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

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Abstract

We study what affects the volatility of sub-central public spending in 20 OECD countries, extending the literature that has mainly investigated the determinants of either the volatility of aggregate spending or of sub-central government size. The evidence based on data spanning 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 can adversely affect the stability of their spending, while allowing them to autonomously levy taxes relying on responsive tax bases, such as those on property, provides incentives to smooth their expenditure.

Keywords: *local spending volatility, local revenues, property taxes, intergovernmental grants.*

JEL classification: E62, H71, H77, R50

1. 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 (Stigler 1957; Musgrave 1959; Oates 1972; Rodríguez-Pose and Gill 2005), and possibly boosting economic growth (Martinez-Vazquez and McNab 2003, Hammond and 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 (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 the central government (OECD 2006a, 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 (Shah 1998; Mc-Lure and Martinez-Vazquez 2000), and can affect the economic implications of the decentralization process.

First, decentralization is thought to be less effective when local governments[1] rely on transfers and grants rather than 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; Oates and Schwab 1988). More autonomy is likely to lead to better local services (Hoffman and Gibson 2005) and possibly to a sounder development path over time (Sokoloff and Zolt 2006; Sorens 2014). Second, as pointed out by Ashworth et al. (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.

[1] The terms "local", "sub-national", and "sub-central" are used interchangeably throughout the paper.

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 light of its potential effects on the economy, as suggested by the literature on aggregate spending volatility. On one hand, the latter may have detrimental effects on economic growth and welfare (Fatas and Mihov 2003, 2005; Furceri 2007; Loayza et al. 2007; Afonso and Furceri 2010); on the other hand, it may be beneficial to smooth out business cycle fluctuations (Furceri and 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 and 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 et al. (2014) find 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.

We contribute to the existing literature along the following lines. We study 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. We further break down the latter 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)[2]; 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 (Zax 1988), economic performance (Karras and Furceri 2009), and fiscal

[2] Although local tax systems differ across countries, experts agree that property taxes are the easiest to assign to sub-national governments (Lotz 2006). McCluskey et al. (2012) provide a thorough analysis of local taxation, with a particular focus on property taxes.

discipline (Presbitero et al. 2014). Although most studies conclude favorably on the utilization of property taxes (Charbit 2010, Bell et al. 2010)[3], 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 and Hoxby 2012).

Our empirical model analyzes the determinants of local spending volatility, and its main explanatory variables deal with the revenue mix of the local governments. We also take into account potential endogeneity issues that may arise given the interdependency of the revenue and expenditure decisions. The main results, based on a sample of 20 OECD countries over the 1972-2007 period, 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. This seems to be in line with the findings of Glaeser (1996) who points out that property taxes provide incentives for adequate and efficient local public goods provision (see also Borge and Rattso 2008; Fiva and Ronning 2008). 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.

The remainder of the paper is organized as follows. In Section 2 there is a brief review of the two strands of literature that this paper builds upon, and some hypotheses are drawn as a basis for the empirical analysis. Section 3 illustrates the empirical strategy and the data, while section 4 contains the results of the analysis. Finally, section 5 concludes and provides some policy implications.

[3] Dye and England (2009) offer an interesting analysis on land value taxation which can be considered as an alternative to the property tax (Boyd 2011).

2. Review of related literature

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

2.1 Fiscal decentralisation 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 and Salotti 2014b). These financing requirements are usually met with a mix of own and shared taxes, and intergovernmental grants. 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 (see, among others, 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 (Jin and Zou 2002, Cassette and Paty 2010; see Golem 2010 for a review).

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, not all types of local taxes tend to constrain sub-central government spending over GDP: 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, i.e. on tax bases used solely by local governments (OECD 1999). Thus, local governments enjoy higher degrees of autonomy and responsibility over property taxes (Bordignon and Minelli 2001), which

explains their different economic consequences with respect to the other types of taxes (Slack and Bird 2014).

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 that attract capital and labor and reduce the wastage of resources. 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 and Rattso 2008; Fiva and Ronning 2008; Crowley and Sobel 2011). 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. Put differently, property values would increase to the extent that benefits and taxes are capitalized into property values (Fischel 2001).[4]

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. This reduces the tax competition that may arise in the case of mobile tax bases (Eyraud, 2014). The reliability of property tax revenues also lies in the legally defined value of properties (Brunori 2003; Giertz 2006; Alm et al. 2011; Doerner and Ihlanfeldt 2011; Lutz et al. 2011). There are other factors reducing the cyclicality of local revenues arising from property taxes: for instance, Lutz et al. (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).[5]

Our 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 (OECD 2012, Sacchi and Salotti 2014a). The lack of correspondence between local taxes and

[4] On the other hand, according to the renter illusion hypothesis (Dollery and Worthington 2006), renters underestimate the property tax burden and support excessive levels of local expenditure. However, Blom-Hansen (2005) convincingly argues against the validity of such hypothesis.

