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Fiscal Rules, Discretionary Fiscal Policy and Macroeconomic Stability: An Empirical Assessment for OECD Countries

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Abstract: Does aggressive use of discretionary fiscal policy induce macroeconomic instability in terms of higher output and inflation volatility? Three main conclusions arise from our cross-section and panel analysis for a sample of 20 OECD countries: First, discretionary fiscal policy has a significant and sizeable effect on volatility of GDP (per capita) and all of its components. Second, there is no direct effect on inflation volatility; since output volatility is an important determinant of inflation volatility, however, discretionary fiscal policy indirectly exacerbates inflation volatility. These results turn out robust with respect to alternative fiscal policy measures and endogeneity concerns. Finally, many of the fiscal rules introduced since 1990 appear to have reduced the use of discretionary fiscal policy.

Keywords: discretionary fiscal policy, output volatility, inflation volatility

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I. Introduction

Over the last 15 years many OECD countries introduced fiscal rules. The European Union's Maastricht criteria of 1992, which were extended to the Stability and Growth Pact in 1997, represent only the most prominent case among numerous changes in the fiscal policy framework. This move towards 'rules rather than discretion' reflects a fundamental shift in the paradigm of fiscal policy. Not only is it widely accepted now that monetary policy is a superior tool for macroeconomic stabilization policy (see Romer and Romer, 1994); it is also widely believed today that tying the government's hand by a proper design of fiscal rules can help to improve fiscal policy outcomes. Two main arguments are usually put forward to support this view: First, to prevent governments from running excessive deficits and from conducting unsustainable policies; second, to limit the room for discretionary policy in order to improve macroeconomic stability. The latter argument, which is the main subject of this study, is based on the assumption that aggressive use of fiscal policy induces instabilities in terms of higher output volatility (Fatas and Mihov, 2003a) or higher inflation volatility (Rother, 2004). The detrimental effects may go beyond the welfare costs of instability per se which are widely viewed to be negligible since Lucas (1987). Fatas and Mihov (2003a) find a negative relation between output volatility and long-run growth; and it was already Friedman (1977) to argue that inflation volatility is harmful to growth. If discretionary fiscal policy in fact lowered output growth by inducing higher volatility the welfare gains from restricting fiscal policy discretion could be sizeable (Barlevy, 2004).

Whether fiscal policy should be left unrestricted or bound by rule, and how such an optimal rule would look like, are questions of obvious policy relevance. The widespread disagreement in the debate on the reform (abolishment) of the EU's Stability and Growth Pact does not only reflect alternative ideological positions but also bears witness that the academic debate on a proper framework for fiscal policy is far from settled. Before firm recommendations can be derived, however, it is a prerequisite that the effects of discretionary fiscal policy have been clarified unambiguously.

This paper investigates, as carefully and comprehensively as possible, the link between discretionary fiscal policy and macroeconomic stability in terms of output and inflation volatility. It goes beyond previous studies by investigating the effect on GDP components separately, checking the robustness of the results with respect to alternative measures of fiscal policy, and by using both a cross-section approach (based on annual data) and a panel approach (based on quarterly data). Endogeneity concerns are addressed in two different ways: in the cross section estimation, we use (mainly time-invariant) institutional variables suggested by Fatas and Mihov (2003a) as instruments; in the panel analysis we use the system GMM approach suggested by Blundell and Bond (1998). Finally, we also provides a first, tentative assessment, whether the fiscal rules introduced by OECD countries over the last 15 years have indeed led to a significant reduction in the use of discretionary fiscal policy.

The topic of this paper is related closely to a strand of literature that investigates the evolution of output volatility over time and the sources of business cycle volatility. A number of studies has noticed that the volatility of the growth rate in real output appears to have fallen in OECD countries over the past decade, particularly compared with the 1970s (see Blanchard and Simon (2001), McConnell and Perez-Quiros (2000), Stock and Watson (2002) for the US, Buch, Döpke and Pierdzioch (2004), Fritsche and Kuzin (2005) for Germany, Debs (2001) for Canada, Buckle, Haugh and Thomson (2001) for New Zealand and Simon (2001) for Australia). Regarding the sources of output volatility, Cecchetti, Flores-Lagunes, and Krause (2005) argue that improvements in inventory management, monetary policy, financial innovation, international openness and smaller shocks, all played a role in determining a widespread fall in output volatility across OECD countries. This paper adds to this strand of literature by investigating the causal link between fiscal policy and output volatility and whether a change in the use of discretionary fiscal policy over time has also contributed to the shift in output volatility across countries.

