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The Case for Fiscal Rules*

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Abstract

This paper estimates the effects of fiscal institutions on fiscal policy outcomes, addressing issues related to measurement and endogeneity in a novel way. Recently developed indices, based on partially ordered set theory, are used to quantify the stringency of fiscal rules. Identification of their effects is achieved by exploiting the exogeneity of institutional variables (checks and balances, government fragmentation, inflation targeting), which are found to be relevant determinants of fiscal rules. Our two-stage least squares estimates for (up to) 79 countries over the period 1985-2012 provide strong evidence that countries with more stringent fiscal rules have higher fiscal balances (lower deficits), lower interest rate spreads on government bonds, and lower output volatility.

Keywords: Fiscal Rules · Fiscal Balances · Interest Rates · Volatility

JEL Classification: E62 · H30 · H60

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1 Introduction

Over the last decades, a growing number of countries have introduced or strengthened fiscal rules to reduce their governments' deficit bias, increase confidence in fiscal policy, lower costs of public borrowing, and to ensure the sustainability of public debt. Yet the effectiveness of fiscal rules in achieving these goals is still subject to debate, not least because empirical studies on the effects of fiscal rules are confronted with two major obstacles: measurement and endogeneity. The present paper addresses both issues in a novel way.

Fiscal rules are typically characterized by numerous properties in terms of both legislative acts and informal agreements, which are often ordinal in nature and not comparable with each other. This makes it difficult to construct a single measure of fiscal rules that can be utilized to estimate their effects on outcome variables such as the fiscal balance. Previous studies have used either dummy variables indicating the existence of fiscal rules (e.g., Candelon et al., 2010; Galí and Perotti, 2003) or aggregated a subset of the information on fiscal institutions into one composite index (e.g., ACIR, 1987; Alesina et al., 1999; Debrun et al., 2008), which involves the assignment of (cardinal) values and weights to mainly ordinal properties. The unavoidably high degree of subjectivity involved may explain the partly conflicting results in the literature, the lack of a widely accepted measure of fiscal rules, and the absence of a broad agreement on their effects.

In the present paper, we are the first to make use of a novel dataset by Badinger and Reuter (2015), who employ partially ordered set (POSET) theory to derive indices of the stringency of fiscal rules for a sample of 81 countries over the period 1985-2012. The virtue of the POSET approach is that it is well established in the natural and technical sciences, builds on rigorous mathematical concepts, takes the ordinal nature of the data seriously, fully exploits the information contained in the data, and reduces the need for subjective choice to a minimum.

Fiscal rules will typically be endogenous in many empirical applications of interest, e.g., due to reverse causality since governments may have an incentive to change fiscal institutions in response to changes in fiscal performance (Poterba, 1994). In fact, according to IMF (2009), fiscal conditions themselves are the best predictors of the likelihood of a country having fiscal rules. Moreover, there could be unobserved, omitted variables (such as voter tastes) affecting both fiscal outcomes and fiscal rules. Finally, even the most carefully constructed measures of fiscal rules cannot be expected to capture countries' fiscal institutions entirely and accurately; as a consequence,

measures of fiscal rules are likely to be prone to classical measurement error.

Recent studies indicate favorable effects of fiscal rules on fiscal balances (e.g., Dahan and Strawczynski, 2013; Hallerberg et al., 2009; Fabrizio and Mody, 2006), interest rates (e.g., Iara and Wolff, 2014), or output volatility (e.g., Fatás and Mihov, 2006). Yet in spite of their suggestive findings, previous studies are subject to some shortcomings. Given the lack of comprehensive data on fiscal rules (till recently), most results have been obtained for a single or a small group of countries; moreover, a large variety of measures for fiscal rules constructed from different sources (dummies or composite indices) have been used. This makes generalizations and comparisons of the results difficult. The POSET measures of fiscal rules used in the present paper, which are derived by Badinger and Reuter (2015) from the recently released IMF (2012) database, take up these issues by providing commonly defined measures of the stringency of fiscal rules for a large sample of countries. Finally, the endogeneity of fiscal rules has not been addressed in a comprehensive and systematic manner so far. One notable exception is Debrun et al. (2008), who study the effect of fiscal rules on fiscal policy outcomes (overall and cyclically adjusted primary balance, debt level); they use the lagged fiscal rule index and a dummy for the commitment form of fiscal governance (centralized vs. decentralized) as instruments, but find virtually no difference between the least squares and instrumental variable estimates.

The present paper considers the effects of fiscal rules on fiscal balances, government bond interest rate spreads, and output volatility, carefully addressing endogeneity concerns by first testing for (arguably exogenous) determinants of fiscal rules. In particular, a country's system of checks and balances, its government fragmentation, and an indicator variable for inflation targeting regimes turn out to be relevant instruments, which are then used in a two-stage least squares (2SLS) approach to estimate the effects of fiscal rules on the aforementioned outcome variables.

Our estimates for a panel of up to 79 countries over the period 1985-2012 yield several interesting results: i) Fiscal rules in fact turn out endogenous. ii) Countries with more stringent fiscal rules have higher fiscal balances and lower interest rate spreads on government bonds. iii) Fiscal rules are negatively related to output volatility, although their stabilizing effect materializes indirectly by reducing fiscal policy volatility. iv) The 2SLS estimates are always larger (in magnitude) than the LS estimates; this finding is consistent with endogeneity due to classical measurement error or reverse causality, where fiscal rules are introduced or strengthened in times of bad fiscal performance.

2 Fiscal Rules and Fiscal Policy

Several reasons for constraining fiscal policy makers' discretion by fiscal rules have been put forward in the literature. The arguments can be grouped according to incentive structures, creating a deficit bias that results in a fiscal balance below of what would be socially optimal.

(i) *Common pool theory*: Many decision makers are involved in the budgetary process and each of them may be lobbied by or depend on specific interest groups. As a consequence, the likelihood of spending and large deficits increases with the number of decision makers. Egger and Koethenbuerger (2010) find strong evidence for such 'pork barrel spending' using German municipality level data; Roubini and Sachs (1989) and Alesina and Perotti (1995) document public spending pressures associated with political fragmentation for OECD countries.

(ii) *Information asymmetry*: Decision makers have more information on the true fiscal position than voters, which can be used for (promising) spending increases or tax cuts before elections, creating a political business cycle (see, e.g., Brender and Drazen, 2005; Shi and Svensson, 2006).

