Fiscal Policy Responsiveness, Persistence, and Discretion

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ABSTRACT/RÉSUMÉ

Fiscal Policy Responsiveness, Persistence, and Discretion

In this working paper, we decompose fiscal policy in three components: i) responsiveness, ii) persistence and iii) discretion. Using a sample of 132 countries, our results point out that fiscal policy tends to be more persistent than responding to output variations. We also found that while the effect of cross-country covariates is positive (negative) for discretion, it is negative (positive) for persistence, suggesting that countries with higher persistence have lower discretion and vice versa. In particular, while government size, country size and income have negative effects on the discretion component of fiscal policy, they tend to increase fiscal policy persistence.

JEL classification: E62; H50.

Keywords: fiscal policy; fiscal volatility.

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Réaction au cycle, persistance et effet discrétionnaire de la politique budgétaire

Nous décomposons la politique budgétaire en trois composantes : i) réponse, ii) persistance et iii) effet discrétionnaire. Utilisant un échantillon de 132 pays, nos résultats montrent que la politique budgétaire tend à être plus persistante qu'elle ne répond aux variations du PIB. Nous trouvons également qu'alors que l'effet des covariations entre pays affecte positivement (négativement) l'effet discrétionnaire, il a un effet négatif (positif) sur la persistance. Cela suggère que les pays dotés d'une forte persistance ont un effet discrétionnaire plus faible et vice versa. En particulier, alors que la taille du gouvernement, la taille du pays et le revenu ont des effets négatifs sur la composante discrétionnaire de la politique budgétaire, ils tendent à augmenter la persistance de la politique budgétaire.

Classification JEL : E62; H50.

Mots clés : politique fiscale; volatilité fiscale

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FISCAL POLICY RESPONSIVENESS, PERSISTENCE, AND DISCRETION

by

António Afonso, Luca Agnello, Davide Furceri[1]

1. Introduction

1. In the last decade, several studies in the economic literature have assessed fiscal policy characteristics. Most of these studies analyze the *responsiveness* of fiscal policy, that is, the response of fiscal policy to output, in order to explore the effectiveness of automatic stabilizers. Other contributions analyze the extent to which fiscal *discretion* impacts on the macroeconomic environment.

2. Interestingly, few empirical studies asses the relevance of a third fiscal policy characteristic: *persistence*. Generally speaking, fiscal persistence can be considered as a measure of the degree of dependence of current fiscal behaviour on its own past developments. We contribute to the literature by providing evidence that also accounts for this latter fiscal characteristic. In particular, the aim of this paper is to disentangle fiscal policy (both government spending and revenue) in three components: *responsiveness, persistence* and *discretion*, and to assess the variables that explain these components vary across countries. Thus, compared to existing work on the literature, we provide a broader and more comprehensive approach to assess the behaviour of fiscal policy (in terms of responsiveness, persistence and discretion) and its determinants.

3. In particular, we extend the analysis of Fatás and Mihov (2003, 2006) in several ways: i) we also compute a measure of fiscal persistence, allowing to cross-check persistence and discretion; ii) the abovementioned three fiscal components are obtained both for government spending and revenue; iii) we analyse the determinants of all three fiscal components with a set of macroeconomic, political and institutional variables, and geographical variables; iv) finally we also use several datasets.

4. From a methodological point of view, we consider the elasticity of government revenues and expenditures to output as a measure of the fiscal *responsiveness* to economic conditions. We relate the degree of fiscal *persistence* to the long-memory properties of the processes describing the behaviour of both government expenditures and revenues. Finally, we identify *discretion* as the part of government spending and revenue that does not correspond to systematic responses to output conditions and in past values of government spending and revenue, but is instead the consequence of exogenous political processes or extraordinary non-economic circumstances.

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5.   Our analysis covers a set of 132 developed and developing countries over the period 1980-2007, as well as data for EU-15 countries over the period 1970-2007. The main results of the paper can be summarized as follows: a) fiscal policy is a-cyclical in most of the countries in the sample (i.e. *responsiveness* is generally small and in most of the cases not statistically significant) while *persistence* is the dominant component; b) more interestingly, there exists a significant trade-off between *persistence* and *discretion*. Both for revenue and spending, persistence is negatively correlated to the discretion component thereby suggesting that countries with higher persistence have lower discretion. These findings are supported by the results of the second part of the analysis. In fact, we found that regressing both discretion and persistence estimates on a common set of explanatory variables, the sign of the coefficient associated to many of these cross-country covariates is opposite in the two regressions.

6.   Moreover, we find that macro and political and institutional variables cannot account for responsiveness, once regional dummies are considered.

7.   The rest of the paper is organized as follows. Section two briefly reviews the related literature. Section three explains the empirical strategy used to identify the responsiveness, persistence and discretionary parts of both government spending and revenue. It also illustrates the strategy used to identify the determinants of fiscal characteristics within a set of economic, institutional and political variables. Section four presents and discusses the results. Section five concludes with the main findings, policy implications and suggestion for future works.

2.   Literature

8.   The existing related literature has usually analyzed two of three abovementioned components of fiscal policy. On the one hand, the responsiveness of fiscal policy to output, and on the other hand, the discretionary part of fiscal policy. These two issues have deserved great interest since both are crucial for output stabilization and, therefore, indirectly for growth and aggregate welfare.[2]

9.   The issue of responsiveness of fiscal policy has received increasing attention from researchers both from a theoretical and empirical point of view.

10.   From a theoretical point of view, standard Keynesian models imply that fiscal policy should be counter-cyclical, i.e. government spending (taxes) should rise (decrease) in recessions and increase in booms. At the other stream, tax-smoothing models inspired by Barro (1979) imply that government will smooth both tax rate and government spending by borrowing in recessions and repaying in booms, i.e. government spending will be uncorrelated with changes in GDP, while tax revenue will be positively correlated.

11.   From an empirical point of view, the evidence is quite mixed, varying across spending and revenues categories as well as across countries. For OECD countries, some research shows that spending is counter-cyclical (Gali, 1994), while others show no discernible pattern (e.g. Fiorito, 1997; Gavin and Perotti, 1997b). The differences in these results depend on the components of spending being measured. For example, Gali (1994) studies government consumption and investment in a simple cross-country regression for a sample of 22 OECD countries and finds that both taxes and government purchases seem to be effectively working as "automatic stabilizers", with government purchases following a counter-cyclical pattern. Fiorito and Kollintzas (1994) and Fiorito (1997), on the other hand, study specifically government consumption in the G-7 countries and find that the expenditures are either counter-cyclical or a-cyclical.

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2.   Regarding the relationship between output volatility, growth and welfare, see, for example, Ramey and Ramey (1995), Epaulard and Pommeret (2003), Fatás and Mihov (2003, 2005, 2006), Barlevy (2004), Furceri (2007, 2008) and Imbs (2007).

12.   The limited number of empirical studies for developing countries suggests that government spending tends to be pro-cyclical. For example, Gavin and Perotti (1997a) find that fiscal policy is highly pro-cyclical in Latin America; Kaminsky, Reinhart, and Vegh (2004) find that fiscal policy is pro-cyclical in their sub-sample of 83 low- and middle-income countries; Braun (2001) finds that government expenditure is pro-cyclical in a panel of 35 developing countries for the period 1970-1998.

13.   The conventional wisdom that emerges from these studies is that fiscal policy is counter-cyclical or a-cyclical in most developed countries, while it is pro-cyclical in developing countries. This result is corroborated by Lane (2003) who finds that the capability to implement fiscal control procedures is positively correlated with the level of development (measured by output per capita). This implies that richer countries enjoy less pro-cyclical government spending.

14.   Several explanations have been advanced to explain the cross-country variation in the degree of fiscal cyclicality especially between developing and industrial countries.

15.   Important factors behind cyclicality of fiscal policy are political and institutional ones. For example, Talvi and Vegh (2005) find that pro-cyclicality of fiscal policy is related to political distortions. They develop an optimal fiscal policy model in which running budget surpluses is costly because they create pressures to increase public spending. Given this distortion, a government that faces large fluctuations in the tax base will find it optimal to run pro-cyclical fiscal policy. Considering the differences in tax base between countries, the authors conclude that while fiscal policy in the G-7 countries appears to be broadly consistent with Barro's tax smoothing proposition, in developing countries government spending and taxes are highly pro-cyclical.

16.   Persson (2001), Persson and Tabellini (2001), Alesina and Tabellini (2005), also find that political and institutional factors matter also for fiscal responsiveness. In particular, while Persson (2001) and Persson and Tabellini (2001) find that parliamentary and majority based systems are related to cyclicality of fiscal policy, Alesina and Tabellini (2005) show that most of the pro-cyclicality of fiscal policy in developing countries can be explained by high levels of corruption.

17.   Hallerberg and Strauch (2002) argue that fiscal policy is less anti-cyclical in the Economic and Monetary Union (EMU) countries in election years. Similar results in U.S. states are documented by Sorensen, Wu and Yosha (2001). Using data for OECD countries, Lane (2003) shows that countries with volatile output and dispersed political power are the most likely to run pro-cyclical fiscal policies.

18.   Finally, an interesting contribution is the work of Galì and Perotti (2003). After estimating fiscal policy rules for eleven EMU countries over the period 1980-2002, they test whether fiscal constraints of the EMU – as embedded in the Maastricht Treaty and the Stability Growth Path – may be conducive of pro-cyclical fiscal policies. According to their results, anti-cyclical policies became stronger after the adoption of the Maastricht Treaty. Galì (2005) demonstrates that this latter evidence holds in general for all industrialized countries. Afonso (2008) also finds evidence of counter-cyclical responses of fiscal policy for the EU countries.

19.   The second issue of fiscal policy that has been considered in the literature regards the discretionary component of fiscal policy. A large number of studies provide evidence that discretionary spending is strongly and negatively related to the quality of institutions as well as to political and budgetary constraints. Fatás and Mihov (2003) analyze the political and institutional determinants of discretionary fiscal policy and their effects on output volatility and economic growth. They use the term discretionary to refer to changes in fiscal positions that represent neither automatic reaction to economic conditions nor can be related to persistent changes in budget items. Using data from 91 countries, they find that highly volatile discretionary fiscal policy exerts a strong destabilizing effect on the economy.

Additionally, fiscal policy is explained to a large extent by such variables as the characteristics of electoral and political systems and the lack of political constraints. They conclude that institutional arrangements that constrain discretion via checks and balances allow nations to achieve higher rates of economic growth and reduce macroeconomic instability.

