

The impact of national fiscal rules on the stabilisation function of fiscal policy

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Abstract

We study the relationship between discretionary fiscal policy and macroeconomic stability in 20 OECD countries over the 1985-2012 period. The novelties of our contribution lie in the use of annual panel data, whereas most of the existing evidence is cross-sectional, and more importantly in the thorough investigation of how fiscal rules affect the policy-macroeconomic stability relationship. We find that the aggressive use of discretionary fiscal policy, particularly of government consumption items, leads to higher volatility of both output and inflation. However, when strict fiscal rules are introduced, discretionary policy becomes output-stabilising rather than destabilising. This result can be more easily achieved by rules on balanced budgets, rather than on expenditures, revenues, or debt. On the other hand, fiscal rules are unable to affect the inflation-destabilising nature of discretionary policy, probably because of the higher importance of central banks in that respect.

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JEL classification: E32, E62, H60

1. Introduction

Recent events such as the ongoing European sovereign debt crisis that followed the 2007-09 financial crisis have highlighted the relevance of the attempts to keep under control government balances and to reinforce budgetary procedures (Spilimbergo *et al.*, 2008; Hauptmeier *et al.*, 2011). There is now a lively debate on the necessity to restore public finances and limit the discretion of governments in many industrialised countries. In particular, the adoption of fiscal rules strengthening fiscal discipline (sometimes referred to as fiscal performance, see *e.g.* Kennedy and Robbins 2003) and reducing both the deficit bias and political failures starts to be viewed as an effective remedy (see, *e.g.*, Debrun *et al.* 2008 for an analysis on national deficits, and Foremny 2014 for one on sub-national ones).

Although the impact of rules on fiscal discipline is an interesting topic and bears important implications for the fiscal behaviour of governments at all levels, we believe that concentrating on the sole disciplinary role of such rules constitutes too narrow of an approach. Running balanced budgets is, indeed, not valuable *per se*.¹ It matters for what it implies for other macroeconomic targets. In 1969 Musgrave wrote that governments should focus on three main goals: macroeconomic stabilisation, efficiency in resource allocation, and income redistribution. The importance of macroeconomic stabilisation has been also recently highlighted by, among others, Blinder (2004) who points out that, especially in occasional abnormal circumstances (*e.g.*, when recessions are extremely long and/or deep), monetary policy can be used to stimulate the economy, while fiscal policy is better suited for the role of macroeconomic stabiliser.

The latter part of this statement is the focus of our paper. In particular, we aim at understanding if the existence of fiscal rules affects the effectiveness of the governments' macroeconomic stabilisation function. While automatic stabilisers certainly play a key role for the stabilisation of output in response to business cycle developments, the role of discretionary fiscal policy is harder to pinpoint *a priori*. The existing empirical evidence finds a destabilising impact on the economy of the government's voluntary corrections of expenditure and/or taxation not taken in response to cyclical developments (Furceri 2007, Afonso and Furceri 2008, Loayza *et al.* 2007). In light of the recent and

¹ But it can certainly help to avoid problems such as those generated by too large fiscal imbalances.

widespread introduction of fiscal rules it seems natural to investigate whether such rules influence how discretionary fiscal policy affects macroeconomic stability.

Fiscal rules, usually defined as formalised numerical restrictions on relevant aggregate fiscal variables, have been recognised as institutions capable of affecting fiscal outcomes in addition to, *e.g.*, election systems, political parties, government fragmentation, and the organisation of the budget process (Ferejohn and Krehibel 1987; von Hagen 1992; von Hagen and Harden 1995; Kopits and Symansky 1998; Alesina and Perotti 1999). Fiscal rules should also simplify the decision-making processes, and they may play an important role in post-crisis fiscal consolidation (Kumar *et al.* 2009; Cottarelli and Schaechter 2010, European Commission 2011). Over the past two decades, fiscal rules have spread worldwide. In 1990, only five countries (Germany, Indonesia, Japan, Luxembourg, and the United States) had fiscal rules in place that covered at least the central government level. Since then, the number of countries with national and/or supranational fiscal rules surged to 76 by mid-2012 (Schaechter *et al.* 2012).

Given that a wide range of fiscal rules is conceivable and that the design of the appropriate fiscal framework depends on country-specific circumstances (von Hagen 2006a Hallerberg *et al.* 2007 and 2009; Ljungman 2008), it is hard to comment on the general effectiveness of fiscal rules. Wyplosz (2005), for instance, argues that neither strict rules nor full discretion are optimal to ensure fiscal discipline, drawing a parallel to monetary policy where most central banks adopt flexible inflation targeting strategies rather than strictly abiding to rules (Svensson 2005). More recently, Wyplosz (2011) has concluded that rules and institutions should be combined with advisory fiscal councils to ensure that budget balances are kept under control. Schick (2010) also supports this view, mentioning the so-called ‘next-generation fiscal rules’ (see also Lienert 2010 and Schaechter *et al.* 2012 on related topics).² Those conclusions stem from the evidence of scarce effects (if any) of rules on fiscal discipline (Guichard *et al.* 2007), although some authors claim that rules have limited the pro-cyclicality of fiscal behaviour in recent years (see, among others, Manasse 2007, Debrun *et al.* 2008). On the whole, despite a large number of contributions, no consensus has emerged over fiscal rules

² ‘Next-generation fiscal rules’ are designed to strike a better balance between sustainability and flexibility goals: they usually account for economic shocks and are often complemented by other institutional arrangements.

being a sufficient condition to get sustainable fiscal parameters, or on their ability to address the source of the bias toward unsustainable policies.

And what about the effects of fiscal rules on the stabilisation function of fiscal policy? The literature has hardly investigated this research question, but it offers a number of theoretical and empirical contributions on the effects of fiscal policy on macroeconomic volatility. For example, Gali (1994) constructs a theoretical framework predicting output-stabilising effects of government purchases, then proved wrong by the empirical analysis presented in the same article. Since then, a number of researchers have tested the relationship between fiscal policy and macroeconomic stability using measures of discretionary policy rather than readily available fiscal series. The seminal article by Fatas and Mihov (2003) is particularly enlightening: they firstly estimate a measure of discretionary fiscal policy starting from a government expenditure series in order to exclude endogenous fiscal reactions to economic conditions, and then investigate its effects on output volatility. Conclusions suggest that the aggressive use of fiscal policy reduces macroeconomic stability. Rother (2004) presents similar results focusing on inflation volatility.

