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Abstract

We study the relationship between discretionary fiscal policy and macroeconomic stability in 21 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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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 sound public finance 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 favourably by policy makers and researchers alike (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. Musgrave (1969) 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 latter, that is of the government's voluntary corrections of expenditure and/or taxation not taken in response to

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

cyclical developments (Furceri 2007, Afonso and Furceri 2008, Loayza *et al.* 2007). In light of the recent and 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; European Commission 2006; Cottarelli and Schaechter 2010). Since numerical fiscal rules establish clear benchmarks and targets with which actual policies can be compared, they can provide a focal point for the governments undertaking fiscal adjustments and post-crisis fiscal consolidation processes (Guichard *et al.* 2007; Kumar *et al.* 2009).[2]

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 has surged to 76 by mid-2012 (Schaechter *et al.* 2012). It is important to point out that there could be important differences between *de jure* and *de facto* fiscal rules depending on their effectiveness.[3] Wyplosz (2011) suggests that governments may gain public support to introduce rules believed to ensure the interest of society, only to disregard those rules when effectively constraining the governmental actions.

In terms of our empirical analysis, existing datasets on fiscal rules (like those provided by the IMF and the European Commission) only measure *de jure* rules, in particular those that have taken effects already, or where clear transition regimes have been specified. As Schaechter *et al.* (2012) put it, to what degree rules have been adhered to in practices can be considered as an important area for

[2] For example, in Estonia an externally-imposed fiscal rule has acted as a major focal point in guiding deficit-reduction efforts (Raudla 2013). The findings by Lavigne (2011) and Price (2010) suggest that fiscal rules can be used by governments as a political 'cover' when implementing austerity measures, should they turn out to be unpopular. However, Kumar *et al.* (2007) affirm that the simple adoption of fiscal rules does not generally appear to be sufficient to support sustained fiscal adjustment efforts.

[3] For instance, in the US the targets set by the Deficit Control Act of 1985 were initially met in part through the sale of government assets and in part by moving expenditures 'off-budget'. After exhausting this strategy, the deficit targets were adjusted upward in 1987 and again in 1990 (Inman 1998). Similar considerations apply to the golden rule in Germany (Baumann *et al.* 2008).

future research. The results of our paper (and indeed of the vast majority of the existing literature) should be read with this important caveat in mind.

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).[4]

The literature evaluating the first generation fiscal rules mostly expresses a positive verdict. Guichard *et al.* (2007) find that rules targeting expenditure are associated with larger and longer fiscal adjustments. Manasse (2007) and Debrun *et al.* (2008) claim that rules limit the pro-cylclicality of fiscal behaviour. Sub-national rules in federal countries such as the US and Switzerland have also been extensively studied. Alesina and Bayoumi (1996) show that in the US states balanced budget rules are effective in enforcing fiscal discipline and that they have no costs in terms of increased output variability. Similar findings are offered by Poterba (1994), Alt and Lowry (1994), Bayoumi and Eichengreen (1995), all claiming that US state-level fiscal restrictions contribute to lower deficits and to react faster to negative fiscal shocks. As for Switzerland, Feld and Kirchgassner (2008) praise the success of rules in forcing sub-national governments to follow strictly sustainable policies without any intervention of the national government. Krogstrup and Walti (2008) also prove that fiscal rules significantly affect the real budget balances of the Swiss sub-federal jurisdictions.[5]

[4] '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.

[5] We have thought of performing an empirical investigation of the effects of fiscal rules on the stabilisation function of federal governments only. However, our sample only includes four federal countries (Belgium, Canada, Switzerland, and the US) and restricting the sample to such a small number of countries is not likely to

In general, most of the existing literature deals with the appraisal of the ability of fiscal rules to address the sources of the deficit-bias, and tries to understand whether rules constitute a sufficient condition to get sustainable fiscal parameters. 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

lead to reliable results. A better approach would be to consider data at the regional/state level for such federal countries, but this goes beyond the scope of the present paper and it can constitute material for future research.

approach as done in most of the existing literature. In particular, we use multi-year periods data (three-year periods are used as a benchmark) for a sample of 21 OECD countries that, to the best of our knowledge, have never been used before in this context.[6] Then, and most importantly, we study how this relationship is affected by the existence of national fiscal rules.[7] In all cases we control for potential endogeneity issues that are widely recognised to affect this type of analysis, and we provide a substantial number of robustness checks to support the validity of our conclusions.

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 construct the measures of discretionary fiscal policy. Section 3 deals with the relationship between discretionary fiscal policy and output volatility, while section 4 concentrates on

[6] 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.

[7] 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).

the relationship between the former and inflation volatility. Finally, section 5 concludes and provides some policy implications.

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.

It would be inappropriate to simply use cyclically adjusted series (which are available for most advanced countries) because the discretionary component of a fiscal policy series 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. The latter represents the fiscal shocks that are normally thought to proxy for the aggressive use of fiscal policy (Gali and Perotti 2003), and it is the discretionary policy measure that we are interested in. There is no theoretical guidance on which 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).

This section deals with the estimation of those shocks. The objective of this specific part of the analysis is not to innovate on the existing literature: rather, we purposely adopt a standard approach so to ensure that the results that we are interested in (those about the influence of fiscal rules on the macroeconomic stabilisation function presented in the following part of the paper) are not driven by

non-standard choices in the first stage. We use the following model to recover the fiscal shocks used to measure discretionary policy:

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

where *spending_* is a measure of real government expenditure, *gdp* is real GDP, π is inflation rate (included in both level and squared forms),[8] and *trend* is a linear time trend. The main object of interest of equation (1) is $\varepsilon_t^{discr\_fp}$, 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*).[9] 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*).

[8] The inflation rate is included on the right-hand-side to ensure that our results are not determined by high-inflation episodes during which the co-movement between real government spending and output might be due to monetary instability instead of fiscal policy. Controlling for inflation is also important as the variables are expressed in real terms, but spending (especially government consumption) is typically budgeted in nominal terms. Thus, inflation shocks are likely to affect public expenditure and a possible nonlinear relationship between inflation and spending may take place. Hence, inflation squared is also included to control for this possibility.

[9] 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 (as in Badinger 2009). We use them for robustness purposes as detailed below but we prefer to concentrate on the measures obtained from government spending series consistently with the previous literature.

We estimate model (1) for every country of our sample over the period 1961-2012 (at most).[10] 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, 2006, and Badinger 2009 for a similar application).[11]

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 models 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 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.[12]

INSERT TABLE 1 ABOUT HERE

[10] The countries are: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, 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 Luxembourg and Switzerland; and to about 30 observations in the cases of France, Iceland, and Portugal. The sample is therefore made by OECD countries all at comparable stages of development and the choices are mostly dictated by data availability issues.

[11] The choice of instrumenting real GDP by the oil price is quite standard in the literature pointing out that measures of oil price and its shocks are good predictors of output (Mork 1989; Dotsey and Reid 1992; Ferderer 1997; Lee and Ni 2002). It has been pointed out that the oil price may be used as an instrument for inflation as well, but at this stage we are only interested in applying a standard estimation strategy so to obtain reliable discretionary policy series.

[12] 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* with respect to Badinger (2009). Also, for robustness purposes we have re-estimated model (1) excluding the years of the recent crisis, and the correlations among the shocks obtained from this sub-sample and those arising from the full sample (not reported for the sake of brevity) are reassuringly high. We use the full sample results to avoid affecting the time dimension of the panel estimates in the following part of the analysis.

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:

$$\ln \sigma^{gdp}_{i,[t,t+2]} = \varphi_1 discr\_fp_{i,[t,t+2]} + \phi_1 \mathbf{W}_{i,[t,t+2]} + \mu_i + \eta_t + \upsilon_{i,t}, \qquad (2)$$

where $\sigma^{gdp}_{i,[t,t+2]}$ 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 ε^{discr_fp} 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 government primary expenditure divided by GDP[13]), openness (*open*, the KOF globalization index whose construction is explained in Dreher (2006) and Dreher *et al.* (2008)), 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

[13] 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.

measure of discretionary policy). All variables are expressed as averages over non-overlapping three-year periods. μ_i and η_t are individual and time fixed effects, respectively.

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 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*). Finally, we treat as predetermined 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 (the coefficients of the latter are positive in all cases, although the *discr_gpe* one is not statistically significant at conventional levels), 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 0.36 and 0.48 percentage points according to the *discr_gci* and to the *discr_gc* specifications, respectively. The estimated elasticity in the *discr_gpe* case lies between the two, being slightly larger than 0.36.

These elasticities are smaller than 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. Their estimated elasticity is larger than ours possibly because of their sample including emerging economies which may experience a larger influence of fiscal policy on the volatility of output than developed countries. Despite this difference, we can certainly 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, private GDP volatility columns). In this case the coefficient related to *discr_gpe* is highly statistically significant. The elasticities based on those alternative estimates are in all cases comparable to those estimated earlier and higher in magnitude (between 0.42 and 0.44).

As for the controls, richer countries seem to face higher output volatility, as the coefficient of real GDP per capita is estimated to be positive in all specifications, and in all cases but one statistically different from zero. The inclusion of period fixed effects reveals to be appropriate, as most of their coefficients are significantly different from zero at standard levels. Given that the reference period, *i.e.* the omitted dummy, is the most recent one, it seems that output volatility has always been lower in the first part of the sample. This is not surprising, given that the last period includes the turmoil following the recent crisis and the resulting recession. 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 in the case of GPD volatility (but it does in two of the three private-GDP specifications).

We have carried out a number of robustness checks in order to ensure that the above results do not depend on specific sampling and modelling choices. First of all, we have re-estimated model (2) using the 2SLS estimator to check whether the choice of the system-GMM turns out to be crucial for the results. Table A2 in the Appendix contains the estimated coefficients of the *discr_gc* specification of model (2) where the endogenous variables (that is, the two fiscal policy series *gov_size* and *discr_gc*) are instrumented with two lags of themselves, the three exogenous instruments *pop*, *dep_ratio*, *urban*, and the rest of the variables of the model (Table A3 presents the first stage results). In order to facilitate the comparison with the 2SLS estimates, Table A2 also reports the GMM results in the first two columns. The 2SLS results reassuringly confirm the above findings, and in particular the positive relationship between discretionary fiscal policy and the volatility of both GDP and private GDP. Standard diagnostics tests do not reveal any issue with the estimates. Table A2 also demonstrates why we prefer to use the system-GMM estimator as our benchmark: when using lags as instruments, it permits to use more observations than the 2SLS one. In this case, we are able to use 183 observations when estimating the model with the system-GMM, and only 141 when using the 2SLS.

