The Determinants of Public Deficit Volatility

Luca Agnello* Ricardo M. Sousa†

Abstract

This paper empirically analyzes the political, institutional and economic sources of public deficit volatility. Using the system-GMM estimator for linear dynamic panel data models and a sample of 125 countries analyzed from 1980 to 2006, we show that higher public deficit volatility is typically associated with higher levels of political instability and less democracy. In addition, public deficit volatility tends to be magnified for small countries, in the outcome of hyper-inflation episodes and for countries with a high degree of openness.

Keywords: *public deficit, volatility, political instability, institutions.*

JEL Classification: *E31, E63.*

*University of Palermo, Department of Economics, Business and Finance, Italy; European Central Bank, Kaiserstraße 29, D-60311 Frankfurt am Main, Germany. Email: luca.agnello@economia.unipa.it, luca.agnello@ecb.europa.eu.

†University of Minho, Department of Economics and Economic Policies Research Unit (NIPE), Campus of Gualtar, 4710-057 - Braga, Portugal; London School of Economics, Department of Economics and Financial Markets Group (FMG), Houghton Street, London WC2 2AE, United Kingdom. Email: rjsousa@eeg.uminho.pt, r.j.sousa@lse.ac.uk.

1 Introduction

A major economic development of the post-World War II era is the rise and persistence of fiscal deficits in a wide range of developed and developing countries.

High and volatile fiscal deficits can be harmful to welfare for several reasons. First, they can lead to an inefficient allocation of resources and act as a constraint to the private sector by generating "crowding-out" effects. Second, by raising the debt-to-GDP ratio, they may negatively impact on a country's long-run fiscal sustainability, therefore, affecting the living standards of future generations. Third, they can increase the level and volatility of inflation, in particular, when there is a lack of independence of the central bank.

Many academics have, therefore, devoted a great effort to understanding the determinants of the large public deficits, but surprisingly the literature on public deficit volatility is inexistent. Moreover, given that the cross-sectional pattern of deficits is far from homogeneous, one can hardly explain it using economic arguments alone. For instance, while OECD countries are relatively similar, their institutions (such as budget, Central Bank and electoral laws, degree of decentralization, party structure, political stability and social polarization...) are quite different. As North (1990), Persson and Tabellini (1992), Keefer and Knack (1995), Wagner (1997), and Persson (2001) note, economic outcomes are influenced by the institutional framework within which fiscal decisions are implemented. That is, in practice, a country's economic reality is influenced by a complex array of factors and does not emerge in a vacuum. Consequently, political and institutional factors may also be crucial for explaining the heterogeneity of budget deficit volatility, in particular, and fiscal policy in general.

The major goal of this paper is to empirically assess the political, institutional and economic determinants of fiscal policy. We do so by improving the existing literature in three major directions. First, we focus on the sources of fiscal deficit *volatility* instead of looking at the drivers of fiscal deficit's *level*. Second, we use a system-GMM estimation applied to dynamic panel data, therefore, addressing the econometric limitations of the OLS (ordinary least squares) models previously used, namely, by accounting for the endogeneity of political, institutional and economic variables that may affect fiscal deficit volatility. Third, we rely on measures of political instability by using information from datasets such as the Database of Political Institutions from Beck et al. (2001) and the Cross National Time Series Data Archive. The combination of modern econometric techniques and a richer data coverage should, therefore, provide a more accurate estimation of the linkages between public deficit volatility and political, institutional and economic instability.

Using a panel dataset of 125 countries from 1980 to 2006, we show that a higher level of political instability (as measured by the higher level of ministerial turnover and the larger number of government crises) leads to an increase in public deficit volatility. These effects are sizeable - an additional cabinet change raises deficit volatility by 15%, while a new incoming signal of government crisis increases it by 45% - and magnified in the face of episodes of hyper-inflation.

Additionally, the empirical findings suggest that the political regime and the country size are other important sources of the public deficit volatility. We show that: (*i*) when the Polity Scale (greater democracy) increases by one point, the fiscal deficit volatility falls by 3%; and (*ii*) smaller countries have more volatile budget deficits as a result of their larger output volatility and wider exposure to idiosyncratic shocks.

Finally, we find that a higher level of inflation leads to an increase of deficit volatility, although the magnitude of the effect is small. Countries with larger deficits (in percentage of

GDP) also exhibit higher deficit instability. On the other hand, richer countries - that is, the ones where real GDP per capita is larger - are characterized by stable deficits.

The balance of the paper is organized as follows. Section 2 reviews the existing literature on the political, institutional and economic determinants of public deficits. Section 3 presents the estimation methodology and Section 4 describes the data. In Section 5, we discuss the results and, in Section 6, we provide some sensitivity analysis. Finally, Section 7 concludes with the main findings and policy implications.

