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# The influence of decentralized taxes and intergovernmental grants on local spending volatility

Agnese Sacchi<sup>a</sup> and Simone Salotti<sup>b</sup>

## ABSTRACT

The influence of decentralized taxes and intergovernmental grants on local spending volatility. *Regional Studies*. This paper studies what affects the volatility of sub-central public spending in 20 Organisation for Economic Co-operation and Development (OECD) countries. The evidence based on data from 1972 to 2007 shows that the volatility of intergovernmental grants from upper levels is positively associated with the volatility of local expenditure. On the other hand, the volatility of local tax revenues – mainly that of property taxes – exerts the opposite effect. These findings suggest that making local governments rely more on grants than own tax revenues adversely affects their spending stability. Allowing them to levy autonomously taxes relying on responsive tax bases provides incentives to smooth their expenditure.

## KEYWORDS

local spending volatility; local revenues; property taxes; intergovernmental grants

## 摘要

去中心化的税收与跨政府补助对地方支出波动的影响。区域研究。本文研究是什么因素影响了经济合作与发展组织（OECD）二十个国家的次中央公共支出的波动。根据1972年至2007年的数据之证据显示，来自较高级别的跨政府补助的波动，与地方支出的波动具有正相关。反之，地方税收的波动——主要是财产税——发挥了相反的作用。这些研究发现主张，让地方政府依赖补助更甚于自身的税收，将对其支出稳定性产生不利的影响。让它们能够依赖回应性税基进行自主徵税，则提供了缓和其支出的诱因。

## 关键词

地方支出波动; 地方税收; 财产税; 跨政府补助

## RÉSUMÉ

L'impact de la décentralisation fiscale et de l'octroi des subventions intergouvernementales sur la volatilité des dépenses locales. *Regional Studies*. Cet article étudie ce qui influe sur la volatilité des dépenses publiques au niveau régional dans 20 pays de l'Organisation de coopération et de développement économique (OCDE). À partir des données pour la période allant de 1972 jusqu'à 2007, les résultats laissent voir une corrélation positive entre la volatilité des subventions intergouvernementales provenant des niveaux supérieurs d'administration avec la volatilité des dépenses locales. De l'autre côté, la volatilité des recettes fiscales locales – principalement les impôts fonciers – produit l'effet contraire. Ces résultats laissent supposer que la dépendance des administrations locales des subventions plutôt que des recettes fiscales propres a un effet négatif sur la stabilité de leurs dépenses. Leur permettre de prélever de façon autonome des impôts qui reposent sur des assiettes fiscales adaptables fournit des incitations au lissage de leurs dépenses.


## MOTS-CLÉS

volatilité des dépenses locales; ressources fiscales locales; impôts fonciers; subventions intergouvernementales

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**ZUSAMMENFASSUNG**

Einfluss von dezentralisierten Steuern und regierungsübergreifenden Subventionen auf die Volatilität von kommunalen Ausgaben. *Regional Studies*. In diesem Beitrag wird untersucht, welche Faktoren sich auf die Volatilität von subzentralen öffentlichen Ausgaben in 20 Ländern der Organisation für wirtschaftliche Zusammenarbeit und Entwicklung (OECD) auswirken. Aus den Ergebnissen auf der Grundlage von Daten im Zeitraum von 1972 bis 2007 geht hervor, dass die Volatilität von regierungsübergreifenden Subventionen auf höheren Ebenen in einem positiven Zusammenhang mit der Volatilität der kommunalen Ausgaben steht. Andererseits hat die Volatilität der lokalen Steuereinnahmen – in erster Linie der Grundsteuer – die umgekehrte Auswirkung. Aus diesen Ergebnissen geht hervor, dass es sich nachteilig auf die Ausgabenstabilität von Kommunalregierungen auswirkt, wenn man sie dazu bringt, sich stärker auf Subventionen zu verlassen als auf ihre eigenen Steuereinnahmen. Wenn man es ihnen ermöglicht, autonome Steuern zu erheben und sich auf reaktionsfreudige Steuergrundlagen zu verlassen, werden Anreize zur Glättung der Ausgaben geschaffen.

**SCHLÜSSELWÖRTER**

volatilität der kommunalen ausgaben; kommunale einnahmen; grundsteuer; regierungsübergreifende subventionen

**RESUMEN**

La influencia de los impuestos descentralizados y las subvenciones intergubernamentales en la volatilidad del gasto local. *Regional Studies*. En este artículo estudiamos qué factores influyen en la volatilidad del gasto público subcentral en 20 países de la Organización para la Cooperación y el Desarrollo Económico (OCDE). Según los resultados de datos de 1972 a 2007, la volatilidad de las subvenciones intergubernamentales de niveles superiores está positivamente asociada a la volatilidad del gasto local. Por otra parte, la volatilidad de los ingresos fiscales locales –principalmente de impuestos inmobiliarios– ejerce el efecto contrario. Estos resultados indican que si los Gobiernos locales confían más en las subvenciones que en sus propios ingresos fiscales se produce un efecto negativo en la estabilidad de sus gastos. Si se permite que recauden impuestos autónomamente y cuenten con bases impositivas receptoras se crean incentivos para amortiguar sus gastos.

**PALABRAS CLAVES**

volatilidad del gasto local; ingresos locales; impuestos inmobiliarios; subvenciones intergubernamentales

**JEL** E62, H71, H77, R50

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**INTRODUCTION**

In most advanced economies the fiscal responsibility assigned to sub-national government levels has recently been increased with the aim of improving the efficiency in the allocation of public resources (Oates, 1972; Rodríguez-Pose & Gill, 2005), and possibly boosting economic growth (Martinez-Vazquez & McNab, 2003; Hammond & Tosun, 2011). However, in most countries those reforms have led to a widespread mismatch between expenditure and tax decentralization, with the former being more accentuated than the latter (Organisation for Economic Co-operation and Development (OECD), 2012). As a result, most sub-central governments have varying degrees of autonomy over the different types of revenues used to finance their expenditures, that is, own taxes, piggybacked and shared taxes, and grants that represent money flowing from other tiers of government – mainly from central government (OECD, 2006; Charbit, 2010). Such divergence goes against the theoretical prescriptions of the fiscal federalism literature according to which expenditure responsibility should be combined with a sufficient budgetary autonomy at each government level (McLure & Martinez-Vazquez, 2000), and can affect the economic implications of the decentralization process.

First, decentralization is thought to be less effective when local governments rely on transfers and grants rather than on own resources (Weingast, 2009, 2014) because the existence of grants lowers the accountability of local governments and does not respect the ‘benefit principle’ of taxation. According to that principle, sub-central governments should rely on taxes perceived by households and firms to be clearly linked to the public services received (Musgrave, 1983; King, 1984). More autonomy is likely to lead to better local services (Hoffman & Gibson, 2005) and possibly to a sounder development path over time (Sorens, 2014). Second, as pointed out by Ashworth, Galli, & Padovano (2013) and Rodden (2003), tax revenues raised by sub-central governments lead to smaller aggregate government sizes, while grants have the opposite effects. Cassette and Paty (2010) also show that grants financing leads to larger local governments (consistently with the common pool theory), while smaller local governments result from local expenditure being financed by own taxes (according to the Leviathan hypothesis). Finally, according to a study by the OECD (2009a) grants tend to exacerbate sub-central revenue fluctuations over the cycle.

