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ON THE DESIGN OF STABILISING FISCAL RULES

CONTENTS

ABBREVIATIONS

CAB – cyclically adjusted budget balance
dep. var. – dependent variable
EC – European Commission
EU – European Union
EU28 countries – 28 EU Member States (historical data are calculated consistently with the current EU membership)
GDP – gross domestic product
GMM – generalised method of moments
IMF – International Monetary Fund
OECD – Organisation for Economic Cooperation and Development
POSET – partially ordered set
SGP – Stability and Growth Pact
2SLS – 2-stage least squares
SW – Sanderson–Windmeijer

ABSTRACT

Utilising data of the EU28 Member States for the period 1996–2015, this paper confirms the findings of previous studies that the stipulation of fiscal rules reduces fiscal volatility and consequently contributes to macroeconomic stability. Yet, we document that this result only holds for rules which are designed to be unaffected by the current state of the business cycle, i.e. which are "a-cyclical". Those can, e.g. be budget balance rules that set ceilings in cyclically adjusted terms or expenditure rules that set a limit relative to potential instead of current output. Furthermore, the stringency of fiscal rules amplifies their stabilising effect. Actual year-to-year compliance with fiscal rules seems to play no systematic role, such that effects of the rules can be observed even if they are not complied with year-to-year. Overall, our paper suggests that strong, properly designed numerical rules act as an anchor for fiscal policy makers and contribute to more stable discretionary fiscal policy.

Keywords: fiscal rules, fiscal policy volatility, panel data, compliance

JEL codes: C23, E62, E32, H60

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1. INTRODUCTION

The recent sovereign debt crisis was triggered by concerns about the sustainability of public debt in a number of euro area Member States. Supranational fiscal rules in the euro area (laid out in the SGP) appeared insufficient to ensure sustainable fiscal policies before the crisis. This reinforced calls for imposing stricter political constraints on fiscal policy. In 2012, EU Member States agreed on the Fiscal Compact.[1] As a result, many EU countries introduced more stringent numerical fiscal rules and incorporated them into their statutory legislation, including, in some cases, through constitutional amendments. While only seven EU countries had a budget balance, expenditure or debt rule in place in the mid-1990s, this number rose to 25 by 2015. This surge has also been accompanied by a considerable increase in the strength of the rules and fiscal frameworks (IMF (2017)).

The stipulation of numerical constraints on fiscal policy (numerical fiscal rules) usually aims at counteracting the widely recognised deficit bias of governments and limiting the accumulation of a large public debt.[2] While the positive effect of stipulating fiscal rules on the fiscal discipline has been well documented in empirical studies[3], the stabilising effects are not straightforward. On the one hand, explicit numerical restrictions should reduce the uncertainty and volatility of the conduct of discretionary fiscal policy. If this restricts ill-timed or erratic discretionary fiscal policy, which might exacerbate swings in output growth, it increases macroeconomic stability. On the other hand, rules may limit the capacity to use discretionary fiscal policy tools for smoothing out business cycle fluctuations and therefore increase instability. Which of these two effects prevails is *a priori* unclear.

Overall, there already exists some evidence that fiscal constraints dampen the amplitude of business cycles through their stabilising effect on fiscal policy. However, to the best of our knowledge, there has been no discussion of whether these effects depend on certain properties of fiscal rules or actual compliance with them. If the effects of rules depend on their ability to constrain fiscal policy and keep it within the limits set out by them, the rules that are actually complied with year-to-year should be associated with a stronger effect. However, the rules can also act as kind of a benchmark or anchor for fiscal policy which reduces uncertainty and prevents long-lasting deviations from the limits set by the rules. In that case the rules might still have an effect even if they are not complied with year-to-year, and other features of the rules might come into focus. We intend to fill this gap in the literature with this paper by investigating whether and how volatility of fiscal policy is affected by existence and design of fiscal rules and compliance with them.

Our study is related to several streams of literature that analyse the links between fiscal policy volatility, macroeconomic stability, national fiscal rules and compliance with them. Two papers, which we follow methodologically, are the seminal study by Fatas and Mihov (2006) and a more recent one by Badinger and Reuter (2017). The former study demonstrates that fiscal constraints reduce the use of fiscal discretion leading to less volatile output growth. The study by Badinger and Reuter (2017) also confirms the dampening effect of fiscal rules on fiscal policy volatility, particularly if

[1] The Treaty on Stability, Coordination and Governance in the Economic and Monetary Union.
[2] For the definition of national fiscal rules, their rationale, a brief historical overview of the earliest rules as well as basic properties of an "ideal" rule, see the seminal study by Kopits and Symansky (1998). Wren-Lewis (2011) presents a more recent overview of the literature on the deficit bias of governments and politicians.
[3] See, e.g. Section III of IMF (2009) for the overview of the empirical evidence on the impact of fiscal rules.

rules are embedded in a more stringent fiscal framework, e.g. by strong legislative support, broader coverage or formal enforcement procedures. However, our paper goes beyond the existing literature by i) employing panel data and thus taking within-country time variation into account (similar to Sacchi and Salotti (2015)), ii) taking design properties of fiscal rules into account, and iii) investigating if actual compliance with rules alter their effect on volatility of fiscal policy. In the sense of the latter contribution to the literature, our paper is most closely related to the study by Reuter (2015) that looks at the effect of compliance with numerical fiscal rules and finds evidence that even if rules are not always adhered to they still help to steer fiscal policy variables towards their numerical limits.

We employ panel data for the EU28 countries that share a similar institutional fiscal environment shaped by the EU common fiscal governance framework over the period 1996–2015. In our econometric specification we regress the standard deviation of the discretionary fiscal policy shock (measure of fiscal policy stability) on alternative measures of fiscal rules. We account for heterogeneity in rule design by differentiating between budget balance rules that are defined in cyclically adjusted and nominal terms as well as expenditure rules setting ceilings that are independent of the current position in the business cycle. In order to investigate the effect of compliance with the rules, we include an interaction of the fiscal rule variable with a variable that accounts for compliance with it. We check the robustness of our estimates with respect to expanding the sample by including data of non-EU OECD countries as well as employing alternative time windows and alternative indicators of fiscal rules that account for their stringency. Finally, after establishing the relationship between the rules and fiscal policy volatility we investigate whether fiscal rules contribute to macroeconomic stability (directly or indirectly by lowering fiscal volatility).

The main findings of our study can be summarised as follows. We confirm that fiscal rules are effective means to limit fiscal policy volatility. In particular, the effect can be observed for "a-cyclical" rules, i.e. budget balance rules that set limits in cyclically adjusted terms and expenditure rules that restrict expenditure growth relative to potential GDP. Furthermore, the stabilising effect is stronger for more stringent rules. However, actual compliance with rules is not found to be significant. This might suggest that appropriately designed, stringent rules act as a benchmark for fiscal policy makers and the public. Thus, the rules seem to contribute to a more anchored and predictable fiscal policy even if they are not complied with year-to-year. Furthermore, we document that less volatile discretionary fiscal policy indeed improves macroeconomic stability. To this end, our conclusions support the view that rules, even if they are not adhered to year-to-year, can be effective in lowering fiscal volatility and hence contribute to macroeconomic stability.

The remainder of the paper is structured as follows. Section 2 summarises evidence from three streams of the related literature. Section 3 describes the methodology and the data employed in this study as well as the construction of the measure of fiscal policy shock. Section 4 gives an overview of national fiscal rules in the EU28 countries, examines their properties as well as assesses the compliance with the respective rules. Section 5 provides the estimation results using different measures of fiscal volatility. It also uncovers the effect of various rule characteristics as well as actual compliance with fiscal rules and checks the robustness of the baseline estimates. Finally, Section 6 concludes.

2. EVIDENCE FROM THE EMPIRICAL LITERATURE

From a theoretical point of view macroeconomic policy effects of fiscal rules are not straightforward. On the one hand, restrictions should limit volatility in the conduct of discretionary fiscal policy and thereby output volatility. On the other hand, rules might also limit the capacity to use discretionary fiscal policy for smoothing out business cycle fluctuations. The existing empirical evidence seems to lean in favour of the former effect of fiscal rules.