Subsequent studies are broadly in line with those initial findings (see, among others, Herrera and Vincent 2008), with some exceptions. For example, Badinger (2009) confirms the positive relationship between discretionary policy and output volatility, but not that between the former and inflation volatility, using data for OECD countries. Most of the studies of the effects of discretionary fiscal policy on macroeconomic stability follow the strategy introduced by Fatas and Mihov (2003). However, most studies concentrate on the US economy and results are usually based on cross-sectional analyses (*e.g.*, Fatas and Mihov 2001, 2006).

Our paper contributes to the literature along several lines. First, we estimate discretionary fiscal policy using several alternative measures of government intervention, something that allows for a better disentangling of the cyclical and the structural components of fiscal policy. Then, we analyse the relationship between discretionary fiscal policy and macroeconomic stability, *i.e.* output volatility as well as inflation volatility, employing annual panel data rather than adopting a cross-sectional approach as done in most of the existing literature. In particular, we use three-year periods data for a sample of 20 OECD countries that, to the best of our knowledge, have never been used before in this

context.³ Then, and most importantly, we study how this relationship is affected by the existence of national fiscal rules.⁴ In all cases we control for potential endogeneity issues that are widely recognised to affect this type of analysis.

Our results are the following. First, despite using the same econometric model to extract the discretionary component of fiscal policy from government expenditure series, the choice of the series to be used (*i.e.* government consumption, consumption and investment, or primary spending) matters and yields different results. Second, the panel estimates of the effects of discretionary policy on macroeconomic stability mostly confirm the existing cross-sectional evidence, with aggressive use of fiscal policy leading to higher volatility of output and of inflation. However, and third, fiscal rules can alter the relationship between discretionary policy and output stability, to the point that the former may enhance output stability when coupled with strict-enough fiscal rules. Moreover, not all types of rules are equally effective: in particular, rules on balanced budgets are more effective than those targeting different aggregates such as expenditures, revenues, or debt. On the other hand, no matter the degree of stringency, fiscal rules seem to be unable to mitigate the inflation-destabilising effects of discretionary policy. This latter result seems reasonable, given the influence of monetary policy in keeping inflation under control more so than fiscal policy.

The remainder of the paper is organised as follows. Section 2 illustrates the empirical strategy and the variables used to recover the measures of discretionary fiscal policy. Section 3 deals with the relationship between discretionary fiscal policy and output volatility, while section 4 concentrates on the relationship between the former and inflation volatility. Finally, section 5 concludes and provides some policy implications.

³ There are previous works, mostly limited to the US case, studying the influence of fiscal rules on the relationship between fiscal policy and macroeconomic stability (see *e.g.* Bayoumi and Eichengreen 1995; Alesina and Bayoumi 1996; Fatas and Mihov 2006). However, the time variability of the data has not been exploited in a panel context. The use of panel data by Rother (2004) constitutes an exception, but he only deals with inflation volatility and does not investigate the role played by fiscal rules as we do in the second part of the empirical analysis.

⁴ Note that we purposely leave out of the analysis supranational fiscal rules, as their effectiveness has been questioned by many, particularly in the countries adhering to the eurozone (Wyplosz 2006; Ayuso-i-Casals *et al.* 2007; Debrun and Kumar 2007).

2. Estimating discretionary fiscal policy

Discretionary fiscal policy series are not readily available in existing datasets and there is no consensus in the literature on how to appropriately obtain them (see Furceri and Ribeiro 2009 for a detailed discussion). The existing estimates are mostly based on expenditure-side series, such as government consumption (Afonso *et al.* 2010), government consumption plus investment (Blanchard and Perotti 2002), primary spending and receipts (Gali and Perotti 2003), or total real state government spending (Fatas and Mihov 2006). In all cases the aim is to distinguish the cyclical (*i.e.* endogenous) component of the budget from the discretionary (*i.e.* structural) component for each spending aggregate. The discretionary part may be in turn decomposed into one further endogenous component, representing policy measures taken in response to the business cycle, and a purely exogenous one, representing the fiscal shocks that are normally thought to proxy for the aggressive use of fiscal policy that we are interested in. There is no theoretical guidance on which expenditure series should be used as the starting point for the estimates, and this is why authors take different decisions on this (see Fatas and Mihov 2003; Badinger 2009). On the other hand, there is a certain consensus on how to obtain the discretionary fiscal shocks, normally recovered by estimating country-specific models (panel estimates would not yield discretionary policy estimates for each country) such as the following:

$$\Delta \ln spending_{-t} = \alpha_0 + \alpha_1 \Delta \ln spending_{-t-1} + \alpha_2 \Delta \ln gdp_t + \beta_1 \pi + \beta_2 \pi^2 + trend + \varepsilon_t^{spending}, \quad (1)$$

where $spending_{-t}$ is a measure of real government expenditure, gdp is real GDP, π is inflation rate (included in both level and squared forms), and $trend$ is a linear time trend. The main object of interest of equation (1) is $\varepsilon_t^{spending}$, which is to be interpreted as a discretionary fiscal shock. Its volatility, *i.e.* its standard deviation over a certain time period, is normally considered as an indicator of the aggressiveness of a government's discretionary fiscal stance.

We estimate three different specifications of model (1) by using three alternative government spending series as the dependent variable one at a time: government consumption ($spending_{gc}$);

consumption plus investment (*spending_gci*); primary expenditure (*i.e.* total disbursements minus interest payments, *spending_gpe*).⁵ As stated above, there are no criteria to select the most appropriate spending series to be used as the dependent variable in model (1). It is conceivable that all three expenditure series listed above contain both cyclical and structural components. Primary expenditure is the most comprehensive of the three series that we use (containing all spending items except for interest payments), and government consumption the narrowest. Thus, we will distinguish the resulting discretionary fiscal policy series accordingly: the broadest one obtained from primary expenditure (*discr_gpe*), the middle one obtained from consumption plus investment (*discr_gci*), and the narrowest measure obtained from government consumption (*discr_gc*).

We estimate model (1) for every country of our sample over the period 1961-2012 (at most).⁶ In order to tackle potential endogeneity, we estimate the various specifications of the model with the 2SLS estimator, where real GDP is instrumented with two of its own lags, the logarithm of the oil price, and the rest of the explanatory variables of the model (see Fatas and Mihov 2003 for a similar application).

