

Determinants and Effects of Fiscal Stabilization: New Evidence from Time-Varying Estimates*

Davide Furceri⁺

João Tovar Jalles[§]

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Abstract

This paper provides a novel dataset of time-varying measures of fiscal stabilization for an unbalanced panel of advanced and emerging market economies from 1980 to 2014. The use of time-varying measures of fiscal stabilization overcomes the major limitation of existing studies assessing the determinants and the effects of fiscal stabilization that rely on cross-country regressions and, therefore, are not able to account for country-specific as well as global factors. The key findings of the paper are: (i) fiscal stabilization has increased over time for many economies over the last two decades; (ii) fiscal stabilization is positively associated with financial deepening, the level of economic development, trade openness, government size as well as political factors; (iii) fiscal stabilization significantly reduces output volatility. The results are robust to various specifications and endogeneity checks.

Keywords: E62; H50; H60.

JEL codes: Fiscal policy; fiscal stabilization; output volatility.

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⁺ International Monetary Fund, Research Department, 700 19th Street NW, Washington DC, 20431, USA. E-mail: dfurceri@imf.org. Tel.: +1-202-623-5854. University of Palermo.

[§] International Monetary Fund, Fiscal Affairs Department, 700 19th Street NW, Washington DC, 20431, USA. Email: jjalles@imf.org Tel.: +1-202-623-8689.

1. Introduction

Several years after the Global Financial Crisis growth in many advanced and emerging market economies remains well below precrisis rates. Medium-term growth expectations have been steadily revised downward since 2011, highlighting uncertainties surrounding medium-term growth prospects (IMF 2015). At the same time, public debt-to-GDP ratios have increased in many advanced and emerging market economies, reaching historical high levels in some of them. Against this background, how can fiscal policy contribute to higher medium-term growth?

Since output volatility can negatively affect medium-term growth through its effects on investment and productivity, fiscal policy can foster medium-term growth by reducing aggregate macroeconomic volatility.¹ The idea that fiscal policy can affect productivity growth by operating in a counter-cyclical way has been suggested by Aghion et al. (2005). Their argument is that firms' ability to borrow to finance investment is typically reduced during recessions: to the extent that higher macroeconomic volatility translates into deeper recessions, it will have a negative effect on investment, especially on productivity-enhancing long-term projects (for example, R&D investment) that are more subject to liquidity risks. This prediction finds empirical support in cross-country regressions (Aghion et al. 2005) as well as in studies based on sectoral- (Furceri and Jalles 2016) and firm-level data (Berman et al. 2007).

Fiscal policy has a stabilizing effect on the economy if the budget balance-to-GDP ratio increases when output growth increases and falls when output growth declines: (i) the more countercyclical government spending is, the higher the effect of fiscal stabilization—a relatively high level of government spending when private demand is low will stabilize aggregate demand; (ii) the more progressive taxes are, the higher fiscal stabilization will be—if taxes fall more than output, when output falls, then taxes contribute to stabilize household's disposable income.

But how stabilizing is *de facto* fiscal policy and how fiscal stabilization vary over time, between countries and across phases of the business cycle? Which policy and structural variables determine the effectiveness of fiscal stabilizers? Finally, how much does fiscal stabilization contribute to lower overall macroeconomic volatility? This paper tries to answer these questions using a novel empirical strategy and estimating time-varying measures of fiscal stabilization for an unbalanced panel of 53 advanced and emerging market economies

¹ See, for example, Ramey and Ramey (1995) and Imbs (2007) for the empirical evidence on a negative relation between output volatility and growth.

from 1980 to 2014. To the best of our knowledge, this is the first paper that estimates time-varying measures of fiscal stabilization for a large set of economies, including emerging market ones.²

The use of time-varying measures of fiscal stabilization overcomes the major limitation of existing studies assessing the drivers and the determinants of fiscal stabilization that rely on cross-country regressions and therefore are not able to account for country-specific as well as global factors. The key findings of the paper are: (i) fiscal stabilization has increased over time for many economies over the last two decades; (ii) fiscal stabilization is positively associated with financial deepening, the level of economic development, trade openness, government size as well as political constraints on the executive; (iii) fiscal stabilization significantly reduces output volatility.

While we are not aware of previous work assessing the determinants and the effects of fiscal stabilization on output volatility using time-varying measures for a large sample of economies, there are several studies in the literature that have performed a similar analysis using cross-country regressions. As for the determinants of fiscal stabilization, government size has typically found to be the most important driver (Gali 1994; Debrun et al. 2008; Debrun and Kapoor 2011; Furceri 2010; Afonso and Jalles 2013). Another important determinant of fiscal stabilization is the degree of openness: economies more open to trade tend to be more exposed to external shocks and may use more actively fiscal policies in order to provide stabilization (Rodrik 1998; Lane 2003). Similarly capital account openness is found to affect fiscal stabilization as foreign capital tends to flow in (out) during expansions (recessions), therefore increasing the cost of financing counter-cyclical fiscal policies (Aghion and Marinescu, 2008). Studies have also found higher fiscal stabilization in more developed countries, as these tend also to be characterized by a better quality of institutions and by a higher level of financial development (Talvi and Vegh 2005; Frankel et al. 2011; Acemoglu et al. 2013; and Fatas and Mihov 2013).

On the effects of fiscal stabilization on macroeconomic volatility, while the existing empirical evidence on the links between fiscal stabilization and growth is mixed, several studies seem to agree that a timely countercyclical response of fiscal policy to (demand) shocks is likely to deliver considerably lower output and consumption volatility (Van den Noord 2000; Kumhof and Laxton 2009; Debrun and Kapoor 2011; Fatas and Mihov 2012).

The remainder of the paper is organized as follows. In Section 2, a framework for measuring fiscal stabilization is presented. Sections 3 and 4 develop the empirical strategies

² Aghion and Marinescu (2008) estimates time-varying measures of deficit counter-cyclical for an unbalanced panel of 19 advanced economies over the period 1960-2007.

to analyze the determinants and the effects of fiscal stabilization, respectively. The last section concludes and discusses some policy implications.