(iii) *Impatience and short-sightedness*: Governments tend to discount future events (e.g., future public spending) or future election periods at a higher rate than voters because politicians may lose their office in the short-run (see, e.g., Woo, 2005; Van der Ploeg, 1984; Rogoff and Bertelsmann, 2010).

(iv) *Political competition*: Governments, anticipating the possibility of being replaced in the future, have an incentive to reduce the room for fiscal maneuver for future governments by accumulating debt (Persson and Svensson, 1989; Alesina and Tabellini, 1990) .

(v) *Spillovers and outside pressure*: Government on the sub-national level or in monetary or fiscal unions may fail to internalize all spillover costs (such as higher interest rates on debt) into their decision making. Moreover, fiscal policy can interfere with and lead to sub-optimal outcomes of monetary policy, e.g., in inflation targeting regimes (Dixit and Lambertini, 2003; Combes et al., 2014).

For all these reasons, unconstrained fiscal policy is likely to result in excessively high deficits and debt levels, distorted trust, lack of confidence in the sustainability of public finances, and hence in higher costs of borrowing. While fiscal rules do not eliminate the incentives underlying the deficit bias, they do limit the room for maneuver of fiscal policy makers and the opportunities to act in a biased way.

Another rationale for binding the budgetary process, unrelated to the

deficit bias, has been put forward by Fatás and Mihov (2003, 2006). They argue that fiscal constraints lead to lower volatility of discretionary fiscal policy, lower output volatility and thereby enhanced economic growth, which may result in a virtuous circle that boosts sustainability (Fatás and Mihov, 2010).

According to this reasoning and provided that fiscal rules reduce (the room for exploiting) the deficit bias and fiscal policy volatility, one would expect fiscal rules to affect fiscal policy outcomes – the more so, the more stringent they are. In particular, countries with more stringent fiscal rules should have i) a higher fiscal balance (a lower deficit), ii) a smaller risk premium on government bonds, and iii) lower output volatility. These hypotheses will be tested in the following.

3 Estimation Framework

For an empirical assessment of the effects of fiscal rules on our outcome variables of interest, we consider panel data models of the form

$$y_{i,t} = \alpha + \gamma FR_{i,t} + \boldsymbol{x}_{i,t}\boldsymbol{\beta} + \mu_i + \varepsilon_{i,t}, \tag{1}$$

where y is the dependent variable, FR is a measure of the stringency of fiscal rules to be defined below, and $\boldsymbol{x}$ is a vector of control variables; μ_i denotes country-fixed effects and $\varepsilon_{i,t}$ is the idiosyncratic error term. Finally, i is the cross-section index and t is the time index.

We consider three outcome variables: i) the structural fiscal balance as a share of potential GDP, ii) the spread on (short-run and long-run) interest rates of government bonds relative to the US, and iii) output volatility, defined as standard deviation of real GDP per capita growth.[1] Before turning to the estimation results, we discuss our approach to the measurement of fiscal rules and the identification strategy to estimate their effects.

3.1 Measurement of Fiscal Rules

As measures of the stringency of fiscal rules, we draw on Badinger and Reuter (2015). They derive indices of the stringency of fiscal rules based on partially ordered set (POSET) theory, using the IMF (2012) fiscal rules database,

[1] As outlined below, the regression analysis using output volatility as dependent variable is based on a cross-section of countries rather than a panel.

which covers national and supranational numerical fiscal rules in 81 countries from 1985-2012. It provides information on the type of fiscal rules in place (balanced budget, debt, expenditure, and revenue rule) and their characteristics such as legal basis, enforcement mechanisms, coverage, escape clauses, provisions for cyclical adjustments, and supporting features like independent monitoring bodies or fiscal responsibility laws.[2]

From a methodological perspective, the use of POSET indices to quantify the stringency of fiscal rules is an attractive alternative to the composite index approach mainly used in previous studies. It avoids the assignment of (cardinal) values to different properties of fiscal frameworks, takes the ordinal nature of (most of) the data seriously, fully exploits the information contained in the data, and reduces the need for subjective choice to a minimum. Interestingly, this approach is well established in the natural and technical sciences but has rarely been used in the social sciences so far. For a more detailed discussion of how the POSET approach is used to obtain measures of the stringency of fiscal rules, see Badinger and Reuter (2015).

In the present study, we consider three types of indices describing a country's fiscal institutions: i) balanced budget rules (BR), aiming at balancing the fiscal budget or keeping it within certain boundaries, ii) debt rules (DR), aiming at stabilizing or reducing the level of public debt, and iii) an index relating to general fiscal institutions (GI), indicating the existence of multi-year frameworks, of independent bodies setting assumptions as well as laws on monitoring performance, transparency, and accountability.

Although it is possible (and in fact the case for several countries) to have more than one fiscal rule in place, we include only one index at a time in the estimation to avoid collinearity issues. (The average correlation between the fiscal rule indices amounts to 0.783.) Hence, Equation (1) will be estimated separately for each of the three indices of fiscal rules.

Note that each fiscal rule index ranges from 0 to 1 and is increasing in stringency, broadly defined in terms of the hierarchy of the legal basis, coverage, transparency, and accountability. Summary statistics of the fiscal rule indices are given in Table A2 in the Appendix.

[2]The IMF database documents the increase in the use of fiscal rules over the last decades; whereas only 5% of the 81 countries covered had fiscal rules in place in 1985, this share has increased to 15% in 1995 and 56% in 2012.

3.2 Identification: Determinants of Fiscal Rules

There are several empirical studies pointing to economic, political, and institutional determinants of fiscal institutions (e.g. IMF, 2009; Calderón and Schmidt-Hebbel, 2008; Elbadawi et al., 2011). In the present context, our goal is not to derive and estimate a comprehensive, well-specified model of the determinants of fiscal rules. Rather we aim at obtaining a small set of instrumental variables for fiscal rules, which are relevant and valid in the context of Equation (1).

