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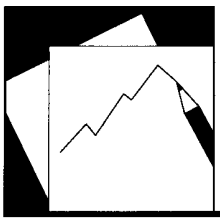

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Deep Roots of Fiscal Behavior

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Deep Roots of Fiscal Behavior

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Abstract

This paper investigates the determinants of fiscal policy behavior and its time-varying volatility, using panel data for a broad set of advanced and emerging market economies during the period 1990–2012. The empirical results show that discretionary fiscal policy is influenced by policy inertia, the level of public debt, and the output gap in both advanced and emerging market economies. In addition, the paper finds that macro-financial factors—such as real exchange rate, financial development, interest rates, asset prices, and natural resource rents—and demographic and institutional factors—such as the old-age dependency ratio, the quality of institutions, and policy anchors such as fiscal rules and IMF-supported stabilization programs—tend to have a significant effect on fiscal policy behavior. The results also indicate that higher government debt leads to more volatile fiscal behavior, while fiscal rules and higher institutional quality reduce the volatility of fiscal policy over time.

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I. INTRODUCTION

The 2008-09 economic crisis has led to an unprecedented erosion of fiscal positions in both advanced and emerging market economies. The average fiscal deficit in advanced economies rose from 1.1 percent of GDP in 2007 to 9 percent in 2009, while the increase was smaller but still sizable in emerging market economies, from a surplus of 1.3 percent to a deficit of 4.6 percent. Although budget deficits narrowed by 2012, fiscal vulnerabilities remain elevated, especially in advanced economies with gross public debt levels of 110 percent of GDP, on average, up from 74 percent in 2007. Furthermore, fiscal policy has become more volatile, with the standard deviation of the overall budget balance rising from an average of 0.9 between 2000 and 2007 to 1.7 after the crisis in advanced economies and from 1.0 to 1.2 in emerging markets, partly reflecting more volatile environment. Although these unusual developments have generally been blamed on fiscal stimulus packages, the severity of the economic downturn, and the bailout of financial institutions, the extent of the change in fiscal positions and the variation in policy responses call for an in-depth analysis of the underlying determinants of discretionary fiscal policy and its volatility over time.

An extensive literature on fiscal reaction functions links fiscal behavior to a host of macro-financial and institutional characteristics. Most empirical studies find that the fiscal policy stance tends to be procyclical, although theoretical considerations require neutral or countercyclical behavior. The literature has identified a link between cross-country divergence in discretionary fiscal policy and a wide range of macro-financial and demographic characteristics and institutional and political features. There is also empirical evidence suggesting that fiscal rules and external anchors, such as an International Monetary Fund (IMF)-supported economic stabilization programs, tend to influence fiscal behavior. Even though empirical findings are broadly consistent, most of the literature focus on advanced economies and cover the period prior to the 2008-09 economic crisis. These studies also tend to rely on unbalanced panels and do not deal with econometric complications associated with endogenous regressors and country-specific heterogeneity.

This paper empirically investigates the main determinants of discretionary fiscal policy and its volatility in advanced and emerging market economies. First, differently from previous studies, this paper estimates fiscal reaction functions for a large panel of advanced and emerging market economies, using the cyclically adjusted primary budget balance as a measure of discretionary fiscal policy and focusing on possible differences between the two groups of countries.[1] Second, this paper studies a wide range of economic, financial, demographic and institutional variables as potential determinants over two decades including

[1] Although there are some caveats in estimation, the cyclically adjusted primary balance helps minimize the simultaneity bias that may arise as policy decisions and growth interact. For a criticism of the cyclically adjusted primary budget balance as an approximation of discretionary fiscal policy, see Mélitz (2000), Alberola, Mínguez, De Cos, and Marqués (2003), Larch and Salto (2005), and Riera-Crichton, Végh, and Vuletin (2012).

the aftermath of the 2008-09 crisis. Third, as the crisis has shown, macroeconomic volatility can have larger impact than previously expected, and therefore this paper estimates the determinants of time-varying volatility of discretionary fiscal policy, as measured by the standard deviation of the cyclically adjusted primary balance. Fourth, we adopt a dynamic panel estimation approach based on the Generalized Method of Moments (GMM) that corrects for biases associated with endogenous regressors and unobserved country-specific heterogeneity. Finally, this paper relies on a balanced panel that yields more robust estimations than unbalanced panels widely used in the literature.[2]

The empirical results suggest that discretionary fiscal policy is influenced by a range of macro-financial and institutional factors. In line with the literature, the results show that discretionary fiscal policy exhibits a high degree of inertia and responds to the level of public debt and the output gap in both advanced and emerging market economies. In addition, we find that macro-financial factors—such as real exchange rate, financial development, interest rates, asset prices, and natural resource rents—and demographic and institutional factors—such as the old-age dependency ratio, the quality of institutions, and policy anchors such as fiscal rules and IMF-supported stabilization programs—tend to have a significant influence fiscal behavior. The results indicate that these factors tend to influence discretionary fiscal policy differently in advanced and emerging market economies and that policy inertia is significantly greater in the post-crisis period. We also find strong evidence that fiscal policy behavior after the recent crisis has turned even more procyclical and become less responsive to the government's intertemporal budget constraint and, therefore, long-run fiscal solvency concerns. Finally, we show that higher government debt leads to more volatile policy behavior, while fiscal rules and higher institutional quality reduce fiscal volatility.

The remainder of this paper is organized as follows. Section II provides a brief overview of the literature, followed by a summary of panel data sources in Section III. Sections IV and V describe our empirical strategy and the estimation results, respectively. Robustness checks are presented in Section VI, while Sections VII offers some concluding remarks.

II. THEORETICAL AND EMPIRICAL BACKGROUND

Fiscal policy tends to be procyclical, as opposed to theoretical considerations calling for neutral or countercyclical behavior. The tax-smoothing model with perfect foresight proposed by Barro (1979) and Lucas and Stokey (1983) argues that fiscal policy is determined by the government's need to smooth distortions associated with taxation. Accordingly, revenue and spending shocks should be absorbed by budget deficits during economic recessions and by surpluses in times of economic expansion. From an empirical

[2] Balanced panels provide equal heterogeneity conditional distribution, avoid the initial value problem with observations entering at the same time points, and produce consistent estimates.

point of view, however, the tax-smoothing theory cannot explain the persistence of budget deficits, and why countries facing similar economic shocks experience in reality different fiscal policy paths. Many empirical studies find that the fiscal policy stance tends to be procyclical, contrary to theoretical considerations that call for neutral or countercyclical behavior.[3] However, most the existing literature does not use a cyclically-adjusted measure of the fiscal policy stance and tend to rely on unbalanced panels with a focus on some variables of particular interest.

The empirical literature has identified a link between cross-country divergence in fiscal behavior and a range of macro-financial and demographic characteristics. Easterly and Rebelo (1993) found evidence that the budget balance is mainly correlated with economic growth, as well as with the level of per capita income, leading to diverging fiscal trends between countries at different stages of development. Several studies have focused on the impact of interest rates in modeling fiscal policy behavior (Baldacci et al., 2011 and Kiley, 2012), while others have identified trade openness, financial development and natural resource rents as important factors in determining fiscal policy behavior (Alesina and Perotti, 1995). The fiscal consequences of financial crises are also considered to have a significant effect on discretionary policy decisions (Schaechter et al, 2012). Demographic characteristics also appear to influence fiscal policy behavior (Woo, 2003, 2009).

Political institutions appear to play a role in determining the extent and persistence of fiscal imbalances. Building on the theory of political business cycles, Roubini and Sachs (1989) showed that government fragmentation tends to result in large and persistent budget deficits and excessive fiscal policy reactions in response to economic shocks. Other empirical studies have confirmed this relationship between fiscal performance and a wide range of institutional and political factors, including budget institutions and procedures, type of political regime, government structure, ideological orientation, electoral cycles, the quality of institutions, and corruption, among others, in samples of advanced and developing countries.[4] Some papers also find that fiscal rules and external anchors, such as an IMF-supported program, tend to have a positive effect on fiscal policy behavior (see, for example, Celasun, Debrun, and Ostry, 2006; Debrun et al., 2008; Poplawski-Ribeiro, 2009; Ghosh et al., 2013).

An important aspect of fiscal policy behavior is its time-varying volatility, which may have significant macro-financial implications. Although it has received less attention in the literature, excessive volatility in fiscal policy can undermine fiscal sustainability and lead to macro-financial distortions. Ramey and Ramey (1995) presented evidence that government

[3] See, for example, Gavin and Perotti, 1997; Bohn, 1998; Talvi and Végh, 2000; Favero, 2002; Galí and Perotti, 2003; Lane, 2003; Balassone and Francese, 2004; Kaminsky, Reinhart, and Végh, 2004; Alesina and Tabellini, 2005; Annett, 2006; Wyplosz, 2006; Debrun and Kumar, 2007; Ilzetzki, Mendoza and Végh, 2010.

[4] Eslava (2011) provides a recent overview of the literature on the political economy of fiscal policy.

spending volatility has a negative effect on real GDP per capita growth. Looking at the underlying determinants, Furceri and Poplawski-Riberio (2008) found that smaller countries tend to have more volatile government spending, while Agnello and Sousa (2009) observed significant linkages between deficit volatility and the level of economic development, political instability, and inflation, especially in countries with more trade openness. From a macro-fiscal point of view, Fatás and Mihov (2003) showed that numerical fiscal rules tend to lead to a lower degree of volatility in fiscal policy implementation.

This paper contributes to the empirical literature on the determinants of fiscal reaction functions in four ways. First, differently from most of the existing literature, we use the cyclically adjusted primary budget balance as a measure of discretionary fiscal policy in a balanced panel of advanced and emerging market economies over two decades including the aftermath of the 2008-09 crisis. Second, we include a comprehensive set of economic, financial, demographic and institutional variables as potential determinants of fiscal policy behavior. Third, we augment the analysis of fiscal behavior by estimating the determinants of time-varying volatility of discretionary fiscal policy, as proxied by the standard deviation of the cyclically adjusted primary balance. Fourth, we adopt a dynamic panel estimation approach that corrects for biases associated with endogenous regressors and unobserved country-specific heterogeneity.

III. DATA

We construct a panel dataset covering the period 1990–2012 and consisting of 49 advanced and emerging market economies.[5] The panel includes 24 advanced and 25 emerging market economies (Table A1). While the focus is on two groups of countries, we do not explore differences across regions or the influence of regional factors on fiscal policy. The dependent variable—the cyclically adjusted primary budget balance—is based on the IMF's *Public Finances in Modern History* database, assembled from historical sources by Mauro et al. (2013).[6] We measure the volatility of fiscal policy behavior as the standard deviation of the cyclically adjusted primary budget balance over two years, and estimate the output gap for each country by applying the Hodrick-Prescott (HP) filter to decompose real GDP into trend and cyclical components (Hodrick and Prescott, 1997). We test for the stationarity of the variables by applying the Im-Pesaran-Shin and Fisher-type unit root tests

[5] A detailed description of data sources is presented in the Data Appendix.