We find destabilizing effects of discretionary fiscal policy on GDP per capita and its components. In contrast, we do not find a direct effect on inflation volatility. Since the volatility of output (of the output gap) turns out to be an important determinant of inflation volatility, however, discretionary fiscal policy exerts and indirect effect on inflation volatility. It is worth emphasizing, how robust the results turn out against alternative measures and estimation methods. Finally, most rules introduced by OECD countries over the last 15 years appear to have reduced the use of discretionary fiscal policy.

The remainder of the paper is organized as follows. Section II estimates and compares various measures of discretionary fiscal policy. Sections III and IV investigate the effects of discretionary fiscal policy on the volatility of GDP (and its components) and the volatility of inflation, using both a cross-section and a panel approach. Section V presents some stylized facts on the effects of the fiscal rules that have been introduced in several OECD countries in the 1990s. The final section VI summarizes the results and concludes.

II. Measuring discretionary fiscal policy

1. Methodological issues

There is no consensus in the literature on how to construct a measure of a government's fiscal stance. The first question is how broadly fiscal policy should be defined. Fatas and Mihov (2003a) consider the expenditure side only, using the narrowest measure (government consumption). Blanchard and Perotti (2002), who study the effects of tax and spending shocks in a structural VAR approach, include government investment in their expenditure measure. Gali and Perotti (2003), in their investigation of the consequences of the Stability and Growth Pact for counter-cyclical fiscal policy in EU Member States, focus on the primary budget deficit (They also consider primary spending and revenues separately). A priori, none of these measures is superior. One the one hand, expenditures are less responsive to the cycle than receipts and hence less vulnerable to endogeneity concerns with respect to GDP than revenues or the budget. On the other hand, omitting taxes and other receipts may give an incomplete measure of the fiscal stance; this is particularly true if a tax cut is financed by a decrease in expenditures, or, mutatis mutandis, in the case of a tax financed expenditure programme. The ultimate choice will not only depend much on the question of interest, but will also be dictated by the availability of (budget) data. Focussing on OECD countries enables us to pursue a comprehensive approach and to check the robustness of the results obtained with alternatively defined variables (all of them in real terms): i) government consumption (*GC*); ii) government spending, i.e. consumption and investment (*GS*); iii) total primary spending, i.e. total disbursements excl. interest payments (*EXP*); iv) total primary receipts, i.e. total receipts excl. interest receipts (*REC*); and v) the primary balance or net lending (*NL* = *REC*-*EXP*).

Irrespective of which variable is used, it is of crucial importance to distinguish cyclical movements (e.g. in the budget deficit) from discretionary changes in fiscal policy. Following the notion of Gali and Perotti (2003), the *cyclical component* may also be termed *endogenous component* of the budget; it is that part of the budget that is driven by forces which are largely outside the control of fiscal authorities (at least in the short-run); unemployment benefits are a case in point. The *structural component*, representing discretionary changes by the policy makers, may in turn be decomposed into two parts: an *endogenous structural component*, which reflects discretionary policy measures taken in response to the state of the economy (such as counter-cyclical fiscal policy) and an *exogenous structural component*, reflecting discretionary policy measures unrelated to the state of the economy, i.e. pure fiscal shocks. Henceforth, 'discretionary fiscal policy' is always meant to represent this exogenous structural component.

One approach to decomposing fiscal policy is to partial out business cycle effects in a regression of the fiscal policy measure on variables related to the state of the economy; the residuals, i.e. that part of the variables unexplained by the state of the economy, may then be interpreted as exogenous structural component. This is the approach suggested by Fatas and Mihov (2003a). In particular, they use the following regression

$$\Delta \ln GC_{i,t} = \alpha_i + \gamma_i \Delta \ln GC_{i,t\text{-}1} + \beta_i \Delta \ln Y_{i,t} + \delta_i \mathbf{W}_{i,t} + \varepsilon_{i,t}^{GC} \quad (1)$$

where GC is (real) government consumption, Y is real GDP, and $\mathbf{W}$ is a matrix of controls (inflation, squared inflation, and a time trend). Since Y and GC are likely to be determined simultaneously, $\Delta \ln Y_{i,t}$ is instrumented using all other right hand side variables plus two lags of output growth ($\Delta \ln Y_{i,t\text{-}1}$, $\Delta \ln Y_{i,t\text{-}2}$), and the natural log of the average crude oil price. This regression is run separately for each of the i countries; t denotes the time period which differs from country to country due to data availability. Fatas and Mihov (2003a) interpret the error term ($\varepsilon_{i,t}^{GC}$) as discretionary fiscal shock and view its volatility over a certain time period ($\sqrt{Var(\varepsilon_{i,t}^{GC})}$) – the typical size of a change in discretionary policy – as indicator of the aggressiveness of a government's discretionary fiscal policy. They use a large cross-section of countries and consider government consumption (GC) only, but their approach can be easily extended to the other fiscal variables mentioned above, i.e. government spending (GS), primary spending (EXP) and primary receipts (REC). For the primary deficit (NL), which can also take negative values, however, we modify equation (1), taking the absolute difference (in per cent of GDP) rather than the log difference as dependent variable. The interpretation of the residuals remains the same, now relating to the deficit, however.