2 Revision of the Literature

A striking feature of the majority of countries over the last thirty years is the rise and persistence of fiscal deficits. In addition, the damages of high public deficit volatility can not be neglected and pose a major challenge for many developing countries. First, a high deficit volatility may lead to high volatility of interest rates, which in turn represents a financial burden on companies and a potential drawback for their competitiveness. Second, in the context of high deficit volatility, it becomes more difficult for agents to understand the timing and magnitude of the fiscal policies, which increases the inefficiency of economic decisions. Third, when the deficit volatility is high, the government spending patterns can not be smoothed and the distortions created by temporary or infrequent measures are amplified. Fourth, when fiscal deficit volatility has its roots in extreme revenue volatility, the quality of government services may be reduced given the difficulties in planning, for instance, future health or education services. Fifth, high deficit volatility may skew investment towards short run gains and lead to irreversible human capital losses.

While high and volatile fiscal deficits can negatively impact on welfare, the literature on fiscal policy has typically focused on the economic determinants of government spending vis-a-vis government revenue in accordance with the tax smoothing theory introduced by Barro (1979). This has been done by analyzing the responsiveness of fiscal policy to the business cycle (Lane, 2003; Galí and Perotti, 2003; Akitoby et al., 2004; Talvi and Vegh, 2005; Darby and Melitz, 2007), the discretionary impact of fiscal policy on the macroeconomic environment, and, more recently, the fiscal persistence (Afonso et al., 2008). Not surprisingly, the three dimensions of fiscal policy have gathered a great deal of attention from academics as they are crucial for output stabilization and growth (Ramey and Ramey, 1995; Epaulard and Pommeret; 2003; Fatás and Mihov, 2003, 2005, 2006; Barlevy, 2004; Furceri, 2007; Imbs, 2007).

Nevertheless, the large cross-country heterogeneity of the deficit size is hard to reconcile on purely economic grounds and, as a result, a growing literature on fiscal politics has started to focus on the political and institutional determinants of fiscal responsiveness and discretion. In this context, Persson (2001) and Persson and Tabellini (2001) find that political and institutional variables also matter for fiscal responsiveness. Hallerberg and Strauch (2002) and Sorensen et al. (2001) argue that fiscal policy is less anti-cyclical in election years. Lane (2003) shows that countries with volatile output and dispersed political power are the most likely to run pro-cyclical fiscal policies. Fatás and Mihov (2003, 2006) find that strict budgetary constraints lead to lower policy volatility and reduce the responsiveness of fiscal policy to output shocks. Alesina and Tabellini (2008) suggest that most of the pro-cyclicality of fiscal policy in developing countries can be explained by high levels of corruption. Afonso et al. (2008) show that while country and government sizes and income have negative effects

on the discretionary component of fiscal policy, they tend to increase fiscal policy persistence.

Among this strand of political economy literature, some authors have also tried to assess the determinants of the *level* of public deficit. Alesina and Perotti (1995) and Persson and Tabellini (1997) find that large deficits and debts have been more common in countries with proportional rather than majoritarian and presidential electoral systems, in countries with coalition governments and frequent government turnovers, and in countries with lenient rather than stringent budget processes. Henisz (2004) suggests that the presence of institutional checks and balances may improve economic outcomes. Woo (2003) emphasizes the role of political factors (government fragmentation, political instability and institutions), social polarization (ethnic division and income inequality), and institutional factors (budgetary procedures and rules, bureaucratic efficiency, and democracy). Leachman et al. (2007) show that fiscal performance is better when fiscal budgeting institutions are strong.

Some important questions remain. Why do some countries have more volatile fiscal deficits than others? What are the determinants of the *volatility* of public deficit? This paper argues that an important part of the answer lies on the fact that politically unstable countries with weak institutions are often susceptible to shocks that, in turn, result in higher deficit volatility. We hypothesize that political and institutional factors have a direct impact on deficit volatility that goes beyond the economic sources of fiscal instability. Analyzing the relationship between fiscal policy volatility and a set of political, institutional and economic factors is, therefore, the major goal of this work.

3 Econometric Methodology

In order to identify the main determinants of the budget deficit volatility, we estimate a dynamic panel data models for standard deviations of the general government budget deficit (as percentage of GDP) for consecutive, non-overlapping, 3-year periods, from 1980 to 2006.[1] We specify the following dynamic log-linear equation:

$$\log[\sigma(Def_{i,t})] = \beta_0 \log[\sigma(Def_{i,t-1})] + \mathbf{Y}_{i,t}^{'}\beta_1 + \beta_2 W_{i,t} + \mathbf{X}_{i,t}^{'}\boldsymbol{\beta_3} + v_i + \varepsilon_{i,t} \qquad (1)$$

for $i = 1, ..., N$, $t = 1, ..., T_i$, where $\log[\sigma(Def_{i,t})]$ stands for the logarithm of the standard deviation of budget deficit of country i for the 3-year period t. $\mathbf{Y}_i$, $\mathbf{X}_i$ and W_i are the set of controls that we assume to be related to deficit volatility. In particular, $\mathbf{Y}_i$ denote a set of political and institutional variables, $\mathbf{X}_i$ is a set of macroeconomic variables while W_i is a variable which controls for the influence of country-specific demographic characteristics; β_0, β_1, β_2, β_3 and v_i are the parameters to be estimated and $\varepsilon_{i,t}$ is an i.i.d. error term.