20.   More recently, Fatás and Mihov (2006), using data from 48 US states, explore the role that "rules" and institutions play in determining discretionary fiscal policy and look at whether the same rules and institutions influence the cyclicality of fiscal policy. Cyclicality is defined as the elasticity of government spending with respect to output. They find that strict budgetary restrictions lead to lower policy volatility and reduce the responsiveness of fiscal policy to output shocks. These two results should have opposite effects on output volatility. While less discretion should reduce volatility, less responsiveness of fiscal policy might amplify business cycles.

21.   According to the empirical evidence reviewed above, political and institutional variables can affect the composition of government spending in its discretionary, persistence and responsiveness components. Thus, ultimately, it is natural to expect that countries differ in the behaviour of both government spending and revenue along these three elements.

3.   Empirical Strategy

3.1   Fiscal Measures of Responsiveness, Persistence and Discretion

22.   Following Fatás and Mihov (2003, 2006), in order to differentiate between persistence, responsiveness and discretion in government spending and revenue we estimate for each country i (with $i =1,...,N$) the following regressions:

$$\log(G_{i,t}) = \alpha_i^G + \beta_i^G \log(Y_{i,t}) + \gamma_i^G \log(G_{i,t-1}) + \delta_i^G \mathbf{Z}_{i,t} + \varepsilon_{i,t}^G \qquad (1)$$

$$\log(R_{i,t}) = \alpha_i^R + \beta_i^R \log(Y_{i,t}) + \gamma_i^R \log(R_{i,t-1}) + \delta_i^R \mathbf{Z}_{i,t} + \varepsilon_{i,t}^R \qquad (2)$$

where G is real government spending, R is real government revenue, Y is real GDP, and $\mathbf{Z}$ is a set of controls including also a time trend.

23.   The specification of the equation in levels is used for three main reasons. First, as also done by Fatás and Mihov (2004, 2006), it is necessary to include in the regressions the level of the current and lagged value of spending and revenue in order to capture the persistence of fiscal policy. Second, once the lagged dependent variable is used in levels, and considering the fact that the series employed are non stationary, the inclusion of output expressed in first differences may lead to a situation where the coefficient of the lagged variable converges to 1 and the coefficient of the stationary series (output expressed in differences) converges to zero (Wirjanto and Amano, 1996). Third, the time series properties of G, R, Y show that the series are integrated of order (1), and at the same time inspection of autocorrelation of the residuals of equation (1) and (2) and unit root tests, both for short and longer time series, show that they are stationary, implying that our estimates are super-consistent (see Appendix 3). Moreover, from a theoretical point of view G and Y (R and Y) should be cointegrated given that the ratio G/Y (R/Y) is bounded and strictly greater than zero.[3]

24.   The estimates of the country-specific coefficients β_i, γ_i and σ_i in (1) and in (2) (where σ_i is the standard deviation of the residuals of the above regressions) will represent respectively our measures of responsiveness, persistence, and a quantitative estimate of discretionary fiscal policy. In order to get these

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3.   At the same time, the results are qualitatively unchanged if we express the variables in differences.

estimates, we include as control variables (i.e. the vector $\mathbf{Z_i}$) the current and the lagged value of real oil prices, the current inflation rate and a linear time trend. Oil prices are included since they affect the state of the economy and more importantly because they contribute significantly to total revenue for some of the countries in the sample. We include inflation to ensure that our results are not driven by high inflation episodes. We also consider a time trend in our specifications, since government spending and revenue can also have a deterministic time trend in addition to the stochastic one. Finally, in order to control for possible endogeneity we use past values of real GDP as instruments.

3.2 What Matters for the Fiscal Measures?

25.   Once we obtain the estimates for responsiveness ($\hat{\beta}_i^{G,R}$), persistence ($\hat{\gamma}_i^{G,R}$) and discretion ($\hat{\sigma}_i^{G,R}$) of fiscal policy we can explain cross-country variation in fiscal policy behaviour, regressing those estimates on a set of explanatory variables that the literature has found to be related to fiscal policy.[4]

26.   We estimate the following three cross-country equations (six considering both estimations for the spending and the revenue equation):

$$\log\left(\hat{\sigma}_i^{G,R}\right) = \alpha_1 + \sum_j \delta_j D_{ij} + \sum_j \phi_j P_{ij} + \sum_j \theta_j E_{ij} + \xi_i \qquad (3)$$

$$\hat{\gamma}_i^{G,R} = \alpha_2 + \sum_j \delta_j D_{ij} + \sum_j \phi_j P_{ij} + \sum_j \theta_j E_{ij} + \upsilon_i \qquad (4)$$

$$\hat{\beta}_i^{G,R} = \alpha_3 + \sum_j \delta_j D_{ij} + \sum_j \phi_j P_{ij} + \sum_j \theta_j E_{ij} + \omega_i \qquad (5)$$

for $i = 1,..., N$ and where: E_j denotes macroeconomic variables; P_j denotes political and institutional variables; D_j denotes demographic and geographical variables; $\omega, \nu,$ and ξ are well-behaved residuals; α's are nuisance coefficients; $\delta, \phi,$ and θ are our coefficients of interest.

27.   In more detail, the set of controls consists of the following variables:[5]

   i)   Macroeconomic variables (E): a) GDP per capita; b) openness; c) GDP deflator-based inflation rate; d) government size, and e) country size.[6]

   ii) Political and institutional variables (P): a) an index of the level of democracy; b) an index for political stability; c) an index for presidential versus parliamentary electoral system, d) an index that accounts for constitutional limits on the number of years the executive can serve before new elections; e) an index of government effectiveness; f) the Herfindahl index of parties concentration in the government, g) a dummy if the chief executive is a military chief.[7]

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4.   Data constraints limit the analysis to cross-country. By doing this we implicitly neglect time variations in fiscal policy discretion, persistence and responsiveness within countries, and the over-time effect of our explanatory variables on these components.

5.   See Appendix 1 for a detailed description of the variables and sources.

6.   As found in Alesina and Wacziarg (1998), Rodrick (1998), Fatás and Mihov (2001, 2003) and Furceri and Poplawski (2008), economic variables are found to be correlated to both persistence, automatic stabilizers and spending volatility. Among others, see these papers for a more detailed discussion.

7.   The economic literature has generally focused on political and institutional characteristics to explain cross country differences in government spending (Drazen, 2000; Persson, 2001; Persson and Tabellini, 2001). See Fatás and Mihov (2003) for a more detailed discussion.

    iii)   Geographical variables (D)[8]: a) the log of absolute latitude (kilometres from the equator); b) regional dummies for developing countries from b1) Latin America, b2) Sub-Saharan Africa, b3) East Asia, b4) South Asia, b5) Europe-Central Asia, b6) and Middle East-North Africa.[9]

28.   Since our dependent variables are based on estimates, 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 as opposed to estimated. This would lead to an increase in the standard deviation of the estimates, which would 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.[10]

29.   We estimate equations (4)-(5) by Weighted Least Squares (WLS). This choice takes account of the fact that the dependent variables are measured with different degrees of precision across countries, and of the fact that some of the estimated values of our dependent variables are not statistically significant from zero.[11]

4.   Results and discussion

30.   We use data from the *IMF World Economic Outlook* for a set of 132 countries for which we have data available from 1980 to 2007 (see the data Appendix for further details).[12] Moreover, using data from the European Commission AMECO database, we perform a similar exercise for the 15 "old" members of the European Union (EU-15), for which the time sample broadly spans between 1960 and 2007.

4.1   Quantitative Estimates for Responsiveness, Persistence and Discretion

31.   We start our empirical analysis by estimating the coefficients of responsiveness, discretion and persistence. The results relative to both government spending and revenue, for the entire set of countries are reported in Table 1. Looking at the table it is possible to see that in terms of magnitude the coefficient of persistence in the great majority of the cases is bigger than the one of responsiveness. This is also confirmed by the fact, that while the coefficient of persistence is statistically significant in most of the cases (73 times for spending and 68 times for revenue) the coefficient used as our measure of fiscal responsiveness is statistically significant for a smaller number of cases (42 times for spending and 48 for revenue). Thus, it seems that overall, fiscal policy tends to be more persistent than responding to current output conditions. Moreover, it is interesting to note that while government revenue reacts relatively more to output than government spending, spending overall seems to be more persistent than revenue.[13]

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8.   Alesina and Wacziarg (1998) have found that geographical variables are important to explain cross country differences in government spending.

9.   As suggested by La Porta et al. (1999), it is likely that latitude from the equator, income and regional dummies are related to the quality of government and institutions.

10.   Related to this problem would be the possibility of heteroskedasticity. In most of our estimations heteroskedasticity turns out not to be a problem. When it does, we correct for that using White standard errors.

11.   See, Lane (2003) for a similar approach. All the results presented do not qualitatively change when we estimate equations (3)-(5) by OLS.

12.   We have also analyzed data from the World Development Indicator CD-ROM 2007. The results with this data set are broadly similar and available upon request. However, for the IMF we had more data availability, especially for government revenue, and for many countries a longer time span was also available, which is needed for a meaningful estimation of the time-series regression.

13.   While this goes beyond the main purpose of our analysis, it is important to point out that the responsiveness of both revenue and spending maybe asymmetric over cycle.