A related but unexplored issue is whether the volatility of local spending is affected by the revenues used to finance

such expenditure. Sub-central spending volatility is worth studying in the light of its potential effects on the economy, as suggested by the literature on aggregate spending volatility. On the one hand, the latter may have detrimental effects on economic growth and welfare (Fatás & Mihov, 2003, 2005; Furceri, 2007; Loayza, Ranciere, Servén, & Ventura, 2007) and, on the other hand, it may be beneficial to smooth out business cycle fluctuations (Furceri & Poplawski-Ribeiro, 2009). It is conceivable for local spending volatility to have similar effects as it constitutes a significant part of aggregate spending in most advanced countries (OECD, 2009b).

Although the volatility of local expenditure may well be related to the size of local governments, the literature briefly mentioned above has concentrated on the latter and has yet to explore the former. The existing contributions dealing with volatility only investigate that of aggregate expenditure measures, such as government consumption (Furceri & Poplawski-Ribeiro, 2009) or discretionary spending (Albuquerque, 2011). The main existing findings point towards spending volatility being negatively associated with the quality of institutions and country size/population. In a recent paper, Furceri, Sacchi, and Salotti, (2014) found that the level of fiscal decentralization is also negatively associated with the volatility of government consumption, suggesting that redistributing spending and taxing powers to sub-central governments may alleviate government consumption volatility.

This paper contributes to the existing literature along the following lines. It studies the volatility of local public spending concentrating on the role played by the financing sources used by local governments, and distinguishing between intergovernmental grants and own tax revenues. The latter is further broken down into the following three main tax components: taxes on property, on income, and on goods and services. This disaggregation is relevant as property taxes are normally assigned to sub-national governments through tax separation arrangements, meaning that only sub-national governments are entitled to collect and manage such taxes, deciding over the tax rates, the tax bases and other relevant issues (e.g., exemptions and reliefs);<sup>1</sup> on the other hand, the other two types of taxes usually follow tax base/revenue sharing schemes. As a result, the literature suggests that they may be used differently by governments, with different consequences in terms of efficiency and accountability (McLure & Martinez-Vazquez, 2000), economic performance (Karras & Furceri, 2009), and fiscal discipline (Presbitero, Sacchi, & Zazzaro, 2014). Although most studies conclude favourably on the utilization of property taxes (Charbit, 2010; Bell, Brunori, & Youngman, 2010), increasing the weight of property taxes in the revenue mix of sub-central governments usually meets with strong resistance given the perceived salience of this tax (Cabral & Hoxby, 2012).

The empirical model analyzes the determinants of local spending volatility, and its main explanatory variables deal with the revenue mix of the local governments. The main results, based on a sample of 20 OECD countries over the period 1972–2007, can be summarized

as follows: the volatility of local public spending is significantly affected by that of the revenues available at the sub-central level. The evidence suggests that there are important differences between own taxes and revenues over which sub-national governments cannot exert much control, such as intergovernmental grants and shared taxes. In particular, the higher the volatility of intergovernmental grants, the higher the volatility of public spending. This proves that having to rely on transfers from upper levels make local expenditure more prone to instability. This result fits well with related evidence suggesting that grants also reduce the sub-central governments' tax effort and inflate their spending, with adverse consequences on local deficits and debt (Stein, 1999; OECD, 2009a).

On the other hand, the volatility of property taxes is inversely related to the volatility of spending. This suggests that local governments manipulate own taxes in order to smooth their expenditure when they have sufficient autonomy to do so. The impact of the volatility of the other types of local taxes (on income and on goods and services) on that of local expenditure is instead more similar to that of grants' volatility. This may reflect the fact that local governments do not enjoy high degrees of autonomy over such taxes, making their economic effects resemble those of intergovernmental grants. Results are robust to potential endogeneity and reverse causality issues between spending decisions and tax tools at the local level.

The paper is organized as follows. The second section has a brief review of the two strands of literature upon which this paper builds, and some hypotheses are drawn as a basis for the empirical analysis. The third section illustrates the empirical strategy and the data, while the fourth section contains the results of the analysis. Finally, the fifth section concludes.

## REVIEW OF RELATED LITERATURE

This contribution integrates two different strands of literature: (1) the studies on fiscal decentralization, both those analyzing the expenditure/tax mismatch and those focusing on the implications of the various sources of revenues for the sub-central and aggregate government size; and (2) the literature on the determinants of government (aggregate) spending volatility.

### Fiscal decentralization and the local revenue system

The investigation of the volatility of local expenditure needs to take into account not only the relationship between expenditure decentralization and tax decentralization but also the structure and composition of the revenue side of local budgets. When certain expenditure tasks are assigned to sub-national authorities, adequate revenues are likely to be needed to finance them (Sacchi & Salotti, 2014). Existing studies demonstrate that fiscal decentralization funded by intergovernmental grants gives rise to common revenue pool issues and it is

associated with higher overall and local government spending (e.g., Rodden, 2003; Fiva, 2006). On the contrary, fiscal decentralization based on own taxes seems less likely to lead to soft budget constraints and it is associated with smaller local and overall governments (see Golem, 2010, for a review). Following this reasoning, Foremny (2014) has recently shown that deficits of sub-national sectors in federations can be avoided through adequate tax autonomy at the local level.

Given those findings on the ‘common pool versus own resources’ issue, there is surprisingly little research digging further into the role of local revenue composition. Liberati and Sacchi (2013) constitute a notable exception studying the impact of different disaggregated tax revenues on the size of local governments. According to their findings, property taxes are strongly associated with smaller local governments, but income and goods and services taxes are not. The intuition behind this result lies in the latter taxes being usually assigned to lower tiers of governments following revenue-sharing mechanisms and piggybacked formulas (implying overlapping fiscal competences among government levels and less taxing power and autonomy for sub-national authorities). On the other hand, property taxes are more frequently based on tax-separation schemes, that is, on tax bases used solely by local governments (OECD, 1999). Thus, local governments enjoy higher degrees of autonomy and responsibility over property taxes (Bordignon & Minelli, 2001), which explains their different economic consequences with respect to the other types of taxes.

There are other reasons that may explain why property taxes seem to be more effective in limiting the growth of local public spending. Contributions as early as Tiebout (1956) recognized that property taxes are the ideal form of local taxation because they encourage local policy-makers to design efficient policies. Brennan and Buchanan (1978, 1980) develop theoretical arguments suggesting that a responsive tax base, such as that of property taxes, may help limit the growth of the public sector in the case of Leviathan governments. According to some researchers, the reliance on property taxes can increase the incentives to control costs in the public goods provided at the local level such as utility services and school districts (Borge & Rattsø, 2008; Fiva & Ronning, 2008). When local property taxes finance local services, public sector decisions are likely to be more efficient because taxpayers would presumably support those activities whose perceived benefits exceed the burden of taxes. Property values would increase to the extent that benefits and taxes are capitalized into property values (Fischel, 2001).