We then calculate the standard deviation over three-year periods of the fiscal shocks just estimated to construct the measures of aggressiveness of discretionary fiscal policy. This represents the first step of the empirical analysis. We use such measures to investigate their impact on output volatility and inflation volatility, by including them as the main explanatory variable of the model in the second part of the analysis (see the next two Sections for more details).

Table 1 shows that the positive correlation among the three measures of discretionary fiscal policy estimated with equation (1) is substantial, particularly between *discr_gc* and *discr_gci*. *discr_gc* is also substantially positively correlated with *discr_gpe* (0.46), while the correlation between the latter

⁵ For the sake of completeness, we also performed the analysis using as dependent variables primary receipts and the primary balance (both unadjusted and cyclically adjusted) to get alternative measures of discretionary fiscal shocks (estimates are not reported in the paper but available upon request). We prefer to concentrate on the measures obtained from government spending series consistently with the previous literature.

⁶ The countries are: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States. For most countries there are no missing observations in the government consumption specification (the exceptions being Germany and Ireland, for which observations start in 1991 and 1990 respectively). In the other two specifications the sample is limited to about 20 observations in the cases of Australia, Luxembourg, and Switzerland; and to about 30 observations in the cases of France, Iceland, and Portugal.

and *discr_gci* is positive but lower (0.31). The fact that correlations are never equal to one foreshadows the fact that different series will yield different results.⁷

INSERT TABLE 1 ABOUT HERE

3. Discretionary fiscal policy and output volatility

This section illustrates the empirical model used to study the relationship between discretionary fiscal policy and output volatility, and reports the estimated results. Sub-section 3.1 deals with the typical model used in the literature, although the fact that we estimate it using annual panel data constitutes a novelty. More importantly, we deal with the role of fiscal rules by appropriately enriching the model in sub-section 3.2.

3.1 The standard model

We carry out this second part of the analysis using data from 1985 to 2012. We restrict the sample to this time span because fiscal rules were basically non-existent before and we prefer to simplify the comparison between this first model and the richer one taking into account the role played by the rules. The benchmark model is the following:

$$\ln \sigma_{i,[t,t+2]}^{gdp} = \varphi_{i,0} + \varphi_1 \text{discr_fp}_{i,[t,t+2]} + \phi_1 \mathbf{W}_{i,[t,t+2]} + \eta_{i,t}, \quad (2)$$

where $\sigma_{i,[t,t+2]}^{gdp}$ is the standard deviation of the growth rate of real GDP per capita over the three-year periods, standing for output volatility. *discr_fp* is one of the three measures of discretionary policy, *i.e.* the standard deviation of the discretionary shocks obtained from model (1), used separately one at a time. $\mathbf{W}_{i,[t,t+2]}$ is a vector of controls including government size (*gov_size*, calculated as

⁷ Our results compare well with those of Badinger (2009), who also estimates discretionary policy using several alternative fiscal policy series. In particular, we obtain a higher correlation between *discr_gc* and *discr_gci*, but a lower one among those two and *discr_gpe*.

government primary expenditure divided by GDP⁸), trade openness (*open*, calculated as the sum of exports and imports divided by GDP), and the logarithm of real GDP per capita (*gdp_level*). In an alternative specification of the model we use the volatility of private-GDP as the dependent variable for robustness purposes (we calculate private-GDP by subtracting from GDP the appropriate government expenditure – depending on the utilised measure of discretionary policy). All variables are expressed as averages over non-overlapping three-year periods.

Although model (2) is basically taken from the literature on the subject, it is usually estimated with cross-sectional data. Badinger (2009) constitutes an exception in offering panel estimates of this model with quarterly data. However, using quarterly data when dealing with fiscal policy can be quite problematic, as most fiscal data at that frequency usually result from interpolations or estimations based on fiscal information additional to the yearly budget (see, *e.g.*, Paredes *et al.* 2009). As a result, quarterly fiscal data may incorrectly represent a country's fiscal policy stance: most governments do not revise their budgets on a quarterly schedule, while many do it once per year. Thus, the novelty of our first set of results lies in the use of multi-periods annual panel data, which puts to the test the existing results of the literature that normally highlight a positive correlation between discretionary fiscal policy and GDP volatility.

The main object of interest in model (2) is ϕ_1 , whose sign indicates whether discretionary fiscal policy contributes to the output stability of the countries under observation (a negative coefficient would indicate that it does). We estimate equation (2) using the System-GMM estimator (developed by Arellano and Bover 1995; Blundell and Bond 1998), that is a recommended choice when the time dimension is small, for instance when variables are observed in multi-year periods as in our case (Bond *et al.* 2001). The GMM estimator also deals with the potential endogeneity of the fiscal policy variables (*discr_fp* and *gov_size*), a well-known issue affecting this type of models: as argued by Rodrik (1998), more volatile economies may have an incentive to set up larger governments.

Given the difficulty of finding proper exogenous instruments for those two variables, we use their own values two periods before, *i.e.* their second lags, as instruments (consistently with the tests for

⁸ We avoid using the frequently used government size series taken from the Penn World Tables (Heston *et al.* 2012) given the shortcoming noted by Knowles (2001), namely that that series is calculated imposing a set of PPPs prices that may yield imprecise values.

autocorrelation of second order, Arellano and Bond 1991). We also use the following variables excluded from the model as instruments for *gov_size* (drawing from the work by, among others, Fatas and Mihov 2001): the logarithm of total population (*pop*), the dependency ratio (*dep_ratio*) and the urbanisation rate (*urban*). Given the potential relationship between government size and fiscal decentralisation in advanced economies (Prohl and Schneider 2009, Cassette and Paty 2010), we add an index of fiscal decentralisation (*f_dec*, represented by the average between tax and expenditure decentralisation to get a more comprehensive measure) as an exogenous instrument for *gov_size*. Finally, we treat as predetermined trade openness and the level of real GDP per capita, and we use them as instruments in the levels equation.

We report the results for the one-step GMM estimators that have been found to be more reliable for finite sample inference as the asymptotic standard errors associated with the two-step GMM estimators can be seriously biased downwards (see Blundell and Bond 1998; Bond *et al.* 2001; Madariaga and Poncet 2007). The results reported in Table 2 are obtained with GDP volatility used as the dependent variable in the first three columns of the table (these columns differ depending on the discretionary fiscal policy series included among the right-hand-side variables), while private-GDP volatility is the dependent variable in the remaining columns.