Using a large cross section of countries, Fatas and Mihov (2003) argue that the presence of political constraints accounts for a large portion of the cross-country variation in the use of fiscal policy. Furthermore, they show that the aggressive use of discretionary fiscal policy amplifies business cycle fluctuations. Similarly, Fatas and Mihov (2006) find that fiscal policy restrictions are effective means of reducing policy volatility in the US states that in turn contributes to macroeconomic stability. They show that the effect of rules on output stability is intermediated by less aggressive use of discretionary fiscal policy. The two more recent papers by Sacchi and Salotti (2015) and Badinger and Reuter (2017) investigate the effect of fiscal rules focusing on two alternative channels. Sacchi and Salotti (2015) argue that fiscal rules may render fiscal volatility less destabilising if fiscal shocks are procyclical, so that the presence of fiscal rules reduces the destabilising procyclicality in the conduct of discretionary fiscal policy. They find empirical evidence for this effect and show that budget balance rules are more efficient than other types of rules in reducing procyclicality. Badinger and Reuter (2017) argue that there is an indirect negative relation between fiscal rules and output volatility via the rules' stabilising effect on fiscal policy volatility (similarly as in Fatas and Mihov (2003; 2006)). Furthermore, more stringent fiscal rules that have strong legislative support, broader coverage and formal enforcement procedure in place appear to be more efficient in reducing fiscal policy volatility than less rigorous rules.

While the literature on the general effects of the stipulation of fiscal rules is quite large, there are only few studies looking at the design features of fiscal rules and even fewer looking at actual compliance with them. One of the first comprehensive studies that investigates compliance with fiscal rules is Reuter (2015). The paper looks at 23 fiscal rules, enacted in 11 EU countries from 1994 to 2012. It shows that even if rules are not complied with they help to steer fiscal policy variables towards their numerical limits. Fiscal rules seem to act as a benchmark for both fiscal authorities and the general public. Cordes et al. (2015) show that countries comply with expenditure rules more often than with budget balance rules, particularly if they cover a part of public finances that is under direct government control and if the rules are enshrined into legislation.

Reuter (2017) looks at the causes of non-compliance with national fiscal rules in 20 EU countries from 1995 to 2015. The results indicate that macroeconomic factors are irrelevant in explaining adherence to fiscal rules, while some political factors, like government fragmentation or decentralisation, turn out to be significant. In a country-specific environment, Delgado-Téllez et al. (2017) analyse determinants of non-compliance with Spanish regional fiscal deficit targets over the period 2002–2015. They show that the strength of fiscal rules in Spanish regions does not have an impact on the frequency of non-compliance or at least it is not robust across different estimation procedures.

3. ESTIMATION FRAMEWORK

3.1 Fiscal rules and fiscal policy volatility

Following Fatas and Mihov (2006) and Badinger and Reuter (2017), we estimate the effect of stipulating fiscal rules on the volatility of discretionary fiscal policy:

$$\widehat{\sigma_{i,t}^{\varepsilon^{discr.fp}}} = Z'_{i,t}\,\partial + \alpha_1 FR_{i,t} + \mu_i + \omega_{i,t} \quad (1)$$

where $\sigma_{i,t}^{\varepsilon^{discr.fp}}$ is fiscal policy volatility measured as the standard deviation of discretionary shocks in one of four different fiscal aggregates: primary expenditure, public consumption, the sum of public consumption and public investment and primary balance. The calculation of the discretionary shocks is described in detail later in this section. $Z'_{i,t}$ is a vector of control variables with the respective coefficient ∂. μ_i denotes country-fixed effects and $\omega_{i,t}$ – the idiosyncratic error term. $FR_{i,t}$ is a measure of fiscal rules.

Estimations are based on data of the EU28 countries, covering the period 1996–2015. The sample is split into four non-overlapping 5-year periods: 1996–2000, 2001–2005, 2006–2010 and 2011–2015 in total comprising 110 observations. As a robustness check we test the sensitivity of our results with respect to the length of these time windows. Our sample is restricted to 1996–2015 as data availability for earlier years is low, particularly for the Member States that joined the EU in 2004 or later. Furthermore, also the number of fiscal rules that were in force in the early 1990s is small. In our robustness checks we also augment our dataset with non-EU OECD countries[4] which gives us 45 additional observations at the cost of using a more heterogeneous country sample.

We consider two different types of fiscal rules: budget balance rules that set restrictions on the level of fiscal balances either in nominal or cyclically adjusted terms; and expenditure rules aimed at keeping the expenditure-to-GDP ratio below a certain threshold or restricting changes in government expenditure. We estimate equation (1) for each type of rule separately.

As in Fatas and Mihov (2006) and Badinger and Reuter (2017), we employ various measures of fiscal rules. First, we include the share of years within each 5-year period in which a country had a fiscal rule in place.[5] In addition, to account for the heterogeneity of fiscal rules as well as to ensure robustness of our estimates we use measures of the stringency of fiscal rules based on the POSET theory (calculated by Badinger and Reuter (2015)) as well as the IMF fiscal rules index (with the methodology laid out in Schaechter et al. (2012)).

Following our baseline estimations described above, we also explore whether the design of fiscal rules, specifically if they have "a-cyclical" properties, matters. Therefore, we analyse the sign and significance of the following interaction terms:

a) For budget balance rules: the share of years in which the rule is set in *cyclically adjusted* or *structural terms*. The rules based on basic nominal variables may have a

[4] These countries are: Australia, Canada, Chile, Iceland, Israel, Japan, Mexico, New Zealand, Norway, Korea, Switzerland, Turkey and the US.

[5] For example, if a country has a fiscal rule in force in two out of five years, the variable takes the value of 0.4.

destabilising effect on fiscal policies due to ill-timed binding constraints. However, cyclically adjusted variables should allow the full operation of automatic stabilizers and deviations of nominal balances from targeted levels at different stages of the business cycle.

b) For expenditure rules: the indicator of whether the limit set by the rule partials out the current state in the business cycle, e.g. by relating expenditures to developments in *potential output* opposed to nominal output or other measures. Expenditure rules that base their limit, e.g. only on nominal output (growth), may turn policy destabilising. When the economy is booming, such a rule would provide extra room for additional spending and the contrary would be the case during recessions.

Setting budget balance ceilings in cyclically adjusted terms and/or tying budget expenditure to potential output could prevent procyclical behaviour and might therefore contribute to policy stabilisation.

Next, we include interactions with a compliance variable to explore the impact of compliance with fiscal rules on their effect on fiscal volatility. Within each 5-year period the variable is equal to the number of years in which the rule was adhered to over the number of years the rule was in force.[6] For budget balance rules we also investigate whether the distance between the realised value and the numerical constraint has any influence on the fiscal policy volatility.

There might be concerns that fiscal rules are endogenous to fiscal conditions if governments introduce them inspired by fiscal performance. In a cross-section setting reverse causality could be addressed by instrumenting fiscal rules using institutional or political variables, such as the nature of the political system and monetary policy setup. However, in a panel framework this gets more complicated due to the lack of time variation in such instruments, particularly in a panel as ours where the time dimension is represented by time windows. Still, we tried employing variables (government fragmentation, checks and balances and inflation targeting) identified as fiscal rules determinants by Badinger and Reuter (2017) in their broad panel of 71 countries. However, in our study they turn out to be uncorrelated with fiscal rules as we use a much more homogeneous group of countries and a more limited time span further divided into 5-year time windows.

Importantly, Badinger and Reuter (2017) show that the Hausman test does not reject the null hypothesis of exogeneity of fiscal rules when these are used as determinants of fiscal volatility. They argue that compared with fiscal balances, volatility of discretionary fiscal policy is a much less reported and debated indicator, making it unlikely that governments introduce or strengthen fiscal rules in response to changes in fiscal policy volatility. Similarly, in a comprehensive study of fiscal rules and their effect on fiscal balances, Debrun et al. (2008) reveal that the risk of reverse causality between fiscal rules and fiscal discipline is relatively small. They estimate fiscal reaction functions using least squares and instrumental variable approaches and find almost identical magnitudes of the impact of fiscal rules. Therefore, we proceed without instrumenting fiscal rules while acknowledging that endogeneity may still be relevant in the context of our study and represents an avenue for future research.

[6] If a rule was in force in all five years and was adhered to in three years out of the five, the compliance variable takes the value of 0.6.