Moreover, property taxes are a more reliable and predictable source of revenues than other forms of taxation (Norregaard, 2013), since the property tax base is mostly immovable and taxpayers can hardly relocate it to areas with lower tax rates. The reliability of property tax revenues also lies in the legally defined value of properties (Brunori, 2003; Giertz, 2006; Alm, Buschman, & Sjoquist, 2011). There are other factors reducing the cyclical volatility of local revenues arising from property taxes: for instance, Lutz,

Molloy, and Shan (2011) find that policy-makers tend to offset declines in the property tax base (e.g., following housing prices’ declines) by raising the tax rates, despite the sensitivity of voters to changes of this particular tax, as documented by Cabral and Hoxby (2012).<sup>2</sup>

This paper is also related to the studies on the widespread divergence between sub-national expenditures and tax revenues, leading to a well-documented fiscal imbalance calling for transfers from upper government tiers (OECD, 2012). As argued by Ashworth et al. (2013), grants and revenue sharing programmes may de facto blur the responsibility for spending decisions and make it easier for sub-central governments to shift the political and economic costs of their spending decisions onto others.

Thus, expenditure decentralization without corresponding local taxing powers is likely neither to generate beneficial tax competition among government levels nor solve principal-agent problems between residents and local representatives (Rodden, 2003; Devarajan, Khemani, & Shah, 2009; Khemani, 2010).

Given the findings illustrated above, the following hypotheses are advanced:

*Hypothesis 1: The volatility of the revenues utilized by local governments affects that of their expenditure.*

However, given the different nature of the different types of revenues used to finance local expenditure, Hypothesis 1 is further developed as follows:

*Hypothesis 2: The higher (lower) the volatility of grants, the higher (lower) the volatility of local spending. This would be explained by the fact that local governments can only respond to the volatility of a revenue stream over which they have no control by modifying their expenditures, therefore increasing their volatility.*

*Hypothesis 3: The higher (lower) the volatility of local taxes, the lower (higher) the volatility of local spending. This would signal the ability of local governments to manipulate their taxes in order to smooth the volatility of their expenditures. However, the autonomy over own taxes differs from that over shared taxes: property taxes usually pertain to the former group, while income and consumption taxes to the latter.*

*Hypothesis 3a: Hypothesis 3 should hold for property taxes more so than for taxes on income and on goods and services, over which local governments have less autonomy.*

The empirical analysis is constructed so to test the above hypotheses. The general framework used builds on the literature on spending volatility reviewed in the following sub-section.

### Government spending volatility

The existing literature offers some contributions on the determinants of the volatility of government aggregate expenditure and on its economic effects. However, no effort has been made to deal with the determinants of

local spending volatility. Therefore, the analysis can only partially rely on, and take advantage from, the existing studies on spending volatility. Although local expenditure constitutes a non-negligible part of aggregate expenditure, the volatility of the former is likely to be driven by different factors (above all, those related to the revenue side of the local budget).

The studies closer in spirit to this analysis are those investigating discretionary policy, which in empirical analyses is normally measured with the volatility of government spending which is explained neither by changes in gross domestic product (GDP) growth nor by its own degree of persistence (Fatás & Mihov, 2003, 2005). The literature offers a few studies on the determinants of such volatility. For instance, Furceri and Poplawski-Ribeiro (2009) use data for 160 countries from 1960 to 2000 to prove that country size, proxied by total population, is associated with lower government consumption volatility. This suggests that smaller countries are characterized by more volatile public spending.

In addition to country size, the literature suggests that both demographic (Albuquerque, 2011; Furceri & Poplawski-Ribeiro, 2009) and macroeconomic (Afonso, Agnello, & Furceri, 2010; Brzozowski and Siwinska-Gorzela, 2010) factors may potentially affect government consumption volatility, as well as political and institutional ones (Albuquerque, 2011).<sup>3</sup> In general, the level of development is thought crucially to affect public spending volatility, with low-income economies experiencing higher volatility than high-income ones (Furceri et al., 2014). Given that the analysis deals with developed countries only (and that it concentrates on the volatility of local, rather than aggregate, spending), such variables are not expected to play particularly crucial roles, but are still included as controls in some of the estimates.

All in all, the relevance of studying the volatility of public spending mostly lies in its potentially important economic effects. Afonso and Furceri (2010) argue that the volatility of government consumption is detrimental to growth in advanced economies (this confirms earlier evidence offered by, among others, Brunetti, 1998; Gong & Zou, 2002; and Furceri, 2007). On the other hand, some authors argue that restrictions on government spending, and therefore lower spending volatility, may result in a slower adjustment of the economy to unexpected shocks (Roubini & Sachs, 1989; Lane, 2003), and therefore more macroeconomic instability.

## THE EMPIRICAL STRATEGY

Data for 20 OECD countries over the period 1972–2007 are used and organized into three different multi-year frequencies, i.e., three-, four- and five-year non-overlapping periods, used alternatively for robustness purposes.<sup>4</sup> The use of multi-year periods is necessary in order to be able to measure the object of interest, i.e., the volatility of local public spending, as well as the main explanatory variables of the model, i.e., the volatility of the various types of local revenues (see below for details on how the volatility of

those variables is measured). There are two specifications of the empirical model: the most parsimonious one (model A) includes the local revenue-side variables and country and period fixed effects as the sole explanatory variables. The second specification (model B) also includes some macroeconomic and demographic control variables taken from the literature investigating the volatility of aggregate public spending. Thus, the model is the following:

$$\begin{aligned} \sigma_{i,[t,t+x]}^{\text{local}_G} = & \alpha_{i,0} + \alpha_{i,1}\sigma_{i,[t,t+x]}^{\text{IT}} + \alpha_{i,2}\sigma_{i,[t,t+x]}^{\text{GST}} \\ & + \alpha_{i,3}\sigma_{i,[t,t+x]}^{\text{PT}} + \alpha_{i,4}\sigma_{i,[t,t+x]}^{\text{GR}} \\ & + \beta'_{i,y}\text{controls}_{i,t} + \tau_t + u_{i,t} \end{aligned} \quad (1)$$

where  $\sigma_{i,[t,t+x]}^{\text{local}_G}$  is local spending volatility, which is defined as the standard deviation (SD) of the annual growth rate of real local government expenditure (excluding intergovernmental grants received from upper levels) over the multi-year periods described above. The main explanatory variables are similarly defined, being the volatility of the following: sub-central income taxes ( $\sigma_{i,[t,t+x]}^{\text{IT}}$ ), sub-central taxes on goods and services ( $\sigma_{i,[t,t+x]}^{\text{GST}}$ ), sub-central property taxes ( $\sigma_{i,[t,t+x]}^{\text{PT}}$ ), and intergovernmental grants ( $\sigma_{i,[t,t+x]}^{\text{GR}}$ ). All fiscal variables are converted into real terms using the GDP deflator.<sup>5</sup>

Country fixed effects ( $\alpha_{i,0}$ ) are included to control for time-invariant country-specific characteristics. This accounts for institutional settings such as the countries being federal, but also, and more importantly, for other political and governance variables such as the nature of the electoral system. Those variables have been associated with the volatility of discretionary public spending in the past, but are normally characterized by little or no time variation (Albuquerque, 2011). Period dummies ( $\tau_t$ ) are also included in order to control for period-specific events that may potentially affect more than one country at the same time, such as shocks that may require policy intervention. For instance, when reacting to adverse economic conditions, most national governments normally adopt countercyclical measures and fiscal stimulus packages capable of affecting sub-national expenditures and revenues due to their impact on fiscal balances as well as on the income of the taxpayers (Vammalle & Hulbert, 2013). Finally,  $u_{i,t}$  is the disturbance term.

