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CONTENTS

Abstract

This paper provides empirical evidence showing that smaller countries tend to have more volatile government spending for a sample of 160 countries from 1960 to 2000. We argue that the larger size of a country decreases the volatility of government spending because it acts as an insurance against idiosyncratic shocks, and it leads to increasing returns to scale due to the higher ability of the government to spread its cost of financing over a larger pool of taxpayers. The results are robust to different time and country samples, different econometric techniques and to several sets of control variables. The analysis also evinces that country size is negatively related to the discretionary part of government spending and to the volatilities of most of the government spending items.

Keywords: Fiscal Policy, Government Size, Fiscal Volatility, Country Size.
JEL: E62, H10.

Non-Technical Summary

This paper provides empirical evidence showing that smaller countries tend to have more volatile government spending. From a theoretical point of view, we show that a negative relationship between government spending volatility and country size can be explained by two arguments: i) to the extent that government spending is used for fine tuning purposes, the size of a country acts as an insurance against idiosyncratic shocks, leading to a less volatile government spending; ii) increasing returns to scale of government spending originating from higher ability to spread the cost of financing it over a larger pool of taxpayer, allow the government to provide the public good in a less volatile way.

These claims are confirmed by our empirical analysis, which is robust to different time and country samples, different econometric techniques and to several sets of control variables.

Our results highlight the need for small countries to undertake fiscal adjustments in order to reduce macro-fiscal vulnerabilities and improve their economic growth prospects. In addition, to the extent that large fiscal areas reduce government spending volatility, our findings reinforce the role of fiscal coordination (or common fiscal policy) in monetary unions.

1. Introduction

In recent years there has been a growing economic literature concentrating on the effects of scale and country size on various economic outcomes. From a theoretical point of view, the sign of these scale and size effects is ambiguous (Alesina and Spolaore, 2003). Empirically, even though Rose (2006) concludes that countries performance in terms of several indicators is not related with the size of the nation, Alesina and Wacziarg (1998) robustly show that smaller countries have higher levels of public consumption as a share of GDP[1]. This latter finding originates from economies of scale in the production of public goods and redistributive policies resulting from the higher ability of governments in big countries to spread the cost of financing public goods over a larger pool of taxpayers.

Notwithstanding this level effect, to the best of our knowledge, the impact of the size of nations upon the volatility of government spending has not yet been discussed in the literature. Government spending volatility may be decreasing in the size of nations given that smaller economies are found to be more volatile and exposed to economic shocks (Furceri and Karras, 2007 and 2008). More specifically, we claim that a negative relationship between government spending volatility and country size can be explained by two arguments:

1) To the extent that government spending is used for fine tuning purposes, smaller economies, characterized by more volatile output and more exposure to idiosyncratic shocks, may use government spending more aggressively.

2) To the extent that public goods are of a non-rival nature, increasing returns to scale of varying government spending may originate from the higher

[1] See, in addition, Bolton and Roland (1997), Alesina and Spolaore (2003), and Alesina et al. (2004).

ability to spread the cost of financing it over a larger pool of taxpayers. This promotes less volatile government expenditure in particular if public goods are, as desirable as, or more desired than private consumption.

Nevertheless, other effects of country size may work in the opposite direction. For instance, more individual heterogeneity may prompt bigger political divergences in terms of preferences for type and size of public goods (O'Higgins and Ruggles, 1981), resulting in larger government spending volatility due to the switching of different political groups in power.

Therefore, the objective of this paper is to analyze the empirical relationship between government spending volatility and country size. Such analysis is further motivated by the finding that higher volatility of public spending impacts negatively on economic growth and welfare (see, among others, Fatás and Mihov, 2003 and 2005; Furceri, 2007; Afonso and Furceri, 2008; and Loayza et al., 2007). Fatás and Mihov (2003), for example, estimate that every percentage point increase in volatility of discretionary fiscal policy lowers economic growth by more than 0.8 percentage points. In turn, Herrera (2007) estimates that the welfare loss of public spending volatility corresponds to 8 percent of consumption in developing countries[2]. Most of these effects of volatility occur via its negative impact on capital formation and investment as the theories of irreversible investment emphasize (see, in addition, Ramey and Ramey, 1995; Aghion and Banerjee, 2005; and Imbs, 2007).

[2] For other analysis on the effects of public spending volatility on the welfare and capital formation of developing countries see Afonso et al. (2006) and Harberger (2005).

Our empirical analysis uses a panel data set that includes 160 countries with observations from 1960 to 2000 and yields as main results that: 1) smaller countries have more volatile government spending; 2) discretionary government spending volatility (corrected for output volatility) is decreasing with the size of nations; 3) consumption spending in Defense, Economic Affairs, Housing, Health, Recreation and Education is more volatile in smaller countries, but it is not in Public Services, Public Order, and Social Protection. These results are extremely robust to different time and country samples, different econometric techniques as well as to several sets of control variables.

The rest of the paper is organized as follows. The next section presents a theoretical model that discusses the arguments linking country size and volatility of government spending. The third section describes the paper's empirical methodology used to test for the relationship between country size and government spending volatility. The fourth section reports the results. Finally, Section 5 concludes the paper.

2. Theoretical Model

This section presents a simple closed economy model based on Alesina and Wacziarg (1998), which illustrates why smaller countries could have more volatile government spending. We modify and extend that model in three ways. First, we use a different utility specification, even though our specification provides similar qualitative results as in Alesina and Wacziarg (1998). Second, we allow individual heterogeneity in consumption, by assuming a different income endowment for each consumer. That assumption introduces idiosyncratic income shocks in our model and it is useful to analyze how a bigger country can mitigate the effects of those shocks. Third, we use a two-period version of the model to compute the volatility of government spending.

Consider a country composed of N individuals. The Social Planner maximizes the expected sum of utilities of all individuals:

$$E_t \sum_{i=1}^{N} \sum_{t=1}^{2} U_{i,t} = E_t \sum_{i=1}^{N} \sum_{t=1}^{2} \beta^{t-1} \left[u\left(c_{i,t}\right) + v\left(G_t\right) \right], \tag{1}$$

where E_t is the expectation operator conditional on information at time t, β is the social discount factor, $c_{i,t}$ is the private consumption of individual i in period t, and G_t is the level of non-rival public goods in period t. The functions u and v are further assumed to be increasing in c and G, strictly concave and twice continuously differentiable.