Obviously, this rules out fiscal outcome variables such as the fiscal balance, which is one of our dependent variables, or control variables ($\boldsymbol{x}$) included in Equation (1) such as the debt-to-GDP ratio or GDP per capita. Given the lack of a choice theory on why governments introduce (strengthen) fiscal rules, we pursue an empirical search strategy to motivate our selection of instruments. Thereby, we confine ourselves to a set of institutional variables that are plausibly exogenous and have been argued and empirically shown to be related to fiscal rules. In particular, we consider government confidence, government ideology, government ideological range, government fragmentation, government stability, inflation targeting, and parliamentary dispersion. Table A1 in the Appendix gives a description of the variables and data sources.

Starting with a comprehensive model for fiscal rules including all variables, we proceed with a general-to-specific approach and eliminate sequentially insignificant variables according to their p-values.[3] Following the results from this approach, we choose three instruments for the stringency of fiscal rules: checks and balances (CB), government fragmentation (GF), and inflation targeting (IT).[4] Table 1 shows the regression results for the final set of variables.

– Table 1 –

The variables suggested by our empirical search strategy (and the sign of their coefficients) are backed by theoretical arguments. A tight system of political checks and balances (other than fiscal constraints) may be viewed

[3] We base our search strategy on the model with balanced budget rules (BR) as dependent variable; since the use of DR or GI yields essentially identical results, we use the same set of instruments for each of the three variables (BR, DR and GI).

[4] Government size and government stability also turned out to be robust determinants of fiscal rules, but their inclusion as instruments in the two-stage least squares estimation of Equation (1) leads to a rejection of instrument validity.

as implicit contract between governments and voters that reduces the need for fiscal rules (Debrun and Kumar, 2007). Political fragmentation typically leads to public spending pressures (Roubini and Sachs, 1989; Velasco, 2000; Volkerink and de Haan, 2001; Perotti and Kontopoulos, 2002; Besley and Case, 2003), creating incentives for voters and governments to establish or strengthen fiscal rules to countervail these pressures.

The finding that inflation targeting regimes are conducive to the existence of stringent fiscal rules has a strong theoretical foundation; it is consistent with a series of papers that show theoretically and provide evidence that inflation targeting works better when accompanied by fiscal discipline through fiscal rules (Beetsma and Bovenberg, 1997; Dixit and Lambertini, 2003; Castellani and Debrun, 2005; Combes et al., 2014). Accordingly, one would expect countries with inflation targeting regimes to have more stringent fiscal rules in place.

All three variables (CB, GF, IT) are highly significant for each type of fiscal rule (BR, DR, GI) and hence likely to serve as relevant instruments in Equation (1). Moreover, there is no strong reason to assume that a country's system of checks and balances or the fragmentation of its government are prone to a reverse causality issue; and the strict separation between monetary and fiscal policy in most countries makes it very unlikely that the presence of an inflation targeting regime is systematically (and directly) related to fiscal policy outcomes (through channels other than fiscal rules). We will consider this point further by testing for overidentifying restrictions and using alternative subsets of instruments in the robustness analysis.

4 Estimation Results

We next report the least squares (LS) and two-stage least squares (2SLS) panel data estimates of Equation (1), using as dependent variable the structural fiscal balance (Section 4.1) and the spreads on the interest rates of government bonds (Section 4.2), followed by a robustness analysis (Section 4.3). We then turn to the estimation of the effects of fiscal rules on output volatility in Section 4.4, using a cross-section version of Equation (1). A description of the variables used in the estimation and summary statistics are provided in Tables A1 and A2 in the Appendix.

4.1 Fiscal Rules and Fiscal Balances

The upper panel of Table 2 presents the LS and 2SLS estimates of the specification in Equation (1) for the structural fiscal balance without control variables. The lower panel shows the corresponding results including as standard controls the debt-to-GDP ratio along with real GDP growth and an indicator variable taking a value of one for election years. As outlined above, three variables are used as instruments for fiscal rules in the 2SLS estimation: checks and balances (CB), government fragmentation (GF), and inflation targeting (IT). All estimates in Table 2 are based on an unbalanced panel of 47 countries over the period 1985-2012 (785 observations), which is determined by data availability.

Notice first that for all specifications, both the LS and 2SLS estimates yield significant effects of the control variables with the expected sign. A high level of debt is associated with a lower structural fiscal balance, whereas high GDP growth has a positive effect. In election years fiscal performance is systematically worse, pointing to the relevance of political business cycles.

– Table 2 –

Turning to the effect of fiscal rules on the fiscal balance, several results are worth noting. For both specifications (with and without controls) and for all three types of fiscal rules (BR, DR, GI), it holds that: i) The Hausman test clearly rejects the null of exogeneity, necessitating the use of a 2SLS approach. ii) The 2SLS estimates are always larger than the LS estimates, a result that is consistent with endogeneity due to classical measurement error or negative reverse causality, where a deterioration of the fiscal balance triggers the introduction or strengthening of fiscal rules.[5] iii) The 2SLS estimates are all significant and point to a positive effect of fiscal rules on fiscal performance in terms of the fiscal balance. iv) Instrument validity is never rejected by the tests for overidentifying restrictions (OID); this is supportive to our choice of instruments and does not indicate the presence of correlation with unobserved variables affecting fiscal rules and the fiscal balance (such as voter tastes, ideology).

Also notice that the 2SLS estimates hardly change when the control variables are added, i.e, the instruments appear to produce reliable estimates

[5] If there is a simultaneous effect of the fiscal balance on the fiscal rule amounting to ρ, the partial covariance between the respective fiscal rule and the error term in Equation (1) has the sign of the expression $\rho/(1-\gamma\rho)$; assuming that $(1-\gamma\rho)$ is greater than zero, a downward bias of the LS estimates implies that ρ is negative.

even in the simple regression model (as it is also suggested by the insignificant OID tests). Instrument quality, judged by the F-statistic on excluding the instruments from the first-stage regression, is fine with values above 20. In sum, the evidence for a positive effect of fiscal rules on the fiscal balance is quite strong.

In terms of magnitude, note that the indices of fiscal rules range from 0 to 1. E.g., for balanced budget rules (BR), the estimates imply that a one standard deviation increase in BR (0.409) leads to an improvement of the fiscal balance by 1.493 percentage points or 0.436 standard deviations. The corresponding standardized (beta) coefficients of DR and GI amount to 0.400 and 0.336, respectively.