[6] The source database covers an unbalanced panel of 55 countries (24 advanced and 31 emerging market economies) over the period 1800–2012 (http://www.imf.org/external/np/fad/histdb/index.htm). (http://www.imf.org/external/np/fad/histdb/index.htm). This paper uses a balanced panel of 49 countries, excluding Bulgaria, Haiti, Iran, Nicaragua, Romania, and Russia from the original database due to missing observations.

for dynamic heterogonous panels.[7] The results, presented in Appendix Table A4, indicate significant test statistics to reject the presence of a unit root in the panel dataset. Additionally, we conduct a test for slope homogeneity using a bootstrapped Hausman test of poolability across advanced and developing countries, and find that the slope coefficients of country groups are similar so that poolability cannot be rejected.[8]

IV. Empirical Model and Strategy

Following the existing literature, we model fiscal reaction functions using a range of potential determinants. We build on the model-based fiscal sustainability approach developed by Bohn (1998) and expanded by Fatás and Mihov (2003), Galí and Perotti (2003), and Alesina and Tabellini (2008). In our dynamic panel context, the estimated equation takes the following form:

$$(1) \quad \mathrm{CAPB}_{i,t} = \lambda_i + \theta \mathrm{CAPB}_{i,t-1} + \mu \mathrm{GD}_{i,t-1} + \rho \mathrm{OG}_{i,t-1} + \beta X_{i,t} + \gamma Z_{i,t} + \varepsilon_{i,t}$$

where $\mathrm{CAPB}_{i,t}$ is the cyclically adjusted primary budget balance scaled by potential GDP in country *i* at time *t*, λ_i is a country-specific intercept (fixed effect) accounting for heterogeneity, $\mathrm{CAPB}_{i,t-1}$is the lagged cyclically adjusted primary balance, $\mathrm{GD}_{i,t-1}$ is gross government debt as a share of GDP in country *i* at time *t*-1,[9] $\mathrm{OG}_{i,t-1}$ is the lagged output gap,[10] $X_{i,t}$ represents a vector of macro-financial variables for country *i* at time *t*, including real GDP per capita, consumer price inflation, interest rates, real exchange rate, domestic credit, stock market capitalization, residential property prices, natural resource rents, and trade openness. $Z_{i,t}$ denotes a matrix of demographic, institutional, and political variables, including population, old-age dependency ratio, a composite index of political regime type, measures of government fragmentation, bureaucratic quality, and corruption, and binary variables for crisis episodes, elections, fiscal rules and IMF programs. $\varepsilon_{i,t}$ is the error term.

[7] Descriptive statistics for all variables are presented in Appendix Table A3. In Appendix Table A4, we report results from the Im-Pesaran-Shin (2003) test and Fisher-type tests using ADF and PP tests for unbalanced panels. The Im-Pesaran-Shin test has good small sample performance, while the Fisher-type test uses *p*-values obtained by Monte Carlo simulations from unit root tests for each cross-section. Unlike the Im-Pesaran-Shin test, the Fisher-type tests do not require a balanced panel.

[8] Conventional tests for slope homogeneity—such as a Chow test and the Roy-Zellner Wald-type χ^2—are less accurate and tend to reject poolability too often even when is true. Bun (2004) tests poolability on dynamic regressions and finds that the classical asymptotic tests tend to over-reject poolability, while bootstrap method tests are more accurate (see also Baltagi, 2008 and Di Iorio and Fachin, 2012).

[9] We also test the square and cubic function of government debt with the aim of capturing nonlinear effects of debt accumulation beyond a certain threshold, but find it to be an insignificant factor in the regressions.

[10] Some studies include the output gap at time *t* as a regressor, but we prefer the lagged output gap, as policymakers may react to past conditions. Moreover, there could be measurement errors in real time, which in turn suggests that data and forecast revisions influence fiscal policy behavior (Beetsma and Giuliodori, 2008).

We also estimate the determinants of fiscal policy volatility, as measured by the standard deviation of the cyclically adjusted primary budget balance. Using the above-outlined model, we estimate the equation for the volatility of fiscal reaction functions in the following form:

$$(2)\ V\_\mathrm{CAPB}_{i,t} = \lambda_i + \theta V\_\mathrm{CAPB}_{i,t-1} + \mu \mathrm{GD}_{i,t-1} + \rho \mathrm{OG}_{i,t-1} + \beta Y_{i,t} + \gamma Z_{i,t} + \varepsilon_{i,t}$$

where $V\_\mathrm{CAPB}_{i,t}$ is the standard deviation of the cyclically adjusted primary balance in country *i* at time *t,* $V_\mathrm{CAPB}_{i,t-1}$is the lagged standard deviation of the cyclically adjusted primary balance, $\mathrm{GD}_{i,t-1}$ is gross government debt as a share of GDP in country *i* at time *t-1*, $\mathrm{OG}_{i,t-1}$ is the lagged output gap, $Y_{i,t}$ represents a vector of economic and financial variables for country *i* at time *t*, including real GDP per capita, the standard deviation of real GDP growth, the level and standard deviation of inflation, the level and standard deviation of interest rates, the level and standard deviation of real exchange rate, domestic credit, the level and standard deviation of stock market capitalization, the level and standard deviation of residential property prices, natural resource rents, and trade openness. $Z_{i,t}$ denotes the same set of demographic, institutional, and political variables as defined in Equation 1.

We estimate these models using the system GMM estimator, which corrects for biases associated with endogenous regressors and country-specific heterogeneity. Econometric complications may emerge using the standard estimators, such as the pooled ordinary least squares (OLS) method, because the lagged dependent variable is correlated with the error term, even if we assume that the disturbances are themselves not autocorrelated. One possible solution is the system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), which corrects for potential biases associated with endogenous regressors and the persistence of the dependent variable. Although the two-step system GMM estimator is superior in estimating regression models with instrumental variables, it is less reliable in small samples and systematically underestimates the real standard deviation of the estimates compared to the one-step system GMM estimator (Blundell, Bond, and Windmeijer, 2000). Therefore, we prefer the one-step approach in our benchmark estimations and present empirical findings based on the two-step estimator as a robustness check.[11]

V. Interpreting Empirical Results

We present empirical findings based on a standard model of fiscal sustainability applying alternative estimation techniques. The empirical findings on the determinants of fiscal reaction functions and volatility of fiscal policy are discussed below in Section A and

[11] With the two-step system GMM model, we test the robustness to the reduction of instruments by collapsing the instrument set as suggested by Roodman (2009) and implementing a small sample correction procedure recommended by Windmeijer (2005).

B, respectively. We estimate a standard model of fiscal sustainability—relating the cyclically adjusted primary budget balance to its lagged value, lagged government debt, and the lagged output gap—and present the complete set of the results in Table 1.[12] In Tables 2–4, we present our findings based on the system GMM estimation methodology and using a list of potential determinants of fiscal reaction functions.[13] Using a balanced panel, we present two different versions of our benchmark specifications estimated with the one-step system GMM approach in the first and second columns of Tables 2–4 and with the two-step system GMM estimator in the sixth and seventh columns. In Table 5, we present the estimation results for the determinants of fiscal policy volatility, following the same multivariate panel regression approach using one- and two-step system GMM estimators.

A. Determinants of Fiscal Policy Behavior

Discretionary fiscal policy has a considerable degree of persistence both in advanced and emerging market economies. The lagged cyclically adjusted primary budget balance has a positive and statistically significant coefficient across all specifications of the model, as presented in Tables 1 and 2. The extent of policy inertia is also evident when we estimate fiscal reaction functions separately for advanced and emerging market economies during the period 1990–2012, as presented in Table 3 and Table 4, respectively. Although there are small differences between group coefficients relative to their standard errors, the lagged cyclically adjusted primary budget balance appears to have a greater effect on fiscal policy behavior in advanced economies (0.8–0.9) than in emerging market economies (0.6–0.7).

The fiscal policy stance takes into account the government's intertemporal budget constraint and, therefore, long-run solvency concerns. According to Bohn (1998), the coefficient of the debt variable in the model of fiscal reaction functions must be greater than zero to ensure the sustainability of government finances. As predicted by the theoretical model, we find that the coefficient on public debt is positive and statistically significant in most specifications. This positive response of the cyclically adjusted primary budget balance to a higher stock of public debt is a robust indication of a pattern of fiscal policy behavior that takes into account the government's intertemporal budget constraint and, therefore, long-run fiscal solvency concerns. Furthermore, we observe a similar pattern of behavior when we estimate fiscal reaction functions separately for advanced and emerging market economies, although the fiscal policy response to the level of public debt is stronger in advanced economies than in emerging market economies.

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[12] Reduced-form fiscal reaction functions are estimated using Generalized Least Squares (GLS) and one- and two-step system GMM estimators.

[13] All specifications are based on a balanced panel, with the exception of specifications in the third and fifth columns of Tables 2–4. Our panel becomes unbalanced only when we include long-term bond yields and residential property prices, which are not significant factors in both columns.

Table 1. Fiscal Reaction Functions

Dependent variable: Cyclically adjusted primary budget balance (CAPB)

Panel Specification [4]	All Countries						Advanced						Developing					
	GLS [1]	GLS [1]	SYS GMM [2]	SYS GMM [2]	2S-SYS GMM [3]	2S-SYS GMM [3]	GLS [1]	GLS [1]	SYS GMM [2]	SYS GMM [2]	2S-SYS GMM [3]	2S-SYS GMM [3]	GLS [1]	GLS [1]	SYS GMM [2]	SYS GMM [2]	2S-SYS GMM [3]	2S-SYS GMM [3]
Lagged CAPB	**0.77*** **	**0.77*** **	**0.82*** **	**0.83*** **	**0.81*** **	**0.78*** **	**0.83*** **	**0.81*** **	**0.91*** **	**0.90*** **	**0.86*** **	**0.90*** **	**0.66*** **	**0.68*** **	**0.67*** **	**0.68*** **	**0.63*** **	**0.68*** **
	(0.02)	(0.02)	(0.05)	(0.05)	(0.07)	(0.06)	(0.02)	(0.02)	(0.04)	(0.04)	(0.09)	(0.10)	(0.03)	(0.03)	(0.08)	(0.09)	(0.08)	(0.10)
Lagged debt	**0.01*** **	**0.01*** **	**0.01** **	**0.01** **	0.01	-0.01	**0.01*** **	**0.01*** **	**0.01***	**0.01*** **	0.01	0.01	**0.01*** **	**0.01*** **	0.01	0.01	**0.03***	0.02
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.02)
Output gap		**-0.07*** **		**-0.09** **		-0.06		-0.03		-0.06		-0.02		**-0.08*** **		**-0.11** **		-0.06
		(0.02)		(0.04)		(0.04)		(0.03)		(0.05)		(0.05)		(0.02)		(0.04)		(0.06)
Lagged output gap	**-0.11*** **		**-0.16*** **		0.01		**-0.12*** **		**-0.26*** **		0.03		**-0.09*** **		**-0.10** **		-0.06	
	(0.02)		(0.03)		(0.07)		(0.03)		(0.04)		(0.09)		(0.02)		(0.04)		(0.08)	
Adjusted R^2	0.76	0.75	-	-	-	-	0.80	0.79	-	-	-	-	0.70	0.70	-	-	-	-
Number of countries	49	49	49	49	49	49	24	24	24	24	24	24	26	25	25	25	25	25
Number of years	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23

Notes:

1/ Specifications are estimated with the Generalized Least Squares (GLS) assume no constant, the presence of cross-section heteroskedasticity, country-specific fixed effects are included and error term is assumed to follow an AR (1) process.