In each period households are endowed with an income level $y_{i,t}$, on which they have to pay taxes. The resulting net income is assumed to be consumed at the same period, so that the individual household flow budget constraint reads:

$$c_{i,t} \leq \left(1 - \tau\right) y_{i,t}, \tag{2}$$

where τ denotes the constant and exogenous (income) tax rate.

In this society each individual is further assumed to live in a distinct region that faces an idiosyncratic income shock $\varepsilon_{i,t}$. Thus, in each period the stochastic income endowment is given by:

$$y_{i,t} = \bar{y} + \varepsilon_{i,t}, \tag{3}$$

where $\bar{y}$ is the average income level assumed for simplicity to be constant over time. Moreover, for every period, the income shock $\varepsilon_{i,t}$ is independently and identically distributed among the individuals (regions) with expected value equal to zero and standard deviation equal to σ_ε. Hence, by the Law of Large Numbers, the country's income shock (sum of idiosyncratic shocks) converges to its expected value the larger is the number of individuals in the country.

The government, in turn, raises tax revenues T_t and purchases goods G_t every period. For simplicity, we also assume that the government does not borrow, which makes the government's flow budget constraint equal to[3]:

$$G_t = T_t \Leftrightarrow G_t = \tau \sum_{i=1}^{N} y_{i,t}.$$

Without any further constraints and using (2) and (3), the period-by-period resource constraint in this economy reads:

$$\sum_{i=1}^{N} y_{i,t} = \sum_{i=1}^{N} c_{i,t} + G_t \Leftrightarrow N\bar{y} + \sum_{i=1}^{N} \varepsilon_{i,t} = \sum_{i=1}^{N} c_{i,t} + G_t. \qquad (4)$$

The Social Planner maximizes then (1) subject to (4) with respect to $c_{i,t}$ and G_t, which by assuming perfect foresight leads to:

$$\sum_{i=1}^{N} u'(c_{i,t}) = Nv'(G_t). \qquad (5)$$

This condition shows that the average marginal utility of consumption is equal to the marginal utility of government spending when welfare is maximized in this economy. Further, to assess the overall effect of changes in the population size N on government spending volatility, we resort to the following quadratic utility function:

$$u(x) = \frac{v(x)}{\omega} = -(\xi - 1)x^2 / 2 + \xi x, \qquad \omega > 0,\ \xi > 1,\ and\ x < \xi/(\xi - 1), \qquad (6)$$

where the restriction $x < \xi/(\xi - 1)$ ensures that the marginal utilities of private consumption and public spending are always positive, and the parameter ω regulates the desirability of

[3] Notice that, in fact, governments use public debt management to cushion the effect of income shocks on its revenues and to keep government expenditures more stable (see Herrera, 2007). However, not all countries can rely on such instrument. Moreover, this simplifying non-borrowing assumption is useful here to test how the country size impacts on that volatility.

public spending relative to private consumption. The higher is ω the more desirable is government expenditure compared to private consumption[4].

Then, using (6), we obtain from (5) that

$$G_t = \frac{1}{\omega N}\sum_{i=1}^{N} c_{i,t} + \frac{N(\omega-1)}{\omega N}\frac{\xi}{\xi-1},$$

which by using (4) becomes[5]:

$$G_t = \frac{1}{1+\omega N}\left(N\bar{y} + \sum_{i=1}^{N}\varepsilon_{i,t}\right) + \frac{N(\omega-1)}{1+\omega N}\frac{\xi}{\xi-1}. \qquad (7)$$

Further, from (3) and (7) the effect of country size on the government expenditure over aggregate income (GDP) is:

$$\frac{\partial(G_t/Y_t)}{\partial N} = -\frac{\omega}{(1+\omega N)^2} + \frac{\omega-1}{(1+\omega N)^2}\left[\frac{\xi}{(\xi-1)Y_t}\right] - \frac{N(\omega-1)}{1+\omega N}\frac{\xi}{\xi-1}\frac{\bar{y}}{(Y_t)^2}. \qquad (8)$$

This expression is negative whenever $\omega \geq 1$ and the sum of idiosyncratic shocks $\sum_{i=1}^{N}\varepsilon_{i,t}$ is not too high[6]. If government spending is as desirable as, or more desirable than private consumption, then an increase in country size leads to a fall in the government spending-income ratio.

As Alesina and Wacziarg (1998) discuss, an increase in country size raises the optimal level of public spending provision, which can be interpreted as an income effect; but it also reduces per capita cost of public goods for a given level of provision, allowing more private consumption (substitution effect). This latter effect comes from the higher

[4] For more details and another application of equation (6) see, among others, Poplawski Ribeiro and Beetsma (2008).

[5] Notice that ξ can always be chosen such that equation (7) provides a larger G_t when government expenditure compared to private consumption becomes more desirable (higher ω).

[6] More precisely this expression is always negative if $\omega \geq 1$ and $\sum_{i=1}^{N}\varepsilon_{i,t} < \bar{y}\omega N^2$.

ability of the government to spread the cost of financing public goods over a larger pool of taxpayers (higher N) leading to increasing returns to scale. Therefore, expression (8) shows that if government expenditure is as desirable as private consumption, the substitution effect dominates and the ratio G_t/Y_t falls when N increases.