Following Fatas and Mihov (2006), we include the following control variables: GDP per capita, population and dependency ratio. In addition, we capture institutional characteristics by country fixed effects and use a government fragmentation index, calculated as the sum of the squared seat shares of the parties in government.[7]

3.2 Fiscal rules and output volatility

Finally, we investigate whether fiscal rules contribute to macroeconomic stability in a direct or indirect way. To this end, we estimate the following regression:

$$\ln(\sigma_{i,t}^{\Delta GDP\ pc}) = \beta_1 \sigma_{i,t}^{\widehat{\varepsilon^{discr.fp}}} + \beta_2 FR_{i,t} + W'_{i,t}\,\theta + \eta_i + \vartheta_{i,t} \qquad (2)$$

where vector $W_{i,t}$ is comprised of the control variables, which have been identified as determinants of output volatility in the previous literature: government size[8], calculated as primary expenditure ratio to GDP (emphasised by Galí (1994), Fatas and Mihov (2001) and Debrun et al. (2008) among others), log of real GDP per capita[9] (see, e.g. Acemoglu and Zilibotti (1997) and Greenwood and Jovanovic (1990)) and trade openness[10], expressed by the sum of exports and imports relative to GDP (Rodrik (1998), Easterly et al. (2001) as well as di Giovanni and Levchenko (2009)). We use average values of these variables over the corresponding time windows. As explained in detail in Rodrik (1998), government size might be affected by our dependent variable – output volatility. Thus, government size needs to be treated as endogenous. Following the existing literature (e.g. Badinger (2009), Sacchi and Salotti (2015)), 5-year average values of the following variables are used as instruments for government size: log of the total population, dependency ratio and urbanisation rate.

First, in order to assess whether there is a direct relation between fiscal restrictions and output volatility, we estimate equation (2) by least squares and including *FR* directly in the regression. Then, to assess the presence of only an indirect effect, we estimate equation (2) using a 2SLS procedure, where we exclude FR from the main equation and use it instead as an instrument for fiscal volatility among the other above-mentioned determinants.[11]

Table A1 in the Appendix gives an overview of the variables used in our analysis and their sources. Table A2 presents the corresponding descriptive statistics.

3.3 Estimation of fiscal policy volatility

We do not deviate from the existing literature in calculating the volatility of discretionary fiscal policy and focus on purely *exogenous* fiscal policy shocks, i.e.

[7] Most of the institutional variables suggested as determinants of fiscal volatility by Fatas and Mihov (2003) and Badinger (2009), such as a measure of political regime, the number of elections or degree of fiscal decentralisation, become useless in a panel setting due to low or lack of time variation.
[8] Larger governments exhibit smaller output fluctuations than smaller governments because they have more possibilities and larger automatic stabilizers to smooth out business cycles.
[9] Richer countries display a more diversified sectoral decomposition of output that reduces its variability.
[10] Output volatility tends to be larger in countries that are more open to international trade and hence exposed to fluctuations in the global market and external shocks.
[11] Note that the urbanisation rate and trade openness are also included as controls for fiscal volatility in equation (1) to ensure that the variables used as fiscal volatility determinants in equation (1) and as instruments for fiscal volatility in first-stage regressions of equation (2) are identical. The inclusion of these two variables does not have any significant impact on the estimation results of equation (1).

looking at the part of the change in real fiscal variables that does not emanate from cyclical fluctuations either automatically or endogenously.[12] To this end, we cannot rely on cyclically adjusted government series (Badinger (2009)). We base our calculations on the standard methodology employed, e.g. in the papers by Sacchi and Salotti (2015), Badinger (2009), Fatas and Mihov (2003; 2006), Agnello at al. (2013) and Afonso et al. (2010).[13] We estimate equation (3) to obtain quantitative estimates of the fiscal shocks as the residual ($\varepsilon_{i,t}$), i.e. the part of the change in a government series that is not attributable to a country's position in the business cycle or changes in other control variables:

$$\Delta\log(G_{i,t}) = \alpha_i + \beta_1\Delta\log(G_{i,t-1}) + \beta_2\Delta\log(Y_{i,t}) + \beta_3\pi + \beta_4\pi^2 + \beta_5 trend + \varepsilon_{i,t} \quad (3)$$

where $G_{i,t}$ is the annual growth rate of a fiscal variable in real terms for country i in period t, Y is real GDP, π is the rate of inflation included alongside its squared value and *trend* is a linear time trend. Inflation is included to capture the possibility that in some countries several expenditure items are not inflation-adjusted and might be affected by inflation shocks at least in the short-run. We consider four alternative fiscal policy variables to measure the discretionary fiscal policy shock: primary expenditure, public consumption, sum of public consumption and investment and primary balance.[14] To address endogeneity of real GDP, we instrument real GDP growth by its two lags, an oil price index and lagged inflation.

We estimate equation (3) for each of the four alternative fiscal variables using both the 2SLS and GMM approaches[15] in the panel of EU28 countries.[16] Since in the presence of a lagged dependent variable 2SLS may result in inconsistent estimates, we employ GMM estimated fiscal shocks in the baseline. However, to check the robustness of our results with respect to the choice of the econometric approach, we also present the results based on 2SLS estimates instead of GMM.

We obtain the residuals from equation (3) and calculate the standard deviation over our four non-overlapping 5-year periods for each country. This serves as our indicator of fiscal volatility in both equation (1) and equation (2). Tables A3 and A4 in the Appendix show that the positive correlation between different measures of fiscal volatility is notable, in particular when variables are derived from regressions estimated by GMM.

[12] In the latter case, the government is deliberately applying pro- or counter-cyclical fiscal policies in response to the business cycle. For a detailed discussion of fiscal balance decomposition, see Galí et al. (2003).

[13] One of the first methods to construct measures of discretionary fiscal policy was laid out in Blanchard (1993), also applied by Alesina et al. (1995). Fatas and Mihov (2003) show that the employment of this approach is equivalent to what they do in their paper and what we follow in our study.

[14] All of the expenditure aggregates are used in real terms, whereas budget balance variables are expressed in % of GDP.

[15] We use a GMM-difference estimator (Arellano and Bond (1991)) not only because the results of the Sargan test based on GMM-system (Arellano and Bover (1995), Blundell and Bond (1998)) estimations are not satisfactory, but also because there is only low persistency in the change of fiscal variables.

[16] Employing country-by-country estimation would entail few degrees of freedom due to the very short time series (we deal with a maximum of 20 observations per country). Therefore, in this paper we present results based on the panel estimates of fiscal shocks, even though those might be heterogeneous across EU Member States. However, Sacchi and Salotti (2015) show that the residuals of this model estimated country by country are highly correlated with the residuals obtained with panel estimates.

4. DATA ON FISCAL RULES

4.1 Presence and characteristics of fiscal rules

In this study we use information on fiscal rules from two major datasets compiled by the EC (2016) and the IMF (2017).[17] The IMF dataset covers national and supranational fiscal rules in 96 countries from 1985 to 2015, while the EC database considers only the national fiscal rules that have been in force since 1990 across EU Member States. Both datasets provide definitions and descriptions of fiscal rules as well as information on their properties (e.g. their legal basis, coverage, monitoring body, escape clauses and enforcement procedure).

The sample of this study includes national fiscal rules[18] in the EU28 countries from 1996 to 2015. Due to data availability we focus only on the rules that are set at central or general government levels and have already come into force or were in force but are not anymore (rather than those that are merely planned in the future). We consider two types of numerical fiscal rules: budget balance rules and expenditure rules. Table 1 presents an overview of how the rules included in our study are distributed across countries and rule characteristics.

Table 1
Main characteristics of fiscal rules

			Budget balance rule (%)	Expenditure rules (%)
Rule in place	% of countries	(1)	89	64
	% of observations	(2)	34	34
Statutory base	Constitution	(3)	16	2
	Legal act	(4)	45	34
	Coalition agreement	(5)	32	42
	Political commitment	(6)	8	22
Monitoring outside government	Exists	(7)	37	35
	Does not exist	(8)	63	65
Enforcement procedure	Exists	(9)	36	28
	Does not exist	(10)	64	72
Escape clause	Exists	(11)	28	6
	Does not exist	(12)	72	94
Budget balance rule definition	In cyclically adjusted or structural terms	(13)	49	–
	Other	(14)	51	–
Expenditure rule definition	Potential growth benchmark	(15)	–	8
	Other	(16)	–	92

Sources: EC (2016) and IMF (2017).
Notes. The first row of the table presents the share of countries (%) that have had a fiscal rule in at least one year from 1996 to 2015. The rest of the figures included in the table reflect the number of observations (% of total) with the respective characteristic.