Table 1. Estimates of Responsiveness (β), Persistence (γ) and Discretion (σ)

Country	βG	βR	γG	γR	σG	σR	country	βG	βR	γG	γR	σG	σR
Angola	0.02	0.07	-0.29	0.56**	0.16	0.19	Kuwait	-0.01	1.21***	0.6***	0.29**	0.09	0.12
Albania	0.92	-0.5	0.63**	0.69	0.06	0.22	Lao PDR	-0.77	2.71**	-0.27	-0.11	0.14	0.14
United Arab Emirates	1.74**	2.38	0.04	0.14	0.09	0.15	Lebanon	-0.26	1.31	0.94***	-0.04	0.18	0.23
Argentina	1.48**	1.22	0.11	0.13	0.13	0.10	Libya	0.24	-0.47	0.54*	0.34	0.12	0.13
Australia	0.36	2.17***	0.81***	0.49***	0.03	0.03	St. Lucia	0.35	0.98**	0.38**	-0.08	0.08	0.07
Austria	-0.05	2.1***	0.75***	-0.12	0.02	0.03	Sri Lanka	0.78	0.05	0.3*	0.7***	0.05	0.05
Burundi	1.49***	2.83***	0.06	-0.12	0.11	0.11	Lesotho	0.16	0.45	0.5***	0.76**	0.09	0.08
Belgium	-0.42	-0.38	-0.1	0.57***	0.02	0.02	Luxembourg	0.66*	0.37	0.56**	0.44*	0.05	0.04
Burkina Faso	2.29	-0.71	-0.38	-0.19	0.12	0.22	Morocco	0.28	1.73**	0.51**	0.47**	0.05	0.07
Bulgaria	1.3***	2.15***	0.09	-0.23	0.06	0.07	Madagascar	-2.93	23.26	0.18	-1.51	0.19	0.69
Bahamas	-0.02	0.11	-0.02	0.47*	0.04	0.05	Maldives	1.32	3.27	0.15	0.22	0.13	0.22
Belize	1.5***	0.02	0.22	0.79	0.09	0.10	Mexico	0.86	-0.2	0.19	0.19	0.18	0.15
Bolivia	1.79	-1.05	0.09	0.16	0.09	0.28	Mali	-0.22	-0.74	0.3	-0.12	0.08	0.22
Brazil	0.52	-0.62	0.63	0.47	0.10	0.09	Malta	0.39	0	0.55*	0.65**	0.07	0.07
Barbados	0.83**	0.41**	0.33	0.24	0.07	0.03	Myanmar	1.21***	0.57	-0.02	0.36*	0.10	0.13
Brunei	2.83	8.61	-0.01	0.06	0.10	0.16	Mozambique	1.22**	1.44**	0.4***	0.62***	0.14	0.16
Bhutan	0.3	0.23	0.24	0.23	0.14	0.13	Mauritania	-2.61	-3.05	0.75***	0.17	0.16	0.31
Botswana	0.98**	0.33	0.24	0.64***	0.06	0.09	Mauritius	0.33	-1.14	0.6***	0.81*	0.05	0.07
Central African Republic	0.04	0.3	0.32**	0.24	0.17	0.23	Malawi	2.46*	3.65	-0.75	-0.35	0.20	0.23
Canada	0.18	0.38**	0.91***	0.44**	0.02	0.02	Malaysia	-0.04	0.76**	0.11	0.23	0.05	0.06
Switzerland	-0.97	0.11	0.55**	0.36***	0.02	0.02	Niger	-0.16	1.99*	0.66	-0.17	0.15	0.24
Chile	0.31	0	0.77***	0.29*	0.04	0.05	Nigeria	0.24	0.84	0.51*	0.55***	0.25	0.20
China	1.32***	1.32***	0.97***	0.93***	0.04	0.04	Nicaragua	3.37**	3.09**	0.18	0.23	0.17	0.17
Cote d'Ivoire	0.09	0.34	0.64***	0.79***	0.08	0.08	Netherlands	0.81	0.69*	1.09***	0.59***	0.02	0.03
Cameroon	1.39***	2.61***	0.09	-0.27	0.09	0.20	Norway	-0.92***	0.99***	0.27	0.55***	0.02	0.02
Congo, Rep.	2.21**	1.08*	0.18	0.15	0.13	0.09	New Zealand	0.22	-0.49	0.79**	0.62**	0.05	0.05
Colombia	1.54***	0.91***	0.61***	0.42**	0.05	0.04	Oman	0.47	0.64**	0.47**	0.59***	0.05	0.05
Comoros	5.65	7.27	0.28	0.27	0.16	0.17	Pakistan	1.78	0.72	0.4	0.67**	0.06	0.06
Cape Verde	-1.26	-0.51	0.8***	0.58***	0.14	0.10	Panama	0.39	0.63	0.27	0.22	0.06	0.10
Costa Rica	0.66	-0.64	-0.09	0.1	0.11	0.15	Peru	-0.59	-1.16**	1.07*	0.77***	0.12	0.16
Cyprus	0.17	-0.38	0.35**	0.58	0.04	0.04	Philippines	-0.09	-0.49	0.59***	0.94***	0.07	0.08
Czech Republic	1.11***	1.63***	0.62***	0.4**	0.04	0.04	Poland	0.75***	0.34	0.34***	0.65**	0.04	0.05
Germany	0.8***	0.85***	0.44***	0.38***	0.02	0.01	Portugal	0.41	0.28	0.47**	0.49**	0.07	0.07
Dominica	0.24	-0.77	0.51***	0.75**	0.07	0.09	Paraguay	1.37***	1.87***	0.54***	0.44**	0.08	0.06
Denmark	-0.55**	0.77**	0.85***	0.37**	0.01	0.02	Qatar	0.5	0.47*	0.33*	0.2	0.10	0.12
Dominican Republic	1.26*	0.15	0.4	0.28	0.12	0.12	Romania	0.52	0.58	0.54***	0.59***	0.06	0.07
Ecuador	4.48	0.33	0.31	0.34	0.17	0.15	Senegal	2.19***	1.15*	0.34*	0.45	0.07	0.05
Egypt, Arab Rep.	1.78***	0.17	0.31	0.48**	0.11	0.10	Singapore	2.92**	2.73	0.39	0.17	0.12	0.10
Spain	0.61***	0.71***	0.9***	0.73***	0.02	0.02	Sierra Leone	0.57	1.14	0.4**	0.3	0.21	0.28
Ethiopia	2.73***	1.5	0.45***	0.58*	0.13	0.12	El Salvador	1.58**	2.72***	0.75***	0.85***	0.10	0.11
Finland	0.02	0.6***	0.85***	0.47***	0.03	0.03	Sao Tome and Principe	2.14	5.99*	0.36	0.11	0.25	0.43
France	0.45*	-0.07	1.07***	0.71***	0.01	0.01	Suriname	0.36	0.08	0.22	0.13	0.10	0.14
United Kingdom	-0.16	0.82	0.76***	0.51**	0.02	0.02	Sweden	-0.21	0.94***	0.68***	0.32	0.02	0.02
Guinea	4.22	3.55	0.24	0.21	0.15	0.15	Swaziland	0.48	1.24***	0.5***	0.29**	0.08	0.06
Gambia, The	-0.79	-1.68	-0.12	0.58***	0.12	0.16	Seychelles	1.27***	-0.44	0.02	0.83***	0.07	0.07
Guinea-Bissau	0.48	-0.04	-0.03	-0.02	0.17	0.29	Syrian Arab Republic	0.11	0.93	0.64***	0.32*	0.08	0.09
Equatorial Guinea	0.23	0.47**	0.52***	0.4**	0.27	0.27	Chad	-0.05	0.78	0.55***	0.77***	0.14	0.18
Greece	0.2	-0.7	0.39	0.88***	0.04	0.04	Togo	0.3	-0.18	0.55***	0.56	0.11	0.22
Guyana	-0.21	0.15	0.63***	0.06	0.13	0.14	Thailand	0.78***	1.65***	0.91***	-0.21	0.06	0.05
Hong Kong, China	0.59	-0.81	0.76*	0.23	0.07	0.12	Tonga	2.05***	0.73	-0.01	0.49	0.14	0.10
Haiti	-3.74	-5.82	0.97***	0.93***	0.28	0.36	Trinidad and Tobago	1.09***	0.55**	0.27	0.27	0.06	0.06
Hungary	0.23	1.42***	0.71***	0.15	0.04	0.03	Tunisia	2.06	3.72	0.04	0.13	0.06	0.08

The top header spanning the parameter columns reads "parameter estimates (1980-2007)" for both the left and right halves of the table.

+Table 1 (contd.). Estimates of Responsiveness (β), Persistence (γ) and Discretion (σ)

Parameter estimates (1980-2007)						Parameter estimates (1980-2007)					
Country	β_G	β_R	γ_G	γ_R	σ_G	σ_R	Country	β_G	β_R	γ_G	γ_R	σ_G	σ_R
Indonesia	0	0.33	0.25	0.18	0.09	0.06	Turkey	0.06	0.28	0.4	0.14	0.09	0.08
India	1.23**	0.63**	0.28*	-0.07	0.03	0.03	Taiwan	1.75*	1.38	0.19	-0.01	0.07	0.05
Ireland	0.26	0.31*	0.51***	0.33*	0.03	0.03	Tanzania	0.95	0.85	0.23	0.04	0.11	0.09
Iran, Islamic Rep.	0.57	0.51	0.48**	0.64**	0.15	0.17	Uganda	1.28	2.02*	0.16	0.08	0.17	0.18
Iceland	0.56**	0.82***	0.63***	0.32**	0.03	0.03	Uruguay	0.84***	1.05**	0.47**	0.41*	0.05	0.06
Israel	0.77***	0.33	0.48***	0.37*	0.02	0.05	United States	0.27	1.05***	0.83***	0.51**	0.01	0.03
Italy	1.15***	0.68*	0.81***	0.8***	0.02	0.02	St. Vincent and the Grenadines	-0.07	-1.31	0.58*	0.59*	0.09	0.08
Jamaica	-1.1	-1.24	0.4**	0.57**	0.07	0.10	Venezuela, RB	1.07	-0.29	-0.04	0.63	0.11	0.11
Jordan	0.42	0.07	0.36	0.24	0.11	0.09	Vietnam	-1.15	-1.27	0.28	0.83***	0.14	0.10
Japan	0.4**	1.1***	0.83***	0.42	0.02	0.03	Vanuatu	0.95	1.21**	0.47**	0.35**	0.13	0.12
Kenya	0.96**	0.47*	0.26	0.62***	0.08	0.05	Samoa	-1.4	0.37	0.49**	0.36*	0.10	0.14
Cambodia	-11.96*	-9.63**	-0.72	-0.37	0.22	0.27	South Africa	-0.59	0.69*	0.68***	0.49**	0.03	0.03
Kiribati	0.97**	0.15	0.14	0.25	0.14	0.18	Zambia	0.9	-0.27	0.3	-0.21	0.11	0.14
Korea, Rep.	0.25	0.03	0.88***	0.51***	0.04	0.04	Zimbabwe	0.08	-0.35	0.63*	0.88***	0.16	0.13

Note: E – expenditure; R – revenue. *, ***, ***, significant at respectively 10, 5, and 1 per cent.