In addition, we can easily obtain the variance of government spending in this simple two-period model. For that, we first compute the average value of that variable:

$$\overline{G} = \frac{N\overline{y}}{1+\omega N} + \frac{\xi}{\xi - 1}\frac{N(\omega - 1)}{1+\omega N} + \frac{1}{2(1+\omega N)}\sum_{i=1}^{N}\left(\varepsilon_{i,1} + \varepsilon_{i,2}\right),$$

which makes the variance of government spending equal to:

$$\mathrm{var}(G) = \frac{1}{4(1+\omega N)^2}\left[\sum_{i=1}^{N}\left(\varepsilon_{i,1} - \varepsilon_{i,2}\right)\right]^2. \qquad (9)$$

Hence, the effect of an increase in N on the variance of government spending becomes:

$$\frac{\partial\,\mathrm{var}(G)}{\partial N} = -\frac{\omega}{2(1+\omega N)^3}\left[\sum_{i=1}^{N}\left(\varepsilon_{i,1} - \varepsilon_{i,2}\right)\right]^2 < 0. \qquad (10)$$

Equation (10) shows that the larger the country size, the lower the variance of government spending. That is due to two main effects. First, by the Law of Large Numbers, the income shocks $\varepsilon_{i,1}$ and $\varepsilon_{i,2}$ converge to their expected values the bigger the country size (higher N), thus moving that variance towards zero. Intuitively, larger countries are less exposed to specific idiosyncratic shocks, and therefore, government revenues and expenditures become less volatile (see also Rodrik, 1998). Moreover, it is possible to argue that, the larger the country the less exposure to "shock surprises" ($\varepsilon_{i,1}$ - $\varepsilon_{i,2}$) and the lower the output volatility σ_ε (see Furceri and Karras, 2007 and 2008).

Second, an increase in country size eases the provision of a less volatile government expenditure, which is preferred the more desired is the public good compared to private

consumption. That is again due to the increasing returns to scale of that non-rival good, and the consequent reduction in the per capita cost of public goods for a given level of provision when N goes up. In fact, as previously argued, if government spending is as desirable as, or more desirable then private consumption ($\omega \geq 1$), then an increase in the country size leads to a fall in government spending-income ratio. Similarly it is possible to see from equation (9) that an increase in the desirability of public consumption over private consumption ($\omega \uparrow$) will lead to a decrease in spending volatility.

In sum, our model illustrates reasons for less volatile government expenditure in larger countries, namely lower exposure to idiosyncratic risks and economies of scale in public goods provision. Nevertheless, the magnitude and the sign of the effect of country size on the volatility of government spending remains an empirical question, on which the next sections delve into.

3. Empirical Strategy

Data for government expenditure is retrieved from the Penn World Table 6.2. The dataset consists of 160 countries, which had available data for each of the years from 1960 to 2000. We use the log of its population as our measure of a country's size, and the standard deviation of annual growth of government consumption spending[7] as our measure for government spending volatility[8].

[7] We use the annual growth rate of total government expenditure as dependent variable rather than annual growth rate of government total expenditure (or total revenue), since the latter is not available for such an extensive set of countries for a long time span. Moreover, government consumption accounts usually for approximately 4/5 of total expenditure.

[8] The choice of the standard deviation of the growth rate of real government spending as measure of spending volatility could be criticized since, usually, countries with higher growth rates of government spending have higher standard deviations. An alternative measure to control for this "scale" effect could be to consider the coefficient of variation as a measure of volatility. However, there is an obvious problem when we compute the coefficient of variation: for some countries (with highly volatile government spending) the average growth

We set up our estimated models in a number of different ways. In particular, we use (i) OLS both in a bivariate model and in models controlling for a country-specific volatility effect; (ii) Fixed Effects estimation; (iii) Random Effect estimation; and (iv) Instrumental variables (IV) estimation both in a bivariate model and in models with control variables.

Similarly to Rose's (2006) and Furceri and Karras (2007, 2008) strategy, we use four different sets of control variables, most of them obtained from Rose's website (www.haas.berkeley.edu/~arose)[9].

The *first set* of controls includes: (a) the urbanization rate, (b) population density, (c) the log of absolute latitude (kilometers from the equator), (d) a binary dummy variable for a landlocked country, (e) an island-nation dummy, (f) a high income country dummy, (g) regional dummies for developing countries from 1) Latin America, 2) Sub-Saharan Africa, 3) East Asia, 4) South Asia, 5) Europe-Central Asia, 6) and Middle East-North Africa, and (h) language dummies for countries that speak 1) English, 2) French, 3) German, 4) Dutch, 5) Portuguese, 6) Spanish, 7) Arabic, and 8) Chinese. Many of these variables are related to the quality of governments. In fact, as pointed out by La Porta et al. (1998), it is likely that latitude from the equator, income and regional dummies are related to the quality of government and institutions. Moreover, by including language dummies

rate over some time spans turns out to be negative, implying thus a very low measure of volatility in contrast with the evidence. Therefore, we check the robustness of our results with two other measures of government spending. The first is the standard deviation of the cyclical component of real government spending (Furceri, 2007; Afonso and Furceri, 2008). Its use avoids the "scale" problem since the time average of the cyclical component by construction is zero for each country. The second measure is the ratio between the standard deviation of real government spending and the average level of government spending. Its use avoids business-cycle effects resulting from the employment of annual data. All results of this paper are qualitatively unchanged if we use these measures of volatility.

[9] See Data Appendix for a more detailed description of the variables and their source.

we are able to capture (at least in part) different level of language fractionalization among countries[10].

The *second set* of control variables augments the first set including also dummies to control for the effect of new, decolonized, and COMECON countries (see Alesina and Wacziarg, 1998): (a) a dummy for countries created post-World War 2, (b) a dummy for countries created after 1800 but before 1945, (c) a dependency dummy, (d) an OPEC dummy, and (e) a COMECON dummy.

The *third set* of controls includes four other macroeconomic variables that are associated with government volatility: (a) GDP per capita[11], (b) Openness[12], (c) CPI Inflation, and (d) Government size[13]. In fact, as pointed out by Fatás and Mihov (2003) it is likely that poor countries have shorter and more volatile business cycles due to less developed financial markets, for example, and at the same time they may resort more often to discretionary policy (see also Rand and Tarp, 2002). Similarly, economies with a higher degree of openness, and thus more exposed to external shocks, may use more frequently discretionary countercyclical fiscal policies (Rodrik, 1998). Moreover, countries with bigger government are usually characterized by bigger automatic stabilizers and thus are less tempted to use discretionary measure of fiscal policy for fine tuning purposes (Fatás and Mihov, 2001).