4.2 Fiscal Rules and Government Bond Spreads

Table 3 shows the LS and 2SLS estimates of Equation (1) using as dependent variable the spreads of short-run and long-run interest rates on government bonds relative to the US. In line with Iara and Wolff (2014), three control variables are included: the structural fiscal balance, the debt-to-GDP ratio, and a composite risk term, which is proxied by the (log of the) Chicago Board Options Exchange Market volatility index. The panels over the period 1985-2012, for which data on all variables is available, comprises 30 countries (short-run spreads) and 36 countries (long-run spreads), respectively.

Considering the results for the control variables firsts, for both short-run and long-run interest rates on government bonds, a higher fiscal balance (lower deficit) is associated with a smaller spread. For long-run spreads, the debt-to-GDP ratio is positive and significant as expected; this does not hold for short-run spreads, where its effect is insignificant or negative. The latter result is difficult to interpret; it could be due to sampling variation or by omitted determinants of short-run spreads related to the debt level. Finally, general risk measured by the volatility index drives up interest rate spreads, in particular in the short-run.

– Table 3 –

The negative effect of the budget balance on interest rate spreads reported in Table 3, together with the positive effect of fiscal rules on the fiscal balance obtained in Section 4.1 (Table 2), imply that fiscal rules indirectly lower interest rate spreads by improving the fiscal balance.

As to the direct effect of fiscal rules on interest rate spreads, operating trough channels other than the fiscal balance such as increased trust and credibility of fiscal policy, the following results are common to all types of fiscal rules: i) The Hausman tests show strong evidence for the endogeneity of fiscal rules, whereas the OID tests do not point to a problem regarding instrument validity; instrument quality is fine with F-statistics around 20 or larger. ii) The 2SLS estimates indicate a negative effect of fiscal rules on government bond interest rate spreads and are much larger in magnitude than the LS estimates. The fact that the LS estimates are upward biased (downward biased in magnitude) points to the relevance of measurement error and is consistent with endogeneity due to positive reserve causality. Hence, as in Section 4.1, these results can be interpreted as evidence that policy makers respond to downturns, i.e., an increase in interest rate spreads (a deterioration of the fiscal balance), by introducing or strengthening fiscal rules.

In terms of magnitude, the effect of fiscal rules is also economically significant; e.g., for balanced budget rules (BR), the estimates imply that a one standard deviation increase in BR (0.406) leads to a reduction in short-run (long-run) spreads by 3.887 (1.758) percentage points or 0.875 (0.678) standard deviations. The standardized coefficients of DR and GI are -0.736 and -0.634 (short-run) and -0.906 and -0.573 (long-run). Hence, in terms of beta coefficients, the effects on short-run and long-run spreads are of the same magnitude.

4.3 Robustness

We next turn to a robustness analysis of the effects of balanced budget rules (BR) and the general fiscal framework (GI) on the three outcome variables considered so far. The results for debt rules (DR) are very similar and not shown for the sake of brevity.

Table 4 reports the estimates of the baseline models in Tables 2 and 3, along with four variations. To ensure that our results are not driven by a few 'extreme' data points, we exclude i) outliers, defined as observations with standardized residuals greater than two, and ii) observations, where the (absolute value of the) dependent variable exceeds twice its standard deviation, i.e., 7% for fiscal balances, and 9% and 5% for short-run and long-run spreads, respectively. Overall, the estimates effects of fiscal rules become somewhat smaller in magnitude, but the precision of the estimates improves and the coefficients remain statistically significant in all specifications.

We next consider alternative identification strategies for the effects of fiscal rules. In the baseline specification, three instruments are used for fiscal rules: checks and balances (CB), government fragmentation (GF), and inflation targeting (IT). We re-estimate the baseline model, using two subsets of the instruments: i) inflation targeting (IT), and ii) the two institutional variables (CB, GF). Notice that inflation targeting is not only the instrument best motivated theoretically; it also turns out to be the strongest instrument empirically, showing by far the largest F-statistics in the first-stage regression. The estimated effects of fiscal rules, using IT as instrument, are very similar to those in the baseline model and all of them remain significant at 1%.

Using as instruments the two institutional variables (CB, GF) only, instrument quality becomes weaker and the results differ across the dependent variables. For the short-run interest rate spreads, all results hold up (though the estimates become less precise). For long-run interest rate spreads the coefficient of BR is rendered insignificant with a p-value of 0.113, the coefficient of GI remains significant at 10%; compared with the baseline model, these changes are due to less precise parameter estimates due to the weaker instruments and a reduction in the magnitude of the estimated effect.

For the fiscal balance, the outcome is similar. The coefficients of BR and GI become smaller and their standard errors larger, such that they are rendered insignificant with p-values of 0.217 and 0.132, respectively. Again, this appears to be a matter of instrument quality, as evident from the drop in the F-statistics relative to the baseline model. We address this issue by adding another institutional variable, government confidence (GC), as further instrument. This improves instrument quality and both BR and GI turn out significant at 1%. The drawback of this approach is that data on the variable GC is available for a much smaller number of countries and time periods, resulting in a sample of only 215 observations.[6]

Hence, with very few exceptions, which appear to be a matter of instrument quality, our results obtained so far hold up for different samples and different identification strategies: Stringent fiscal rules improve the fiscal balance and lower interest rate spreads on government bonds.

[6]We add that BR and GI do not become significant due to the change in the sample; also in the reduced sample, they would be insignificant without using GC as additional instrument. Apart from data availability, GC was not chosen as instrument in the first place, since – with inflation targeting included – it does not add to instrument quality.

4.4 Fiscal Rules, Fiscal Policy, and Output Volatility

As a final point, we consider the relation between fiscal rules, fiscal volatility, and output volatility. Output volatility (σ_Y) is measured as standard deviation of GDP per capita growth, fiscal policy volatility (σ_{FP}) as standard deviation of the growth of real government expenditures over the period 1985-2012.[7] Accordingly, we obtain a cross-sectional data set of 74 countries, where the variables are volatilities or averages over the period 1985-2012.

Fiscal Rules and Output Volatility
Relating output volatility to fiscal rules directly, the first column in Table 5 reports a weakly significant, negative effect of balanced budget rules (BR) on output volatility obtained by 2SLS estimation, using our standard set of instruments (CB, GF, IT). GDP per capita is included as control variable to account for the level of development and as a proxy for institutional quality. However, as shown in second column, once we add fiscal policy volatility to the model, which has been shown to be an important determinant of output volatility by Fatás and Mihov (2003), the variable (BR) becomes insignificant. This holds true for the other types of fiscal rules (DR, GI) as well, and also when the model is estimated by LS. Hence, we conclude that fiscal rules do not have a direct effect on output volatility, once fiscal policy volatility is controlled for.