32.   We remark that our discretion estimates are computed as the standard deviation of the residuals from both government spending and revenue equations. Thus, it is clear that the lower and less significant are the coefficients of responsiveness and persistence the higher will be the component of discretion[14]. This argument, together with the fact that fiscal policy seems to be more persistent than responsive, suggests a negative relation between the measures of persistence and discretion. This intuition is empirically confirmed. Figure 1 provides the scatter plot of our measures of persistence against discretion exhibiting a negative relation between these two variables. In particular, the estimate of this simple bivariate relation for the spending equation is:

$$\hat{\gamma}_i^G = -0.09 - 0.190 \log\left(\hat{\sigma}_i^G\right)$$
$$(-0.89) (-5.39)$$

with $R^2 = 0.18$ (t statistics are in parenthesis). The negative relationship also holds for the revenue equation (see Figure 2):[15]

$$\hat{\gamma}_i^R = -0.00 - 0.143 \log\left(\hat{\sigma}_i^R\right)$$
$$(-0.01) (-4.16)$$

with $R^2 = 0.12$ (t statistics are in parenthesis). Thus, it seems that countries with higher persistence have a lower discretionary component of fiscal policy. In Table 2 we also report a rank analysis for our measure of persistence and discretion.

Table 2. Spearman correlation matrix

	γ^G	γ^R	σ^G	σ^R
γ^G	1			
γ^R	0.395	1		
σ^G	-0.391	-0.279	1	
σ^R	-0.388	-0.309	0.900	1

---

14.   In fact, the lower the significance of the coefficients, the lower the R-squared of the regression, and the higher the variance of the residuals.

15.   The correlation between $\hat{\gamma}_i^G$ and $\ln\left(\hat{\sigma}_i^G\right)$ equals to -0.43 while the correlation between $\hat{\gamma}_i^R$ and $\ln\left(\hat{\sigma}_i^R\right)$ equals to -0.34.

Figure 1. Scatter plot of $\hat{\gamma}_i^G$ vs. $\hat{\sigma}_i^G$ from country-specific spending equation

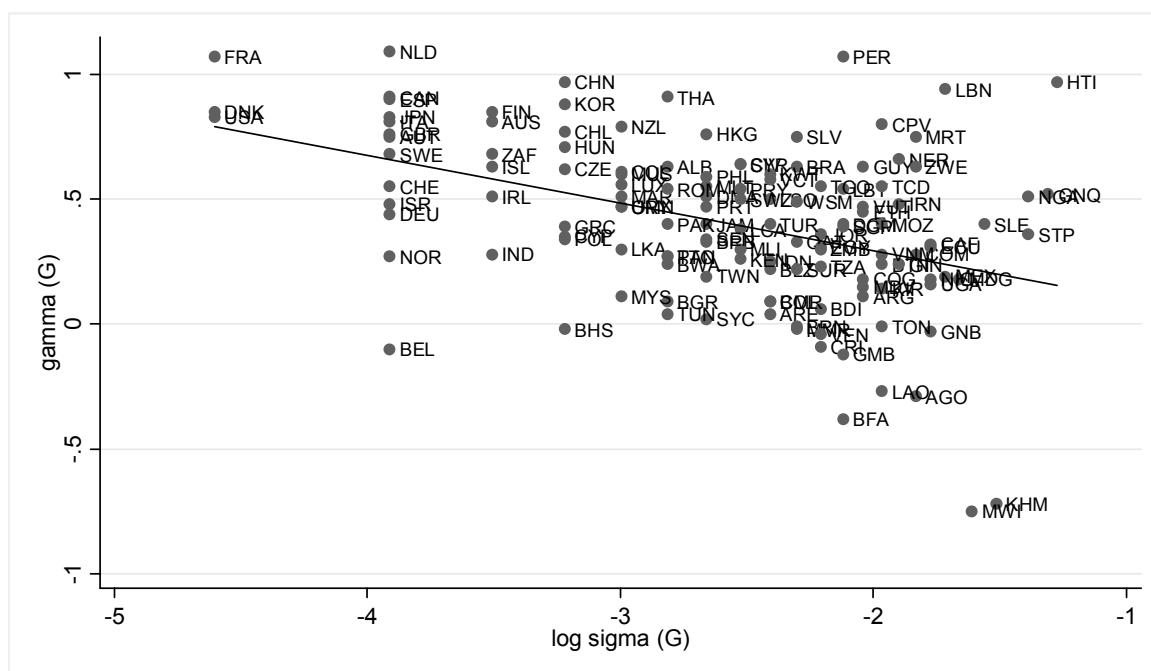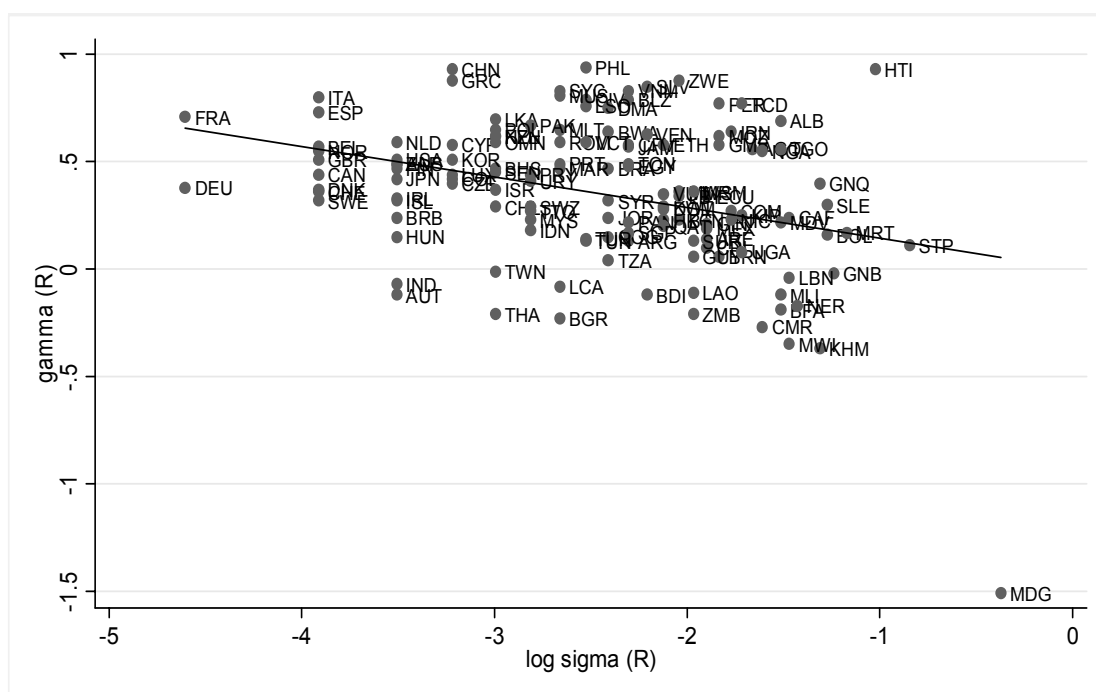**Figure 2. Scatter plot of $\hat{\gamma}_i^R$ vs. $\hat{\sigma}_i^R$ from country-specific revenue equation**

33.   In order to check for the robustness of our results, we consider another data source for both revenues and government spending: the AMECO dataset comprising data from 1960 to 2007 for European Union countries. Therefore, we have considered the "old" EU-15 countries, with the exception of

Luxemburg, for which data are not available for the period 1988-89. For comparative purposes, we have decided to include also the United States and Japan.

34.   Table 3 reports parameter estimates of responsiveness, persistence and discretion from the equations (1)-(2) over the sample period 1960-2007. We note that, while parameter estimates $\hat{\gamma}_i^G$ and $\hat{\gamma}_i^R$ are always statistically significant (at 1% for all countries), estimates of β s are significant only for 62% of the cases (10 countries out of 16 for both revenues and spending). Moreover, we also find a negative correlation between γ coefficients and their corresponding discretionary components. In particular, we find that the cross-country correlation between $\hat{\gamma}_i^G$ and $\log(\hat{\sigma}_i^G)$ equals -0.14 while the cross-country correlation between $\hat{\gamma}_i^R$ and $\log(\hat{\sigma}_i^R)$ is -0.32.

Table 3. Results with AMECO dataset

Country	Parameter estimates (1960-2007)
	$\hat{\beta}^G$	$\hat{\beta}^R$	$\hat{\gamma}^G$	$\hat{\gamma}^R$	$\hat{\sigma}^G$	$\hat{\sigma}^R$
Austria	0.59***	0.52**	0.78***	0.76***	0.02	0.02
Belgium	0.97***	0.39*	0.66***	0.79***	0.03	0.01
Germany	0.51**	0.42*	0.73***	0.73***	0.02	0.03
Denmark	0.36	1.15*	0.90***	0.68***	0.03	0.04
Spain	0.28*	0.39	0.99***	0.93***	0.02	0.03
Finland	0.24*	0.39***	0.93***	0.80***	0.04	0.04
France	0.06	-0.15	0.90***	1.03***	0.01	0.02
United Kingdom	0.47*	0.54**	0.85***	0.81***	0.04	0.03
Greece	0.08	0.16	0.88***	0.77***	0.04	0.03
Ireland	-0.01	-0.02	0.69***	0.65***	0.04	0.03
Italy	0.59***	0.14	0.75***	0.89***	0.02	0.03
Netherlands	0.46***	0.55***	0.85***	0.81***	0.02	0.02
Portugal	0.44***	0.5***	0.86***	0.67***	0.04	0.04
Sweden	-0.39	0.03	0.77***	0.79***	0.03	0.03
United States	0.28	0.76***	0.83***	0.59***	0.02	0.02
Japan	0.32***	0.27***	0.77***	0.78***	0.04	0.03

Notes: *, **, ***, significant at respectively 10, 5, and 1 per cent.

The above results corroborate our previous conclusions: a) persistence is the dominant component of both government spending and revenue while evidence about their responsiveness to the economic conditions is less clear; b) there is a negative relationship between the degree of persistence and discretion.

4.2   *Determinants of the Fiscal Measures*

35.   In the previous section we found a significant and negative relation between discretion and persistence. On the one hand, this is partly explained by the fact that fiscal policy is not responsive for many countries in our sample. On the other hand, these results can be explained by the fact that if spending is left to discretionary actions its development will be less persistent, deviating more from the trend.