The main advantage of this set of controls is that they are variables usually associated with government volatility, which are available for all the period under study.

[10] In the following of the analysis we will use other variables as proxy of ethnic fractionalization. The use of language dummies to this purpose, at this stage, is justified for the greater data availability.
[11] Although the inclusion of GDP per capita could lead to multicollinearity since both population and GDP per capita may account for scale effects, in our sample these two variables result to be scarcely correlated (0.07).
[12] We use as proxy for openness the GDP's share of total exports and imports.
[13] Government size is here measured as the ratio of government spending to GDP.

Moreover, other variables for which we have data just for the last decade could also be important determinants for government volatility. For this purpose, we consider a fourth set of controls for which we have data only relatively to the last time period 1991-2000. The variables included are those of the third set of controls plus: (a) an index of the level of Democracy, (b) an index for the level of Corruption, (c) an index for Political Stability, (d) an index for Government Effectiveness, (e) an index for Country Risk, and (f) an index for language fractionalization.

To summarize, we estimate the effect (β) of country size on government spending volatility using the following regression model:

$$\ln(\sigma_{i,t-t+\tau}) = \beta \ln(Pop_{it}) + \alpha + \{\gamma_t T_t\} + \Sigma_j \delta_j X_{ijt} + \varepsilon_{it} \qquad (11)$$

where σ measures government spending volatility for country i at time t, Pop denotes population, $\{T_t\}$ denotes a set of time- specific fixed effects, and $\{X_j\}$ denotes a set of control variables. ε is a well-behaved residual, and α, $\{\gamma\}$, $\{\delta\}$, are the coefficients of our other control variables.

4. Results

Figures 1 provides the scatter plot of government spending volatility (measured by the standard deviation of the annual growth rate of government expenditure) against country size (measured by the natural logarithm of population) for the entire period 1960-2000. The figure exhibits negative and statistically significant relation between these two variables. In particular, the estimate of this simple bivariate relation for the full sample gives us:

$$\sigma_i = 0.207 - 0.011 \ln(Pop_i)$$
$$(7.77) \quad (-3.40)$$

with $R^2 = 0.06$, and *t* statistics shown in parenthesis. The relationship is clearly negative and statistically significant, even though the relatively low value of the R-squared coefficient suggests that other factors could have a significant impact on volatility of government spending [14]. Moreover, the coefficient of country size does not seem to be affected by outliers such as those countries with volatility higher than 0.3. To confirm this, running again the regression, this time excluding outliers, the relationship is still negative and actually strengthened[15]:

$$\sigma_i = \underset{(9.90)}{0.169} - \underset{(-3.92)}{0.008} \ln(Pop_i)$$

with $R^2 = 0.08$, and *t* statistics shown in parenthesis.

We now proceed with more formal statistical evidence. Table 1 reports the estimated slope coefficient (β) of country size, along with the associated t-statistics in parentheses for several specifications of equation (11). In particular, the four columns of Table 1 correspond to: (i) bivariate OLS; (ii) OLS including the first set of controls; (iii) OLS including the second set of controls; and (iv) OLS including the third set of controls.

Focusing on the full-period (pooled) 1961-2000, it can be readily seen that the relation between country size and government expenditure volatility is negative and

[14] Since our dependent variable is based on estimates (sample standard deviation) the regression residuals can be thought of as having two components. The first component is sampling error (the difference between the true value of the dependent variable and its estimated value). The second component is the random shock that would have been obtained even if the dependent variable was directly observed rather than estimated. This would lead to an increase of the standard deviation of the estimates, which will lower the t-statistics. This means that any correction to the presence of this un-measurable error term will increase the significance of our estimates. A second concern is the possibility of heteroskedasticity. However, in most of our estimations heteroskedasticity does not seem to be a problem. When it does, we correct for that by using White standard errors.

[15] Estimating a non linear relation, the relation is still significant and negative:

$$\sigma_i = \underset{(9.90)}{0.169} + \underset{(1.34)}{0.022} \ln(Pop_i) - \underset{(-1.94)}{0.022} \ln(Pop_i)^2$$

statistically significant: the larger the size of the country, the less volatile its government expenditure. It is noteworthy that the coefficient on size remains negative and significant in every specification. In particular, two considerations are important. First, the magnitude of the coefficient is broadly constant over the different set of controls. Second, the coefficient remains significant even after controlling for an exhaustive set of regional, geographical, and macroeconomic variables[16]. In fact, we believe it is significant that country size is shown to reduce government spending volatility even when we control for openness, since trade openness is the only variable found to be robustly and significantly related with country size (Rose, 2006)[17].

The interpretation of the coefficient relative to country size is the following. By our estimations, an increase of one percent in population will determine a decrease of 0.2 percent in government expenditure volatility (on average). In other words, just because Germany is ten times the size of Belgium, means that Germany has 50 percent less volatile government expenditure than Belgium.

We have also examined the robustness of the relation between country size and fiscal volatility with respect to different time periods. In particular, we considered six different time samples: 1961-1970, 1971-1980, 1981-1990 and 1991-2000. Table 2 presents, across the above mentioned time periods, the coefficient on country size obtained

[16] In our estimations, *Island*, *Arabic language, OPEC*, and *Government Size* are other variables that we find to be highly significant. For Island countries that could be attributed to the fact that they are more open to foreign trade, even though expenditure volatility is very high for some of these countries (Le Borgne and Medas, 2007). In turn, Arabic and OPEC economies are rich in oil revenues and contingent upon that commodity. Hence, the volatility in oil price might explain the higher volatility of government spending on those countries.

[17] As robustness check, we also include *private consumption volatility* and *public debt* in the third set of controls of Table 1. The first variable turns out highly significant and positive (not shown here), but *country size* still remains highly significant when controlling for it. The link between public expenditure and household consumption results from the transfers made by the governments or the taxes paid by households (Herrera, 2007). *Public debt*, in turn, is insignificant in our estimations. Further, its inclusion reduces substantially the number of countries in the sample, which hams the significance of all other variables, including that of *country size*.

using the same specification as in Table 1. Our results suggest that while the effect of country size on government expenditure volatility remains negative and statistically significant, the magnitude increases over time, especially in the last decade. From a statistical point of view, this could be attributed to a lower number of degrees of freedom for this sample period (for the first sample period), and to the fact that government expenditure has been poorly measured during the first years. From an economic point of view, a possible interpretation, as suggested by Alesina and Wacziarg (1998), is that many new decolonized had to "build up" their public sector during the first time samples, and as their level and volatility of government expenditure converged to a sort of steady state level, the effect of the fundamental determinants of government volatility started to play a larger role.