As a consequence, we proceed with a specification relating output volatility to fiscal policy volatility. As argued by Fatás and Mihov (2003), fiscal policy volatility has to be considered potentially endogenous in such a specification; they use institutional variables (number of elections, political constraints, majoritarian/presidential system) as instruments. We pursue a similar approach here, using our measures of fiscal rules as instruments for fiscal policy volatility. The first-stage regression of fiscal volatility on fiscal rules is then informative of a possible indirect effect of fiscal rules on output volatility through fiscal policy volatility.

– Table 5 –

Fiscal Policy Volatility and Output Volatility

[7] We do not partial out cyclical movements in fiscal policy, since we are interested in the effects of fiscal volatility, stemming from all changes in the fiscal stance (related or unrelated to the cycle), but we will consider an alternative, cyclically adjusted measure of fiscal policy volatility below.

The third column in Table 5 shows the results using balanced budget rules as instrument. As expected we find a significant positive effect of fiscal policy volatility on output volatility. The fourth column re-runs this regression, using as alternative instruments our three institutional variables: checks and balances (CB), government fragmentation (GF), and inflation targeting (IT). Again we find a positive effect, confirming the results by Fatás and Mihov (2003) using different sets of instruments. With an elasticity of around one, also the magnitude of the estimated effect of fiscal policy volatility is in line with their findings.

When debt rules are used as instrument, we still find a positive coefficient for fiscal policy volatility, but due to the poor instrument quality (the F-statistic in the first-stage regression amounts to 0.4), it is rendered insignificant. Using the general framework (GI) as instrument (which is the strongest instrument in the present context with an F-statistic of 8.4), the effect of fiscal policy volatility turns out significant at 1% again.

The final column confirms these findings for an alternative measure of fiscal policy volatility, calculated as standard deviation of the residuals from a time series regression (for each country) of the growth of government expenditures on output growth (to partial out cyclical effects).[8] The results are very similar to those using as dependent variable the the 'gross' measure of fiscal policy volatility, which is not too surprising given the high correlation between the two variables (0.896).

Overall, it should be pointed out that instrument quality is unsatisfactory in the regressions in the upper panel of Table 5. However, taken together with the results from previous studies (Fatás and Mihov, 2003), we find the evidence for a positive effect of fiscal policy volatility on output volatility to be quite strong. We next consider whether fiscal rules have an indirect effect on output volatility through their (direct) effect on fiscal policy volatility.

Fiscal Rules and Fiscal Policy Volatility

The middle panel of Table 5 shows, for all specifications using fiscal rules as instrument for fiscal volatility (in the upper panel), the corresponding first-stage regressions of fiscal policy volatility on GDP per capita and the respective fiscal rule. All three fiscal rules show a negative coefficient, suggesting that more stringent fiscal rules are associated with lower fiscal policy

[8]Specifically, the equation is $\Delta \ln(G_{i,t}) = \alpha_i + \beta_i \Delta \ln(Y_{i,t}) + \gamma_i \ln(G_{i,t-1}) + \varepsilon_{i,t}$, where G denotes real government expenditures and Y is real GDP. It is estimated by 2SLS using three lags of output growth, i.e., $\Delta \ln(Y_{i,t-1})$, $\Delta \ln(Y_{i,t-2})$ and $\Delta \ln(Y_{i,t-3})$ as instruments for $\Delta \ln(Y_{i,t})$.

volatility, and hence also less output volatility. Balanced budget rules (BR) and the general framework (GI) turn out statistically significant as well, whereas the coefficient of DR is insignificant.

These findings of a negative indirect effect of fiscal rules on output volatility, materializing through a reduction in fiscal policy volatility, is consistent with the negative direct effect of fiscal rules on output volatility, which is rendered insignificant once fiscal policy volatility is accounted for (Table 5, upper panel, second column).

The regressions of fiscal policy volatility on fiscal rules in the middle panel are estimated by LS, which is the natural choice when they are viewed as first-stage regressions of the models for output volatility in the upper panel. In the following, we consider two-stage least squares estimates of fiscal policy volatility on fiscal rules to address potential endogeneity concerns, given that fiscal volatility is an outcome variable of fiscal policy (as are the fiscal balance and interest rate spreads in Sections 4.1 and 4.2).

The lower panel of Table 5 shows the 2SLS estimates using our standard instruments (CB, GF, IT). The results are close to the LS estimates in terms of statistical significance, whereas the effects of fiscal rules become larger in magnitude. However, the difference between LS and 2SLS estimates is not significant; in stark contrast to the models for fiscal balances and interest rate spreads, the Hausman test never rejects the null of exogeneity of fiscal rules. This is not implausible; compared with the other outcome variables considered, fiscal policy volatility is a much less reported and debated indicator of fiscal policy, making it unlikely that policy makers introduce or strengthen fiscal rules in response to changes in fiscal policy volatility.

Summing up, we find that stringent balanced budget rules and a stringent general fiscal framework have a dampening effect on output volatility, which materializes indirectly through a reduction of fiscal policy volatility.

5 Conclusions

This paper provides an empirical assessment of the effects of fiscal rules on macroeconomic outcomes (budget balance, interest rate spreads, and output volatility) for a sample of up to 79 countries over the period 1985-2012. For an improved measurement of fiscal rules we use indices of the stringency of balanced budget rules, debt rules, and of the general fiscal framework, which are based on partially ordered set theory and derived by Badinger and Reuter (2015). For identification of the effects of (endogenous) fiscal rules, we employ

a two-stage least squares procedure, using institutional variables (checks and balances, government fragmentation, inflation targeting) as instruments.

We find that countries with more stringent fiscal rules have higher fiscal balances and lower interest rate spreads on government bonds. Moreover, fiscal rules are negatively related to output volatility, where this effect is channeled through a reduction in fiscal policy volatility (which is confirmed to be an important determinant of output volatility). The institutional variables turn out as relevant instruments of satisfactory quality; tests for overidentifying restrictions indicate no problems with instrument validity.