Since the specification is dynamic panel and embodies fixed country-specific effects (v_i), the parameters are estimated by system GMM. In fact, when model (1) is estimated using OLS in both the fixed and random effects settings, the lagged dependent variable, $\log[\sigma(Def_{i,t-1})]$, will be correlated with the error term $\omega_{i,t} = v_i + \varepsilon_{i,t}$, even if we assume that the disturbances are not themselves autocorrelated.[2] The bias of the fixed effects estimator is a function of T, and only if $T \to \infty$ will the parameters be consistently estimated (Nickell, 1981; Kiviet, 1995). Since our sample has only 9 non-overlapping 3-year periods, the bias may still be important.

[1] The periods are: 1980–82, 1983–85, ..., 2001–03, and 2004–06.

[2] See Arellano and Bond (1991) and Baltagi (2001).

To avoid these problems, Arellano and Bond (1991) develop a generalized method of moments (GMM) estimator that allows one to get rid of country-specific effects or any time invariant country-specific variable, and any endogeneity that may be due to the correlation of the country-specific effects and the right-hand side regressors. Consequently, first differencing (1) removes v_i and produces an equation that can be estimated by instrumental variables:

$$\Delta \log[\sigma(Def_{i,t})] = \Delta\beta_0 \log[\sigma(Def_{i,t-1})] + \mathbf{\Delta Y}'_{i,t}\beta_1 + \beta_2 \Delta W_{i,t} + \mathbf{\Delta X}'_{i,t}\boldsymbol{\beta}_3 + \Delta\varepsilon_{i,t} \quad (2)$$

where $i = 1, ..., N$, $t = 1, ..., T_i$.

When the explanatory variables are not strictly exogenous, they become endogenous even after first-differencing since they will be correlated with the error term. As a result, Arellano and Bond (1991) follow Holtz-Eakin et al. (1988) and develop a Generalized Method of Moments (GMM) estimator for linear dynamic panel data models that solves this problem by instrumenting the differenced predetermined and endogenous variables with their available lags in levels, namely: the levels of the dependent and endogenous variables lagged two or more periods; and the levels of the pre-determined variables lagged one or more periods. The exogenous variables can be used as their own instruments.

A final problem of the difference-GMM estimator is that lagged levels are weak instruments for first-differences when the series are very persistent (Blundell and Bond, 1998). According to Arellano and Bover (1995), efficiency can be increased by adding the original equation in levels to the system. If the first-differences of the explanatory variables are not correlated with the individual effects, lagged values of the first-differences can then be used as instruments in the equation in levels. Lagged differences of the dependent variable may also be valid instruments for the levels equation. Following the above considerations, we follow Blundell and Bond (1998) and estimate the model (1) by system-GMM, therefore, accounting for potential reversal causality problems.

4 Data

We gather annual data on economic, political and institutional variables, from 1980 to 2006, for 207 countries. Nevertheless, the presence of missing values for several variables reduces the number of countries in the estimations to at most 125. The dependent variable ($\log[\sigma(Def_{i,t})]$) is computed using the WEO's data for general government revenue and spending. Political and institutional data are obtained from the Cross National Time Series Data Archive (CNTS) and the Polity IV Database (Polity IV). The sources of economic data are the International Financial Statistics (IFS) and the World Economic Outlook (WEO) from the International Monetary Fund (IMF), the Penn World Table 6.2 (PWT), and the World Bank's World Development Indicators (WDI).

The set of controls includes the following variables:

- Variables that represent political instability and the quality of government institutions ($\mathbf{Y}$), namely:

Polity Scale (Polity IV). To capture how democratic a country is, we rely on the variable Polity2 (Polity IV), which subtracts the country's score in an "Autocracy" index from its score in a "Democracy" index. The resulting unified polity scale ranges from +10 (strongly democratic) to -10 (strongly autocratic). We expect that democracy is associated with lower deficit volatility.

Cabinet changes (CNTS). It counts the number of times in a year in which a new premier is named and/or 50% of the cabinet posts are occupied by new ministers. By including this variable, we investigate whether the government instability (as measured by the ministerial turnover) has a significant impact on deficit volatility. A positive coefficient is expected, as greater political instability should lead to more uncertainty about the course of fiscal policy and, consequently, to greater deficit volatility.

Goverment crisis (CNTS). It indicates the number of any rapidly developing situation that threatens to bring the downfall of the present regime - excluding situations of revolt aimed at such overthrow. Similar to cabinet changes, we expect that the larger the number of episodes of crises, the higher the level of deficit volatility.

- A demographic variable (W) to control for country size effects:

Population (PWT). According to Furceri and Poplawski (2008), the negative relationship between government spending volatility and country size can be explained by two arguments: (i) the size of a country can be an insurance against idiosyncratic shocks which leads to a less volatile government spending; and (ii) the higher ability to spread the cost of financing government spending over a larger pool of taxpayers may lead to increasing returns to scale which allows the government to provide the public good in a less volatile way. As a result, we expect that the population has a negative effect on public deficit volatility.