INSERT TABLE 2 ABOUT HERE

The results confirm previous findings on the positive relationship between aggressive use of discretionary fiscal policy and output volatility, meaning that government spending volatility adversely affects output stability. This result is robust to different measures of discretionary fiscal policy, and the magnitude of the effect is economically meaningful and higher when narrower spending measures are used, *i.e.* government consumption (*discr_gc*) and government consumption plus investment (*discr_gci*). On average, a one percent increase in volatility of discretionary fiscal policy increases output volatility - *i.e.* worsens macroeconomic stability - by between 0.32 and 0.97 percentage points - according to the *discr_gpe* and to the *discr_gc* specifications, respectively. The estimated elasticity in the *discr_gci* case lies between the two, being close to 0.60.

These elasticities are not too far from those of Fatas and Mihov (2003) who estimate the same elasticity to be equal to 0.80 using government spending for a sample of 91 countries over the period 1960-2000. Therefore, we can borrow their conclusions and confirm that discretionary fiscal policy does induce significant fluctuations in economic activity.

Moreover, our results suggest that most of the output-destabilising effects of discretionary expenditure pertain to public investment as well as to other spending items belonging to the government consumption aggregate (*e.g.*, the expenses and purchases necessary for the functioning of the public administration). Many governments, particularly in the European Union, have recently focused on cutting the latter in order to implement austerity measures taken as a response to the great recession and its effects on public finances (*e.g.*, Italy, as specified in the legislative decree D.L. 78/2010). Our estimates suggest that manipulating such public spending item may yield additional, and possibly unexpected, effects on the volatility of output that may be either positive or negative depending on the resulting volatility of the spending item itself.

Given that government expenditure is an important part of GDP, the result that aggressively using fiscal policy leads to more volatile output may seem partly tautological: volatile public spending may lead to a volatile output just because it is included in it. The results of the estimation of model (2) when the volatility of GDP excluding government expenditure is used as the dependent variable confirm that the previous results are not driven by the fact that GDP includes public expenditure (see Table 2).

As for the controls, government size and the level of real GDP per capita both increase macroeconomic volatility, while trade openness has the opposite effect. Hence, larger public sectors as well as richer countries seem to face higher output volatility, while more open economies are characterised by higher output stability. Finally, the diagnostic tests do not reveal strong evidence against the models: the Hansen test does not reject the null of valid instruments in any of the specifications. The AR(2) test never indicates second order serial correlation apart from the first of the private-GDP specifications, *i.e.* the one with *discr_gpe*, therefore instruments can be considered valid in five out of six cases.

3.2 The effects of fiscal rules

The previous results suggest that the aggressive use of discretionary fiscal policy is likely to reduce output stability. This in turn may adversely affect economic welfare and growth (Fatas and Mihov 2003), and it is probably among the reasons leading to the adoption of fiscal rules capable of restricting the possibility of governments to aggressively use fiscal policy.

This section investigates whether the existence of fiscal rules affects the relationship between the discretionary component of government spending and output volatility. We estimate an enriched version of model (2) that includes among the right-hand-side variables a measure of fiscal rules, and its interaction with discretionary fiscal policy. The idea behind the introduction of the interaction term is that the existence of fiscal rules may affect the stabilisation function of fiscal policy, although *a priori* it is difficult to say whether it will limit it or enhance it. The model is the following:

$$\ln \sigma_{i,[t,t+2]}^{gdp} = \gamma_{i,0} + \gamma_1 \text{discr_fp}_{i,[t,t+2]} + \gamma_2 \text{rule_}_{i,[t,t+2]} + \gamma_3 \text{discr_fp} * \text{rule_}_{i,[t,t+2]} + \mu_1 \mathbf{W}_{i,[t,t+2]} + v_{i,t} \quad (3)$$

The two new variables with respect to model (2) are: *rule_*, an index taking a value between 0 and 5 measuring the extent of fiscal rules with higher values indicating more stringent stricter rules⁹ (there are five types of rules pertaining to different budgetary items and public finance targets for which we have indices, and we use them separately in different specifications of the model – see below for details), and its interaction term with discretionary fiscal policy, *discr_fp*rule_*.

The rules' indices are taken from the Fiscal Rules Dataset published by the IMF (see Kinda *et al.* 2013 for details) that has data on national fiscal rules from 1985 to 2012 and covers four types of rules: budget balance (*rule_bb*), debt (*rule_d*), expenditure (*rule_e*), and revenue (*rule_r*) rules. Those four indices are also combined to generate a fifth index, *i.e.* the overall fiscal rules index (*rule_overall*). We report the estimates of the model specifications with national rules which cover at least the central government. The most frequently used rules constrain debt and the fiscal balance,

⁹ These indices take into account dimensions such as legal basis, coverage, formal enforcement procedures, expenditure ceilings, fiscal responsibility laws, and the existence of independent body setting budget assumptions and monitoring the budget implementation (Schaechter *et al.* 2012).

often in combination. However, for the sake of completeness we provide estimations using all the five types of rules for which data are available.

We estimate equation (3) with the System-GMM estimator as before. In this case, we also need to deal with the potential endogeneity of the interaction term between discretionary policy and fiscal rules. To this purpose, we add to the set of instruments a variable constructed as the interaction between the second lag of *discr_fp* and *rule_* (Ozer-Balli and Sørensen 2010). Table 3 contains the results of model (3) with *discr_gpe* as the measure of discretionary fiscal policy and the five types of fiscal rules used separately one at a time (accordingly, there are five columns in the table). Table 4 shows the estimates when *discr_gc* is used instead, similarly organised. For the sake of brevity, we do not report the estimates of the *discr_gci* specification as the results (available upon request) are remarkably similar to those of the *discr_gc* specification.

INSERT TABLES 3&4 ABOUT HERE

These new estimates confirm the positive relationship between aggressiveness of discretionary fiscal policy and output volatility, with positive and statistically significant coefficients associated with both *discr_gpe* and *discr_gc* in all specifications. However, due to the inclusion of the interaction term between the discretionary policy variable and the rules' indices, those coefficients are only indicative of the policy effects when there are no fiscal rules in place, *i.e.* the value of the *rule_* index is equal to zero.

