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NON-TECHNICAL SUMMARY

This paper provides empirical evidence showing that smaller countries tend to have more volatile government consumption for a sample of 160 countries from 1960 to 2000. While Alesina and Wacziarg (1998) robustly show that smaller countries have higher levels of public consumption as a share of GDP, to the best of our knowledge, the impact of the size of nations upon the volatility of government consumption has not yet been discussed in the literature.

From a business cycle perspective, some government consumption volatility may be positive if fiscal authorities use expenditures counter cyclically to smooth out the effects of economic shocks. However, most of the existing empirical studies finds that higher volatility of public consumption 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).

We argue that a negative relationship between government consumption volatility and country size can be mainly explained by two reasons: 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.

Our empirical finding 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, our empirical analysis shows that the discretionary (not reacting to the state of economy for fine tuning purpose) government consumption volatility is also decreasing with the size of nations.

This paper, therefore, highlights the need for small countries to smooth government consumption in order to improve their economic growth prospects. In addition, to the extent that large fiscal areas reduce government consumption volatility, our findings reinforce the role of fiscal coordination and/or fiscal federalism in monetary unions.

ABSTRACT

This paper provides empirical evidence showing that smaller countries tend to have more volatile government consumption for a sample of 160 countries from 1960 to 2000. The analysis also shows that country size is negatively related to the discretionary part of government consumption and to the volatilities of most of government consumption items. The results are robust to different time and country samples, different econometric techniques and to several sets of control variables.

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

VOLATILITE DE LA CONSOMMATION GOUVERNEMENTALE ET TAILLE DU PAYS

RESUME NON TECHNIQUE

Mené sur un échantillon de 160 pays sur la période 1960-2000, notre travail montre que la volatilité de la consommation publique est plus forte dans les petits pays. Alesina et Wacziarg (1998) ont établi que la consommation publique est, en proportion du PIB, plus élevée dans les petits pays, mais, à notre connaissance, l'impact de la taille du pays sur la volatilité de cette consommation n'a jamais été traité dans la littérature. Du point de vue du cycle d'activité, une certaine volatilité de la consommation publique peut être positive si les autorités budgétaires l'utilisent pour amortir l'impact des chocs économiques ; mais, du point de vue de la croissance et du bien-être, la plupart des études empiriques ont montré que cette volatilité est négative. On peut notamment citer les travaux de Fatás et Mihov (2003 et 2005), Furceri (2007), Afonso et Furceri (2008), Loayza et al. (2007).

Le lien entre taille du pays et volatilité de la consommation publique peut s'expliquer essentiellement par deux raisons : i) la taille du pays permettant d'amortir les chocs idiosyncratiques, la volatilité de la consommation publique employée au réglage conjoncturel est moindre dans les grands pays ii) les rendements d'échelle croissants de la dépense publique, qui proviennent du fait que les grands pays disposent d'un plus grand nombre de contribuables sur lesquels répartir la charge du financement de la dépense budgétaire, permettent aux plus grands pays de fournir les biens publics de manière moins volatile.

Nos résultats apparaissent robustes à la composition de l'échantillon (pays et période), aux techniques économétriques et au choix des variables de contrôle. En particulier, une analyse de la consommation publique désagrégée par fonction montre que la volatilité est plus grande dans les petits pays quelle que soit la fonction considérée. De plus, notre analyse montre que la volatilité de la consommation publique discrétionnaire (celle qui n'est pas utilisée au réglage conjoncturel) est plus faible dans les grands pays.

Dans la mesure où une large base fiscale permet de réduire la volatilité de la consommation publique, nos résultats soulignent l'avantage que la coordination ou le fédéralisme budgétaire peut représenter pour les pays membres d'une union monétaire.

RESUME COURT

Mené sur un échantillon de 160 pays sur la période 1960-2000, notre travail montre que la volatilité de la consommation publique est plus forte dans les petits pays. Cette corrélation négative s'observe aussi sur la composante discrétionnaire et les différentes fonctions de la consommation publique. Nos résultats apparaissent robustes à la composition de l'échantillon (pays et période), aux techniques économétriques et au choix des variables de contrôle.

Classement JEL : E62, H10.
Mots Clés : Politique fiscale, taille du gouvernement, volatilité fiscal, taille du pays

GOVERNMENT CONSUMPTION VOLATILITY AND COUNTRY SIZE

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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 large 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. From a business cycle perspective, some government spending volatility may be positive if fiscal authorities use expenditures counter cyclically to smooth out the effects of economic shocks.