2. Measuring Fiscal stabilization

2.1 Conceptual Framework

Measuring the stabilizing effect of fiscal policy requires assessing how fiscal policy affects aggregate demand. As discussed by Blanchard (1993), in a static setting, the budget balance-to-GDP ratio is an appropriate proxy for the aggregate demand's effect of fiscal policy in a given year. This implies that the response of the budget balance to changes in economic activity gives a good approximation of the stabilizing effects of fiscal policy: (i) the more countercyclical government spending is, the higher the effect of fiscal stabilization—a relatively high level of government spending when private demand is low will stabilize aggregate demand; (ii) the more progressive taxes are, the higher fiscal stabilization will be—if taxes fall more than output, when output falls, then taxes contribute to stabilize household's disposable income.³

Within this conceptual framework, assessing the degree of fiscal stabilization in a given country implies estimating the following regression:

$$b_i = \alpha_i + \beta_i \Delta y_i + \varepsilon_i \quad (1)$$

where b is the budget balance-to-GDP ratio, Δy is GDP growth (or a measure of the output gap) and β measures the degree of fiscal stabilization, with larger values of the coefficient denoting higher stabilization.

We generalize equation (1) by introducing the assumption that the regression coefficients may vary over time:

$$b_{it} = \alpha_{it} + \beta_{it} \Delta y_{it} + \varepsilon_{it} \quad (2)$$

³ In principle, one should adjust the budget balance and taxes by the marginal propensity to consume out of disposable income, which is typically less than one. Moreover, in a dynamic setting, measuring the impact of fiscal policy on aggregate demand requires looking not only at current budget balance but also at future anticipated deficits and at the level of the stock of public debt (Blanchard and Summers, 1984 and Blanchard, 1985).

In particular, the coefficient β is assumed to change slowly and unsystematically over time its expected value to be equal to its past value. The change of the coefficient is denoted by $v_{i,t}$, which is assumed to be normally distributed with expectation zero and variance σ_i^2 :

$$\beta_{it} = \beta_{it-1} + v_{it} \quad (3)$$

Equation (2) and (3) are jointly estimated using the Varying-Coefficient model proposed by Schlicht (1985, 1988). In this approach the variances σ_i^2 are calculated by a method-of-moments estimator that coincides with the maximum-likelihood estimator for large samples (see Schlicht, 1985, 1988 for more details). The model described in equation (2) and (3) generalizes equation (1), which is obtained as a special case when the variance of the disturbances in the coefficients approaches to zero.

As discussed by Aghion and Marinescu (2008), this method has several advantages compared to other methods to compute time-varying coefficients such as rolling windows and Gaussian methods. First, it allows using all observations in the sample to estimate the degree of fiscal stabilization in each year—which by construction is not possible in the rolling windows approach. Second, changes in the degree of fiscal stabilization in a given year come from innovations in the same year, rather than from shocks occurring in neighboring years. Third, it reflects the fact that changes in policy are slow and depends on the immediate past. Fourth, it reduces reverse causality problems when fiscal stabilization is used as explanatory variable as the degree of fiscal stabilization depends on the past.

2.2 Fiscal Stabilization over time

We now report the average level and the time path of the coefficient of fiscal stabilization estimated in equation (2) and (3) for a sample of 53 advanced and emerging market economies, for which we have estimates of fiscal stabilization for at least 20 years (Figure 1).

As a first observation, it is worth noting that the time-average fiscal stabilization coefficient is positive (about 0.25-0.3), which is consistent with the fact that the budget balance is generally counter-cyclical (Lane 2003; Aghion and Marinescu 2008). Second, the degree of fiscal stabilization has increased over time for both advanced and emerging market economies (Figure 1), with the pattern holding for most countries within each group (Figure 2).

However, while the increase in advanced economies has occurred mostly during the 80s and the 90s, in emerging market economies fiscal stabilization has increased in the late 90s-early 2000s. Interestingly, fiscal stabilization seems also to increase during recessions, particular during financial crises (Figure 3).

3. Determinants of Fiscal Stabilization

3.1 Empirical Methodology

This section tests the importance of various macroeconomic and political factors in affecting the degree of fiscal stabilization. For this purpose, the following regression is estimated on a balanced sample of 61 countries for which we have estimates of fiscal stabilization for at least 20 years:

$$\beta_{it} = \delta_i + \gamma_t + \theta'X_{it} + \epsilon_{it} \quad (4)$$

where δ_i are country-fixed effects to capture unobserved heterogeneity across countries, and time-unvarying factors such as geographical variables which may affect the degree of fiscal stabilization (Afonso et al. 2010); γ_t are time-fixed effects to control for global shocks; and X_{it} is a vector of time-varying macroeconomic and political variables:⁴

Macroeconomic variables:

- Real GDP per capita: it is expected that fiscal stabilization is higher in more developed countries, as those tend to be also characterized by a better quality of institutions (Talvi and Vegh 2005).
- Financial development—proxied by the credit-to-GDP ratio: a higher level of financial development positively influences the ability of the government to borrow during downturns, and therefore it is expected to increase fiscal stabilization (Aghion and Marinescu 2008).
- Trade openness—proxied by ratio of total exports and imports in GDP: more open economies tend to be more exposed to external shocks and therefore may use more actively fiscal policies in order to provide stabilization (Rodrik 1998; Lane 2003).
- Capital account openness—proxied by the Chinn-Ito index of capital account openness: foreign capital is likely to flow in (out) during expansions (recessions), therefore increasing the cost of financing countercyclical fiscal policies (Aghion and Marinescu 2008).

⁴ See the Appendix regarding the sources, definitions and descriptive statistics of these variables.

- Government size—proxied by government expenditure-to-GDP ratio: as discussed in Fatas and Mihov, (2013) and Debrun and Kapoor (2011), government size can be considered as a proxy of fiscal stabilization under the assumption of unitary elasticity of taxes to GDP. Therefore, it is expected that fiscal stabilization tends to be a positive function of the size of the government.
- Financial crises—based on the Leaven and Valencia (2010) dataset: the effect of financial crises on fiscal stabilization is ambiguous a priori. On the one hand, governments would be willing to run expansionary fiscal policies to offset the contractionary effects of the crises. On the other hand, the cost of financing countercyclical fiscal policies may increase during crises, particularly in countries with high debt levels.

