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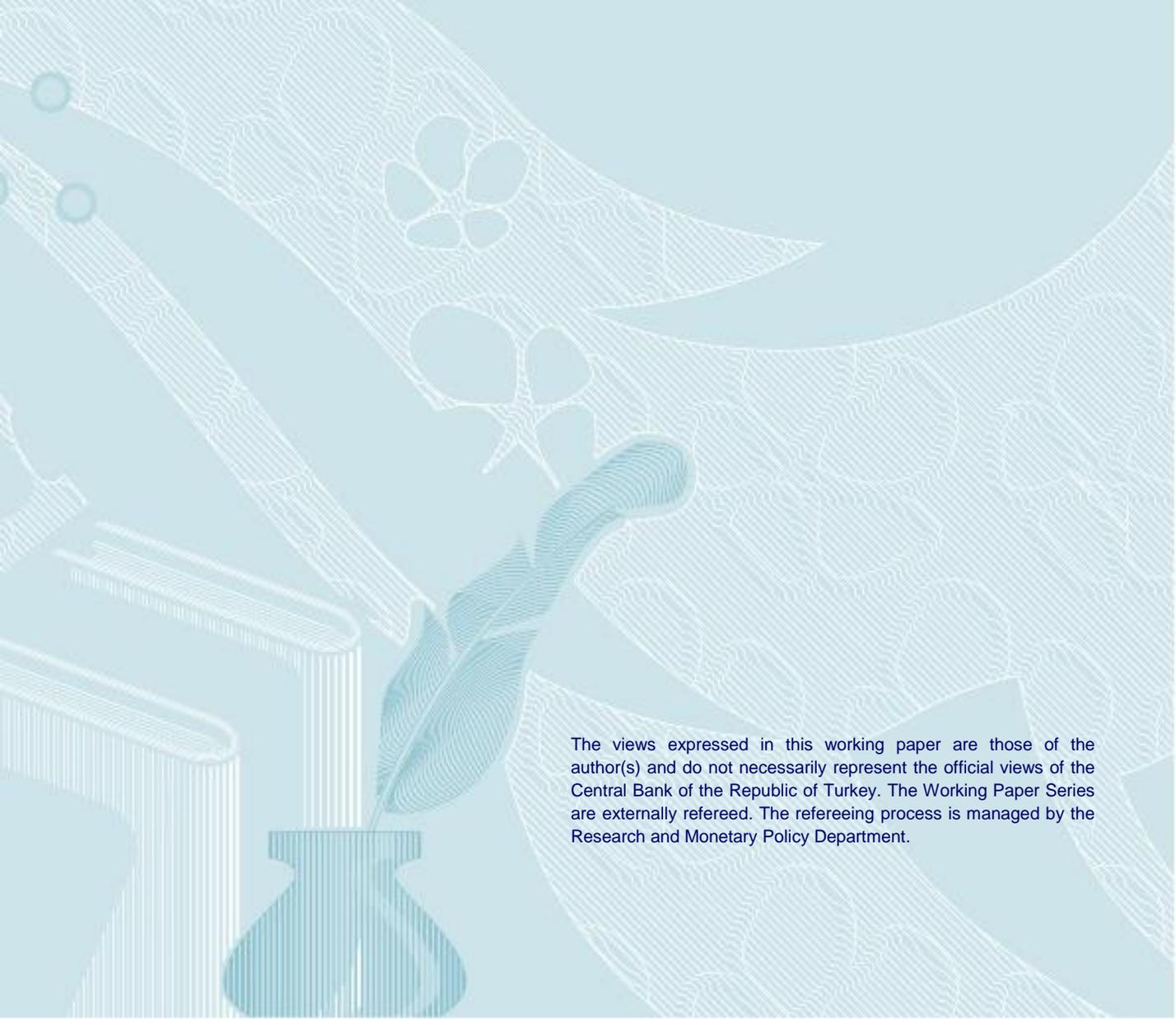
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Asymmetric Government Expenditure: A Comparison of Advanced and Developing Countries*

Ali Aşkın Çulha[†]

Abstract

This paper studies the responsiveness of government expenditures to business cycles and introduces an index of asymmetric government expenditures using panel data for a broad set of advanced and developing countries during the period 1981-2014. The empirical findings show that government expenditures tend to be procyclical in developing countries but acyclical in advanced economies. In addition, it is found that government expenditures respond in a countercyclical manner during bad times in advanced countries, but in a strongly procyclical manner during good times in developing countries. The results also indicate that the index of asymmetric government expenditures for developing countries tend to be higher than that of the advanced countries.

JEL Classification Codes: E32, E62, H50.

Keywords: Government expenditure, procyclicality, countercyclicality, asymmetry.

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I. Introduction

The cyclical behavior of fiscal policy has been the subject of increasing number of empirical studies over the last decade. Cyclicity of fiscal policy reflects changes in government expenditures stemming from discretionary actions by policymakers as well as the operation of automatic stabilizers. Standard Keynesian approach suggests that fiscal policy should be countercyclical and should act as a stabilizing force: the government should increase expenditures and lower taxes to help the economy to spend its way out of the recession. On the other hand, the neoclassical tax-smoothing approach with perfect foresight proposed by Barro (1979) suggests that governments should try to smooth the distortions associated with taxation and fiscal policy should remain neutral over the business cycle. Accordingly, tax rates should be held constant during the business cycle for a given path of government expenditure and the budget surplus should move in a procyclical manner.

Procyclical fiscal policies, namely policies that are expansionary during economic booms and contractionary during recessions are generally deemed as sub-optimal given their damaging effects on welfare. Procyclical fiscal policies tend to exacerbate booms and aggravate busts reinforcing the business cycle thereby giving rise to macroeconomic volatility, which in turn depresses investment and hampers economic growth in the long-run (see e.g. Woo (2009) and Maravalle and Claeys (2012)). In addition, expansionary fiscal policies during booms that are not completely offset by contractionary fiscal policies tend to produce a large deficit bias and raise the question of debt sustainability. Moreover, by utilizing a comprehensive set of 114 countries for 1950-2010, McManus and Özkan (2015) find that fiscally procyclical countries tend to have lower rates of economic growth, higher volatility in output and higher rates of inflation.

The literature on the cyclicity of fiscal policy provides ample evidence contrary to the theoretical notions that call for countercyclical or neutral fiscal behavior over the business cycle. In their seminal paper, Gavin and Perotti (1997) observed that budget deficits in Latin America largely failed to respond to economic growth, suggesting that fiscal policy was used in a procyclical fashion. Recent literature analyzing the cyclical properties of fiscal policy shows that this phenomenon is not specific to Latin America but quite widespread among developing countries, as documented by Kaminsky et al. (2004), Tornel and Lane (1999), Ilzetzki and Végh (2008), Talvi and Végh (2005), Alesina et al. (2008), Woo (2009), Akitoby et al. (2006), and Halland and Bleaney (2011). Frankel et al. (2013) provide evidence that more than 90% of developing countries (67 out of 73 in their sample) show procyclical government spending. Talvi and Végh (2005), moreover, argue that procyclical fiscal policy should be viewed as the rule for developing countries rather than the exception.

The empirical evidence, however, on the cyclical pattern of fiscal policy from advanced, particularly OECD, countries presents mixed results. While a number of researches such as Lane (2003), Ilzetzki and Végh (2008) and Çevik and Teksöz (2014) show that fiscal policy in advanced countries is procyclical, Braun (2001), Galí and Perotti (2003), Alesina et al. (2008), Égert (2010) and Frankel et al. (2013) find that fiscal policy is countercyclical. On the other hand, some studies such as Gavin and Perotti (1997), Fiorito (1997) and Talvi and Végh (2005) point out that no discernible pattern can be inferred for advanced economies.

A number of studies such as Kaminsky et al. (2004), Hercowitz and Strawczynski (2004), Balassone and Francese (2004), Jaimovich and Panizza (2007) and Granado et al. (2013) have argued that the reaction of government expenditures may differ with respect to the phase of the business cycle. More specifically, it is found that government spending may respond asymmetrically during expansions and contractions, which in turn may have potential adverse effects on the sustainability of fiscal policy and macroeconomic stability. Besides, recent research (e.g. Auerbach and Gorodnichenko (2012)) finds large differences in the size of fiscal multipliers in contractions and expansions rendering fiscal policy more effective in contractions than in expansions. This finding implies that larger fiscal multipliers during recessions amplify the effects of countercyclical fiscal policy on aggregate economy. On the other hand, procyclical fiscal policies during expansions might lead to higher levels of inflation especially when the real output growth rate is close to its potential.

The aim of this paper is twofold. First, it tries to empirically assess the cyclical sensitivity of government expenditures in a relatively large panel of advanced and developing countries. Second, it attempts to estimate the reaction of government expenditures with respect to positive and negative phases of the cycle. More specifically, the paper tries to examine whether the government expenditures behave asymmetrically during good and bad times in advanced and developing countries. In this vein, this paper tries to contribute to the relevant literature by introducing an index of asymmetric government expenditure separately for advanced and developing countries to assess the extent of asymmetries in government expenditures as regards the relative country groupings.