However, most of the existing empirical research in the field finds 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

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

[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).

investment as the theories of irreversible investment emphasize (see, in addition, Ramey and Ramey, 1995; Aghion and Banerjee, 2005; and Imbs, 2007).

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 mainly explained by two arguments:

1) To the extent that government spending is used for counter-cyclical purposes, smaller economies, characterized by more volatile output and more exposure to idiosyncratic shocks, may use government spending more aggressively.[3]

2) Increasing returns to scale of government spending originating from the higher ability to spread the cost of financing it over a larger pool of taxpayers, may facilitate a less volatile provision of public goods.

Other effects of country size may work in the opposite direction, though. In large countries, for instance, more individual heterogeneity may prompt higher political polarization in terms of preferences for type and size of public goods (see, among others, Dixit and Weibull, 2007; Fernández and Levy, 2008; and Lindqvist and Österling, 2008), resulting in larger government spending volatility due to the switching of different political groups in power.[4]

The objective of this paper is to analyze the empirical relationship between government consumption volatility and country size using a panel data set that includes 160 countries with observations from 1960 to 2000. That relationship is investigated for both the discretionary (controlling for the automatic stabilizers) and the non-discretionary parts of government consumption. This allows us to check if each one of our hypotheses plays a role in explaining that relationship. For the same reason, we also estimate the effect of country size on the volatility of the several functional categories of government consumption. We focus on government consumption rather than on government total spending (or total revenue) given that consumption accounts for most of the spending (approximately 4/5 of the total), and because government total spending is not available for an extensive set of countries for a long time span in our data sample.

[3] Even if output were as volatile as in larger countries, smaller countries would have to use larger fiscal impulses given the smaller size of their fiscal multipliers. Moreover, smaller countries are also less diversified, which again makes them more unstable and asks for more counter cyclical fiscal policy (see Down, 2007).

[4] Using the dispersion of self-reported political preferences, Lindqvist and Österling (2008) show that larger nations are more politically polarized, and have governments that both consume and redistribute less.

As main findings of our analysis, we obtain that: 1) smaller countries have more volatile discretionary (corrected for output volatility) and non-discretionary government consumption volatility; 2) consumption spending in all functional categories is more volatile in smaller countries. These results are extremely robust to different time and country samples, different econometric techniques as well as to several sets of control variables. Thus, they confirm that the larger size of a country both acts as an insurance against idiosyncratic shocks and leads to increasing returns to scale, decreasing the volatility of government consumption.

The rest of the paper is organized as follows. Next section describes the paper's empirical methodology used to test for the relationship between country size and government consumption volatility. The third section presents the results. The fourth section shows the results of our robustness tests. Section 5 conveys the results of the estimations for the volatilities of the different functional categories of government consumption. Finally, Section 6 concludes the paper.

2. 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 total population as our measure of country size, and the standard deviation of annual growth of real government consumption spending as our measure for government consumption volatility.[5]

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.

[5] The choice of the standard deviation of the growth rate of real government consumption as measure of consumption volatility could be criticized since, usually, countries with higher growth rates of government consumption 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 consumption) the average growth 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 consumption volatility. The first is the standard deviation of the cyclical component of real government consumption. Its use avoids the "scale" problem since the time average of the cyclical component by construction is zero for each country (Furceri, 2007; Afonso and Furceri, 2008). The second measure is the ratio between the standard deviation and the average level of real government consumption. 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.

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).[6]

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,[7] and (h) language dummies.[8] 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 we are able to capture (at least in part) different level of language fractionalization among and within countries.[9]

The *second set* of control variables augments the first set by 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 consumption volatility: (a) GDP per capita,[10] (b) Openness,[11] (c) CPI Inflation, and (d) Government size.[12] 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

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

[7] Dummies are created for developing countries originating from the following regions: 1) Latin America, 2) Sub-Saharan Africa, 3) East Asia, 4) South Asia, 5) Europe-Central Asia, 6) and Middle East-North Africa.

[8] Dummies are created for countries speaking the following languages: 1) English, 2) French, 3) German, 4) Dutch, 5) Portuguese, 6) Spanish, 7) Arabic, and 8) Chinese.

[9] 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.

[10] 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).

[11] We use as proxy for openness the GDP's share of total exports and imports. Note that this measure is negatively correlated with our measure of country size (0.57). Nevertheless, its inclusion does not change the significance and sign of the coefficient of country size in our regressions, indicating that our estimations are not really affected by the collinearity between the two variables.

[12] Government size is here measured as the ratio of government consumption to GDP.