Another robustness check that we provide involves the use of different estimation techniques. Tables 3 and 4 report the estimated slope coefficient of country size for the first, second, and third set of controls with: (i) Fixed Effects and Time Random Effects; and (ii) IV estimation, respectively[18]. Analyzing these tables we can immediately see that the effect of country size on government volatility is still robust to all methods of estimations. In particular, while the magnitude of the coefficient is broadly unchanged over the different

[18] We use the logarithm of the country's total area as instrumental variable for the log of its population, as did Rose (2006), Furceri and Karras (2007, 2008) and as argued by Drazen (2000). The F-statistic of the simple regression of log of population on log of total area is 2070.43, which suggests that the possible bias of the IV is substantially lower than the one of the OLS (Staiger and Stock, 1997). There is also very little concern of reverse causality. In fact, it is very unlikely that people choose where to live based on consideration of government spending volatility. In contrast, there could a more serious issue of endogeneity for other controls variables (as inflation). We address this issue (and also the one for our variable of interest) considering the starting value of the control between time t and time $t+\tau$, while we use a measure of volatility of time$(t, t+\tau)$.

techniques of estimation and set of controls, its significance level increases with respect to OLS and IV when we control for time effects both Fixed and Random[19].

The analysis presented so far has shown that the effect of country size on government spending volatility is very robust to different econometric techniques and sets of controls. However, other variables for which we have data only for the last decade, such as Democracy, Corruption, Political Stability, Government Effectiveness, Country risk and language fractionalization, can account for higher fiscal volatility. To check for robustness, we consider these variables in the OLS and IV estimation. The results are reported in Table 5. Again the results are robust. In particular, while the coefficient on population is still statistically significant its magnitude is increased.

It is possible to argue that most of the variation in many determinants of fiscal volatility (such as political constraints, income, inflation and etc.) occurs between the rich and the poor countries. Thus, both from a theoretical perspective and (especially) from a policy point of view is important to assess whether the relationship between country size and government spending volatility is still negative within each group (Rich and Poor[20]). While, we have already shown that our analysis still holds when we include as control variable the level of GDP and income dummies, it would be important also to run two different regressions for each group of countries. Table 6 conveys the results. They show

[19] According to the Hausman test, the Fixed Effects specification is preferred to the Random Effects. However, we cannot reject the hypothesis of absence of time effects at 5% significant level. Similarly, the inclusion of country effect does not improve the fitness of our model either the significance of our estimates. This is mainly due to the fact that country effects are to some extent captured by language and regional dummies. However, by including only country effects in the regression with the third set of controls the magnitude of the coefficient of country size increases (to -0.77) and its significance level remains high (t-statistic=-4.50).

[20] We use the World Bank classification to differentiate among Rich and Poor countries. In particular, we includes in Poor countries those countries classifies as "Low Income", "Lower Middle Income", and "Upper Middle Income"; and we include in the Rich countries those classifies as "High Income-non OECD" and "High Income-OECD".

that while the coefficient on population has the same sign across the two different groups, the magnitude and significance level is bigger for Poor countries.

Finally, our empirical analysis regarding volatility of aggregate government consumption concludes using a proxy for discretionary spending volatility, instead of general government spending volatility, as our dependent variables.

It is important to stress the fact that there is no consensus in the literature on the appropriate measure of discretionary (cyclically adjusted) fiscal policy[21]. The difficulty mainly comes from the simultaneity in the determination of output and government spending volatility. To this purpose we use a measure of discretionary fiscal policy that is not affected by output volatility. In more detail, following Fatás and Mihov (2003, 2006) our measure is obtained by estimating, for each country *i*, the following equation:

$$\Delta G_{i,t} = \alpha_{i,t} + \beta_i \Delta Y_{i,t} + \gamma_i \Delta G_{i,t-1} + \delta_i W_{i,t} + \varepsilon_{i,t} \quad , \qquad (12)$$

where *G* is the logarithm of real government spending, *Y* is the logarithm of real *GDP*, and *W* includes a time trend, inflation and inflation squared. The estimated standard deviation of the residuals (i.e. $\sigma_{i,t+\tau} = \sqrt{\text{var}(\varepsilon_{i,t-t+\tau})}$) is assumed as a quantitative estimate of discretionary fiscal policy volatility. In order to estimate equation (11) we include the contemporaneous value of output growth and we use past values as instrumental variable to avoid the possibility of endogeneity bias. We instrument current output growth with lagged *GDP* growth, the index of oil prices, lagged inflation, and the lagged value of government spending growth.

Table 7 presents the coefficient on country size obtained using the same specification used in Table 1. Our results point out that the effect of country size on

[21] See Alesina and Perotti (1996), Blanchard (1993) and Fatás and Mihov (2003, 2006) for a detailed discussion on alternative measures of discretionary fiscal policy.

discretionary government spending volatility is still negatively and statistically significant. Thus, not only smaller countries have more volatile general government spending but they also, independently of automatic stabilizers, tend to use government spending more actively. This could suggest that the relation between spending volatility and country size is negative not only to the extent that government spending is used for fine tuning purposes, but also to the extent that public goods are of a non rival nature.

4.1 Government Spending Volatility by Functional Categories

Our analysis, so far, has pointed out a clear negative relation between government spending volatility and country size. However, to better understand this relation it is useful to analyze the different components of government consumptions. For this purpose, we consider the following categories: i) General public services; ii) Defense; iii) Public order and safety; iv) Economic affairs; v) Housing and community amenities; vi) Health; vii) Recreation, culture and religion; viii) Education; and ix) Social protection[22].