36.   However, it has to be kept in mind that we cannot infer any causal relation between these two components of fiscal policy since they are both simultaneously determined by macroeconomic, institutional, political and geographical variables. Thus, it is also likely to expect that the sign of some of these variables will be different in the econometric specification for our measures of persistence and

discretion. In other words we expect that (at least for some variables) if a cross-country covariate has a negative (positive) impact on discretion it should have a positive (negative) impact on persistence.

37.	We start our analysis by estimating equation 3 for government spending *G* in order to explain the respective discretion component. Results are reported in Table 4. In each column of the table we present a different specification of the controls. Starting with the first column, we can see that all the macro variables (with the exception of openness) are significantly related to discretionary spending and with the expected sign. Discretionary spending is negatively related to government size, since usually bigger governments have more stable government spending and automatic stabilizers are larger (Fatás and Mihov, 2001). Income (GDP per capita) is negatively related to discretionary spending, since it is likely that poorer countries have a more volatile business cycle due to less developed financial markets, and at the same time may resort more often to discretionary fiscal policy (Rand and Tarp, 2002). Inflation is positively related to higher discretionary spending volatility, since higher inflation corresponds to higher price volatility affecting thereby discretionary spending. Finally, smaller countries tend to have more discretion (lower volatility of government spending). In fact, as argued by Furceri and Poplawski (2008) a negative relationship between government spending volatility and country size can be explained by two arguments: i) to the extent that government spending is used for fine tuning purposes, smaller economies, characterized by more volatile output and more exposure to idiosyncratic shocks, may use government spending more aggressively; ii) to the extent that public goods are of a non-rival nature, increasing returns to scale of varying government spending may originate from the higher ability to spread the cost of financing it over a larger pool of taxpayers.

38.	In the second column of Table 4 we present the results obtained when institutional variables are taken into account. While the macroeconomic variables continue to be significant, we find that government effectiveness is significantly and negatively related to discretionary spending. This is in line with previous results in the literature (Persson and Tabellini, 2001; Fatás and Mihov, 2003). Moreover, we find that considering alternatively different proxies for the quality of institutions (voice and accountability; political stability; regulatory quality; rule of law; and control of corruption) the results are almost unchanged (due to the high correlation among these indicators)[16].

39.	In the third column of Table 4, we show the results when political variables are also included. We can see that the political system proxy variables, parties' concentration, the dummy for military chief and for the presence for a finite term are also related to our discretion measure. In particular, in line with Persson and Tabellini (2001), we find that the presidential system is associated with more discretionary spending, since in a parliamentary system the executive is supported by the parties in the parliament and therefore is constrained in the implementation of policy by the threat of a no-confidence vote. In a presidential system the president does not face the confidence requirement and hence can alter more easily policy either for opportunistic or partisan reasons. Therefore, presidential regimes may be associated with more volatile discretionary policy.

40.	We also find that a lower concentration (lower Herfindahl index) in the government leads to higher discretion, since proportional systems lead to coalitions and fiscal deadlocks which delay stabilizations and increase discretionary spending (as argued by Alesina and Perotti, 1994).

41.	Finally, the presence of a finite term (a dummy that assumes 1 if the numbers of mandates is limited, and 0 otherwise) makes the government more accountable acting as a disincentive to take discretionary measures (Ferejohn, 1986), while a military chief (dummy assumes 1 if this is the case) tends to result in the use of fiscal policy in a more activist way. The results are robust when we include geographical and regional variables.

16.	Results are not reported, but are available upon request.

Table 4. Determinants of Spending Discretion ($\hat{\sigma}_i^G$)

	Explanatory variables	1	2	3	4
Macro	Government size	-0.198 (-2.49)***	-0.206 (-2.69)***	-0.177 (-2.00)**	-0.180 (-1.86)*
	Income	-0.497 (-12.48)***	-0.298 (-5.72)***	-0.262 (-5.06)***	-0.332 (-5.44)***
	Openness	0.016 (0.15)	0.072 (0.76)	0.094 (0.93)	0.089 (0.78)
	Inflation	0.005 (7.85)***	0.002 (3.23)***	0.002 (1.92)*	0.002 (3.27)***
	Country size	-0.103 (-4.54)***	-0.090 (-4.27)***	-0.103 (-4.50)***	-0.091 (-3.05)***
Institutional	Government effectiveness		-0.327 (-5.32)***	-0.326 (-5.73)***	-0.192 (-2.42)**
Political	Political system			-0.135 (-2.85)***	-0.100 (-1.93)*
	Parties concentration			0.001 (3.99)***	0.000 (2.22)**
	Veto drops			-0.191 (-1.62)	-0.194 (-1.52)
	Special interest			0.072 (0.60)	0.127 (1.13)
	Military chief			0.001 (3.90)***	0.000 (1.81)*
	Finite term			-0.000 (-2.81)***	-0.000 (-2.25)**
Geographical	Distance from Equator				0.000 (0.01)
	East Asia & Pacific				0.333 (1.94)*
	Europe & Central Asia				0.074 (0.47)
	Latin America & Caribbean				0.470 (2.48)**
	Middle East & North Africa				0.279 (1.22)
	South Asia				-0.028 (-0.14)
	Sub-Saharan Africa				0.113 (0.66)
	R-square	0.67	0.73	0.78	0.82
	Observations	111	110	106	106

Note: *,**,*** respectively significant at 10%, 5% and 1%. Numbers 1-4 denote different specifications. OLS estimates.

42.   We now proceed to analyze the determinants for persistence of government spending. In Table 5 we report the results of estimating equation 4. In particular, as we did for the estimate of our discretion equation, we report four columns each presenting a different specification of the set of controls.

43.   As already argued, we should expect at least for some of the controls, that if a cross country covariate has a negative (positive) impact on discretion it should have a positive (negative) impact on the persistence of government spending. This intuition is confirmed by our results. In fact, looking at the first column of Table 5, we can see that most of the macroeconomic variables are statistically significant and they have opposite signs with respect to the volatility of spending discretion.

44.   However there are exceptions. For example, institutional variables are not significant in the specification for fiscal persistence but they are significant in the fiscal discretion specification. Other variables such as military chief and finite term enter with the same sign in both the persistence and the discretionary equation. In particular, we find that countries with higher political stability and with a military chief have more persistent government spending. In contrast, countries where the executive has a

given finite term or in which the executive represent special interests have a less persistent government spending.

Table 5. Determinants of Spending Persistence ($\hat{\gamma}_i^G$)

Explanatory variables		1	2	3	4
Macro	Government size	0.083 (2.29)***	0.080 (2.19)***	0.146 (2.93)***	0.133 (2.61)***
	Income	0.108 (7.78)***	0.124 (5.07)***	0.126 (4.94)***	0.098 (2.84)***
	Openness	-0.444 (-1.15)	-0.043 (-1.10)	-0.012 (-0.29)	0.013 (0.28)
	Inflation	-0.003 (-4.07)***	-0.003 (-4.12)***	-0.003 (-3.85)***	-0.003 (-3.72)***
	Country size	0.039 (4.01)***	0.039 (3.96)***	0.041 (3.78)***	0.047 (3.46)***
Institutional	Government effectiveness		-0.022 (-0.78)	-0.019 (-0.61)	-0.024 (-0.68)
Political	Political system			0.008 (0.38)	-0.009 (-0.41)
	Parties concentration			-0.000 (-0.10)	0.000 (0.64)
	Veto drops			0.113 (-2.03)**	0.119 (2.08)**
	Special interest			-0.125 (-2.42)**	-0.150 (-2.86)***
	Military chief			0.001 (3.49)***	0.000 (3.62)***
	Finite term			-0.000 (-3.32)***	-0.00 (-3.07)***
Geographical	Distance from Equator				0.001 (0.91)
	East Asia & Pacific				-0.095 (-1.03)
	Europe & Central Asia				-0.132 (-1.51)
	Latin America & Caribbean				-0.088 (-1.36)
	Middle East & North Africa				-0.248 (-2.78)***
	South Asia				-0.363 (-3.18)***
	Sub-Saharan Africa				-0.059 (-0.66)
	Goodness of fit χ²	214.63***	213.73***	182.85***	160.93***
	Observation	111	110	106	106

Note: *,**,*** respectively significant at 10%, 5% and 1%. Numbers 1-4 denote different specifications. WLS estimates.

45.   Given the high correlation between spending and revenue in our sample (0.9) it is likely to expect that the determinants of discretion and persistence have a similar effect on spending and revenue. However, as we discussed in section 4.1, government revenue tends to be relatively less persistent than government spending. Thus, the fact that both components of discretion and persistence of government revenue are affected in a similar way by our set of explanatory variables cannot be taken for granted.

46.   In Table 6 and 7, we report the estimates of equations (3) and (4) for government revenue. Focusing first on the revenue discretion equation (Table 6), we can observe that similarly to the volatility of government spending discretion, government size, country size, income, government effectiveness, parliamentary system and veto drops are negatively associated with the discretion component of revenue. In contrast, countries with higher inflation and characterized by lower concentration of parties tend to have more government revenue discretion.

Table 6. Determinants of Revenue Discretion ($\hat{\sigma}_i^R$)

Explanatory variables		1	2	3	4
Macro	Government size	-0.254 (-2.63)***	-0.288 (-2.96)***	-0.282 (-2.86)***	-0.286 (-2.92)***
	Income	-0.521 (-11.29)***	-0.298 (-3.81)***	-0.244 (-3.12)***	-0.306 (-3.45)***
	Openness	-0.072 (-0.59)	-0.021 (-0.20)	-0.042 (-0.43)	-0.069 (-0.59)
	Inflation	0.005 (11.65)***	0.002 (2.04)**	0.001 (1.69)*	0.002 (2.18)**
	Country size	-0.130 (-4.52)***	-0.129 (-4.63)***	-0.162 (-6.33)***	-0.166 (-4.90)***
Institutional	Government effectiveness		-0.356 (-4.24)***	-0.366 (-4.62)***	-0.276 (-3.00)***
Political	Political system			-0.163 (-3.39)***	-0.171 (-3.43)***
	Parties concentration			0.001 (2.47)**	0.000 (1.84)*
	Veto drops			-0.233 (-1.82)*	-0.244 (-1.79)*
	Special interest			-0.091 (-0.80)	-0.049 (-0.46)
	Military chief			0.000 (0.77)	-0.000 (-0.02)
	Finite term			-0.000 (-0.88)	-0.000 (-0.52)
Geographical	Distance from Equator				-0.000 (-0.12)
	East Asia & Pacific				0.241 (1.30)
	Europe & Central Asia				0.112 (0.64)
	Latin America & Caribbean				0.217 (1.22)
	Middle East & North Africa				0.043 (0.19)
	South Asia				-0.196 (-0.77)
	Sub-Saharan Africa				-0.032 (-0.16)
	R-square	0.63	0.68	0.77	0.78
	Observation	111	110	106	106

Note: *,**,*** respectively significant at 10%, 5% and 1%. Numbers 1-4 denote different specifications. OLS estimates.