It is therefore important to consider what happens when fiscal rules are introduced. There are significant differences between the two tables regarding the rules' coefficients and those of the interaction terms. The estimates in Table 3 (*discr_gpe* specification) surprisingly indicate that the existence of fiscal rules contributes to increase GDP volatility (the *rule_* coefficients are always positive and significant at standard levels). However, the coefficient of the interaction term *discr_gpe*rule_* is negative and statistically significant in all cases, suggesting that discretionary fiscal policy may enhance output stability when properly coupled with fiscal rules. The quantification of the overall marginal effect of *discr_gpe* (taking into account its interaction with *rule_*) leads to the

finding that the stringency of fiscal rules is crucial for the relationship between discretionary fiscal policy and output volatility. When the rules' indices assume values higher than three, on a scale from zero to five, the overall effect of *discr_gpe* on output volatility becomes negative, meaning that fiscal rules mitigate the output-destabilising impacts of discretionary primary expenditure. Actually, in the case of balanced budget rules, *rule_bb*, the threshold is lower (*circa* two), while in the case of rules on revenues, *rule_r*, the threshold is higher (almost four). This implies that rules on balanced budgets are more effective in mitigating the output-destabilising effects of discretionary policy than rules focusing on one side of the budget only, *i.e.* expenditure or revenue.¹⁰

What does it mean to have fiscal rules corresponding to a value of three in our measures? There are numerous cases in our sample in which the strictness of fiscal rules implies values of, *e.g.*, *rule_overall* higher than the threshold. Canada between 1998 and 2005 is an example: in 1998 the government set out a 'balanced budget or better' policy as part of a debt repayment plan, with a Contingency Reserve and an economic prudence factor built into the federal budget and devoted to debt reduction if needed. Other examples include France from 2006 onwards, with strict rules in place regarding expenditure (targeted increases of expenditure are to be respected each year) and revenues (the allocation of higher than expected tax revenues has to be defined *ex ante* by central government and social securities), as well as Sweden from 2000 onwards (implementing both a nominal expenditure ceiling for government consumption and a surplus target for the general government). Thus, when strict rules are implemented as done by a number of industrialised countries at least for some years lately, discretionary primary expenditure becomes output-stabilising.

Moving to Table 4, we can comment on the influence of fiscal rules on the output stabilisation function of fiscal policy when government consumption is used to estimate the use discretionary fiscal policy. In this case, the signs of the coefficients of both the rules' indices and their interaction with discretionary policy are consistent with those of the previous specification, but they are never statistically significant at standard levels. This may derive from the fact that the budgetary items and

¹⁰ This result is close to that of Debrun *et al.* (2008) who however investigate the effects of national fiscal rules on fiscal discipline. According to their analysis, balanced budget and debt rules have a stronger and significant effect in determining higher cyclically adjusted primary balances, while this is not the case for expenditure rules.

targets to which rules are mainly referred to do not necessarily pertain to government consumption. As a result, these particular estimates unable to pick up the influence of such rules on the stabilisation function of fiscal policy.

Diagnostic tests do not reveal specific problems, as the null hypotheses of both the Hansen J test statistic and of the AR(2) test are not rejected in any case. As done previously, we check the robustness of the results just presented by re-estimating model (3) replacing the dependent variable with private-GDP volatility. Alternative estimates with *discr_gpe* and *discr_gc* as the discretionary policy variables (not reported but available upon request) reveal that findings are robust.

To conclude on the influence of fiscal rules on the relationship between output stability and discretionary policy, one important result seems to be that different measures of the latter can bear different implications (similarly to arguments laid out by Blanchard, 1993, Alesina and Perotti 1999). In particular, the existence of strict fiscal rules emerges as a condition capable of radically changing the output-destabilising nature of discretionary fiscal policy. On the other hand, the fact that this result is not supported by the estimates employing narrow definitions of the latter variable may work in favour of the strand of literature casting doubts on the effectiveness of the rules - particularly when they are not supported by a strong political commitment and fiscal institutions ensuring effective monitoring, corrective actions, and sanctions (*e.g.*, Wyplosz 2005; von Hagen 2006b). Finally, not all types of fiscal rules are equally effective in favouring output stabilisation, as those on balanced budgets seem to be more effective than others, particularly of those on revenues.

4. Discretionary fiscal policy and inflation volatility

This section deals with the effects of discretionary fiscal policy on inflation volatility. It is organised mimicking Section 3, with an initial model close to those used in the existing literature but estimated with panel data, and a second model investigating the role of fiscal rules.

4.1 The standard model

The following model has been commonly used to analyse the effects of fiscal policy on the volatility of inflation (see Rother 2004 among others). We estimate it using non-overlapping three-year periods data from 1985 to 2012.

$$\ln \sigma_{i,[t,t+2]}^{infl} = \chi_{i,0} + \chi_1 \text{discr_fp}_{i,[t,t+2]} + \delta_1 \mathbf{V}_{i,[t,t+2]} + \varpi_{i,t}, \quad (4)$$

where $\sigma_{i,[t,t+2]}^{infl}$ is the standard deviation of the inflation rate calculated as its average over the three-year periods, standing for inflation volatility. *discr_fp* is one of the three measures of discretionary policy introduced earlier and arising from equation (1), used separately one at a time. $\mathbf{V}_{i,[t,t+2]}$ is a vector of controls including government size (*gov_size*), trade openness (*open*), the inflation level (*infl_level*), and the volatilities (*i.e.* the standard deviations over the three-year periods) of the change in output gap, the money growth rate, and the effective exchange rate (*gap_vol*, *money_vol*, and *exch_vol* respectively).

In equation (4), we are prevalently interested in estimating the coefficient χ_1 , whose sign indicates how discretionary fiscal policy affects inflation volatility in the countries of our sample (a negative coefficient would indicate that it alleviates inflation instability). We estimate equation (4) using the System-GMM estimator to deal with the potential endogeneity of the fiscal policy variables (*discr_fp* and *gov_size*) that we instrument using their own second lags. We also use the following variables excluded from the model as exogenous instruments for *gov_size*: the logarithm of total population, the dependency ratio, the urbanisation rate, and fiscal decentralisation. Finally, we treat as predetermined the rest of the right-hand-side variables, and we use them as instruments in the levels equation.