As we discussed in our theoretical section, a larger country size may reduce government spending volatility because of the higher returns to scale of the non-rival good. To this extent, we should expect spending volatility related to non-rival public goods (such as general administration) to be more associated with country size than spending volatility related to rival public goods (such as education, health, and order and safety).

However, our theoretical model also evinces that larger countries are more able to mitigate idiosyncratic shocks and stabilize its government spending. Therefore, we should expect, to a certain extent, all items of government spending to be negatively associated with country size.

[22] Data for government consumption classified by function are retrieved by the UN and OECD data sets.

Table 8 shows the results of the regression between government consumption volatility classified by economic function and country size for the period 1971-2000 and using the third set of control variables[23]. Each of the columns of the table corresponds to a different economic function of government consumption.

Analyzing the results, we can observe that the relation between government consumption and country size is negative for each of the different categories. Thus, these results seem to confirm the idea that smaller countries tend to have more volatile government spending also because they are more exposed to idiosyncratic shocks. Moreover, from all spending items analyzed, economic affairs and public order are the one whose the coefficient of country size is more significant, which might be due to the high level of non-rivalry of these goods.

Summarizing, this analysis has confirmed the findings of our theoretical model that due to both, the higher scale economies in the provision of non-rival public goods and to a lower exposure to idiosyncratic shocks, larger economies are more able to stabilize their government spending.

5. Conclusions

This paper provides empirical evidence showing that smaller countries tend to have more volatile government spending. From a theoretical point of view, we show that a negative relationship between government spending volatility and country size can be explained by two arguments: i) to the extent that government spending is used for fine tuning purposes, the size of a country acts as an insurance against idiosyncratic shocks,

[23] The results are qualitatively robust also to the inclusion of the additional variables present in the fourth control set.

leading to a less volatile government spending; ii) increasing returns to scale of government spending originating from higher ability to spread the cost of financing it over a larger pool of taxpayer, allow the government to provide the public good in a less volatile way.

These claims are confirmed by our empirical analysis, which is robust to different time and country samples, different econometric techniques and to several sets of control variables. In particular, disaggregating government consumption by function, it emerges that government consumption spending in all functions is more volatile in smaller countries. In addition, the empirical analysis evinces that the discretionary (not reacting to the state of economy for fine tuning purpose) government spending volatility is also decreasing with the size of nations.

Our paper highlights the need for small countries to undertake fiscal adjustments in order to reduce macro-fiscal vulnerabilities and improve their economic growth prospects (see also Le Borgne and Medas, 2007; and Medina Cas and Ota, 2008). In addition, to the extent that large fiscal areas reduce government spending volatility, our findings reinforce the role of fiscal coordination and the move towards common fiscal policy in monetary unions, even though other factors may undermine and overcome such fiscal manoeuvre (see, among others, Beetsma and Bovenberg, 1998; Beetsma et al., 2001; and von Hagen et al. 2002).

The current analysis also offers various possibilities for further research. On the theoretical side, a more structural model would be helpful to better understand the mechanisms underlying the economic and political effects of country size on the government spending volatility. For instance, modeling the political side of the economy could be useful to investigate the impacts of country size and political heterogeneity on our variable of interest. On the empirical side, an analysis of the effects of country size on the

volatility of taxes revenues, transfers, and debt management could ratify our findings that that variable indeed acts as an insurance against idiosyncratic shocks, and show how strong this effect is indeed.

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Data Appendix

Table A. Summary Statistic and Source for the Main Variables

Description	Source	# Obs.	Mean	St. Dev.
Government Spending Volatility	PWT6.2	451	0.015	0.017
Log of Population	PWT6.2	832	14.852	2.303
Urbanization Rate	Rose	819	48.842	24.839
Density	Rose	710	253.421	1300.324
Latitude	Rose	832	9.577	15.208
GDP per capita	Rose	612	5220.501	7780.298
Openness	Rose	582	76.572	45.310
CPI Inflation	Rose	504	55.799	499.7929
Democracy	Rose	531	3.902	4.190
Corruption	Rose	184	-0.004	1.001
Political Stability	Rose	165	-0.004	1.001
Government Effectiveness	Rose	184	-0.006	1.000
Country Risk	Rose	139	67.937	11.743
Language Fractionalization	Rose	191	0.394	.0280

Notes: PWT6.2 refers to the Penn World Table v. 6.2. Rose refers to A.K. Rose's website.

Table B. Correlation between Government Spending Volatility Categories

	GS	PU	DE	OS	EA	HO	HE	RE	ED	SP
GS	1									
PU	0.215	1								
DE	0.164	0.044	1							
OS	0.173	0.591	0.092	1						
EA	0.440	0.320	0.249	0.561	1					
HO	0.088	0.207	0.078	0.255	0.341	1				
HE	0.026	0.397	0.162	0.753	0.423	0.21	1			
RE	-0.045	0.044	0.192	0.177	0.266	0.30	0.394	1		
ED	0.088	0.234	0.073	0.610	0.565	0.16	0.696	0.128	1	
SP	0.076	0.141	0.082	0.375	0.322	0.32	0.531	0.715	0.416	1

GS= Government Spending; PU= General public services; DE= Defense; OS= Public order and safety; EA=Economic affairs; HO=Housing and community amenities; HE=Health; RE=Recreation, culture and religion; ED=Education; SP=Social protection.