The differences between the least squares and two-stage least squares estimates are sizable and statistically significant, pointing to the importance of addressing the endogeneity of fiscal rules in empirical studies on their effects. Our finding that the least squares estimates are downward biased (in magnitude) in all models is consistent with endogeneity due to classical measurement error or a reverse causality relationship, where fiscal rules are introduced or strengthened when fiscal performance deteriorates, e.g., when fiscal balances go down or interest rate spreads go up.

Overall, our results make a strong case for the use of fiscal rules to improve fiscal policy (and thereby macroeconomic) outcomes. To make this policy conclusion operational, more research is warranted to identify which features of fiscal rules are crucial and which ones are less relevant and can be dispensed with. Dissecting fiscal rules and their effects in such a way would provide important information on how to design effective fiscal rules, ensuring sustainable fiscal policy, low costs of government borrowing, and low output volatility, while at the same time allowing for the required flexibility to respond to large shocks.

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Appendix

Table A1: Variables and Data Sources

Variable	Description	Source
Balanced budget rule (BR)	POSET index of stringency of balanced budget rule	B/R
Checks and balances (CB)	Political Constraints - measure of the institutional constraints faced by authorities	WB, DPI
Debt/GDP	General government gross debt in percent of GDP	IMF, WEO
Debt rule (DR)	POSET index of stringency of debt rule	B/R
Election	1 in year with election of legislative, 0 otherwise	WB, DPI
Fiscal balance	General government structural balance, percent of potential GDP	IMF, WEO
Fiscal policy volatility (σ_{FP})	st.dev. of growth rate of government expenditures	IMF, WEO
GDP growth	Real GDP growth (Percentage change)	IMF, WEO
GDP per capita (GDPPC)	PPP Converted GDP Per Capita (Chain Series), at 2005 constant prices	PWT 8.1
General fiscal framework (GI)	POSET index of general fiscal framework	B/R
Government confidence (GC)	Popular confidence in government	World Values Survey
Government fragmentation (GF)	Rae (1971) fractionalisation index $1-\sum_{i=1}^{N} p_i^2$ where p_i is the seats share and N is number of government parties	Own calculations with WB, DPI
Government ideology	Degree of political conservatism, between 0 (left-wing) and 8 (rightwing)	Own calculations with WB, DPI
Government ideological range	Difference between the two extreme ideological scores of parties in coalition governments	Own calculations with WB, DPI
Government stability	Term length of governments	Own calculations with WB, DPI
Inflation targeting (IT)	1 if central bank operates with inflation targeting	Hammond (2012)
Long-run spread	Interest rate on government bond relative to US	IMF, IFS
Output volatility (σ_Y)	st.dev. of growth rate of GDP per capita	PWT 8.1
Parliamentary dispersion	Dispersion of political parties: sum of squared seat fractions of parties in parliament	Own calculations with WB, DPI
Risk	Chicago Board Options Exchange (CBOE) Options and Futures Volatility Index	CBOE
Short-run spread	Interest rate on treasury bills relative to US	IMF, IFS

Notes: Abbreviations: IMF ... International Monetary Fund, WEO ... World Economic Outlook, IFS ... International Financial Statistics, PWT ... Penn World Tables, WB ... World Bank, DPI ... Database of Political Institutions, B/R ... Badinger and Reuter (2015).

Table A2: Summary Statistics

Variable	Mean	Median	Std.Dev.	Min	Max
Panel data					
Balanced budget rule (BR)	0.300	0.001	0.409	0.000	1.000
Checks and balances (CB)	4.046	4.000	1.066	2.000	8.000
Debt/GDP	57.150	50.859	33.511	3.894	236.564
Debt rule (DR)	0.188	0.001	0.364	0.000	1.000
Election	0.280	0.000	0.449	0.000	1.000
Fiscal balance	−2.618	−2.513	3.423	−19.106	8.189
GDP growth	2.792	2.930	3.151	−17.729	12.113
General fiscal framework (GI)	0.299	0.331	0.311	0.000	0.989
Government fragmentation (GF)	0.796	0.805	0.101	0.241	0.986
Inflation targeting (IT)	0.321	0.000	0.467	0.000	1.000
Long-run spread	0.927	0.375	2.593	−4.698	20.696
Risk	21.349	21.680	39.450	11.460	7.389
Short-run spread	2.635	1.557	4.444	−5.139	21.092
Cross-section					
Balanced budget rule (BR)	0.164	0.004	0.225	0.000	0.800
Checks and balances (CB)	3.396	3.457	1.093	1.000	6.036
Debt rule (DR)	0.094	0.001	0.169	0.000	0.666
Fiscal policy volatility (σ_{FP})	0.083	0.061	0.070	0.013	0.356
GDP per capita (GDPPC) (1,000)	14.255	10.280	12.692	0.531	57.502
General fiscal framework (GI)	0.157	0.142	0.155	0.000	0.585
Government fragmentation (GF)	0.675	0.737	0.178	0.148	0.909
Inflation targeting (IT)	0.136	0.000	0.249	0.000	0.857
Output volatility (σ_Y)	0.044	0.037	0.037	0.014	0.313

Notes: Panel data statistics based on the 785 observations in Table 2, except for the long-run spread and risk (604 observations, see Table 3) and the short-run spread (477 observations, see Table 3). Statistics in lower section based on cross-section of 74 countries (see Table 5).

Table 1: Determinants of Fiscal Rules: LS Estimates

	BR	BR	BR	BR	DR	GI
Checks and balances (CB)	0.013**			−0.019***	−0.026***	−0.018***
	(0.005)			(0.007)	(0.006)	(0.006)
Gov. fragmentation (GF)		0.163***		0.134***	0.202***	0.118***
		(0.020)		(0.028)	(0.028)	(0.023)
Inflation targeting (IT)			0.324***	0.317***	0.242***	0.356***
			(0.025)	(0.026)	(0.022)	(0.018)
R^2	0.481	0.488	0.534	0.537	0.494	0.499
SEE	0.250	0.248	0.237	0.236	0.195	0.190

Notes: All specifications include country-fixed effects and are estimated for an unbalanced panel of 71 countries over the period 1985-2012 (1922 observations). Heteroskedasticity-robust standard errors in parentheses. *, **, *** indicate significance at 10, 5, and 1 percent. Dependent variables: $BR\ldots$ balanced budget rule, $DR\ldots$ debt rule, $GI\ldots$ general fiscal framework.