An alternative approach is to start from a cyclically adjusted measure of the fiscal variable as calculated by several organizations (OECD, EU Commission, IMF). Together with a hypothesis on how policy makers conduct fiscal policy (a fiscal rule) the structural measure can be further decomposed into its endogenous and exogenous component. The advantage of this approach is that it yields a complete decomposition of the fiscal measure into all three components. There are some drawbacks, however: First it relies on cyclically adjusted measures, which requires an estimate of potential GDP. The second is that one has to specify a fiscal rule; a government's fiscal behaviour, however, may be hard to summarize with a simple equation. Finally, cyclically adjusted measures are unavailable for several countries. This approach was suggested by Gali and Perotti (2003), who investigate the consequence of the EU's Stability and Growth Pact on fiscal policy, particularly on the room for countercyclical fiscal policy. Their empirical model is

$$NLA_{i,t} = \alpha_i + \gamma_i NLA_{i,t-1} + \beta_i GAP^{e}_{i,t} + \delta_i D_{i,t} + \upsilon^{NLA}_{i,t} \qquad (2)$$

where $NLA_{i,t}$ is the cyclically *adjusted*, primary deficit (calculated by the OECD), expressed in per cent of potential output; a positive value of the parameter in front of the expected output gap (GAP^e), defined as the deviation of actual from potential output in per cent of potential output, is associated with the conduct of counter-cyclical fiscal policy. The debt level (D) is included as control variable, reflecting the presumption that a higher level of debt leaves less room for manoeuvre. Finally, the lagged dependent variable is included to take up the serial correlation in the residuals, which may reflect a partial adjustment process to the target level of the adjusted deficit.[1] Again the residuals are interpreted as exogenous component of the structural deficit; by definition, the predicted values then represent the endogenous structural component, which – by least squares properties – have the convenient property of being orthogonal to the exogenous component. Apart from the use of a cyclically adjusted dependent variable, there are two further differences to aforementioned approach in (1): equation (2) is specified in levels rather than in absolute differences of the primary deficit

[1] As mentioned by Gali and Perotti, equation (2) can also be interpreted as reduced form of a structural model, where governments have a target level of the debt-GDP ratio and there are costs of changing the structural deficit over time (see Ballabriga and Martinez-Mongay (2002)).

and the dependent variable is expressed in per cent of potential rather than actual output. In order to make the estimates for the primary deficit comparable to that obtained using model (1) (i.e. the Fatas and Mihov (2003a) approach), we will take first differences of the residuals. Rescaling our measure in per cent of actual rather than potential output changes the results only trivially, such that we dispense from making this transformation. Finally, to make (2) estimable, we follow Gali and Perotti (2002): the expected output gap is replaced by its actual value and instrumented using the lagged output gap and the lagged output gap of the USA; for the USA the lagged output gap of the EU is used as second instrument.[2]

2. Estimation

Previous studies used annual data and focussed on selected measures; often, these restrictions were due to the use of large cross section of countries. Our approach is to focus on selected OECD countries which allows us i) to give a comprehensive assessment based on various measures of fiscal policy using an annual data set, and ii) to extend the previous studies to a panel approach using a quarterly data set. Accordingly, we will split the discussion of the results into two parts.

2.1 Analysis using annual data

Depending on the measure used, the number of countries ranges from 18 to 20; the length of the time series varies across countries. Table A1 in the appendix gives a detailed overview of the samples for the alternative measures. Model (1) was then estimated for each country *i*,

[2] Since (2) is interpreted as fiscal rule, and the first-stage regression as forecast function of the policy maker for the output gap, we use the second-stage residuals (rather than the structural residuals) of the IV estimation as measure of fiscal shocks. This is also required to obtain orthogonality between the endogenous structural component (i.e. the second-stage predicted values from (2)) and the exogenous structural component (i.e. the second-stage residuals from (2)).

using five alternative dependent variables: government consumption (*GC*), government spending (*GS*), total primary spending (*EXP*), total primary receipts (*REC*), all of them in real terms[3] and log differences, and the primary deficit (*NL*) in absolute differences expressed in per cent of GDP. For each country *i*, this yields five alternative time series reflecting exogenous fiscal shocks: $e_{i,t}^{GC}, e_{i,t}^{GS}, e_{i,t}^{EXP}, e_{i,t}^{REC}$, and $e_{i,t}^{NL}$; the typical size of these shocks, i.e. the measure of the aggressiveness of fiscal policy, is obtained by taking the standard deviation of these time series, yielding five variables per country: $\sigma_i^{GC}, \sigma_i^{GS}, \sigma_i^{EXP}, \sigma_i^{REC}$, and σ_i^{NL}.