The study employs a dynamic panel estimation approach based on the Generalized Method of Moments (GMM) that avoids estimation biases associated with endogenous regressors and unobserved country specific heterogeneity.

The empirical findings suggest that government expenditures are procyclical in developing countries while acyclical in advanced countries. The study also finds significant evidence of asymmetric government spending across advanced and developing countries. Government expenditures tend to be procyclical during good times but acyclical during bad times in developing countries. On the other hand, the empirical findings suggest that

government expenditures behave in a countercyclical manner during bad times but in an acyclical manner during good times in advanced countries. The results also suggest that the asymmetry index for developing countries is higher than the one for advanced countries. This finding implies that government expenditures tend to be more asymmetric in developing countries compared to advanced economies mainly as a result of the more-than proportionate increase in government spending in developing countries when the economy is operating above potential real growth rate.

The remainder of the paper is organized as follows. Section II presents a brief review of the literature on the cyclicity of fiscal policy and asymmetric government spending. Section III describes the data and the methodology. Section IV reports and interprets the empirical results. Robustness checks are provided in Section V. Finally, section VI discusses some concluding remarks.

II. Literature Review

Why would the policymakers, particularly in developing countries, pursue sub-optimal procyclical fiscal policies that add to macroeconomic instability? A brief review of the literature reveals that explanations to this puzzle fall into two main strands: (i) imperfect access to international credit markets and lack of domestic financial depth that prevent developing countries from borrowing in bad times and leave them with no choice but to cut spending and raise taxes (Gavin and Perotti (1997), Riascos and Végh (2003), Kaminsky et al. (2004) and Calderón and Schmidt-Hebbel (2008)) and (ii) institutional and political economy considerations, which typically argue that developing countries tend to be more prone to political pressures exacerbated by larger political fragmentation and/or more volatile tax bases that lead to higher spending in good times (Tornell and Lane (1999), Talvi and Végh (2005), Alesina et al. (2008), Lane (2003) and Ilzetzki and Végh (2008)).

The theoretical and empirical literature on the cyclicity of fiscal policy has mainly concentrated on issues related to pro- or countercyclicity of government expenditure, which implicitly assumes that the reaction of government expenditures over the business cycle is symmetric. However, some recent studies have found that government spending may not behave the same way during expansions as it behaves during recessions. More specifically, it is shown that government expenditures may respond asymmetrically with respect to good and bad times.¹ This phenomenon, defined as the asymmetric government expenditure or “cyclical

¹ In the literature, good and bad times are generally defined as periods when the output gap is positive and negative, respectively. There are also some other indicators of business cycle used in the literature where good and bad times are defined with respect to positive and negative deviations from the trend

ratcheting” in the terminology of Hercowitz and Strawczynski (2004), refers to the tendency of the ratio of government spending to GDP to rise during bad times and to be only partially reduced during good times. The implementation of fiscal policy in such an asymmetric fashion endangers fiscal sustainability, since enhanced government expenditure in bad times that is not compensated by a commensurate reduction in good times leads to an increase in the budget deficit and an eventual rise in public debt with potentially adverse effects for long-run growth.

Cyclical ratcheting is mainly driven by the countercyclical expenditure policies during economic recessions and the inability of governments to contain spending during economic expansions when tax revenues abound, which, in turn, leads to higher government spending over time. Hercowitz and Strawczynski (2004), using a panel of twenty-two OECD countries, find that the prolonged rise in the spending to GDP ratio is partially explained by cyclical upward ratcheting due to asymmetric fiscal behavior. In a similar vein, Gavin and Perotti (1997) present evidence of asymmetric government expenditures in industrial countries. In particular, they find that government consumption and transfers display a pronounced countercyclical pattern during recessions, and they conclude that public spending, rather than revenue, determines the asymmetric behavior of fiscal balance in industrial economies. Gavin and Perotti (1997) also find some evidence of asymmetric behavior in public spending in Latin American countries. Nevertheless, rather than becoming countercyclical as in developed economies, public spending tends to become more procyclical during bad times. Thus, economic recessions appear to be closely associated with exaggerated collapses in government spending in Latin America. Likewise, Kaminsky et al. (2004) provide evidence of asymmetric government expenditures in developing countries where real government spending tends to increase much more in good times than in bad times.

In a sample of sixteen OECD countries, Balassone and Francese (2004) and in sample of fourteen EU countries, Balassone et al. (2008) find evidence of significant asymmetry in the reaction of fiscal policy to positive and negative cyclical conditions, with budgetary balances deteriorating during recessions and not improving sufficiently during expansions, leading to accumulation of public debt. In addition, in their analysis of budget components, Balassone et al. (2008) show that public expenditures, particularly transfers in cash, appear to be the main drivers of the asymmetry. Zápál (2007) tests the existence of cyclical bias in government spending for the sample of ten new EU member countries and shows that the increase in public spending during bad times is not offset by a commensurate decrease during good times, giving way to a ratcheting behavior of government spending to GDP ratio.

(sample mean or median) real GDP growth rates, respectively (see e.g. Kaminsky et al. (2004) and Hercowitz and Strawczynski (2004)).

Lee and Sung (2007) also find evidence of asymmetries in government expenditures both in OECD and non-OECD countries. Their findings suggest that fiscal policy takes a strong expansionary position during recessions, but does not tighten sufficiently during expansions. Similarly, Leigh and Stehn (2009), in their analysis of G7 countries, argue that fiscal policy appears to be subject to an easing bias, with more easing during bad times than tightening during good times. Manasse (2006) argues that policymakers' reactions to the business cycle differ depending on the state of the economy. More specifically, the findings of the study suggest that fiscal policy tends to be largely acyclical during bad times and procyclical during good times for both groups of developed and developing countries. Jaimovich and Panizza (2007), nevertheless, find that in developed countries government expenditures tend to be either countercyclical or acyclical in good times, and clearly countercyclical in bad times. However, fiscal policy is found to be acyclical during good and bad times in developing countries. Still, Calderón and Schmidt-Hebbel (2008) find no evidence of asymmetric government spending in advanced countries. On the other hand, government expenditure in developing countries is found to be acyclical in good times, and countercyclical in bad times. On the contrary, Granado et al. (2013) suggest that total government expenditures are procyclical in both good and bad times in developing countries, but the degree of procyclicality tends to be higher during good times.

There exist also a number of studies which emphasize the importance of using real-time data to assess the cyclicity of fiscal policy. Beetsma and Giuliodori (2008) use ex-ante data based on economic forecasts to estimate standard fiscal rules and then assess how fiscal policy reacts to new information on the business cycle. Their results point to marked differences between ex-ante behavior and responses to new information. In particular, they find that ex-ante fiscal policy is acyclical for EU countries and countercyclical for other OECD countries. Nevertheless, fiscal policy tends to react in a procyclical way to unexpected business cycle changes in EU countries, while the response of other OECD countries appears to be acyclical. Beetsma and Giuliodori (2008) also analyze the cyclical reaction of fiscal authorities to forecasts of negative and positive output gaps, and their findings indicate asymmetries in the planning of the fiscal policy. Fiscal policy planning for the full sample tends to be countercyclical when the output gap forecast is positive (good times), and acyclical when it is negative (bad times). When the country-sample is split into EU and non-EU countries, fiscal planning turns to be acyclical in both good and bad times. Similar to the findings of Beetsma and Giuliodori (2008), Golinelli and Momigliano (2009), using real-time data for the OECD countries, find that fiscal policy planning tends to be countercyclical in good times and procyclical in bad times. In a similar manner, Forni and Momigliano (2004) estimate a fiscal policy rule for the EU and OECD countries using real-time data on cyclical conditions, and also find evidence of asymmetric fiscal policy. Their results, however, point

to a sizeable countercyclical fiscal policy in bad times and acyclical fiscal policy in good times.

The results obtained from the empirical studies in the literature obviously point to a disagreement on the cyclical properties of fiscal policy over good and bad times. As argued in Golinelli and Momigliano (2009), many factors account for the differences in the results, as these empirical studies differ in a number of respects such as the specification of the model, the econometric method used, data sources, the coverage of the countries and the time periods studied.

III. Data and Methodology

III.1. Data

This study examines the cyclical properties of government expenditures using an unbalanced panel data set covering annual series of 42 countries (22 advanced and 20 developing) over the period 1981-2014.² All the data are retrieved from the World Economic Outlook (WEO) database of the International Monetary Fund (IMF).³ The dependent variable -total government expenditures-⁴ is deflated by GDP deflator and then transformed to log differences, which reflects the real growth rates of government expenditures.⁵ The output gap, as indicator of the business cycle, is estimated separately for each country by applying the Hodrick- Prescott (HP) filter to decompose the logarithm of real GDP into trend and cyclical components.⁶ Debt stock is measured by the nominal value of general government gross financial liabilities and defined as a ratio of nominal GDP. Government size is defined as the ratio of total government outlays as a percent of GDP and real GDP per capita is computed in terms of the logarithm of GDP in constant national currency per person. Table 1 presents descriptive statistics for the main variables used in the study.