The volatility of the various revenues of sub-central governments is the main object of interest. The inclusion of the four variables controlling for that permits one to test the hypotheses laid out above on the relationships between the volatility of local expenditure and the (in)stability of the main revenue streams used to finance it.<sup>6</sup>

This cross-country analysis fits into a vast strand of literature investigating fiscal decentralization using data at the country level (e.g., Cassette & Paty, 2010), and many others mentioned in the literature review above). It could be suggested that such an analysis could miss interesting sub-national dynamics. For instance, it could mask significant differences between government tiers receiving large transfers and others receiving only small amounts, with

the former possibly associated with more volatile spending than the latter. This hypothesis is checked by using sub-national data for the Italian regions and the Spanish autonomous communities, as well as for the US states – for which relatively good data are available – and reassuringly results suggest that this is not the case (the results are not reported but are available from the authors upon request).<sup>7</sup>

Table A1 in Appendix A in the supplemental data online contains the simple pairwise correlations among the series measuring the volatility of local spending and of the various sources of local revenues at the three different period frequencies. At all data frequencies, correlations are positive but small, suggesting that the different revenue sources indeed behave differently and that it is meaningful to analyze them separately.

In addition to estimating the parsimonious specification A of model (1), specification B of the model is also estimated, and it includes the **controls** vector containing the following: (1)  $pop_{i,t}$  is the logarithm of the total population, commonly used as a measure of country size (e.g., Alesina & Wacziarg, 1998); (2)  $urb_{i,t}$  is urbanization measured by the percentage of the urban population over the total population; (3)  $pop\_dens_{i,t}$  is population density; (4)  $gdp_{i,t}$  is the logarithm of real GDP per capita; (5)  $inflation_{i,t}$  is inflation calculated from the GDP deflator; and (6)  $open_{i,t}$  is trade openness measured by the sum of imports and exports divided by GDP. All these controls are included because the literature suggests that they can potentially affect the volatility of aggregate public spending; therefore, it seems natural to include them in a model investigating the volatility of local public spending.

Population may be related to the volatility of public spending as smaller countries are usually more volatile and exposed to economic shocks (Furceri & Karras, 2008). On the other hand, larger countries may be characterized by individual heterogeneity prompting higher political polarization regarding the type and size of public goods resulting in spending volatility due to the switching of different political groups in power (Dixit & Weibull, 2007; Fernández & Levy, 2008). Urbanization and population density are instead included as they capture key social and territorial characteristics that affect spending policy and its volatility (Albuquerque, 2011), and are also relevant from a sub-national point of view (the public needs of a densely populated country are likely to differ from those of a less densely populated one; the same holds for more or less rural areas).

GDP per capita is included as it proxies for the level of development of the country and, consequently, it can stand for the quality of institutions (Afonso et al., 2010; Brzozowski & Siwinska-Gorzalak, 2010). Inflation controls for the possibility that high inflation episodes could result in large deviations in government spending due to price volatility and uncertainty (Albuquerque, 2011). Finally, trade openness is included as it has been found to affect output volatility and therefore it may affect spending volatility in turn (Afonso et al., 2010; Furceri & Poplawski-Ribeiro, 2009). Given the focus on advanced economies, it is unclear which expected effects could be associated

with those controls. All the control variables are taken at time  $t$ , i.e., at the beginning of the non-overlapping multi-year periods, in order to deal with potential reverse causality issues given that the dependent variable is expressed with period averages (for similar applications see, among others, Furceri & Zdzienicka, 2012).

Initially the two specifications of model (1) are estimated using the following estimators: ordinary least squares (OLS) with clustered standard errors, fixed effects (FE)<sup>8</sup> with heteroskedasticity-robust standard errors, and FE with the standard errors robust to heteroskedasticity, autocorrelation and cross-sectional dependence (Driscoll & Kraay, 1998).<sup>9</sup> In all cases, data are used at the three different multi-year frequencies introduced above. The use of various model specifications and estimators ultimately aims at producing results robust to potential issues such as omitted variables and changes in the data properties due to their different time frequencies. This leads us to the discussion of potential endogeneity problems affecting the empirical model, which may arise due to simultaneity, reverse causality and model misspecification (omitted variables).

The use of beginning-of-the-period values of the right-hand-side variables of the model is a simple way to deal with reverse causality, as mentioned above, but does little to take care of potential simultaneity, that is the joint determination of the volatility of local taxes and expenditure. Moreover, tax volatility is measured over the same time periods of expenditure volatility, therefore reverse causality cannot be controlled for with that simple method. In fact, it can be hypothesized that the volatility of local expenditure and of local revenues may be jointly determined, as the existing literature does not contain clear indications on whether tax or expenditure decisions come first (Blanchard & Perotti, 2002). The volatility of the four revenue sources for local governments may not only influence spending volatility, but also be influenced by it. In particular, local governments may respond to the assignment of new spending responsibility by manoeuvring the taxes they control. Also, central governments may assign new tasks to local governments (requiring changes in spending) and at the same time manipulate the intergovernmental grants to ensure adequate financing.

Moreover, tax and expenditure volatility may be influenced by another variable/shock, which leads onto a discussion of the potential omitted variable bias. The use of the two-way FE estimator aims at taking care of such a possibility, although under admittedly restrictive assumptions on the country and time-specific nature of such variables. Thus, there is a need to check the robustness of the results to potential endogeneity problems. Estimating a dynamic version of the empirical model using the system-GMM estimator (Blundell & Bond, 1998)<sup>10</sup> accounts for potential endogeneity of the following variables: the lagged dependent variable, all the revenue-side variables that may be jointly determined with the dependent variable, as well as GDP per capita and inflation, which may in fact be affected by the volatility of local public expenditure. As a first step, only lagged values of such potential endogenous variables are used as instruments, but then also external instruments

are used, as explained in more detail below, where the estimates are presented.

## RESULTS

Table 1 contains the coefficients of the variables of model (1) estimated respectively with the OLS, FE and FE-DK estimators. Table 1 refers to specification B, which includes the vector of macroeconomic and demographic controls (Table A2 in Appendix A in the supplemental data online shows the results of specification A).

The first thing to notice is that the results are remarkably consistent across the various batteries of estimates, which differ in terms of estimators and data frequency. This is a sign of robustness and consistency of the results. Turning to the hypotheses formulated in the second section, Hypothesis 1 seems to be confirmed: there are significant linkages between the volatility of sub-central spending and that of the various financing sources locally available.

First of all, there is a positive and highly statistically significant relationship between the volatility of local expenditure and that of intergovernmental grants, concurring with Hypothesis 2. The magnitude of the coefficients associated with the latter is consistent both across the different estimators and across the different data frequencies, and lies within the 0.40/0.49 range depending on both the estimator and the frequency of the data used. Since model (1) is linear, this implies an elasticity of 0.73/0.90 for average values of the variables ( $\sigma_{i,t,t+x}^{local-G}$  and  $\sigma_{i,t,t+x}^{GR}$ ), which proves the economic importance of the relationship. This means that when the volatility of grants increases by 1 percentage point, sub-central expenditure becomes more volatile by between 0.73 and 0.90 percentage points. That is, local public spending cannot be expected to be stable when local governments have to rely on revenues over which they have no control to finance it. Central governments should be aware that making local public finances mostly based on grants can result in a highly volatile local expenditure.