- A set of economic variables reflecting structural characteristics of the countries ($\mathbf{X}$), in particular:

Deficit (WEO). We consider the log of deficit-to-GDP ratio with the goal of testing the hypothesis that there is a positive relationship between the *level* of the deficit and the deficit *volatility*. We expect that an economy characterized by higher level of public deficit has more fiscal instability due to more frequent changes in goverment spending and taxation.

Income (PWT). To allow for differences in the level of economic development, we include real per capita income. This variable is computed as the log of the ratio between the real GDP and the level of population. As pointed by Fatàs and Mihov (2003), it is likely that low-income countries have shorter and more volatile business cycles due to less developed financial markets and weaker economic institutions. At the same time, these countries may resort more often to discretionary fiscal policy (Rand and Tarp, 2002). This suggests that deficit volatility should be negatively correlated to the country's income.

Inflation (WEO). We include this variable in order to test the prediction that the higher the level of inflation is, the higher the budget deficit volatility will be. In fact, when the inflation rate is high, the level of economic uncertainty is large and both government spending and revenue are highly volatile, therefore, making it difficult to plan the fiscal budget.

Openness (WDI). This variable is computed as the log of the ratio of national trade to GDP. Given that economies with a higher degree of openness are more exposed to external shocks, a positive coefficient is expected.

Table 1 provides a summary of the descriptive statistics of the above-mentioned explanatory variables.

Table 1: Descriptive statistics.

Variable (name)	Observ.	Mean	St. Dev.	Minimum	Maximum	Source
$\log[\sigma(Def_{i,t-1})]$	1287	0.42	1.01	-4.18	4.45	IMF-WEO
Polity Scale	1226	1.63	7.25	-10.00	10.00	Polity IV
Cabinet Changes	1359	0.38	0.53	0.00	4.00	CNTS
Government Crises	1352	0.10	0.33	0.00	3.00	CNTS
Population	1488	8.46	2.03	2.60	14.06	WDI-WB
Deficit	1287	3.83	6.94	-39.00	57.95	IMF-WEO
Income	1520	9.68	3.37	-17.37	16.53	IMF-IFS
Inflation	1450	43.73	372.98	-25.74	9963.08	IMF-IFS
Openness	1458	66.08	53.50	6.95	983.67	WDI-WB

Sources:
CNTS: Cross-National Time Series database.
IMF-IFS: International Financial Statistics - International Monetary Fund.
IMF-WEO: World Economic Outlook - World Bank.
Polity IV: Polity IV database.
WDI-WB: World Development Indicators - World Bank.

5 Empirical results

In this Section, we discuss the results of our baseline model using the Blundell and Bond (1998) method. Table 2 summarizes the main findings.[3] In column 1, we begin by quantifying the empirical relationship between the volatility of budget deficit and the set of political and institutional variables ($\mathbf{Y}$). We then broaden our scope by examining the significance of demographic (column 2) and macroeconomic variables (columns 3 and 4). We also include a dummy variable for the EU15 countries (column 5), which controls for structural characteristics related to geographical location.

Column 1 shows that fiscal deficit volatility exhibits a reasonable degree of persistence, as the coefficient associated to the lagged dependent variable is statistically significant. This is consistent with the relative inertia of the budgetary process and, therefore, supports the use of a dynamic panel estimation.[4]

We also find that the political and institutional variables are significantly related to deficit volatility and with the expected sign. In particular, a higher level of political instability (as measured by the higher level of ministerial turnover and the greater number of government crises) and a lower level of democracy are typically associated with a higher deficit volatility. The effects are sizeable: an additional cabinet change directly increases the standard deviation of the budget deficit by a factor of about $1.15 \approx \exp(0.143)$, that is by 15%, while a new incoming signal of government crisis increases it by 45%. On the contrary, a one point increase in the Polity Scale (greater democracy) reduces the budget deficit volatility by 3%.

In the second column, we add the *Population* variable (W). This does not change the

[3] In order to address endogeneity, we have treated *Deficit, Income*, *Inflation* and *Trade* as endogenous variables. By doing this, we account for the plausible correlation between of these variables with the dependent variable $\log[\sigma(Def_{i,t})]$. We have also tested the validity of the instruments in our GMM specification and, as reported in Table 2, we cannot reject the hypothesis of no over-identifying assumptions (Hansen test) and no higher-order correlation in the first-differenced residuals.

[4] The inclusion of the lagged dependent variable can also be justified by the fact that changes in government revenue tend to lead to changes in expenditure. Nevertheless, spending increases are easier to accommodate than spending reductions. As a result, in the context of revenue volatility, there is a bias in favour of deficits, which in turn generates persistence in deficit volatility.

results concerning the importance of institutional and political variables. In particular, *Polity Scale* and *Government Crises* are still highly significant while *Cabinet Changes* is significant at 10% level. We also find that *Population* is highly significant and has the expected negative sign. This, therefore, implies that smaller countries have more volatile deficits as a result of their wider exposure to idiosyncratic shocks and larger output volatility.

Columns 3 and 4 display a summary of the results when macroeconomic variables ($\mathbf{X}$) - specifically, the deficit-to-GDP ratio, the real GDP per capita, the inflation rate, and the degree of openness - are included. We distinguish between a closed-economy specification (column 3) in which we consider only the influence of domestic economic variables, and an open-economy specification which controls for the potential impact of trade on deficit volatility.