Overall, national fiscal rules seem to be part of fiscal frameworks in most of EU Member States. Nearly all countries in the sample have introduced a budget balance

[17] A detailed description of the earlier version of the IMF dataset is provided in Schaechter et al. (2012).
[18] We do not consider supranational fiscal rules since i) in our sample, they have been introduced with exactly the same properties simultaneously in many countries and thus cannot explain cross-country differences, ii) they have to a large extent been incorporated into national legislation.

rule in one way or another, whereas expenditure rules are relatively less common (89% and 64% of countries respectively). More than half of the budget balance rules and approximately a third of expenditure rules are enshrined either in legal acts or constitutions. Generally, expenditure rules have a somewhat weaker legal status as a majority of them are set out in coalition agreements or political commitments. External monitoring bodies exist in approximately a third of the observations. A similar share has a formal enforcement procedure. Escape clauses are embedded in approximately a quarter of budget balance rules, a feature less common for expenditure rules.

In nearly half of the observations we consider in our study budget balance rules are set in cyclically adjusted (or structural) terms, i.e. a limit is formulated in a way to allow the full operation of automatic stabilizers. Only three countries had a cyclically adjusted budget balance rule from the very beginning of our sample. These countries are Denmark (in force since 1992), Finland (1999) and Sweden (2000). Finland and Sweden introduced their numerical fiscal rules as part of a comprehensive reform of their fiscal frameworks in response to a severe economic and fiscal crisis they experienced in the early 1990s. In the rest of the EU, the introduction of a cyclically adjusted rule took place after the crisis of 2007–2008. The adoption of numerical national fiscal rules, including the cyclically adjusted ones, was facilitated by the approval of the EU requirements for budgetary frameworks of the Member States[19] in 2011. As a result, the number of countries that set their budget balance limit in cyclically adjusted terms grew to 22 by 2015.

Similarly, expenditure rules that tie government outlays to the developments in potential GDP (rather than setting a threshold for expenditure growth or its ratio in relation, e.g. to nominal GDP) have also come into fashion only recently. In particular, five EU countries introduced such rules since 2006, i.e. Bulgaria, Denmark, Croatia, Poland and Latvia. Among these countries only Latvia introduced such an expenditure rule from scratch, whereas Bulgaria and Denmark added it to the already existing nominal rule.[20] Croatia and Poland[21] replaced the nominal expenditure rule with a rule respecting the business cycle. Within such rules, additional spending (i.e. beyond that determined by potential GDP developments) is allowed only when it is financed by specific discretionary revenue measures.

4.2 Compliance with fiscal rules

Finally, we look at compliance with national fiscal rules. Staying below the numerical ceilings has often been named as one of the key elements when defining a successful fiscal framework. Nevertheless, previous evidence shows that compliance *per se* might not be necessary to reap positive effects of fiscal rules (Reuter (2015)). To further explore the economic implications of fiscal rules, we look at a subsample of fiscal rules for which a numerical ceiling and compliance with it can be measured. It has to be noted that we only observe statistical compliance with fiscal rules as opposed to *de jure* legal compliance, which would need some kind of judgment by an external

[19] Council Directive 2011/85/EU of 8 November 2011 on requirements for budgetary frameworks of the Member States.
[20] These nominal rules imposed a ceiling on the expenditure-to-GDP ratio (Bulgaria) or the level of expenditure (Denmark).
[21] In Poland, a permanent expenditure rule, limiting the growth of public expenditure to trend GDP growth, took effect in 2015. However, later it was modified to allow more flexibility to increase spending (IMF (2017)).

monitoring body, e.g. by a fiscal council. We draw on Reuter (2015) database which consists of numerical limits (calculated on the basis of the respective legal documents) and actual outcomes of the constrained budgetary positions for the EU28 countries from 1996 to 2013. Using the same methodology, we expand the dataset to include the most recent years. Overall, it seems that breaching national fiscal rules is not an extraordinary event. We observe that countries have met the limits imposed by fiscal rules in less than half of the years. The incidence of (non-)compliance is broadly similar for both types of rules (41% for budget balance rules and 43% for expenditure rules). Judging by the simple comparison of the mean POSET values, rules that were complied with do not appear notably different in terms of stringency from the rules that were not complied with. It appears that compliance with budget balance rules that partial out cyclical developments is somewhat higher (46%) than compliance with other types of budget balance rules (39%). As for expenditure rules that set expenditure ceilings based on potential output developments, the number of observations for this type of rules is too small to draw meaningful conclusions.

Table 2 reports mean values of fiscal volatility for various degrees of compliance with fiscal rules. Discretionary fiscal policy indeed appears more volatile when there is no national fiscal rule in place. Hence, setting a budget balance or expenditure ceiling seems to promote more stable discretionary fiscal policy. However, the design of the rules matters, especially in connection with compliance. For rules which are designed in an "a-cyclical" way, e.g. cyclically adjusted budget balance rules, higher compliance is associated with less volatile fiscal policy, while for other rules the opposite is the case and lower fiscal volatility is observed with less compliance. This supports the intuition that if a country complies with a rule with pro-cyclical design, volatility increases. In Subsection 5.3 we test the relationship between rule design, compliance and volatility more formally in a regression framework.

Table 2
Mean fiscal volatility for different levels of compliance with fiscal rules

	Primary expenditure	Public consumption	Public consumption and investment	Primary balance
No rule	0.787	0.821	0.766	0.756
Budget balance rule	0.529	0.424	0.374	0.523
Complied with <50%	0.530	0.413	0.368	0.504
Complied with >50%	0.528	0.451	0.388	0.571
CAB rule	0.401	0.323	0.293	0.439
Complied with <50%	0.406	0.331	0.301	0.430
Complied with >50%	0.391	0.309	0.279	0.455
Other budget balance rules	0.728	0.580	0.500	0.655
Complied with <50%	0.685	0.514	0.452	0.596
Complied with >50%	0.903	0.841	0.689	0.890
Expenditure rules	0.328	0.282	0.250	0.360
Complied with <50%	0.237	0.224	0.192	0.293
Complied with >50%	0.516	0.401	0.368	0.500

Sources: data on compliance from Reuter (2015) for the period 1995–2013 and authors' calculations for 2014–2015. In order to assess the compliance, we calculate numerical limits based on the description of fiscal rules in IMF's (2017) dataset and respective legal documents.
Note. Mean values of fiscal volatility were calculated by using shares of years (within the 5-year periods) when a fiscal rule was in force as weights.

5. ESTIMATION RESULTS

In this section, we present the main findings of this study. First, we report the baseline results on the impact of fiscal rules on fiscal volatility (see Subsection 5.1). Second, we investigate the influence of stabilisation properties of fiscal rules (see Subsection 5.2). Next, we analyse if actual compliance with fiscal rules changes the effects (see Subsection 5.3). Afterwards, we present some robustness checks of our results (see Subsection 5.4). Finally, we examine whether fiscal rules have an effect on macroeconomic stability (see Subsection 5.5).

5.1 Baseline results

In this study, we aim at exploring whether and how fiscal policy stability is affected by the existence of national numerical fiscal rules.

Table 3 documents the baseline results that show that lower volatility of discretionary fiscal policy[22] is associated with the presence of budget balance rules. This finding appears to be robust across various fiscal aggregates, albeit with somewhat different magnitudes of estimated coefficients. In turn, expenditure rules do not seem to exert a significant effect on fiscal volatility.

For the interpretation of the magnitude of the effect of fiscal rules on fiscal volatility, we first, as an illustrative example, look at the results for primary expenditure and budget balance rules. An increase in the budget balance rule variable by one standard deviation (which corresponds to having a rule for two additional years) results in a 0.2 percentage point lower fiscal volatility[23] (which has a mean of 0.7 as presented in Table A2 in the Appendix).