² Countries are categorized with reference to IMF's Fiscal Monitor (April, 2015) economy groupings classification. The list of countries is presented in Table A.1 in Appendix A.

³ This dataset provides central government data whenever general government expenditure data are not available.

⁴ total government expenditure = government consumption + government investment + transfer payments + interest payments.

⁵ Kaminsky et al. (2004) and Jaimovich and Panizza (2007) argue against the use of government expenditure as a percent of GDP as the dependent variable since the inference about the cyclicity turns ambiguous due to the existence of GDP in the denominator.

⁶ In accordance with Ravn and Uhlig (2002), HP filter with smoothness parameter $\lambda=6.25$ is employed to extract the cyclical component from the GDP data. Different values for the smoothing parameter λ were also tried and results were found to be robust to different choices. To overcome the end-point bias problem inherent in the HP filtering methodology that affects the estimates of output gaps, the forecasts for the last four years for real GDP series in the WEO database were used in the computational process.

Table 1: Descriptive Statistics

	Mean	Std-dev	Minimum	Maximum	Observations
All countries					
Government expenditures	0.03	0.05	-0.36	0.37	1031
Output gap	0.00	0.02	-0.11	0.13	1384
Output gap (positive)*	0.01	0.01	0.00	0.13	651
Output gap (negative)*	-0.01	0.01	-0.11	0.00	729
Gross government debt	54.94	32.15	3.89	245.05	991
Government size	38.63	12.46	10.70	70.99	1062
Real GDP per capita (log)	11.15	2.14	6.73	17.16	1392
Advanced countries					
Government expenditures	0.03	0.04	-0.20	0.19	633
Output gap	0.00	0.01	-0.07	0.05	734
Output gap (positive)*	0.01	0.01	0.00	0.05	329
Output gap (negative)*	-0.01	0.01	-0.07	0.00	403
Gross government debt	61.72	35.87	8.17	245.05	621
Government size	45.03	9.61	14.16	70.99	644
Real GDP per capita (log)	11.15	1.78	9.01	17.16	734
Developing countries					
Government expenditures	0.05	0.07	-0.36	0.37	398
Output gap	0.00	0.02	-0.11	0.13	650
Output gap (positive)*	0.02	0.02	0.00	0.13	322
Output gap (negative)*	-0.02	0.02	-0.11	0.00	326
Gross government debt	43.57	20.09	3.89	137.51	370
Government size	28.76	9.59	10.70	52.17	418
Real GDP per capita (log)	11.16	2.49	6.73	16.27	658

*Statistics for these variables exclude zero values.

The sample of developing countries exhibit higher volatility in output gap and government expenditures compared to the sample of advanced countries. On the other hand, advanced countries, in general, seem to have a higher volatility in government debt with respect to developing countries. Government size in advanced countries appears to be, on average, one and half times higher than that in developing countries, pointing to a fairly larger share of public spending in advanced countries' economies.

III.2. Empirical Model and Estimation Strategy

In order to analyze the cyclical behavior of government expenditures in advanced and developing countries in response to output fluctuations, a fiscal reaction function is introduced that builds on the model-based fiscal sustainability approach developed by Bohn (1998). Following the works by Galí and Perotti (2003), Hercowitz and Strawczynski (2004), and Alesina et al. (2008), the baseline equation is specified in the following form:

$$g_{i,t} = \alpha_i + \mu_t + \delta g_{i,t-1} + \beta y_{i,t} + \rho d_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

In equation (1), the index i ($i=1, \dots, N$) denotes the country, and the index t ($t=1, \dots, T$) indicates the period. α_i stands for the country specific intercept (fixed effect) accounting for heterogeneity and μ_t represents time fixed effects capturing common shocks across countries. $y_{i,t}$ is the output gap computed as the log deviation of real GDP from its HP trend and $g_{i,t-1}$ is the log difference of the real total government expenditure for country i at time $t-1$. $d_{i,t-1}$ denotes gross government debt as a share of GDP in country i at time $t-1$. $\varepsilon_{i,t}$ is the error term.

Following the literature (e.g., Lane (2003) and Woo (2009)), we add two control variables, namely government size and real GDP per capita to the baseline fiscal reaction function.⁷ Then, equation (1) with control variables can be written as follows:

$$g_{i,t} = \alpha_i + \mu_t + \delta g_{i,t-1} + \beta y_{i,t} + \rho d_{i,t-1} + \lambda x_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $x_{i,t}$ represents the vector of additional control variables.

As argued by Rodrik (1998), governments tend to mitigate the exposure to external risk by increasing the share of domestic output which they consume. Therefore, government spending may function as a buffer against higher external vulnerabilities and tend to stabilize output fluctuations. Real GDP per capita, on the other hand, is included to control for the level of economic development. As pointed out by Fatás and Mihov (2003), poor countries may tend to rely on discretionary fiscal policy more frequently inducing higher output volatility. Accordingly, higher level of output per capita, in other words, higher level economic development is expected to decrease output fluctuations.

The coefficient β reflects the degree of cyclicity of government expenditures. It measures the elasticity of government spending with respect to output gap. A positive value of β indicates procyclicality of government expenditures, whereas a negative value implies countercyclical behavior. Accordingly, a positive value above unity points to a more-than-proportionate procyclicality.

In order to analyze whether the government expenditures behave asymmetrically during good and bad times, and to introduce an index of asymmetric government expenditure for advanced and developing countries, we split the output gap variable ($y_{i,t}$) into positive ($(y_{i,t})^p$) and negative ($(y_{i,t})^n$) output gaps. More specifically, we define $(y_{i,t})^p = (y_{i,t})d_t$ and $(y_{i,t})^n = (y_{i,t})(1-d_t)$ where d_t is a dummy variable identifying positive and negative output gaps, such that $d_t = 1$ if $(y_{i,t}) > 0$ and $d_t = 0$ if $(y_{i,t}) < 0$. Hence, good times are

⁷ Estimation results from the equations with control variables are also reported in the tables along with the results from the baseline equations that do not include control variables.

characterized as periods when the output gap is positive and bad times when the output gap is negative.

Equation (2) is then extended to account for the asymmetric considerations in the following form:

$$g_{i,t} = \alpha_i + \mu_t + \delta g_{i,t-1} + \beta_1 (y_{i,t})^p + \beta_2 (y_{i,t})^n + \rho d_{i,t-1} + \lambda x_{i,t} + \varepsilon_{i,t} \quad (3)$$

The coefficients β_1 and β_2 capture the government expenditure pattern during good and bad times, respectively. As argued by Hercowitz and Strawczynski (2004), the cyclical pattern of government expenditure may have two alternative forms: Symmetric and asymmetric behavior in expansions and contractions. If government expenditure behaves in the same way with respect to good and bad times, then it is symmetrical, and $\beta_1 = \beta_2$. If the reaction of government expenditure differs over the business cycle, then it is asymmetrical, and $\beta_1 \neq \beta_2$.

It should be noted that an active stabilization fiscal policy would require that $\beta_1, \beta_2 < 0$, which indicates that government expenditure should be countercyclical during both good and bad times. In other words, government spending should be reduced during economic expansions and increased during contractions by the policy makers. In contrast, if $\beta_1, \beta_2 > 0$, then government expenditure behaves in a procyclical manner during both good and bad times. In this case, government expenditure increases during economic expansions and decreases during contractions, which points to a sub-optimal implementation of fiscal policy in terms of economic stabilization. If government expenditure is procyclical in good times and countercyclical in bad times, this would imply that $\beta_1 > 0$ and $\beta_2 < 0$. On the contrary, if government expenditure is countercyclical in good times and procyclical in bad times, then $\beta_1 < 0$ and $\beta_2 > 0$.

In order to quantitatively assess the asymmetry in government spending, an index of asymmetric government expenditure can be defined as $\phi \equiv |\beta_1 - \beta_2|$. Hence, larger values of ϕ indicate a higher degree of asymmetry in government expenditure.

