10, 201-220.

Qian Y., Weingast, B.R., (1997), "Federalism as a Commitment to Preserving Market Incentives", *Journal of Economic Perspectives*, vol.11, n. 4, 83-92.

Rodden, J. (2003), "Reviving Leviathan: Fiscal Federalism and the Growth of Government", *Industrial Organization*, vol. 57, 695-729.

Rodrik, D. (1998), "Why do more open economies have bigger governments?", *Journal of Political Economy*, vol. 106, n. 5, 997-1032.

Salmon, P. (1987), "Decentralisation as an Incentive Scheme", *Oxford Review of Economic Policy*, vol. 3, 24-43.

Shadbegian, R.J. (1999), "Fiscal federalism, collusion, and government size: evidence from the states", *Public Finance Review*, vol. 27, 262-281.

Shah, A. (1999), *"Fiscal federalism and macroeconomic governance: For better or worse?"* Policy Research Working Paper n. 2005, World Bank.

Singh, N., Srinivasan, T.N. (2006), *"Federalism and economic development in India: An assessment"*, SCID Conference on the Challenges of Economic Policy Reform in Asia, Stanford University, June 1–3, 2006.

Stegarescu, D. (2005), "Public sector decentralisation: measurement concepts and recent international trends", *Fiscal Studies*, vol. 26, 301-333.

Stein, E. (1999), "Fiscal Decentralisation and Government Size in Latin America", *Journal of Applied Economics*, vol. 11, n. 2, 357-391.

Tiebout, C. (1956), "A pure theory of local expenditures", *Journal of Political Economy*, vol. 64, n. 5, 416–424.

Zax, J.S. (1988), "The Effects of Jurisdiction Types and Numbers on Local Public Finance" in H.S. Rosen (ed.), *Fiscal Federalism: Quantitative Studies*, 79-106, Chicago University Press, Chicago.

Zax, J.S. (1989), "Is There a Leviathan in Your Neighborhood", *American Economic Review*, n. 3, vol. 79, 560-567.

Zodrow, G.R. and Mieszkowski, P. M., (1986), "Pigou, Tiebout, Property Taxation, and the Underprovision of Local Public Goods", *Journal of Urban Economics*, vol. 19, 356-370.

Wallis, J.J. (1991), ""The political economy of New Deal fiscal federalism", *Economic Inquiry*, vol. 29, n. 3, 510-524.

Wallis, J.J., Oates, W.E. (1988), "Decentralisation in the Public Sector: An Empirical Study of State and Local Government", in H.S. Rosen (ed.), *Fiscal Federalism: Quantitative Studies*, 5-32, Chicago University Press, Chicago.

Weingast, B.R. (2009), "Second Generation Fiscal Federalism: the implication of fiscal incentives", *Journal of Urban Economics*, vol. 65, 279-293.

Wickens, M.R., Breusch, T.S. (1988), "Dynamic specification, the long run and the estimation of transformed regression model", *The Econometric Journal*, vol. 98, 189-205.

Winer, S.L. (1983), "Some evidence on the effects of the separation of spending tax decisions", *Journal of Political Economy*, vol. 91, 126-140.

Wildasin, D. (1997), *"Externalities and bailouts: Hard and soft budget constraints in intergovernmental fiscal relations"*, Typescript, Vanderbilt University.

Wilson, J. D. (1986), "A Theory of Interregional Tax Competition", *Journal of Urban Economics*, vol. 19, 296-315.

World Bank (2004), *"Measuring fiscal decentralization, decentralization and subnational regional economics thematic groups"*, Data Note, August.