This result is strengthened by the findings related to the variable accounting for the most autonomous among the local taxes, i.e., the volatility of property taxes. The coefficients associated with this explanatory variable are in all cases negative, and range between  $-0.13$  and  $-0.17$ . Given the average values of the involved variables, the elasticity is smaller (in absolute value) than that of grants' volatility, but still economically important: it ranges between  $-0.28$  and  $-0.37$ . This suggests that local governments tend to utilize property taxes in order to counteract the volatility of spending. The fact that local property taxes are characterized by a reliable tax base (as they mostly refer to land, building and other immovable property) facilitates the activity of administration and collection by local policy makers (Alm et al., 2011; Lutz et al., 2011; Norregaard, 2013).<sup>11</sup>

On the other hand, the coefficient associated with the volatility of local income and sales' taxes is only rarely significant and positive, like those associated with grants, although smaller in magnitude. Keeping in mind that

those taxes are usually organized according to tax sharing and piggybacking schemes, this result supports the intuition that not all local taxes are equal in favouring government spending stability. In terms of expectations, Hypothesis 3a – related to property taxes – is fully confirmed.

Of all the hypotheses, Hypothesis 3 is only partially confirmed by the estimates, given the lack of a clear relationship between the volatility of local spending and that of income and goods and services' taxes. This is consistent with the findings of Liberati and Sacchi (2013) regarding government size and the different effects of property taxes versus those of income and consumption taxes. But, are those findings robust to the potential endogeneity issues identified in the previous section? The estimates presented in Table 2 take into account all those possibilities (given the requisites in terms of number of observations of the chosen estimator, only the three-year periods data are used).

Table 2 contains the estimates of the dynamic versions of specifications A and B of model (1) obtained by adding the lagged dependent variable, which captures the persistence of spending volatility, to the sets of regressors. The first four columns contain the coefficients of various specifications of the model estimated without external instruments for the potential endogenous variables. With regards to specification A, the lagged dependent variable and the revenue-side explanatory variables are treated as endogenous and instrumented with their own lags. In the case of specification B, *gdp* and *inflation* are also treated as endogenous, and the rest of the explanatory variables of the model are treated as predetermined and used as instruments in the level equation only. Either the second lags of the variables of the model are used as instruments (first two columns) or all lags are used but then collapsed in order to reduce the number of instruments (the proliferation of instruments is a well-known problem of the system-GMM estimator; Roodman, 2009).<sup>12</sup>

It is arguably difficult to find valid external instruments for the variables considered endogenous in the model and for fiscal decentralization in general. Indeed, the lack of suitable time-variant instruments is common in the literature (e.g., Filippetti & Sacchi, 2013; Gemmill, Kneller, & Sanz, 2013). Nevertheless, the model is also estimated by adding as a proper instrument either an index of regional authority (namely *RAI* constructed by Hooghe, Marks, & Schakel, 2008) or a measure of party system nationalization (*PSNS*) (Jones & Mainwaring, 2003; Harbers, 2009). The former is a country-level measure of the authority of intermediate and regional governments in terms of institutional depth, policy scope, fiscal autonomy and seven additional dimensions, providing a comprehensive approach to political and administrative decentralization (Rondinelli, 2008). *PSNS* measures the extent to which a political party receives similar levels of electoral support throughout a country, which affects the issues dominating political competition, legislative behaviour and public policies.<sup>13</sup> High levels of nationalization imply the existence of parties involved in regional policies nationwide, possibly leading to highly



**Table 1.** Model B: OLS, FE and FE-DK estimates, three different period frequencies.

Variables/estimator	Three-year periods			Four-year periods			Five-year periods		
	OLS	FE	FE-DK	OLS	FE	FE-DK	OLS	FE	FE-DK
$\sigma_{i,t,t+x}^{IT}$	0.04 (0.75)	0.02 (0.62)	0.02 (1.40)	0.03 (1.14)	0.01 (0.22)	0.01 (0.09)	0.03 (0.48)	0.0002 (0.00)	0.0002 (0.00)
$\sigma_{i,t,t+x}^{PT}$	-0.13*** (-2.94)	-0.14*** (-3.34)	-0.14*** (-2.93)	-0.14*** (-2.60)	-0.14*** (-3.39)	-0.14*** (-2.90)	-0.14** (2.55)	-0.17*** (-3.37)	-0.17*** (-3.13)
$\sigma_{i,t,t+x}^{GST}$	0.02** (2.45)	0.02** (2.03)	0.02 (1.56)	-0.001 (-0.10)	0.002 (0.17)	0.002 (0.17)	0.02** (2.15)	0.03** (2.51)	0.03*** (2.74)
$\sigma_{i,t,t+x}^{GR}$	0.40*** (3.47)	0.42*** (3.83)	0.42*** (4.76)	0.40*** (3.27)	0.43*** (3.91)	0.43*** (4.39)	0.44*** (4.15)	0.49*** (5.97)	0.49*** (8.04)
<i>pop</i>	0.001 (0.19)	0.37* (1.72)	0.37*** (5.45)	-0.003 (-0.80)	0.22* (1.75)	0.22*** (5.31)	-0.001 (-0.29)	0.30** (2.01)	0.30*** (3.03)
<i>urb</i>	-0.0002 (-0.52)	-0.01 (-1.24)	-0.01** (-2.09)	0.0001 (0.22)	0.002 (0.66)	0.002 (1.52)	-0.0002 (-0.33)	-0.01** (-1.99)	-0.01*** (-3.35)
<i>pop_dens</i>	-0.00001 (-0.20)	0.00003 (0.02)	0.00003 (0.03)	0.00004 (1.00)	-0.003** (-2.36)	-0.003*** (-2.93)	0.00001 (0.36)	0.001 (0.86)	0.001 (1.06)
<i>gdp</i>	-0.05 (-1.08)	-0.08 (-0.76)	-0.08 (-1.29)	-0.01 (-0.19)	0.10 (1.35)	0.10 (1.37)	-0.05 (-1.39)	-0.04 (-0.53)	-0.04 (-1.34)
<i>inflation</i>	-0.001 (-0.37)	0.001 (0.62)	0.001 (0.54)	-0.00001 (-0.02)	0.0004 (1.29)	0.0004 (1.02)	0.0002 (0.42)	0.001 (1.50)	0.001** (2.51)
<i>open</i>	0.004* (1.94)	-0.002** (-2.09)	-0.002*** (-2.76)	0.0002 (1.01)	-0.001 (-1.59)	-0.001* (-1.72)	0.0003** (2.11)	-0.003*** (-3.13)	-0.003*** (-3.07)
<i>period_2</i>	0.04 (0.84)	0.06 (1.05)	0.06*** (3.92)	0.04 (0.92)	0.05 (1.09)	0.05*** (2.96)	0.07* (1.95)	0.10*** (2.79)	0.10*** (21.30)
<i>period_3</i>	0.12** (2.05)	0.13** (2.44)	0.13*** (23.42)	0.07 (1.43)	0.07 (1.40)	0.07*** (3.28)	0.05* (1.83)	0.12*** (3.13)	0.12*** (5.85)
<i>period_4</i>	0.07 (1.41)	0.11* (1.82)	0.11*** (6.20)	0.04 (1.04)	0.04 (0.81)	0.04 (1.46)	0.06** (2.07)	0.13*** (3.13)	0.13*** (6.06)
<i>period_5</i>	0.05 (1.08)	0.12** (2.15)	0.12*** (3.93)	0.07 (1.51)	0.04 (0.90)	0.04* (1.66)	0.05 (1.57)	0.11** (2.26)	0.11*** (5.05)
<i>period_6</i>	0.09* (1.82)	0.15*** (2.85)	0.15*** (4.28)	0.06 (1.47)	0.03 (0.50)	0.03 (0.79)	0.05 (1.46)	0.15** (2.37)	0.15*** (4.51)

(Continued)

Table 1. Continued.