Estimation of the above equations by standard estimators such as pooled ordinary least squares (OLS) method clearly suffers from endogeneity problem since the lagged dependent variable may be correlated with the error term, giving rise to biased estimates in small samples. One possible solution is to use the system Generalized Method of Moments (system GMM) estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), which corrects for potential biases associated with endogenous regressors and unobserved country specific heterogeneity. Furthermore, as indicated in Golinelli and Momigliano (2009), system GMM is potentially less affected by the problem of weak instruments with persistent

data such as public debt or the output gap compared with other instrumental variable estimators such as difference GMM developed by Arellano and Bond (1991).⁸

As argued in Bond (2002), even in the presence of considerable heteroskedasticity, the dependence of the two-step weight matrix on estimated parameters makes the usual asymptotic distribution approximations be less reliable for the two-step system GMM estimator. Moreover, as shown by a number simulation studies, the asymptotic standard errors tend to be much too small, or the asymptotic t-ratios much too big for the two-step system GMM estimator in sample sizes where the equivalent tests based on the one-step system GMM estimator are quite accurate. Therefore, in this study we prefer to employ one-step approach as the benchmark estimation methodology in the same way as Golinelli and Momigliano (2008 and 2009) and Çevik and Teksöz (2014).

IV. Empirical Results

This section reports the estimation results of the fiscal reaction functions based on one-step system GMM methodology⁹, relating the government expenditure to its lagged value, output gap, lagged government debt and two additional control variables, namely government size and real GDP per capita. Columns denoted by (1) and (2) in the tables present the results for country groupings without and with control variables, respectively.

Initially, we focus on the cyclical properties of government expenditures reported in Table 2. We begin with examining the estimation results of equation (1) without control variables. For the whole sample and developing countries, the coefficients for the output gap are positive, whereas the coefficient for advanced countries is negative. Nevertheless, all these coefficients are statistically insignificant pointing to acyclicity of government expenditures with respect to business cycles. Estimation results with control variables reveal that coefficients for the output gap are positive for all country groupings, but statistically significant only for developing countries signaling procyclical government spending (See also Graphic B.1 in appendix B). The coefficients for lagged government expenditure and lagged government debt are negative and statistically significant for developing countries, which indicate that debt sustainability issues are more of a concern in developing countries

⁸ In this context, a comprehensive discussion for the preference of system GMM is presented in the appendix of Golinelli and Momigliano (2008). Celasun and Kang (2006) also provide an extensive discussion of the relative merits of alternative estimators in the context of fiscal policy countercyclicality.

⁹ As argued by Bond (2002), using a large number of instrumental variables in system GMM model can overfit endogenous variables and significantly reduce the power of the Sargan test in finite samples. Therefore, as discussed in Golinelli and Momigliano (2008), the model is estimated by using a subset of the available instrument matrix spanning by lags from $t-2$ to $t-3$.

compared to advanced countries, and developing countries tend to implement fiscal policy in a way to ensure the sustainability of government finances.

Table 2: Cyclicity of Total Government Expenditures (System GMM)

Dependent variable: Total government expenditures (<i>g</i>)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures (<i>t-1</i>)	-0.106 (0.089)	-0.089 (0.093)	0.146 (0.097)	0.166* (0.096)	-0.225*** (0.088)	-0.207** (0.084)
Output gap	0.257 (0.205)	0.388 (0.256)	-0.027 (0.201)	0.086 (0.211)	0.324 (0.244)	0.474* (0.246)
Government debt (<i>t-1</i>)	-0.001** (0.000)	-0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001** (0.001)	-0.001** (0.001)
Government size		0.003* (0.002)		0.003* (0.001)		0.007** (0.004)
Real GDP per capita		0.007 (0.007)		0.015*** (0.005)		0.005 (0.013)
Constant	0.089*** (0.023)	-0.108 (0.119)	0.021 (0.019)	-0.265** (0.104)	0.104*** (0.021)	-0.183 (0.263)
Number of observations	921	921	585	585	336	336
Number of instruments	125	127	125	127	87	89
Sargan test ^a	0.649	0.527	0.105	0.172	0.954	0.598
Autocorrelation ^b	0.305	0.416	0.604	0.879	0.160	0.145

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, *p*-values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, *p*-values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

The coefficient on government size is positive and significant for both advanced and developing countries, whereas the coefficient on real GDP per capita is positive and significant only for advanced countries. These findings suggest that, the size of the government plays an important role in the determination of fiscal policy both in advanced and developing countries, as argued by e.g. Galí (1994) and Fatás and Mihov (2001). On the other hand, the level of economic development appears to be a significant factor affecting the fiscal behavior only in advanced economies. As discussed in the literature for example by Lane (2003), Granado et al. (2013) and Woo (2009), this result seems to be affirmative of the argument that, as countries improve their economic development, they can use government spending as a stabilization tool more effectively to dampen cyclical fluctuations.

As mentioned before, the main purpose of this study is to examine whether the government expenditures react asymmetrically during good and bad times in advanced and developing countries, and to introduce an index of asymmetric government expenditure in order to quantitatively assess the extent of asymmetries regarding the relative country groups. Table 3 reports whether or not government expenditures respond differently with respect to positive and negative output gaps for the whole sample and for advanced and developing

countries. Once again, the model is estimated without and with control variables, which are indicated by columns (1) and (2), respectively.

Table 3: Cyclicalities of Total Government Expenditures in Good and Bad Times (System GMM)

Dependent variable: Total government expenditures (g)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures ($t-1$)	-0.269*** (0.076)	-0.238*** (0.078)	-0.048 (0.089)	-0.032 (0.077)	-0.345*** (0.079)	-0.300*** (0.078)
Good times	1.234*** (0.403)	1.321*** (0.414)	0.564 (0.607)	0.493 (0.609)	1.181*** (0.325)	1.227*** (0.411)
Bad times	-0.626** (0.279)	-0.387 (0.358)	-0.667*** (0.256)	-0.584*** (0.228)	-0.601* (0.361)	-0.181 (0.429)
Government debt ($t-1$)	-0.001* (0.000)	-0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001* (0.001)	-0.001** (0.001)
Government size		0.001 (0.001)		0.000 (0.001)		0.005* (0.003)
Real GDP per capita		0.003 (0.006)		0.010* (0.005)		0.002 (0.011)
Constant	0.048** (0.022)	-0.005 (0.092)	0.001 (0.024)	-0.104 (0.094)	0.066*** (0.022)	-0.102 (0.225)
Asymmetry index (ϕ)	1.860	1.708	1.231	1.077	1.782	1.408
Test $\phi = 0$ (p -value)	0.001	0.004	0.004	0.012	0.001	0.046
Number of observations	921	921	585	585	336	336
Number of instruments	127	129	127	129	89	91
Sargan test ^a	0.633	0.519	0.104	0.171	0.984	0.730
Autocorrelation ^b	0.257	0.360	0.654	0.895	0.135	0.120

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, p -values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, p -values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

The results reported in Table 3 point to the existence of asymmetric government expenditures across country groupings. The estimation results presented in columns denoted by (1) indicate that, during good times, government expenditures behave procyclically in the whole sample and in developing countries, but acyclically in advanced countries. On the other hand, government expenditures tend to behave in a countercyclical manner in all country groups during bad times, with the coefficient on developing countries being statistically significant only at 10 per cent level. Estimation results with control variables that are presented in columns denoted by (2), nevertheless, show that government spending is countercyclical for advanced countries, but acyclical for the whole sample and developing countries during bad times. During good times, however, while government expenditures appear to react in a strong procyclical manner in developing countries, an acyclical reaction is observed in advanced countries (see also Graphics B.2 and B.3 in appendix B).

The coefficient on positive output gap for developing countries, which is positive and above unity, points to a more-than proportionate procyclical government expenditure during good times. The coefficients on lagged government expenditure and lagged government debt

are negative and significant for developing countries, which imply that fiscal policy in developing countries takes into account debt sustainability concerns.

The hypothesis that the reaction of government expenditures during good and bad times is symmetric ($\phi = 0$) can be rejected for the whole sample, advanced and developing countries. The asymmetry index (ϕ) for developing countries is found to be greater than for advanced countries, which implies that government expenditure tends to be more asymmetric in developing countries compared to advanced economies. The reason for this asymmetry seems to be the more-than proportionate increase in government expenditures in developing countries when the real GDP growth is above potential.

V. Robustness Checks

To assess the robustness of our estimation results, we proceed along three dimensions. First, we check the sensitivity of our definition of good and bad times by employing an alternative indicator of cyclical conditions. Second, we rerun our regressions using Arellano-Bond estimator (difference GMM) to check whether our estimation results are sensitive to an alternative dynamic panel data estimation methodology. Third, we re-estimate our baseline specification over different periods, namely before and after the 2008-09 global financial crisis to check if there have been salient changes in the cyclical behavior of government expenditures.