Political variables:

- Constraints on the executive: the main variables used are those proposed by Acemoglu et al. (2013) and Fatas and Mihov (2013). The first (*constraints*) captures potential veto points on the decisions of the executive. The second (*polconv*) captures not only institutional characteristics in the country but also political outcomes as its value is adjusted when, for example, the president and the legislature are member of the same party. In addition, we use dummies for the presence of expenditure, taxes and debt rules. As documented by Fatas and Mihov (2013), constraints on the executive are likely to reduce spending volatility and positively influence fiscal stabilization.
- Elections—based on dummies for the occurrence of executive and legislative elections: during elections politicians may be tempted to change spending and taxes for electoral reasons and not necessarily for macroeconomic stabilization purposes (Drazen 2000; Persson and Tabellini 2000).
- Other political variables: margin of majority, proportional representations and parliamentary regimes.

Since the dependent variable in equation (4) is based on estimates, the regression residuals can be thought of as having two components. The first component is sampling error (the difference between the true value of the dependent variable and its estimated value). The second component is the random shock that would have been obtained even if the dependent variable was observed directly as opposed to estimated. This would lead to an increase in the standard deviation of the estimates, which would lower the *t*-statistics. This means that any correction to the presence of this un-measurable error term will increase the significance of

our estimates. To address this issue, equation is estimated using Weighted Least Squares (WLS). Specifically, the WLS estimator assumes that the errors ϵ_{it} in equation (1) are distributed as $\epsilon_{it} \sim N(0, \sigma^2/s_i)$, where s_{it} are the estimated standard deviations of the fiscal stabilization coefficient for each country i , and σ^2 is an unknown parameter that is estimated in the second-stage regression. Finally, in order to reduce reverse causality, all the macroeconomic variables enter the specification with one lag.

3.2 Results

Table 1 presents the results obtained by estimating equation (4) using different econometric specifications. The coefficients associated with the various determinants typically exhibit the expected sign and confirm the conjectures discussed above.

[insert Table 1 here]

Starting with the macroeconomic variables, we find that fiscal stabilization is robustly and positively associated with the level of financial development, with an increase of 10 percentage points in the credit-to-GDP ratio increasing fiscal stabilization by about 0.2-0.3 (i.e. by about $\frac{3}{4}$ -1 standard deviation). We also find that more developed and open to trade economies tend to have a larger degree of fiscal stabilization. Similarly, countries with larger government are also able to provide more stabilization, even though the magnitude is not economically significant: an increase of 10 percentage points in the government expenditure-to-GDP ratio increases fiscal stabilization only by about 0.05. Finally, we find that fiscal stabilization does not increase during financial crises once other macroeconomic variables are controlled for.⁵

Looking at the political variables, we find that constraints on the executive (*constraint* and *polconv*) are robustly and significantly associated with fiscal stabilization. The results are consistent with the evidence in Fatas and Mihov (2013) and Lane (2003), who find that more constraints on the executive tend to reduce government spending volatility and positively influence overall fiscal stabilization. In contrast, all the other political variables, as well as dummies for fiscal rules, are not statistically significant.

As a robustness check, we replicated the results for the full specification by alternatively excluding country and/or time fixed effects. The results reported in Table 2 confirm the statistical significance of the macroeconomic variables. In addition, while

⁵ The results, not reported here but available upon request, suggest that fiscal stabilization increases during banking crises but declines during currency and sovereign debt crises.

constraints on the executive remain statistically significant across all specifications, we also find that some of the political variables that were not significant in the baseline regression become significant when country- and/or time-fixed effects are omitted. In particular, both proportional representation and expenditure rules turn out to be negatively and statistically significantly associated with fiscal stabilization across the various specifications II-IV.

[insert Table 2 here]

4. Effects of Fiscal Stabilization

4.1 Empirical Methodology

This section examines the effect of fiscal stabilization on output volatility. For this purpose, the following regression is estimated based on a balanced sample of 61 countries for which we have estimates of fiscal stabilization for at least 20 years:

$$S_{it} = \delta_i + \gamma_t + \vartheta\beta_{it} + \boldsymbol{\pi}'\mathbf{Z}_{it} + \epsilon_{it} \quad (5)$$

where S_{it} denotes output volatility—measured by the absolute value of output gap—in country i at time t ; β_{it} is the measure of fiscal stabilization estimated in the previous section for country i at time t ; δ_i are country-fixed effects to capture unobserved heterogeneity across countries, and time-unvarying factors such as geographical variables which may affect the degree of fiscal stabilization and output volatility; γ_t are time-fixed effects to control for global shocks.⁶

In order to reduce endogeneity due to omitted variables that may simultaneously affect output volatility and fiscal stabilization, we include in the specification a set of control variables (\mathbf{Z}_{it}) that have been found in the literature and in the previous section to be relevant: (i) trade openness; (ii) capital account openness; (iii) credit-to-GDP ratio; (iv) GDP per capita; (v) GDP growth; (vi) population; and (vii) government size. Moreover, all the macroeconomic variables enter the specification with one lag to minimize reverse causality. Equation (5) is estimated by OLS with robust clustered standard errors.

⁶ Data for output gap are taken from the IMF WEO. Since this measure is sensitive to variations in potential growth, we check the robustness of our results to alternative measure in the next subsection.

4.2 Results

We start with a parsimonious specification of equation (5), using only country- and time-fixed effects as control variables. The results reported in Column I of Table 3 suggest that fiscal stabilization reduces output volatility. In particular, the results suggest that an increase of 0.5 in our measure of fiscal stabilization (about 2 standard deviations) reduces output volatility by about ½ percentage point. In order to limit reverse causality, we re-estimate this specification using the lag of fiscal stabilization. The results reported in Column II of Table 3 are similarly and not statistically significantly different.

[insert Table 3 here]

The results are robust when the controls variables discussed above are included in the specification (Columns III-VI of Table 3), with that the effect of fiscal stabilization actually increasing, even though the differences with the baseline estimates are not statistically significant. Among the control variables, we find that credit-to-GDP is positively associated with output volatility; while larger countries tend to be characterized by lower output volatility (this result is consistent with Furceri and Karras 2007). Interestingly, some of the variables such as trade openness, GDP per capita and government size—which are typically found to be associated with output volatility in cross-countries studies (for example, Fatas and Mihov 2001; Debrun and Kapoor 2011)—are not statistically significant. The reason is that the inclusion of country-fixed effects purges most of their variability. Indeed, they turn to be significant when equation (5) is re-estimated by excluding country fixed effects (Columns II-III of Table 4).