Table 2: Fiscal Rules and Fiscal Balances: LS and 2SLS Estimates

	BR		DR		GI	
Simple model	LS	2SLS	LS	2SLS	LS	2SLS
Fiscal rule	1.282***	3.520***	1.218***	3.818***	1.421***	3.595***
	(0.321)	(1.158)	(0.308)	(1.358)	(0.399)	(1.154)
Hausman		(0.032)		(0.029)		(0.033)
OID		(0.528)		(0.757)		(0.778)
IQual		24.313		31.318		20.504
R^2	0.546	0.520	0.543	0.517	0.545	0.527
SEE	2.378	2.457	2.388	2.46	2.383	2.432
	BR		DR		GI	
With controls	LS	2SLS	LS	2SLS	LS	2SLS
Fiscal rule	1.201***	3.652***	0.966***	3.720***	1.584***	3.697***
	(0.292)	(1.064)	(0.289)	(1.265)	(0.354)	(1.037)
Debt/GDP	−0.027***	−0.025***	−0.027***	−0.022***	−0.029***	−0.030***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)
GDP growth	0.231***	0.234***	0.230***	0.231***	0.232***	0.234***
	(0.033)	(0.034)	(0.033)	(0.034)	(0.033)	(0.034)
Election	−0.314*	−0.322*	−0.317*	−0.338*	−0.311*	−0.312*
	(0.181)	(0.189)	(0.182)	(0.190)	(0.180)	(0.184)
Hausman		(0.009)		(0.012)		(0.021)
OID		(0.488)		(0.308)		(0.584)
IQual		24.317		33.213		39.358
R^2	0.610	0.578	0.605	0.576	0.611	0.595
SEE	2.210	2.311	2.224	2.310	2.206	2.256

Notes: Dependent variable is the structural fiscal balance as a share of potential GDP in %. All specifications include country-fixed effects and are estimated for an unbalanced panel of 47 countries over the period 1985-2012 (785 observations). Heteroskedasticity-robust standard errors in parentheses. *, **, *** indicate significance at 10, 5, and 1 percent. 2SLS estimates use checks and balances (CB), government fragmentation (GF), and inflation targeting (IT) as instruments for the respective fiscal rule; p-values for heteroskedasticity-robust Hausman test and heteroskedasticity-robust test for overidentifying restrictions (OID) in parenthesis. IQual denotes instrument quality and reports the F-statistic of excluding the instruments from the first-stage regression. The R^2 is calculated as squared correlation between actual and predicted values.

Table 3: Fiscal Rules and Interest Rate Spreads: LS and 2SLS Estimates

	BR		*DR*		*GI*	
Short-run spread	LS	2SLS	LS	2SLS	LS	2SLS
Fiscal rule	-1.426^{***}	-9.566^{***}	-1.985^{***}	-8.457^{***}	-0.964^{*}	-9.261^{***}
	(0.428)	(2.065)	(0.688)	(1.976)	(0.532)	(2.033)
Fiscal balance	-0.448^{***}	-0.318^{***}	-0.452^{***}	-0.392^{***}	-0.454^{***}	-0.312^{***}
	(0.068)	(0.081)	(0.068)	(0.071)	(0.069)	(0.080)
Debt/GDP	-0.029^{***}	-0.044^{***}	-0.029^{***}	-0.040^{***}	-0.026^{**}	-0.023^{*}
	(0.010)	(0.013)	(0.010)	(0.012)	(0.010)	(0.012)
Risk	0.867^{**}	0.955^{*}	0.912^{**}	1.108^{**}	0.874^{**}	1.069^{**}
	(0.397)	(0.500)	(0.394)	(0.445)	(0.401)	(0.493)
Hausman		(0.000)		(0.000)		(0.000)
OID		(0.928)		(0.060)		(0.258)
IQual		19.380		28.755		26.522
R^2	0.599	0.439	0.601	0.517	0.594	0.456
SEE	2.918	3.729	2.908	3.291	2.937	3.566
	BR		*DR*		*GI*	
Long-run spread	LS	2SLS	LS	2SLS	LS	2SLS
Fiscal rule	-0.847^{***}	-4.353^{***}	-0.636^{**}	-6.606^{***}	-0.993^{***}	-4.750^{***}
	(0.251)	(0.956)	(0.312)	(1.726)	(0.284)	(1.064)
Fiscal balance	-0.122^{**}	-0.060	-0.133^{**}	-0.093	-0.121^{**}	-0.060
	(0.056)	(0.058)	(0.056)	(0.059)	(0.057)	(0.057)
Debt/GDP	0.032^{***}	0.028^{***}	0.032^{***}	0.023^{*}	0.033^{***}	0.036^{***}
	(0.010)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Risk	0.328	0.445^{*}	0.303	0.325	0.329	0.439^{*}
	(0.206)	(0.238)	(0.205)	(0.247)	(0.206)	(0.234)
Hausman		(0.000)		(0.000)		(0.000)
OID		(0.201)		(0.261)		(0.174)
IQual		30.417		21.545		38.159
R^2	0.559	0.467	0.555	0.412	0.559	0.482
SEE	1.780	2.016	1.790	2.168	1.780	1.972

Notes: Dependent variable is short-run interest rate spread (upper panel) and long-run interest rate spread on government bonds (lower panel). All specifications include country-fixed effects; upper panel: 30 countries, 1985-2012 (477 observations); lower panel: 36 countries, 1985-2012 (604 observations). Heteroskedasticity-robust standard errors in parentheses. *, **, *** indicate significance at 10, 5, and 1 percent. 2SLS estimates use checks and balances (CB), government fragmentation (GF), and inflation targeting (IT) as instruments for the respective fiscal rule; p-values for heteroskedasticity-robust Hausman test and heteroskedasticity-robust test for overidentifying restrictions (OID) in parenthesis. IQual denotes instrument quality and reports the F-statistic of excluding the instruments from the first-stage regression. The R^2 is calculated as squared correlation between actual and predicted values.