A second robustness check deals with the choice of the expenditure series to calculate the discretionary policy variables. As stated above, we have also estimated alternative specifications of model (1) using the following: primary receipts, net lending, and cyclically adjusted net lending. The first three columns of table A4 present the coefficients of model (2) when the discretionary policy measures are based on those three alternative variables (in this case it is impossible to use private GDP volatility as an alternative dependent variable because private GDP can only be calculated using an expenditure series). The positive relationship between GDP volatility and discretionary policy is once again confirmed, particularly when using primary receipts as the starting fiscal policy series.

A third robustness check deals with the use of non-overlapping 3-year periods, which could be questioned on the ground that three years probably do not cover a full business cycle. While this is certainly a possibility, the limited time dimension of our sample prevents us from using 5-year periods, most commonly used in macroeconomic analyses to smooth out business cycle fluctuations. For this reason, tables A5 and A6 in the Appendix show the results of model (2) estimated over 4-year and 2-year periods respectively. The findings contained in both tables effectively confirm the

benchmark results. However, we prefer to use the 3-year periods given that the number of observations is significantly reduced in the case of 4-year periods, and that the diagnostics of the 2-year estimates is far from being optimal (also, two years do not seem enough to meaningfully interpret the volatility of fiscal policy).

A final robustness check deals with the specific 3-year periods used in the benchmark analysis. It is conceivable that the use of alternative 3-year periods, *i.e.* starting in different years (1986 and 1987 respectively: the dataset used for the benchmark results starts in 1985), may lead to different results. The estimates presented in table A7 rule out this possibility, as the benchmark results do not seem to be affected by the use of specific periods, no matter the dependent variable of model (2), that is the volatility of either GDP or private GDP.

3.2 The effects of fiscal rules

Overall, the previous results suggest that the aggressive use of discretionary fiscal policy is likely to reduce output stability. This lower stability 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. It is easily conceivable that fiscal rules can affect the governmental macroeconomic stabilisation function by influencing both expenditure and revenue ~~side~~ instruments. However, it is hard to understand *a priori* the way in which such rules will influence the role played by governments for macroeconomic stability.

On the one hand, national fiscal rules are institutions capable of increasing the transparency of the public budget, thus potentially improving government effectiveness and accountability (Blume and Voigt 2103). Budgetary transparency requirements related to the adoption of numerical fiscal rules may also significantly affect fiscal policy and governability. The permanent constraints on fiscal and budgetary items imposed by fiscal rules are likely to contribute to macroeconomic stability by helping countries to avoid unsustainable fiscal policies and improve fiscal performance management systems (Lavigne 2011).

On the other hand, as fiscal rules are normally used to constrain budgetary variables – especially on the expenditure side with expenditure ceilings (*e.g.*, in Sweden) and spending review measures (*e.g.*, in Italy recently) –, they can lead to smaller public sectors, possibly weakening the effectiveness of the stabilisation function of fiscal policy. As a matter of fact, there is some evidence proving that larger governments have experienced milder economic fluctuations than countries with smaller governments (Galì 1994). Moreover, fiscal rules imposing balanced budget targets may work against the tax-smoothing theory of budget deficits (Barro 1979) and in turn harm stability. Such rules may reduce the government's flexibility in using deficits and surpluses as a buffer during economic downturns and other emergencies (Alesina and Perotti 1999), again with adverse consequences on the stabilisation function of national governments.

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 as explained above. The model is the following:

$$\ln \sigma^{gdp}_{i,[t,t+2]} = \gamma_1 discr\_fp_{i,[t,t+2]} + \gamma_2 rule\_{}_{i,[t,t+2]} + \gamma_3 discr\_fp * rule\_{}_{i,[t,t+2]} + \mu_1 \mathbf{W}_{i,[t,t+2]} + \mu_i + \eta_t + \upsilon_{i,t} \quad (3)$$

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 stricter rules[14], and its interaction term with discretionary fiscal policy, *discr_fp*rule_*. There are four 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).

[14] 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).

The rules' data 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. The dataset does not contain the rules' indices expressed as scores from 0 to 5: in order to construct those we have followed the procedure explained in the paper by Schaechter *et al.* (2012, see pages 30-35 in particular). Thanks to that procedure, we have also generated a fifth composite index, *i.e.* the overall fiscal rules index (*rule_overall*), which is standardized to range from zero to five like the other indices.

We report the estimates of the model specifications with national rules which cover at least the central government. It is worth noting that institutional mechanisms that support fiscal discipline at the sub-national level are also clearly important (Sutherland *et al.* (2005) and Foremny (2014)), particularly in federal countries.[15] However, rules for sub-national governments and fiscal sub-aggregates (*e.g.*, expenditure caps on particular spending items or those linked to the use of revenues from natural resources) are not included in the IMF dataset (Schaechter *et al.* 2012 state that work on that was ongoing, and nothing has been published as of yet).

The most frequently used rules constrain debt and the fiscal balance, often in combination. Shaechter *et al.* (2012, p. 9) note that "not all types of fiscal rules are equally apt to support the sustainability, economic stabilisation, and possibly the size of government objectives, even when its design features are fine-tuned." In our sample, for instance, only four countries (Belgium, Denmark, France, and the Netherlands) ever adopted revenue rules, possibly because most of these rules (such as ceilings or floors on revenues; rules aimed at boosting revenue collection and/or preventing an excessive tax burden) are not directly linked to the control of public debt, as they do not constrain spending; thus, they are considered less well suited to ensure the sustainability of public finances.

[15] The experience of the US seems to be particularly relevant. The states typically adjust to revenue downturns rather quickly, and most likely because of their balanced budget rules, they do not smooth expenditures over the business cycle through borrowing. In fact, the revenues and expenditures of the US states are both extremely pro-cyclical. Negative revenue shocks are met with rapid expenditure cuts. In the most recent downturns, these cuts have been so severe as to almost completely offset the impact of any federal government attempts at fiscal stimulus (Rodden and Wibbels 2010, Rodden 2012).

However, for the sake of completeness we provide estimations using all the five types of indicators for which data are available.

We estimate equation (3) with the System-GMM estimator as before. In this case, we also treat as endogenous the interaction term between discretionary policy and fiscal rules.[16] 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' indicators 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 coefficients associated with both *discr_gpe* and *discr_gc* in all specifications (statistically significant in all but the first of the *discr_gc* 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. In such case, elasticities for average values of the variables lie within the 0.23-0.31 and 0.45-0.54 for *discr_gpe* and *discr_gc* respectively.

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 with the only exception of the one measuring expenditure rules). However, the coefficient of the interaction term *discr_gpe*rule_* is negative and statistically significant in all cases (the *rule_e* coefficient is negative but not statistically different from zero),

[16] Results are unaffected when adding to the set of instruments a variable constructed as the interaction between *rule_* the second lag of *discr_fp* (Ozer-Balli and Sørensen 2010).

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 GDP volatility. Figures 1a-1e illustrate how the effects of discretionary policy change as fiscal rules of varying degrees of strictness are introduced: when there are no fiscal rules in all cases there is a positive relationship between discretionary policy and GDP volatility, as the estimates of model (2) revealed. However, as fiscal rules are introduced, the positive relationship weakens, and in many cases it becomes a negative one, that is increasing the effectiveness of the stabilisation function of fiscal policy. In general, *i.e.* referring to the *rule_overall* index, when the rules' indices approach 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 (slightly above one), while in the case of rules on expenditures, *rule_e*, the threshold is higher (above three). 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.[17]

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

[17] 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 cyclcically adjusted primary balances, while this is not the case for expenditure rules.

expenditure ceiling for government consumption and a surplus target for the general government). Thus, when strict rules are implemented as it has been recently done by a number of industrialised countries, discretionary fiscal policy may become output-stabilising. Obviously, it is important to recall that the fiscal rules indices that we refer to are only *de jure* measures which may not perfectly capture the real effectiveness of the rules themselves.

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, although with a lower statistical significance in general. Figures 2a-2e show how the introduction of rules of various degrees of strictness affects the discretionary policy effects on GDP volatility. When there are no rules there is a positive relationship, in line with the results of model (2). As rules are introduced, the positive effect on volatility diminishes, albeit less than in the case of *discr_gpe*. This may derive from the fact that the budgetary items and targets to which rules are mainly referred to do not necessarily pertain to government consumption.

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 have checked the robustness of the results just presented by re-estimating model (3) replacing the dependent variable with private-GDP volatility. These alternative estimates (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 lead to different conclusions (similarly to arguments laid out by Blanchard, 1993, Alesina and Perotti 1999). Moreover, 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 relevant for 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.

$$\ln \sigma^{infl}_{i,[t,t+2]} = \chi_1 discr\_fp_{i,[t,t+2]} + \delta_1 \mathbf{V}_{i,[t,t+2]} + \mu_i + \eta_t + \upsilon_{i,t}, \qquad (4)$$

where $\sigma^{infl}_{i,[t,t+2]}$ 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*), 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). Country and period fixed effects (μ_i and η_t respectively) are again controlled for.

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, and the urbanisation rate. 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.

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 inflation volatility by between 0.24 - according to the *discr_gci* specification - and 0.55-percentage points - according to the *discr_gc* specification (the *discr_gpe* elasticity is equal to 0.17 but it is not statistically significant at standard levels). This means that a one percent increase in the volatility of discretionary policy increases inflation volatility by between 0.17 and 0.51 percentage points. As for the controls, the volatility of money growth is also inflation-destabilising, while the level of inflation is positively correlated to its volatility. Both results are reasonable, given the possible link between the magnitude of the inflation rate and its volatility, and given the economic links between money growth rates and inflation. Contrarily to the output volatility case, period fixed effects turn out to be

mostly not statistically significant. Finally, the diagnostic tests do not indicate any issue with the estimates.

Similarly to what we did for GDP volatility, we provide additional estimates checking the robustness of the results (see the Appendix). Table A4 contains the findings when using the three alternative measures of discretionary fiscal policy based on revenues, net lending, and cyclically adjusted net lending as the dependent variable. The inflation-destabilising effect of discretionary policy is confirmed by this alternative set of estimates, particularly when using cyclically adjusted net lending. Tables A8 and A9 show the estimated coefficients of model (4) when using 4-year and 2-year periods respectively. Table A10 reports the results obtained with the two alternative 3-year datasets starting in 1986 and 1987 respectively, rather than in 1985 as the dataset used for the benchmark estimates. All these estimates again prove the robustness of the benchmark results.

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 increases 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:

$$\ln \sigma^{infl}_{i,[t,t+2]} = \lambda_1 discr\_fp_{i,[t,t+2]} + \lambda_2 rule\_{}_{i,[t,t+2]} + \lambda_3 discr\_fp * rule\_{}_{i,[t,t+2]} + \rho_1 \mathbf{W}_{i,[t,t+2]} + \mu_i + \eta_t + \upsilon_{i,t} \quad (5)$$

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 indices separately), and its interaction term with discretionary fiscal policy, *discr_fp*rule_*. The system-GMM estimator is used and the

interaction term between discretionary policy and fiscal rules is treated as endogenous as done above for model (3).