[5] One may think 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: both Lutz et al. (2011) and Doerner and Ihlanfeldt (2011) demonstrate that property tax revenues do not tend to decrease following house price declines.

local expenditures is made up for by transfers from upper government tiers. As argued by Ashworth et al. (2013), grants and revenue sharing programs 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. If local governments do not finance services themselves, the connection between expenditures and revenues is lost and the choice of services will not be based on an accurate perception of their cost (Bird and Slack 2013).

Thus, expenditure decentralization without corresponding local taxing powers is likely to neither generate beneficial tax competition among government levels, nor solve principal-agent problems between residents and local representatives (Rodden et al. 2003; Rodden 2003; Devarajan et al. 2009; Khemani 2010).[6]

Given the findings illustrated above, *we posit the following hypotheses*:

H_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, we further develop hypothesis H_1 as follows:

H_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;

H_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 differ from that over shared taxes: property taxes usually pertain to the former group, while income and consumption taxes to the latter. Thus:

H_{3a}. H_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.

Our empirical analysis is constructed so to be able to test the above hypotheses, therefore it analyses how the volatility of intergovernmental grants and local taxes (further disaggregated into property, income, and consumption taxes) influences the volatility of local

[6] The importance of the vertical imbalance is also proved by the many empirical findings differing depending on the use of expenditure versus tax decentralization series (e.g., Afonso and Hauptmeier 2009; Escolano et al. 2012; Gemmell et al. 2013).

expenditure. The general framework used builds on the literature on spending volatility reviewed in the following sub-section.

2.2 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, to the best of our knowledge, no effort has been made to deal with the determinants of local spending volatility as we do in our paper. Therefore, we can only partially rely on, and take advantage from, the existing studies on spending volatility for our analysis. 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 literature offers a few studies on the determinants of aggregate government spending volatility. Furceri and 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 (Rodrik 1998, Fatás and Mihov 2003, 2005) suggests that both demographic (e.g., the urbanization rate, and population density) and macroeconomic (e.g., GDP per capita, openness, and inflation) factors may potentially affect government consumption volatility. In general, the level of development is thought to crucially affect the latter, with low-income economies experiencing higher volatility than high-income ones (Furceri et al. 2014). Given that our analysis deals with developed countries only (and that it concentrates on the volatility of local, rather than aggregate, spending), we do not expect such variables to play particularly crucial roles, but we still include them 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 and Zou 2002; 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 and Sachs 1989, Poterba 1995, Lane 2003), and therefore more macroeconomic instability.

3. The empirical strategy

We use data for 20 OECD countries over the period 1972-2007 organized in three different multi-year frequencies, i.e. 3-year, 4-year, and 5-year non-overlapping periods, used alternatively for robustness purposes.[7] The use of multi-year periods is necessary in order to be able to measure our 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 we measure the volatility of those variables). We use 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:

$$\sigma_{i,[t,t+x]}^{local\_G} = \alpha_{i,0} + \alpha_{i,1}\sigma_{i,[t,t+x]}^{IT} + \alpha_{i,2}\sigma_{i,[t,t+x]}^{GST} + \alpha_{i,3}\sigma_{i,[t,t+x]}^{PT} + \alpha_{i,1}\sigma_{i,[t,t+x]}^{GR} + \boldsymbol{\beta}_{i,j}^{'}\mathbf{controls}_{i,t} + \tau_t + u_{i,t}, \quad (1)$$

where $\sigma_{i,[t,t+x]}^{local\_G}$ stands for local spending volatility, which is defined as the standard deviation 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 ($\sigma_{i,[t,t+x]}^{IT}$), sub-central taxes on goods and services ($\sigma_{i,[t,t+x]}^{GST}$), sub-central property taxes ($\sigma_{i,[t,t+x]}^{PT}$), and intergovernmental grants ($\sigma_{i,[t,t+x]}^{GR}$). All fiscal variables are converted into real terms using the GDP deflator.[8]

Country fixed effects ($\alpha_{i,0}$) are included to control for time-invariant country-specific characteristics (such as the countries being federal); period dummies (τ_t) are included in order to control for period-specific events that may potentially affect more than one country at the same time; $u_{i,t}$ is the disturbance term

[7] 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 United Kingdom, and the United States. The sample starts in 1972 and ends in 2007, therefore it includes 36 years. This means that there are twelve 3-year periods, nine 4-year periods, and seven 5-year periods (in the latter case, the first period spans from 1972 to 1977, and the rest of the periods are regular 5-year periods).