2/ Specifications are estimated with the system Generalized Method of Moments (GMM) assume three lags robust standard errors in parenthesis are consistent to panel specific heteroscedasticity and autocorrelation

3/ Specifications are estimated with the two-step system Generalized Method of Moments (GMM) assuming collapsed instrument matrix, two lags and finite sample corrected standard errors

4/ Robust standard errors reported in parenthesis ***, ** and * denote significance at 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Authors' estimations.

Discretionary fiscal policy tends to be procyclical both in advanced and emerging market economies. The lagged output gap has a negative and statistically significant coefficient in most specifications of the model, indicating that the policy stance tends to be procyclical. This empirical result is in contradiction to both the standard Keynesian predictions and the tax-smoothing theory, but aligns with a large body of empirical studies that finds a pattern of procyclical behavior. Contrary to most of the previous literature, however, we find that the estimated coefficient on the lagged output gap tends to be of a larger magnitude in advanced economies, compared to emerging market economies, which indicates that the degree of procyclicality is greater in advanced economies.

The inclusion of the contemporaneous output gap, instead of the lagged output gap, points towards countercyclical behavior. This finding is consistent with studies that use *real time* data instead of *ex post* observations.[14] Following the approach implemented by Bernoth, Hallet, and Lewis (2008) and Cimadomo (2012), we take the previous year's projections (t-1) for the output gap and cyclically adjusted primary budget balance as reported in years (t) in the December issues of the *OECD Economic Outlook*, and estimate our model for 19 OECD countries (which form a subset of our full panel). The coefficients remain similar in size and significance, but the results indicate that the coefficient on the output gap becomes positive when fiscal policy reaction functions are estimated with *real time* data. One explanation is that OECD countries tend to plan a countercyclical fiscal strategy, which can turn out to be procyclical in implementation for a variety of reasons including forecast errors, delays in implementation, and policy divergence.

Economic development and, to a lesser extent, consumer price inflation influence fiscal reaction functions. The coefficient on per capita income indicates that the cyclically adjusted primary balance increases, on average, by about 0.3–0.4 percentage points with each percentage point increase in the level of real GDP per capita. This finding is consistent with previous empirical studies that estimate income elasticity in an interval of 0.3–0.6, and suggests a more procyclical fiscal reaction. Furthermore, the results indicate that the positive coefficient on per capita income is of a marginally larger magnitude in advanced economies than in emerging market economies. The magnitude of the estimated coefficient on inflation varies with specifications, and remains weakly significant. In particular, the impact of inflation on discretionary fiscal policy becomes less robust when we estimate the model separately for advanced and emerging market economies. While the coefficient remains positive and mostly significant for advanced economies, it turns out to be negative, but statistically insignificant, in one of the specifications for emerging market economies.

[14] An emerging strand of the empirical literature on fiscal reaction functions, using *real time* data instead of *ex post* observations, finds countercyclical fiscal behavior, especially in advanced economies (see, for example, Forni and Momigliano, 2004; Golinelli and Momigliano, 2006; Cimadomo, 2007; Bernoth, Hallet, and Lewis, 2008). Although *real time* data may yield empirically better performing descriptions of fiscal policy behavior, such figures are available only for a limited number of mostly advanced economies.

Financial developments appear to exert a significant effect on discretionary fiscal policy in advanced and emerging market economies. The extent of financial development, measured by the ratio of domestic credit to GDP, tends to have two opposing effects on the cyclically adjusted primary balance: enabling deficit financing while imposing market discipline on fiscal policy behavior. In this context, short-term interest rates appear to have a statistically significant influence, but their economic magnitude is negligible across various specifications. The impact of short-term interest rates is significantly greater in advanced economies than in developing countries, suggesting stronger linkages between monetary and fiscal policymaking in advanced economies. Long-term bond yields, on the other hand, do not appear to be an empirically important factor when we estimate the model for the full set of countries. However, our dataset becomes unbalanced when we introduce long-term bond yields into the model, because of limited data availability in emerging market economies. Indeed, when the model is estimated for the sample of advanced countries, long-term bond yields turn out to have a positive, but still statistically insignificant effect, which may reflect market discipline (i.e. fiscal consolidation efforts when the cost of debt service increases). Likewise, we find that stock market capitalization and property prices have a positive and statistically significant effect on fiscal policy behavior across all countries, albeit the cyclically adjusted primary budget balance is not corrected for asset price changes.[15]

Structural features of the economy tend to be an important determinant of discretionary fiscal policy. While trade openness appears to have no significant effect, change in terms of trade turns out to be an important determinant of the cyclically adjusted primary budget balance, particularly in emerging market economies.[16] We also find that resource dependence—measured by natural resource rents as a share of GDP—tends to have a statistically significant effect on the fiscal policy stance. This result, however, should not be taken as an indication of prudent fiscal behavior in natural resource–rich countries. Indeed, our dependent variable—the cyclically adjusted primary budget balance—may not appropriately measure the fiscal stance in economies, where commodity price cycles tend to have a significant bearing on fiscal outcomes.[17] Moreover, the findings indicate that real exchange rate appreciation has a statistically significant negative effect on fiscal behavior, which possibly reflects the fall in revenues in local currency terms when the exchange rate appreciates. Finally, the old-age-dependency ratio appears to influence fiscal policy behavior,

[15] Although the effect of residential property prices turns out to be negative in our sample of developing countries, this could be a dubious result because of limited data availability.

[16] The growth literature shows that terms-of-trade shocks are a key determinant of macroeconomic performance in developing countries (see, for example, Cashin and Pattillo, 2000). Indeed, the estimated coefficient on trade openness is negative in the case of emerging market economies, which may be a reflection of a higher degree of vulnerability to external shocks.

[17] A better measure of the fiscal stance in resource–rich countries is the cyclically adjusted primary balance excluding resource-based revenues, but these figures are not readily available for our sample of countries.

with a reasonably negative and statistically significant coefficient. Its economic magnitude is greater among advanced economies, which tend to have a less favorable demographic profile.

Institutional and political factors appear to influence fiscal behavior, varying in direction and degrees of magnitude. Government fragmentation has no strong effect on fiscal policy in advanced economies, but becomes empirically significant in emerging market economies. On the other hand, political regime type—measured by a composite index ranging from autocracy to democracy—is not a statistically significant factor in determining fiscal policy behavior in advanced and emerging market economies. The impact of electoral cycles on discretionary fiscal policy decisions, as measured by a binary variable that takes the value of 1 in the year preceding elections to capture opportunistic behavior, does not appear to be statistically significant.[18] We also find that the quality of bureaucratic institutions has a positive and statistically significant effect on discretionary fiscal policy, suggesting that better institutions are associated with a more prudent structural fiscal position. Likewise, corruption—measured by an index ranging from 0 (most corrupt) to 6 (least corrupt)—turns out to be a statistically significant factor. That is, a lower degree of corruption improves the cyclically adjusted primary balance. Furthermore, we find that the interaction of government fragmentation and corruption is a significant factor, indicating a higher degree of vulnerability to corruption in a politically fragmented environment.

Crisis episodes have a large and statistically significant effect on fiscal policy behavior across all countries. The fiscal impact of crisis episodes, as measured by a dummy variable for banking, currency and debt crises, appears to be larger in advanced economies, but is still substantial in emerging market economies. Furthermore, fiscal reaction functions tend to differ during periods of crisis compared to pre-crisis periods. Using the full set of advanced and emerging market economies, we compare three different subperiods—the 1990s, 2000–07 and 2008–12—and present the results in Appendix Table A5.[19] The findings indicate that the degree of persistence in discretionary fiscal policy (as measured by the coefficient on the lagged cyclically adjusted primary balance) is significantly greater in the post-crisis period. While turning even more procyclical after the 2008-09 crisis, fiscal policy behavior appears to have become less responsive to the government's intertemporal budget constraint and, therefore, long-run fiscal solvency concerns. We also check the interaction of crisis episodes and government debt and find a negative coefficient, as expected. Even though it is not empirically significant, this result implies that crisis episodes have a more pronounced fiscal impact in countries with a higher level of indebtedness.

[18] Although the literature tends to focus on pre-electoral expansionary fiscal policies, the results do not change when we include the election dummy without a lag.

[19] Additional tests are performed for parameter consistency and homogeneity during three subperiods.