Extending this example for other fiscal aggregates, we see that the calculated effect of having a budget balance rule on fiscal volatility is relatively stable across different specifications. An increase in the presence of budget balance rule by 1 standard deviation on average decreases fiscal volatility by around 0.2–0.3 percentage point.

[22] In the baseline regression we employ fiscal volatility measures estimated using a GMM approach, while the results based on estimations using fiscal volatility estimated with 2SLS are very similar and are provided in Tables A6–A8 in the Appendix.

[23] The value 0.221 is obtained by multiplying the coefficient of budget balance rule variable (–0.517) and the standard deviation in this variable (0.428; see Table A2 in the Appendix).

Table 3
Effects of fiscal rules on fiscal volatility

	Primary expenditure		Public consumption		Public consumption and investment		Primary balance	
Dep. var.: Fiscal volatility								
Budget balance rule	–0.517*		–0.647**		–0.560*		–0.471*	
	(0.269)		(0.290)		(0.285)		(0.264)	
Expenditure rules		–0.082		–0.180		–0.199		0.061
		(0.220)		(0.240)		(0.217)		(0.265)
Population size	11.261***	10.271***	10.336***	8.963***	10.629***	9.369***	9.020***	8.352***
	(3.060)	(3.002)	(3.007)	(2.852)	(2.896)	(2.689)	(2.824)	(2.700)
Dependency ratio	–0.025	–0.030	–0.013	–0.018	–0.010	–0.013	0.016	0.006
	(0.028)	(0.029)	(0.027)	(0.028)	(0.025)	(0.025)	(0.032)	(0.030)
Urbanisation rate	0.002	–0.007	0.029	0.020	0.009	0.001	0.052	0.041
	(0.029)	(0.030)	(0.026)	(0.028)	(0.025)	(0.028)	(0.035)	(0.033)
Government fragmentation	–1.301	–1.569	0.703	0.387	0.315	0.053	–0.686	–0.964
	(1.308)	(1.332)	(1.480)	(1.586)	(1.401)	(1.503)	(1.140)	(1.092)
GDP per capita	1.993***	1.763***	1.485**	1.221*	1.170*	0.955	1.271*	1.020
	(0.569)	(0.582)	(0.710)	(0.719)	(0.662)	(0.679)	(0.678)	(0.681)
Trade openness	–0.006	–0.006	–0.005	–0.006	–0.005	–0.005	–0.005	–0.005
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
R-sq within	0.271	0.230	0.200	0.147	0.203	0.152	0.209	0.174

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Cross-sectional fixed effects are also accounted for. Coefficient t-test results are based on heteroskedasticity robust standard errors. These standard errors are presented in parentheses.

5.2 Stabilising properties of fiscal rules

As fiscal rules are sometimes claimed to be procyclical, many countries introduced rules which partial out the current position in the business cycle and are thus in a way "a-cyclical". We study two of the potential stabilising features of fiscal rules. First, we make a distinction between budget balance rules, which constrain budget balances in nominal terms and those which constrain balances in cyclically adjusted or structural terms. In the regression, this is accomplished by interacting the budget balance rule with a variable that represents the share of years a rule is set in cyclically adjusted or structural terms. Second, similarly, we make a distinction between the expenditure rules that tie expenditure growth to potential output developments and other expenditure rules, which in most cases impose a threshold on the expenditure-to-GDP ratio or establish expenditure ceilings which depend on current revenue or growth.

It turns out that the baseline effects of budget balance rules on fiscal volatility, found in Subsection 5.1, are driven by the rules which limit CABs rather than nominal ones. This result is robust across all definitions of fiscal volatility (see Table 4) and the magnitude of the effect of such structural balance rules is also somewhat stronger, with an overall decrease in fiscal volatility of 0.3–0.4 percentage point. Thus, the results found in the literature so far might need to be interpreted with caution as not all budget balance rules seem to decrease fiscal volatility, but rather only the ones that

are defined in cyclically adjusted or structural terms. Nevertheless, we also do not find the opposite result for budget balance rules constraining nominal measures. They only turn out to be insignificant while they are not found to contribute to higher volatility.

With respect to expenditure rules, contrary to the baseline results, we find significant effects if we take into account how the ceiling of such rules is set. The coefficients for the interaction term, indicating if the ceiling of an expenditure rule is tied to potential output, appear statistically significant for almost all measures of fiscal volatility. This, together with the results of the F-test and the joint significance test, implies that expenditure rules in general seem to be neutral with respect to fiscal policy volatility, but reduce volatility if they base their numerical limit on a measure related to potential output (as opposed to current or nominal output). The magnitude of the effect of such expenditure rules is similar to the effect of structural balance rules, i.e. between 0.2 and 0.4 percentage point. However, this result should be treated with a considerable portion of caution as the number of this type of rules is still relatively small.

Table 4
Effect of fiscal rules on fiscal volatility (by type of rule)

	Primary expenditure		Public consumption		Public consumption and investment		Primary balance	
Dep. var.: Fiscal volatility								
Budget balance rule	–0.307		–0.269		–0.282		–0.194	
	(0.313)		(0.296)		(0.312)		(0.284)	
Budget balance rule × CAB rule	–0.415*		–0.749***		–0.551**		–0.550**	
	(0.228)		(0.271)		(0.249)		(0.261)	
Expenditure rules		–0.050		–0.102		–0.141		0.119
		(0.213)		(0.216)		(0.198)		(0.261)
Expenditure rules × Potential output benchmark		–0.345		–0.836**		–0.616*		–0.614**
		(0.308)		(0.371)		(0.332)		(0.275)
F-test	13.30***	4.93**	17.99***	6.44**	15.99***	6.27**	7.86***	3.29*
Joint-sign test	6.66***	3.07*	9.16***	3.37**	8.17***	3.23*	4.01**	5.51***
R-sq within	0.289	0.237	0.255	0.183	0.239	0.180	0.240	0.198

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Controls as well as cross-sectional fixed effects are also included but not reported for the sake of brevity. Coefficient t-test results are based on heteroskedasticity robust standard errors. These standard errors are presented in parentheses. The null of F-test means that the sum of coefficients on a fiscal rule variable and on its interaction is equal to zero. The null of joint significance test means that both a coefficient on a fiscal rule variable and on its interaction are equal to zero.

5.3 Compliance with fiscal rules

In the past years, strong emphasis has been put on strengthening fiscal frameworks to increase compliance with fiscal rules. While in general higher compliance rates might increase the effects of fiscal rules on debt sustainability and fiscal policy stabilisation, rules might also have an effect without being adhered to year-to-year. Furthermore, the effect on fiscal volatility might differ, depending on a specific rule. For example, a structural budget balance rule might be counter-cyclical if always complied with but turn neutral or pro-cyclical if it is sometimes not complied with. For nominal budget balance rules the opposite might be true, with them possibly being pro-cyclical if always complied with.

The estimation results reported in Table 5 show no evidence that compliance with rules affects the impact of fiscal rules on fiscal volatility. The compliance variable is always insignificant, while the coefficients of the rule variables as well as the test statistics remain broadly in line with the previous results. These results might suggest that there is an effect of fiscal rules on fiscal volatility which is not due to the strict constraint for fiscal policy, but rather because they work as a benchmark or anchor for fiscal policy which reduces volatility even if the rules are not always complied with. Nevertheless, we cannot rule out that rules might have even stronger effects if they are always complied with (which we do not observe in our sample).