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 counter-cyclical fiscal policies (Rodrik, 1998). In turn, countries with larger government are usually characterized by larger automatic stabilizers and thus are less tempted to use discretionary measure of fiscal policy for fine tuning purposes (Fatás and Mihov, 2001).[13]

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. 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 consumption volatility using the following regression model:

$$\ln(\sigma_{i,t-t+\tau}) = \beta \ln(Pop_{\mathrm{it}}) + \alpha + \{\gamma_t T_t\} + \Sigma_j \delta_j X_{\mathrm{ijt}} + \varepsilon_{\mathrm{it}} \qquad (1)$$

where σ measures government consumption 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.

3. RESULTS

Figure 1 provides the scatter plot of government consumption volatility (measured by the standard deviation of the annual growth rate of government consumption 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:

$$\sigma_i = \underset{(7.77)}{0.207} - \underset{(-3.40)}{0.011} \ln(Pop_i)$$

[13] We also include the *volatility of private consumption* as additional variable in the third set of controls for robustness check. That is because private consumption volatility is usually related to public expenditure due to transfers made by the governments or taxes paid by households (Herrera, 2007; and Herrera and Vincent, 2008). However, given that the direction of causality among those two variables is not clear, we exclude this variable from the rest of the analysis in order to avoid endogeneity problems.

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 consumption.[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:

$$\sigma_i = 0.169 - 0.008 \ln(Pop_i)$$

$$(9.90) \quad (-3.92)$$

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 (1). In particular, the five 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; (iv) OLS including the third set of controls; and (v) OLS including the third set of controls plus the volatility of private consumption.

Focusing on the full-period (pooled) 1961-2000, it can be readily seen that the relation between country size and government consumption volatility is negative and 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.[15] In fact, we believe it is significant that country size is shown to reduce government spending volatility even when we control for openness, since

[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] In our estimations, *Island*, *Arabic language, OPEC*, *Government Size, and Private consumption volatility* are other variables that we find to be highly significant. In particular, 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 them (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.

trade openness is the only variable found to be robustly and significantly related with country size (Rose, 2006).

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). Hence, just because Germany is approximately ten times the size of Belgium, this means that Germany has roughly 58 percent less volatile government expenditure than Belgium.

Two main effects can explain this result. First, by the Law of Large Numbers, larger countries are less exposed to specific idiosyncratic shocks, and therefore, government revenues and expenditures become less volatile (Rodrik, 1998). For instance, a region or state in a large country hit by a localized recession or natural disaster would benefit from fiscal transfers from the rest of the country, reducing government spending volatility for the nation as a whole.[16] Moreover, it is possible to argue that, the larger the country the less it will be exposed to "shock surprises" and the lower will be output volatility σ_ε (Furceri and Karras, 2007 and 2008).

Second, increasing returns of scale of non-rival public goods allow larger countries to provide less volatile government expenditure, which is preferred given the impacts of that volatility on growth discussed before. As Alesina and Wacziarg (1998) show, an increase in country size raises the optimal level of public spending provision, which can be interpreted as an income effect. Nevertheless, 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 ability of the government to spread the cost of financing public goods over a larger pool of taxpayers leading to the increasing returns to scale. Empirically, the substitution effect dominates the income effect (Alesina and Wacziarg, 1998), implying a lower government spending ratio to GDP for larger countries and easing a less volatile provision of public good.

4. ROBUSTNESS TESTS

As additional robustness checks, the relation between country size and fiscal volatility in different time periods is also examined. 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 using the same specification as in Table 1. Our results suggest that while the effect of country size on government consumption volatility remains negative and statistically significant, the

[16] Notice that governments could, in addition, use public debt management to cushion the effect of income shocks on its revenues and to keep government consumption more stable (see Medina Cas and Ota, 2008). Therefore, as another robustness check, we include *public debt* in the third set of controls of Table 1. However that variable is insignificant in our estimations. Further, its inclusion reduces substantially the number of countries in our sample, which diminishes the significance of all other variables, including that of *country size*.

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 (for the first sample period), and to the fact that government consumption 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 consumption 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, the second and the third set of controls with: (i) Fixed Effects and Time Random Effects; and (ii) IV estimation, respectively.[17] 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 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.[18]

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 and again our findings remain 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

[17] As robustness check 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 consumption 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$(t, t+\tau)$.

[18] 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).

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).[19] 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 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 consumption volatility, instead of general government consumption volatility, as our dependent variable.