Table 2. Determinants of Fiscal Reaction Functions—All Countries

Dependent variable: Cyclically adjusted primary budget balance (t)							
	one-step GMM estimation					*two-step GMM*	
	1	**2**	**3**	**4**	**5**	**6**	**7**
Cyclically adjusted primary	**0.816*** **	**0.787*** **	**0.792*** **	**0.810*** **	**0.853*** **	**0.805*** **	**0.728*** **
	[0.046]	[0.050]	[0.062]	[0.050]	[0.052]	[0.067]	[0.054]
Gross government debt (t-1)	**0.003***	**0.018***	**0.020***	0.006	**0.025****	0.008	0.008
	[0.002]	[0.010]	[0.011]	[0.005]	[0.010]	[0.008]	[0.035]
Output gap (t-1)	**-0.163****	**-0.119*** **	**-0.113*** **	**-0.143****	**-0.188*** **	0.008	0.047
	[0.031]	[0.036]	[0.032]	[0.033]	[0.061]	[0.072]	[0.091]
Real GDP per capita (log)		**0.261****					**0.435****
		[0.122]					[0.189]
Inflation			0.030		**0.141****		
			[0.019]		[0.066]		
Short-term interest rate		**0.001****		**-0.001***			**0.001*** **
		[0.000]		[0.000]			[0.000]
Real exchange rate		-0.006	0.001	**-0.006***			**-0.015*** **
		[0.004]	[0.004]	[0.003]			[0.005]
Change in terms of trade				**0.023***			
				[0.012]			
Domestic credit (log)		**-0.613*** **	**-0.347***		**-0.908*** **		-0.624
		[0.215]	[0.202]		[0.314]		[0.430]
Stock market capitalization		**0.008*** **	**0.007*** **		**0.006****		**0.007***
		[0.002]	[0.003]		[0.003]		[0.004]
Population (log)			**-0.146****				
			[0.068]				
Corruption			**0.240*** **				
			[0.077]				
Bureaucratic quality					**0.337***		
					[0.198]		
Crisis			**-0.966****		**-1.305****		
			[0.421]		[0.528]		
IMF-supported program		**0.573***		**0.642****			0.767
		[0.285]		[0.242]			[0.714]
Number of observations	1171	1073	874	1078	565	1171	1073
Number of countries	49	48	43	49	32	49	48
Specification tests (p-values)							
Arellano-Bond AR(1) test	0.001	0.001	0.005	0.002	0.046	0.000	0.001
Arellano-Bond AR(2) test	0.753	0.893	0.923	0.907	0.249	0.773	0.916
Hansen-Sargent test	0.999	0.999	0.999	0.999	0.999	0.060	0.054

Notes :

1/ The table reports one- and two-step system GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata. The one-step estimation uses three lags with robust standard errors in brackets, consistent to panel specific heteroscedasticity and autocorrelation. The two-step estimation uses collapsed instrument matrix, two lags and finite sample corrected standard errors in brackets. The AR(1) and AR(2) tests report the p-values for the first and second order residual autocorrelation in the first differenced equation, providing no evidence for significant second order autocorrelation. Hansen-Sargent test for overindentifying restrictions provides the probability value for H0. joint validity of the instruments. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust but grows weaker with higher the number of moment conditions.

2/ All results in the table are presented in easily comparable format. Regressions 1 and 2 (one step GMM) have exactly the same specification as regressions 6 and 7 (two steps GMM).

3/ Regressions include the following control variables - long term bond yield, trade openness, property prices, natural resource rents, old age dependency ratio, regime*fragmentation, fragmentation*corruption, lagged election and fiscal rule, which were found to be insignificant.

4/ *, **, *** indicates significance at 10 percent (p<0.10), 5 percent (p<0.05) and 1 percent (p<0.01), respectively.

Source: Authors' estimations.

Table 3. Determinants of Fiscal Reaction Functions—Advanced Countries

Dependent variable: Cyclically adjusted primary budget balance (t)							
	one-step GMM estimation					*two-step GMM*	
	1	**2**	**3**	**4**	**5**	**6**	**7**
Cyclically adjusted primary	**0.909*** **	**0.855*** **	**0.900*** **	**0.886*** **	**0.824*** **	**0.855*** **	**0.826*** **
	[0.036]	[0.070]	[0.041]	[0.054]	[0.066]	[0.089]	[0.083]
Gross government debt (t-1)	**0.003***	**0.018** **	**0.024*** **	**0.010***	**0.021** **	0.004	0.049
	[0.002]	[0.008]	[0.008]	[0.006]	[0.009]	[0.004]	[0.033]
Output gap (t-1)	**-0.262*** **	**-0.178*** **	**-0.223*** **	**-0.218*** **	**-0.242*** **	0.033	0.085
	[0.039]	[0.046]	[0.047]	[0.037]	[0.063]	[0.091]	[0.097]
Real GDP per capita (log)		0.222					**0.532***
		[0.168]					[0.272]
Inflation			**0.163***		**0.296** **		
			[0.082]		[0.093]		
Short-term inerest rate		**0.094*** **		**0.089*** **			0.070
		[0.030]		[0.022]			[0.063]
Real exchange rate		0.002	0.015	**-0.014*** **			-0.014
		[0.014]	[0.010]	[0.004]			[0.022]
Domestic credit (log)		**-0.894** **	**-0.628** **		**-0.698***		**-1.139** **
		[0.367]	[0.287]		[0.366]		[0.494]
Stock market capitalization		**0.009*** **	**0.007** **		**0.008** **		**0.009*** **
		[0.003]	[0.003]		[0.003]		[0.002]
Natural resource rents		**0.172*** **		**0.129*** **	**0.214** **		**0.266*** **
		[0.059]		[0.038]	[0.080]		[0.062]
Population (log)			**-0.137** **				
			[0.067]				
Old age dependency ratio		-0.026	**-0.052***				-0.132
		[0.040]	[0.025]				[0.084]
Crisis			**-1.070** **		**-1.151*** **		
			[0.550]		[0.593]		
IMF-supported program		**3.457***		**3.203** **			1.530
		[1.734]		[1.500]			[1.505]
Number of observations	552	517	507	506	473	552	517
Number of groups	23	23	23	23	23	23	23
Specification tests (p-values)							
Arellano-Bond AR(1) test	0.047	0.047	0.049	0.058	0.068	0.028	0.030
Arellano-Bond AR(2) test	0.475	0.228	0.321	0.301	0.289	0.450	0.192
Hansen-Sargent test	0.999	0.999	0.999	0.999	0.999	0.580	0.585

Notes :

1/ The table reports one- and two-step system GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata. The one-step estimation uses three lags with robust standard errors in brackets, consistent to panel specific heteroscedasticity and autocorrelation. The two-step estimation uses collapsed instrument matrix, two lags and finite sample corrected standard errors in brackets. For all estimations the difference-in-Hansen test reports the p-values for the null hypothesis of additional moment conditions validity. The AR(1) and AR(2) tests report the p-values for the first and second order residual autocorrelation in the first differenced equation, providing no evidence for significant second order autocorrelation. Hansen-Sargent test for overindentifying restrictions provides the probability value for H0. joint validity of the instruments. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust but grows weaker with higher the number of moment conditions.

2/ All results in the table are presented in easily comparable format. Regressions 1 and 2 (one step GMM) have exactly the same specification as regressions 6 and 7 (two steps GMM).

3/ Regressions include the following control variables - long term bond yield, trade openness, chnage in terms of trade, property prices, government fragmentation, regime*fragmentation, fragmentation*corruption, corruption, bureaucratic quality, lagged election and fiscal rule, which were found to be insignificant.

4/ *, **, *** indicates significance at 10 percent (p<0.10), 5 percent (p<0.05) and 1 percent (p<0.01), respectively.

Source: Authors' estimations.

Table 4. Determinants of Fiscal Reaction Functions—Emerging Markets

Dependent variable: Cyclically adjusted primary budget balance (t)							
	one-step GMM estimation					*two-step GMM*	
	1	**2**	**3**	**4**	**5**	**6**	**7**
Cyclically adjusted primary	**0.674*** **	**0.632*** **	**0.600*** **	**0.649*** **	**0.606*** **	**0.628*** **	**0.662*** **
	[0.085]	[0.081]	[0.108]	[0.089]	[0.113]	[0.077]	[0.068]
Gross government debt (t-1)	0.005	**0.016***	**0.019*** **	**0.011***	**0.052*** **	**0.027***	**0.047****
	[0.003]	[0.008]	[0.007]	[0.006]	[0.015]	[0.014]	[0.019]
Output gap (t-1)	**-0.103****	-0.071	**-0.091***	**-0.071****	0.025	-0.062	0.200
	[0.042]	[0.042]	[0.046]	[0.037]	[0.086]	[0.076]	[0.075]
Real GDP per capita (log)		**0.357*** **					0.423
		[0.125]					[0.210]
Inflation			**0.038****		-0.058		
			[0.015]		[0.060]		
Short-term interest rate		**0.000****		**-0.001****			**0.001****
		[0.000]		[0.000]			[0.000]
Real exchange rate		**-0.010****	**-0.006****	**-0.006*** **			-0.008
		[0.005]	[0.004]	[0.002]			[0.006]
Change in terms of trade				**0.024****			
				[0.009]			
Domestic credit (log)		**-0.572*** **	-0.077		0.304		**-0.844****
		[0.187]	[0.182]		[0.417]		[0.380]
Stock market capitalization		**0.106****	**0.011****		**0.006****		**0.018*** **
		[0.004]	[0.005]		[0.002]		[0.006]
Property prices (log)					**-0.594****		
					[0.182]		
Natural resource rents		0.023		**0.029****	-0.017		**0.039***
		[0.156]		[0.013]	[0.033]		[0.022]
Old age dependency ratio		**-0.065****	0.002				-0.048
		[0.026]	[0.025]				[0.039]
Government fragmentation					**1.275****		
					[0.559]		
Crisis			-0.085		**-2.136*** **		
			[0.414]		[0.467]		
IMF-supported program		**0.382***		**0.415***			0.024
		[0.222]		[0.206]			[0.344]
Number of observations	619	556	367	572	92	619	556
Number of groups	26	25	20	26	9	26	25
Specification tests (p-values)							
Arellano-Bond AR(1) test	0.002	0.004	0.007	0.006	0.069	0.003	0.006
Arellano-Bond AR(2) test	0.457	0.482	0.498	0.489	0.699	0.466	0.530
Hansen-Sargent test	0.999	0.999	0.999	0.999	0.999	0.212	0.161

Notes :

1/ The table reports one- and two-step system GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata. The one-step estimation uses three lags with robust standard errors in brackets, consistent to panel specific heteroscedasticity and autocorrelation. The two-step estimation uses collapsed instrument matrix, two lags and finite sample corrected standard errors in brackets. For all estimations the difference-in-Hansen test reports the p-values for the null hypothesis of additional moment conditions validity. The AR(1) and AR(2) tests report the p-values for the first and second order residual autocorrelation in the first differenced equation, providing no evidence for significant second order autocorrelation. Hansen-Sargent test for overindentifying restrictions provides the probability value for H0. joint validity of the instruments. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust but grows weaker with higher the number of moment conditions.

2/ All results in the table are presented in easily comparable format. Regressions 1 and 2 (one step GMM) have exactly the same specification as regressions 6 and 7 (two steps GMM).

3/ Regressions include the following control variables - long term bond yield, trade openness, population, regime*fragmentation, fragmentation*corruption, corruption, bureaucratic quality,lagged election and fiscal rule, which were found to be insignificant.

4/ *, **, *** indicates significance at 10 percent (p<0.10), 5 percent (p<0.05) and 1 percent (p<0.01), respectively.

Source: Authors' estimations.