47.   Analyzing the results for revenue persistence (Table 7) we can see that, as for the spending specification, macroeconomic variables such as income and country size are significant and they have opposite sign with respect to the revenue discretion equation. In contrast, government effectiveness, political stability, parliamentary system and party concentration have the same sign in both the persistence and discretion equation (Tables 6 and 7). Other variables such as military chief and finite term are only significant in the persistence specification, and the sign of their coefficients is the same as in the spending specification.

Table 7. Determinants of Revenue Persistence ($\hat{\gamma}_i^R$)

Explanatory variables		1	2	3	4
Macro	Government size	0.063 (1.62)*	0.064 (1.66)*	0.098 (1.96)**	0.067 (1.28)
	Income	0.021 (1.32)	0.069 (2.36)**	0.068 (2.28)**	0.066 (1.62)*
	Openness	0.023 (0.50)	0.018 (0.39)	0.113 (2.23)**	0.059 (0.98)
	Inflation	-0.000 (-0.20)	-0.000 (-1.03)	-0.000 (-0.94)	-0.000 (-0.67)
	Country size	0.039 (3.85)***	0.040 (3.89)***	0.045 (4.03)***	0.052 (3.49)***
Institutional	Government effectiveness		-0.063 (-1.95)**	-0.027 (-0.71)	-0.002 (-0.05)
Political	Political system			-0.071 (-2.71)***	-0.060 (-2.10)**
	Parties concentration			0.000 (2.55)***	0.000 (2.73)***
	Veto drops			0.184 (3.00)***	0.184 (2.93)***
	Special interests			-0.008 (-0.16)	-0.031 (-0.57)
	Military chief			0.001 (2.89)***	0.000 (2.64)***
	Finite term			-0.000 (-2.89)***	-0.000 (-2.94)***
Geographical	Distance from Equator				0.004 (3.42)***
	East Asia & Pacific				0.102 (0.98)
	Europe & Central Asia				-0.109 (-0.94)
	Latin America & Caribbean				0.016 (0.20)
	Middle East & North Africa				0.002 (0.02)
	South Asia				-0.210 (-1.67)*
	Sub-Saharan Africa				0.088 (0.77)
	Goodness of fit χ²	254.04***	250.07***	219.30***	195.74***
	Observation	111	110	106	106

Note: *,**,*** respectively significant at 10%, 5% and 1%. Numbers 1-4 denote different specifications. WLS estimates.

48.   We conclude our analysis by assessing the cross-country determinants of responsiveness of fiscal policy. In Table 8 we report the results of estimating equation (5) for government spending. Starting with the first column of the table, we can see that an only variable that is statistically significant is income. In particular, we find that developed countries tend to be less pro-cyclical. This result is in line with other evidence in the literature, as discussed in the previous section of the paper. However, when we include the other set of variables, we find that none of the macro, political and institutional variables is statically significant. In contrast, as argued by Gavin and Perotti (1997a), we find that government spending is highly pro-cyclical in Latin America.

Table 8. Determinants of Spending responsiveness ($\hat{\beta}_i^G$)

Explanatory variables		1	2	3	4
Macro	Government size	-0.069 (-0.66)	-0.045 (-0.42)	-0.050 (-0.39)	-0.202 (-1.42)
	Income	-0.176 (-4.68)***	-0.086 (-1.29)	-0.048 (-0.66)	-0.155 (-1.53)
	Openness	-0.145 (-1.81)*	-0.128 (-1.59)	-0.098 (-1.14)	-0.170 (-1.57)
	Inflation	-0.000 (-0.65)	-0.001 (-1.38)	-0.001 (-1.32)	-0.000 (-0.06)
	Country size	-0.000 (-0.02)	0.012 (0.53)	0.008 (0.32)	0.042 (1.25)
Institutional	Government effectiveness		-0.106 (-1.59)	-0.158 (-1.95)**	0.015 (0.16)
Political	Political system			-0.003 (-0.06)	0.038 (0.74)
	Parties concentration			0.000 (0.76)	0.000 (0.20)
	Veto drops			0.045 (0.34)	-0.038 (-0.28)
	Special interests			-0.187 (-1.53)	-0.212 (-1.64)
	Military chief			-0.000 (-0.52)	-0.001 (-1.15)
	Finite term			0.001 (0.99)	0.001 (1.18)
Geographical	Distance from Equator				0.011 (3.82)***
	East Asia & Pacific				0.082 (0.36)
	Europe & Central Asia				0.316 (1.66)*
	Latin America & Caribbean				0.462 (3.00)***
	Middle East & North Africa				0.240 (0.95)
	South Asia				0.473 (1.33)
	Sub-Saharan Africa				0.035 (0.15)
	Goodness of fit χ²	220.48***	215.40***	204.56***	176.77***
	Observation	111	110	106	106

Note: *,**,*** respectively significant at 10%, 5% and 1%. Numbers 1-4 denote different specifications. WLS estimates.

49.   Different results are obtained when we estimate equation (5) for government revenue (Table 9). In particular, we find that while government size, government effectiveness, special interests, East Asia & Pacific, and Europe & Central Asia dummies are positively associated with revenue responsiveness, openness is negatively related. This different behaviour between the responsiveness of government spending and revenue is coherent with the fact that countries with pro-cyclical (counter-cyclical) spending may not have necessarily pro-cyclical (counter-cyclical) revenue, and vice versa.

Table 9. Determinants of Revenue responsiveness ($\hat{\beta}_i^R$)

Explanatory variables		1	2	3	4
Macro	Government size	0.219 (1.95)**	0.206 (1.78)*	0.413 (3.18)***	0.235 (1.63)*
	Income	-0.011 (-0.28)	0.014 (0.21)	-0.025 (-0.33)	0.006 (0.06)
	Openness	-0.028 (-0.31)	-0.031 (-0.34)	-0.060 (-0.62)	-0.395 (-3.19)***
	Inflation	-0.002 (-1.96)**	-0.002 (-1.92)**	-0.003 (-2.40)**	-0.002 (-1.26)
	Country size	0.000 (0.04)	-0.003 (-0.12)	0.003 (0.10)	-0.049 (-1.44)
Institutional	Government effectiveness		-0.032 (-0.48)	0.045 (0.49)	0.214 (2.09)**
Political	Political system			-0.023 (-0.43)	-0.053 (-0.89)
	Parties concentration			-0.000 (-2.03)**	-0.000 (-1.74)*
	Veto drops			0.089 (0.69)	0.081 (0.61)
	Special interests			0.317 (2.65)***	0.275 (2.20)**
	Military chief			0.000 (0.25)	-0.000 (-0.25)
	Finite term			0.000 (0.49)	0.000 (0.78)
Geographical	Distance from Equator				0.009 (2.56)***
	East Asia & Pacific				0.770 (3.30)***
	Europe & Central Asia				0.906 (3.75)***
	Latin America & Caribbean				0.050 (0.30)
	Middle East & North Africa				0.345 (1.46)
	South Asia				0.259 (0.84)
	Sub-Saharan Africa				0.334 (1.26)
	Goodness of fit χ²	262.78***	262.32***	237.07***	212.55***
	Observation	111	110	106	106

Note: *,**,*** respectively significant at 10%, 5% and 1%. Numbers 1-4 denote different specifications. WLS estimates.

4.3 Robustness Analysis

50.   The behaviour of fiscal policy varies across countries. Thus, it is interesting to see whether our estimated measures of responsiveness, persistence and discretion are different across groups of countries. For this purpose, we consider three groups of countries: EMU, OECD and non OECD countries. Looking at the panel results reported in Table 10, it is possible to see that the responsiveness of both expenditure and revenue to output is lower than for the measure of persistence for all countries. Moreover, it does not seem that countries significantly differ in terms of responsiveness. In contrast, country groups systematically differ in terms of discretion and persistence of both expenditure and revenue. In particular, EMU countries are those characterized by the lowest estimated discretion coefficient for spending, while non OECD countries are those with the highest (lowest) level of discretion (persistence).

Table 10. Panel regressions

Country Group	Observations		Parameter estimates (1980-2007)					
			Responsiveness		Persistence		Discretion	
	G	R	$\hat{\beta}^G$	$\hat{\beta}^R$	$\hat{\gamma}^G$	$\hat{\gamma}^R$	$\hat{\sigma}^G$	$\hat{\sigma}^R$
EMU	312	312	0.20***	0.22***	0.82***	0.76***	0.035	0.035
OECD	760	760	0.25***	0.23***	0.80***	0.82***	0.054	0.055
Not OECD	2974	2974	0.25***	0.21***	0.72***	0.72***	0.138	0.194

Note: G -the government spending, R –revenues. *,**,*** respectively significant at 10%, 5% and 1%.

51.　　　It is also possible to argue that most of the variation in many determinants of government spending and revenue, and its persistence, responsiveness and discretion components (such as political constraints, income, inflation, etc), occur between developed and developing countries. Thus, both from a theoretical perspective and, especially, from a policy point of view it is important to assess whether our analysis is robust within developed and developing country groups. Table 11 reports the results both for the discretion, persistence and responsiveness equations for government spending. The first two columns refer to the results relative to fiscal discretion respectively for developed and developing countries. Looking at these two columns, it seems that there is not much discrepancy between the two groups. For both sets of countries, spending discretion is negatively related to GDP per capita, country size, government effectiveness and the dummy for finite terms. In contrast, other political variables and inflation seem to affect spending discretion only for developing countries.