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.[20] The difficulty mainly comes from the simultaneity in the determination of output and government consumption 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) and Herrera and Vincent (2008), our measure is obtained by estimating for each country *i* the following equation:

$$\Delta G_{i,t} = \alpha_{i,t} + \beta_i \Delta Y_{i,t} + \gamma_i \Delta G_{i,t-1} + \delta_i W_{i,t} + \varepsilon_{i,t} \quad , \tag{2}$$

where G is the logarithm of real government consumption, 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. $\sigma_{i,t+\tau} = \sqrt{\mathrm{var}(\varepsilon_{i,t-t+\tau})}$) is assumed as a quantitative estimate of discretionary fiscal policy volatility. In order to estimate equation (2) 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 (see also Herrera and Vincent, 2008).

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 discretionary government consumption volatility is still negatively and statistically significant, even though

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

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

significantly smaller in value than that for the general government consumption.[21] This suggests that part of the higher government consumption volatility in smaller countries can be explained by stronger use of counter-cyclical fiscal policy in those countries. Nevertheless, given that country size is still significant and negative after controlling for automatic stabilizers, the relation between government consumption volatility and country size seems also to be affected by the increasing returns to scale in the provision of non rival public goods.

5. GOVERNMENT CONSUMPTION VOLATILITY BY FUNCTIONAL CATEGORIES

Our analysis, so far, has pointed out a clear negative relation between government spending consumption volatility and country size. However, to better understand this relation it is useful to analyze the different components of government consumption. 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 previously discussed, a larger country size may reduce government consumption volatility because of the higher returns to scale of the non-rival good. To this extent, we should expect expenditure volatility related to non-rival public goods (such as general administration) to be more associated with country size than expenditure volatility related to rival public goods (such as education, health, and order and safety).

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

Table 8 shows the results of the regression between government consumption volatility classified by economic function and country size for the period 1971-2000 using in addition 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 consumption also because they are more exposed to idiosyncratic shocks. Moreover, from all

[21] For the volatility of discretionary government consumption the coefficient of country size is around 0.07, whereas for the general government consumptions it is around 0.2.

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

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

consumption items analyzed, economic affairs and public order are the ones whose coefficient of country size has larger value, which might be due to the high level of non-rivalry of these goods.

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

6. CONCLUSION

This paper provides empirical evidence showing that smaller countries tend to have more volatile government consumption spending. We argue that a negative relationship between government consumption volatility and country size can be mainly explained by two reasons: i) to the extent that government consumption is used for counter-cyclical purposes, the size of a country acts as an insurance against idiosyncratic shocks, leading to a less volatile government consumption; ii) increasing returns to scale of government consumption originating from higher ability to spread the cost of financing it over a larger pool of taxpayers, allow the government to provide the public good in a less volatile way.

This finding 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, our empirical analysis shows 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 smooth government consumption in order to 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 consumption volatility, our findings reinforce the role of fiscal coordination and/or fiscal federalism in monetary unions, even though other factors may undermine and overcome such fiscal manoeuvres (see, among others, Beetsma and Bovenberg, 1998; Beetsma et al., 2001; and von Hagen et al. 2002).

The current analysis offers various possibilities for further research. On the theoretical side, including a 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 total spending, taxes revenues, and debt management could ratify our findings that that variable indeed acts as an insurance against idiosyncratic shocks, and could show how strong this effect is indeed.