Table 6 contains the results of model (5) 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

The *discr_gpe* coefficients are always positive and statistically significant in three cases out of five (Table 6), while those associated with *discr_gc* (Table 7) are also always positive, and in all but one specifications significantly different from zero. This suggests that when there are no fiscal rules the aggressive use of spending items mostly 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. As recently suggested by Combes *et al.* (2014), central bank independence, often along with some form

of inflation targeting, is thought to have played a key role in achieving low and stable inflation rates in advanced economies.

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 national 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 data. 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 fiscal policy is both output- and inflation-destabilising. 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 significantly affect 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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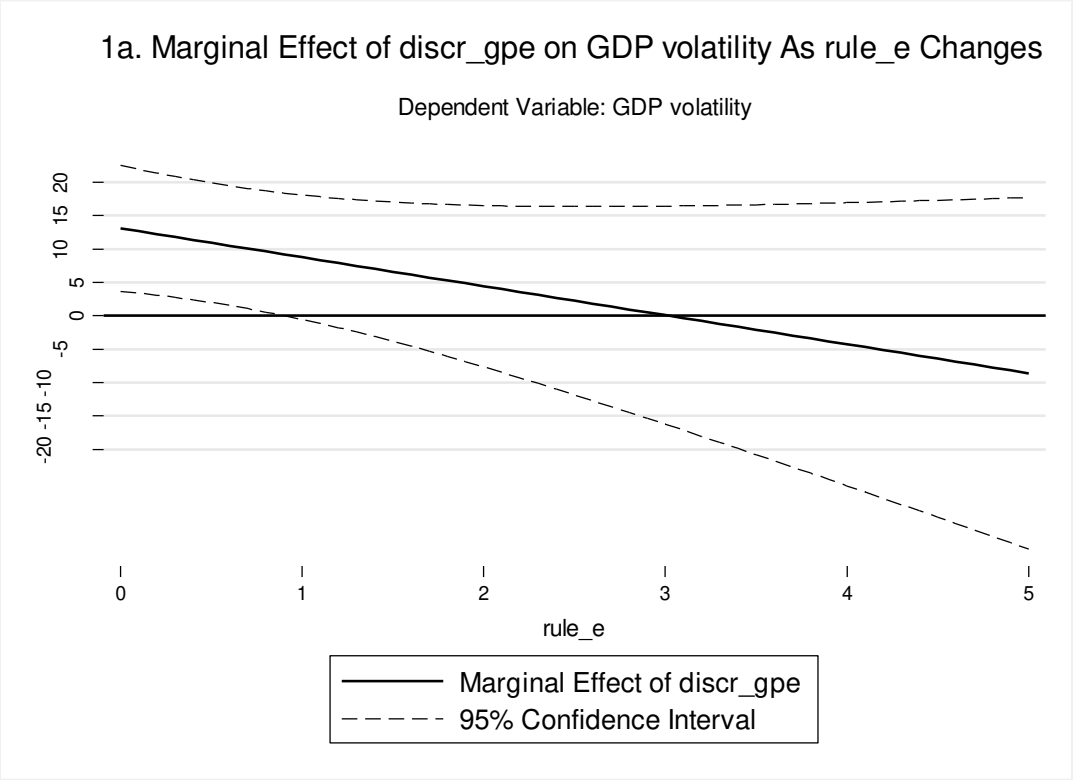
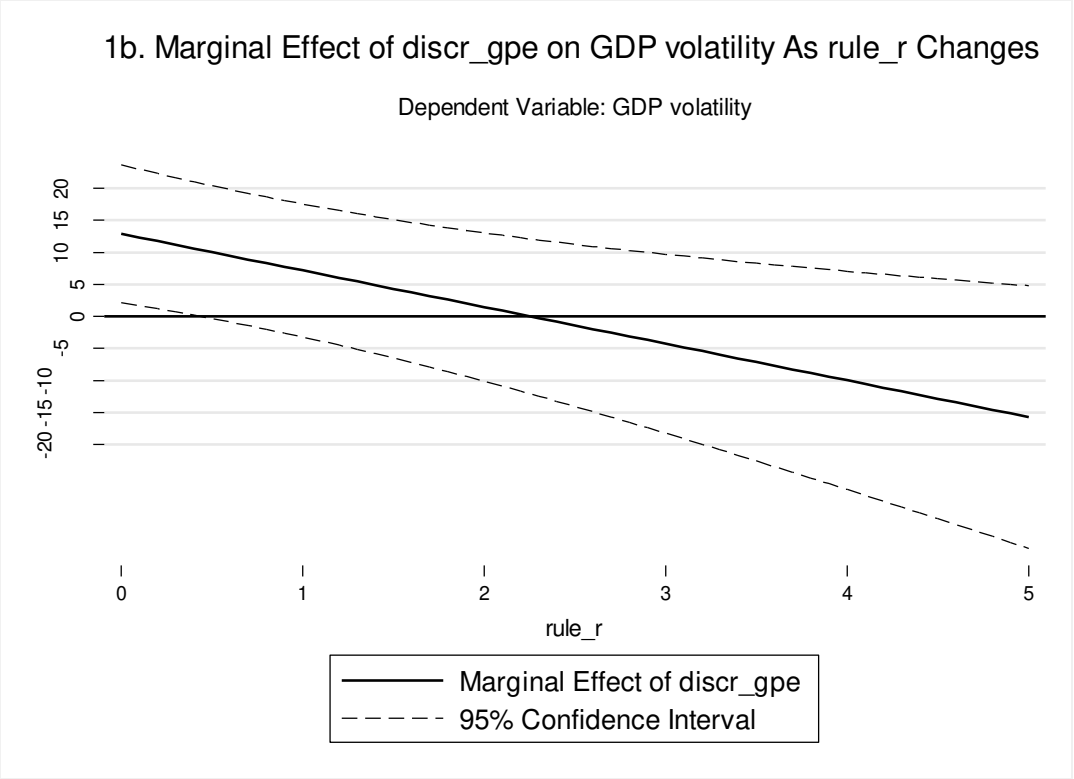
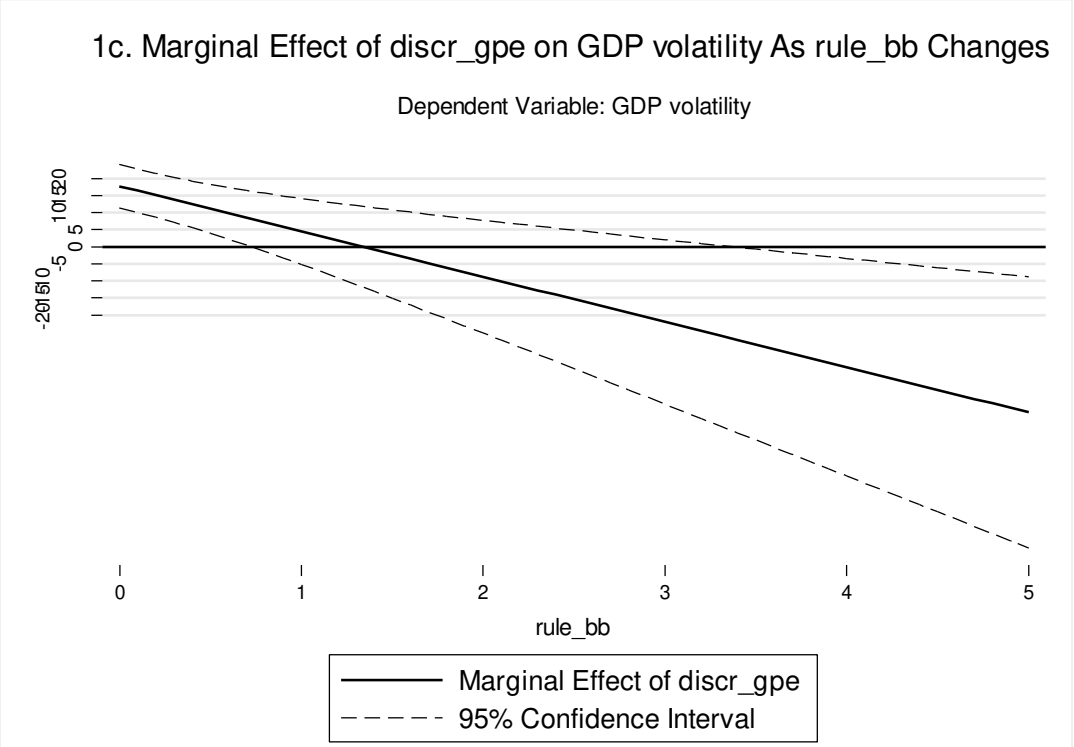
Figures and tables

Figures 1a-e: marginal effects of *discr_gpe* on GDP volatility depending on fiscal rules






1c. Marginal Effect of discr_gpe on GDP volatility As rule_bb Changes
Dependent Variable: GDP volatility
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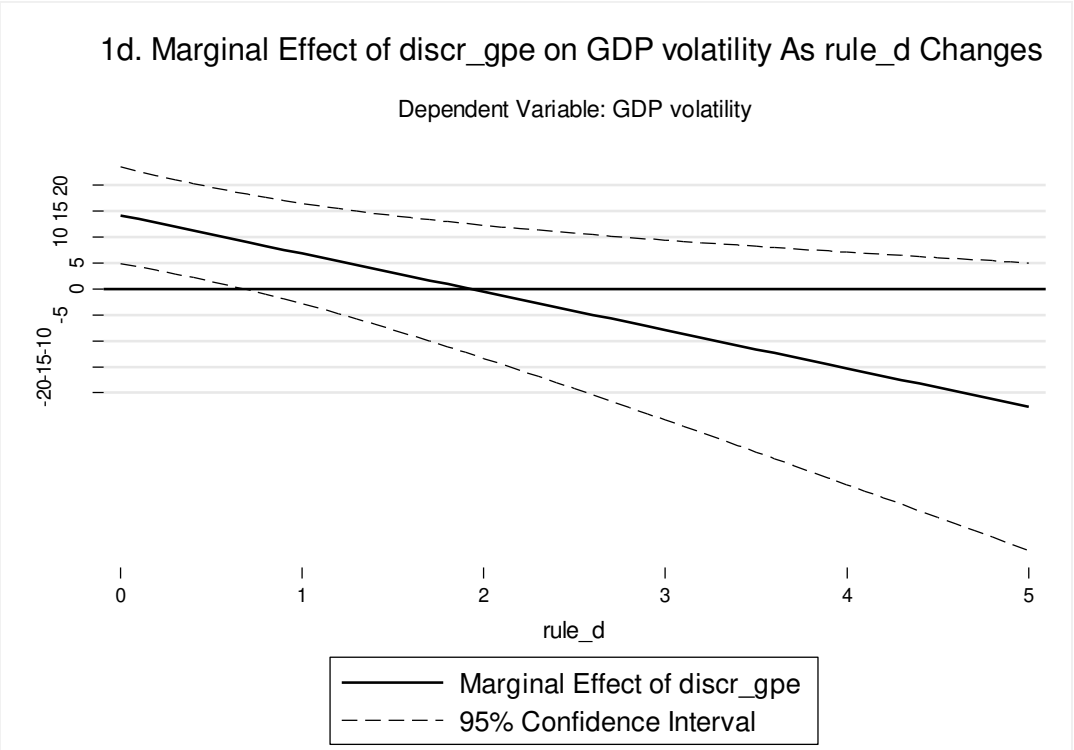
0 1 2 3 4 5
rule_bb
Marginal Effect of discr_gpe
95% Confidence Interval