In the literature, a number of studies such as Kaminsky et al. (2004), Hercowitz and Strawczynski (2004) and Jaimovich and Panizza (2007) use measures of real GDP growth rates instead of output gaps as indicators of cyclical conditions. According to these indicators, good times are defined as positive and bad times as negative deviations from the trend (sample mean or median, which is calculated on a country-by-country basis) real GDP growth rates. Nevertheless, as argued by Forni and Momigliano (2004), indicators based on growth rates may not represent an adequate proxy for cyclical conditions since, during the business cycle, periods in which the output gap is positive or negative may not correspond to periods when the real output growth is above or below the trend real growth rate. Yet, it remains still an open question as to which measure determines the budgetary choices of policy-makers. Thus, indicators based on real GDP growth rates stand as potential candidates. In that vein, we rerun our benchmark regressions by replacing an indicator of business cycle based on real growth rates as a robustness check. In this exercise, deviations from the trend (sample mean) real GDP growth rates are used as cyclical indicator instead of the output gap variable.

Besides, good times are defined as periods when the real growth rate is above, and bad times are defined as periods when the real growth rate is below the trend real growth rates.¹⁰

Table 4 presents the cyclical properties of government expenditures with respect to the deviations from the trend real GDP growth rates as the business cycle indicator. The results appear to be quite similar to those reported in Table 2. The coefficients on the cyclical indicator are positive for the full sample and developing countries, but negative for advanced countries. Nevertheless, none of the coefficients tend to be statistically significant pointing to acyclicity of government expenditures with respect to business cycles. Moreover, the coefficients for lagged government expenditure and lagged government debt are negative and statistically significant for developing countries, which is indicative of a fiscal policy that takes into account the sustainability of government debt.

Table 4: Cyclicity of Total Government Expenditures (System GMM)

Dependent variable: Total government expenditures (g)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures ($t-1$)	-0.107 (0.090)	-0.090 (0.093)	0.150 (0.099)	0.168* (0.098)	-0.228*** (0.088)	-0.207** (0.083)
Deviations from real growth	0.156 (0.180)	0.216 (0.204)	-0.112 (0.124)	-0.077 (0.115)	0.216 (0.221)	0.167 (0.182)
Government debt ($t-1$)	-0.001*** (0.000)	-0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.002*** (0.000)	-0.001** (0.001)
Government size		0.003* (0.002)		0.003** (0.001)		0.007** (0.003)
Real GDP per capita		0.008 (0.007)		0.015*** (0.005)		0.005 (0.013)
Constant	0.098	-0.115 (0.128)	0.018 (0.017)	-0.267*** (0.099)	0.111*** (0.021)	-0.173 (0.253)
Number of observations	921	921	585	585	336	336
Number of instruments	125	127	125	127	87	89
Sargan test ^a	0.812	0.681	0.133	0.169	0.960	0.581
Autocorrelation ^b	0.283	0.377	0.642	0.904	0.140	0.119

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, p -values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, p -values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

Table 5 reports if government expenditures react asymmetrically during good and bad times, where good times are defined as the positive and bad times as the negative deviations of the real growth rates from the trend real GDP growth rates, respectively. The estimation results presented in Table 5 also point to asymmetric government spending in the whole sample, and in advanced and developing countries. In accordance with the estimation results obtained by using output gap as the cyclical indicator, results reported in Table 5 show that government expenditures react countercyclically during bad times in advanced countries and

¹⁰ Real GDP growth rates are calculated as the changes in the logarithms of annual real GDP figures.

procyclically during good times in developing countries. Nevertheless, different from the results reported in Table 3, government expenditures in advanced countries seem to respond in a procyclical manner during good times.

As shown in Table 5, the coefficients on lagged government expenditure and lagged government debt are found to be negative and significant for developing countries. This result provides empirical support to our previous finding that developing countries, rather than advanced economies, tend to implement fiscal policy in a way that takes into account the sustainability of government finances.

Table 5: Cyclicity of Total Government Expenditures in Good and Bad Times (System GMM)

Dependent variable: Total government expenditures (g)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures ($t-1$)	-0.274*** (0.083)	-0.243*** (0.083)	-0.038 (0.084)	-0.022 (0.075)	-0.354*** (0.085)	-0.303*** (0.080)
Good times	1.170*** (0.293)	1.128*** (0.310)	0.859*** (0.189)	0.842*** (0.206)	1.119*** (0.374)	0.816** (0.355)
Bad times	-0.316** (0.127)	-0.232 (0.140)	-0.390*** (0.131)	-0.384*** (0.124)	-0.289** (0.143)	-0.126 (0.130)
Government debt ($t-1$)	-0.001** (0.000)	-0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001** (0.001)	-0.001*** (0.001)
Government size		0.001 (0.001)		0.000 (0.001)		0.004* (0.003)
Real GDP per capita		0.008 (0.006)		0.011** (0.005)		0.005 (0.012)
Constant	0.059** (0.024)	-0.053 (0.105)	-0.001 (0.020)	-0.148* (0.080)	0.074*** (0.023)	-0.101 (0.212)
Asymmetry index (ϕ)	1.486	1.360	1.249	1.226	1.408	0.942
Test $\phi = 0$ (p -value)	0.003	0.001	0.001	0.001	0.014	0.098
Number of observations	921	921	585	585	336	336
Number of instruments	127	129	127	129	89	91
Sargan test ^a	0.898	0.782	0.147	0.167	0.976	0.683
Autocorrelation ^b	0.191	0.278	0.333	0.538	0.097	0.096

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, p -values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, p -values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

The results presented in Table 5 suggest that the hypothesis that the reaction of government expenditures during good and bad times is symmetric ($\phi = 0$) can be rejected for all country groupings. As shown in columns denoted by (1), developing countries seem to have a higher asymmetry index (ϕ) for government expenditures than advanced countries, where government expenditures in developing countries increase more-than proportionately when the real growth is above the trend real GDP growth rate. Estimation results with control variables, as shown in columns denoted by (2), nevertheless, indicated that the asymmetry index for advanced countries is higher than the one for developing economies.

As the second step of our robustness analysis, we check the sensitivity of our estimation results by using an alternative dynamic panel data estimation technic, namely one-step difference GMM (Arellano-Bond estimator) methodology. Results from this methodology are presented in Tables C.1 and C.2 in appendix C, and to a large extent, they seem to be in conformity with the results that we obtained from our benchmark estimation methodology. As shown in Table C.1, estimation results with control variables reveal that government expenditures in developing countries tend to be strongly procyclical. Moreover, statistically significant and negative coefficients on lagged government expenditure and lagged government debt for developing countries indicate that fiscal policy in developing countries is implemented in a way that takes into account the debt sustainability issues.

Results presented in Table C.2 point to the existence of asymmetric government expenditures for all country groupings. Estimation results without control variables indicate that government expenditures are procyclical in the whole sample and in developing countries, while acyclical in advanced countries during good times. During bad times, nevertheless, all country groupings tend to exhibit countercyclical government expenditures. Results with control variables point to acyclical government spending in advanced countries, but a quite strong procyclical government spending in developing countries during good times.

The hypothesis that the reaction of government expenditures during good and bad times is symmetric ($\phi = 0$) can be rejected for all country groupings according to the results presented in Table C.2. Estimation results without control variables, as shown in columns denoted by (1) suggest that the asymmetry index (ϕ) for government expenditures is higher for developing countries than for advanced countries. Furthermore, government spending tends to increase more-than proportionately in developing countries when the real GDP growth rate is above potential.

In the third step of our robustness checks, we try to examine whether there have been significant changes in the cyclical behavior of government expenditures before and after the 2008-09 global financial crisis. In the aftermath of the global financial crisis, substantial fiscal stimulus packages have been enacted in a large number of countries, particularly in some industrialized countries, to cope with the widespread economic downturn, which in turn raised the cost of fiscal interventions to unprecedented levels. Nevertheless, the subsequent destabilizing fiscal burden led many countries to reverse the course of expansionary fiscal policy and consolidate their fiscal balances. As regards changes in the fiscal policy cyclicity over time, Frankel et al. (2013) argue that nearly one third of the developing world has been able to escape from procyclical fiscal policies and become more countercyclical over the last decade. In contrast to the findings of Frankel et al. (2013), McManus and Özkan (2015)

provide evidence that the average procyclicality statistics has increased from one decade to the next, suggesting that countries are becoming more procyclical over time.

To test whether the cyclical behavior of government expenditure in advanced and developing countries has changed before and after the onset of the global financial crisis in 2008, we re-estimate our baseline specification with the system GMM methodology by splitting our whole sample period into two sub-samples: 1981-2008 and 2009-2014. The estimation results for the sub-sample 1981-2008 are presented in Tables D.1 and D.2 in appendix D, and the results for the sub-sample 2009-2014 are shown in Tables E.1 and E.2 in appendix E. A comparison of the estimation results concerning the two sub-periods reveals that procyclicality of government expenditures tend to increase in developing countries in the aftermath of the global financial crisis, while there seems to exist no marked changes in the cyclical behavior of government expenditures in advanced countries. Moreover, the findings suggest that government expenditures in developing countries tend to react in a more procyclical manner during good times in the 2009-2014 period with respect to both 1981-2008 and the whole sample periods. Likewise, procyclicality in government expenditures in advanced countries during good times seems to strengthen in the aftermath of the global financial crisis. Therefore, our findings appear to be in conformity with those of McManus and Özkan (2015), who suggest that procyclicality has been on the increase over time.