[8] We follow Afonso and Furceri (2010) on this, who 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 that we are using here.

The volatility of the various revenues of sub-central governments is our main object of interest. The inclusion of the four variables controlling for that permits us to test the hypotheses laid out in sub-section 2.1 on the relationships between the volatility of local expenditure and the (in)stability of the main revenue streams used to finance it.[9] Table 1 contains the simple pairwise correlations among the series measuring the volatility of local spending and of the various sources of local revenues. The correlations obtained from the data at the three different period frequencies used in the analysis suggest that measuring the series over different periods does not fundamentally alter the relationships among the variables. Values in Table 1 demonstrate that there is a strong positive correlation between the volatility of local spending and that of intergovernmental grants. The correlation is always very high (between 0.67 and 0.73) and statistically significant. This seems to indicate that having to rely on grants (mainly from the central government, OECD 2006a) may adversely affect the stability of sub-central spending. As for the other sources of revenues, i.e. different local taxes, the correlations with spending volatility are in all cases much lower (being at most equal to 0.22), and in most cases they are not statistically significant at standard levels.

The econometric analysis will yield more sophisticated results to better understand the type of relationships characterizing the variables we are interested in. The shaded area of Table 1 illustrates how the revenue side variables are correlated with each other. 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. Also, the small correlation coefficients prove that the inclusion of the revenue variables on the right-hand-side of equation (1) does not pose multicollinearity problems.

INSERT TABLE 1 ABOUT HERE

In addition to estimating the parsimonious specification A of model (1), we also estimate specification B of the model which includes the **controls** vector containing the following: a) $pop_{i,t}$ stands for the logarithm of total population, commonly used as a measure of country size (e.g., Alesina and Wacziarg 1998); b) $urb_{i,t}$ stands for urbanization measured by the percentage of urban population over the total population; c) $pop\_dens_{i,t}$ is population

[9] 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 the central government (for similar types of analysis see, among others, Dziobek et al. 2011). The fact that we treat 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.

density; d) $gdp_{i,t}$ is the logarithm of real GDP per capita; e) $inflation_{i,t}$ is inflation calculated from the GDP deflator; f) $open_{i,t}$ 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. However, given that we focus on a panel of advanced economies (differently from most of the literature on aggregate spending volatility that employs large panels of both developing and developed countries), and that the dependent variable of our model only captures local spending volatility, it is unclear which expected effects could be associated with those controls, if any. All the control variables are taken at time *t*, i.e. at the beginning of the multi-year periods, in order to deal with potential reverse causality issues (for similar applications see, among others, Furceri and Zdzienicka 2012).

We estimate the two specifications of model (1) using the following estimators: OLS with clustered standard errors, Fixed Effects (FE)[10] with heteroskedasticity-robust standard errors, and FE with the standard errors robust to heteroskedasticity, autocorrelation, and cross-sectional dependence (Driscoll and Kraay 1998).[11] In all cases, we use data at the three different multi-year frequencies introduced above. We finally check the robustness of the results by estimating a dynamic version of model (1) with the system-GMM (Blundell and Bond 1998) to account for potential endogeneity issues concerning the revenue-side variables in relation to the volatility of local expenditure.

4. Results

This section is organized in two parts. Sub-section 4.1 illustrates the OLS and FE estimates of the two specifications of model (1). Sub-section 4.2 deals with the additional estimates carried out to take care of potential endogeneity issues.

4.1 Benchmark estimates

Table 2 contains the estimated coefficients of the variables included in specification A of the empirical model.

[10] The Sargan-Hansen statistics (not reported but available upon request) support the choice of the FE rather than the random effects estimator.

[11] 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 not reported but available upon request).