Table 11. Developed and developing countries (government expenditure)

		Discretion		Persistence		Responsiveness	
	Explanatory variables	$\hat{\sigma}^G_{developed}$	$\hat{\sigma}^G_{developing}$	$\hat{\gamma}^G_{developed}$	$\hat{\gamma}^G_{developing}$	$\hat{\beta}^G_{developed}$	$\hat{\beta}^G_{developing}$
Macro	Government Size	-0.720 (-2.23)**	-0.160 (-1.61)	-0.102 (-0.55)	0.174 (3.22)***	-0.131 (-0.35)	0.035 (0.23)
	Income	-0.464 (-4.34)***	-0.206 (-3.50)***	0.145 (1.51)	0.117 (3.37)***	0.312 (1.27)	0.142 (1.24)
	Openness	0.097 (0.62)	0.009 (0.09)	-0.049 (-0.61)	0.185 (0.31)	0.132 (0.86)	-0.576 (-4.07)***
	Inflation	0.016 (0.28)	0.002 (2.25)**	-0.018 (-0.54)	-0.003 (-3.88)***	-0.022 (-0.37)	-0.002 (-1.23)
	Country Size	-0.198 (-4.26)***	-0.070 (-2.56)***	-0.040 (-1.11)	0.047 (3.83)***	-0.084 (-1.30)	0.011 (0.35)
Institutional	Government Effectiveness	-0.414 (-2.22)**	-0.193 (-2.61)***	-0.029 (-0.27)	-0.069 (-1.59)	-0.439 (-1.93)**	-0.087 (-0.66)
Political	Political System	0.224 (1.83)*	-0.118 (-2.52)***	0.037 (0.56)	-0.005 (-0.20)	0.004 (0.03)	0.097 (1.38)
	Parties Concentration	0.960 (1.48)	0.000 (3.35)***	0.874 (1.77)*	0.000 (0.16)	1.422 (1.85)*	-0.000 (-0.38)
	Veto drops	-0.210 (-1.04)	-0.461 (-2.76)***	0.169 (-1.99)**	0.023 (0.27)	0.268 (1.22)	-0.425 (-2.21)**
	Special Interests	-0.140 (-0.75)	0.044 (0.33)	-0.375 (-2.44)***	-0.124 (-1.98)**	-0.761 (-2.65)***	0.119 (0.72)
	Military Chief	(dropped)	0.000 (2.37)**	(dropped)	0.000 (3.85)***	(dropped)	-0.001 (-1.04)
	Finite Term	-1.074 (-5.21)***	-0.000 (-2.80)***	-0.248 (-1.19)	-0.000 (-3.21)***	0.288 (0.76)	0.001 (1.20)
	R-square	0.79	0.59	-	-	-	-
	Goodness of fit χ²	-	-	28.63***	134.28***	55.44***	109.07***
	Observation	27	79	27	79	27	79

Note: *,**,*** respectively significant at 10%, 5% and 1%. Goodness of fit: χ2 statistics for persistence and responsiveness, R-square for discretion.

52.   The second two columns report the results of the persistence equation for both developed and developing countries. Differently from what was obtained for the equation regarding the discretion component, it seems that while macroeconomic variables have been more relevant for fiscal persistence in developing countries, political and institutional variables in general played a role in affecting fiscal persistence in both developed and developing countries, even if with some differences.

53.   Finally, analyzing the last two columns we can see that the determinants of responsiveness of government spending vary between developed and developing countries. In particular, while government effectiveness and special interests are essentially the only variables found to be significant in the specification for developed countries, openness and veto drops are the only variables that have a statistically significant impact on spending responsiveness in developing countries. This result suggests that not only the measure of responsiveness and cyclicality varies between developing and developed countries, but this is also true for its determinants.

5.   Conclusion

54.   By making use of a two-step estimation procedure, we pursue a twofold objective in this paper. First, we provide an empirical study on the decomposition of fiscal policy into three components: responsiveness, persistence and discretion. Second, we analyze the determinants of these components. The key conclusions of our analysis are as follows.

55.   Using a country-specific estimation approach to disentangle the abovementioned three components of fiscal policy, both for government spending and revenue, we find that, for most of the 132 countries in our sample, fiscal policy is rather more persistent than responsive to current economic conditions. More interestingly, we find that, for both revenue and spending, persistence is negatively correlated to the discretion component thereby suggesting that countries with higher persistence have lower discretion. The above conclusions are robust by considering the AMECO dataset for EU countries, for a larger time span. In the second part of our analysis, we carry out a cross-country estimation approach to identify the source of fluctuations of persistence, responsiveness and discretion components. According to the previous empirical finding, suggesting a negative relationship between discretion and persistence, we find that while government size and effectiveness and income have negative effects on the discretion component of fiscal policy, they tend to increase fiscal persistence. Moreover, we find that macro and political and institutional variables are less relevant for responsiveness, once regional dummies are considered.

56.   Our study suggests possible extensions. First, comparing for each country the estimates of the degree of persistence from government expenditure and revenue equations and the starting value of these two series, one could detect signals of potential fiscal deterioration (some preliminary analysis is provided in Appendix 2).

57.   Second, given the negative relative relation between government spending volatility and growth, and welfare (Fatás and Mihov, 2003; Herrera and Vincent, 2008) it would be interesting to extend the analysis to revenue volatility, and to assess the impact of political and institutional variables that affect growth through changes in fiscal policy discretion.

58.   Thirdly, it would be interesting to deepen the decomposition of discretion, persistence and responsiveness by analyzing different components of government spending and revenue.

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APPENDIX 1. DATA AND SOURCES

We use annual data from the *IMF World Economic Outlook* for 132 countries over the period 1980–2007. The choice of our sample is dictated by data availability. We started with a sample of 180 countries but we had to drop some (forty eight) either because fiscal data were not available or because the time span was too short for a meaningful estimation of time-series regressions in the paper. We decided to keep countries for which we have at least 18 years of data (see Table A1.1). Table A1.2 reports for each variable used in the time-series regressions the number of country-specific observations.

Table A1.1. Country sample

Country list				
Albania	Congo, Republic of	Iran, Islamic Republic of	Myanmar	St. Vincent and the Grenadines
Angola	Costa Rica	Ireland	Netherlands	Suriname
Argentina	Côte d'Ivoire	Israel	New Zealand	Swaziland
Australia	Cyprus	Italy	Nicaragua	Sweden
Austria	Czech Republic	Jamaica	Niger	Switzerland
Bahamas, The	Denmark	Japan	Nigeria	Syrian Arab Republic
Barbados	Dominica	Jordan	Norway	Taiwan Province of China
Belgium	Dominican Republic	Kenya	Oman	Tanzania
Belize	Ecuador	Kiribati	Pakistan	Thailand
Bhutan	Egypt	Korea	Panama	Togo
Bolivia	El Salvador	Kuwait	Paraguay	Tonga
Botswana	Equatorial Guinea	Lao People's Democratic Republic	Peru	Trinidad and Tobago
Brazil	Ethiopia	Lebanon	Philippines	Tunisia
Brunei Darussalam	Finland	Lesotho	Poland	Turkey
Bulgaria	France	Libya	Portugal	Uganda
Burkina Faso	Gambia, The	Luxembourg	Qatar	United Arab Emirates
Burundi	Germany	Madagascar	Romania	United Kingdom
Cambodia	Greece	Malawi	Samoa	United States
Cameroon	Guinea	Malaysia	São Tomé and Príncipe	Uruguay
Canada	Guinea-Bissau	Maldives	Senegal	Vanuatu
Cape Verde	Guyana	Mali	Seychelles	Venezuela
Central African Republic	Haiti	Malta	Sierra Leone	Vietnam
Chad	Hong Kong SAR	Mauritania	Singapore	Zambia
Chile	Hungary	Mauritius	South Africa	Zimbabwe
China	Iceland	Mexico	Spain	
Colombia	India	Morocco	Sri Lanka	
Comoros	Indonesia	Mozambique	St. Lucia	

Table A1.2. Number of observations

Country	G	R	RGDP	Inflation	Country	G	R	RGDP	Inflation	Country	G	R	RGDP	Inflation
Albania	26	26	28	18	Greece	28	28	28	28	Oman	28	28	28	28
Angola	28	28	28	28	Guinea	28	28	28	28	Pakistan	28	28	28	28
Argentina	28	28	28	28	Guinea-Bissau	28	28	28	28	Panama	28	28	28	28
Australia	28	28	28	28	Guyana	28	28	28	28	Paraguay	28	28	28	28
Austria	28	28	28	28	Haiti	28	28	28	28	Peru	28	28	28	28
Bahamas, The	28	28	28	28	Hong Kong SAR	28	28	28	28	Philippines	28	28	28	28
Barbados	28	28	28	28	Hungary	28	28	28	28	Poland	27	27	28	28
Belgium	28	28	28	28	Iceland	28	28	28	28	Portugal	28	28	28	28
Belize	27	27	28	28	India	20	20	28	28	Qatar	28	28	28	28
Bhutan	28	28	28	28	Indonesia	28	28	28	28	Romania	28	28	28	28
Bolivia	28	28	28	28	Iran, Islamic Republic of	28	28	28	28	Samoa	28	28	28	28
Botswana	26	28	28	28	Ireland	28	28	28	28	São Tomé and Príncipe	28	28	28	28
Brazil	27	27	28	28	Israel	28	28	28	28	Senegal	28	28	28	28
Brunei Darussalam	23	23	24	25	Italy	28	28	28	28	Seychelles	27	27	28	28
Bulgaria	23	23	28	27	Jamaica	28	28	28	28	Sierra Leone	28	28	28	28
Burkina Faso	28	28	28	28	Japan	28	28	28	28	Singapore	28	28	28	28
Burundi	28	28	28	28	Jordan	28	28	28	28	South Africa	28	28	28	28
Cambodia	21	21	28	21	Kenya	28	28	28	28	Spain	28	28	28	28
Cameroon	28	28	28	28	Kiribati	28	28	28	28	Sri Lanka	28	28	28	28
Canada	28	28	28	28	Korea	28	28	28	28	St. Lucia	28	28	28	28
Cape Verde	28	28	28	28	Kuwait	28	28	28	28	St. Vincent and the Grenadines	24	24	28	28
Central African Republic	27	27	28	28	Lao People's Democratic Republic	28	28	28	28	Suriname	28	28	28	28
Chad	25	28	28	28	Lebanon	28	28	28	28	Swaziland	27	27	28	28
Chile	27	27	28	28	Lesotho	28	28	28	28	Sweden	28	28	28	28
China	28	28	28	28	Libya	28	28	28	28	Switzerland	25	25	28	28
Colombia	26	26	28	28	Luxembourg	28	28	28	28	Syrian Arab Republic	28	28	28	28
Comoros	27	27	28	28	Madagascar	28	28	28	28	Taiwan Province of China	28	28	28	28
Congo, Republic of	28	28	28	28	Malawi	28	28	28	28	Tanzania	28	28	28	28
Costa Rica	28	28	28	28	Malaysia	23	23	28	28	Thailand	28	28	28	28
Côte d'Ivoire	27	27	28	28	Maldives	28	28	28	28	Togo	28	28	28	28
Cyprus	28	28	28	28	Mali	28	28	28	28	Tonga	28	28	28	28
Czech Republic	28	28	28	28	Malta	28	28	28	28	Trinidad and Tobago	26	26	28	28
Denmark	28	28	28	28	Mauritania	28	28	28	28	Tunisia	28	28	28	28
Dominica	27	27	28	28	Mauritius	28	28	28	28	Turkey	21	21	28	28
Dominican Republic	28	28	28	28	Mexico	28	28	28	28	Uganda	25	26	28	28
Ecuador	28	28	28	28	Morocco	28	28	28	28	United Arab Emirates	28	28	28	28
Egypt	28	28	28	28	Mozambique	28	28	28	28	United Kingdom	28	28	28	28
El Salvador	27	27	28	28	Myanmar	26	26	28	28	United States	28	28	28	28
Equatorial Guinea	28	28	28	27	Netherlands	28	28	28	28	Uruguay	22	22	28	28
Ethiopia	28	28	28	28	New Zealand	28	28	28	28	Vanuatu	28	28	28	28
Finland	28	28	28	28	Nicaragua	28	28	28	28	Venezuela	20	20	28	28
France	28	28	28	28	Niger	28	28	28	28	Vietnam	28	28	28	28
Gambia, The	27	27	28	28	Nigeria	23	23	28	28	Zambia	28	28	28	28
Germany	28	28	28	28	Norway	28	28	28	28	Zimbabwe	27	27	28	28