Figures and Tables

FIGURE1. CORRELATION OF GOVERNMENT VOLATILITY AND POPULATION

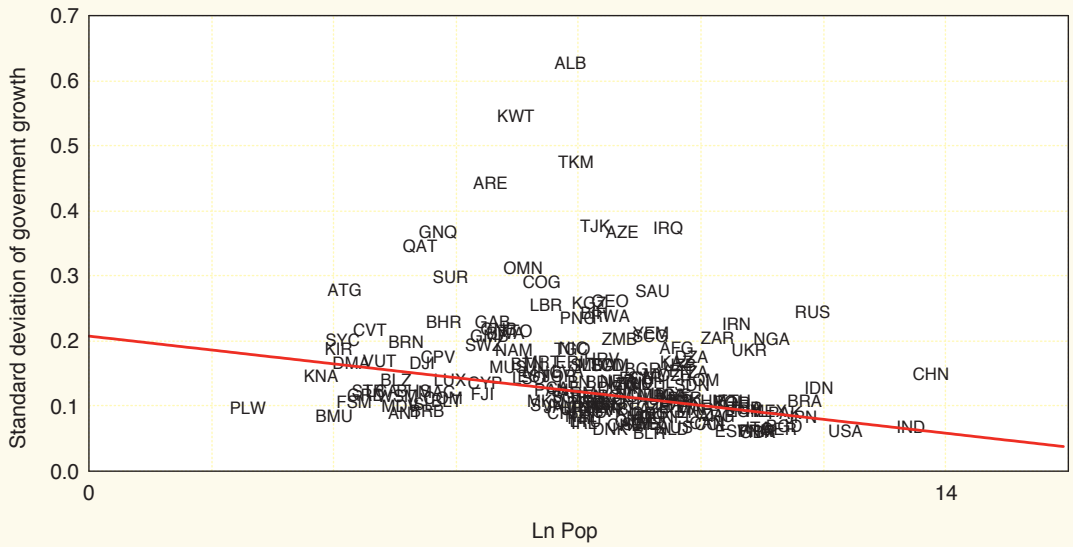

Table 1-Government Spending Volatility and Country Size

	Bivariate	Control1	Control2	Control3
Lnpop	-0.098	-0.153	-0.160	-0.208
	(-6.09)***	(-7.47)***	(-6.53)***	(-5.97)***
Urban	-	-0.002	-0.002	-0.003
	-	(-0.70)	(-1.08)	(-0.99)
Density	-	-0.001	-0.001	-0.001
	-	(-1.57)	(-0.29)	(-0.75)
Landlocked	-	-0.131	-0.071	-0.078
	-	(-1.30)	(-0.72)	(-0.70)
Island	-	-0.303	-0.238	-0.223
	-	(-2.90)***	(-2.09)***	(-1.85)*
English	-	-0.079	-0.033	0.026
	-	(-1.01)	(-0.41)	(0.31)
French	-	-0.127	-0.015	-0.047
	-	(-1.34)	(-0.16)	(-0.47)
Spanish	-	-0.224	-0.110	-0.144
	-	(-1.96)**	(-0.84)	(-1.02)
Portuguese	-	-0.456	-0.210	-0.249
	-	(-2.62)**	(-1.02)	(-0.94)
Arabic	-	0.382	0.195	0.335
	-	(3.43)***	(1.70)*	(2.38)
German	-	-0.338	-0.236	-0.307
	-	(-1.59)	(-1.18)	(-1.27)
Dutch	-	-0.276	-0.062	0.101
	-	(-1.31)	(-0.28)	(0.43)
Swedish	-	-0.742	-0.547	-0.375
	-	(-1.82)*	(-1.43)	(-1.09)
Chinese	-	0.656	0.780	0.544
		(2.33)**	(2.07)**	(0.97)
Latitude from	-	-0.003	-0.004	-0.006
Equator	-	(-1.21)	(-1.50)*	(-2.03)**
Income	-	-0.132	-0.124	-0.114
	-	(-3.28)***	(-2.84)***	(-2.19)**

Opec	-	-	0.982	0.746
	-	-	(6.63)***	(5.67)***
Comecon	-	-	0.212	-0.072
	-	-	(0.97)	(-0.20)
Independence	-	-	0.000	-0.000
	-	-	(0.30)	(-1.00)
Post war	-	-	0.085	0.063
	-	-	(0.64)	(0.41)
Inflation	-	-	-	0.029
	-	-	-	(1.72)*
Openness	-	-	-	-0.003
	-	-	-	(-0.03)
GDP per capita	-	-	-	-0.001
				(-1.02)
Government Size				-0.013
	-	-	-	(-3.38)***
N	545	438	376	275
R^2	0.064	0.162	0.372	0.445
Adjusted-R^2	0.062	0.130	0.337	0.392

Notes: t-statistics in parenthesis;
*,**,*** respectively significant at 10%,5% and 1%.

Table 2. Government Spending Volatility and Country Size (OLS)-Robustness over time

	Bivariate	Control1	Control2	Control3
1961-1970				
Lnpop	-0.096	-0.109	-0.081	-0.054
	(-2.26)**	(-2.25)**	(-1.67)*	(-0.63)
N	94	94	91	66
R^2	0.052	0.315	0.385	0.472
Adjusted-R^2	0.042	0.183	0.215	0.227
1971-1980				
Lnpop	-0.059	-0.099	-0.002	-0.182
	(-1.79)*	(-2.69)***	(-2.04)**	(-2.11)**
N	140	137	123	74
R^2	0.022	0.334	0.354	0.423
Adjusted-R^2	0.016	0.246	0.227	0.189
1981-1990				
Lnpop	-0.119	0.165	-0.149	-0.137
	(-4.38)***	(-4.94)***	(-3.71)***	(-2.43)**
N	146	144	126	93
R^2	0.118	0.321	0.431	0.638
Adjusted-R^2	0.111	0.235	0.322	0.516
1991-2000				
Lnpop	-0.108	-0.188	-0.216	-0.221
	(-3.42)***	(-4.88)***	(-4.54)***	(-3.51)***
N	160	149	124	109
R^2	0.069	0.333	0.415	0.471
Adjusted-R^2	0.063	0.252	0.301	0.320

Notes: t-statistics in parenthesis;
*,**,*** respectively significant at 10%,5% and 1%.