Figures and Tables

FIGURE1. CORRELATION OF GOVERNMENT VOLATILITY AND POPULATION

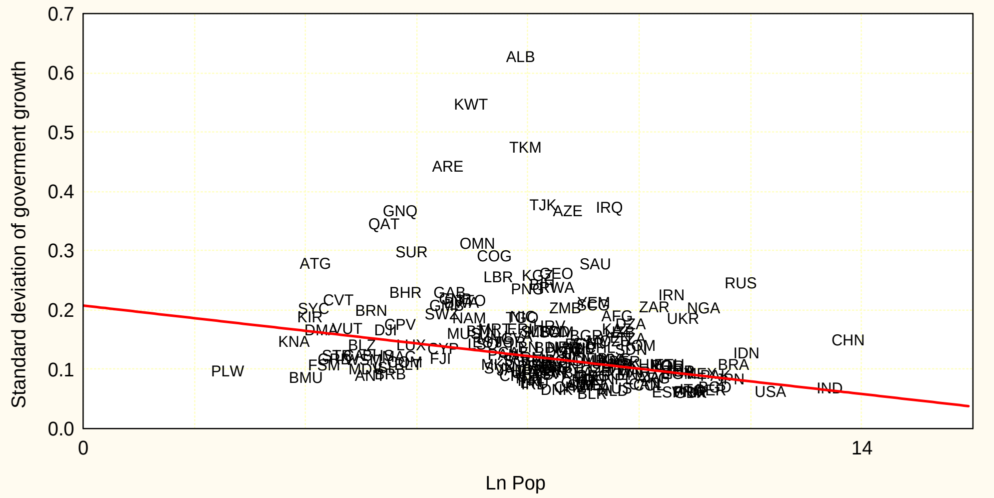

Table 1. Government Consumption Volatility and Country Size

	Bivariate	Control1	Control2	Control3	Control3[a]
Lnpop	-0.098	-0.153	-0.160	-0.208	-0.145
	(-6.09)***	(-7.47)***	(-6.53)***	(-5.97)***	(-4.62)***
Urban	-	-0.002	-0.002	-0.003	-0.004
	-	(-0.70)	(-1.08)	(-0.99)	(-1.60)
Density	-	-0.001	-0.001	-0.001	-0.001
	-	(-1.57)	(-0.29)	(-0.75)	(-0.72)
Landlocked	-	-0.131	-0.071	-0.078	-0.054
	-	(-1.30)	(-0.72)	(-0.70)	(-0.55)
Island	-	-0.303	-0.238	-0.223	-0.133
	-	(-2.90)***	(-2.09)***	(-1.85)*	(-1.25)
English	-	-0.079	-0.033	0.026	-0.001
	-	(-1.01)	(-0.41)	(0.31)	(-0.01)
French	-	-0.127	-0.015	-0.047	-0.030
	-	(-1.34)	(-0.16)	(-0.47)	(0.33)
Spanish	-	-0.224	-0.110	-0.144	-0.166
	-	(-1.96)**	(-0.84)	(-1.02)	(-1.35)
Portuguese	-	-0.456	-0.210	-0.249	-0.020
	-	(-2.62)**	(-1.02)	(-0.94)	(-0.08)
Arabic	-	0.382	0.195	0.335	0.309
	-	(3.43)***	(1.70)*	(2.38)	(2.51)
German	-	-0.338	-0.236	-0.307	-0.319
	-	(-1.59)	(-1.18)	(-1.27)	(-1.50)
Dutch	-	-0.276	-0.062	0.101	-0.222
	-	(-1.31)	(-0.28)	(0.43)	(-1.07)
Swedish	-	-0.742	-0.547	-0.375	-0.284
	-	(-1.82)*	(-1.43)	(-1.09)	(-0.94)
Chinese	-	0.656	0.780	0.544	0.374
		(2.33)**	(2.07)**	(0.97)	(0.76)

Latitude from	-	-0.003	-0.004	-0.006	-0.004
Equator	-	(-1.21)	(-1.50)*	(-2.03)**	(-1.52)
Income	-	-0.132	-0.124	-0.114	-0.614
	-	(-3.28)***	(-2.84)***	(-2.19)**	(-1.34)
Opec	-	-	0.982	0.746	0.663
	-	-	(6.63)***	(5.67)***	(4.72)***
Comecon	-	-	0.212	-0.072	-0.048
	-	-	(0.97)	(-0.20)	(-0.20)
Independence	-	-	0.000	-0.000	-0.000
	-	-	(0.30)	(-1.00)	(-1.11)
Post war	-	-	0.085	0.063	0.052
	-	-	(0.64)	(0.41)	(0.38)
Inflation	-	-	-	0.029	0.010
	-	-	-	(1.72)*	(0.96)*
Openness	-	-	-	-0.003	0.010
	-	-	-	(-0.03)	(0.92)
GDP per capita	-	-	-	-0.001	-0.001
				(-1.02)	(-1.06)
Government Size	-	-	-	-0.013	-0.013
	-	-	-	(-3.38)***	(-3.84)***
Consumption	-	-	-		
volatility	-	-	-		44.767
					(8.74)***
N	545	438	376	275	275
R^2	0.064	0.162	0.372	0.445	0.445
Adjusted-R^2	0.062	0.130	0.337	0.392	0.392

Notes: t-statistics in parenthesis; *,**,*** respectively significant at 10%,5% and 1%.
[a] This column includes private consumption volatility in the third set of control variables.

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

	1961-1970			
	Bivariate	Control1	Control2	Control3
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			
	Bivariate	Control1	Control2	Control3
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			
	Bivariate	Control1	Control2	Control3
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			
	Bivariate	Control1	Control2	Control3
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 Consumption 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 Consumption 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 Consumption 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 Consumption 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 Consumption 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 Consumption 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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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 Consumption 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.

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