Table 1 – The relation between fiscal federalism and government size

Authors	Hypothesis	TG	CG	LG	Country coverage
Oates (1972)	DH	Negative			57 countries
Marlow (1988)	DH	Negative			United States
Grossman (1989)	DH	Negative			United States
Zax (1989)	DH			Negative	United States
Edhaie (1994)	DH	Negative			30 countries
Pereira (2000)	DH	No relation			17 countries
Jin and Zou (2002)	DH	Negative	Negative	Positive	32 countries
Prohl and Schneider (2009)	DH	Negative			29 countries
Cassette and Paty (2010)	DH	Positive	Negative	Positive	15 countries
Wallis and Oates (1988)	WH			Positive	United States
Forbes and Zampelli (1989)	WH			Positive	United States
Shadbegian (1999)	WH	Positive			United States
De Mello (2001)	WH			Positive	Moldova
Jin and Zou (2002)	WH			Positive	32 countries
Oates (1985)	LH	No relation		No relation	United States; 43 countries
Nelson (1987)	LH			Negative	United States
Marlow (1988)	LH	Negative			United States
Forbes and Zampelli (1989)	LH			Positive	United States
Edhaie (1994)	LH	Negative			30 countries
Stein (1999)	LH	Positive			20 countries
Shadbegian (1999)	LH	Negative			United States
Feld *et al.* (2003)	LH			Negative	Switzerland
Rodden (2003)	LH	Negative	Negative	Positive	59 countries
Fiva (2006)	LH	Negative			18 countries
Asworth *et al.* (2009)	LH	Negative			28 countries
Oates (1985)	FH	No relation		No relation	United States; 43 countries
Nelson (1987)	FH			Negative	United States
Zax (1989)	FH			Negative	United States
Feld *et al.* (2003)	FH			No relation	Switzerland
Grossman (1989)	CH	Positive			United States
Edhaie (1994)	CH	Positive			30 countries
Grossman and West (1994)	CH	Positive			Canada
Shadbegian (1999)	CH	Positive			United States
De Mello (2001)	CH			Negative	Moldova
Jin and Zou (2002)	CH	Positive	Positive	Positive	32 countries
Rodden (2003)	CH	Positive	Positive	Positive	59 countries
Prohl and Schneider (2009)	CH	Positive			29 countries
Casette and Paty (2010)	CH	Positive	Positive	Positive	15 countries
Winer (1983)	FIH			Positive	Canada
De Mello (2001)	FIH			Negative	Moldova
Feld *et al.* (2003)	FIH			Positive	Switzerland

Note: DH=Decentralisation Hypothesis; LH=Leviathan Hypothesis; WH=Wallis Hypothesis; CH=Collusion Hypothesis; FH=Fragmentation Hypothesis; FIH=Fiscal Illusion Hypothesis; TG=Total (or aggregate) government size; LG=Local government size; CG=Central (or national) government size.

Source: Authors' elaborations

Table 2 – Local tax revenue and tax assignment methods

Country	1995	2005	1995			2002			2005		
	% GDP	% GDP	IT	GST	PT	IT	GST	PT	IT	GST	PT
Australia	9.6	9.5	/	d (LG)	a (LG)	/	d (LG)	a (LG)	/	d (LG)	a (LG)
Austria	8.2	8.1	d (LG, Lan)	d (LG, Lan)	b (LG)	d (LG, Lan)	d (LG, Lan)	d (LG)	d (LG, Lan)	d (LG, Lan)	d (LG)
Belgium	12.0	13.0	b (LG, R); d (Com)	d (Com)	b (R)	b (R, LG) d (Com)	d (R, LG, Com)	b (R)	b (R, LG, M)	d (R, LG, Com)	b (R)
Canada	16.7	15.2	b (Pr)	a (Pr)	b (M)	b (Pr)	a (Pr)	b (M)	b (Pr)	a (Pr)	b (M)
Denmark	15.6	17.1	b (M, Co)	/	b (M); e (Co)	b (Co, M)	/	b (M); e (Co)	b (M)	/	b (M)
Finland	10.2	9.1	b (LG)	d (LG)	b (LG)	b (M)	d (M)	b (M)	b (M)	d (M)	b (M)
France	4.4	5.1	/	e (LG)	b (LG)	/	e (LG)	b (LG)	/	e (LG)	b (LG)
Germany	10.7	10.1	d (LG, Lan)	d (Lan)	b (M)	d (LG)	d (Lan)	b (M)	d (LG)	d (Lan)	b (M)
Greece	0.3	0.3	/	/	b (LG)	/	/	b (LG)	d (M)	/	b (LG)
Iceland	8.8	8.7	b (LG)	a (LG)	b (LG)	b (M)	/	b (M)	b (M)	/	b (M)
Italy	6.8	6.8	/	d (R)	b (M)	b (R, M); d (Pr)	d (R)	b (M)	b (R, M); d (Pr, M)	d (R)	b (M)
Netherlands	1.1	1.5	/	/	b (M, PB)	/	/	b (M, PB)	/	/	b (M, PB)
Norway	8.0	5.8	d (M)	d (M)	b (M)	d (M)	d (M)	b (M)	b (M, Co)	d (M)	b (M)
Portugal	1.7	2.1	e (AR)	e (AR)	a (LG)	d (LG)	d (LG)	a (M)	d (LG)	d (LG)	a (M)
Spain	4.2	11.0	a (LG, R)	d (LG, R)	b (LG)	b (AR); d (M)	d (AR)	b (M)	b (AR); d (M)	d (AR)	b (M)
Sweden	14.7	15.9	b (M, Co)	a (M)	b	b (M, Co)	/	/	b (M, Co)	/	/
Switzerland	11.5	11.9	b (LG); a (Ca)	b (LG); a (Ca)	b (LG); a (Ca)	b (M); a (Ca)	d (Ca, M)	b (Ca, M)	b (M); a (Ca)	d (Ca, M)	b (Ca, M)
United Kingdom	1.3	1.7	/	/	b (M)	/	/	b (M)	/	/	b (M)
United States	9.1	9.4	b (M, LG)	a (LG); M (b)	a (LG)	b (M, LG)	a (LG); M (b)	a (LG)	b (M, LG)	a (LG); M (b)	a (LG)