Regardless the two above-mentioned specifications, the qualitative and quantitative roles for political and institutional variables remain unchanged. In fact, the coefficients associated to *Political Scale*, *Government Crises*, and *Population* are still highly significant. Additionally, we find that *Deficit*, *Inflation* and *Trade* are significant and have the expected positive sign, although the impact of inflation is quantitatively small. We find that a one percentage point increase in the deficit-to-GDP ratio increases deficit volatility by between 3.3% and 3.7%. Moreover, when the degree of openness increases by one percentage point, deficit volatility raises by 0.4%. In contrast, the hypothesis that richer countries generally exhibit lower deficit volatility is not supported by our results. In fact, although the *Income* variable enters with the appropriate negative sign, its estimated coefficient is not statistically significant.

Finally, in column 5 we add a regional dummy variable that takes the value of one for the EU-15 countries and zero otherwise. We do not find evidence of systematic differences in deficit volatility of countries belonging to Euro-15 region and other countries. In fact, while the dummy variable *EU15* has the expected negative sign, the coefficient is not statistically significant.[5]

A last remark should be brought into the discussion: the estimates do not change significantly among the five specifications shown in Table 1. That is, our conclusions regarding the political, institutional and economic determinants of fiscal deficit volatility are robust and validate the general predictions of the baseline model. They support the hypothesis that small country size, weak social-political and institutional background, fiscal deterioration, and high inflation typically characterize an environment of high deficit volatility.

[5] We also replace the *EU-15* dummy variable by a dummy aimed at capturing whether there are systematic differences in public deficit volatility for OECD countries, but the results do not significantly change.

Table 2: Deficit volatility for 3-year periods.

Deficit Volatility	(1)	(2)	(3)	(4)	(5)
L. Deficit Volatility	0.141**	0.174***	0.110**	0.090*	0.094**
	[0.057]	[0.054]	[0.050]	[0.047]	[0.047]
Polity Scale	-0.026***	-0.023***	-0.026***	-0.027***	-0.028***
	[0.007]	[0.006]	[0.008]	[0.007]	[0.007]
Cabinet Changes	0.143**	0.129*	0.107	0.113*	0.120**
	[0.069]	[0.069]	[0.065]	[0.060]	[0.059]
Government Crises	0.376***	0.434***	0.303***	0.361***	0.361***
	[0.130]	[0.126]	[0.111]	[0.107]	[0.109]
Population		-0.165***	-0.144***	-0.119***	-0.119***
		[0.031]	[0.033]	[0.042]	[0.040]
Deficit (% of GDP)			0.036**	0.032*	0.031*
			[0.018]	[0.016]	[0.016]
Real GDP per Capita			-0.059	-0.056	-0.053
			[0.051]	[0.048]	[0.047]
Inflation			0.000**	0.000**	0.000**
			[0.000]	[0.000]	[0.000]
Merchandise Trade (% of GDP)				0.004*	0.004**
				[0.002]	[0.002]
EU15					-0.002
					[0.158]
Time	-0.034**	-0.029*	-0.002	-0.015	-0.018
	[0.016]	[0.016]	[0.018]	[0.017]	[0.018]
Constant	0.366***	1.844***	2.049***	1.644**	1.634**
	[0.098]	[0.289]	[0.550]	[0.635]	[0.629]
Observations	753	753	711	705	705
# Countries	125	125	124	124	124
Hansen (p-value)	0.41	0.28	0.35	0.54	0.60
AR2 (p-value)	0.67	0.81	0.71	0.51	0.52

Note: Estimation method is Blundell and Bond (1998). Heteroscedasticity and serial correlation robust standard errors in brackets. * statistically significant at 10% level; ** at 5% level; *** at 1% level.

6 Sensitivity analysis

In this section, we enlarge our baseline model with the aim of analyzing the importance of the interplay between institutional and macroeconomic variables. For this purpose, we interact both *Cabinet Changes* and *Government Crises* with dummy variables that account for deficit above and below 3 percent and inflation above and below 50 percent. These threshold values are chosen according to the unconditional average values over the sample.

Table 3 reports results obtained when *Deficit* is used as the interaction variable. In column 1, we replace *Deficit* by $Deficit \geq 3\%$ and $Deficit < 3\%$. In column 2, we interact *Cabinet Changes* with $Deficit \geq 3\%$ and $Deficit < 3\%$. In column 3, we replace *Government Crises* by its interaction with $Deficit \geq 3\%$ and $Deficit < 3\%$. Finally, in column 4, we include the interactions of both *Cabinet Changes* and *Goverment Crises* with $Deficit \geq 3\%$ and $Deficit < 3\%$.