Model (2) was also estimated for each country *i*, using the cyclically adjusted primary deficit, expressed in per cent of potential output, as dependent variable (*NLA*). For each country *i*, this yields us an additional time series of fiscal shocks, which was differenced ($\Delta v_{i,t}^{NLA}$) to make it comparable with the measures above; taking the standard deviation again, we obtain σ_i^{NLA} as sixth alternative measure of the aggressiveness of fiscal policy.

It is of interest in itself to compare the various measures of discretionary fiscal policy. Table 1 shows the correlation between the country-specific standard deviations of the exogenous, structural component of the alternative fiscal variables.[4]

< Table 1 here >

Considering first the measures constructed with the Fatas and Mihov (2003a) approach (i.e. model (1)), we observe that the three expenditure-based measures ($\sigma_i^{GC}, \sigma_i^{GS}, \sigma_i^{EXP}$) are highly correlated; thus the size and frequency of changes in government consumption appear to reflect a government's behaviour with respect to the overall expenditure side well.

[3] For total primary spending (*EXP*), total primary receipts (*REC*), and the primary deficit (*NL*) the GDP deflator was used to convert the nominal figures into real terms.

[4] Notice that the time periods from which the country-specific standard deviations are calculated differ somewhat across countries as a result of data availability (see Appendix A1). The results are hardly affected, however, if overlapping time periods are used.

Moreover, the variability of primary spending and revenues are highly correlated as well (0.836); thus governments with an active expenditure policy do on average also pursue an active tax policy. This is also reflected in the correlation between the variability of spending or revenues with the budget (0.712 and 0.624 respectively). Comparing the deficit-based measures obtained with the Fatas and Mihov (2003a) and the Gali and Perotti (2003) approach, i.e. σ_i^{NL} with σ_i^{NLA}, the correlations is 0.720. This suggests that the two approaches deliver broadly comparable results.

2.1 Analysis using quarterly data

The use of quarterly data (or higher frequency data) is a natural choice when investigating volatility issues. The problem here is that budget data are unavailable at a quarterly level (or derived by mechanical interpolations); for several countries, quarterly data on government investment is missing as well. Hence, the gain from increasing in observation comes at the cost of a reduction in the available measures of fiscal policy. In our quarterly analysis we consider only government consumption (*GC*), which is available for 18 countries. Based on the evidence from the annual analysis, however, it is not implausible to assume that our measure based on government consumption (*GC*) can be regarded as representative. Again, Table A1 in the Appendix gives a detailed overview of the quarterly sample.

As before we estimate equation (1) using the log difference of government consumption (*GC*) as dependent variable. In the baseline specification, using just one lag, we find strong serial correlation in the residuals. Removing the serial correlation is important for two reasons: From an econometric perspective, serial correlation in the presence of a lagged dependent variable yields inconsistent estimates. From an economic perspective, the presence of serial correlation conflicts with the interpretation of the residuals as exogenous shocks. Hence, we extended the lag structure of model (1), adding lags two to four of the dependent variable as explanatory variable; additionally we included one lag of GDP growth (extending the instruments up to lag five accordingly). This removes the correlation from all 18 series except that of Spain and the United Kingdom ($e^{GC}_{ESP,t}$ $e^{GS}_{GBR,t}$). Explicit adjustment for autocorrelation using the corresponding AR-terms leads to residual series for these two countries, which are highly correlated with the original series, so that – for the sake of consistency – we use the same model as for the other countries.

A further point is worth noting: White tests of the residuals indicate the presence of heteroscedasticity in most series (for 12 of the 18 series the White-test is significant and for 3 further series close to the 10 per cent level). This suggests that it is in fact worthwhile to pursue a panel approach to exploit not only the cross-country variation, but also the within-country variation of the series of fiscal shocks in order to infer something about their effects on macroeconomic stability.