Table 5. Determinants of Fiscal Policy Volatility—All Countries

Dependent variable: Standard Deviation (SD) of the cyclically adjusted primary budget balance (t)				
	one-step GMM estimation			*two-step GMM estimation*
	1	**2**	**3**	***4***
SD of cyclically adjusted primary	**0.292*** **	**0.228*** **	**0.251** **	**0.171*** **
	[0.060]	[0.071]	[0.088]	[0.056]
Gross government debt (t-1)	**0.016*** **	**0.017*** **	**0.021*** **	0.020
	[0.007]	[0.004]	[0.007]	[0.016]
Output gap (t-1)	**0.081*** **	**0.084*** **	**0.093*** **	0.024
	[0.018]	[0.015]	[0.020]	[0.030]
SD of real GDP growth		0.011	**0.051***	
		[0.028]	[0.021]	
SD of real exchange rate	**0.020** **	0.014		**0.023*** **
	[0.008]	[0.010]		[0.008]
Natural resource rents	**0.041*** **	**0.040*** **		**0.039** **
	[0.012]	[0.015]		[0.015]
Bureaucratic quality			**-0.267** **	
			[0.113]	
Fiscal rule		**-0.442*** **		
		[0.161]		
Number of observations/countries	1025/48	1025/48	1076/49	1025/48
Number of instruments	129	131	129	11
Specification tests (p-values)				
Arellano-Bond AR(1) test	0.000	0.000	0.000	0.000
Arellano-Bond AR(2) test	0.869	0.930	0.569	0.796
Hansen-Sargent test	0.999	0.999	0.999	0.106

Notes :

1/ The table reports one and two -step System GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata (Roodman, 2009). The one-step System GMM uses three lags with robust standard errors in brackets, consistent to panel specific heteroscedasticity and autocorrelation. The two-step System GMM model uses collapsed instrument matrix, two lags and only one instrument for each variable. Windmeijer (2005) finite sample corrected standard errors in brackets are employed. The AR(1) and AR(2) tests report the p-values for the first and second order residual autocorrelation in the first differenced equation, providing no evidence for significant second order autocorrelation.Hansen-Sargent test for overindentifying restrictions provides the probability value for H0. joint validity of the instruments. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust but grows weaker the higher the number of moment conditions.

2/ All results in the table are presented in easily comparable format. Regression 1 (one-step GMM) have exactly the same specification as regression 4 (two-steps GMM).

3/ Regressions include the following control variables - real GDP per capita, standard deviation of cpi, trade openness,domestic credit, standard deviation of stock market cap., government fragmentation, corruption, and crisis, which were found to be insignificant.

4/ *, **, *** indicates significance at 10% (P<0.10), 5% (P<0.05) and 1% (P<0.01) respectively.

Source: Authors' estimations.

Table 6. Determinants of Fiscal Policy Volatility—Advanced Countries

Dependent variable: Standard Deviation (SD) of the cyclically adjusted primary budget balance (t)				
	one-step GMM estimation			*two-step GMM estimation*
	1	**2**	**3**	***4***
SD of cyclically adjusted primary	**0.253*** **	**0.217*** **	**0.214*** **	**0.218** **
	[0.066]	[0.074]	[0.056]	[0.091]
Gross government debt (t-1)	0.007	**0.009** **	**0.010** **	0.018
	[0.004]	[0.004]	[0.004]	[0.025]
Output gap (t-1)	**0.061** **	**0.054** **	**0.075*** **	0.030
	[0.029]	[0.024]	[0.022]	[0.055]
SD of real GDP growth		**0.084** *	**0.089** **	
		[0.049]	[0.043]	
Natural resource rents	**0.056*** **	**0.057*** **		**0.073** **
	[0.018]	[0.018]		[0.042]
Number of observations/countries	494/23	494/23	506/23	494/23
Number of instruments	129	131	129	11
Specification tests (p-values)				
Arellano-Bond AR(1) test	0.001	0.001	0.000	0.001
Arellano-Bond AR(2) test	0.466	0.455	0.483	0.474
Hansen-Sargent test	0.999	0.999	0.999	0.058

Notes :

1/ The table reports one and two -step System GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata (Roodman, 2009). The one-step System GMM uses three lags with robust standard errors in brackets, consistent to panel specific heteroscedasticity and autocorrelation. The two-step System GMM model uses collapsed instrument matrix, two lags and only one instrument for each variable. Windmeijer (2005) finite sample corrected standard errors in brackets are employed. The AR(1) and AR(2) tests report the p-values for the first and second order residual autocorrelation in the first differenced equation, providing no evidence for significant second order autocorrelation.Hansen-Sargent test for overindentifying restrictions provides the probability value for H0. joint validity of the instruments. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust but grows weaker the higher the number of moment conditions.

2/ All results in the table are presented in easily comparable format. Regression 1 (one-step GMM) have exactly the same specification as regression 4 (two-steps GMM).

3/ Regressions include the following control variables - real GDP per capita, standard deviation of cpi,standard deviation of real exchange rate, trade openness,domestic credit, standard deviation of stock market cap., government fragmentation, corruption,bureaucratic quality, crisis and fiscal rule, which were found to be insignificant.

4/ *, **, *** indicates significance at 10% (P<0.10), 5% (P<0.05) and 1% (P<0.01) respectively.

Source: Authors' estimations.

Table 7. Determinants of Fiscal Policy Volatility— Emerging Markets

Dependent variable: Standard Deviation (SD) of the cyclically adjusted primary budget balance (t)				
	one-step GMM estimation			*two-step GMM estimation*
	1	**2**	**3**	***4***
SD of cyclically adjusted primary	**0.266*** **	**0.241** **	**0.293*** **	**0.144** **
	[0.083]	[0.090]	[0.125]	[0.057]
Gross government debt (t-1)	**0.016** **	**0.014*** **	**0.016** **	**0.020** **
	[0.007]	[0.005]	[0.007]	[0.008]
Output gap (t-1)	**0.080** **	**0.072*** **	**0.080*** **	0.026
	[0.025]	[0.019]	[0.022]	[0.030]
SD of real exchange rate	**0.019** **	**0.020** *		**0.023*** **
	[0.009]	[0.010]		[0.007]
SD of stock market capitalization	**0.013** **	0.009		**0.013** *
	[0.006]	[0.006]		[0.008]
Natural resource rents	**0.033*** **	**0.037** **		0.067
	[0.013]	[0.016]		[0.034]
Number of observations/countries	531/25	531/25	570/26	531/25
Number of instruments	129	131	129	11
Specification tests (p-values)				
Arellano-Bond AR(1) test	0.004	0.004	0.002	0.011
Arellano-Bond AR(2) test	0.238	0.278	0.340	0.444
Hansen-Sargent test	0.999	0.999	0.999	0.675

Notes :

1/ The table reports one and two -step System GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata (Roodman, 2009). The one-step System GMM uses three lags with robust standard errors in brackets, consistent to panel specific heteroscedasticity and autocorrelation. The two-step System GMM model uses collapsed instrument matrix, two lags and only one instrument for each variable. Windmeijer (2005) finite sample corrected standard errors in brackets are employed. The AR(1) and AR(2) tests report the p-values for the first and second order residual autocorrelation in the first differenced equation, providing no evidence for significant second order autocorrelation.Hansen-Sargent test for overindentifying restrictions provides the probability value for H0. joint validity of the instruments. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust but grows weaker the higher the number of moment conditions.

2/ All results in the table are presented in easily comparable format. Regression 1 (one-step GMM) have exactly the same specification as regression 4 (two-steps GMM).

3/ Regressions include the following control variables - real GDP per capita,standard deviation of real GDP, standard deviation of cpi, trade openness,domestic credit, government fragmentation, corruption, bureaucratic quality, crisis and fiscal rule, which were found to be insignificant.

4/ *, **, *** indicates significance at 10% (P<0.10), 5% (P<0.05) and 1% (P<0.01) respectively.

Source: Authors' estimations.

IMF-supported stabilization programs tend to have a significant effect on fiscal behavior, while fiscal rules turn out to play an insignificant role. IMF-supported stabilization programs have a statistically significant effect on fiscal policy behavior across various specifications of the model. This finding remains valid when we estimate the model separately for subsamples of advanced and emerging market economies. Fiscal rules, on the other hand, come out to be statistically insignificant in our broad set of countries. This may, however, reflect the fact that most fiscal rules in our sample are not defined in terms of the cyclically adjusted primary balance, which is our measure of fiscal policy behavior.

B. Determinants of Fiscal Policy Volatility

Higher public debt leads to more volatile fiscal behavior, while fiscal rules and higher institutional quality reduce volatility of fiscal policy. As presented in Tables 5–7, the lagged volatility of the cyclically adjusted primary balance has a positive and empirically significant coefficient across all specifications of the model, indicating a high degree of persistence in the volatility of fiscal policy reaction functions over time. The extent of policy volatility appears to be higher in emerging market economies, but still economically substantial in advanced economies as well. The level of public debt and the lagged output gap have statistically significant and positive coefficients, indicating that higher government debt or output gap (i.e. above-potential growth) lead to more volatile policy behavior. Real GDP growth volatility has a positive and empirically significant coefficient, particularly in the case of advanced economies, while the volatility of consumer price inflation appears to be insignificant across all countries. Fiscal policy volatility is higher in the presence of natural resource rents, real exchange rate volatility, and stock market volatility, especially in emerging market economies. On the other hand, we find that fiscal rules and higher institutional quality reduce volatility of fiscal policy, while crisis episodes do not appear to have a statistically significant effect on the volatility of fiscal policy behavior.[20]

The empirical results remain robust when we use an alternative measure of discretionary fiscal policy volatility. Following Fatás and Mihov (2003), we introduce an alternative regression-based measure of average volatility of policy changes using the standard deviation of the residuals from country-specific regressions (Appendix Table A6). The residuals quantitatively estimate discretionary fiscal policy and are drawn from the estimated fiscal reaction function of the cyclically adjusted fiscal balance on its lagged value, lagged government debt, and lagged output gap. We find that the lagged volatility of discretionary fiscal policy has a positive and significant effect on the cyclically adjusted fiscal balance volatility, supporting the results in Table 5. These results are also robust to the

[20] This is broadly in line with other studies estimating the impact of fiscal rules on discretionary policymaking. For example, Fatás and Mihov (2003), Woo (2009), and Brzozowski and Siwinska-Gorzelak (2010) find that formal constraints tend to lower the volatility of government spending.

subsamples of advanced and developing countries as the volatility of discretionary fiscal policy is, with somewhat smaller magnitude, in advanced economies.