Note: a=Discretion on rates and reliefs; *b*=Discretion on rates; *c*=Discretion on reliefs; *d*=Tax sharing arrangements; *e*=Other methods; *LG*=Local governments; *R*=Regional governments; *Co*=Counties; *Lan*=Lander; *M*=Municipalities; *PB*=Polder Board; *AR*=Autonomous Regions; *Ca*=Cantons; *Com*=Communities; *Pr*=Provinces; "/"=Tax not applied.

.

Source: Authors' elaborations on OECD data

Table 3 – Definition of variables

Variables (*)	***Description***	***Source***
LG_Exp	Local government expenditure on GDP (**)	Elaborations on GFS data
LG_Income taxes	Local income taxes on aggregate local revenues (**)	Elaborations on GFS data
LG_Property Taxes	Local property taxes on aggregate local revenues	Elaborations on GFS data
LG_Goods and Services Taxes	Local taxes on goods and services on aggregate local revenues	Elaborations on GFS data
LG_Grants	Transfers from higher levels of governments on aggregate local revenues	Elaborations on GFS data
Federal	Dummy for federal countries	Authors' elaborations
Population	Total official population	OECD
Population 14	Population under 14	OECD
Population 65	Population over 65	OECD
Political party	Dummy variable for left governments	Authors' elaborations on official data
GDP growth	Growth of real GDP (percentage change from previous year)	OECD
Debt	Gross government debt (financial liabilities) on GDP	OECD
Deficit	Dummy variable for deficit	Elaborations on OECD data
Openness	Import + Export on GDP	PWT 6.2
Unemployment rate	Unemployment rate as a percentage of civilian labour force	Codebook
Inflation	Average consumer prices (annual percent change)	IMF
CG_Exp	Central government expenditure on GDP	GFS

(*) Depending on the specific econometric method, many variables are used in first difference (indicated by Δ) and/or lagged (indicated by $_{t-1}$)

(**) *Local government expenditure* is the sum of expenditures at all sub-central government levels (State, Regional, Provincial, and Local); *Aggregate local revenues* is the sum of local tax revenues and grants from higher levels of government. Local non-tax revenues and capital revenues are excluded.

Note: GFS = Government Finance Statistics, International Monetary Fund; OECD = Organisation for the Economic Cooperation and Development; IMF = International Monetary Fund; PWT 6.2 = Penn World Table 6.2; Codebook = Comparative Political Data Set I.