[insert Table 4 here]

To account for the possibility that the relation between fiscal stabilization and output volatility has changed over time, we extend equation (5) by interacting the measure of fiscal stabilization with dummies for pre- and post-2000s, respectively:

$$S_{it} = \delta_i + \gamma_t + \vartheta^1 D^{post-2000s} \beta_{it} + \vartheta^2 D^{pre-2000s} \beta_{it} + \boldsymbol{\pi}' \mathbf{Z}_{it} + \epsilon_{it} \quad (6)$$

The results obtained estimating equation (6) indeed suggests that the effect of fiscal stabilization on output volatility has increased over time (Column I, Table 5). Moreover, looking at the effect in the pre- and post-2000s periods and between advanced and emerging market economies, it seems that most of the increasing effect of fiscal stabilization on output volatility stems from the increase in fiscal stabilization in emerging market economies in the 2000s (Column II, Table 5). These results are consistent with the increase in the fiscal

stabilization coefficient observed in many countries, particularly in emerging markets since the 2000s (Figure 1).

[insert Table 5]

Robustness checks

To check the robustness of our results we re-estimated equation (5) using alternative measures of output volatility: (i) the standard deviation of the output gap computed over a five-year rolling window; (ii) the standard deviation of GDP growth computed on a five-year rolling window.⁷ The results presented in Columns I-III of Table 5, confirm that the fiscal stabilization reduces output volatility. In addition, the results are also robust when we estimate equation (5) on a five-year panel dataset using standard deviations computed on non-overlapping five-year windows.

Given that our measure of fiscal stabilization is based on estimates, we further check the robustness of our results by estimating equation (5) with WLS, giving more weights to observations for which fiscal stabilization is estimated more precisely. This procedure yields a larger effect of fiscal stabilization on output volatility (Column II, Table 6). In particular, an increase of 0.5 (about 1 standard deviation) reduces output volatility by about 1 percentage point.

[insert Table 6 here]

A concern estimating equation (5) using OLS is that the results may be subject to reverse causality since governments concerned with output volatility could arguably adjust their fiscal behaviors to provide more stabilization. While in principle this issue is likely to not be relevant in our case, as our measure of fiscal stabilization depends on the past, we check the robustness of our results using an IV approach. Following Fatas and Mihov (2001, 2013), we select instruments capturing institutional and political characteristics of the countries likely to be correlated to our measure of fiscal stabilization but presumably not directly related to output volatility. Based on the results presented in the previous section, we alternatively use the constraints on the executive variables (*constraint* and *polconv*) as instruments. Another instrument considered is the lags of fiscal stabilization. The results reported in Column III-IV of Table 7 confirms that fiscal stabilization reduces output volatility, with the effect being slightly higher (although not statistically different) than the one obtained with OLS. In addition, the Kleibergen-Paap test confirms the validity of the instruments.

⁷ The use of the standard deviation computed on a five-year rolling window in the yearly dataset yields errors that are serially correlated within countries, we control for this possible bias by clustering the errors at the country level.

[insert Table 7 here]

5. Conclusion and Policy Considerations

Several years after the Global Financial Crisis growth in many advanced and emerging market economies remains well below precrisis rates. Medium-term growth expectations have been steadily revised downward since 2011, highlighting uncertainties surrounding medium-term growth prospects (IMF, 2015). At the same time, public debt-to-GDP ratios have increased in many advanced and emerging market economies, reaching historical high levels in some of them. Against this background, how can fiscal policy contribute to higher medium-term growth?

Fiscal policy can influence medium-term growth through its support to macroeconomic stability. Using time-varying estimates of fiscal stabilization the paper find that fiscal policy by acting counter-cyclically can significantly reduce output volatility. In particular, our results suggest that an increase of 0.5 in the coefficient of fiscal stabilization (about 2 standard deviations) reduces output volatility by about $\frac{1}{2}$ - $1\frac{1}{2}$ percentage points. Back-to-the-envelope calculations—based on Ramey and Ramey (1995) estimates—suggests that an increase of 0.5 in the coefficient of fiscal stabilization increases medium-term growth by about $\frac{1}{4}$ - $\frac{1}{2}$ percentage point.

A key question is then how can fiscal stabilization be improved, particularly in countries with high debt levels? While a large body of the literature has typically found that government size is the main determinant of fiscal stabilization, the results presented in this paper suggest that other macroeconomic policies and political characteristics can affect fiscal stabilization for a given government size. In particular, the results of the paper suggest that in addition to political constraints, policies aimed at fostering financial deepening, the level of economic institutions (proxied by GDP per capita) and trade openness can significantly increase fiscal stabilization.