VI. Robustness Checks

We perform several specification tests in order to ensure the validity of the system GMM estimations. First, we estimate alternative specifications including additional determinants and arrive at results similar to the baseline models, presented in the first and second columns of Tables 2–4. Second, since the one-step system GMM estimator becomes weaker when the number of instruments increases, we test the second and third lags of the endogenous variable to avoid the problem of invalid instruments (correlated with the error term) or weak instruments (only weakly correlated with explanatory variables). Third, we test the robustness of our benchmark one-step system GMM estimator by comparing three different time periods—the 1990s, 2000–08 and 2009–12 (Appendix Table A5). Fourth, we consider a two-step system GMM estimator, as presented in the last two columns of Tables 2–4, to test the sensitivity of our empirical findings to different GMM estimators.

The two-step system GMM is defined as an alternative model, testing a reduced number of instruments to avoid overidentification while ensuring validity. The two-step estimator is more efficient but can be biased downwards for finite sample inference. We follow Roodman (2009) and estimate the baseline model with two lags and a collapsed instrument matrix, which specifies an instrument for each variable and reduces the size of the instrument matrix by a smaller set of moment conditions. The covariance matrix is robust to the panel-specific autocorrelation and heteroscedasticity improved with the finite sample corrected standard errors developed by Windmeijer (2005). The two-step estimates in Tables 2–4, appear to be consistent in direction and size with the results from the one-step analysis forming a downward interval limit with coefficient that lies between the two bounds given in the sixth and seventh columns and the first and second columns. Some coefficients are not significant when estimated with the two-step GMM model compared to the one-step GMM suggesting the possibility that too many instruments overfit the model (i.e., instrument proliferation problem) resulting in upward-biased estimates.

The test results are robust across all regressions, indicating that our instruments are valid, but weaken with a higher number of instruments. All model specifications satisfy the test statistics for overidentifying restrictions in the instrumental variables, although the number of instruments may be large relative to the number of groups in the one-step approach. Considering that the validity of the instrument set depends on the error structure, we also report the Arellano and Bond (1991) tests AR(1) and AR(2) with p-values for first and second order autocorrelated disturbances in the first-differenced equation. All in all, the tests provide evidence for high first-order autocorrelation—the AR (1) rejects the null hypothesis of no autocorrelation—but no evidence for significant second-order autocorrelation—higher p-value of the AR(2) statistics—suggesting correctly specified

models. Finally, we include the Hansen-Sargan test for overidentifying restrictions to check the joint validity of the instruments. The probability values for the null hypothesis—that is, the instruments are valid—are presented in the last row of each table. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust across all regressions, indicating that our instruments are valid, but the test becomes weaker with a higher number of instruments.[21]

VII. CONCLUSIONS

This paper investigates the main determinants of discretionary fiscal policy and its volatility in advanced and emerging market economies. The state of public finances deteriorated significantly in the aftermath of the 2008-09 economic crisis. While these extraordinary developments have generally been blamed on fiscal stimulus packages, the severity of the economic downturn, and the bailout of financial institutions, there is no systematic time-series estimates of fiscal reaction functions for a large panel of advanced and emerging market economies over the period 1990-2012. Accordingly, this paper investigates the main determinants of discretionary fiscal policy, as measured by the cyclically adjusted primary budget balance, and its time-varying volatility. In view of omitted variables bias and potential endogeneity problems that plague standard econometric techniques commonly used in the empirical literature, this paper adopts a dynamic panel approach based on the system GMM estimator and uses a balanced panel that yields more robust estimations than unbalanced panels.

The empirical results suggest that discretionary fiscal policy is influenced by a range of macro-financial and institutional factors. In line with the existing literature, we show that discretionary fiscal policy is influenced by policy inertia, the level of public debt, and the output gap in both advanced and emerging market economies, although the fiscal policy response to debt accumulation is stronger in advanced economies than in emerging market economies. In addition, we find that macro-financial factors—such as real exchange rate, financial development, interest rates, asset prices, and natural resource rents—and demographic and institutional factors—such as the old-age dependency ratio, the quality of institutions, and policy anchors such as fiscal rules and IMF-supported stabilization programs—tend to have a significant influence fiscal behavior. The empirical results indicate that these abovementioned factors tend to influence discretionary fiscal policy differently in advanced and emerging market economies. Moreover, we show that the degree of policy inertia is significantly greater in the post-crisis period, with fiscal behavior turning more procyclical and becoming less responsive to the government's intertemporal budget constraint. With regards to the volatility of fiscal policymaking, the results indicate that

[21] It should be noted that having a large number of moment conditions can overfit the endogenous variables, weakening Hansen tests of instrument validity (Roodman, 2009).

higher government debt leads to more volatile policy behavior, while fiscal rules and higher institutional quality reduce volatility of fiscal policy.

Policymakers should aim for a countercyclical fiscal policy stance that takes into account long-run solvency concerns. The empirical results presented in this paper have a number of critical policy implications, as countries continue to struggle with putting public finances on a growth-enhancing and sustainable path. First, discretionary fiscal policy tends to exhibit a pattern of procyclical behavior both in advanced and emerging market economies, worsening, instead of smoothing out, macro-financial oscillations. Second, although the fiscal policy stance appears to take into account the government's intertemporal budget constraint across all countries in our sample, the policy response to the level of public debt is stronger in advanced economies than in emerging market economies. In the aftermath of the 2008-09 crisis, however, fiscal policy behavior has become more procyclical and less responsive to the government's intertemporal budget constraint and, therefore, long-run fiscal solvency concerns, especially in advanced economies. In this context, the results show that the policymakers need to take into account financial developments, such as the fluctuations in stock market capitalization and property prices, that tend to have a significant effect on fiscal policy behavior. Likewise, improving the quality of bureaucratic institutions is a necessary condition to have an effective fiscal policy framework, especially against the risk of corruption in a politically fragmented environment. Finally, even though fiscal rules do not appear to be an empirically significant determinant of fiscal policy behavior, a rule-based fiscal regime is still found to reduce the volatility of fiscal policy over time.

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Appendix. Data

Economic and financial series are drawn from the IMF's International Financial Statistics (IFS) and World Economic Outlook (WEO) databases and the World Bank's World Development Indicators (WDI) database. Data on institutional and political indicators come from the World Bank's Database of Political Institutions (DPI), the Polity IV Database, and the *International Country Risk Guide*. The crisis dummy—taking the value of 1 when a country experiences a systemic banking, currency, and debt crisis—is constructed according to the list compiled by Laeven and Valencia (2008), and expanded by recent episodes outlined by Baldacci et al. (2011). The binary variable for IMF-supported stabilization programs is based on lending arrangements,[22] while the binary variable for fiscal rules is drawn from the IMF's Fiscal Rules Dataset.[23]

[22] The list of IMF lending arrangements, which are similar to a line of credit and require a country to observe specific terms in order to be eligible to receive a disbursement or to maintain a flexible or precautionary line of credit, is available at http://www.imf.org/external/np/fin/tad/extarr1.aspx.

[23] Schaechter et al. (2012) provide detailed information on the Fiscal Rules Dataset, which is available at http://www.imf.org/external/datamapper/FiscalRules/map/map.htm.

Table 1. Country Sample

Advanced	*Developing*
24	*25*
Australia	Argentina
Austria	Bolivia
Belgium	Brazil
Canada	Chile
Denmark	China
Finland	Colombia
France	Costa Rica
Germany	Dominican Republic
Greece	Ghana
Iceland	Honduras
Ireland	Hungary
Israel	India
Italy	Indonesia
Japan	Mexico
South Korea	Pakistan
Netherlands	Panama
New Zealand	Paraguay
Norway	Peru
Portugal	Philippines
Spain	Poland
Sweden	South Africa
Switzerland	Thailand
United Kingdom	Turkey
United States	Uruguay
	Venezuela

Notes:

1/ Country classification is based on per capita income level, export diversification, and degree of integration into the global financial system, according to the IMF's WEO database.

Table 2. Descriptions of Variables and Data Sources

Variable	*Description*	*Source*
Cyclically adjusted primary budget balance	Budget balance net of interest payments and stripping out the effect of the business cycle in percent of potential GDP	IMF/FAD
Gross government debt	Stock of gross general government debt in percent of GDP	WEO
Real GDP per capita	Ratio of real GDP to total population (log)	WEO
Output gap	Deviation of real GDP from its trend in percent of GDP	IMF
Inflation	Annual percentage change in the consumer price index	WEO
Short-term interest rate	Percent	WEO
Long-term bond yield	Percent	WEO
Real exchange rate	Real effective exchange rate index (2005 = 100)	WDI
Domestic credit	Domestic bank lending in percent of GDP (log)	WEO
Market capitalization	Stock market valuation in percent of GDP	WDI
Property prices	Average residential real estate prices (log)	BIS
Natural resource rents	in percent of GDP	WDI
Trade openness	Ratio of exports amd imports to GDP (percent)	WEO
Change in terms of trade	Annual percentage change in the terms of trade index	WEO
Population	Total population in millions (log)	WEO
Political regime	Type of political regime ranging from -10 (strongly autocratic) to 10 (strongly democratic)	Polity IV
Government fragmentation	The probability that two deputies picked random from among the government parties will be of different parties	DPI
Bureaucratic quality	Index	ICRG
Corruption	Index of corruption perception measuring excessive patronage, nepotism, job reservation, secret party funding, and close ties between politics and business	ICRG
Old-age dependency ratio	Number of people aged 65 or over in percent of working-age population (aged 15-64)	WDI
IMF-supported program	Binary variable (taking the value of one when a country implements an IMF-supported program in a given year)	IMF
Crisis	Binary variable (taking the value of one when a country experiences an episode of banking, currency and/or debt crisis)	IMF
Election	Binary variable (taking the value of one in an election year)	DPI
Fiscal rule	Binary variable (taking the value of one when there is a numerical fiscal rule in effect)	IMF/FAD

Table 3. Summary Statistics

Variables	*Obs*	*Mean*	*Std-dev*	*Min*	*Max*
Cyclically adjusted primary budget balance	1174	1.45	3.68	-26.02	21.44
Gross government debt	1176	57.00	31.00	4.10	235.71
Output gap	1176	-0.07	3.24	-19.08	14.26
Real GDP per capita (log)	1127	8.84	1.34	5.40	10.64
Inflation	1127	25.00	265.25	-1.71	7481.70
Short-term interest rate	1127	26.93	312.73	0.00	9394.29
Long-term bond yield	902	8.80	8.14	0.80	96.88
Real exchange rate	1127	102.93	18.55	37.51	227.20
Domestic credit (log)	1127	4.31	0.70	2.35	5.85
Market capitalization	1073	52.94	49.05	0.17	309.45
Property prices (log)	568	5.06	1.18	3.23	9.70
Natural resource rents	1127	3.35	5.78	0.00	47.88
Trade openness	1127	69.33	34.84	13.75	198.77
Terms of trade	1176	104.2	34.7	28.9	678.8
Population (log)	1176	3.14	1.50	0.23	7.21
Regime type	1127	7.85	3.79	-7.00	10.00
Government fragmentation	1127	0.27	0.28	0.00	0.89
Bureaucratic quality	1127	2.95	1.01	0.00	4.00
Corruption	1127	3.62	1.42	0.00	6.00
Old-age dependency ratio	1127	15.78	7.53	5.35	38.03

Source: Authors' calculations.