The core set of political, institutional and macroeconomic controls remain statistically significant in accordance with the previous findings. Interestingly, we find that the deficit-to-GDP ratio has an asymmetric impact on deficit volatility. In fact, when deficit is above 3%, an increase of one percentage point in the deficit-to-GDP ratio increases deficit volatility by

6.2% ≈ exp(0.06) and this impact is highly significant. In contrast, when deficit is below 3%, there is weak evidence of an effect of the deficit-to-GDP ratio on deficit volatility. Finally, the results show that conditioning the effect of *Cabinet Changes* and *Government Crises* on the deficit-to-GDP ratio does not help explaining deficit volatility as the coefficients associated to the interacted variables are not statistically significant.

Table 3: Results using interaction variables (deficit).

Deficit Volatility	(1)	(2)	(3)	(4)
L. Deficit Volatility	0.041	0.078*	0.092**	0.076*
	[0.041]	[0.043]	[0.045]	[0.045]
Polity Scale	-0.026***	-0.028***	-0.026***	-0.025***
	[0.007]	[0.007]	[0.007]	[0.007]
Cabinet Changes	0.093		0.127**	
	[0.071]		[0.060]	
Cabinet Changes *		0.002		0.006
(Deficit ≥ 3%)		[0.011]		[0.011]
Cabinet Changes *		-0.037		-0.041
(Deficit < 3%)		[0.031]		[0.029]
Government Crises	0.343***	0.409***		
	[0.108]	[0.106]		
Government Crises *			0.028	0.028
(Deficit ≥ 3%)			[0.017]	[0.017]
Government Crises *			0.146	0.201**
(Deficit < 3%)			[0.099]	[0.097]
Population	-0.127***	-0.128***	-0.121***	-0.123***
	[0.039]	[0.039]	[0.040]	[0.041]
Deficit (% of GDP)		0.033**	0.028*	0.030**
		[0.014]	[0.015]	[0.014]
Deficit ≥ 3%	0.060***			
	[0.014]			
Deficit < 3%	-0.044*			
	[0.023]			
Real GDP per Capita	-0.055*	-0.059	-0.053	-0.056
	[0.032]	[0.052]	[0.051]	[0.050]
Inflation	0.000*	0.000**	0.000**	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]
Merchandise Trade (% of GDP)	0.001	0.003*	0.004*	0.003*
	[0.002]	[0.002]	[0.002]	[0.002]
Time	0.005	-0.014	-0.016	-0.015
	[0.017]	[0.016]	[0.016]	[0.017]
Constant	1.676***	1.835***	1.670**	1.773***
	[0.514]	[0.655]	[0.675]	[0.656]
Observations	705	705	705	705
# Countries	124	124	124	124
Hansen (p-value)	0.97	0.7	0.56	0.64
AR2 (p-value)	0.45	0.59	0.56	0.59

Note: Estimation method is Blundell and Bond (1998). Heteroscedasticity and serial correlation robust standard errors in brackets. * statistically significant at 10% level; ** at 5% level; *** at 1% level.

Table 4 provides a summary of the results when we include *Inflation* as the interaction variable. In column 1, we replace *Inflation* by $Inflation \geq 50\%$ and $Inflation < 50\%$. In column 2, we interact *Cabinet Changes* with $Inflation \geq 50\%$ and $Inflation < 50\%$. In column 3, we replace *Government Crises* by its interaction with $Inflation \geq 50\%$ and $Inflation < 50\%$. Finally, in column 4, we include the interactions of both *Cabinet Changes* and *Goverment Crises* with $Inflation \geq 50\%$ and $Inflation < 50\%$.

Similarly to the case of deficit, Column 1 suggests that the effect of inflation on deficit volatility is asymmetric: when the inflation rate is above 50%, an increase of inflation leads to a significant rise of deficit volatility, although the magnitude of the impact is very small; in contrast, there is no evidence of a significant effect of inflation on deficit volatility when the inflation rate is below 50%. These findings imply that fiscal deficit volatility is magnified during episodes of hyper-inflation.

We also find that conditioning the effect of *Government Crises* on the inflation rate helps explaining deficit volatility as the coefficients associated to the interactions between these variables and the dummy variables for inflation are statistically significant (Columns 2 and 4). In contrast, the effect of *Cabinet Changes* on deficit volatility does not seem to depend on the level of inflation (Columns 3 and 4).

In Table 5, we analyze the sensitivity of the results to alternative econometric specifications and country samples. While in column 1 we model deficit volatility as a fixed-effects static panel, columns 2 to 6 analyze the extent to which structural characteristics related to countries' geographical location influence deficit volatility. Specifically, we either add regional dummies to the baseline model (column 2) or consider the following sub-set of countries: non-OECD countries (column 3); non-EU15 countries (column 4); developing countries (column 5); and non Land-locked countries (column 6). The highlight of non land-locked countries is explained by the theoretical consideration that argues that countries without seaports face higher costs of international trade, which may as well affect foreign direct investment. Indeed, Sachs(2001) finds that the distance from the sea-coast is negatively related to per capita GDP. As a result, this can impact on public deficit volatility and this is the reason why we consider this sub-set of countries.