1d. Marginal Effect of discr_gpe on GDP volatility As rule_d Changes
Dependent Variable: GDP volatility
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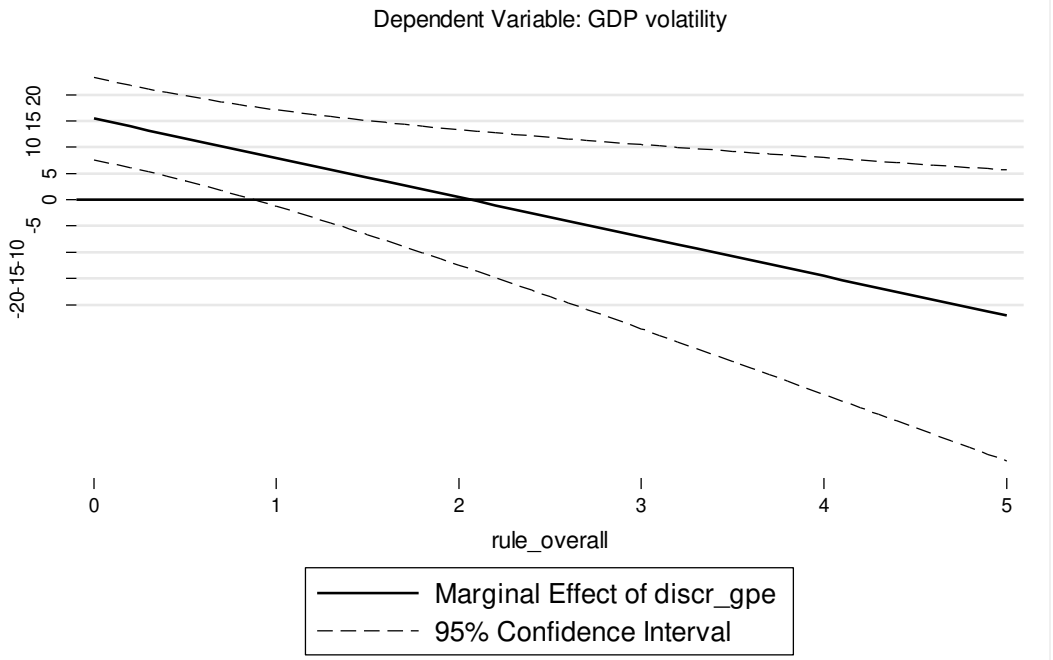
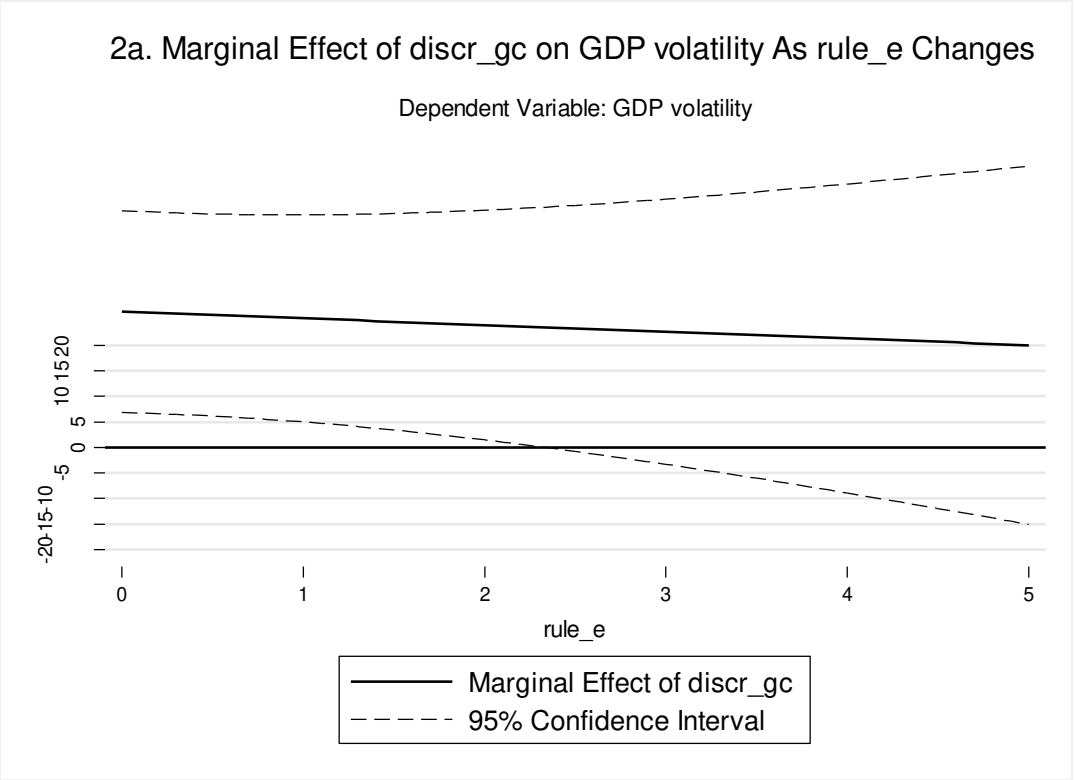
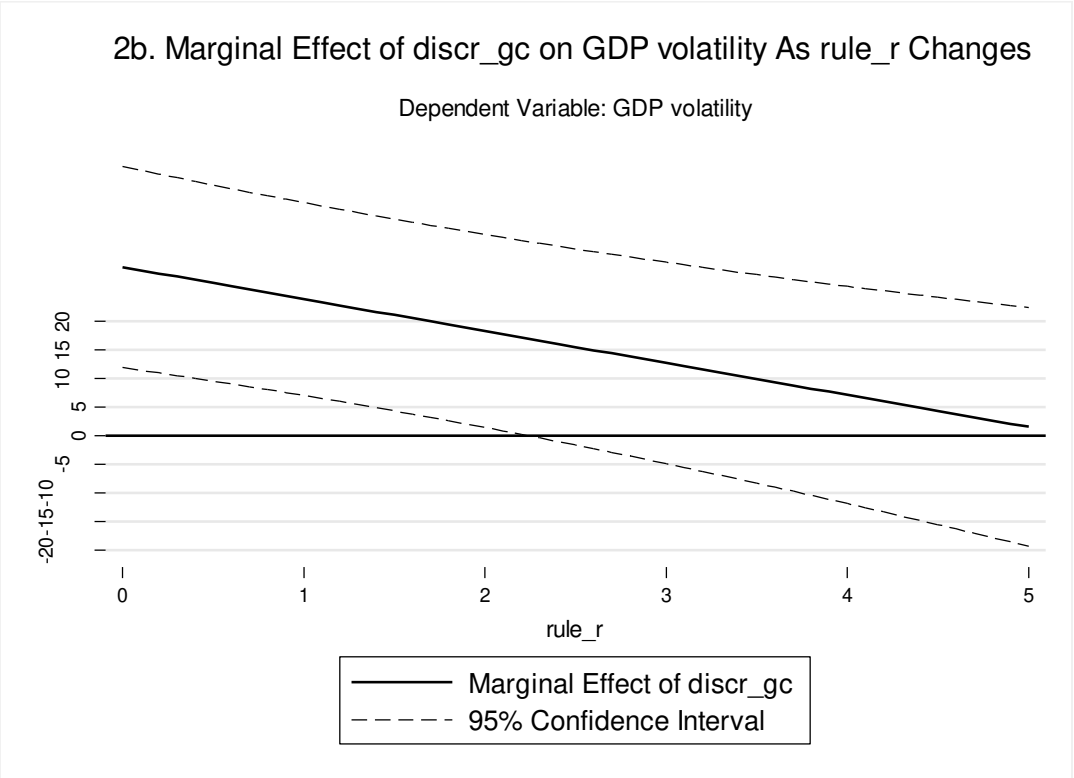
0 1 2 3 4 5
rule_d
Marginal Effect of discr_gpe
95% Confidence Interval

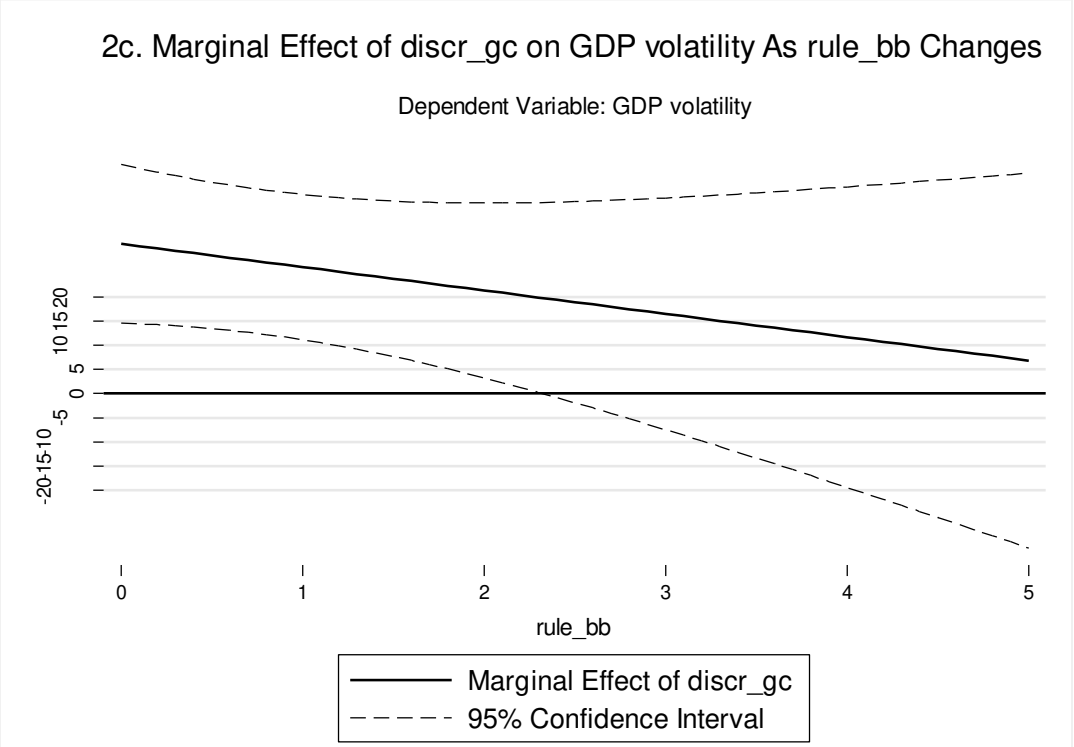
1e. Marginal Effect of discr_gpe on GDP volatility As rule_overall Changes