III. Fiscal policy and output volatility

Having obtained several alternative measures of fiscal policy we now go on to provide an assessment of the effect of fiscal policy on output volatility. We first consider the cross-section estimates using annual data; then we turn to the panel estimates using quarterly data. To give a first impression of the variation in the data, Figure 1 shows a scatter plot of one of our fiscal measures (σ_i^{GS}) against output volatility.

< Figure 1 here >

1. Cross section analysis

We depart from the baseline model by Fatas and Mihov (2003a); thereby, output volatility, defined as standard deviation of the growth rate of output per capita ($\sigma_i^{\Delta \ln y}$), is regressed on the standard deviation of the fiscal policy measure (σ_i^{FP}) and several control variables (**W**):

$$\ln\sigma_i^{\Delta \ln y} = \alpha + \gamma \ln\sigma_i^{FP} + \delta \mathbf{W}_i + \varepsilon_i \qquad (3)$$

Three controls are added: government size (*GSIZE*) to account for the government's potentially stabilizing role emphasized by Gali (1994); the log of real GDP per capita (*GDP p.c.*), since poorer countries may more often resort to discretionary policy; finally, trade is included as standard control for output volatility as argued by Rodrik (1998).

Two variables in (3) are likely to be correlated with the error term: the fiscal policy measure (σ_i^{FP}), while constructed in a very careful way, may be still due in part to output volatility; moreover, it is likely to be subject to measurement error. Government size (*GSIZE*) might be endogenous as well; as argued by Rodrik (1998), more volatile economies may have an incentive to set up larger governments. We thus estimate our models using both least squares and instruments to ensure that our results are not contaminated by endogeneity of the regressors.

The volatility of fiscal policy (σ_i^{FP}) is instrumented using the institutional variables suggested by Fatas and Mihov (2003a; zero-one dummies for majoritarian (*MAJ*) and presidential (*PRES*) regimes, a measure of political constraints (*PCON*), and the number of elections (*NEL*)); as additional instrument, we add the degree of fiscal decentralisation, measured in terms of the share of sub-national government expenditures in general government expenditures net of intergovernmental transfers (FD^{EXP}).[5] The theoretical underpinning of these instruments is taken from the growing literature on institutions and economic policy (see, for example, Person and Tabellini (2000)) and discussed more in detail by Fatas and Mihov (2003a). As far as government size (*GSIZE*) is concerned, we follow the standard approach in the literature and use the dependency ratio (*DEP*), the urbanization rate

[5] For the revenue based measure of fiscal policy, fiscal decentralisation in terms of revenues was used (FD^{REV}); for the deficit measures, both FD^{EXP} and FD^{REV} were included as instruments.

(*URB*), and the log of population (*POP*) as (additional) instruments. A detailed description of the variables and the data sources is given in the Appendix.

Fatas and Mihov (2003a) consider government consumption as measure of fiscal policy only. We estimate model (3) using all five measures of fiscal policy derived above in order to check the robustness of the results with respect to alternatively defined measures of fiscal policy. As a consequence of data availability (particularly budget data and cyclically adjusted data) the cross-section dimension i is very low; hence, the panel analysis using quarterly data, which is pursued below, is an important complement to the cross-section estimates, which are shown in Table 2.

< Table 2 >

Several points are worth emphasizing: First, the coefficient using government consumption (*GC*) as fiscal measure (0.428) is de facto identical to that obtained by Fatas and Mihov (2003a) for their subsample of 25 OECD countries (0.490). Second, it is astonishing, how robust the findings turn out against the use of alternative measures of fiscal policy. We always find a significant impact of fiscal policy on output volatility, whether expenditure-based, tax-based or budget-based measures are used; it also makes no difference, which of the two approaches to estimate the budget-based measure (model (1) or (2)) is pursued. Third, the null of valid instruments cannot be rejected by any of the tests of overidentifying restrictions; notice that the IV estimates of γ are always higher, which points to an attenuation bias of the least squares estimates as a result of measurement error.

The coefficients of the fiscal variables are also economically significant. It is clearly unrealistic to assume that the volatility of discretionary fiscal policy could be reduced to zero. But it is not implausible to assume that the scope for reducing the volatility of fiscal policy (σ_i^{FP}) amounts to one and a half times the standard deviation of σ_i^{FP} across countries (on average this is less than 40 per cent of the difference between the maximum and minimum value of σ_i^{FP}). According to our estimates this would reduce output volatility by some 27 per cent on average; depending on the fiscal measure used the attainable reduction ranges from 22 to 35 per cent.