The results corroborate the previous findings regarding the effects of political, institutional and economic variables on public deficit volatility. Column 1 shows that the estimates of the static model are similar to those obtained from the dynamic specification, therefore, indicating that the relation between deficit volatility and our set of controls is robust to potential specification problems. Column 2 suggests that the regional dummies are not statistically significant and, consequently, do not play a role in explaining the deficit volatility. Columns 3 to 5 show that there is little change in the quantitative nature of our findings. Nevertheless, we find that: (*i*) the effect of *Cabinet Changes* on public deficit volatility tends to be stronger for non-OECD countries - an additional cabinet change directly increases the standard deviation of the budget deficit by a factor of about $1.158 \approx \exp(0.147)$, that is, by 16%; (*ii*) the impact of *Government Crises* is larger for developing countries, as a new incoming signal of government crisis increases deficit volatility by 69%; and (*iii*) the effects of the size of the country, its degree of openness and the level of public deficit are, in general, quantitatively more important for developing countries. Finally, we find that the degree of persistent of deficit volatility is significantly higher for non land-locked countries (0.179). A possible explanation for this result lies on the fact that these countries are more exposed to external shocks. Consequently, governments may try to insure against them by systematically using fiscal policies which in turn lead to a larger persistence of deficit volatility.

Table 4: Results using interaction variables (inflation).

Deficit Volatility	(1)	(2)	(3)	(4)
L. Deficit Volatility	0.113**	0.087*	0.087*	0.086*
	[0.046]	[0.049]	[0.044]	[0.048]
Polity Scale	-0.027***	-0.028***	-0.025***	-0.026***
	[0.006]	[0.007]	[0.007]	[0.007]
Cabinet Changes	0.123*		0.125*	
	[0.066]		[0.071]	
Cabinet Changes *		0.000		0.000
(Inflation $\geq$ 50%)		[0.000]		[0.001]
Cabinet Changes *		0.002		0.001
(Inflation $<$ 50%)		[0.004]		[0.005]
Government Crises	0.370***	0.383***		
	[0.112]	[0.103]		
Government Crises *			0.000**	0.000
(Inflation $\geq$ 50%)			[0.000]	[0.001]
Government Crises *			0.010*	0.013**
(Inflation $<$ 50%)			[0.006]	[0.007]
Population	-0.113***	-0.130***	-0.121**	-0.126***
	[0.040]	[0.039]	[0.050]	[0.045]
Deficit (% of GDP)	0.034**	0.034**	0.032**	0.034**
	[0.015]	[0.016]	[0.016]	[0.016]
Real GDP per Capita	-0.053	-0.058	-0.063	-0.063
	[0.043]	[0.049]	[0.049]	[0.048]
Inflation		0.000*	0.000*	0.000*
		[0.000]	[0.000]	[0.000]
Inflation $\geq$ 50%	0.000**			
	[0.000]			
Inflation $<$ 50%	-0.003			
	[0.005]			
Merchandise Trade (% of GDP)	0.003*	0.003*	0.004*	0.003*
	[0.002]	[0.002]	[0.002]	[0.002]
Time	-0.018	-0.01	-0.012	-0.009
	[0.016]	[0.018]	[0.016]	[0.016]
Constant	1.607***	1.801***	1.741***	1.838***
	[0.603]	[0.627]	[0.616]	[0.655]
Observations	705	705	705	705
# Countries	124	124	124	124
Hansen (p-value)	0.97	0.62	0.66	0.69
AR2 (p-value)	0.58	0.58	0.6	0.68

Note: Estimation method is Blundell and Bond (1998). Heteroscedasticity and serial correlation robust standard errors in brackets. * statistically significant at 10% level; ** at 5% level; *** at 1% level.

Table 5: Sensitivity analysis.

Deficit Volatility	Static Model	Regional Dummies	Non-OECD Countries	Non-EU15 Countries	Developing Countries	Non Land-Locked Countries
L. Deficit Volatility		0.084*	0.073	0.07	0.002	0.179***
		[0.048]	[0.057]	[0.054]	[0.058]	[0.062]
Polity Scale	-0.026***	-0.031***	-0.035***	-0.029***	-0.029***	-0.028***
	[0.007]	[0.008]	[0.008]	[0.007]	[0.007]	[0.008]
Cabinet Changes	0.105*	0.135**	0.147**	0.110*	0.102	0.104
	[0.060]	[0.068]	[0.066]	[0.063]	[0.066]	[0.076]
Government Crises	0.297***	0.358***	0.487***	0.496***	0.522***	0.394***
	[0.095]	[0.107]	[0.108]	[0.100]	[0.109]	[0.115]
Population	-0.148***	-0.135***	-0.148***	-0.134***	-0.162***	-0.129***
	[0.046]	[0.042]	[0.045]	[0.039]	[0.051]	[0.045]
Deficit (% of GDP)	0.035**	0.035**	0.037**	0.031*	0.056***	0.018
	[0.016]	[0.016]	[0.017]	[0.016]	[0.014]	[0.016]
Real GDP per Capita	-0.063	-0.039	-0.071	-0.069	-0.037	-0.074
	[0.056]	[0.045]	[0.048]	[0.048]	[0.044]	[0.047]
Inflation	0.000**	0.000**	0.000**	0.000**	0.000*	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Merchandise Trade (% of GDP)	0.003	0.003*	0.004**	0.004*	0.005*	0.001
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Asia and Pacific		-0.463				
		[0.317]				
South America		-0.252				
and West indies		[0.302]				
Middle East		-0.306				
		[0.354]				
Africa		-0.465				
		[0.328]				
Europe		-0.418				
		[0.312]				
Time	-0.004	-0.006	-0.011	-0.017	-0.004	-0.021
	[0.016]	[0.019]	[0.021]	[0.020]	[0.022]	[0.018]
Constant	1.963**	1.982***	1.950***	1.923***	1.639**	2.122***
	[0.769]	[0.694]	[0.630]	[0.604]	[0.692]	[0.680]
Observations	797	705	537	613	535	552
# Countries	124	124	97	110	97	95
Hansen (p-value)	0.48	0.63	0.99	0.92	0.99	0.99
AR2 (p-value)	0.17	0.48	0.98	0.84	0.76	0.77