Note : G is the Government Spending; R is the Government Revenue; RGDP is the Real Gross Domestic Product.

Data series used in the country-specific regressions are: a) Real GDP, b) Inflation: calculated as annual percentage change of the GDP deflator, c) Index of oil prices: computed as the logarithm of real petroleum annual average spot price. Source: *International Financial Statistics* (IFS).

Data series used in the cross-sectional regressions are:

Government size: Logarithm of the ratio of government spending to GDP. Source: *Penn World Tables 6.1* (PWT).

Income: Logarithm of per-capita income. Source: *Penn World Tables 6.1* (PWT).

Openness: The ratio of exports plus imports to GDP at constant prices. Source: *Penn World Tables 6.1* (PWT).

Inflation: Calculated as the difference in the logarithm of the GDP deflator. Source: *International Financial Statistics* (IFS).

Country Size: Calculated as the logarithm of the population. Source: *World Development Indicators* (WDI).

Government Effectiveness: Measuring the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Source: *Worldwide Governance Indicators* (WGI).

Political System: Dummy variable that takes a value of zero for Presidential regime, the value one for the Assembly-elected Presidential regime and two for Parliamentary regime. Source: *Database of Political Institutions* (*DPI 2004)*. Original series identifier: SYSTEM

Parties Concentration: The Herfindahl Index calculated as the sum of the squared set shares of all parties in the government. Equals NA if there is no parliament or if there are no parties in the legislature and blank if any government or opposition party seats are blank. Source: *Database of Political Institutions* (*DPI 2004)*. Series identifier: HERFTOT.

Veto drops: This variable counts the percent of veto players who drop from the government in any given year. Source: *Database of Political Institutions* (*DPI 2004)*. Original series identifier: STABS

Special Interests: Dummy variable that takes the value one if the party of the largest government party represents any special interests and zero otherwise. Source: *Database of Political Institutions* (*DPI 2004)*. Original series identifier: GOVSPEC.

Military Chief Executive: Definition of the variable depends on the following question: Is Chief Executive a military officer? It takes the value one if the source (Europa or Banks) includes a rank in their title, 0 otherwise. If chief executives were described as officers with no indication of formal retirement when they assumed office, they are always listed as officers for the duration of their term. If chief executives were formally retired military officers upon taking office, then this variable gets a 0. Source: *Database of Political Institutions* (*DPI 2004)*. Original series identifier: MILITARY.

Finite Term: Dummy variable that takes the value one if there exists a constitutional limit on the number of years the executive can serve before new elections must be called and zero otherwise.

Deviating from the convention, a zero is recorded if a limit is not explicitly stated. Variable gets a zero value in the cases where the constitution with year limits is suspended or un-enforced. Source: *Database of Political Institutions* (*DPI 2004)*. Original series identifier: FINITTRM.

Set of regional variables: a) Distance from Equator, computed as the vertical distance of parallels from the equator, b) set of six binary variables (East Asia & Pacific, Europe and Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia and Sub-Saharan Africa) which take value one if the country belongs one of the above regions. Variables are taken from Andy Rose's site: http://faculty.haas.berkeley.edu/arose/.

APPENDIX 2. FURTHER ANALYSIS ON FISCAL DEVELOPMENTS

Comparing for each country the estimates of the degree of persistence from government expenditure and revenue equations and the starting value of these two series, one could be able to detect signals of potential fiscal deterioration. Those results could bring additional information regarding the approach of testing the behaviour of public finances, via the intertemporal government budget constraint, such as performed, for instance, by Afonso (2005) and Afonso and Rault (2007). In particular, if government expenditure series exhibit a higher level of persistence than revenues ($\gamma_i^R < \gamma_i^G$), we could infer something about the existence of conditions for fiscal deterioration. Linked to this is the idea that a persistent series contains a permanent component, whereby past shocks exert an ongoing effect on the level of the series. Therefore, the bigger the magnitude of the persistence (measured by γ), the bigger the impact of past fiscal policy shocks. From an economic point of view, this implies that, in the case where $\gamma_i^R < \gamma_i^G$, policy-induced shocks have long-run consequences on the series such that, when expenditure increases, improvements in the budget balance may be harder to attain because of the slower adjustment of the revenues. Only in the case where the hypothesis $\gamma_i^R = \gamma_i^G$ holds, would developments of the government spending and revenue series compensate each other in such a way to avoid fiscal deterioration.

Focusing only on countries for which our estimation results indicate that the persistence component is statistically significant (see Table 1 in the main text), we plot in Figure A2.1 the magnitude of difference in the persistence component of government spending and revenues. The values range from a minimum of -0.40 (higher overall revenue persistence) to a maximum of 0.50 (higher overall spending persistence). The bold circle in Figure A2.1 indicates the cases where $\hat{\gamma}_i^G = \hat{\gamma}_i^R$. However, in order to formally test the presence of fiscal deterioration equation (1) and (2) should be simultaneously estimated. This, although beyond the purpose of this paper, could be a potential topic for future research.

Figure A2.1. Country-specific persistence bias ($\hat{\gamma}_i^G - \hat{\gamma}_i^R$)
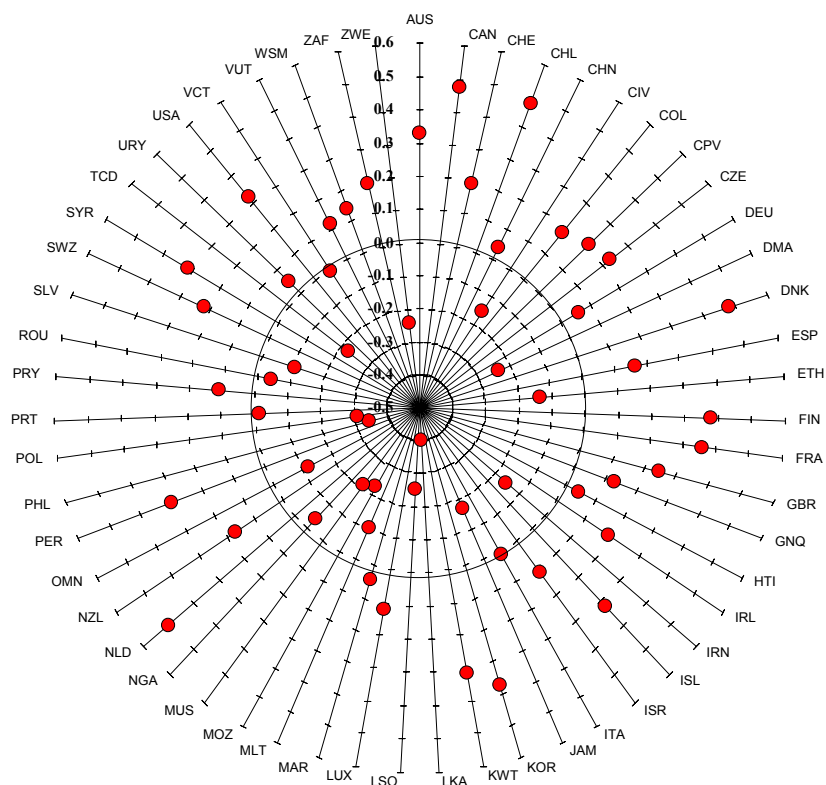
APPENDIX 3 – DICKEY-FULLER TESTS

In this section we present the Augmented Dickey-fuller tests for the residual obtained through the estimation of equations (1) and (2). The table below reports the -statistics obtained using one lag to augment the test. They are robust to different lag specifications. The results show that we can reject for each country the hypothesis of non stationarity of the residuals.[17]

Table A3. Results with AMECO dataset (1960-2007)

Country	G	R
Austria	-4.10***	-5.23***
Belgium	-5.82***	-4.54***
Germany	-4.86***	-5.21***
Denmark	-4.39***	-3.45**
Spain	-4.39***	-4.39***
Finland	-3.72***	-5.10***
France	-5.06***	-6.55***
United Kingdom	-3.68***	-4.15***
Greece	-4.86***	-7.30***
Ireland	-5.19***	-4.70***
Italy	-4.92***	-5.04***
Netherlands	-5.53***	-4.47***
Portugal	4.11***	5.77***
Sweden	-3.74***	-3.61**
United States	-5.40***	-4.58***
Japan	-4.24***	-3.72***

Notes: *, **, ***, significant at respectively 10, 5, and 1 per cent.

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17. From a technical point of view, it has to be acknowledged that the relative short time span implies that the results have to be treated with caution, even if the inspection of the autocorrelation coefficient indeed confirms that they are stationary. Moreover, as we already mentioned, from a theoretical point of view *G* and *Y* (*R* and *Y*) should be cointegrated given that the ratio G/Y (R/Y) is bounded and strictly greater than zero.

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