Variables/estimator	Three-year periods			Four-year periods			Five-year periods		
	OLS	FE	FE-DK	OLS	FE	FE-DK	OLS	FE	FE-DK
<i>period_7</i>	0.08* (1.69)	0.14** (2.58)	0.14*** (4.29)	0.03 (0.64)	-0.01 (-0.21)	-0.01 (-0.36)	0.06* (1.93)	0.17** (2.43)	0.17*** (4.69)
<i>period_8</i>	0.07 (1.46)	0.13** (2.42)	0.13*** (3.71)	0.05 (1.26)	0.02 (0.29)	0.02 (0.46)			
<i>period_9</i>	0.05 (0.91)	0.12** (2.07)	0.12*** (2.58)	0.05 (1.20)	0.01 (0.14)	0.01 (0.22)			
<i>period_10</i>	0.07 (1.42)	0.16*** (2.64)	0.16*** (3.08)						
<i>period_11</i>	0.07 (1.43)	0.17*** (2.56)	0.17*** (2.98)						
<i>period_12</i>	0.08 (1.55)	0.18*** (2.67)	0.18*** (2.97)						
Observations	162	162	162	121	121	121	105	105	105
$R^2$	0.65	0.67	0.67	0.68	0.73	0.73	0.70	0.77	0.77

Notes:  $t$ -statistics in parentheses are based on clustered standard errors (OLS), robust standard errors (FE) and Driscoll-Kraay standard errors (FE-DK). Country fixed effects are included in the FE and FE-DK estimates, but not reported.

\*\*\*Statistical significance at the 1% level; \*\*statistical significance at the 5% level; \*statistical significance at the 10% level.

**Table 2.** Dynamic models A and B: system-GMM estimates, three-year periods data.

Variables/specification	External instruments: none				External instruments: RAI				External instruments: PSNS			
	Instruments: second lag		Instruments: collapse		Instruments: second lag		Instruments: collapse		Instruments: second lag		Instruments: collapse	
	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
$\sigma_{i,t,t+x}^{\text{local}_G}$	-0.07 (-1.03)	0.03 (0.28)	-0.01 (-0.15)	-0.09 (-1.30)	-0.06 (-0.85)	0.03 (0.28)	-0.03 (-0.76)	-0.10 (-1.42)	-0.08 (-1.26)	0.03 (0.24)	-0.03 (-0.44)	-0.10 (-1.36)
$\sigma_{i,t,t+x}^{\text{IT}}$	0.06* (1.73)	0.04 (0.99)	0.05 (1.14)	0.06*** (3.14)	0.06 (1.59)	0.04 (0.98)	0.03 (0.71)	0.05** (2.35)	0.03 (0.92)	0.03 (0.71)	0.01 (0.35)	0.05*** (2.58)
$\sigma_{i,t,t+x}^{\text{PT}}$	-0.17*** (-4.25)	-0.15*** (-4.07)	-0.002 (-0.03)	-0.10** (-2.23)	-0.17*** (-4.39)	-0.15*** (-4.06)	-0.02 (-0.47)	-0.09* (-1.93)	-0.17*** (-4.44)	-0.15*** (-4.25)	-0.11* (-1.78)	-0.10** (-2.00)
$\sigma_{i,t,t+x}^{\text{GST}}$	0.02** (2.53)	0.02*** (3.08)	-0.02* (-1.89)	0.01 (1.04)	0.02*** (2.86)	0.02*** (3.06)	0.003 (0.21)	0.005 (0.67)	0.03*** (2.65)	0.02*** (2.98)	0.01 (0.48)	0.01 (1.18)
$\sigma_{i,t,t+x}^{\text{GR}}$	0.46*** (5.10)	0.44*** (4.55)	0.26* (1.75)	0.44*** (4.35)	0.46*** (5.21)	0.44*** (4.54)	0.28** (2.10)	0.41*** (3.88)	0.47*** (6.04)	0.44*** (4.67)	0.39*** (2.58)	0.44*** (4.50)
<i>pop</i>		0.001 (0.26)		-0.004 (-0.66)		0.001 (0.26)		-0.002 (-0.47)		-0.001 (-0.19)		-0.001 (-0.16)
<i>urb</i>		-0.0003 (-0.71)		-0.001 (-1.03)		-0.0003 (-0.72)		-0.001 (-0.84)		-0.0001 (-0.15)		-0.001 (-0.60)
<i>pop_dens</i>		0.00001 (0.23)		0.0001 (1.14)		0.00001 (0.24)		0.0001 (0.77)		0.0001 (0.94)		0.0001 (0.63)
<i>gdp</i>		-0.04 (-1.07)		0.11** (2.19)		-0.04 (-1.07)		0.03 (0.37)		-0.06 (-1.34)		0.002 (0.03)
<i>inflation</i>		-0.001 (-0.53)		-0.002 (-0.77)		-0.001 (-0.53)		-0.001 (-0.52)		-0.001 (-0.75)		-0.001 (-0.78)
<i>open</i>		0.0003* (1.64)		-0.0002 (-0.74)		0.0003* (1.64)		0.0001 (0.29)		0.000003 (0.01)		0.0001 (0.48)
<i>period_2</i>	-0.003 (-0.13)	-0.03 (-1.51)	0.001 (0.04)	0.07* (1.73)	0.002 (0.10)	-0.03 (-1.50)	0.03 (0.97)	0.03 (0.72)	-0.04 (-1.06)	-0.05*** (-2.73)	0.004 (0.10)	0.01 (0.25)
<i>period_3</i>	0.02 (1.18)	0.05 (1.58)	-0.001 (-0.01)	0.11*** (3.17)	0.02 (1.20)	0.05 (1.58)	0.04 (0.80)	0.08* (1.68)	0.03 (1.02)	0.03 (0.75)	0.05 (1.12)	0.06 (1.27)
<i>period_4</i>	-0.01 (-0.39)	-0.01 (-0.29)	-0.03 (-1.14)	0.07 (1.27)	-0.01 (-0.36)	-0.01 (-0.29)	-0.02 (-0.92)	0.03 (0.52)	-0.03 (-1.26)	-0.02 (-0.79)	-0.02 (-0.56)	0.02 (0.37)

(Continued)

Table 2. Continued.