INSERT TABLE 2 ABOUT HERE

The first thing to notice is that results are remarkably consistent across the various batteries of estimates, which differ in terms of estimators and data frequency. We interpret this fact as a sign of robustness and consistency of the results. Turning to the hypotheses that we formulated in Section 2, H_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 H_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 0.41/0.46 range depending on both the estimator and the frequency of the data used. Since model (1) is linear, this implies an elasticity of 0.79/0.85 for average values of the variables ($\sigma^{local\_G}_{i,[t,t+x]}$ and $\sigma^{GR}_{i,[t,t+x]}$), which proves the economic importance of the relationship. This means that when the volatility of grants increases by one percentage point, sub-central expenditure becomes more volatile by between 0.79 and 0.85 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 -0.14 and -0.16. 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 -0.34. 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; Doerner and Ihlanfeldt 2011; Lutz et al. 2011; Norregaard 2013).[12]

[12] In most OECD countries some components of the property tax base pertain to the central government, e.g. taxes on inheritances and gifts, and financial and capital transaction taxes. However, property taxation does not

On the other hand, the coefficient associated with the volatility of local income and sales' taxes are 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 favoring government spending stability. In terms of our expectations, hypothesis H_{3a} - related to property taxes - is fully confirmed.

Of all our hypotheses, H_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.

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 sample period than in the first half of the Seventies.

A natural question is whether those results hold when controlling for additional macroeconomic and demographic variables. Table 3 reports the estimates based on specification B of model (1) in order to address this issue.

INSERT TABLE 3 ABOUT HERE

The evidence provided by Table 3 confirms all the above findings. In addition to that, there seems to be weak evidence of a negative relationship between local spending volatility and trade openness, and a negative one of the former with population. When the coefficients of those controls are statistically significant, they are negative. However, in many cases they are not statistically different from zero at standard confidence levels. The fact that more open economies seem to experience lower local spending volatility seems consistent with the existing evidence on aggregate government size (which obviously includes local spending): Rodrik (1998) states that more open economies have bigger governments, and Furceri and Ribeiro (2009) find a negative relationship between government size and spending volatility. On the other hand, the positive relationship between population and local spending volatility goes against the evidence of Furceri and Ribeiro (2009) regarding aggregate spending

occupy a central position in the overall revenue systems of such countries, while it contributes significantly to the financing of sub-national governments (see Presbitero et al. 2014).

volatility. The fact that negative coefficients are associated to population density (although seldom statistically significant) seems to partially reconcile those contrasting findings.

Thus, the results in Table 3 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. The lack of strong linkages between the dependent variable and local income taxes and those on goods and services is also confirmed: 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. On the other hand, when local governments finance their spending with own taxes, particularly with property taxes, the result is a lower spending volatility.

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, 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."

This can give rise to resource waste and inefficiency, as well as to higher spending volatility as proved by our analysis. 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.

4.2 Robustness checks

This sub-section deals with potential endogeneity issues. Indeed, it is possible to conceive that 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 maneuvering the taxes that 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.

The estimates presented in Table 4 take into account all those possibilities. Dynamic versions of specifications A and B of model (1) obtained by adding the lagged dependent variable to the sets of regressors are re-estimated with the system-GMM estimator. The lagged dependent variable and the revenue-side explanatory variables are instrumented with their own second lags (in the case of specification B we treat as predetermined the rest of the explanatory variables of the model by using them as instruments in the level equation) as valid external instruments are unavailable.[13] Given the requisites in terms of number of observations of the chosen estimator, Table 4 only contains the results obtained using the 3-year periods. We report the results obtained with the one-step GMM estimator which is more reliable for finite sample inference as the asymptotic standard errors of the two-step GMM estimator can be biased downwards (Bond et al. 2001).

INSERT TABLE 4 ABOUT HERE

The estimates of the dynamic models dealing with potential endogeneity confirm once again the main results relative to property taxes and intergovernmental grants. The coefficients estimated with the system-GMM estimator are in all cases in line those of the estimates of the previous sub-section. The AR(1) and AR(2) tests do not indicate any issue with the estimates, and the Hansen *J* statistic never rejects the validity of the instruments, suggesting that these new estimates are sound. Thus, the comments based on the benchmark estimates presented in sub-section 4.1 remain valid even when controlling for potential endogeneity issues, and even the magnitudes of the coefficients involved are robust to our taking into account potential endogeneity.

5. Summary and conclusions

The recent economic literature has investigated the determinants of aggregate spending volatility, given its relevant effects on the economic performance and welfare (Fatas and Mihov 2003 and 2005, Furceri 2007, Afonso and Furceri 2008, Loayza et al. 2007). In this paper we contribute to this line of research by focusing on the sub-central levels of government whose importance has constantly increased in the recent decades due to widespread decentralization reforms. In particular, we analyze the volatility of local public spending in 20 OECD countries over the period 1972-2007.