INSERT TABLE 5 ABOUT HERE

Table 5 displays the estimates of three different specifications of equation (4), one for each measure of discretionary fiscal policy included in the model. As in the case of output volatility, the

discretionary spending coefficients are always estimated to be positive, and highly statistically significant in the cases of *discr_gci* and *discr_gc*. This suggests that aggressive use of narrowly-defined fiscal policy, *i.e.* considering government consumption and investment only, may destabilise inflation. This marks a slight difference with respect to the previous results on output volatility which was also correlated with the other spending items different from government consumption and investment.

While evidence of inflation-destabilising effects of fiscal policy confirms the findings by Rother (2004), it goes against those of Badinger (2009), who offers panel estimates based on quarterly data in addition to cross-sectional ones. It is worth recalling that fiscal quarterly data are problematic, given that they mostly result from interpolation. Our estimates indicate that, for average values of the variables, every percentage point increase in volatility of discretionary fiscal policy increases output volatility by between 0.37 - according to the *discr_gci* specification - and 0.51 percentage points - according to the *discr_gc* specification. The *discr_gpe* elasticity is not significant, and given the very small point estimate the resulting elasticity is also close to zero. As for the controls, the volatility of money growth is also inflation-destabilising, while the level of inflation level is negatively correlated to its volatility. Finally, the diagnostic tests do not indicate any issue with the estimates.

4.2 The effects of fiscal rules

The results in the previous sub-section prove that the aggressive use of discretionary fiscal policy tends to increase inflation instability. The adverse effects on economic welfare and growth of inflation instability have been extensively documented in the literature (see, among others, Fountas *et al.* 2006). We are now going to investigate whether the existence of fiscal rules can mitigate those adverse effects by affecting the relationship between discretionary policy and inflation volatility.

We estimate a more comprehensive version of model (4) that includes among the right-hand-side variables a measure of fiscal rules, and its interaction with discretionary fiscal policy. The model is the following:

$$\ln \sigma_{i,[t,t+2]}^{infl} = \lambda_{i,0} + \lambda_1 discr_fp_{i,[t,t+2]} + \lambda_2 rule__{i,[t,t+2]} + \lambda_3 discr_fp * rule__{i,[t,t+2]} + \rho_1 \mathbf{W}_{i,[t,t+2]} + \zeta_{i,t} \quad (5)$$

The only difference between model (4) and model (5) lies in the two new variables accounting for the existence of fiscal rules: *rule_* (we use again the five types of rules separately), and its interaction term with discretionary fiscal policy, *discr_fp*rule_*.

The System-GMM estimator is used and, in order to deal with the potential endogeneity of the interaction term between discretionary policy and fiscal rules, we add to the set of instruments a variable constructed as the interaction between the second lag of *discr_fp* and *rule_*, as done above for model (3).

Table 6 contains the results of model (3) with *discr_gpe* as the measure of discretionary fiscal policy and the five types of fiscal rules are used separately one at a time. Table 7 shows the estimates when *discr_gc* is used instead.

INSERT TABLES 6&7 ABOUT HERE

These new estimates broadly confirm the results obtained with model (4). The *discr_gpe* coefficients are never statistically significant (Table 6), while those associated with *discr_gc* (Table 7) are always positive, and in most specifications significantly different from zero. This suggests that when there are no fiscal rules only the aggressive use of spending items pertaining to government consumption are inflation-destabilising.

As for the role of fiscal rules, we can conclude that the overall lack of statistical significance of the coefficients associated with the rules' indices and with the interaction terms between such rules and discretionary policy points towards a lack of influence of fiscal rules in this case. Diagnostic tests do not reveal specific problems, as the null hypotheses of both the Hansen J test statistic and of the AR(2) test are not rejected in any case.

All in all, we conclude that discretionary policy can hardly enhance inflation stability even when coupled with fiscal rules. More precisely, it emerges an inflation-destabilising role of discretionary

fiscal policy, in particular that related to consumption and investment categories of the budget. This marks a stark difference from our findings on the relationship between aggressive use of fiscal policy and output stability. In that case we found that fiscal rules were capable of changing the nature of the relationship from being output-destabilising to being output-stabilising. However, the lack of influence of fiscal rules in the case of inflation volatility seems legitimate, given that the task of maintaining a stable inflation rate is in the hands of central banks, rather than governments.

5. Summary and conclusions

In times of large deficits and growing public debt in advanced countries, economists, policy makers, and the media are all engaged in a stimulating debate on how to keep under control government national accounts and public finances. As a result, the economic literature now offers a number of recent theoretical and empirical studies dealing with the effectiveness of fiscal rules as a measure to ensure fiscal discipline. We contribute to this debate by studying the impact of such rules on one of the main objectives of fiscal policy, namely the macroeconomic stabilisation function, rather than investigating their pure disciplinary effects.

We firstly estimate three alternative measures of discretionary fiscal policy using three government expenditure series in an econometric model designed to disentangle their cyclical and structural components. Then, we test the relationship between discretionary fiscal policy and macroeconomic stability with annual panel. Finally, and most importantly, we study how this relationship is affected by the existence of national fiscal rules.

Our results suggest that the aggressive use of discretionary government consumption (and, to a minor extent, investment) expenditure is both output- and inflation-destabilising. Discretionary spending items outside government consumption are less output-destabilising, and are not associated with inflation volatility. More importantly, we find that the introduction of fiscal rules significantly affects the stabilisation function of fiscal policy. In particular, stringent fiscal rules are capable of making discretionary policy output-stabilising, and this is another key result of the analysis: in order to be effective for what concerns output volatility, fiscal rules need to be strict enough. Among the

various types of rules, those on balanced budgets seem to be the most effective, and those on revenues the least effective. On the other hand, rules are unable to mitigate the inflation-destabilising effects of discretionary policy regardless of their type or their degree of stringency.

Overall, our findings bear interesting policy implications. The governments of most advanced countries responded to the 2007-09 financial crisis by implementing significant financial stimulus programs, but due to the ensuing great recession, this led to widespread fiscal imbalances. This situation fuelled the debate on the implementation of fiscal rules to ensure fiscal discipline and budgetary consolidation. Our results suggest that adequately strict fiscal rules, particularly if targeting balanced budgets, can affect the stabilisation function of fiscal policy. More precisely, rules can reduce the output-destabilising effects of discretionary fiscal policy, but they cannot affect the impact of the latter on inflation volatility. Since there is evidence of adverse welfare and growth effects of output volatility, this may imply a beneficial role of fiscal rules additional to the disciplinary one, if any.