Source: Authors' elaborations

Table 4 – Country and period coverage

Country	***Initial year***	***Final year***	***Missing years***	***Number of observations***
Australia	1990	1998		9
Austria	1980	2004		25
Belgium	1980	2004	1993	24
Canada	1980	2004	1982; 1991	23
Denmark	1980	2004	1982; 1983; 1988	22
Finland	1980	2004	1991; 1992	23
France	1987	2004		18
Germany	1980	2004		25
Greece	1995	2004		10
Iceland	1987	2004	1992	17
Italy	1980	2004		25
Netherlands	1990	2004		15
Norway	1980	2004		25
Portugal	1995	2004		10
Spain	1990	2004	1992; 1993	13
Sweden	1990	2004	1991-1993	12
Switzerland	1991	2004		14
United Kingdom	1990	2004	1991	14
United States	1980	2001	1982	21
Total				345

Source: Authors' elaborations

Table 5 – Preliminary tests

Test	***Number of observations***	***Type of test***	***Value***	***Outcome***
Ho: no panel-level heteroskedasticity	345	LR test chi^2 (18)	447.96	Reject Ho
Ho: no cross-sectional correlation	345	Wooldridge test F (1,18)	87.3	Reject Ho
Ho: independent errors within panels				
Australia	9	BG-LM test	9	Reject Ho
Austria	25	BG-LM test	2.4	Accept Ho
Belgium	24	BG-LM test	16.5	Reject Ho
Canada	23	BG-LM test	7.1	Reject Ho
Denmark	22	BG-LM test	7.2	Reject Ho
Finland	23	BG-LM test	6.6	Reject Ho
France	18	BG-LM test	13.2	Reject Ho
Germany	25	BG-LM test	13.1	Reject Ho
Greece	10	BG-LM test	10	Reject Ho
Iceland	17	BG-LM test	17	Reject Ho
Italy	25	BG-LM test	8.8	Reject Ho
Netherlands	15	BG-LM test	15	Reject Ho
Norway	25	BG-LM test	6.1	Reject Ho (*)
Portugal	10	BG-LM test	10	Reject Ho
Spain	13	BG-LM test	13	Reject Ho
Sweden	12	BG-LM test	12	Reject Ho
Switzerland	14	BG-LM test	14	Reject Ho
United Kingdom	14	BG-LM test	14	Reject Ho
United States	21	BG-LM test	6.5	Reject Ho (*)

Note: (*) at 5 percent significance level. In the other cases, the null hypothesis is rejected at 1 percent significance level.

Source: Authors' elaborations

Table 6 – Results with standard panel estimators

Method	*FGLS*		*FE*		*PCSE*	
Dependent Variable	LG_Exp		LG_Exp		LG_Exp	
Independent Variables	Coeff.	Sig. Lev.	Coeff.	Sig. Lev.	Coeff.	Sig. Lev.
LG_Grants	0.0380	(**)	0.2164	(***)	0.1191	(***)
LG_Income Tax	-0.0169		0.0214		-0.0166	
LG_Property Tax	-0.0688	(***)	-0.1261	(***)	-0.1674	(***)
LG_Good Tax	0.0642	(***)	0.0646		0.0777	(***)
Control Variables						
Federal	-0.0551	(**)				
Population	0.1095	(**)	-0.1838	(***)	-0.0042	
Population 14	-0.0076		-0.0333	(**)	-0.0422	(**)
Population 65	0.0243		0.0745	(***)	0.0403	(*)
Political party (left/cent-right)	0.0022	(**)	0.0037	(**)	0.0016	
GDP growth	-0.0017	(***)	-0.0037	(***)	-0.0026	(***)
Debt	-0.0104	(**)	-0.0064		-0.0117	(*)
Deficit	-0.0009		-0.0024		-0.0015	
Openness	-0.0038		0.0037		-0.0005	
Unemployment rate	0.0051	(*)	-0.0142	(***)	0.0006	
Inflation	0.0000		-0.0042		0.0024	
CG_Exp	0.0147		-0.0917	(**)	-0.0144	
Constant	-1.8255	(***)	2.5955	(***)	0.2894	
Number of observations	345		345		345	
Number of countries	19		19		19	
Period dummies	Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes	
F-test			9.12	(***)		
F-test for fixed effects F(19, 321)			144.16	(***)		
Wald chi^2	10830.35	(***)			11011.73	(***)