Variables/specification	External instruments: none				External instruments: RAI				External instruments: PSNS			
	Instruments: second lag		Instruments: collapse		Instruments: second lag		Instruments: collapse		Instruments: second lag		Instruments: collapse	
	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B	Model A	Model B
<i>period_5</i>	-0.02 (-1.48)	-0.02 (-1.54)	0.0001 (0.01)	0.03 (0.74)	-0.02 (-1.52)	-0.02 (-1.53)	-0.02 (-0.85)	-0.01 (-0.31)	-0.01 (-1.14)	-0.04* (-1.84)	-0.02 (-0.95)	-0.01 (-0.24)
<i>period_6</i>	0.001 (0.04)	0.01 (0.42)	0.01 (0.45)	0.04 (1.42)	0.0001 (0.00)	0.01 (0.43)	-0.001 (-0.06)	0.01 (0.36)	0.01 (0.42)	-0.01 (-0.34)	0.02 (0.98)	0.01 (0.29)
<i>period_7</i>	0.02 (1.19)	0.01 (0.56)	0.03* (1.88)	0.05*** (2.64)	0.02 (1.17)	0.01 (0.56)	0.03 (1.46)	0.03 (1.20)	0.04* (1.95)	-0.04 (-0.22)	0.04 (1.60)	0.02 (1.06)
<i>period_8</i>	-0.001 (-0.06)	-0.003 (-0.33)	0.01 (0.60)	0.03** (2.06)	-0.001 (-0.07)	-0.003 (-0.32)	0.001 (0.12)	0.01 (0.85)	0.02 (1.04)	-0.02 (-1.58)	0.01 (0.76)	0.005 (0.27)
<i>period_9</i>	-0.04*** (-2.86)	-0.03** (-2.40)	-0.02 (-1.44)	-0.01 (-1.04)	-0.04*** (-3.01)	-0.03** (-2.40)	-0.03*** (-2.61)	-0.02* (-1.81)	-0.03 (-1.58)	-0.04*** (-2.86)	-0.02 (-1.30)	-0.03 (-1.39)
<i>period_10</i>	-0.01 (-0.36)	-0.003 (-0.22)	0.01 (1.02)	0.01 (0.48)	-0.01 (-0.48)	-0.003 (-0.22)	0.0003 (0.03)	0.0005 (0.04)	0.001 (0.03)	-0.01 (-0.85)	0.01 (0.73)	-0.001 (-0.07)
<i>period_11</i>	-0.01 (-1.00)	-0.01 (-1.29)	0.004 (0.76)	0.001 (0.15)	-0.01 (-1.16)	-0.01 (-1.28)	0.001 (0.27)	-0.002 (-0.46)	0.003 (0.23)	-0.01** (-2.13)	0.002 (0.16)	-0.01 (-0.90)
Observations	152	152	152	152	152	152	152	152	152	152	152	152
Hansen <i>J</i> -statistic	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AR(1)	0.02	0.01	0.06	0.02	0.01	0.01	0.08	0.02	0.01	0.01	0.01	0.02
AR(2)	0.24	0.71	0.38	0.07	0.26	0.71	0.17	0.10	0.07	0.80	0.13	0.05

Notes: z-statistics in parentheses are based on robust standard errors. The *p*-values of the AR(1), AR(2) and Hansen *J* statistics are reported.

\*\*\*Statistical significance at the 1% level; \*\*statistical significance at the 5% level.

integrated sub-national politics. On the other hand, low levels of party system nationalization are likely to be linked with more political and territorial fragmentation (Rodden, 2002). Both variables are certainly related to the system of sub-national taxes and revenues and intergovernmental grants adopted by the various countries.

Admittedly, these may not be perfectly valid instruments because perfectly appropriate instruments probably do not exist in this context (for a review on this issue, see Lago-Penas, Martinez-Vazquez, & Sacchi, 2015). However, they may not be directly related to the volatility of local spending (and thus to the error term), while they should be more directly correlated with that of the revenue sources used by the local governments. For example, the regional authority index will be directly related to the structure of grants versus own revenues in each country not only depending on how much regional representatives co-determine the distribution of national tax revenues (captured by the fiscal control dimension of *RAI*), but also as far as they can independently tax their population (captured by the fiscal autonomy dimension of *RAI*; Hooghe, Marks, Schakel, Chapman, Niedzwiecki, & Shair-Rosenfield, 2015). At the same time, *RAI* should not be directly linked to the volatility of local spending. The same can be said for the *PSNS* index that controls for country-level policies and legislative behaviour, again affecting the design of grants and own revenues across territories (Lago-Penas & Lago-Penas, 2009).

Basically, the general idea is to exploit the fact that the right-hand-side contains the volatility of various revenue sources manoeuvred both at the local level (taxes on income, goods and services, and property) and at the national one (grants), while the left-hand-side only considers the volatility of local spending. The diagnostic tests reported at the bottom of Table 2 seem mostly to support this identification strategy, with only minor problems detected in a couple of specifications by the AR(2) test. The AR(1) never indicate any issue, and the Hansen *J*-statistic never rejects the validity of the instruments, suggesting that these new estimates are sound.<sup>14</sup>

The estimates of the dynamic models dealing with potential endogeneity confirm the initial results relative to property taxes and intergovernmental grants. The signs of the coefficients estimated with the system-GMM estimator are in all cases in line with those of the estimates reported in Tables 1 and A2 in Appendix A in the supplemental data online. The main differences between the two sets of results lie in the magnitude of such coefficients, which in some cases are lower when dealing with endogeneity. With regards to the volatility of property taxes, the lowest (in absolute terms) estimate of  $-0.09$  suggests that the elasticity could be as low as  $-0.19$  (versus the  $-0.28$  to  $-0.37$  range estimated previously). As for grants' volatility, the new estimates suggest that its elasticity could be as low as  $0.48$  (when the estimated coefficient is equal to  $0.28$ ), a bit lower than the one arising from the OLS and FE estimates. In most of the cases, however, the magnitude of the coefficient is not significantly different from the one of the

initial estimates, suggesting that the potential endogeneity bias should be low, if present at all.

Finally, in many of the specifications the period dummies coefficients are statistically significant, and positive in all cases. Since the omitted period dummy is the first one in all cases, local spending has consistently been more volatile in the more recent part of the time span than in the first half of the 1970s. The inclusion of macroeconomic and demographic controls in specification B permits one to comment on some additional findings. There is mixed evidence regarding the relationship between local spending volatility and trade openness, and weak evidence of a negative one of the former with population and population density. In many cases the coefficients of those variables are not statistically different from zero at standard confidence levels. Existing evidence on aggregate government size (which obviously includes local spending) seems to suggest that more open economies should experience lower spending volatility: Rodrik (1998) states that more open economies have bigger governments, and Furceri and Poplawski-Ribeiro (2009) find a negative relationship between government size and spending volatility. The weakly negative relationship between population and local spending volatility is supported by the evidence of Furceri and Poplawski-Ribeiro (2009) regarding aggregate spending volatility.

In essence, the results prove the positive relationship between local spending volatility and grants volatility, as well as the negative relationship between the former and the volatility of local property taxes. On the other hand, there are no robust linkages between local spending volatility and income taxes and those on goods and services: coefficients are mostly positive, like those of grants, but they are not statistically significant at standard levels. Thus, when local governments finance their spending with revenues over which they do not exert much control (and for which they are not held responsible for), the volatility of local expenditure increases, especially in the case of grants. This result seems to be consistent with the common-pool hypothesis and with some moral hazard on the part of local politicians when facing soft budget constraints, as in the case of grants financing. Money transfers from other levels of government (especially those not earmarked, that is not to be used for specific purposes) are likely to be spent with more discretion and fickleness. As Bird and Slack (2013, p. 9) put it: 'it is always easier and more pleasant to spend [...] "other people's money" in an unaccountable (and hence inevitably somewhat irresponsible) fashion'.