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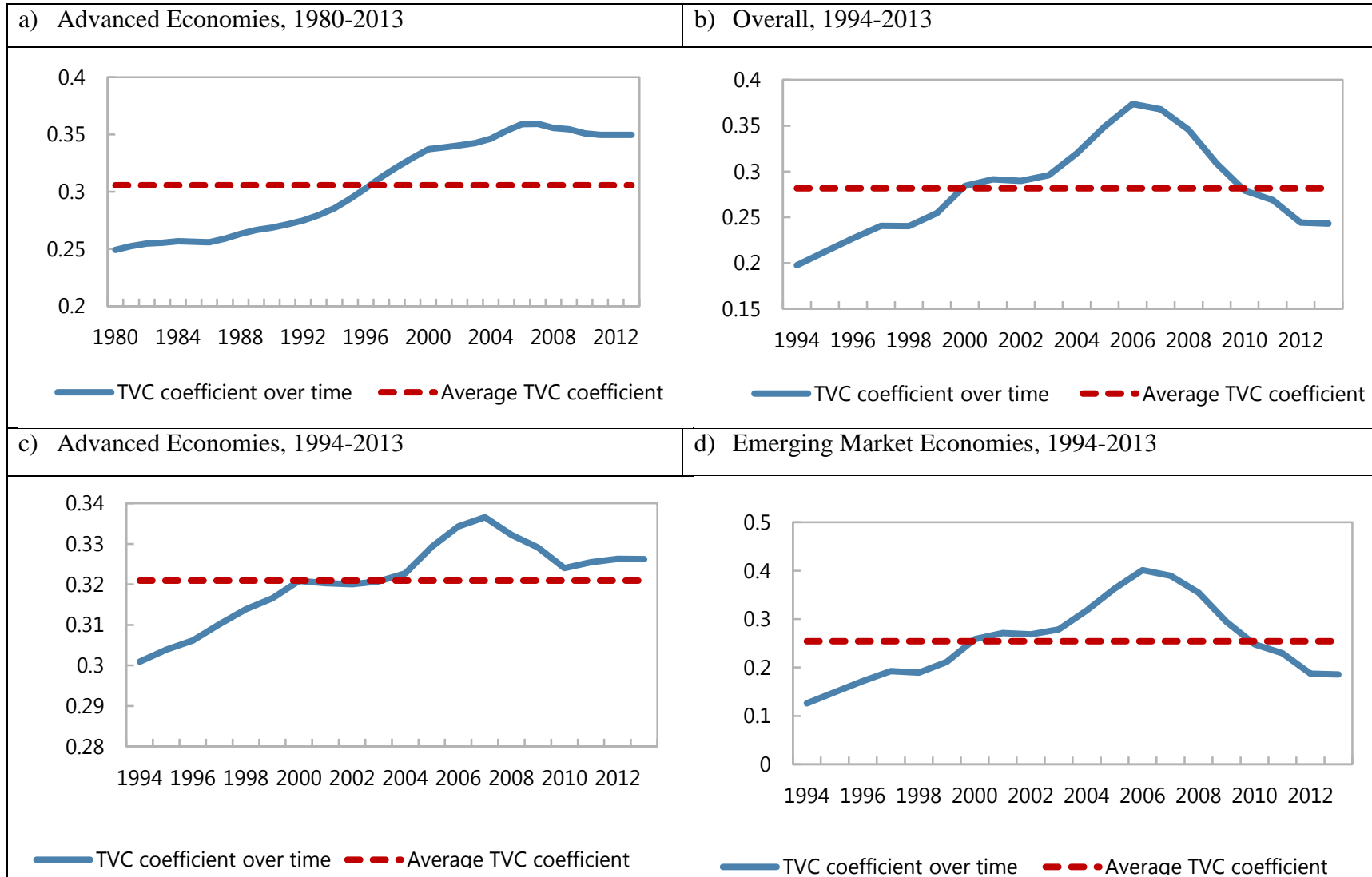
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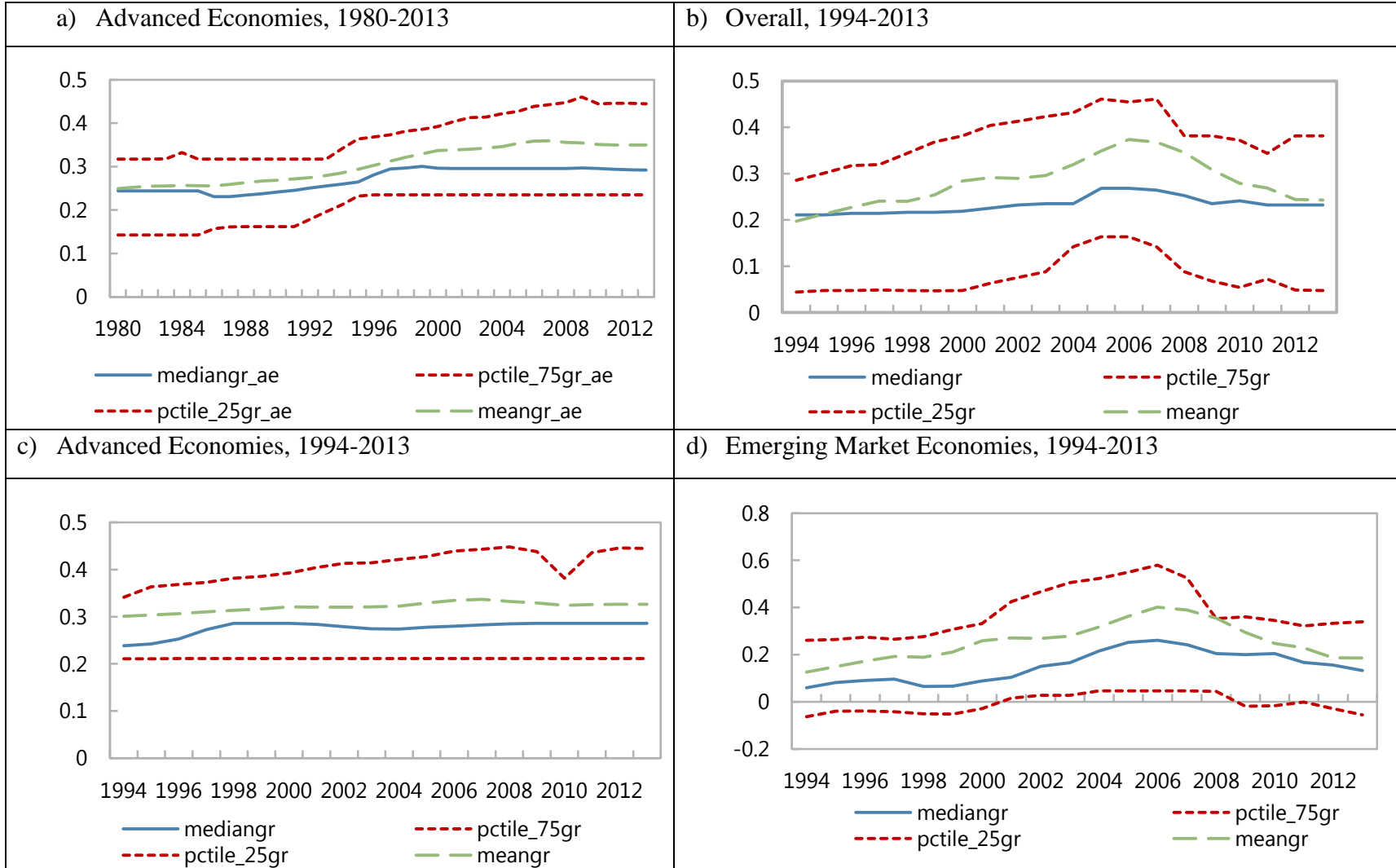
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Figure 1. Fiscal stabilization over time.