Source: Authors' elaborations

Table 7 – Results with the Arellano-Bond methodology

Method	Arellano-Bond		Arellano-Bond	
Dependent Variable	ΔLG_Exp $_t$		ΔLG_Exp $_t$	
Explanatory variables				
ΔLG_Exp $_{t-1}$	0.6521	(***)	0.6870	(***)
ΔLG_Grants $_t$	0.0969	(***)	0.0878	(***)
ΔLG_Income Tax $_t$	-0.0145		0.0067	
ΔLG_Property Tax $_t$	-0.0771	(***)	-0.0625	(***)
ΔLG_Good Tax $_t$	0.0584	(**)	0.0623	(**)
Control Variables				
ΔPopulation $_t$	-0.0592	(*)	-0.0525	
ΔPopulation 14 $_t$	-0.0053		-0.0035	
ΔPopulation 65 $_t$	0.0243	(***)	0.0093	
ΔPolitical party $_t$	0.0018	(*)	0.0008	(*)
ΔGDP growth $_t$	-0.0022	(***)	-0.0022	(***)
ΔDebt $_t$	0.0064	(*)	0.0053	
ΔDeficit $_t$	-0.0006		-0.0004	
ΔOpenness $_t$	-0.0107	(*)	-0.0105	(*)
ΔUnemployment rate $_t$	-0.0093	(***)	-0.0093	(***)
ΔInflation $_t$	-0.0006		-0.0007	
ΔCG_Exp $_t$	-0.0191		-0.0165	
Constant	0.0004	(*)	0.0005	(**)
Number of observations	287		287	
Number of countries	19		19	
Wald chi2	1182.0	(***)	939.1	(***)
Sargan test	307.0		315.8	
H_0: no autocorrelation of order 1	-6.66	(***)	-6.78	(***)
H_0: no autocorrelation of order 2	0.80		0.73	
Treatment of explanatory variables	Endogenous		Predetermined	

Source: Authors' elaborations

Table 8 – Tests for stationarity

Country	*LG*	*IT*	*PT*	*GST*	*GR*	*d.LG*	*d.IT*	*d.PT*	*d.GST*	*d.GR*
Australia	-2.6	n.a.	-1.7	-1.0	0.2	-2.1	-3.0	n.a.	-1.3	-1.8
Austria	-1.3	-2.8	-1.8	-1.1	-2.4	-3.3	-4.6	-4.6	-5.2	-4.1
Belgium	-1.0	-1.3	-1.3	-1.7	-1.6	-4.4	-4.3	-4.4	-4.2	-5.4
Canada	-2.3	-1.9	-1.4	-2.0	-1.7	-2.2	-3.4	-2.4	-4.1	-3.2
Denmark	-0.8	-1.3	-2.9	-2.6	-1.3	-3.3	-1.9	-2.5	-4.0	-2.0
Finland	-3.1	-1.8	n.a.	0.7	-1.7	-2.5	-2.6	-2.8	-3.8	n.a.
France	0.1	-1.4	-1.6	0.2	-1.3	-1.9	-4.2	-5.0	-1.3	-3.9
Germany	-1.4	-0.2	-0.5	-0.9	-1.8	-3.6	-4.0	-6.1	-3.3	-4.1
Greece	-2.6	-1.4	-2.4	-1.3	-1.6	-4.9	-1.9	-2.2	-2.0	-1.7
Iceland	-0.9	-0.4	-2.1	-2.3	-1.9	-3.9	-4.5	-3.8	-3.3	-2.7
Italy	-2.7	-0.8	-1.0	-1.2	-0.3	-5.8	-5.9	-4.4	-5.1	-5.0
Netherlands	-2.7	-1.2	-1.3	-1.9	-1.6	-3.7	-2.6	-3.0	-3.4	-2.6
Norway	-0.7	-2.8	-0.8	-2.7	-3.2	-5.5	-7.2	-7.2	-4.6	-3.8
Portugal	-3.2	-0.9	-1.9	-0.5	-1.4	-2.2	-1.8	-2.1	-4.3	-3.1
Spain	-0.4	-1.1	-1.0	-0.1	-0.6	-3.5	-2.7	-2.0	-3.1	-3.4
Sweden	-0.6	-1.3	n.a.	n.a.	-1.3	-2.8	-1.9	-1.9	n.a.	n.a.
Switzerland	-4.1	-1.2	-2.2	-0.9	-0.9	-3.6	-3.0	-3.0	-3.1	-3.6
United Kingdom	-1.3	-0.8	-2.6	n.a.	-0.9	-1.9	-4.5	-2.4	n.a.	-2.8
United States	0.0	-1.4	0.2	0.0	-0.4	-3.0	-2.9	-4.6	-3.6	-2.7
t-bar	-1.7	-1.3	-1.6	-1.1	-1.4	-3.4	-3.5	-3.6	-3.5	-3.3
Significance level						(**)	(**)	(**)	(**)	(**)