On the other hand, money from local taxpayers collected on taxes more respondent to the benefit principle of taxation (like that stemming from property taxes) is more likely to be spent constructively, with a closer link with local spending, resulting in its lower volatility.

## SUMMARY AND CONCLUSIONS

This paper studies what affects the volatility of sub-central public spending in 20 OECD countries. The analysis shows that there are significant linkages between the

volatility of sub-central public spending and that of the various local revenue sources, and that there are important differences among revenues. In particular, while volatile intergovernmental grants lead to volatile local public spending, the opposite is true in the case of property taxes.

These results suggest that local expenditure turns out to be less stable when it is financed with transfers from other government tiers. The underlying reason is that local decision-makers have more incentives to spend their own tax resources better than those of the *common pool* of national funds. This result fits well with the public choice theory on fiscal federalism (Brennan & Buchanan, 1980); suggesting that local politicians – normally not benevolent – may misbehave by competing according to their own objective functions and have an ‘irresponsible’ spending behaviour when there is not enough accountability of their financing mechanisms to local voters. As a matter of fact, property taxes are envisaged to work in favour of accountability and this is confirmed by the fact that they can be relied upon to attenuate the volatility of local expenditure and induce responsible spending patterns.

This evidence on intergovernmental grants and on property taxes suggests that future local property taxation reforms in OECD countries should not be independent of changes in the transfer system. The two issues are inevitably linked, so that supporting and encouraging local accountability necessarily accompanies with some realignment of functions and finances between levels of government (see, recently, Slack & Bird, 2014).

More generally, the results have relevant policy implications within the realm of intergovernmental relationships. It is not uncommon for central governments to decide over decentralized tax and grant policies taking into account the existence and strength of different regional factions. For example, when sub-national identity differences emerge (many political movements are demanding more local and regional empowerment in many developed countries; Keating & Loughlin, 1996), central governments are reluctant to give tax autonomy to sub-national tiers and grants seem an appealing way to limit the growth of the within-country differences. However, this strategy may adversely affect local spending stability.

The power relations between central and sub-central levels of government are crucial in determining the tax-grant balance and, consequently, the degree of local autonomy. For example, according to Oates (2001), limitations on property taxes in the United States have weakened the role of such revenues in encouraging efficient budgetary decisions resulting in an increase of intergovernmental transfers. This suggests that local autonomy over tax rates is particularly important in countries where upper levels of government determine the tax base. More in general, it seems that the possibility of having negotiations about fiscal tasks and competences between central and sub-central governments without stringent legal requirements may allow the latter to become more autonomous and more accountable to citizens, with positive effects on the stability of sub-central expenditure.

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## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

## SUPPLEMENTAL DATA

Supplemental data for this article can be accessed at <http://10.1080/00343404.2015.1111512>

## NOTES

1. Although local tax systems differ across countries, experts agree that property taxes are the easiest to assign to sub-national governments (Lotz, 2006). McCluskey, Cornia, and Walters (2012) provide a thorough analysis of local taxation, with a particular focus on property taxes.
2. It might be thought that housing prices booms and busts such as those experienced by a number of countries in the recent decade may render property tax revenues highly volatile, however the empirical evidence does not support this idea (Lutz et al., 2011; Doerner & Ihlanfeldt, 2011).
3. There is a rich strand of literature dealing with the political determinants of intergovernmental grants as well (e.g., Veiga & Pinho, 2007, and related articles).
4. The countries are the following: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the UK and the United States. The sample starts in 1972 and ends in 2007, therefore it includes 36 years. This means that there are 12 three-year periods, nine four-year periods, and seven five-year periods (in the latter case, the first period spans from 1972 to 1977; the rest of the periods are regular five-year periods).
5. Afonso and Furceri (2010) use the GDP deflator in order not to eliminate any growth in government spending that takes the form of an increase in the relative price of public sector outputs. Also, there are no well-defined deflators for the series used here.
6. Local non-tax revenues and capital revenues have not been considered as they are recorded irregularly. Also note that sub-central levels of government include local,

regional, provincial and state (when existing) governments, as opposed to central government. Treating several tiers of government as equal by aggregating all sub-central units into a single group may seem over-simplistic, but a further horizontal disaggregation would pose cross-country comparability issues and would damage the actual data coverage.

7. Not only on average are there few differences between regions receiving different amounts of transfers but also there are many examples of regions/states receiving vastly different amounts of grants and exhibiting similar expenditure volatility. Moreover, the positive correlation between the volatility of grants and that of regional/state spending found with country-level data (see the fourth section) is also present at the sub-national level. Thus, while a sub-national level analysis could certainly offer interesting findings, it is the belief of the authors that a cross-country analysis is capable of yielding meaningful insights. In addition, given the importance and the development of decentralization reforms worldwide – both in unitary and federal countries – it is essential not to limit the analysis to a specific case study (whose feasibility is necessarily driven by regional/local data availability). In fact, it is not easy to find sub-national data for decent time spans for many countries. As an example, Foremny (2014) also uses data at the country level to examine empirically an inherently sub-national issue, namely how fiscal rules and tax autonomy influence deficits of sub-national governments across European countries over the period 1995–2008.

8. The Sargan–Hansen statistics (not reported, but available from the authors upon request) support the choice of the FE rather than the random effects estimator.

9. The Pesaran (2004) CD test indicates that residuals are cross-sectionally correlated and the error term is likely to be serially correlated as well (results are not reported but are available from the authors upon request).

10. The use of system-GMM is generally recommended over first-difference GMM (due to conceptual and statistical shortcomings, such as lagged levels being poor instruments for first-differenced variables; Jacome, Sedik, & Townsend, 2012), especially when the variables' frequency is in multi-year averages and the time dimension is necessarily small. Results obtained with the one-step GMM estimator are reported; it is more reliable for finite sample inference as the asymptotic standard errors of the two-step GMM estimator can be biased downwards (Blundell & Bond, 1998; Bond, Hoeffler, & Temple, 2001; Madariaga & Poncet, 2007).

11. In most OECD countries some components of the property tax base pertain to central government, for example, taxes on inheritances and gifts, and financial and capital transaction taxes. However, property taxation does not occupy a central position in the overall revenue systems of such countries, while it contributes significantly to the financing of sub-national governments (Presbitero et al., 2014).

12. For example, the number of instruments is halved to 55 with the 'collapse' option using model A without external instruments.

13. In essence, in a perfect nationalized party system there is exactly the same electoral supply everywhere in the country, whereas in an extreme denationalized system each constituency has its own set of local and regional parties.

14. Government fragmentation (measured by the ratio of the number of lower tiers of government and population density) has also been used as an external instrument. Results (not reported but available from the authors upon request) confirm the main results obtained with the other two external instruments. However, government fragmentation is characterized by lower time variability with respect to *RAI* and *PSNS* in the sample, so it is less appealing as an instrument for local revenues' volatility. The same is true for other factors such as geographical ones (e.g., land area) and institutional aspects of a country (e.g., democratization, legal origins) that have been used in the past as instruments for fiscal decentralization.

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