This welfare-enhancing effect of fiscal rules seems to be particularly relevant given that austerity policies aimed at restoring fiscal discipline are resulting in spending cuts and tax increases adversely affecting economic growth (IMF 2012). Our results suggest that the existence of rules guiding the policy-makers behaviour may mitigate those adverse effects.

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Tables

Table 1: pairwise correlations among the three measures of discretionary fiscal policy

	<i>discr_gc</i>	<i>discr_gci</i>	<i>discr_gpe</i>
<i>discr_gc</i>	1		
<i>discr_gci</i>	0.8398*	1	
<i>discr_gpe</i>	0.4589*	0.3097*	1

Note: * denotes significance at 1%.

Table 2: GDP and private GDP volatility, three different measures of discretionary policy

	Macro volatility: GDP			Macro volatility: private GDP		
	<i>discr_gpe</i>	<i>discr_gci</i>	<i>discr_gc</i>	<i>discr_gpe</i>	<i>discr_gci</i>	<i>discr_gc</i>
<i>discr_fp</i>	17.8*** (2.84)	34.7** (2.52)	59.7*** (3.63)	93.8*** (4.26)	56.6*** (2.95)	80.8*** (3.77)
<i>gov_size</i>	0.12*** (3.27)	0.09*** (4.24)	0.09*** (3.81)	0.48*** (5.41)	0.17*** (5.91)	0.16*** (5.06)
<i>open</i>	-0.0046 (-1.51)	-0.0031 (-1.14)	-0.0063** (-1.96)	-0.019*** (-2.80)	-0.006* (-1.94)	-0.009** (-2.41)
<i>gdp_level</i>	1.21** (1.96)	1.41*** (2.86)	1.89*** (3.59)	5.73*** (3.78)	2.67*** (4.38)	2.89*** (4.55)
No. of obs.	157	157	159	157	157	159
AR(2)	0.20	0.18	0.27	0.02	0.11	0.15
Hansen	0.94	0.98	0.96	0.97	0.97	0.97

Note: z -statistics in parenthesis based on heteroskedasticity-robust standard errors. ***, **, * denote significance at 1%, 5%, and 10% respectively. p -values are reported for both the Hansen J and the AR(2) statistics.

Table 3: GDP volatility, national rules, discretionary fiscal policy = *discr_gpe*

Rules:	<i>rule e</i>	<i>rule r</i>	<i>rule bb</i>	<i>rule d</i>	<i>rule overall</i>
<i>discr_gpe</i>	25.1*** (4.89)	27.4*** (6.77)	27.2*** (5.32)	24.6*** (4.76)	29.0*** (6.31)
<i>interaction</i>	-8.05** (-2.08)	-10.4*** (-4.22)	-13.7** (-2.17)	-10.8* (-1.84)	-10.6** (-2.35)
<i>rule_</i>	0.22** (1.98)	0.29*** (2.63)	0.34** (2.03)	0.33* (1.88)	0.29** (2.10)
<i>gov_size</i>	0.075*** (3.35)	0.076*** (3.37)	0.076*** (3.46)	0.085*** (3.85)	0.062*** (3.40)
<i>open</i>	-0.0023 (-1.12)	-0.0031 (-1.54)	-0.0028 (-1.41)	-0.0028 (-1.40)	-0.0023 (-1.23)
<i>gdp_level</i>	0.73 (1.57)	0.83* (1.82)	0.80* (1.65)	0.80* (1.85)	0.70* (1.66)
No. of obs.	132	132	132	132	132
AR(2)	0.26	0.19	0.23	0.15	0.19
Hansen	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on heteroskedasticity-robust standard errors. ***, **, * denote significance at 1%, 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics.

Table 4: GDP volatility, national rules, discretionary fiscal policy = *discr_gc*

Rules:	<i>rule e</i>	<i>rule r</i>	<i>rule bb</i>	<i>rule d</i>	<i>rule overall</i>
<i>discr_gc</i>	54.2*** (4.64)	57.2*** (4.79)	52.8*** (5.65)	56.2*** (5.96)	46.7*** (4.06)
<i>interaction</i>	-5.27 (-1.31)	-7.60 (-1.57)	-5.21 (-1.10)	-7.39* (-1.76)	-4.47 (-1.05)
<i>rule_</i>	0.13 (1.12)	0.16 (1.08)	0.098 (0.75)	0.17 (1.21)	0.082 (0.64)
<i>gov_size</i>	0.067*** (3.41)	0.069*** (3.56)	0.066*** (3.77)	0.065*** (3.16)	0.047*** (2.79)
<i>open</i>	-0.0044* (-1.75)	-0.0048** (-1.99)	-0.0048** (-2.08)	-0.0049** (-2.01)	-0.0032 (-1.24)
<i>gdp_level</i>	1.41*** (2.81)	1.51*** (3.02)	1.41*** (2.94)	1.39*** (2.69)	1.22** (2.47)
No. of obs.	136	136	136	136	136
AR(2)	0.16	0.16	0.10	0.17	0.11
Hansen	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on heteroskedasticity-robust standard errors. ***, ** denote significance at 1% and 5% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics.

Table 5: inflation volatility, three different measures of discretionary policy

	Macro volatility: inflation		
	<i>discr_gpe</i>	<i>discr_gci</i>	<i>discr_gc</i>
<i>discr_fp</i>	1.56 (0.17)	18.0*** (4.17)	25.9*** (6.27)
<i>gov_size</i>	0.045* (1.75)	0.025 (1.44)	0.021 (1.10)
<i>open</i>	-0.0016 (-0.82)	-0.0014 (-0.80)	-0.0024 (-1.23)
<i>infl_level</i>	-0.015** (-2.09)	-0.018*** (-3.25)	-0.016*** (-2.62)
<i>gap_vol</i>	0.10 (1.12)	0.056 (0.61)	-0.031 (-0.33)
<i>exch_vol</i>	0.029 (0.48)	-0.017 (-0.49)	-0.0063 (-0.17)
<i>money_vol</i>	0.037*** (2.79)	0.028*** (2.70)	0.027** (2.47)
No. of obs.	132	132	132
AR(2)	0.36	0.37	0.72
Hansen	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on heteroskedasticity-robust standard errors. ***, **, * denote significance at 1%, 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics.