Table 4. Unit Root Tests

Variable[3/]	*Panel tests for unit root in levels*[1/]			*Panel tests for unit root in differences*[1/]		
	IPS	*ADF - Fisher*[2/]	*PP - Fisher*[2/]	*IPS*	*ADF - Fisher*[2/]	*PP - Fisher*[2/]
Cyclically adjusted primary budget balance	-4.18***	164.18***	**110.66**	-18.21***	463.58***	658.58***
Gross government debt	**-1.96**	140.14***	**73.91**	-9.64***	287.45***	305.27***
Real GDP per capita	**6.30**	**65.44**	**51.06**	-10.02***	274.35***	313.85***
Output gap	-2.41***	246.28***	122.19**	-14.74***	372.39***	451.78***
Consumer price index	**3.49**	**128.02**	**91.82**	-7.54***	247.82***	254.90***
Short-term int. rate	-29.13***	729.58***	1003.25***	-69.40***	982.19***	1921.26***
Long-term bond yield	-2.93***	134.17***	168.68***	-19.99***	438.64***	712.40***
Real exchange rate	-2.84**	144.17**	**111.67**	-14.67***	370.98***	500.72***
Domestic credit	**-1.83**	**115.24**	**88.14**	-16.84***	429.06***	623.75***
Broad money supply	**0.55**	**93.30**	**53.61**	-12.60***	344.17***	452.70***
Market capitalization	-5.97***	167.57***	148.31***	-20.56***	517.97***	1645.05***
Property prices	**0.70**	**49.50**	**55.35**	-2.91***	91.88***	**59.52**
Natural Resource Rents	-5.92***	191.10***	175.69***	-20.33***	508.47***	1331.37***
Trade openness	-3.32***	140.25**	**110.85**	-18.92***	479.47***	660.92***
Terms of Trade	-4.88***	197.32***	178.89***	-22.48***	582.08***	1364.62***
Population	**2.99**	149.07*	**91.73**	-2.42**	235.77***	252.65***

Notes:

1/ Im-Pesaran-Shin (2003) test (IPS) and Fisher tests for unbalanced panels allow for heterogeneous coefficients. All pooled unit root tests include individual intercept and individual linear trend. Four lag length selection based on Schwarz Info Criterion

2/ Probabilities for Fisher-type tests using ADF and PP tests are computed with an asymptotic Chi -square distribution. IPS test assumes asymptotic normality.

3/ The null hypothesis is that of a unit root process - Ho: all of the time series in the panel are nonstationary; i.e., rejection of the null means that the variables are stationary . The symbols * and ** denote significance at the 5 percent and 1 percent level, respectively.

4/ All economic and financial variables are stationary when differenced except property prices. Non stationary variables are in bold. Rejection of the PP - Fisher panel unit root test in differences is likely due to missing values.

Table 5. System GMM Dynamic Panel by Period—All Countries

Sample Specifications	1990 - 1999		2000 - 2007		2008 - 2012	
	1	*2*	*1*	*2*	*1*	*2*
Cyclically adjusted primary balance (t-1)	**0.657*** **	**0.573*** **	**0.721*** **	**0.436*** **	**0.865*** **	**0.866*** **
	[0.139]	[0.139]	[0.070]	[0.099]	[0.050]	[0.059]
Gross government debt (t-1)	0.006	0.021	**0.014*** **	-0.004	-0.001	0.039
	[0.006]	[0.018]	[0.004]	[0.018]	[0.002]	[0.026]
Output gap (t-1)	-0.012	0.038	**-0.100*** **	**-0.121***	**-0.300*** **	**-0.183*** **
	[0.040]	[0.058]	[0.035]	[0.061]	[0.069]	[0.089]
Real GDP per capita (log)		**0.478*** **		**0.910*** **		-0.078
		[0.177]		[0.253]		[0.264]
Short-term interest rate		**0.001** **		0.019		0.057
		[0.000]		[0.013]		[0.064]
Real exchange rate		**-0.014** **		**-0.030*** **		0.007
		[0.007]		[0.008]		[0.009]
Domestic credit (log)		**-0.798** **		**-0.752***		-0.879
		[0.373]		[0.381]		[0.566]
Stock market capitalization		**0.012*** **		0.005		0.012
		[0.004]		[0.004]		[0.007]
Old-age dependency ratio		-0.038		-0.082		-0.009
		[0.040]		[0.063]		[0.067]
Government fragmentation*Corruption		-0.017		**0.410***		0.232
		[0.104]		[0.198]		[0.178]
Number of observations	488	452	392	384	245	237
Number of countries	49	48	49	48	49	48
Specification tests (p-values)						
Arellano-Bond AR(1) test	0.001	0.001	0.001	0.001	0.117	0.112
Arellano-Bond AR(2) test	0.526	0.647	0.929	0.876	0.479	0.448
Hansen-Sargent test	0.430	0.847	0.426	0.730	0.118	0.133

Notes :

1/ The table reports one-step system GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata. The one-step estimation uses three lags with robust standard errors in brackets, consistent to panel specific heteroscedasticity and autocorrelation. The two-step estimation uses collapsed instrument matrix, two lags and finite sample corrected standard errors in brackets. The AR(1) and AR(2) tests report the p-values for the first and second order residual autocorrelation in the first differenced equation, providing no evidence for significant second order autocorrelation.Hansen-Sargent test for overindentifying restrictions provides the probability value for H_0 joint validity of the instruments. Higher probability value suggests that the instruments are exogenous and not correlated with the error term. The test is robust but grows weaker with higher number of moment conditions.

2/ All results in the table are presented in easily comparable format. Regressions 1 and 2 have exactly the same specification throughout all periods.

3/ Regressions include the following control variables - natural resource rents, old age dependency ratio and IMF-supported program, which were found to be insignificant.

4/ *, **, *** indicates significance at 10 percent (p<0.10), 5 percent (p<0.05) and 1 percent (p<0.01), respectively.

Source: Authors' estimations.

Table 6. Residual-based Volatility—All Countries

Dependent variable: Standard Deviation (SD) of the residuals from country-specific regressions.[1/]				
	one-step GMM estimation			*two-step GMM estimation*
	1	**2**	**3**	***4***
SD of residuals of cyclically adjusted primary balance (t-1)	**0.310*** **	**0.281*** **	**0.284*** **	**0.066*** **
	[0.068]	[0.077]	[0.067]	[0.113]
Gross government debt (t-1)	**0.026*** **	**0.027** **	**0.028** **	0.021
	[0.018]	[0.010]	[0.012]	[0.016]
Output gap (t-1)	**0.096*** **	**0.097*** **	**0.097*** **	0.001
	[0.029]	[0.030]	[0.031]	[0.040]
SD of real GDP growth		**0.051***	**0.079** **	
		[0.030]	[0.029]	
SD of real exchange rate	**0.021** **	0.013		**0.014** **
	[0.009]	[0.008]		[0.007]
Natural resource rents	**0.050*** **	**0.048*** **		0.013
	[0.004]	[0.016]		[0.019]
Bureaucratic quality			-0.181	
			[0.132]	
Fiscal rule		-0.264		
		[0.189]		
Number of observations/countries	1022/48	1022/48	1022/48	1022/48
Number of instruments	129	130	128	11
Specification tests (p-values)				
Arellano-Bond AR(1) test	0.008	0.010	0.014	0.001
Arellano-Bond AR(2) test	0.492	0.455	0.441	0.811

Notes :

1/ The table reports one and two -step System GMM dynamic panel estimations carried out using the 'xtabond2' package in Stata (Roodman, 2009). Following Fatás and Mihov (2003), we measure volatility using the standard deviation of the residuals from estimated fiscal reaction function of the cyclically adjusted fiscal balance on its lagged value, lagged government debt, and lagged output gap.

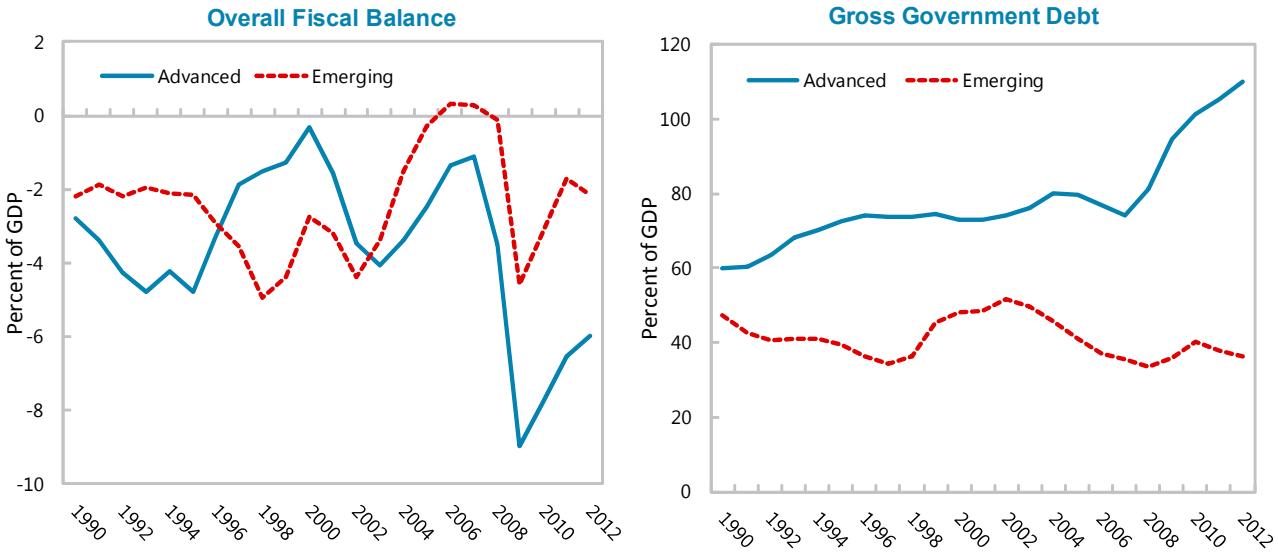
2/ All results in the table are presented in easily comparable format. Regression 1 (one-step GMM) have exactly the same specification as regression 4 (two-steps GMM).