[13] Results do not change when changing the number of lags used as instruments.

Our focus is on the role of the revenues used by sub-central governments, that is intergovernmental grants and the three main types of taxes they normally levy on their residents, *i.e.* on income, on goods and services, and on property. This disaggregation is relevant as local governments exert different degrees of autonomy over those different revenues, highest for property taxes, and lower for shared and piggybacked taxes, and grants (Blöchliger and Petzold 2009). Overall, this suggests that such instruments can be used differently by governments, with different consequences in terms of efficiency and accountability.

The estimates presented in the paper, including those tackling potential endogeneity issues, lead to the following results: there are significant linkages between the volatility of sub-central public spending and that of the various local revenue sources. There are important differences among revenues, in particular between own taxes and revenues over which sub-national governments cannot exert much control, *i.e.* shared taxes and, above all, intergovernmental grants. 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 better spend their own tax resources than those of the *common pool* of national funds (Shah 1998; Weingast 2009; Boetti et al. 2012). This result fits well with the public choice theory on fiscal federalism (Brennan and Buchanan 1980; Salmon 1987; Breton 1987) suggesting that local politicians – normally not benevolent – may misbehave by competing according to their own objective functions and have an "irresponsible" spending behavior 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 favor 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.

Our 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 and Bird 2014).

More generally, our 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 and 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 US 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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Tables

Table 1. Correlations between local spending volatility and the volatility of local revenues

3-y	$\sigma^{local\_G}_{i,[t,t+x]}$	$\sigma^{IT}_{i,[t,t+x]}$	$\sigma^{GST}_{i,[t,t+x]}$	$\sigma^{PT}_{i,[t,t+x]}$	$\sigma^{GR}_{i,[t,t+x]}$
$\sigma^{local\_G}_{i,[t,t+x]}$	1.00				
$\sigma^{IT}_{i,[t,t+x]}$	0.22***	1.00			
$\sigma^{GST}_{i,[t,t+x]}$	0.13*	0.33***	1.00		
$\sigma^{PT}_{i,[t,t+x]}$	0.08	0.34***	0.07	1.00	
$\sigma^{GR}_{i,[t,t+x]}$	0.69***	0.19***	0.03	0.27***	1.00
4-y	$\sigma^{local\_G}_{i,[t,t+x]}$	$\sigma^{IT}_{i,[t,t+x]}$	$\sigma^{GST}_{i,[t,t+x]}$	$\sigma^{PT}_{i,[t,t+x]}$	$\sigma^{GR}_{i,[t,t+x]}$
$\sigma^{local\_G}_{i,[t,t+x]}$	1.00				
$\sigma^{IT}_{i,[t,t+x]}$	0.16*	1.00			
$\sigma^{GST}_{i,[t,t+x]}$	0.07	0.33***	1.00		
$\sigma^{PT}_{i,[t,t+x]}$	0.04	0.35***	0.03	1.00	
$\sigma^{GR}_{i,[t,t+x]}$	0.67***	0.21**	0.06	0.33***	1.00
5-y	$\sigma^{local\_G}_{i,[t,t+x]}$	$\sigma^{IT}_{i,[t,t+x]}$	$\sigma^{GST}_{i,[t,t+x]}$	$\sigma^{PT}_{i,[t,t+x]}$	$\sigma^{GR}_{i,[t,t+x]}$
$\sigma^{local\_G}_{i,[t,t+x]}$	1.00				
$\sigma^{IT}_{i,[t,t+x]}$	0.22**	1.00			
$\sigma^{GST}_{i,[t,t+x]}$	0.14	0.32***	1.00		
$\sigma^{PT}_{i,[t,t+x]}$	0.09	0.32***	0.06	1.00	
$\sigma^{GR}_{i,[t,t+x]}$	0.73***	0.20**	0.05	0.25***	1.00

Note: ***, **, and * indicate statistical significance at 1, 5, and 10%, respectively.