Figures 2a-e: marginal effects of *discr_gc* on GDP volatility depending on fiscal rules






2c. Marginal Effect of discr_gc on GDP volatility As rule_bb Changes
Dependent Variable: GDP volatility
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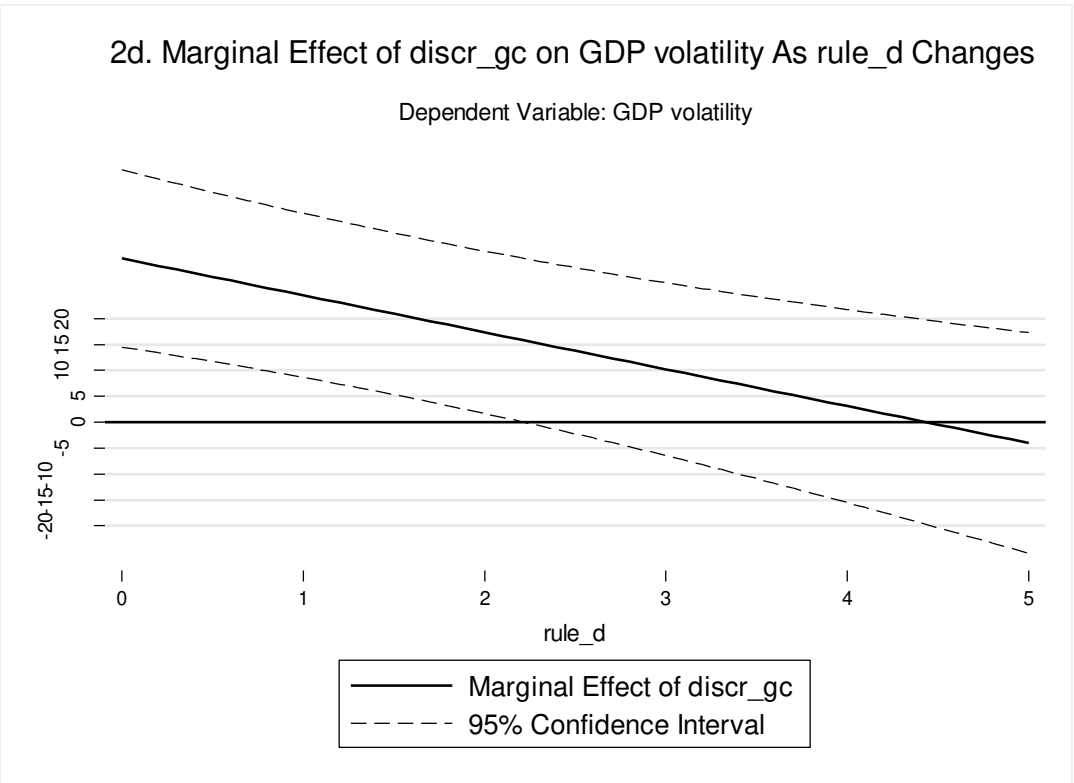
0 1 2 3 4 5
rule_bb
Marginal Effect of discr_gc
95% Confidence Interval


2d. Marginal Effect of discr_gc on GDP volatility As rule_d Changes
Dependent Variable: GDP volatility
-20 -15 -10 -5 0 5 10 15 20
0 1 2 3 4 5
rule_d
Marginal Effect of discr_gc
95% Confidence Interval

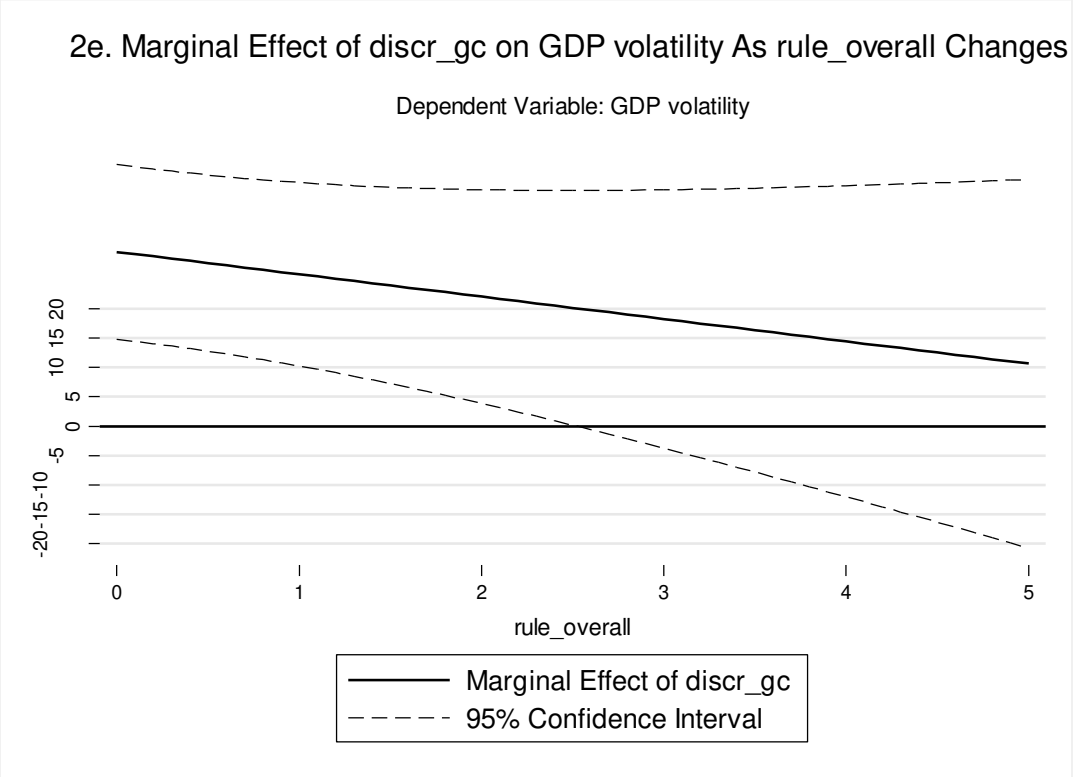


Table 1: pairwise correlations among the three measures of discretionary fiscal policy

	discr_gc	*discr_gci*	*discr_gpe*
discr_gc	1		
discr_gci	0.8398*	1	
discr_gpe	0.4589*	0.3097*	1

Note: * denotes significance at 1%.

Table 2: model (2), three different measures of discretionary policy

	Macro volatility: GDP			Macro volatility: private GDP		
	discr_gpe	*discr_gci*	*discr_gc*	*discr_gpe*	*discr_gci*	*discr_gc*
discr_fp	9.26	21.1*	29.2**	60.0***	34.5**	35.8**
	(1.28)	(1.68)	(2.32)	(3.52)	-2.370	(2.47)
gov_size	0.015	0.0097	0.018	0.19**	0.046	0.047*
	(0.51)	(0.41)	(0.87)	(2.53)	-1.510	(1.95)
open	-0.0075	-0.011	-0.025*	-0.014	-0.012	-0.022
	(-0.47)	(-0.73)	(-1.81)	(-0.34)	(-0.58)	(-1.27)
gdp_level	0.77	0.84*	0.86*	2.15**	1.60***	1.26**
	(1.28)	(1.72)	(1.72)	(2.32)	-3.010	(2.37)
period_1	-1.00	-1.23	-1.78**	-3.00	-1.43	-2.09*
	(-0.88)	(-1.31)	(-2.22)	(-1.60)	(-1.22)	(-1.86)
period_2	-1.89***	-1.99***	-1.99***	-4.22***	-2.65***	-2.69***
	(-4.30)	(-5.24)	(-5.44)	(-5.48)	(-5.43)	(-6.03)
period_3	-1.63***	-1.62***	-1.60***	-4.45***	-2.50***	-2.40***
	(-4.12)	(-4.50)	(-4.61)	(-6.87)	(-4.74)	(-5.16)
period_4	-1.71***	-1.63***	-1.56***	-3.76***	-2.38***	-2.24***
	(-5.57)	(-5.28)	(-5.56)	(-6.14)	(-5.76)	(-6.18)
period_5	-2.29***	-2.22***	-2.06***	-4.86***	-3.06***	-2.90***
	(-7.58)	(-8.19)	(-6.55)	(-8.11)	(-8.78)	(-7.76)
period_6	-1.97***	-1.96***	-1.82***	-3.96***	-2.62***	-2.56***
	(-7.45)	(-9.60)	(-7.14)	(-7.29)	(-11.0)	(-8.94)
period_7	-2.39***	-2.23***	-2.01***	-5.46***	-3.14***	-2.85***
	(-7.68)	(-7.39)	(-5.96)	(-7.84)	(-7.82)	(-6.71)
period_8	-2.24***	-2.15***	-1.92***	-4.69***	-2.96***	-2.74***
	(-9.75)	(-11.4)	(-7.55)	(-8.30)	(-9.64)	(-8.06)
No. of obs.	181	181	183	181	181	183
AR(2)	0.99	0.40	0.49	0.003	0.04	0.26
Hansen	0.92	0.96	0.97	0.98	0.94	0.93

Note: *z*-statistics in parenthesis based on country-level clustered 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 model (3), discretionary fiscal policy = *discr_gpe*

Rules:	*rule_e*	*rule_r*	*rule_bb*	*rule_d*	*rule_overall*
discr_gpe	13.1***	12.9**	17.7***	14.2***	15.4***
	(2.73)	(2.35)	(5.45)	(2.98)	(3.86)
interaction	-4.34	-5.72***	-13.25***	-7.37**	-7.49***
	(-1.53)	(-2.70)	(-3.26)	(-2.54)	(-2.70)
*rule_*	0.14	0.17**	0.33***	0.23***	0.22**
	(1.46)	(2.16)	(2.87)	(2.68)	(2.24)
gov_size	0.010	0.008	0.002	0.005	0.003
	(0.43)	(0.34)	(0.11)	(0.25)	(0.13)
open	-0.007	-0.002	-0.009	-0.002	-0.002
	(-0.75)	(-0.15)	(-0.98)	(-0.21)	(-0.17)
gdp_level	0.57	0.79	0.55	0.63	0.65
	(1.17)	(1.57)	(1.27)	(1.56)	(1.41)
No. of obs.	181	181	181	181	181
AR(2)	0.95	0.95	0.82	0.94	0.99
Hansen	0.999	0.999	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics. Period dummies included but not reported for the sake of brevity.