3/ Regressions include the following control variables - real GDP per capita, standard deviation of cpi, trade openness,domestic credit, standard deviation of stock market cap., government fragmentation, corruption, and crisis, which were found to be insignificant.

4/ *, **, *** indicates significance at 10% (P<0.10), 5% (P<0.05) and 1% (P<0.01) respectively.

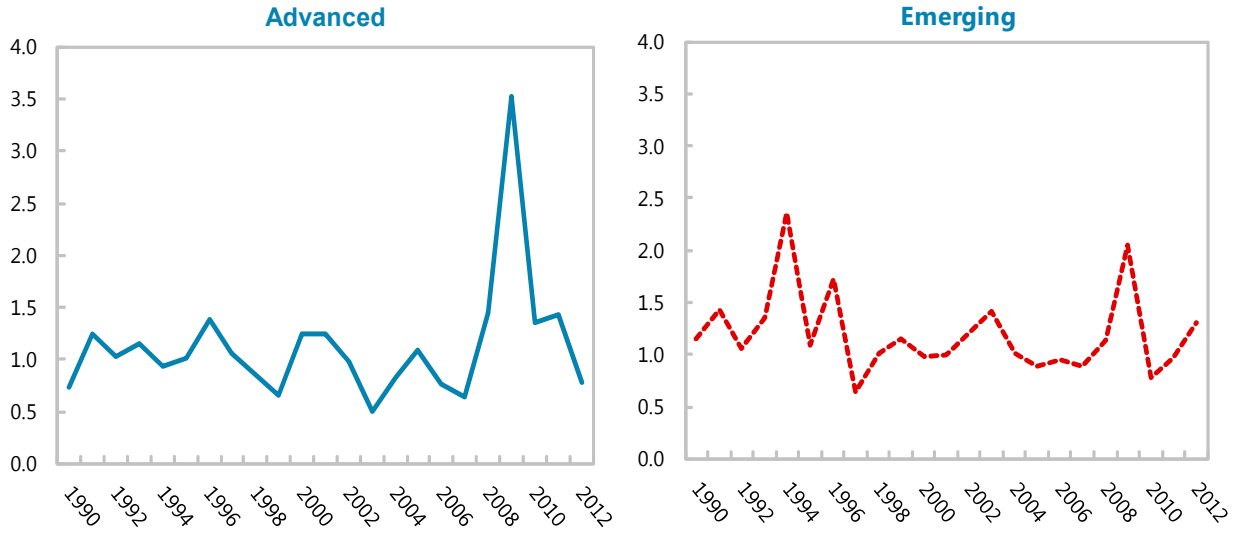
Source: Authors' estimations.

Figure 1. Budget Balance and Government Debt, 1990-2012



Source: International Monetary Fund; Authors' calculations.

Figure 2. Fiscal Policy Volatility, 1990–2012



Source: International Monetary Fund; Authors' calculations.

Figure 3. Overall Budget and Gross Debt Distribution

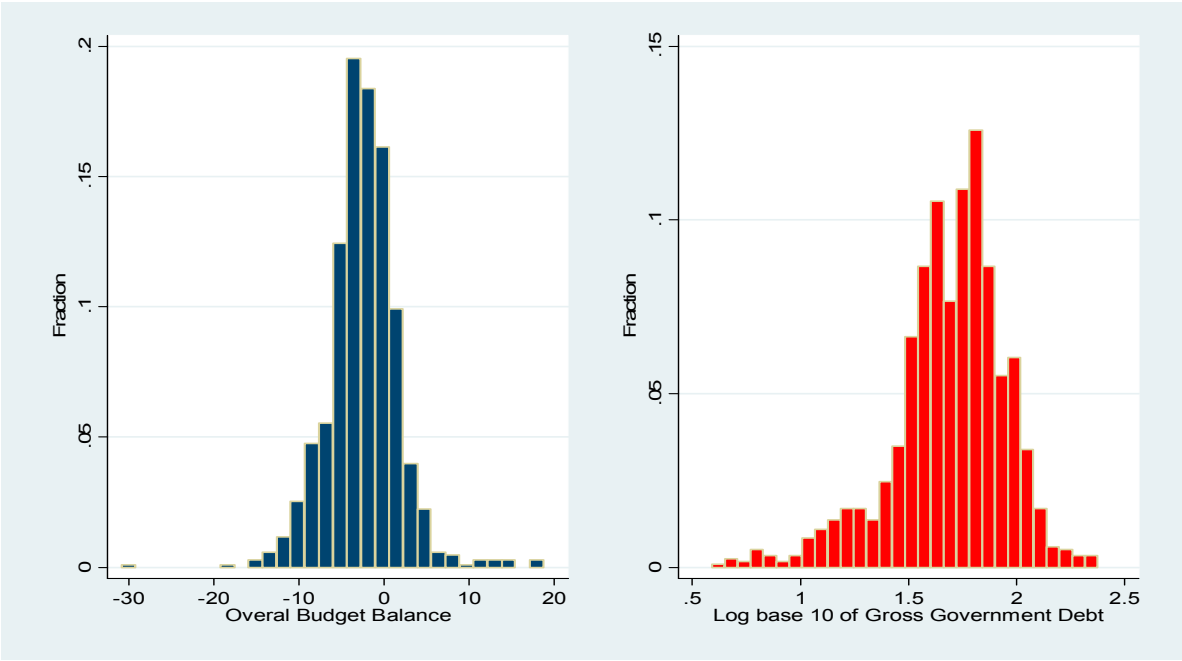
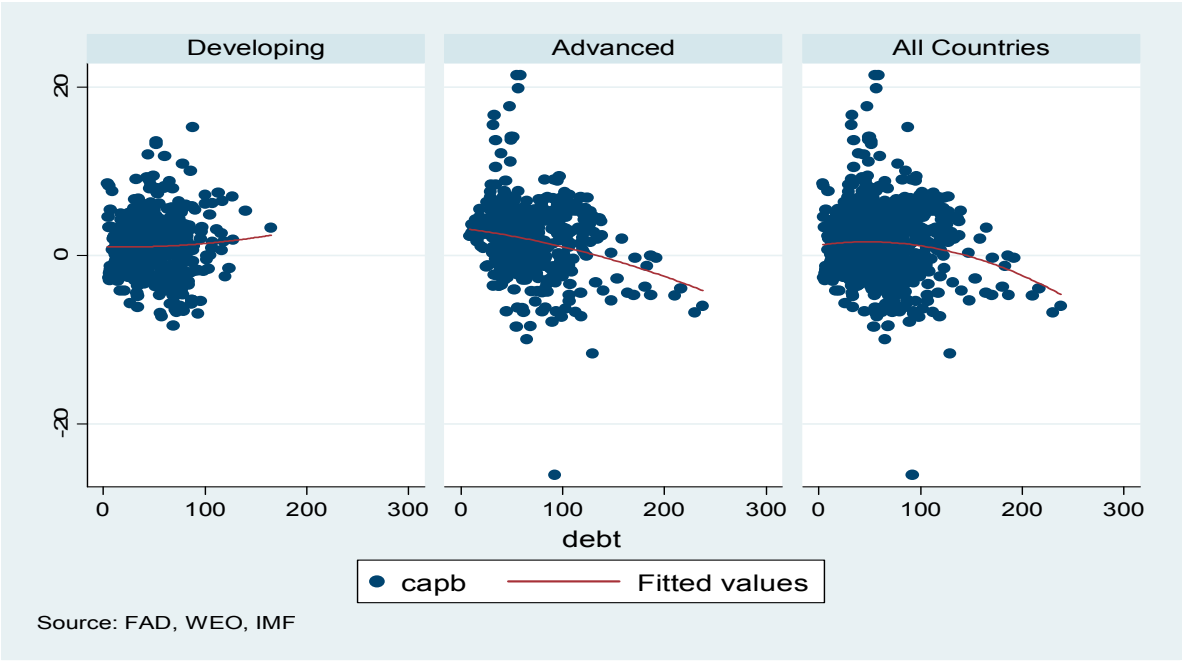


Figure 4. Cyclically adjusted budget balance vs. Gross Debt



Source: FAD, WEO, IMF

Figure 5. Cyclically adjusted budget balance vs. Output Gap

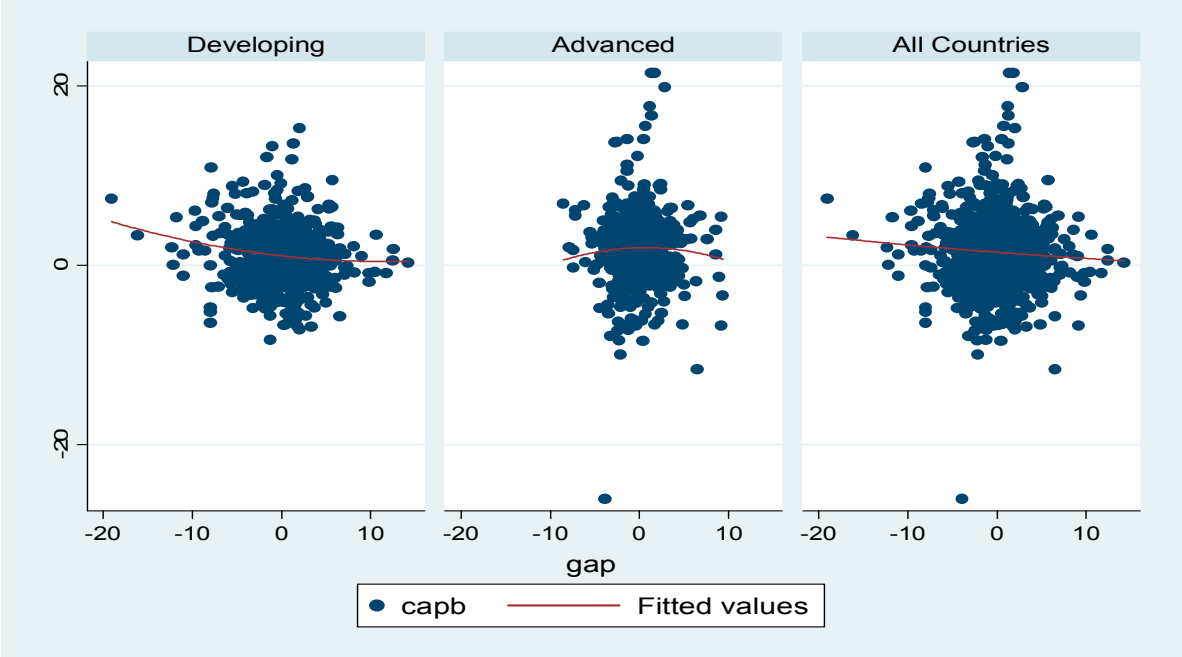


Figure 6. Cyclically adjusted budget balance vs. GDP per capita