Table 2. Model A: OLS, FE, FE-DK estimates, three different period frequencies

Variables/ estimator	3-year periods			4-year periods			5-year periods		
	OLS	FE	FE-DK	OLS	FE	FE-DK	OLS	FE	FE-DK
$\sigma^{IT}_{i,[t,t+x]}$	0.07**	0.02	0.02	0.04*	0.01	0.01	0.07*	0.01	0.01
	(2.21)	(0.48)	(0.96)	(1.77)	(0.51)	(0.29)	(1.87)	(0.13)	(0.15)
$\sigma^{PT}_{i,[t,t+x]}$	-0.14***	-0.14***	-0.14***	-0.15**	-0.14***	-0.14**	-0.14***	-0.16***	-0.16***
	(-2.98)	(-3.12)	(-2.72)	(2.55)	(-2.87)	(-2.44)	(-2.75)	(-3.10)	(-2.93)
$\sigma^{GST}_{i,[t,t+x]}$	0.02**	0.02**	0.02*	0.001	-0.003	-0.003	0.02**	0.02***	0.02***
	(2.03)	(2.16)	(1.73)	(0.14)	(-0.59)	(-0.45)	(2.11)	(2.89)	(3.46)
$\sigma^{GR}_{i,[t,t+x]}$	0.41***	0.42***	0.42***	0.41***	0.42***	0.42***	0.45***	0.46***	0.46***
	(3.54)	(3.70)	(4.58)	(3.31)	(3.57)	(3.82)	(4.45)	(5.00)	(6.58)
period_2	0.04	0.04	0.04***	0.04	0.05	0.05***	0.07*	0.07**	0.07***
	(0.79)	(0.74)	(5.44)	(0.89)	(1.04)	(3.82)	(1.74)	(1.97)	(11.38)
period_3	0.12*	0.11**	0.11***	0.07	0.08	0.08***	0.05	0.05*	0.05***
	(1.95)	(2.11)	(11.68)	(1.36)	(1.49)	(4.27)	(1.56)	(1.78)	(4.76)
period_4	0.07	0.06	0.06***	0.04	0.05	0.05**	0.05	0.05	0.05***
	(1.30)	(1.29)	(5.46)	(0.94)	(1.08)	(2.52)	(1.39)	(1.40)	(9.95)
period_5	0.05	0.05	0.05***	0.06	0.07	0.07***	0.03	0.03	0.03***
	(0.95)	(0.96)	(3.27)	(1.20)	(1.33)	(9.69)	(0.84)	(0.96)	(3.33)
period_6	0.07	0.07	0.07***	0.05	0.06	0.06***	0.02	0.02	0.02***
	(1.45)	(1.59)	(14.61)	(1.11)	(1.27)	(3.07)	(0.72)	(0.67)	(3.03)
period_7	0.07	0.07	0.07***	0.02	0.03	0.03*	0.04	0.04	0.04***
	(1.29)	(1.33)	(2.94)	(0.42)	(0.52)	(1.76)	(1.14)	(1.04)	(3.32)
period_8	0.06	0.06	0.06***	0.05	0.06	0.06***			
	(1.08)	(1.19	(3.54)	(0.98)	(1.07)	(3.07)			
period_9	0.03	0.03	0.03***	0.05	0.05	0.05**			
	(0.59)	(0.59)	(2.97)	(0.93)	(0.95)	(2.37)			
period_10	0.06	0.05	0.05***						
	(1.08)	(1.09)	(4.21)						
period_11	0.05	0.05	0.05***						
	(1.06)	(1.10)	(3.91)						
period_12	0.06	0.05	0.05***						
	(1.18)	(1.12)	(3.81)						
Observations	162	162	162	121	121	121	105	105	105
R-squared	0.63	0.64	0.64	0.65	0.69	0.69	0.67	0.69	0.69

Note: ***, **, and * indicate statistical significance at 1, 5, and 10%, respectively. *t*-statistics in parentheses based on clustered standard errors (OLS), robust standard errors (FE), and Driscoll-Kraay standard errors (FE-DK). Country fixed effects included in the FE and FE-DK estimates, but not reported.