Overall, robustness analysis suggest that the empirical results that are obtained from the baseline reaction functions remain broadly robust to alternative definitions of business cycle indicators, to an alternative use of dynamic panel data estimation methodology and estimation over the periods before and after the global financial crisis.

VI. Concluding Remarks

This paper studied the cyclical behavior of government expenditures in a comparatively large sample of advanced and developing countries using an unbalanced panel data set covering the period 1981-2014. It finds that government expenditures tend to be procyclical in developing countries but acyclical in advanced economies. This study tries to contribute to the existing literature by introducing an index of asymmetric government expenditure separately for advanced and developing countries. Empirical findings suggest significant evidence of asymmetric government spending across advanced and developing countries. Government expenditures are found to react in a countercyclical manner during bad times but in an acyclical manner during good times in advanced countries. On the other hand, in developing countries government expenditures appear to behave procyclically during good times but acyclically during bad times. It is also found in the study that the asymmetry index for

developing countries is larger than the one for advanced countries, which implies that government expenditures tend to be more asymmetric in developing countries than in advanced economies. This result mainly owes to the more-than proportionate increase in government spending in developing countries when the economy is operating above potential real growth rate.

The more-than proportionate procyclicality of government expenditures in developing countries during good times suggest that governments in developing countries have a tendency to spend away additional revenues during expansions. On the other hand, governments in advanced countries seem to increase expenditures during recessions, suggesting the active role of government spending in stabilizing advanced economies during bad times. This behavior of government spending in advanced economies likely reflects the significant automatic stabilizers at work through the extensive social security systems in advanced economies, giving an insurance role to government spending against macroeconomic volatility.

The empirical results also suggest that the fiscal policy response to the level of government debt is stronger in developing countries than in advanced economies. This finding indicates that governments in developing countries tend to implement fiscal policy in a way to ensure the sustainability of government finances. This feature of the fiscal policy in developing countries appears to emerge mainly as a consequence of the concerns about the sustainability of government debt. Lenders can easily get concerned about the fiscal solvency in developing countries when the government spending surges and budget deficits widen. Therefore, the tight resource constraints, as also argued in the literature (e.g. Gavin and Perotti (1997), Riascos and Végh (2003) and Kaminsky et al. (2004)) appears to be an important factor that urges governments in developing countries to cut spending during recessions and increase expenditures strongly, even more-than proportionately as our findings suggest, during expansions when the revenues abound and the capability to get funding from international markets improves.

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Appendix A: Country Sampling

Table A.1: List of Advanced and Developing Countries in the Sample

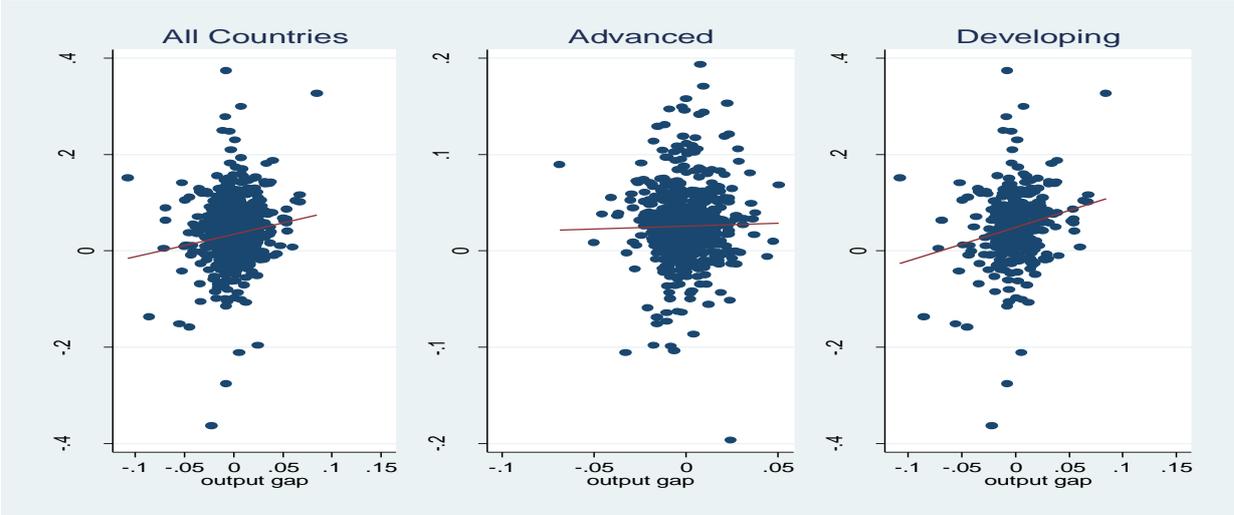
Advanced Countries (22)	Developing Countries (20)
Australia	Argentina
Austria	Brazil
Belgium	Bulgaria
Canada	Chile
Czech rep	China
Denmark	Colombia
Finland	Hungary
France	India
Germany	Indonesia
Ireland	Malaysia
Italy	Mexico
Japan	Peru
Korea	Philippines
Netherlands	Poland
New Zealand	Romania
Norway	Russia
Portugal	South Africa
Spain	Thailand
Sweden	Turkey
Switzerland	Ukraine
United kingdom	
United states	

Notes:

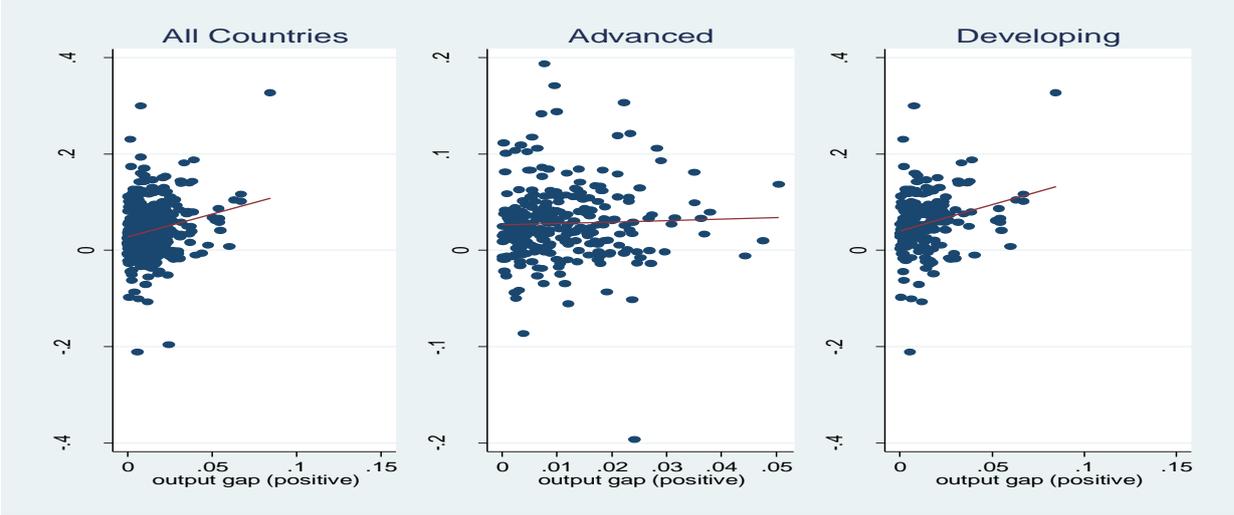
1. Country classification is based on IMF's Fiscal Monitor (September, 2015) economy groupings of "advanced" and "emerging market and middle-income" economies.
2. The grouping of developing countries in this study comprise emerging market economies.
3. Greece is excluded from the sampling due to its economic and financial crisis.