Table 5
Effect of compliance with fiscal rules on fiscal volatility

	Primary expenditure			Public consumption			Public consumption and investment			Primary balance		
Dep. var.: Fiscal volatility												
Budget balance rule	–0.459	–0.305		–0.633**	–0.253		–0.548*	–0.269		–0.478*	–0.151	
	(0.285)	(0.317)		(0.297)	(0.300)		(0.291)	(0.316)		(0.274)	(0.285)	
Expenditure rules			–0.092			–0.142			–0.143			0.088
			(0.197)			(0.223)			(0.186)			(0.287)
Budget balance rule × CAB rule		–0.421			–0.794**			–0.586**			–0.662**	
		(0.256)			(0.313)			(0.286)			(0.288)	
Budget balance rule × Compliance	–0.318			–0.081			–0.065			0.036		
	(0.383)			(0.356)			(0.286)			(0.426)		
Expenditure rules × Compliance			0.040			–0.159			–0.230			–0.110
			(0.402)			(0.454)			(0.427)			(0.436)
Budget balance rule × CAB rule × Compliance		0.019			0.153			0.122			0.385	
		(0.298)			(0.362)			(0.278)			(0.419)	
F-test	6.56**	2.05	0.01	4.76**	3.01*	0.38	4.54**	2.39	0.72	1.72	0.70	0.00
Joint-sign test	5.31**	2.08	0.06	3.75**	3.97**	0.27	3.79**	3.05**	0.45	2.08	2.33*	0.05
R-sq within	0.279	0.290	0.230	0.201	0.257	0.142	0.203	0.240	0.155	0.210	0.247	0.175

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Controls as well as cross-sectional fixed effects are also included but not reported for the sake of brevity. Coefficient t-test results are based on heteroskedasticity robust standard errors. These standard errors are presented in parentheses. The null of F-test means that the sum of coefficients on a fiscal rule variable and on its interaction is equal to zero. The null of joint significance test means that both a coefficient on a fiscal rule variable and on its interaction are equal to zero.

5.4 Robustness checks

In the following section, we present extensive robustness checks of our estimation results discussed above. The summary of the robustness analysis for the case when fiscal volatility is estimated based on public consumption series[24] is presented in Table 6.[25]

First, we check the sensitivity of our results to the country composition of our sample, by augmenting it with the OECD countries that are not part of the EU. Their inclusion allows us to increase the number of observations up to 155. The main results, including the dampening effect of fiscal rules on fiscal volatility, are confirmed also in this larger country sample. However, the magnitude of the effects of fiscal rules on fiscal volatility becomes slightly smaller. This is not surprising as the heterogeneity of the country sample, e.g. in institutional and cultural aspects is increased when moving away from EU Member States.

Second, we split our sample into smaller, 4-year, periods in order to check if our baseline results are influenced by the number of years over which the included variables are averaged and standard deviations are calculated. Again, the main results are broadly confirmed.

Third, we test alternative measures of fiscal rules: i) a dummy variable that takes the value one if there is a fiscal rule in place in at least one year within each 5-year period and zero otherwise; ii) fiscal rule indices (POSET index, Badinger and Reuter (2015) and an index constructed by the IMF in Schaechter et al. (2012)) to also account for the stringency and coverage of fiscal rules. Independently of how the presence of fiscal rules is measured the estimated negative effect of fiscal rules remains statistically significant and the main conclusions are confirmed.[26] The estimation results using indices of the stringency of fiscal rules indicate that more stringent fiscal rules bring about a larger reduction of fiscal volatility. The interaction terms that capture the stabilising properties of budget balance and expenditure rules remain significant, although the level of significance is somewhat lower. The effects of non-compliance remain insignificant. The latter finding is reinforced and further strengthened when we take into account how far the actual fiscal outturn is from the numerical constraint imposed by the rule (see Table 6, row 4). Thus, it seems that regardless of whether the ceiling is missed with a narrow or a wide margin, budget balance rules can still serve as an anchor for fiscal policy makers.[27]

Finally, we look at the robustness of our results with respect to the econometric approach. Tables A5–A7 in the Appendix reproduce the estimations presented in the main part of this study using fiscal volatility estimated with 2SLS instead of GMM. Table A8 displays the estimation results for fiscal volatility when both budget balance and expenditure rules are included in a single regression simultaneously in order to

[24] The public consumption series is chosen to illustrate the results of the robustness analysis due to the comparability of this series across all OECD countries (its construction is based on the same methodology). However, the results for other fiscal aggregates are available upon request.
[25] The rest of the estimated regressions are not shown for the sake of brevity. They are broadly in line with the robustness checks presented in Table 6 and are available upon request.
[26] The coefficient values and therefore the magnitudes of fiscal rule effects are not comparable between the baseline estimation and the estimation using POSET/IMF indices as those are measured in different units.
[27] We also differentiate between positive and negative distances to account for the possible asymmetric response if the limit is missed or overachieved by the same margin; however our conclusions remain unchanged. These results are not reported but available upon request.

avoid the possibility that by having both budget balance and expenditure rules at place the effect of a rule excluded from the regression is caught by a rule included in the regression. Overall, the results in both econometric exercises remain very similar and qualitatively robust with respect to the baseline.

Table 6
Results of the robustness analysis

		Baseline	OECD	4-year periods	Rule dummy	POSET	IMF
Budget balance rule	1	–0.647***	–0.404**	–0.358**	–0.549***	–1.317***	–0.250***
Budget balance rule	2	–0.269	–0.153	–0.019	–0.300	–0.467	–0.100
CAB rule		–0.749***	–0.493***	–0.639***	–0.396**	–1.112**	–0.189**
Budget balance rule	3	–0.633**	–0.362**	–0.346**	–0.586***	–1.301***	–0.249***
Compliance		–0.081	–0.152	–0.053	0.126	–0.085	–0.007
Budget balance rule	4	–0.648**	–0.405**	–0.379**	–0.554***	–1.315***	–0.173**
Distance		–0.004	–0.004	–0.032	0.049	0.012	0.016
Expenditure rules	5	–0.180	–0.071	–0.012	–0.077	–0.608	–0.138
Expenditure rules	6	–0.102	0.018	0.135	0.017	–0.419	–0.097
Potential output benchmark		–0.836**	–0.688**	–0.756***	–0.782**	–1.387*	–0.221*
Expenditure rules	7	–0.142	x	0.106	0.005	–0.394	–0.088
Compliance		–0.159	x	–0.372	–0.186	–0.588	–0.122

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The OECD sample covers 41 countries and four 5-year time windows over the period 1996–2015 (155 observations). Other controls as well as cross-sectional fixed effects according to equation (1) are also included, but not reported. Coefficient t-test results are based on heteroskedasticity robust standard errors.

5.5 The effect of fiscal policy on output volatility

Finally, after documenting the presence of the relationship between fiscal rules and policy volatility, we proceed with assessing whether rules also contribute to macroeconomic stability. We first start by investigating the possibility of a direct relationship between fiscal restrictions and output volatility.

The first two columns of Table 7 report the estimation results when output volatility is directly related to the existence of fiscal rules, without controlling for fiscal volatility. The presence of budget balance rules has a negative effect on output volatility; however its significance is weak. The expenditure rule variable is not significant at any conventional level. Once we control for the conduct of discretionary fiscal policy, by including one of the fiscal volatility measures, the effect of fiscal rules shrinks in magnitude and does not appear statistically significant (see Table 7, columns 3–10).

Table 7
Direct effect of fiscal rules on output volatility

			Fiscal volatility measured as:							
			Primary expenditure		Public consumption		Public consumption and investment		Primary balance	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dep. var.: Output volatility										
Fiscal volatility	xxx	xxx	0.945***	0.971***	0.895***	0.921***	0.940***	0.974***	1.032***	1.032***
			(0.096)	(0.093)	(0.127)	(0.121)	(0.125)	(0.120)	(0.120)	(0.120)
Budget balance rule	–0.810*		–0.229		–0.179		–0.222		–0.244	
	(0.431)		(0.249)		(0.244)		(0.249)		(0.223)	
Expenditure rules		–0.335		–0.054		0.069		0.118		–0.153
		(0.309)		(0.182)		(0169)		(0.171)		(0.200)
R-sq within	0.051	0.062	0.593	0.605	0.593	0.604	0.561	0.573	0.689	0.683

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Coefficient t-test results are based on heteroskedasticity robust standard errors. These standard errors are presented in parentheses. Controls as well as cross-sectional fixed effects are also included, but not reported for the sake of brevity.