Table 4: GDP volatility model (3), discretionary fiscal policy = *discr_gc*

Rules:	*rule_e*	*rule_r*	*rule_bb*	*rule_d*	*rule_overall*
discr_gc	26.6***	29.5***	31.0***	31.6***	29.7***
	(2.63)	(3.29)	(3.70)	(3.62)	(3.90)
interaction	-1.31	-5.59***	-4.83	-7.12***	-3.81
	(-0.42)	(-3.09)	(-1.11)	(-3.24)	(-1.31)
*rule_*	0.043	0.127**	0.093	0.191***	0.088
	(0.77)	(2.19)	(0.88)	(2.64)	(1.35)
gov_size	0.013	0.012	0.011	0.008	0.012
	(0.63)	(0.51)	(0.59)	(0.35)	(0.58)
open	-0.026**	-0.016	-0.023**	-0.013	-0.021*
	(-2.20)	(-1.05)	(-2.07)	(-0.83)	(-1.64)
gdp_level	0.69	0.99**	0.71	0.96**	0.81*
	(1.44)	(2.01)	(1.61)	(2.12)	(1.79)
No. of obs.	183	183	183	183	183
AR(2)	0.47	0.46	0.36	0.50	0.41
Hansen	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5% and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics. Period dummies included but not reported for the sake of brevity.

Table 5: model (4), three different measures of discretionary policy

	Macro volatility: inflation		
	discr_gpe	*discr_gci*	*discr_gc*
discr_fp	8.03	11.4**	28.1***
	(1.18)	(2.21)	(2.77)
gov_size	0.069*	0.077*	0.085*
	(1.94)	(1.87)	(1.86)
open	-0.030*	-0.042**	-0.061***
	(-1.73)	(-2.09)	(-2.78)
infl_level	0.18***	0.20***	0.21***
	(3.43)	(3.17)	(3.70)
gap_vol	0.017	-0.12	-0.46**
	(0.090)	(-0.49)	(-1.97)
exch_vol	-0.016	0.0061	0.049
	(-0.38)	(0.16)	(1.17)
money_vol	0.029**	0.026**	0.025***
	(2.28)	(2.47)	(2.65)
period_1	0.34	-0.85	-2.46*
	(0.43)	(-0.82)	(-1.84)
period_2	-0.38	-0.83	-1.56**
	(-0.63)	(-1.13)	(-2.18)
period_3	-0.14	-0.47	-1.05
	(-0.27)	(-0.71)	(-1.59)
period_4	-0.16	-0.39	-0.82
	(-0.39)	(-0.71)	(-1.39)
period_5	0.19	-0.036	-0.50
	(0.52)	(-0.081)	(-1.21)
period_6	0.38	0.18	-0.23
	(1.20)	(0.50)	(-0.61)
period_7	-0.017	-0.18	-0.48
	(-0.058)	(-0.46)	(-1.27)
period_8	-0.043	-0.21	-0.48
	(-0.14)	(-0.59)	(-1.41)
No. of obs.	152	152	152
AR(2)	0.53	0.37	0.86
Hansen	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered 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: model (5), discretionary fiscal policy = *discr_gpe*

Rules:	*rule_e*	*rule_r*	*rule_bb*	*rule_d*	*rule_overall*
discr_gpe	7.9	11.0*	15.7	7.5	9.3
	(1.54)	(1.82)	(1.57)	(1.10)	(1.62)
interaction	-2.77*	-2.63	-9.95	1.11	-2.86
	(-1.70)	(-1.07)	(-1.24)	(0.24)	(-1.34)
*rule_*	0.036	0.087	0.198	0.052	0.067
	(0.58)	(0.85)	(1.14)	(0.39)	(0.95)
gov_size	0.036	0.050*	0.047*	0.050*	0.042*
	(1.53)	(1.87)	(1.67)	(1.88)	(1.64)
open	-0.012	-0.019	-0.025*	-0.019	-0.016
	(-0.79)	(-1.16)	(-1.86)	(-1.38)	(-1.12)
infl_level	0.16***	0.17****	0.17***	0.162***	0.166***
	(3.96)	(4.01)	(4.32)	(3.99)	(4.12)
gap_vol	0.134	0.083	-0.005	0.177	0.102
	(0.96)	(0.53)	(-0.02)	(1.14)	(0.67)
exch_vol	-0.032	-0.028	-0.016	-0.042	-0.029
	(-0.69)	(-0.60)	(-0.43)	(-0.95)	(-0.66)
money_vol	0.025*	0.027*	0.025*	0.026**	0.026*
	(1.70)	(1.92)	(1.78)	(2.07)	(1.80)
No. of obs.	152	152	152	152	152
AR(2)	0.49	0.50	0.78	0.62	0.52
Hansen	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered standard errors. **, * denote significance at 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics. Period dummies included but not reported for the sake of brevity.

Table 7: model (5), discretionary fiscal policy = *discr_gc*

Rules:	*rule_e*	*rule_r*	*rule_bb*	*rule_d*	*rule_overall*
discr_gc	19.3***	19.0***	10.3*	13.8***	15.3**
	(3.66)	(3.94)	(1.71)	(2.69)	(2.52)
interaction	-0.67	0.56	5.96	3.62	2.98
	(-0.20)	(0.18)	(1.43)	(1.14)	(0.82)
*rule_*	-0.040	-0.042	-0.275	-0.116	-0.123
	(-0.46)	(-0.39)	(-1.61)	(-0.98)	(-1.00)
gov_size	0.057*	0.052*	0.072*	0.051*	0.060*
	(1.88)	(1.94)	(1.74)	(1.71)	(1.68)
open	-0.039***	-0.033***	-0.046**	-0.030**	-0.037**
	(-2.90)	(-2.76)	(-2.46)	(-2.42)	(-2.49)
infl_level	0.19***	0.17***	0.194***	0.169***	0.180***
	(4.54)	(4.02)	(3.81)	(3.87)	(4.28)
gap_vol	-0.211	-0.148	-0.188	-0.083	-0.163
	(-1.03)	(-0.87)	(-0.77)	(-0.45)	(-0.70)
exch_vol	0.023	0.005	0.043	-0.002	0.015
	(0.85)	(0.15)	(1.27)	(-0.04)	(0.50)
money_vol	0.024**	0.024**	0.026***	0.025**	0.025**
	(2.24)	(2.18)	(2.62)	(2.33)	(2.33)
No. of obs.	152	152	152	152	152
AR(2)	0.90	0.89	0.15	0.33	0.52
Hansen	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5% and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics. Period dummies included but not reported for the sake of brevity.

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.

Openness (*open*). KOF globalization index (see Dreher 2006). *Source*: globalization.kof.ethz.ch

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.

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.

Additional tables

Table A1: sample descriptive statistics

Variables		Mean	Standard deviation			Min	Max	Obs.
			overall	between	within			
Macroeconomic volatility								
	gdp	1.522	1.024	0.431	0.932	0.278	6.616	186
	private gdp_level (gpe)	3.762	2.862	1.241	2.596	0.392	20.346	184
	private gdp_level (gci)	2.124	1.477	0.626	1.347	0.446	8.966	184
	private gdp_level (gc)	2.008	1.378	0.530	1.275	0.435	8.609	186
	inflation	1.247	1.402	0.923	1.067	0.093	12.567	186
discr_fp								
	discr_gpe	0.027	0.021	0.015	0.015	0.003	0.149	181
	discr_gci	0.026	0.017	0.011	0.013	0.003	0.099	181
	discr_gc	0.023	0.015	0.010	0.012	0.002	0.086	185
	discr_rev	0.022	0.014	0.010	0.011	0.000	0.112	181
	discr_nl	1.095	0.875	0.408	0.781	0.004	7.056	181
	discr_canl	2.054	1.819	0.996	1.556	0.352	14.634	178
*rule_*								
	rule_e	1.031	1.430	0.982	1.058	0.000	5.000	189
	rule_r	0.731	1.185	0.811	0.880	0.000	5.000	189
	rule_bb	1.097	1.251	0.722	1.032	0.000	4.094	189
	rule_d	0.733	1.142	0.809	0.823	0.000	3.913	189
	rule_overall	1.068	1.350	0.858	1.056	0.000	4.266	189
	gov_size	42.324	7.105	6.414	3.319	28.024	62.932	185
	open	78.943	9.672	7.630	6.150	44.457	92.330	189
	gdp_level	10.273	0.269	0.220	0.159	9.466	11.196	187
	private gdp_level (gpe)	9.716	0.307	0.268	0.164	9.080	10.723	184
	private gdp_level (gci)	10.011	0.279	0.243	0.152	9.281	10.990	184
	private gdp_level (gc)	10.051	0.278	0.233	0.155	9.323	11.031	186
	infl_level	3.069	3.257	1.861	2.688	-2.230	25.539	185
	gap_vol	1.146	0.778	0.320	0.712	0.125	5.031	171
	exch_vol	2.749	2.104	1.131	1.792	0.462	14.081	171
	money_vol	4.904	5.955	2.835	5.250	0.514	43.763	180

Note: descriptive statistics are based on nine three-year averages periods for 21 countries (see footnote 10).

Table A2: model (2), 2SLS estimates, discretionary fiscal policy = *discr_gc*

Estimator:	Sys-GMM		2SLS	
	Macro volatility		Macro volatility	
	GDP	private GDP	GDP	private GDP
discr_fp	29.2**	35.8**	41.9**	53.4*
	(2.32)	(2.47)	(2.01)	(1.95)
gov_size	0.018	0.047*	-0.099*	-0.14**
	(0.87)	(1.95)	(-1.93)	(-2.06)
open	-0.025*	-0.022	0.048	0.081
	(-1.81)	(-1.27)	(1.09)	(1.68)
gdp_level	0.86*	1.26**	-1.44	-1.90
	(1.72)	(2.37)	(-0.81)	(-0.80)
period_1	-1.78**	-2.09*		
	(-2.22)	(-1.86)		
period_2	-1.99***	-2.69***		
	(-5.44)	(-6.03)		
period_3	-1.60***	-2.40***	-1.60**	-2.43**
	(-4.61)	(-5.16)	(-2.14)	(-2.31)
period_4	-1.56***	-2.24***	-1.81***	-2.63***
	(-5.56)	(-6.18)	(-3.11)	(-3.09)
period_5	-2.06***	-2.90***	-2.61***	-3.76***
	(-6.55)	(-7.76)	(-5.22)	(-5.24)
period_6	-1.82***	-2.56***	-2.49***	-3.61***
	(-7.14)	(-8.94)	(-6.47)	(-6.80)
period_7	-2.01***	-2.85***	-2.30***	-3.34***
	(-5.96)	(-6.71)	(-6.68)	(-6.38)
period_8	-1.92***	-2.74***	-2.21***	-3.23***
	(-7.55)	(-8.06)	(-7.72)	(-7.13)
No. of obs.	183	183	141	141
AR(2) - GMM	0.49	0.26		
Hansen *p* -value - GMM	0.97	0.93		
R squared			0.572	0.634
Hansen J			9.25	4.60
Hansen J *p* -value			0.099	0.47
K-P weak id. test			11.0*	11.0*

Note: *t*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5% and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics of the GMM estimates.