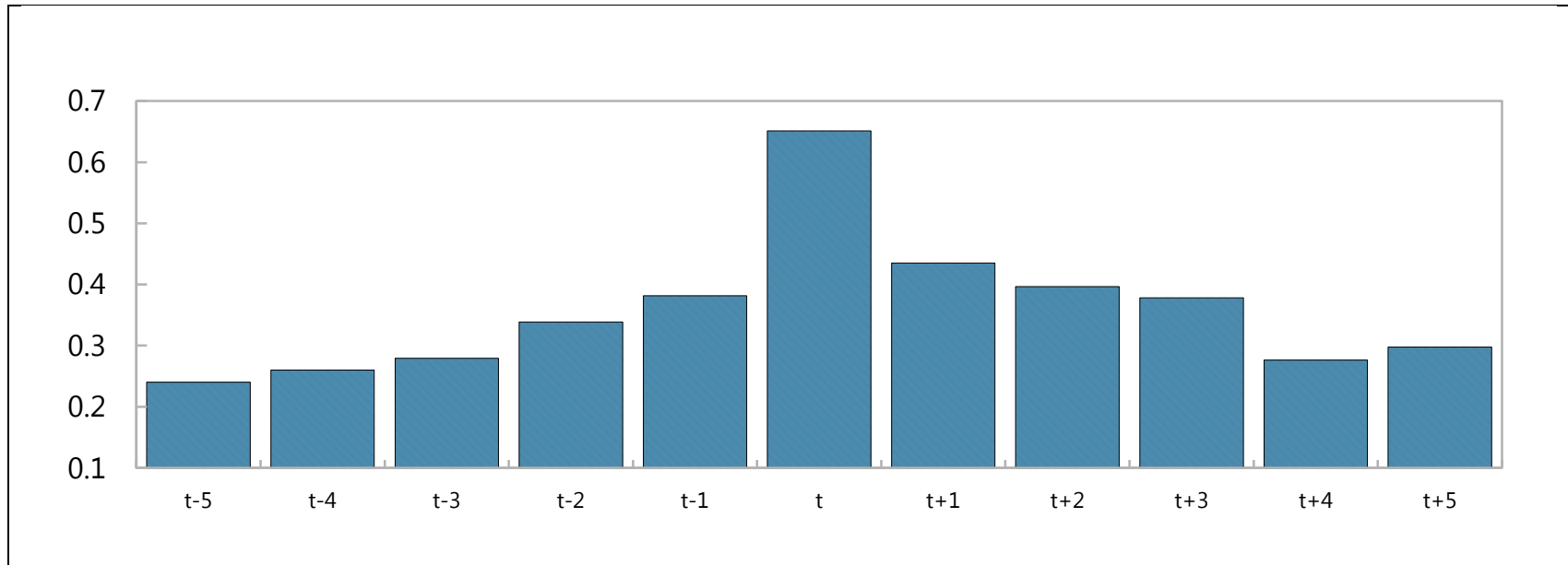
Note: Figure displays the time profile of the TVC coefficient estimates for the entire sample, and two income groups, Advanced and Emerging Market Economies. Panel a) includes 18 countries with at least 34 observations; panel b) contains 61 countries with at least 20 observations; panel c) contains 25 countries with at least 20 observations; panel d) contains 36 countries with at least 20 observations.

Figure 2. Fiscal stabilization over time- within sample.



Note: Figure displays the interquartile and mean evolution of the TVC coefficient estimates for the entire sample, and two income groups, Advanced and Emerging Market Economies. Panel a) includes 18 countries with at least 34 observations; panel b) contains 61 countries with at least 20 observations; panel c) contains 25 countries with at least 20 observations; panel d) contains 36 countries with at least 20 observations.

Figure 3. Fiscal stabilization during financial crises.



Note: Figure displays the average value of the TVC coefficient estimates from 5 years prior to the beginning of a given financial crises (“t”) to five years after it began. In each of the three panels averages were computed over a balanced sample.

Table 1. The determinants of fiscal stabilization.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Credit to GDP (t-1)	0.0285*** (4.9883)	0.0299*** (5.1180)	0.0285*** (4.9283)	0.0265*** (4.4760)	0.0266*** (4.4589)	0.0292*** (4.8660)
GDP per capita (t-1)	0.1840*** (4.2328)	0.1767*** (3.9331)	0.1737*** (3.9594)	0.1888*** (4.3247)	0.1762*** (3.9893)	0.1644*** (3.7060)
Trade openness (t-1)	0.1213*** (3.0063)	0.1129*** (2.6907)	0.1125*** (2.7799)	0.1254*** (3.0938)	0.1162*** (2.8550)	0.1187*** (2.9143)
Capital account openness (t-1)	0.0053 (1.0222)	0.0073 (1.3561)	0.0041 (0.7872)	0.0066 (1.2497)	0.0051 (0.9457)	0.0058 (1.0723)
Government expenditure to GDP (t-1)	0.0053** (2.1380)	0.0052** (2.0481)	0.0050** (2.0207)	0.0050* (1.9616)	0.0048* (1.8940)	0.0052** (2.0116)
Executive constraints			0.0245*** (3.3180)		0.0233*** (3.1308)	
Parliamentary regime			-0.0519 (-1.5517)		-0.0513 (-1.5271)	-0.0346 (-1.0641)
Presidential election held			-0.0021 (-0.1543)		-0.0022 (-0.1573)	0.0024 (0.1758)
Legislative election held			-0.0010 (-0.1236)		-0.0014 (-0.1688)	-0.0017 (-0.2050)
Proportional representation			-0.0294 (-1.0670)		-0.0302 (-1.0866)	-0.0371 (-1.3236)
Margin of majority			-0.0474* (-1.6138)		-0.0477* (-1.6030)	-0.0417 (-1.3683)
Financial crises		0.0109 (0.6442)				
Expenditure rule				-0.0154 (-0.9860)	-0.0174 (-1.1041)	-0.0184 (-1.1646)
Revenue rule				0.0338 (1.5973)	0.0257 (1.2106)	0.0298 (1.4063)
Debt rule				-0.0206 (-1.3218)	-0.0153 (-0.9796)	-0.0103 (-0.6526)

Political constraints						0.1060***
						(2.5962)
Country f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Time f.e.	Yes	Yes	Yes	Yes	Yes	Yes
N	929	929	929	929	929	929
R ²	0.7372	0.7353	0.7422	0.7385	0.7431	0.7421

Note: Results obtained by estimating equation (4). t-statistics in parentheses based on clustered robust standard errors. ***, **, * denote significance at 1,5,10 percent level, respectively.