Note: Estimation method is Blundell and Bond (1998). Heteroscedasticity and serial correlation robust standard errors in brackets. * statistically significant at 10% level; ** at 5% level; *** at 1% level.

As a final robustness check, we consider alternative measures of deficit volatility. To be more specific, we estimate the baseline model using standard deviations of the general government budget deficit (as percentage of GDP) for consecutive, non-overlapping, 2-year and 4-year periods, and compare the results with the ones taken from Column 5 of Table 1, where we consider consecutive, non-overalapping 3-year periods instead.

Table 6 provides a summary of the results and globally confirm the previous findings both in terms of significance and magnitude of the coefficients associated with the political, institutional and economic determinants of public deficit volatility. In particular, it shows that: (*i*) a greater number of government crises and a lower level of democracy are typically associated with a higher deficit volatility; (*ii*) *Population* is highly significant and its negative coefficient suggests that smaller countries are exposed to larger idiosyncratic shocks; (*iii*) *Deficit* and *Inflation* are significant and have the expected positive sign, although the impact of inflation is small in quantitative terms; and (*iv*) both the *Real GDP per Capita* and the *EU-15* dummy variable are not statistically signifIcant, but their estimated coefficients are negative.

Table 6: Alternative measures of deficit volatility.

Deficit Volatility	2-year rolling sample	3-year rolling sample	4-year rolling sample
L. Deficit Volatility	0.118**	0.094**	-0.093
	[0.062]	[0.047]	[0.113]
Polity Scale	-0.025***	-0.028***	-0.030***
	[0.008]	[0.007]	[0.008]
Cabinet Changes	0.051	0.120**	-0.073
	[0.069]	[0.059]	[0.081]
Government Crises	0.161*	0.361***	0.236**
	[0.090]	[0.109]	[0.119]
Population	-0.134***	-0.119***	-0.203***
	[0.033]	[0.040]	[0.049]
Deficit (% of GDP)	0.030**	0.031*	0.041*
	[0.014]	[0.016]	[0.022]
Real GDP per Capita	-0.030	-0.053	-0.038
	[0.040]	[0.047]	[0.059]
Inflation	0.000**	0.000**	0.000***
	[0.000]	[0.000]	[0.000]
Merchandise Trade (% of GDP)	0.001	0.004**	-0.001
	[0.001]	[0.002]	0.0021
EU15	-0.222	-0.002	-0.063
	[0.172]	[0.158]	0.148
Time	-0.006	-0.018	-0.017
	[0.0120]	[0.018]	[0.027]
Constant	1.264***	1.634**	2.848***
	[0.482]	[0.629]	[0.749]
Observations	1117	705	491
# Countries	124	124	121
Hansen (p-value)	1.00	0.60	0.38
AR2 (p-value)	0.05	0.52	0.40

Note: Estimation method is Blundell and Bond (1998). Heteroscedasticity and serial correlation robust standard errors in brackets. * statistically significant at 10% level; ** at 5% level; *** at 1% level.

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7 Conclusion

In this paper, we assess the political, institutional and economic sources of public deficit volatility. Using a system-GMM estimator for linear dynamic panel data models on a sample covering 125 countries from 1980 to 2006, we show that a higher level of political instability leads to an increase in public deficit volatility. The effects are magnified in the face of episodes of hyper-inflation and quantitatively large: an additional cabinet change raises deficit volatility by 15%, while a new incoming signal of goverment crisis increases it by 45%.

In addition, we find the political regime and the country size are other important sources of the instability of the budget deficit. We show that: (*i*) when the Polity Scale (greater democracy) increases by one point, the fiscal deficit volatility falls by 3%; and (*ii*) smaller countries have, in general, more volatile budget deficits as a result a larger output volatility and wider exposure to idiosyncratic shocks.

Finally, the empirical findings suggest that high inflation rate and a large deficit-to-GDP ratio are typically associated to deficit instability. Moreover, richer countries - that is, the ones where real GDP per capita is larger - are frequently characterized by stable budget deficits.

We believe that this paper's analysis and conclusions are a valuable contribution to academics and policymakers alike. By improving the quality of their institutions, creating conditions for government stability, and moving towards democratic regimes, developing countries could go a long way towards long-term economic prosperity.

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