Table A3: first stage of the 2SLS estimates, discretionary fiscal policy = *discr_gc*

Dependent variable:	*discr_fp*	*gov_size*
open	-0.002***	0.269
	(-4.53)	(1.52)
gdp_level	0.004	-5.111
	(0.885)	(-0.53)
l.discr_fp	-0.200*	-6.850
	(-1.97)	(-0.31)
l.gov_size	0.001***	0.828***
	(3.01)	(8.12)
l2.discr_fp	-0.171***	-15.319
	(-2.95)	(-0.62)
l2.gov_size	-0.0004	-0.324***
	(-0.84)	(-3.42)
period_3	-0.024**	1.752
	(-2.42)	(0.36)
period_4	-0.023**	-2.817
	(-2.81)	(-0.76)
period_5	-0.014**	-4.095*
	(-2.54)	(-1.79)
period_6	-0.004	-3.965***
	(-0.74)	(-2.87)
period_7	-0.013***	-2.647***
	(-3.21)	(-2.88)
period_8	-0.013***	-4.996***
	(-3.42)	(-7.76)
pop	-0.037	26.408
	(-0.46)	(1.30)
dep_ratio	0.00001	-0.026
	(0.10)	(-0.15)
urban	0.001	0.027
	(1.48)	(0.26)
No. of obs.	141	141

Note: *t*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5% and 10% respectively.

Table A4: models (2) and (4), three alternative measures of discretionary policy

	Macro volatility: GDP			Macro volatility: inflation		
	discr_rec	*discr_nl*	*discr_canl*	*discr_rec*	*discr_nl*	*discr_canl*
discr_fp	22.2***	0.21	0.087	20.3	0.099	0.17***
	(3.49)	(1.40)	(1.15)	(1.34)	(0.59)	(3.61)
gov_size	0.029	0.046	0.056	0.074**	0.064*	0.072*
	(0.77)	(1.17)	(1.46)	(1.98)	(1.81)	(1.77)
open	-0.0023	-0.020	-0.023	-0.027	-0.027	-0.026
	(-0.099)	(-0.92)	(-1.17)	(-1.49)	(-1.58)	(-1.45)
gdp_level	1.22*	1.12	1.10			
	(1.75)	(1.33)	(1.64)			
infl_level				0.16**	0.17***	0.16***
				(2.49)	(2.98)	(2.76)
gap_vol				0.077	0.10	-0.055
				(0.39)	(0.64)	(-0.23)
exch_vol				-0.034	-0.023	-0.019
				(-0.91)	(-0.48)	(-0.35)
money_vol				0.032**	0.028**	0.021
				(2.12)	(1.98)	(1.58)
No. of obs.	181	181	178	152	152	151
AR(2)	0.57	0.58	0.97	0.060	0.25	0.79
Hansen	0.97	0.91	0.93	1	1.00	1

Note: *z*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics. Period dummies included but not reported for the sake of brevity.

Table A5: model (2), three different measures of discretionary policy, 4-year periods

	Macro volatility: GDP			Macro volatility: private GDP		
	discr_gpe	*discr_gci*	*discr_gc*	*discr_gpe*	*discr_gci*	*discr_gc*
discr_fp	7.93	22.7*	26.8**	87.7***	29.1*	28.1**
	(1.14)	(1.69)	(2.24)	(3.51)	(1.93)	(2.02)
gov_size	0.041	0.041	0.043*	0.20*	0.10**	0.092***
	(0.98)	(1.35)	(1.67)	(1.80)	(2.37)	(2.64)
open	-0.0038	-0.017	-0.027	0.031	-0.027	-0.032
	(-0.14)	(-0.82)	(-1.31)	(0.55)	(-0.80)	(-1.10)
gdp_level	1.49*	1.29*	1.28***	3.04**	2.48***	1.80***
	(1.68)	(1.86)	(2.63)	(2.43)	(2.91)	(3.45)
period_1	1.02	-0.081	-0.42	0.55	0.26	-0.62
	(0.64)	(-0.072)	(-0.58)	(0.23)	(0.16)	(-0.59)
period_2	-0.83*	-1.09***	-1.15***	-2.12***	-1.44**	-1.64***
	(-1.66)	(-2.84)	(-3.39)	(-3.14)	(-2.36)	(-3.72)
period_3	-0.81**	-0.97***	-0.97***	-2.14***	-1.38***	-1.42***
	(-1.97)	(-2.82)	(-3.23)	(-3.53)	(-3.00)	(-3.78)
period_4	-1.49***	-1.48***	-1.42***	-3.14***	-1.90***	-1.94***
	(-4.68)	(-5.56)	(-5.31)	(-5.25)	(-5.69)	(-6.09)
period_5	-1.31***	-1.27***	-1.21***	-3.08***	-1.66***	-1.66***
	(-4.98)	(-5.43)	(-5.01)	(-5.78)	(-5.53)	(-5.38)
period_6	-1.54***	-1.42***	-1.32***	-3.21***	-1.90***	-1.83***
	(-6.78)	(-6.64)	(-5.67)	(-6.01)	(-6.21)	(-5.95)
No. of obs.	143	143	145	143	143	145
AR(2)	0.42	0.17	0.089	0.66	0.70	0.42
Hansen	0.84	0.78	0.83	0.91	0.42	0.70

Note: *z*-statistics in parenthesis based on country-level clustered 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 A6: model (2), three different measures of discretionary policy, 2-year periods

	Macro volatility: GDP			Macro volatility: private GDP		
	discr_gpe	*discr_gci*	*discr_gc*	*discr_gpe*	*discr_gci*	*discr_gc*
discr_fp	5.26	19.8*	29.4***	105***	31.2***	38.6***
	(1.57)	(1.74)	(2.81)	(8.27)	(2.60)	(3.26)
gov_size	0.034	0.029	0.032*	0.18***	0.074***	0.067***
	(1.47)	(1.29)	(1.72)	(3.58)	(2.71)	(3.00)
open	-0.031*	-0.013	-0.036***	-0.073*	-0.022	-0.043**
	(-1.94)	(-0.76)	(-2.71)	(-1.90)	(-0.96)	(-2.53)
gdp_level	0.53	1.17*	0.73	0.18	1.95***	1.08**
	(0.92)	(1.78)	(1.60)	(0.14)	(2.82)	(2.57)
period_1	-0.93	1.34	-1.27	-8.66***	1.41	-1.65
	(-0.82)	(0.85)	(-1.34)	(-2.83)	(0.70)	(-1.22)
period_2	-1.06**	-0.90**	-1.51***	-3.90***	-1.24**	-1.93***
	(-2.50)	(-2.16)	(-4.35)	(-2.94)	(-2.14)	(-4.20)
period_3	-1.10***	-0.86**	-1.33***	-3.51***	-1.09**	-1.67***
	(-2.85)	(-2.10)	(-3.74)	(-3.42)	(-2.09)	(-3.92)
period_4	-0.67*	-0.49	-0.86**	-3.66***	-0.98*	-1.30***
	(-1.75)	(-1.28)	(-2.14)	(-3.84)	(-1.76)	(-2.68)
period_5	-0.49	-0.43	-0.73**	-2.70***	-0.80	-1.07**
	(-1.41)	(-1.11)	(-2.22)	(-3.29)	(-1.63)	(-2.45)
period_6	-0.77***	-0.60**	-0.87***	-2.93***	-0.97**	-1.18***
	(-2.66)	(-2.17)	(-3.18)	(-3.70)	(-2.35)	(-3.21)
period_7	-1.04***	-1.13***	-1.27***	-2.74***	-1.52***	-1.62***
	(-3.93)	(-4.08)	(-5.02)	(-3.55)	(-4.53)	(-5.49)
period_8	-1.16***	-1.30***	-1.44***	-2.92***	-1.78***	-1.93***
	(-4.82)	(-4.81)	(-5.40)	(-4.41)	(-6.30)	(-6.48)
period_9	-0.48**	-0.65**	-0.71***	-1.96***	-0.82***	-0.92***
	(-1.99)	(-2.54)	(-2.77)	(-3.18)	(-3.33)	(-3.60)
period_10	-1.15***	-1.20***	-1.22***	-3.48***	-1.71***	-1.62***
	(-5.46)	(-6.19)	(-5.86)	(-5.44)	(-6.93)	(-6.30)
period_11	-1.19***	-1.30***	-1.28***	-2.80***	-1.78***	-1.67***
	(-5.81)	(-6.14)	(-6.49)	(-7.25)	(-7.12)	(-7.01)
period_12	-0.75***	-0.99***	-0.96***	-2.03***	-1.36***	-1.26***
	(-4.16)	(-5.16)	(-5.90)	(-2.97)	(-6.34)	(-5.64)
period_13	1.20***	0.94***	0.68**	0.40	1.22***	0.96***
	(7.11)	(4.24)	(2.33)	(0.45)	(3.79)	(2.78)
No. of obs.	280	281	283	280	281	283
AR(2)	0.019	0.014	0.033	0.57	0.037	0.077
Hansen	1.00	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered 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 A7: model (2), three different measures of fiscal policy, two alternative 3-year datasets