Table 2. Determinants of Fiscal Stabilization, alternative specifications.

	(I)	(II)	(III)	(IV)
Credit to GDP (t-1)	0.0266*** (4.4589)	0.0103*** (2.7439)	0.0070 (1.5137)	0.0167*** (3.2251)
GDP per capita (t-1)	0.1762*** (3.9893)	0.0228*** (4.3173)	0.0260*** (4.3644)	0.0954*** (2.8242)
Trade openness (t-1)	0.1162*** (2.8550)	0.1027*** (7.2485)	0.0944*** (6.2870)	0.0899** (2.4565)
Capital account openness (t-1)	0.0051 (0.9457)	0.0014 (0.2654)	0.0031 (0.5460)	0.0005 (0.0982)
Government expenditure to GDP (t-1)	0.0048* (1.8940)	0.0052*** (3.8320)	0.0046*** (3.1396)	0.0036 (1.4908)
Executive Constraints	0.0233*** (3.1308)	0.0236*** (3.7227)	0.0202*** (3.1041)	0.0265*** (3.6316)
Parliamentary regime	-0.0513 (-1.5271)	0.0388* (1.8966)	0.0512** (2.1614)	-0.0526 (-1.5891)
Presidential election held	-0.0022 (-0.1573)	0.0000 (0.0002)	0.0042 (0.1975)	-0.0029 (-0.2178)
Legislative election held	-0.0014 (-0.1688)	-0.0090 (-0.7358)	-0.0103 (-0.8055)	-0.0010 (-0.1294)
Proportional representation	-0.0302 (-1.0866)	-0.0803*** (-5.8236)	-0.0831*** (-5.8118)	-0.0452* (-1.6835)
Margin of majority	-0.0477* (-1.6030)	-0.1220*** (-3.2449)	-0.1508*** (-3.8349)	-0.0384 (-1.3625)
Expenditure rule	-0.0174 (-1.1041)	-0.0679*** (-3.5348)	-0.0702*** (-3.5085)	-0.0310** (-2.0425)
Revenue rule	0.0257 (1.2106)	0.1145*** (4.7537)	0.1140*** (4.6558)	0.0234 (1.1159)
Debt rule	-0.0153 (-0.9796)	-0.0105 (-0.7400)	-0.0079 (-0.4733)	-0.0350** (-2.5525)

Country f.e.	Yes	No	No	Yes
Time f.e.	Yes	No	Yes	No
N	929	929	929	929
R ²	0.7431	0.3196	0.3318	0.7331

Note: Results obtained by estimating equation (4). t-statistics in parentheses based on clustered robust standard errors. ***, **, * denote significance at 1,5,10 percent level, respectively.

Table 3. The effect of fiscal stabilization on output volatility.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Fiscal stabilization (t)	-1.117*** (-2.88)		-1.481*** (-2.85)		-1.383** (-2.47)	
Fiscal stabilization (t-1)		-1.421*** (-3.51)		-1.814*** (-3.29)		-1.665*** (-2.89)
Trade openness (t-1)			-0.010* (-1.73)	-0.012* (-1.82)	-0.010 (-1.50)	-0.011 (-1.58)
Capital account openness (t-1)			0.074 (0.76)	0.075 (0.77)	0.113 (1.01)	0.119 (1.07)
Credit to GDP (t-1)			0.009** (2.65)	0.009** (2.65)	0.007* (1.84)	0.007** (1.82)
GDP per capita (t-1)			-0.335 (-0.72)	-0.385 (-0.81)	0.284 (0.37)	0.254 (0.33)
GDP growth (t-1)					-0.005 (-0.11)	-0.007 (-0.17)
Log population (t-1)					-4.636** (-2.11)	-4.573** (-2.08)
Government expenditure to GDP (t-1)					0.033* (1.67)	0.032 (1.66)
Country f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Time f.e.	Yes	Yes	Yes	Yes	Yes	Yes
N	1039	1023	823	811	689	689
R ²	0.32	0.33	0.36	0.35	0.39	0.39

Note: Output volatility measured as the absolute value of the output gap. Results obtained by estimating equation (5). t-statistics in parentheses based on clustered robust standard errors. ***, **, * denote significance at 1,5,10 percent level, respectively.

Table 4. The effect of fiscal stabilization on output volatility, alternative specifications.

	(I)	(II)	(III)
Fiscal stabilization (t)	-1.383** (-2.47)	-1.204*** (-3.91)	-1.062*** (-3.42)
Trade openness (t-1)	-0.010 (-1.50)	0.003** (2.48)	0.003** (2.44)
Capital account openness (t-1)	0.113 (1.01)	0.031 (0.45)	-0.027 (-0.46)
Credit to GDP (t-1)	0.007* (1.84)	0.001 (0.33)	0.002 (1.02)
GDP per capita (t-1)	0.284 (0.37)	-0.114*** (-2.86)	-0.107*** (-2.74)
GDP growth (t-1)	-0.005 (-0.11)	-0.035 (-0.96)	-0.027 (-0.97)
Log population (t-1)	-4.636** (-2.11)	0.009 (0.16)	0.013 (0.24)
Government expenditure to GDP (t-1)	0.033* (1.67)	-0.017** (2.42)	-0.013** (1.96)
Country f.e.	Yes	No	No
Time f.e.	Yes	Yes	No
N	689	689	689
R ²	0.39	0.17	0.06

Note: Output volatility measured as the absolute value of the output gap. Results obtained by estimating equation (5). t-statistics in parentheses based on clustered robust standard errors. ***,**,* denote significance at 1,5,10 percent level, respectively.