Table 4: Robustness

Fiscal balance	BR	IQual	OID	obs	GI	IQual	OID	obs
Baseline (see Table 2)	3.652*** (1.064)	24.317	(0.488)	785	3.697*** (1.037)	39.358	(0.584)	785
Excluding outliers	2.877*** (0.878)	21.83	(0.981)	748	2.912*** (0.858)	34.576	(0.905)	746
|Fiscal balance| $< 7\%$	2.974*** (0.918)	19.817	(0.499)	705	2.784*** (0.839)	33.232	(0.271)	705
IV: IT	3.951*** (1.158)	69.205		785	3.966*** (1.118)	98.564		785
IV: CB, GF	2.297 (1.861)	8.243	(0.286)	785	2.554 (1.695)	14.509	(0.416)	785
IV: CB, GF, GC	1.409** (0.572)	20.695	(0.540)	215	1.491** (0.676)	26.014	(0.372)	215
Short-run spread	BR				GI			
Baseline (see Table 3)	-9.566*** (2.065)	19.380	(0.928)	477	-9.261*** (2.033)	26.522	(0.258)	477
Excluding outliers	-7.829*** (1.692)	20.853	(0.782)	465	-9.240*** (1.757)	25.815	(0.248)	457
|Short-run spread| $< 9\%$	-4.576*** (1.191)	13.221	(0.804)	437	-4.257*** (1.332)	24.026	(0.349)	437
IV: IT	-9.864*** (2.446)	45.887		477	-10.758*** (2.600)	53.614		477
IV: CB, GF	-8.661*** (2.860)	10.602	(0.928)	477	-6.950*** (2.134)	21.295	(0.322)	477
Long-run spread	BR				GI			
Baseline (see Table 3)	-4.353*** (0.956)	30.417	(0.201)	604	-4.750*** (1.064)	38.159	(0.174)	604
Excluding outliers	-3.635*** (0.666)	26.378	(0.800)	575	-3.876*** (0.761)	33.656	(0.778)	575
|Long-run spread| $< 5\%$	-2.352*** (0.574)	21.421	(0.263)	569	-2.407*** (0.608)	30.077	(0.313)	569
IV: IT	-5.215*** (0.971)	69.368		604	-5.708*** (1.119)	176.701		604
IV: CB, GF	-2.389 (1.508)	15.643	(0.505)	604	-2.668* (1.489)	21.157	(0.674)	604

Notes: Dependent variable is the fiscal balance (upper panel), the short-run interest rate spread (middle panel) and the long-run interest rate spread (lower panel). Heteroskedasticity-robust standard errors in parentheses. *, **, *** indicate significance at 10, 5, and 1 percent. p-values for heteroskedasticity-robust test for overidentifying restrictions (OID) in parenthesis. IQual denotes instrument quality and reports the F-statistic of excluding the instruments from the first-stage regression. For each dependent variable, five estimation results are reported: i) Baseline estimates from Tables 2 and 3; ii) Estimates based on sample excluding outliers, defined as observations with a standardized residual larger than two. iii) Estimates based on sample excluding observations where the (absolute) value of the dependent variable exceeds twice its standard deviation, i.e., 7% for fiscal balance, 9% for short-run spread, 5% for long-run spread; iv) Only inflation targeting (IT) is used as instrument; v) Only checks and balances (CB) and government fragmentation (GF) (and government confidence (GC)) are used as instruments.

Table 5: Fiscal Rules, Fiscal Volatility, and Output Volatility

	BR	BR	BR	CB, GF, IT	DR	GI	GI
Dependent variable is output volatility ($\ln \sigma_Y$), 2SLS estimates							
$\ln(\sigma_{FP})$		0.454^{***}	1.083^{**}	0.789^{**}	1.229	0.956^{***}	1.283^{***}
		(0.121)	(0.533)	(0.312)	(1.349)	(0.285)	(0.428)
Fiscal rule	-1.493^{*}	-0.534					
	(0.837)	(0.661)					
ln GDPPC	-0.057	0.072	0.294	0.176	0.352	0.243^{**}	0.262^{*}
	(0.067)	(0.061)	(0.215)	(0.130)	(0.552)	(0.120)	(0.147)
Hausman	(0.189)	(0.731)	(0.168)	(0.296)	(0.494)	(0.034)	(0.013)
OID	(0.480)	(0.500)		(0.503)			
IQual	3.267	2.521	3.035	2.459	0.421	8.367	5.309
R^2	0.136	0.409	0.367	0.384	0.360	0.374	0.386
SEE	0.523	0.412	0.533	0.445	0.589	0.490	0.555
Dependent variable is fiscal policy volatility ($\ln \sigma_{FP}$), first-stage regressions (LS)							
Fiscal rule			-0.537^{*}		-0.261	-1.354^{***}	-1.008^{**}
			(0.287)		(0.314)	(0.440)	(0.424)
ln GDPPC			-0.371^{***}		-0.394^{***}	-0.319^{***}	-0.252^{***}
			(0.050)		(0.047)	(0.054)	(0.052)
R^2			0.144		0.118	0.185	0.182
SEE			0.561		0.571	0.542	0.507
Dependent variable is fiscal policy volatility ($\ln \sigma_{FP}$), 2SLS estimates							
Fiscal rule			-2.040^{**}		-2.417	-3.772^{**}	-2.946^{*}
			(0.935)		(1.540)	(1.519)	(1.571)
ln GDPPC			-0.288^{***}		-0.344^{***}	-0.174	-0.136
			(0.080)		(0.065)	(0.113)	(0.110)
Hausman			(0.042)		(0.023)	(0.050)	(0.686)
OID			(0.358)		(0.520)	(0.771)	(0.136)
IQual			3.266		3.294	2.864	2.864
R^2			0.167		0.106	0.225	0.225
SEE			0.648		0.677	0.636	0.572

Notes: All specifications are based on a cross-section of 74 countries and include a constant. Heteroskedasticity-robust standard errors in parentheses. *, **, *** indicate significance at 10, 5, and 1 percent. 2SLS estimates using as instrument for fiscal volatility the variable given in the first line of the table, i.e., the respective fiscal rule (BR, DR, GI) or – in the fourth column – the institutional variables (CB, GF, IT). The last column in upper panel uses as dependent variable a cyclically adjusted measure of fiscal policy volatility (see page 14). 2SLS estimates in lower panel use CB, GF, and IT as instruments for the respective fiscal rule; p-values for heteroskedasticity-robust Hausman test and test for overidentifying restrictions (OID) in parentheses. IQual denotes instrument quality and reports the F-statistic of excluding the instruments from the first-stage regression. The R^2 is calculated as squared correlation between actual and predicted values.