Critical values for H_0 : Non-stationarity

1%	-3.75
5%	-3.00
10%	-2.63

Note: LG=Local government size; IT=Income Tax; PT=Property Tax; GST=Goods and services tax; GR=Grants

Significance level: (**) = 5 per cent

Source: Authors' elaborations

Table 9 – Results with the ECM

Method	*ECM (FGLS)*		*ECM(FE)*		*ECM(PCSE)*	
Dependent Variable	ΔLG_Exp		ΔLG_Exp		ΔLG_Exp	
	Coeff.	Sig. Lev.	Coeff.	Sig. Lev.	Coeff.	Sig. Lev.
LG_Exp $_{t-1}$	-0.1853	(***)	-0.1892	(***)	-0.1956	(***)
Short-run responses						
ΔLG_Grants	0.0538	(***)	0.0894	(***)	0.0945	(***)
ΔLG_Income Tax	0.0035		0.0160		0.0011	
ΔLG_Good Tax	0.0795	(***)	0.0626		0.0700	(**)
ΔLG_Property Tax	-0.0961	(***)	-0.1573	(***)	-0.1540	(***)
θ parameters						
LG_Grants $_{t-1}$	0.0213	(**)	0.0285	(**)	0.0340	(***)
LG_Income Tax $_{t-1}$	0.0253		0.0267		0.0251	
LG_Good Tax $_{t-1}$	0.0016		-0.0105		-0.0071	
LG_Property Tax $_{t-1}$	0.0228	(*)	0.0080		0.0234	(*)
Long-run responses						
Grants	0.1151	(**)	0.1505	(**)	0.1738	(***)
Income tax	0.1364		0.1412		0.1285	
Goods and services tax	0.0085		-0.0557		-0.0364	
Property tax	0.1229	(*)	0.0422		0.1194	(*)
Control Variables						
ΔPopulation	0.2154	(*)	0.2546		0.2238	(*)
Population $_{t-1}$	-0.0963	(***)	-0.1177	(***)	-0.1344	(***)
ΔPopulation 14	-0.0237		-0.0412		-0.0502	(**)
Population 14 $_{t-1}$	0.0143	(**)	0.0104		0.0096	
ΔPopulation 65	0.0105		0.0250		0.0253	
Population 65 $_{t-1}$	0.0165	(**)	0.0179	(**)	0.0201	(**)
Political party (left/cent-right)	0.0005		0.0003		0.0004	
ΔGDP growth	-0.0011	(*)	-0.0012		-0.0015	(*)
GDP Growth $_{t-1}$	0.0000		0.0003		0.0003	
ΔDebt	-0.0088		-0.0112		-0.0109	(*)
Debt $_{t-1}$	-0.0020		-0.0020		-0.0006	
Deficit	-0.0010		-0.0014		-0.0011	
ΔOpenness	-0.0006		-0.0053		-0.0006	
Openness $_{t-1}$	0.0100	(*)	0.0083		0.0104	
ΔUnemployment rate	0.0062		0.0071		0.0056	
Unemployment rate $_{t-1}$	-0.0124	(***)	-0.0126	(***)	-0.0152	(***)
ΔInflation	-0.0018		0.0004		-0.0002	
Inflation $_{t-1}$	-0.0052	(***)	-0.0061	(***)	-0.0058	(***)
ΔCG_Exp	0.0351		0.0258		0.0343	
CG_Exp $_{t-1}$	0.0045		-0.0004		0.0042	
Constant	1.1695	(***)	1.2293	(***)	1.813	(***)
Period dummies	Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes	
Number of observations	315		315		315	
Number of countries	19		19		19	
Wald chi2	279.33	(***)			269.46	(***)
F-test			4.37	(***)		
F-test for fixed effects			3.55	(***)		

Source: Authors' elaborations