	Macro volatility: GDP						Macro volatility: private GDP					
	Alternative 1			Alternative 2			Alternative 1			Alternative 2		
	discr_gpe	*discr_gci*	*discr_gc*	*discr_gpe*	*discr_gci*	*discr_gc*	*discr_gpe*	*discr_gci*	*discr_gc*	*discr_gpe*	*discr_gci*	*discr_gc*
discr_fp	3.48	13.7	23.8*	15.7***	18.0*	32.4*	105***	29.3**	30.3*	63.2***	29.3**	36.8**
	(0.75)	(1.28)	(1.72)	(2.73)	(1.67)	(1.94)	(5.45)	(2.46)	(1.88)	(4.15)	(2.46)	(1.98)
gov_size	0.045	0.054*	0.050*	0.045	0.044*	0.032	0.14	0.090***	0.087***	0.19***	0.09***	0.079***
	(1.56)	(1.86)	(1.89)	(1.38)	(1.69)	(1.56)	(1.47)	(3.35)	(3.11)	(2.58)	(3.35)	(3.53)
open	-0.033*	-0.023	-0.027	-0.012	-0.0087	-0.023	-0.0059	-0.024	-0.032	-0.045	-0.024	-0.030
	(-1.89)	(-1.10)	(-1.30)	(-0.67)	(-0.51)	(-1.48)	(-0.16)	(-1.14)	(-1.28)	(-1.54)	(-1.14)	(-1.43)
gdp_level	0.72	1.29**	1.39***	0.78	1.21*	1.03**	1.19	1.89***	1.78***	1.43	1.89***	1.44***
	(1.47)	(2.01)	(2.61)	(1.32)	(1.83)	(2.13)	(0.83)	(2.67)	(3.68)	(1.15)	(2.67)	(3.05)
period_1	-0.95	0.39	0.31	-0.56	0.20	-0.88	-2.99	-0.52	-0.15	-3.39	-0.52	-1.17
	(-1.38)	(0.33)	(0.39)	(-0.56)	(0.15)	(-1.00)	(-1.25)	(-0.38)	(-0.16)	(-1.39)	(-0.38)	(-1.03)
period_2	-1.18***	-0.89**	-0.87**	-1.22***	-1.06***	-1.20***	-2.39**	-1.64***	-1.29***	-3.35***	-1.64***	-1.74***
	(-3.34)	(-2.36)	(-2.46)	(-3.53)	(-2.88)	(-3.57)	(-2.37)	(-2.88)	(-2.85)	(-4.43)	(-2.88)	(-4.00)
period_3	-0.84**	-0.63*	-0.59*	-0.96***	-0.86***	-0.90***	-2.21***	-1.44***	-1.08**	-2.35***	-1.44***	-1.40***
	(-2.48)	(-1.79)	(-1.73)	(-3.11)	(-2.68)	(-3.25)	(-2.97)	(-3.46)	(-2.46)	(-3.70)	(-3.346)	(-3.86)
period_4	-1.16***	-0.93***	-0.85***	-1.59***	-1.51***	-1.47***	-2.30***	-2.02***	-1.26***	-3.08***	-2.02***	-1.94***
	(-4.55)	(-3.07)	(-2.75)	(-5.76)	(-4.71)	(-5.08)	(-3.43)	(-5.41)	(-3.34)	(-6.22)	(-5.41)	(-5.79)
period_5	-1.37***	-1.24***	-1.17***	-1.52***	-1.55***	-1.55***	-2.90***	-2.06***	-1.72***	-2.91***	-2.06***	-2.09***
	(-5.03)	(-4.97)	(-4.36)	(-6.41)	(-6.57)	(-6.21)	(-3.80)	(-7.38)	(-5.48)	(-6.08)	(-7.38)	(-7.05)
period_6	-1.02***	-0.93***	-0.86***	-1.50***	-1.49***	-1.36***	-2.39***	-1.99***	-1.27***	-3.28***	-1.99***	-1.84***
	(-4.05)	(-3.85)	(-3.36)	(-5.95)	(-5.78)	(-5.60)	(-3.64)	(-6.07)	(-4.39)	(-7.09)	(-6.07)	(-5.82)
period_7	-1.43***	-1.31***	-1.20***	-1.77***	-1.83***	-1.65***	-2.88***	-2.38***	-1.65***	-3.34***	-2.38***	-2.21***
	(-5.20)	(-4.91)	(-4.04)	(-7.65)	(-7.31)	(-6.37)	(-4.44)	(-6.80)	(-4.31)	(-7.12)	(-6.80)	(-6.23)
period_8	-0.31*	-0.30*	-0.25				-1.06*	163	-0.42**			
	(-1.75)	(-1.85)	(-1.55)				(-1.74)	21	(-2.03)			
No. of obs.	183	183	185	163	163	165	183	183	185	163	163	165
AR(2)	0.42	0.92	0.47	0.27	0.24	0.62	0.10	0.67	0.85	0.088	0.15	0.96
Hansen	0.99	1.00	1.00	0.90	0.98	0.79	1.00	0.99	0.98	0.65	0.95	0.92

Note: *z*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics. The Alternative 1 dataset starts in 1986, and the Alternative 2 dataset starts in 1987 (the benchmark dataset starts in 1985).

Table A8: model (4), three different measures of discretionary policy, 4-year periods

	Macro volatility: inflation		
	discr_gpe	*discr_gci*	*discr_gc*
discr_fp	14.6***	12.1***	19.2***
	(4.09)	(3.22)	(3.52)
gov_size	0.067**	0.056*	0.066**
	(1.98)	(1.80)	(1.96)
open	-0.021	-0.015	-0.029*
	(-1.31)	(-1.08)	(-1.94)
infl_level	0.17***	0.13**	0.14***
	(2.73)	(2.45)	(3.25)
gap_vol	0.022	0.15	-0.0040
	(0.12)	(0.69)	(-0.019)
exch_vol	-0.012	-0.016	0.0065
	(-0.33)	(-0.41)	(0.19)
money_vol	0.027**	0.022**	0.024**
	(2.50)	(2.26)	(2.50)
period_1	1.07	1.24	0.44
	(0.94)	(1.34)	(0.53)
period_2	-0.16	-0.014	-0.34
	(-0.33)	(-0.034)	(-0.77)
period_3	0.050	0.14	-0.12
	(0.15)	(0.37)	(-0.29)
period_4	0.46	0.53	0.33
	(1.50)	(1.44)	(0.88)
period_5	0.31	0.36	0.21
	(1.27)	(1.10)	(0.66)
period_6	0.15	0.18	0.100
	(0.53)	(0.57)	(0.31)
No. of obs.	118	118	118
AR(2)	0.38	0.42	0.32
Hansen	1.00	0.95	1.00

Note: *z*-statistics in parenthesis based on country-level clustered 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 A9: model (4), three different measures of discretionary policy, 2-year periods

	Macro volatility: inflation		
	discr_gpe	*discr_gci*	*discr_gc*
discr_fp	7.18***	23.4**	37.6**
	(4.60)	(2.07)	(2.42)
gov_size	0.063*	0.058*	0.065*
	(1.69)	(1.96)	(1.78)
open	-0.024	-0.034**	-0.053**
	(-1.20)	(-2.05)	(-2.40)
infl_level	0.11*	0.14***	0.16***
	(1.92)	(3.76)	(3.48)
gap_vol	0.16	-0.11	-0.32
	(0.80)	(-0.49)	(-1.13)
exch_vol	-0.0043	0.028	0.091*
	(-0.078)	(0.62)	(1.69)
money_vol	0.019*	0.015	0.012
	(1.88)	(1.61)	(1.36)
period_1	1.37	-0.72	-2.27*
	(1.05)	(-0.74)	(-1.87)
period_2	0.74*	-0.25	-0.70
	(1.75)	(-0.56)	(-1.41)
period_3	0.12	-0.70*	-0.97**
	(0.28)	(-1.74)	(-2.13)
period_4	0.34	-0.35	-0.54
	(1.06)	(-0.88)	(-1.36)
period_5	0.28	-0.39	-0.52
	(1.22)	(-0.97)	(-1.35)
period_6	0.38	-0.14	-0.28
	(1.48)	(-0.40)	(-0.77)
period_7	0.56***	-0.089	-0.24
	(3.13)	(-0.26)	(-0.71)
period_8	0.67*	0.099	0.010
	(1.84)	(0.28)	(0.031)
period_9	0.74	0.24	0.28
	(1.34)	(0.45)	(0.58)
period_10	0.49**	0.092	0.18
	(1.98)	(0.38)	(0.79)
period_11	0.23	-0.22	-0.12
	(1.13)	(-1.00)	(-0.58)
period_12	0.36	-0.18	-0.067
	(1.56)	(-1.07)	(-0.33)
period_13	0.062	0.028	0.073
	(0.24)	(0.11)	(0.27)
No. of obs.	230	231	231
AR(2)	0.084	0.096	0.16
Hansen	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered 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 A10: model (4), three different measures of fiscal policy, two alternative 3-year datasets

	Macro volatility: inflation					
	Alternative 1			Alternative 2		
	discr_gpe	*discr_gci*	*discr_gc*	*discr_gpe*	*discr_gci*	*discr_gc*
discr_fp	5.96**	9.51*	19.2**	19.6**	22.7*	44.6**
	(2.41)	(1.70)	(2.37)	(2.06)	(1.95)	(2.04)
gov_size	0.094**	0.074*	0.085*	0.082*	0.052*	0.064*
	(2.12)	(1.94)	(1.87)	(1.86)	(1.90)	(1.85)
open	-0.033	-0.033	-0.050*	-0.031	-0.034*	-0.063**
	(-1.27)	(-1.43)	(-1.91)	(-1.41)	(-1.76)	(-2.27)
infl_level	0.15*	0.16**	0.18***	0.22**	0.21**	0.24**
	(1.86)	(2.30)	(2.72)	(2.13)	(2.13)	(2.40)
gap_vol	0.024	0.026	-0.13	-0.0071	-0.017	-0.36
	(0.084)	(0.10)	(-0.46)	(-0.026)	(-0.060)	(-1.08)
exch_vol	0.039	0.047	0.077*	0.021	-0.0093	0.014
	(0.88)	(1.13)	(1.72)	(0.46)	(-0.25)	(0.31)
money_vol	0.030***	0.028***	0.030***	0.018*	0.011	0.015
	(3.19)	(3.15)	(3.33)	(1.71)	(0.99)	(1.32)
period_1	1.07	0.18	-0.82	0.28	-0.61	-2.07
	(0.74)	(0.18)	(-0.72)	(0.27)	(-0.54)	(-1.48)
period_2	-0.20	-0.33	-0.67	-0.59	-0.62	-1.27
	(-0.23)	(-0.54)	(-0.97)	(-0.82)	(-0.91)	(-1.52)
period_3	0.096	0.014	-0.25	-0.46	-0.41	-0.90
	(0.14)	(0.029)	(-0.45)	(-0.89)	(-0.74)	(-1.28)
period_4	0.25	0.23	0.092	0.070	0.097	-0.32
	(0.45)	(0.62)	(0.22)	(0.16)	(0.24)	(-0.62)
period_5	0.57	0.46	0.36	0.24	0.18	-0.20
	(1.11)	(1.43)	(1.01)	(0.63)	(0.54)	(-0.49)
period_6	0.50	0.40	0.34	0.086	0.095	-0.093
	(1.12)	(1.18)	(1.03)	(0.32)	(0.40)	(-0.31)
period_7	0.29	0.22	0.23	-0.100	-0.16	-0.31
	(0.58)	(0.77)	(0.65)	(-0.25)	(-0.46)	(-0.75)
period_8	0.38	0.28*	0.30			
	(1.12)	(1.65)	(1.25)			
No. of obs.	150	150	150	134	134	134
AR(2)	0.24	0.29	0.24	0.47	0.80	0.95
Hansen	1.00	1.00	1.00	1.00	1.00	1.00

Note: *z*-statistics in parenthesis based on country-level clustered standard errors. ***, **, * denote significance at 1%, 5%, and 10% respectively. *p*-values are reported for both the Hansen *J* and the AR(2) statistics. The Alternative 1 dataset starts in 1986, and the Alternative 2 dataset starts in 1987 (the benchmark dataset starts in 1985).