Next, we relate output volatility to fiscal volatility and use fiscal rules variables as instruments for fiscal volatility as the latter is considered endogenous. As discussed in Fatas and Mihov (2006), fiscal rules might have an indirect effect on macroeconomic volatility, i.e. intermediated by fiscal policy. Alongside fiscal rules variables, we employ other instruments, previously used when estimating equation (1). The estimation results indicate that the standard deviation of discretionary fiscal policy shocks is a positive and statistically significant determinant of output volatility across all specifications (see Table 8). Instrument validity is not rejected by the estimated Hansen J-test and C-test statistics, which is an alternative indication that fiscal rules do not have a direct effect on macroeconomic stability.[28] With regard to instrument quality, the null hypothesis of instrument irrelevance is rejected by both the SW first-stage chi-squared and F-test statistics for most specifications except the ones where primary balance is used as a dependent variable.[29]

To sum up, the estimation results indicate that volatile conduct of discretionary fiscal policy results in higher macroeconomic volatility. Fiscal policy restrictions, such as the presence of national fiscal rules (in particular those designed to be unaffected by the current state of the business cycle), reduce the use of discretionary fiscal policy and could thus indirectly contribute to smoothing out the business cycles.

[28] For a description of the instrument validity and relevance tests and the calculation of heteroskedasticity robust standard errors, see Schaffer (2005).
[29] For details on these tests, see Sanderson and Windmeijer (2016) who provide a modification and improvement of the method described by Angrist and Pischke (2009).

Table 8
Indirect effect of fiscal rules on output volatility

	Primary expenditure		Public consumption		Public consumption and investment		Primary balance	
Second stage								
Dep. var.: Output volatility								
Fiscal volatility	0.808***	0.604**	0.943***	0.745**	0.944***	0.692**	1.375***	1.267**
	(0.238)	(0.292)	(0.279)	(0.357)	(0.283)	(0.345)	(0.333)	(0.533)
R-sq within	0.581	0.514	0.427	0.571	0.568	0.515	0.668	0.688
First stage								
Dep. var.: Fiscal volatility								
Budget balance rule	–0.517*		–0.647**		–0.560*		–0.471*	
	(0.269)		(0.290)		(0.285)		(0.264)	
Expenditure rules		–0.082		–0.180		–0.199		0.061
		(0.220)		(0.240)		(0.217)		(0.265)
R-sq within	0.271	0.230	0.200	0.147	0.203	0.152	0.209	0.174
Hansen J-stat	3.135	1.112	2.216	1.477	2.939	1.430	0.245	0.507
C-stat	2.378	0.414	0.685	0.003	1.429	0.030	0.114	0.372
SW chi-sq stat	18.73***	16.80***	13.70***	10.00**	14.56***	13.32***	6.86	3.65
SW F-stat	4.28***	3.84***	3.13**	2.29**	3.33**	3.05**	1.57	0.83

Notes. 2SLS estimates of equation (2) are provided in the upper panel, but the first-stage regression results for fiscal volatility – in the lower one. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Other controls as well as cross-sectional fixed effects according to equation (2) are also included in the first and second stages, but not reported. Coefficient t-test results are based on heteroskedasticity robust standard errors. These standard errors are presented in parentheses. 2SLS estimates use the fiscal rule, government fragmentation, instruments of government size (the log of total population, the dependency ratio, the urbanisation rate) and other included exogenous variables (log of GDP per capita and openness) as instruments for fiscal volatility. Hansen J-stat is a test of instrument validity (i.e. they are not correlated with the error term of the main equation). The failure to reject the null hypothesis implies that instruments are valid. Similarly, C-stat is a test of validity of a fiscal rule instrument only. The SW first-stage chi-squared and F-stat are tests of instrument relevance. The null of the SW chi-sq test means that fiscal volatility is unidentified, the null of the SW chi F test means that fiscal volatility is weakly identified.

CONCLUSIONS

In this study, we analyse whether fiscal rules have a positive stabilising effect beyond their widely recognised contribution to the reduction of the deficit bias. In addition to the existing literature, we also look at the design properties of fiscal rules and compliance with the rules. We employ panel data for the EU28 countries over the period 1996–2015 and estimate the effect of budget balance and expenditure rules on fiscal policy volatility. We examine the impact of rule design and compliance by including interactions with the fiscal rule variable.

Overall, our results confirm the finding of previous studies that the existence of fiscal rules is associated with less volatile discretionary fiscal policy and suggest that strong, properly defined numerical rules act as an anchor for fiscal policy makers. However, in the light of our results this general conclusion has to be interpreted with caution as we confirm it for a specific set of fiscal rules that partial out the current state in the business cycle, i.e. which are "a-cyclical". The basic stabilising effect of such rules is not dampened if they are not complied with year-to-year. However, it does not mean that more stringent rules might not lead to more compliance and in consequence also to stronger effects.

The results of our study contribute to the current debate on the reform of the EU supra-national fiscal framework. The existing set of rules stipulated in the SGP has become very complex and opaque, thus reducing their credibility and effectiveness. Several proposals to overhaul the SGP suggest a framework based on a reference value for public debt ratio with an operational annual limit for expenditure growth (European Fiscal Board (2018)). Although an appropriate fiscal rule should mainly be selected due to its ability of counteracting the deficit bias and ensuring the sustainability of public debt, our results suggest that a-cyclical rules could also be an effective tool in achieving more stability in the conduct of fiscal policy. To this end, an expenditure limit should not be related to contemporaneous variables but rather to less time-varying or longer-term variables like potential growth. Furthermore, if one element of the new framework would still be a budget balance rule, it should be in cyclically adjusted or structural terms rather than a nominal limit. Various proposals currently being discussed already take into account both considerations (e.g. Christofzik et al. (2018), Darvas et al. (2018)) such that an accordingly designed new framework might contribute to less volatile discretionary fiscal policy.

It should be kept in mind though that this study is the first attempt to look at design properties of and compliance with fiscal rules in connection with fiscal policy volatility. Thus, it can only be a starting point for future research. A more rigorous analysis of fiscal rule designs might reveal a clearer picture of the properties which make rules more stable and which do not. Furthermore, if rules work as an anchor for politicians and the public, it would be worth investigating how this function can be promoted, e.g. through more transparency, monitoring and accountability of fiscal policy.

APPENDIX

Table A1
List of variables used in the study, their definition and source

Variable	Data source	Definition
Output volatility	Ameco	Standard deviation of annual change in real GDP per capita (× 100; within-period average)
Primary expenditure	Eurostat	General government total expenditure excluding interest outlays, deflated using GDP deflator (2010 base year)
Public consumption	Eurostat	Final consumption expenditure of general government (chain-linked volumes; 2010)
Government investment	Eurostat	General government investment expenditure, deflated using gross fixed capital formation deflator (2010 base year)
Primary balance	Eurostat	General government budget balance excluding interest expenditure (% of GDP)
Inflation	IMF	Consumer price index (% change)
Real GDP	Eurostat	Gross domestic product at market prices (chain-linked volumes; 2010)
Real GDP per capita	Eurostat	Gross domestic product at market prices per capita (chain-linked volumes; 2010), within-period average
Openness	Eurostat	Sum of exports and imports as a share of GDP (within-period average)
Government size	Eurostat	Primary expenditure as a share of GDP (within-period average)
Population size	Eurostat	Population on 1 January (within-period average)
Urbanisation rate	World Development Indicators database	Urban population (% of total; within-period average)
Dependency ratio	Eurostat	Old-age dependency ratio (population 65 and over to population 15 to 64 years; %; within-period average)
Government fragmentation	The Database of Political Institutions	The sum of the squared seat shares of the parties in government (within-period average)
Budget balance rule	Badinger and Reuter (2015), Schaechter et al. (2012)	The share of years when a country has a fiscal rule in place; POSET index of stringency (within-period average); IMF index (within-period average)
Expenditure rules	Badinger and Reuter (2015), Schaechter et al. (2012)	The share of years when a country has a fiscal rule in place; POSET index of stringency (within-period average); IMF index (within-period average)
CAB rule	Own calculations based on IMF (2017)	The share of years when a rule was set in cyclically adjusted or structural terms
Expenditure rules linked to potential growth	Own calculations based on IMF (2017)	The share of years when a rule linked expenditure to potential GDP developments
Compliance	Reuter (2017)	The share of years when a rule was complied with