It could be objected that the results in Table 2 (and that of Fatas and Mihov (2003a)) have some tautological flavour. Particularly, government consumption (*GC*) and government spending (*GS*) are part of GDP; hence their volatilities will normally be correlated with that of GDP. However, essentially the same results are obtained, if the dependent variable is replaced by the volatility of 'private GDP' per capita, i.e. GDP excluding government spending (*GS*) or excluding government consumption *(GC)* when *GC* is used as fiscal measure. The detailed results are given in Table A2 in the Appendix. Here we go one step further and re-estimate equation (3), using the volatility of consumption, investment, exports, and imports (all in per capita terms) as dependent variable. Table 3 shows the results using the net lending measure (σ_i^{NL}) as fiscal variable, but as in the previous regressions, the results may be regarded as representative for the other fiscal variables as well.

< Table 3 >

We find a significant destabilizing effect of fiscal policy on all GDP components except exports. This buttresses the results obtained so far and implies that aggressive use of discretionary fiscal policy does not only amplify business cycles by adding noise to the output series but that fiscal shocks are propagated through the whole economy and spill over to private sector output components as well.[6]

An important qualification to the results obtained so far is the small number of observations. We will thus extend our analysis to a panel approach based on quarterly data in the next section. An important message to carry over to the subsequent quarterly analysis, which uses only government consumption (*GC*) as a measure of fiscal policy for reasons of

[6] A similar point, though referring to counter-cyclical fiscal policy, was already made by Friedman (1953).

data availability, is that the results are extremely robust against using alternative measures of fiscal policy. Thus we may reasonably regard the results for *GC* as representative.

2. Panel analysis

Using quarterly data has considerable appeal for our question of interest. Using higher frequency data is a natural choice, when investigating volatility issues. Moreover, the extension to a panel approach not only allows us to increase the degrees of freedom but also to control for country- and time-specific effects, which – if correlated with the regressors (instruments) – would render our estimates inconsistent. The heteroscedasticity in the series of fiscal shocks, i.e. in the residuals of model (1) using *GC* (see section II), indicates that there is significant within-country variation, which is worth being exploited in a panel approach. As a compromise to the inherent trade-off between generating a sufficient number of observations and choosing sufficiently long subperiods, we split up our sample into non-overlapping 4 year intervals. Hence, model (3) becomes

$$\ln \sigma_{i,t}^{\Delta \ln y} = \alpha_i + \gamma \ln \sigma_{i,t}^{GC} + \delta \mathbf{W}_{i,t} + \eta_t + \varepsilon_{i,t}\,, \qquad (4)$$

where α_i are the country-specific and η_t are the time-specific fixed effects. The cross-section dimension i comprises 18 countries; depending on data availability, the country-specific time dimension T_i ranges from 4 to 11 (quadrennial) observations, i.e. we have an unbalanced panel. As already mentioned above, government consumption is used as only measure of fiscal policy in the quarterly analysis for reasons of data availability.

As in our cross section analysis it is important to check the results from the least squares dummy variable estimates (LSDV) with respect to the exogeneity assumption. Moving to a panel, however, has important implications for the choice of instruments for the fiscal policy variable ($\sigma_{i,t}^{GC}$): The institutional variables become useless; no variation over time (as in *MAJ* and *PRES*) or extremely low variation over time (in *POLCON*, *NOELEC*, FD^{EXP}, FD^{EXP})

make them de facto perfectly collinear with the country-specific fixed effects. Hence, we will adopt a less structural approach, exploiting the (testable) assumption that lags of the endogenous regressors may be used as instruments. An approach that has gained wide acceptance to address endogeneity concerns in a panel framework is the generalized method of moments (GMM) estimator suggested by Blundell and Bond (1998): Thereby a combined system of the equations in levels and in first differences is estimated; in the levels equations lags of the first difference of the endogenous variable are used as instruments; in the equations in first differences, lagged levels are used as instruments. Validity of the instruments requires the absence of second-order serial correlation in the differences specification; overall validity of instruments can be tested using a Sargan-type test. The Appendix shows more in detail the assumptions underlying the system GMM estimation and its application to model (4).[7]

As far as *GSIZE* is concerned, the instruments used in the cross section (*DEP*, *URB*, *POP*) exhibit enough time variation to be used in our panel; additionally, we use the same lag structure as for the fiscal policy variable to improve the informational content of the instruments. Table 4 summarizes the results of the least square dummy variable (LSDV) and the GMM estimates for alternative GDP components.