Table 3. Government Spending Volatility and Country Size (Fixed & Random Effects)

1961-2000 (FE)				
	Bivariate	Control1	Control2	Control3
Lnpop	-0.096	-0.149	-0.157	-0.190
	(-5.94)***	(-7.22)***	(-6.47)***	(-5.42)***
N	545	438	376	275
R^2-within	0.062	0.277	0.377	0.456
R^2-between	0.858	0.562	0.619	0.998
R^2-overall	0.064	0.274	0.371	0.440
1961-2000 (RE)				
	Bivariate	Control1	Control2	Control3
Lnpop	-0.098	-0.153	-0.160	-0.208
	(-6.09)***	(-7.47)***	(-6.53)***	(-5.97)***
N	545	438	376	275
R^2-within	0.062	0.276	0.375	0.452
R^2-between	0.858	0.428	0.494	0.867
R^2-overall	0.064	0.275	0.372	0.445
Hausman Test (FE vs RE)				
p-value	0.24	0.99	1.00	1.00

Notes: t-statistics in parenthesis;
*,**,*** respectively significant at 10%,5% and 1%.

Table 4. Government Spending Volatility and Country Size (IV)

1961-2000				
	Bivariate	Control1	Control2	Control3
Lnpop	-0.054	-0.139	-0.161	-0.183
	(-2.56)***	(-4.76)***	(-4.50)***	(-3.20)***
N	545	438	376	276
R^2	0.051	0.274	0.372	0.304
R^2-adjusted	0.049	0.246	0.337	0.242

Notes: t-statistics in parenthesis;
*,**,*** respectively significant at 10%,5% and 1%.

Table 5. Government Spending Volatility and Country Size

1991-2000		
	OLS & Control4	IV & Control4
Lnpop	-0.200	-0.138
	(-2.59)***	(-1.39)
N	100	100
R^2	0.503	0.499
R^2-adjusted	0.298	0.291

Notes: t-statistics in parenthesis;
*,**,*** respectively significant at 10%,5% and 1%.

Table 6. Government Spending Volatility and Country Size (Rich and Poor countries)

1961-2000 (Rich)				
	Bivariate	Control1	Control2	Control3
Lnpop	-0.159	-0.092	-0.024	-0.069
	(-6.70)***	(-2.96)***	(-0.65)	(-1.61)*
N	228	190	166	133
R^2	0.166	0.492	0.599	0.632
R^2-adjusted	0.162	0.445	0.544	0.553
1961-2000 (Poor)				
	Bivariate	Control1	Control2	Control3
Lnpop	-0.075	-0.154	-0.202	-0.307
	(-3.53)***	(-4.25)***	(-4.60)***	(-5.24)***
N	317	248	210	146
R^2	0.038	0.126	0.181	0.350
R^2-adjusted	0.035	0.070	0.099	0.231

Notes: t-statistics in parenthesis;
*,**,*** respectively significant at 10%,5% and 1%.

Table 7-Discretionary Government Spending Volatility and Country Size

	Bivariate	Control1	Control2	Control3
Lnpop	-0.075	-0.067	-0.029	-0.076
	(-2.32)***	(-3.50)***	(-1.43)	(-3.14)***
Urban	-	0.005	0.005	0.005
	-	(2.60)**	(2.85)**	(2.50)**
Density	-	0.003	0.005	0.006
	-	(1.77)*	(3.18)***	(3.90)***
Landlocked	-	0.116	0.169	0.135
	-	(1.42)	(2.39)**	(1.96)**
Island	-	0.002	0.104	-0.002
	-	(0.02)	(1.31)	(-0.02)
English	-	-0.030	-0.053	-0.046
	-	(-0.46)	(-0.93)	(-0.89)
French	-	-0.082	-0.034	-0.038
	-	(-1.17)	(-0.56)	(-0.66)
Spanish	-	-0.002	0.072	-0.038
	-	(-0.02)	(0.94)	(-0.49)
Portuguese	-	0.107	0.098	-0.109
	-	(0.74)	(0.80)	(-0.83)
Arabic	-	0.052	0.005	-0.005
	-	(0.54)	(0.06)	(-0.07)
German	-	-0.520	-0.524	-0.427
	-	(-3.29)***	(-3.93)***	(-2.73)***
Dutch	-	-0.570	-0.693	-0.654
	-	(-2.76)***	(-3.91)***	(-3.77)***
Swedish	-	-0.545	-0.473	-0.399
	-	(-2.26)**	(-2.34)**	(-2.20)**
Chinese	-	-1.624	-2.573	-3.505
		(-1.74)*	(-3.20)***	(-3.49)***
Latitude from	-	0.000	0.000	0.001
Equator	-	(0.09)	(0.43)	(0.58)
Income	-	-0.260	-0.220	-0.146
	-	(-8.82)***	(-8.20)***	(-4.39)***

Opec	-	-	0.148	0.214
	-	-	(1.35)	(2.10)**
Independence	-	-	0.003	0.002
	-	-	(5.45)***	(3.86)***
Post war	-	-	-0.041	-0.103
	-	-	(-0.39)	(-1.05)
Inflation	-	-	-	0.015
	-	-	-	(2.43)**
Openness	-	-	-	-0.013
	-	-	-	(-1.39)
GDP per capita	-	-	-	-0.002
				(-2.85)***
Government Size				-0.002
	-	-	-	(-0.69)
N	91	90	83	80
R^2	0.057	0.790	0.871	0.905
Adjusted-R^2	0.046	0.743	0.832	0.866

Notes: t-statistics in parenthesis;
*,**,*** respectively significant at 10%,5% and 1%.

Table 8. Government Spending Volatility by Functional Classification and Country Size

	PU	DE	OS	EA	HO	HE	RE	ED	SP
Lnpop	-0.241	-0.180	-0.474	-0.352	-0.192	-0.284	-0.266	-0.315	-0.252
	(-2.43)**	(-1.69)*	(-2.43)**	(-3.81)***	(-2.11)**	(-3.46)***	(-2.60)**	(-3.42)***	(-2.72)***
N	102	83	60	94	95	95	76	100	88
R^2	0.342	0.554	0.555	0.533	0.460	0.524	0.632	0.233	0.342
R^2-adjusted	0.159	0.391	0.290	0.388	0.295	0.378	0.479	0.027	0.132

Notes: t-statistics in parenthesis; PU= General public services; DE= Defense; OS= Public order and safety; EA=Economic affairs; HO=Housing and community amenities; HE=Health; RE=Recreation, culture and religion; ED=Education; SP=Social protection.

*,**,*** respectively significant at 10%,5% and 1%.

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