Table 5. The effect of fiscal stabilization on output volatility, across time and country samples.

	(I)	(II)
Fiscal stabilization (t)* Post 2000	-2.275*** (-3.58)	
Fiscal stabilization (t)* Pre 2000	-0.633 (-1.14)	
Fiscal stabilization (t)* Post 2000*Advanced Economies		-4.231*** (-2.57)
Fiscal stabilization (t)* Pre 2000*Advanced Economies		-2.669* (-1.72)
Fiscal stabilization (t)* Post 2000*Emerging Market Economies		-1.924*** (-3.09)
Fiscal stabilization (t)* Pre 2000* Emerging Market Economies		0.402 (0.51)
Country f.e.	Yes	Yes
Time f.e.	Yes	Yes
N	689	689
R ²	0.39	0.39

Note: Measure I= absolute value of the output gap; Measure II= standard deviation of the output gap on a five-year window; Measure III= standard deviation of GDP growth on a five-year window. Results obtained by estimating equation (6). t-statistics in parentheses based on clustered robust standard errors. ***, **, * denote significance at 1,5,10 percent level, respectively.

Table 6. The effect of fiscal stabilization on output volatility, alternative measures and data frequency.

	Annual			5-year average		
	(I)	(II)	(III)	(IV)	(V)	(VI)
	Measure I	Measure II	Measure III	Measure I	Measure II	Measure III
Fiscal stabilization (t)	-1.383** (-2.47)	-0.708*** (-2.03)	-0.006** (-2.01)	-1.284** (-2.06)	-1.305*** (-2.06)	-0.017** (-2.07)
Country f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Time f.e.	Yes	Yes	Yes	Yes	Yes	Yes
N	689	669	686	284	266	279
R ²	0.39	0.60	0.57	0.49	0.56	0.54

Note: Measure I= absolute value of the output gap; Measure II= standard deviation of the output gap on a five-year window; Measure III= standard deviation of GDP growth on a five-year window. Results obtained by estimating equation (5). t-statistics in parentheses based on clustered robust standard errors. ***,**,* denote significance at 1,5,10 percent level, respectively.

Table 7. The effect of fiscal stabilization on output volatility, alternative estimators.

	(I)	(II)	(III)	(IV)
	OLS	WLS	IV1	IV2
Fiscal stabilization (t)	-1.383** (-2.47)	-2.533*** (-2.93)	-1.731*** (-2.66)	-1.922*** (-2.88)
Country f.e.	Yes	Yes	Yes	Yes
Time f.e.	Yes	Yes	Yes	Yes
Kleibergen-Paap p-value			0.00	0.00
N	689	689	670	675
R ²	0.39	0.36	0.37	0.42

Note: Output volatility measured as the absolute value of the output gap. Results obtained by estimating equation (5). IV1= lagged fiscal stabilization and political constraints as instruments; IV2= lagged fiscal stabilization and polconv as instruments t-statistics in parentheses based on clustered robust standard errors. ***,**,* denote significance at 1,5,10 percent level, respectively.

Appendix

Variables, definitions and sources

Variables	Definition	Source
Credit to GDP	Domestic credit to private sector refers to financial resources provided to the private sector by financial institutions (in percent of GDP)	World Bank, World Development Indicators
GDP per capita	Real gross domestic product divided by population	World Bank, World Development Indicators
Trade openness	Exports plus imports over GDP	IMF, International Financial Statistics
Capital account openness	KAOPEN is an index measuring a country's degree of capital account openness	Chinn-Ito Index of Financial Openness
Government expenditure to GDP	Total government expenditure to GDP ratio	IMF, International Financial Statistics
Executive constraints	This variable refers to the extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities.	Polity IV Project
Parliamentary regime	Parliamentary, Assembly-elected President, or Presidential.	Polity IV Project
Presidential election held	Takes value 1 if there was an executive election in this year.	Polity IV Project
Legislative election held	Takes value 1 if there was a legislative election in this year	Polity IV Project
Proportional representation	Takes value 1 if candidates are elected based on the percent of votes received by their party and/or if our sources specifically call the system "proportional representation". "0" otherwise.	Polity IV Project
Margin of majority	This is the fraction of seats held by the government.	Polity IV Project
Financial crises	Dummy variable taking value 1 when a banking or currency or debt crisis occurs.	Laeven and Valencia (2010)
Expenditure rule	Takes the value 1 when an expenditure rule is in place	IMF Fiscal Rules Dataset http://www.imf.org/external/data_mapper/FiscalRules/map/map.htm
Revenue rule	Takes the value 1 when a revenue-based rule is in place	IMF Fiscal Rules Dataset http://www.imf.org/external/data_mapper/FiscalRules/map/map.htm
Debt rule	Takes the value 1 when a debt rule is in place	IMF Fiscal Rules Dataset http://www.imf.org/external/data_mapper/FiscalRules/map/map.htm
Political constraints	POLCON index takes into account the number of veto points faced by the executive power, as well as the distribution of political preferences across different branches of government.	Political Constraint Dataset, Henisz (2000)
Population	Total population	World Bank, World Development Indicators

Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Fiscal Stabilization	1156	0.240	0.275	-0.929	1.481
Credit to GDP	1229	12.147	2.942	-2.364	20.903
GDP per capita	1335	10.818	2.028	6.415	16.130
Trade openness	1172	0.741	0.512	0.101	4.380
Capital account openness	1181	0.652	1.539	-1.855	2.455
Government expenditure to GDP	1335	16.207	5.664	3.814	43.813
Executive constraints	1295	5.851	1.812	1	7
Political Constraints	1330	0.594	0.264	0	0.894
Parliamentary regime	1335	0.638	0.481	0	1
Presidential election held	1335	0.081	0.274	0	1
Legislative election held	1335	0.251	0.434	0	1
Proportional representation	1335	0.728	0.445	0	1
Margin of majority	1335	0.616	0.168	0.117	1
Financial crises	1210	0.052	0.234	0	1
Expenditure rule	1335	0.127	0.333	0	1
Revenue rule	1335	0.059	0.237	0	1
Debt rule	1335	0.265	0.441	0	1
Population	1276	49.802	158.049	0.218	1241.492