Table 3. Model B: OLS, FE, FE-DK estimates, three different period frequencies

Variables/	3-year periods			4-year periods			5-year periods		
estimator	OLS	FE	FE-DK	OLS	FE	FE-DK	OLS	FE	FE-DK
$\sigma^{IT}_{i,[t,t+x]}$	0.04	0.02	0.02	0.03	0.01	0.01	0.03	0.0002	0.0002
	(0.75)	(0.62)	(1.40)	(1.14)	(0.22)	(0.09)	(0.48)	(0.00)	(0.00)
$\sigma^{PT}_{i,[t,t+x]}$	-0.13***	-0.14***	-0.14***	-0.14***	-0.14***	-0.14***	-0.14**	-0.17***	-0.17***
	(-2.94)	(-3.34)	(-2.93)	(-2.60)	(-3.39)	(-2.90)	(2.55)	(-3.37)	(-3.13)
$\sigma^{GST}_{i,[t,t+x]}$	0.02**	0.02**	0.02	-0.001	0.002	0.002	0.02**	0.03**	0.03***
	(2.45)	(2.03)	(1.56)	(-0.10)	(0.17)	(0.17)	(2.15)	(2.51)	(2.74)
$\sigma^{GR}_{i,[t,t+x]}$	0.40***	0.42***	0.42***	0.40***	0.43***	0.43***	0.44***	0.49***	0.49***
	(3.47)	(3.83)	(4.76)	(3.27)	(3.91)	(4.39)	(4.15)	(5.97)	(8.04)
pop	0.001	0.37*	0.37***	-0.003	0.22*	0.22***	-0.001	0.30**	0.30***
	(0.19)	(1.72)	(5.45)	(-0.80)	(1.75)	(5.31)	(-0.29)	(2.01)	(3.03)
urb	-0.0002	-0.01	-0.01**	0.0001	0.002	0.002	-0.0002	-0.01**	-0.01***
	(-0.52)	(-1.24)	(-2.09)	(0.22)	(0.66)	(1.52)	(-0.33)	(-1.99)	(-3.35)
pop_dens	-0.00001	0.00003	0.00003	0.00004	-0.003**	-0.003***	0.00001	0.001	0.001
	(-0.20)	(0.02)	(0.03)	(1.00)	(-2.36)	(-2.93)	(0.36)	(0.86)	(1.06)
gdp	-0.05	-0.08	-0.08	-0.01	0.10	0.10	-0.05	-0.04	-0.04
	(-1.08)	(-0.76)	(-1.29)	(-0.19)	(1.35)	(1.37)	(-1.39)	(-0.53)	(-1.34)
inflation	-0.001	0.001	0.001	-0.00001	0.0004	0.0004	0.0002	0.001	0.001**
	(-0.37)	(0.62)	(0.54)	(-0.02)	(1.29)	(1.02)	(0.42)	(1.50)	(2.51)
open	0.004*	-0.002**	-0.002***	0.0002	-0.001	-0.001*	0.0003**	-0.003***	-0.003***
	(1.94)	(-2.09)	(-2.76)	(1.01)	(-1.59)	(-1.72)	(2.11)	(-3.13)	(-3.07)
period_2	0.04	0.06	0.06***	0.04	0.05	0.05***	0.07*	0.10***	0.10***
	(0.84)	(1.05)	(3.92)	(0.92)	(1.09)	(2.96)	(1.95)	(2.79)	(21.30)
period_3	0.12**	0.13**	0.13***	0.07	0.07	0.07***	0.05*	0.12***	0.12***
	(2.05)	(2.44)	(23.42)	(1.43)	(1.40)	(3.28)	(1.83)	(3.13)	(5.85)
period_4	0.07	0.11*	0.11***	0.04	0.04	0.04	0.06**	0.13***	0.13***
	(1.41)	(1.82)	(6.20)	(1.04)	(0.81)	(1.46)	(2.07)	(3.13)	(6.06)
period_5	0.05	0.12**	0.12***	0.07	0.04	0.04*	0.05	0.11**	0.11***
	(1.08)	(2.15)	(3.93)	(1.51)	(0.90)	(1.66)	(1.57)	(2.26)	(5.05)
period_6	0.09*	0.15***	0.15***	0.06	0.03	0.03	0.05	0.15**	0.15***
	(1.82)	(2.85)	(4.28)	(1.47)	(0.50)	(0.79)	(1.46)	(2.37)	(4.51)
period_7	0.08*	0.14**	0.14***	0.03	-0.01	-0.01	0.06*	0.17**	0.17***
	(1.69)	(2.58)	(4.29)	(0.64)	(-0.21)	(-0.36)	(1.93)	(2.43)	(4.69)
period_8	0.07	0.13**	0.13***	0.05	0.02	0.02			
	(1.46)	(2.42)	(3.71)	(1.26)	(0.29)	(0.46)			
period_9	0.05	0.12**	0.12***	0.05	0.01	0.01			
	(0.91)	(2.07)	(2.58)	(1.20)	(0.14)	(0.22)			
period_10	0.07	0.16***	0.16***						
	(1.42)	(2.64)	(3.08)						
period_11	0.07	0.17***	0.17***						
	(1.43)	(2.56)	(2.98)						
period_12	0.08	0.18***	0.18***						
	(1.55)	(2.67)	(2.97)						
Observations	162	162	162	121	121	121	105	105	105
R-squared	0.65	0.67	0.67	0.68	0.73	0.73	0.70	0.77	0.77

Note: ***, **, and * indicate statistical significance at 1, 5, and 10%, respectively. *t*-statistics in parentheses based on clustered standard errors (OLS), robust standard errors (FE), and Driscoll-Kraay standard errors (FE-DK). Country fixed effects included in the FE and FE-DK estimates, but not reported.