Appendix B: Scatter Plot Graphics

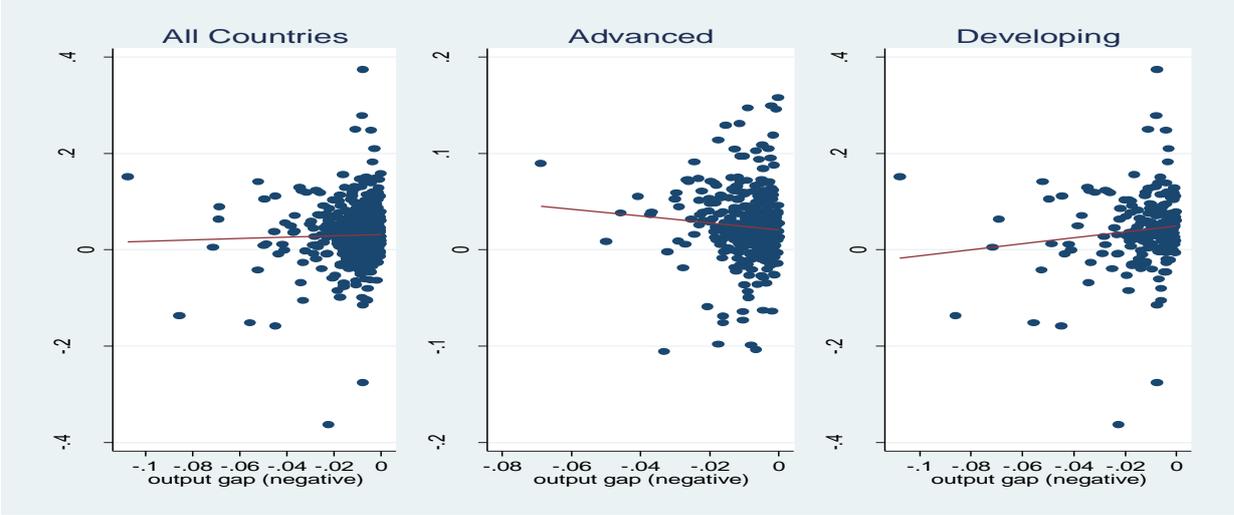
Graphic B.1: *Government Expenditure and Output Gap*



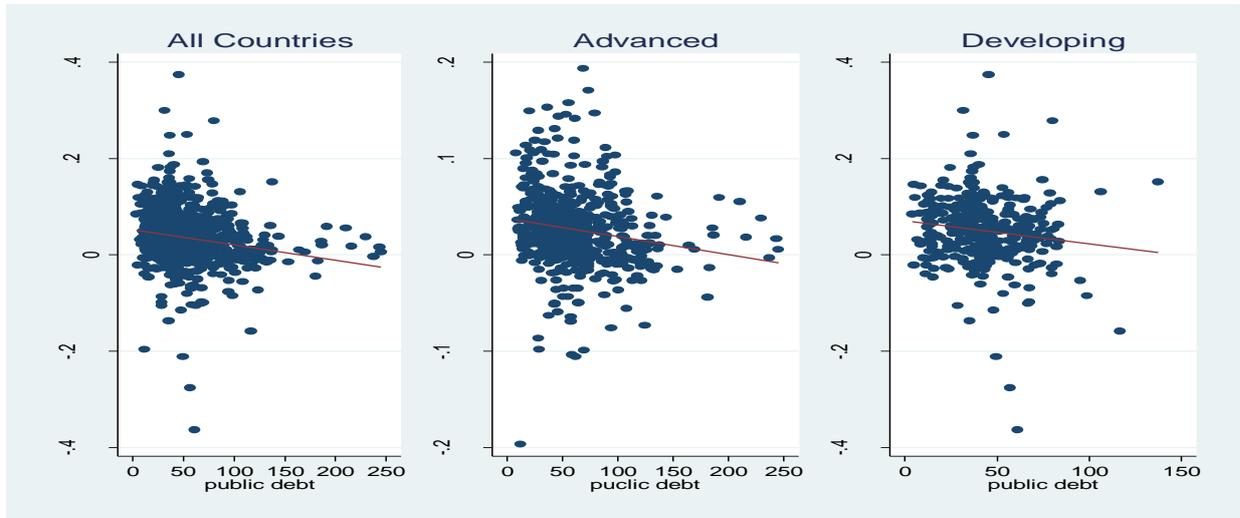
Graphic B.2: *Government Expenditure and Positive Output Gap*



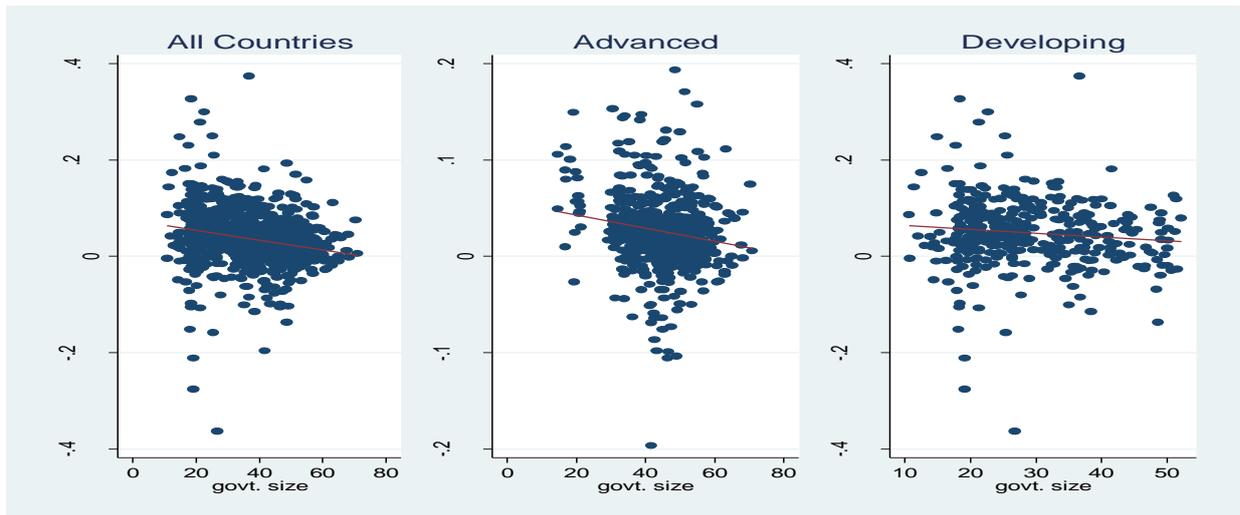
Graphic B.3: *Government Expenditure and Negative Output Gap*



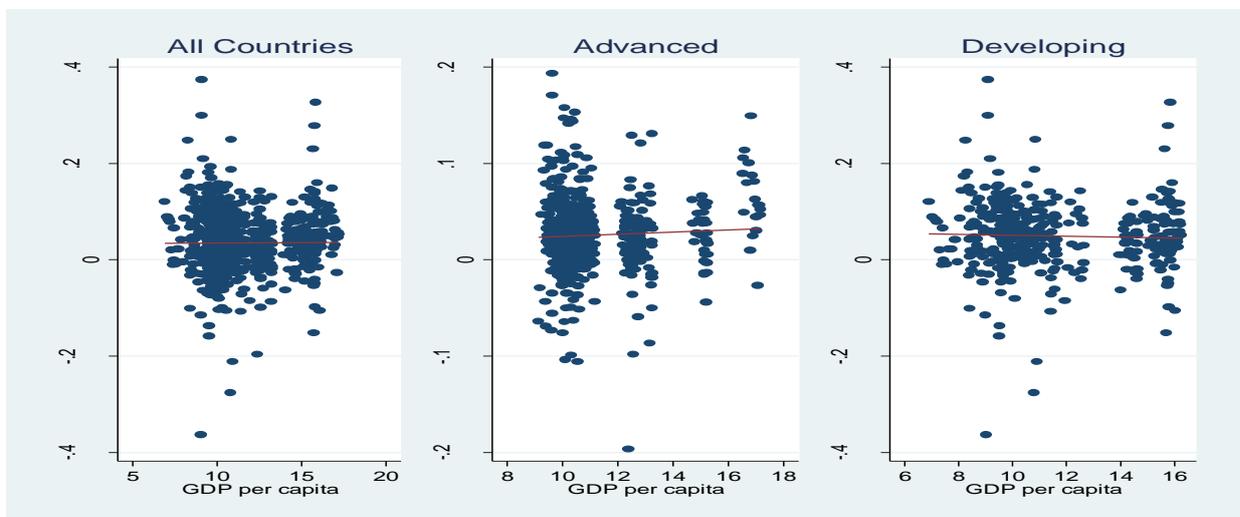
Graphic B.4: *Government Expenditure and Public Debt*



Graphic B.5: *Government Expenditure and Positive Government Size*



Graphic B.6: *Government Expenditure and Negative GDP per Capita*



Appendix C: Robustness Check by Using Difference GMM Methodology

Table C.1: Cyclicity of Total Government Expenditures (Diff-GMM)

Dependent variable: Total government expenditures (<i>g</i>)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures (<i>t-1</i>)	-0.093 (0.078)	-0.042 (0.082)	0.120 (0.110)	0.182 (0.126)	-0.215*** (0.076)	-0.165** (0.077)
Output gap	0.243 (0.224)	0.880*** (0.287)	0.070 (0.210)	0.216 (0.229)	0.314 (0.294)	1.715*** (0.287)
Government debt (<i>t-1</i>)	-0.001** (0.001)	-0.001*** (0.000)	-0.001** (0.000)	-0.001* (0.001)	-0.002*** (0.000)	-0.001*** (0.000)
Government size		0.020*** (0.006)		0.009** (0.005)		0.041*** (0.004)
Real GDP per capita		0.016 (0.091)		0.203** (0.096)		-0.248 (0.157)
Constant	0.106*** (0.036)	-0.870 (0.959)	0.083** (0.034)	-2.640** (1.239)	0.129*** (0.023)	1.679 (1.747)
Number of observations	879	879	563	563	316	316
Number of instruments	93	95	93	95	64	66
Sargan test ^a	0.348	0.211	0.952	0.984	0.723	0.739
Autocorrelation ^b	0.292	0.816	0.546	0.754	0.155	0.408