< Table 4 here >

Again we find a significant destabilizing effect of fiscal policy on the volatility of GDP and all of its components (per capita). Including country- and time-specific effects hardly affects the values of the parameter estimates which are very close to the corresponding cross-section

[7] Another requirement for the application of the GMM system estimator is that the series are stationary. We checked for stochastic trends using panel unit root tests, allowing for individual root processes: the null of a unit root is rejected for both output volatility and our fiscal measures. Regarding the presence of deterministic trends, it should be borne in mind that all models include time-specific effects; this is equivalent to transforming the data into deviations from time means, which implicitly controls for the presence of a common trend.

estimates[8]. As expected, the estimates are more precise, resulting in an improved significance level of the coefficients of our fiscal policy variable. As before, the LSDV estimates appear to suffer from a downward bias; the GMM estimates are always larger.

The results cast only little doubt on the validity of the instruments; the tests for serial correlation indicate significant (negative) first order serial correlation, but no second order serial correlation (as it should be the case if the original residuals in (4) are serially uncorrelated, which is required for the instruments to be valid). In two cases the Sargan test (based on the one-step residuals) rejects the null of valid instruments; since the test is derived under the maintained assumption of homoscedastictiy, this could also be due to heteroscedasticity. For two reasons this is likely to be the case here: first, the Sargan tests based on the two-step estimates are all insignificant with p-values close to one. Second, it is implausible that the instruments are invalid for private GDP, but not for the four GDP components, which sum up to private GDP. Together with the cross-section results there remains hardly a doubt that aggressive use of discretionary fiscal policy has a pervasively destabilizing effect on output.

IV. Fiscal policy and inflation volatility

The amplification of business cycles is not the only destabilizing effect fiscal policy may have; aggressive use of fiscal policy is also argued to increase uncertainty about future inflation, for example, via its impact on aggregate demand, expectations about the sustainability of fiscal policy, and the effect of taxes on marginal costs and consumption. Rother (2004), who also provides a survey of the literature, finds evidence for a positive link between discretionary fiscal policy (measured as year-on-year changes in the cyclically

[8] See the results for σ_i^{GC} in Table 2 and Table A2; this is also true for the effect on the volatility of GDP components (not shown in the paper for σ_i^{GC}).

adjusted deficit) and inflation volatility, using a sample of 15 OECD countries over the periods 1967 to 2001. This issue is of no less importance than the impact of fiscal policy on output volatility; it was already Friedman (1977) to argue that it is not inflation per se but inflation volatility that is harmful to economic growth. Empirical evidence supporting this proposition is provided by Froyen and Waud (1987) and Judson and Orphanides (1999). We will take up this issue here and test the impact of fiscal policy on inflation volatility as well.

In its basic setup, the subsequent analysis corresponds to that of section III. The empirical model is similar to (3), now with the standard deviation of inflation (measured as the growth rate of the GDP deflator[9]) as dependent variable and with a slightly different set of control variables. Thus, we have

$$\ln \sigma_i^{\pi} = \alpha + \gamma \ln \sigma_i^{FP} + \delta \mathbf{W}_i + \varepsilon_i \qquad (5)$$

In line with the analysis by Rother (2004), the matrix **W** includes the following controls: the level of inflation (π), which is widely recognized as important determinant of inflation volatility; *GSIZE* and *TRADE* are included for the same reasons as above. Finally the (log of the) volatility of the change in the output gap (σ_i^{GAP}), the volatility of the growth rate of the nominal effective exchange rate (σ_i^{NEER}), and the volatility of adjusted money growth (σ_i^{GM}) may affect inflation volatility for obvious reasons and are thus controlled for in the regression. A detailed description of the variables and data is given in the Appendix.

Again we estimate (5) as cross-section using annual data and as panel using quadrennial time periods (based on quarterly data), which includes country- and time-specific fixed effects. Endogeneity of the fiscal variable and government size may be an issue here for the same reasons as above (reverse causality, measurement error); to address these concerns we use the same set of instruments as above: in the cross-section estimation of (5), *MAJ*, *PRES*,

[9] As an alternative measure, we used the CPI deflator, and obtained qualitatively identical results.

PCON, and *NEL* are used as instruments for $\ln\sigma_i^{FP}$, and *DEP*, *URB* and (the log of) *POP* as instruments for *GSIZE*; in the panel estimation of (5), a GMM-system approach is employed again, with the same lag structure as above (and *DEP*, *URB* and (the log of) *POP* are again used as additional instruments for *GSIZE*). Table 5 summarizes the cross-section and the panel estimates of equation (5).

< Table 5 here >

Results are unambiguous, but different from that for output volatility: We find no evidence for a direct link between discretionary fiscal policy and inflation volatility, no matter which measure is used. It should be noted that the interpretation of the cross-section results is severally aggravated due to the small number of degrees of freedom and collinearity problems; this may also explain the wrong sign of the output gap variability in some of the regressions. Hence, the cross-section results should not be overstressed.