Table 4. Dynamic models A and B: System-GMM estimates, 3-year periods data

Variables/ specification	3-year periods	
	Model A	Model B
$\sigma_{i,[t-4,t-1]}^{local\_G}$	-0.07	-0.05
	(-1.03)	(-0.66)
$\sigma_{i,[t,t+3]}^{IT}$	0.05*	0.03
	(1.73)	(0.78)
$\sigma_{i,[t,t+3]}^{PT}$	-0.17***	-0.17***
	(-4.25)	(-4.76)
$\sigma_{i,[t,t+3]}^{GST}$	0.02**	0.02**
	(2.53)	(2.45)
$\sigma_{i,[t,t+3]}^{GR}$	0.46***	0.45***
	(5.10)	(5.21)
pop		0.001
		(0.30)
urb		-0.0002
		(-0.51)
pop_dens		-0.000004
		(-0.13)
gdp		-0.06
		(-1.25)
inflation		-0.001
		(-0.71)
open		0.0004*
		(1.69)
period_2	-0.003	-0.02
	(-0.13)	(-0.84)
period_3	0.02	0.02
	(1.18)	(0.85)
period_4	-0.01	-0.02
	(-0.39)	(-0.58)
period_5	-0.02	-0.03
	(-1.48)	(-1.40)
period_6	0.001	-0.01
	(0.04)	(-0.40)
period_7	0.02	0.01
	(1.19)	(0.60)
period_8	-0.001	-0.004
	(-0.06)	(-0.31)
period_9	-0.04***	-0.04***
	(-2.86)	(-2.96)
period_10	-0.01	-0.01
	(-0.36)	(-0.52)
period_11	-0.01	-0.01
	(-1.00)	(-1.39)
Observations	152	152
Hansen *J* statistic	1.00	1.00
AR(1)	0.02	0.01
AR(2)	0.24	0.53

Note: *** and ** indicate statistical significance at 1 and 5%, respectively. *z*-statistics in parentheses based on robust standard errors. The *p*-value of the AR(1), AR(2), and Hansen *J* statistics are reported.

Data Appendix

Local spending volatility $\sigma^{local\_G}_{i,[t,t+x]}$: standard deviation of the annual growth of real (calculated using the GDP deflator) local government expenditure (excluding intergovernmental grants) over the multi-year periods. *Sources*: IMF Government Finance Statistics (GFS from now onwards), and OECD.

Local income taxes volatility $\sigma^{IT}_{i,[t,t+x]}$: standard deviation of the annual growth of real (calculated using the GDP deflator) local income taxes over the multi-year periods. *Sources*: IMF GFS, and OECD.

Local goods and services' taxes volatility $\sigma^{GST}_{i,[t,t+x]}$: standard deviation of the annual growth of real (calculated using the GDP deflator) local taxes on goods and services over the multi-year periods. *Sources*: IMF GFS, and OECD.

Local property taxes volatility $\sigma^{PT}_{i,[t,t+x]}$: standard deviation of the annual growth of real (calculated using the GDP deflator) local property taxes over the multi-year periods. *Sources*: IMF GFS, and OECD.

Intergovernmental grants volatility $\sigma^{GR}_{i,[t,t+x]}$: standard deviation of the annual growth of real (calculated using the GDP deflator) grants from the central government to local governments over the multi-year periods. *Sources*: IMF GFS, and OECD.

Population ($pop_{i,t}$). Logarithm of population. *Source*: OECD.

Urbanisation ($urb_{i,t}$). Urban population, percentage of the total population. *Source*: World Development Indicators (WDI).

Population density ($pop\_dens_{i,t}$). People for square km of land area. *Source*: OECD.

Inflation ($inflation_{i,t}$). Inflation calculated from the Consumer Price Index. *Source*: IMF.

Real GDP per capita ($gdp_{i,t}$). Logarithm of real GDP per capita, volume, at 2005 PPP USD. *Source*: A. Heston, R. Summers, B. Aten: Penn World Tables (PWT) 7.1, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, Nov. 2012.

Trade openness ($open_{i,t}$). Share of imports plus share of exports over GDP. *Source*: PWT 7.1.