Table 6: inflation volatility, national rules, discretionary fiscal policy = *discr_gpe*

Rules:	<i>rule e</i>	<i>rule r</i>	<i>rule bb</i>	<i>rule d</i>	<i>rule overall</i>
<i>discr_gpe</i>	7.69 (1.18)	9.92 (1.35)	5.36 (0.76)	-0.46 (-0.033)	3.17 (0.44)
<i>interaction</i>	-4.23 (-1.11)	-4.47* (-1.70)	-4.53 (-0.75)	3.62 (0.51)	-2.36 (-0.74)
<i>rule_</i>	0.030 (0.35)	0.097 (0.94)	0.020 (0.14)	-0.063 (-0.33)	0.0054 (0.061)
<i>gov_size</i>	0.026 (1.39)	0.034* (1.74)	0.015 (0.88)	0.030 (1.58)	0.025 (1.34)
<i>open</i>	-0.0010 (-0.53)	-0.0016 (-0.77)	-0.00086 (-0.45)	-0.00068 (-0.37)	-0.00078 (-0.43)
<i>infl_level</i>	-0.015 (-1.54)	-0.016* (-1.69)	-0.012 (-1.23)	-0.016** (-1.97)	-0.014 (-1.54)
<i>gap_vol</i>	0.018 (0.14)	-0.014 (-0.12)	0.041 (0.41)	0.065 (0.70)	0.036 (0.33)
<i>exch_vol</i>	0.032 (0.65)	0.035 (0.73)	0.043 (0.92)	0.028 (0.71)	0.037 (0.78)
<i>money_vol</i>	0.022 (1.54)	0.024* (1.70)	0.020 (1.30)	0.024* (1.88)	0.023 (1.60)
No. of obs.	111	111	111	111	111
AR(2)	0.85	0.81	0.83	0.76	0.85
Hansen	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on heteroskedasticity-robust standard errors. **, * denote significance at 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics.

Table 7: inflation volatility, national rules, discretionary fiscal policy = *discr_gc*

Rules:	<i>rule e</i>	<i>rule r</i>	<i>rule bb</i>	<i>rule d</i>	<i>rule overall</i>
<i>discr_gc</i>	17.8*	22.1***	9.24	13.2**	14.8
	(1.93)	(3.30)	(1.07)	(2.04)	(1.60)
<i>interaction</i>	-0.39	-0.32	5.52*	5.21	2.90
	(-0.098)	(-0.099)	(1.76)	(1.35)	(0.80)
<i>rule_</i>	-0.043	-0.016	-0.20**	-0.15	-0.11
	(-0.52)	(-0.17)	(-2.11)	(-1.22)	(-1.13)
<i>gov_size</i>	0.014	0.015	0.014	0.016	0.015
	(0.86)	(1.11)	(1.02)	(1.06)	(0.95)
<i>open</i>	-0.0018	-0.0021	-0.0015	-0.0019	-0.0020
	(-0.90)	(-1.07)	(-0.79)	(-1.12)	(-1.08)
<i>infl_level</i>	-0.014*	-0.015*	-0.014*	-0.017**	-0.015**
	(-1.92)	(-1.94)	(-1.72)	(-2.04)	(-2.08)
<i>gap_vol</i>	-0.000038	-0.030	0.021	0.011	0.00014
	(-0.00026)	(-0.24)	(0.15)	(0.087)	(0.00091)
<i>exch_vol</i>	0.0099	0.0052	0.016	0.0048	0.0094
	(0.27)	(0.15)	(0.47)	(0.15)	(0.28)
<i>money_vol</i>	0.024*	0.023**	0.027**	0.026**	0.024*
	(1.84)	(1.97)	(2.10)	(2.26)	(1.93)
No. of obs.	111	111	111	111	111
AR(2)	0.90	0.91	0.25	0.23	0.52
Hansen	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on heteroskedasticity-robust standard errors. ***, **, * denote significance at 1%, 5% and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics.

Data Appendix

Series used in the first part of the analysis

Government consumption (*spending_gc*). Government final consumption expenditure, expenditure approach. *Source*: OECD Economic Outlook (EO from now on) 93 (June 2013).

Government consumption plus investment (*spending_gci*). *spending_gc* + government fixed capital formation, appropriation account. *Source* (of the latter): OECD EO 93.

Government primary expenditure (*spending_gpe*). Total disbursements of the general government excluding gross government interest payments. *Source* (of both series): OECD EO 93.

Inflation (π). Inflation calculated from the GDP deflator. *Source*: OECD EO 93.

Real GDP (*gdp*). Logarithm of GDP, volume, at 2005 PPP USD. *Source*: OECD EO 93.

Oil price (*oil*). Logarithm of the spot price of a barrel of oil. *Source*: Dow Jones & Company.

Series used in the second part of the analysis

GDP volatility (σ^{gdp}). Standard deviation over three-year periods of the growth rate of real GDP per capita. *Source*: OECD EO 93 (GDP, volume at 2005 PPP USD). *Source* of the population series (*pop*): Penn World Tables (PWT from now on) 8.0. Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2013), "The Next Generation of the Penn World Table" available for download at www.ggdc.net/pwt

Inflation volatility (σ^{infl}). Standard deviation of the inflation rate (calculated from the GDP deflator) over the three-year periods. *Source*: OECD EO 93.

Discretionary fiscal policy (*discr_gc*, *discr_gci*, *discr_gpe*). Volatility over three-year periods of the residuals of the model estimated in the first part of the analysis (see Section 2 for details).

Government size (*gov_size*). Ratio between government primary expenditure and GDP. *Source*: OECD EO 93.

Trade openness (*open*). Share of imports plus share of exports over GDP. *Source*: PWT 8.0.

Fiscal rules (*rule_e*, *rule_r*, *rule_bb*, *rule_d*, *rule_overall*). Rules' indices taking values between zero and five (higher values stand for stricter rules) constructed as explained both in Section 3.2 and in Schaechter *et al.* (2012). *Source*: IMF-FAD Fiscal Rules Dataset.

Fiscal decentralization (*f_dec*). Average between expenditure decentralisation and tax decentralisation. The expenditure (tax) decentralisation indices are constructed as ratios of sub-central expenditure (tax) over consolidated general government expenditure (revenue). *Source*: OECD.

Dependency ratio (*dep_ratio*). Age dependency ratio (people younger than 15 or older than 64), percentage of working-age population (people aged 15-64). *Source*: World Development Indicators (WDI from now on).

Urbanisation (*urban*). Urban population, percentage of the total population. *Source*: WDI.