Table A2
Descriptive statistics

Variable	Mean	Median	Standard deviation	Min.	Max.
Output volatility	2.420	1.665	2.154	0.385	11.258
Fiscal volatility					
– primary expenditure (GMM)	0.723	0.506	0.569	0.034	2.894
– public consumption (GMM)	0.691	0.537	0.587	0.100	3.206
– public consumption and investment (GMM)	0.616	0.456	0.545	0.099	2.910
– primary balance (GMM)	0.736	0.544	0.548	0.087	2.835
– primary expenditure (2SLS)	0.477	0.401	0.309	0.109	2.606
– public consumption (2SLS)	0.926	0.749	0.760	0.119	4.086
– public consumption and investment (2SLS)	0.773	0.613	0.683	0.100	3.742
– primary balance (2SLS)	0.877	0.628	0.666	0.089	3.447
Log of real GDP per capita	9.796	9.889	0.726	7.979	11.293
Openness	109.474	89.531	60.124	44.966	363.035
Government size	42.135	42.018	5.707	30.370	55.332
Log of population size	6.885	6.937	0.618	5.584	7.916
Urbanisation rate	71.761	69.806	12.066	49.083	97.774
Dependency ratio	23.493	23.740	3.776	15.960	32.560
Government fragmentation	0.805	0.813	0.072	0.539	0.910
Budget balance rule	0.343	0.000	0.428	0.000	1.000
CAB rule	0.257	0.000	0.429	0.000	1.000
Expenditure rules	0.314	0.000	0.433	0.000	1.000
Expenditure rules linked to potential growth	0.098	0.000	0.300	0.000	1.000

Note. Descriptive statistics of fiscal rule related variables is analysed in detail in Section 4.

Table A3
Pairwise correlations among the measures of discretionary fiscal policy volatility, panel (2SLS) estimates

Budget item	Primary expenditure	Public consumption	Public consumption and investment	Primary balance
Primary expenditure	1.000			
Public consumption	0.247	1.000		
Public consumption and investment	0.227	0.947	1.000	
Primary balance	0.442	0.692	0.574	1.000

Note. Authors' calculations based on estimates of equation (3).

Table A4

Pairwise correlations among the measures of discretionary fiscal policy volatility; panel (GMM) estimates

Budget item	Primary expenditure	Public consumption	Public consumption and investment	Primary balance
Primary expenditure	1.000			
Public consumption	0.591	1.000		
Public consumption and investment	0.628	0.961	1.000	
Primary balance	0.717	0.650	0.605	1.000

Note. Authors' calculations based on estimates of equation (3).

Table A5

Effect of fiscal rules on fiscal volatility (fiscal volatility is estimated with 2SLS)

	Primary expenditure		Public consumption		Public consumption and investment		Primary balance	
Dep. var.: Fiscal volatility								
Budget balance rule	–0.281**		–0.825**		–0.733**		–0.587*	
	(0.140)		(0.367)		(0.357)		(0.322)	
Expenditure rules		–0.046		–0.117		–0.128		0.057
		(0.107)		(0.319)		(0.274)		(0.319)
R-sq within	0.271	0.198	0.184	0.123	0.155	0.092	0.205	0.168

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Cross-sectional fixed effects are included. Coefficient t-test results are based on heteroskedasticity robust standard errors. These standard errors are presented in parentheses.

Table A6

Effect of fiscal rules on fiscal volatility by type of rule (fiscal volatility is estimated with 2SLS)

	Primary expenditure		Public consumption		Public consumption and investment		Primary balance	
Dep. var.: Fiscal volatility								
Budget balance rule	–0.154		–0.362		–0.404		–0.240	
	(0.145)		(0.373)		(0.399)		(0.347)	
Budget balance rule × CAB rule	–0.250**		–0.919***		–0.654**		–0.690**	
	(0.109)		(0.346)		(0.313)		(0.317)	
Expenditure rules		–0.039		–0.010		–0.045		0.128
		(0.106)		(0.293)		(0.252)		(0.313)
Expenditure rules × Potential output benchmark		–0.075		–1.146**		–0.890*		–0.764**
		(0.119)		(0.483)		(0.449)		(0.334)
F-test	7.69***	1.37	14.94***	6.11**	14.80***	6.07**	8.51***	3.81*
Joint-sign test	3.31**	1.27	5.40***	3.59**	4.51**	3.33*	3.42**	6.02***
R-sq within	0.262	0.199	0.233	0.170	0.189	0.130	0.238	0.193

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Cross-sectional fixed effects are included. Coefficient t-test results are based on heteroskedasticity robust standard errors. Those standard errors are presented in parentheses. The null of F-test is that the sum of coefficients on a fiscal rule variable and its interaction is equal to zero. The null of joint significance test means that both a coefficient on a fiscal rule variable and on its interaction are equal to zero.

Table A7

Effect of compliance with fiscal rules on fiscal volatility (fiscal volatility is estimated with 2SLS)

	Primary expenditure			Public consumption			Public consumption and investment			Primary balance		
Dep. var.: Fiscal volatility												
Budget balance rule	–0.268*	–0.156		–0.831**	–0.325		–0.752**	–0.381		–0.589*	–0.191	
	(0.149))	(0.146)		(0.373)	(0.374)		(0.361)	(0.400)		(0.335)	(0.348)	
Expenditure rules			–0.053			–0.040			–0.018			0.087
			(0.104)			(0.310)			(0.243)			(0.343)
Budget balance rule × CAB rule		–0.249**			–1.017**			–0.715**			–0.816**	
		(0.122)			(0.392)			(0.352)			(0.351)	
Budget balance rule × Compliance	–0.070			0.028			0.101			0.008		
	(0.179)			(0.478)			(0.346)			(0.518)		
Expenditure rules × Compliance			0.027			–0.317			–0.452			–0.122
			(0.183)			(0.596)			(0.565)			(0.530)
Budget balance rule × CAB rule × Compliance		–0.006			–0.496			0.211			0.433	
		(0.159)			(1.969)			(0.390)			(0.510)	
F-test	4.21**	2.28	0.01	4.76**	3.01*	0.31	4.54**	2.39	0.70	1.72	0.70	0.00
Joint-sign test	3.20*	2.18*	0.06	3.75**	3.97**	0.16	3.79**	3.05**	0.35	2.08	2.33*	0.03
R-sq within	0.242	0.263	0.198	0.201	0.257	0.126	0.203	0.240	0.099	0.210	0.247	0.169
Hansen J-stat	2.236	3.755	1.110	2.493	2.229	1.180	3.071	3.477	1.304	1.576	2.234	0.646
C-stat	1.673	0.000	0.057	0.487	0.070	0.003	1.170	0.001	0.097	0.047	0.111	0.082
SW chi-sq stat	15.75***	22.45***	13.47**	13.79**	18.83***	5.92	14.66**	18.71***	7.38	7.16	10.12	3.79
SW F-stat	2.84**	3.33***	2.43**	2.49**	2.79**	1.07	2.65**	2.78**	1.33	1.29	1.50	0.68

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Cross-sectional fixed effects are included. Coefficient t-test results are based on heteroskedasticity robust standard errors. Those standard errors are presented in parentheses. The null of F-test means that the sum of coefficients on a fiscal rule variable and its interaction is equal to zero. The null of joint significance test means that both a coefficient on a fiscal rule variable and on its interaction are equal to zero.

Table A8

Effect of fiscal rules and compliance with them on fiscal volatility measured by volatility in public consumption accounting for all three rules in the single regression (estimated with GMM)

	Public consumption		
	Effect of rules	Effect of rule type	Effect of compliance
Dep. var.: Fiscal volatility			
Budget balance rule	–0.655**	–0.206	–0.152
	(0.286)	(0.274)	(0.328)
Expenditure rules	0.025	0.035	0.006
	(0.211)	(0.208)	(0.244)
Budget balance rule × CAB rule		–0.717***	–0.801**
		(0.265)	(0.338)
Expenditure rules × Potential output benchmark		–0.592**	–0.580**
		(0.265)	(0.283)
Budget balance rule × Compliance			–0.145
			(0.649)
Expenditure rules × Compliance			0.097
			(0.431)
Budget balance rule × CAB rule × Compliance			0.285
			(0.705)
R-sq within	0.200	0.276	0.278

Notes. * indicates significance at a 10% level, ** indicates significance at a 5% level, *** indicates significance at a 1% level. The sample covers the EU28 countries and four 5-year time windows over the period 1996–2015 (110 observations). Controls as well as cross-sectional fixed effects are also included, but not reported for the sake of brevity. Coefficient t-test results are based on heteroskedasticity robust standard errors. These standard errors are presented in parentheses.

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