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, *p*-values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, *p*-values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

Table C.2: Cyclicity of Total Government Expenditures in Good and Bad Times (Diff-GMM)

Dependent variable: Total government expenditures (<i>g</i>)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures (<i>t-1</i>)	-0.361*** (0.060)	-0.327*** (0.054)	-0.166** (0.083)	-0.159** (0.075)	-0.419*** (0.061)	-0.375*** (0.047)
Good times	1.218*** (0.386)	1.710*** (0.373)	0.472 (0.579)	0.796 (0.590)	1.210** (0.254)	1.912*** (0.276)
Bad times	-0.763*** (0.250)	0.354 (0.369)	-0.541** (0.228)	0.070 (0.205)	-0.802** (0.397)	1.187** (0.513)
Government debt (<i>t-1</i>)	-0.001 (0.001)	-0.002*** (0.000)	-0.001 (0.000)	-0.001** (0.000)	-0.001*** (0.000)	-0.002*** (0.000)
Government size		0.010** (0.004)		0.002 (0.003)		0.028*** (0.004)
Real GDP per capita		-0.160*** (0.060)		-0.154*** (0.055)		-0.329*** (0.126)
Constant	0.044 (0.034)	1.557** (0.616)	0.042 (0.036)	1.756*** (0.657)	0.078*** (0.021)	3.062** (1.371)
Asymmetry index (ϕ)	1.982	1.356	1.013	0.726	2.011	0.725
Test $\phi = 0$ (<i>p</i> -value)	0.000	0.005	0.017	0.078	0.024	0.072
Number of observations	879	879	653	563	316	316
Number of instruments	95	97	95	97	66	68
Sargan test ^a	0.258	0.289	0.953	0.970	0.659	0.643
Autocorrelation ^b	0.245	0.721	0.520	0.776	0.126	0.382

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, *p*-values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, *p*-values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

Appendix D: Robustness Check Over the Period 1981-2008

Table D.1: Cyclicity of Total Government Expenditures (System GMM)

Dependent variable: Total government expenditures (<i>g</i>)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures (<i>t-1</i>)	-0.197*** (0.076)	-0.169** (0.083)	0.074 (0.107)	0.115 (0.098)	-0.300*** (0.066)	-0.290*** (0.063)
Output gap	0.409* (0.213)	0.613*** (0.238)	0.236 (0.275)	0.422 (0.341)	0.452** (0.254)	0.604*** (0.216)
Government debt (<i>t-1</i>)	-0.001*** (0.000)	-0.002*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001** (0.001)	-0.001* (0.001)
Government size		0.004 (0.002)		0.003 (0.002)		0.008** (0.004)
Real GDP per capita		0.005 (0.010)		0.012 (0.008)		0.001 (0.013)
Constant	0.130*** (0.027)	-0.049 (0.139)	0.067*** (0.019)	-0.207 (0.155)	0.099** (0.041)	-0.087 (0.230)
Number of observations	669	669	453	453	216	216
Number of instruments	106	108	106	108	68	70
Sargan test ^a	0.327	0.363	0.051	0.065	0.886	0.211
Autocorrelation ^b	0.239	0.320	0.700	0.933	0.176	0.123

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroscedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, *p*-values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, *p*-values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

Table D.2: Cyclicity of Total Government Expenditures in Good and Bad Times (System GMM)

Dependent variable: Total government expenditures (<i>g</i>)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures (<i>t-1</i>)	-0.333*** (0.066)	-0.286*** (0.073)	-0.118 (0.087)	-0.077 (0.079)	-0.390*** (0.062)	-0.353*** (0.062)
Good times	0.937** (0.478)	1.099** (0.474)	0.457 (0.651)	0.322 (0.644)	0.806** (0.380)	0.886** (0.461)
Bad times	0.090 (0.416)	0.298 (0.504)	0.074 (0.227)	0.292 (0.255)	-0.086 (0.578)	0.210 (0.557)
Government debt (<i>t-1</i>)	-0.001* (0.000)	-0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.001 (0.001)	-0.001* (0.001)
Government size		0.002 (0.001)		0.000 (0.002)		0.007** (0.003)
Real GDP per capita		0.001 (0.009)		0.006 (0.007)		0.000 (0.012)
Constant	0.120*** (0.025)	0.061 (0.108)	0.070*** (0.022)	-0.001 (0.143)	0.082** (0.041)	-0.038 (0.202)
Asymmetry index (ϕ)	0.847	0.801	0.383	0.031	0.892	0.676
Test $\phi = 0$ (<i>p</i> -value)	0.082	0.097	0.114	0.043	0.173	0.115
Number of observations	669	669	453	453	216	216
Number of instruments	108	110	108	110	70	72
Sargan test ^a	0.671	0.458	0.074	0.050	0.881	0.202
Autocorrelation ^b	0.085	0.141	0.118	0.059	0.100	0.096

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, *p*-values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, *p*-values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

Appendix E: Robustness Check Over the Period 2009-2014

Table E.1: Cyclicity of Total Government Expenditures (System GMM)

Dependent variable: Total government expenditures (<i>g</i>)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures (<i>t-1</i>)	0.181 (0.114)	0.192 (0.122)	0.238 (0.151)	0.219 (0.176)	0.093 (0.149)	0.116 (0.151)
Output gap	0.374* (0.217)	0.536** (0.236)	-0.218 (0.152)	-0.070 (0.233)	0.707*** (0.230)	0.849*** (0.232)
Government debt (<i>t-1</i>)	-0.001* (0.000)	-0.001 (0.001)	0.000 (0.000)	0.000 (0.001)	-0.002 (0.001)	-0.003** (0.002)
Government size		0.005* (0.003)		0.002* (0.001)		0.007* (0.004)
Real GDP per capita		0.009 (0.015)		0.023*** (0.005)		0.008 (0.026)
Constant	0.066** (0.026)	-0.195 (0.214)	0.011 (0.037)	-0.356*** (0.109)	0.125** (0.054)	-0.168 (0.339)
Number of observations	252	252	132	132	120	120
Number of instruments	22	24	22	24	22	24
Sargan test ^a	0.109	0.287	0.319	0.573	0.375	0.470
Autocorrelation ^b	0.765	0.634	0.120	0.134	0.674	0.542

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroscedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, *p*-values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, *p*-values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

Table E.2: Cyclicity of Total Government Expenditures in Good and Bad Times (System GMM)

Dependent variable: Total government expenditures (<i>g</i>)						
	All countries		Advanced countries		Developing countries	
	(1)	(2)	(1)	(2)	(1)	(2)
Total govt. expenditures (<i>t-1</i>)	-0.087 (0.104)	-0.084 (0.102)	0.027 (0.158)	0.003 (0.166)	-0.153 (0.133)	-0.115 (0.126)
Good times	2.395*** (0.423)	2.368*** (0.400)	1.428** (0.674)	1.651** (0.787)	2.710*** (0.389)	2.567*** (0.384)
Bad times	-1.193*** (0.439)	-1.112*** (0.537)	-1.369*** (0.424)	-1.326*** (0.492)	-0.975* (0.574)	-0.735 (0.617)
Government debt (<i>t-1</i>)	0.000 (0.000)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Government size		0.000 (0.003)		0.002 (0.001)		0.002 (0.003)
Real GDP per capita		0.009 (0.013)		0.024*** (0.007)		0.006 (0.021)
Constant	0.026 (0.028)	-0.089 (0.203)	-0.004 (0.049)	-0.348*** (0.117)	0.064 (0.044)	-0.060 (0.295)
Asymmetry index (ϕ)	3.588	3.480	2.797	2.977	3.684	3.302
Test $\phi = 0$ (<i>p</i> -value)	0.000	0.000	0.007	0.011	0.000	0.000
Number of observations	252	252	132	132	120	120
Number of instruments	24	26	24	26	24	26
Sargan test ^a	0.101	0.188	0.550	0.483	0.486	0.482
Autocorrelation ^b	0.132	0.128	0.108	0.123	0.393	0.515

Notes: ***, ** and * denote statistical significance at 1, 5 and 10 percent, respectively. Robust standard errors in parentheses, consistent to heteroskedasticity and arbitrary patterns of autocorrelation within individuals. All regressions include time period dummies.

^a Overidentifying restrictions test, *p*-values. Sargan tests point to the joint validity of the instruments.

^b Residuals' second-order autocorrelation test, *p*-values. Arellano-Bond test for autocorrelation indicate no second order autocorrelation of the residuals.

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