In the panel estimation the fiscal policy variable turns out insignificant again.[10] A substantial part of the variation in inflation volatility is explained by the level of inflation, the volatility of the output GAP, and the volatility of the nominal effective exchange rate; each of these variables is significant and the coefficients show the expected positive sign. An important point is that the volatility of the output gap can be replaced by the volatility of GDP (or GDP per capita) growth, without altering the basic results (The only difference is that the negative coefficient of the volatility of adjusted money growth becomes significant, too.). We conclude that fiscal policy has no direct effect on inflation volatility, but it may increase inflation volatility indirectly via its effect on output volatility (obtained in section III).[11] This indirect effect is only of moderate size, however; using the effect of fiscal policy on output

[10] This holds true if the volatility of the output gap is omitted.

[11] The similarity of the results when the volatility of the output gap is replaced by that of output growth (per capita) is plausible; if the trend growth were constant the two variables should measure exactly the same thing.

volatility calculated in section III, the attainable reduction in inflation volatility implied by the GMM estimates (using output volatility in (5) rather than the output gap volatility) amounts to some 14 per cent on average.

These results are in strong contrast to that of Rother (2004). This is surprising, since the two samples overlap to a considerable extent both with respect to the cross-country and time dimension. Since the Rother (2004) study uses only one crude measure of fiscal policy, our results, using a variety of measures, cast strong doubt on a direct link between inflation volatility and fiscal policy. The insignificant results may also reflect country-specific differences; it might be worth to pursue this question further and to investigate country-specific effects of fiscal policy on inflation volatility in a time series framework.

V. Fiscal rules and the room for discretionary fiscal policy

Many OECD countries introduced fiscal rules over the last 15 years; the EU's Maastricht criteria and the Stability and Growth Pact (SGP) are only the most prominent examples. Table 6 summarizes the fiscal rules introduced in selected OECD countries since 1990. A more detailed overview is given by OECD (2002).

< Table 6 >

Two main arguments are usually put forward for the introduction of fiscal rules: to ensure sustainability of fiscal policy, and to limit the room for erratic discretionary fiscal policy in order to improve macroeconomic stability. It is widely recognized now that the Maastricht criteria together with the SGP had a disciplinating effect on fiscal authorities, and that they were a driving force of the fiscal consolidations in many EU countries in the 1990s. There is less evidence on whether fiscal rules have actually supported macroeconomic stability. The results in section II suggest that limiting the use of discretionary fiscal policy is a channel via which fiscal rules could potentially reduce output volatility (and indirectly inflation volatility as well). It is unclear, however, whether the fiscal rules introduced have actually achieved a reduction in the use of discretionary policy. Fatas and Mihov (2003b), by casual inspection of the development of the euro area's (average) fiscal stance (in terms of the year-on-year change in the cyclically adjusted budget, and alternatively, using a measure similar to that in section II) argue that there is some evidence in favour of this presumption.

The use of quarterly data allows us to pursue a more formal approach and to explicitly test for a break in the volatility of discretionary fiscal policy. Table 7 gives an overview of the aggressiveness of fiscal policy before and after the introduction of the fiscal rules shown in Table 6. To avoid distortions from the rather erratic 1970s our samples start with year 1980.

< Table 7 >

It is remarkable that for all countries except Sweden and Switzerland the volatility of discretionary policy has decreased. In judging whether the changes are also statistically significant, it has to be borne in mind that our measures of fiscal shocks are residuals from a regression model (i.e. we are actually testing for heteroscedasticity in the residuals of model (1)). Since the residuals are not independent[12], a simple F-test using the ratio of the two variances is not applicable. Therefore, we use a Breusch-Pagan Lagrange multiplier test (see Greene, 2003, 223f.). Since the number of observations in our subsamples is fairly low, and the test is known to be rather sensitive against the normality assumption we use the robust variance estimate suggested by Basset and Koenker (1982). It turns out that of the 16 cases considered, 11 changes turn out significant. Nine of the significant changes point to a reduction in volatility; six of these nine countries are part of the euro area and underlie the rules of the EU Stability and Growth Pact (SGP) including possible sanctions in the case of non-compliance (which do not apply to the 'outs'). To reinforce the point, Figure 2 shows a

[12] Since $e = My = M\varepsilon$, where $M = I - X(X'X)^{-1}X'$, it follows that $Var(e) = Var(M\varepsilon) = \sigma^2 MM' = \sigma^2 M$, which is not diagonal (even if $Var(e) = \sigma^2 I$) .

scatter plot of the change in policy volatility against the change in volatility of output per capita.

< Figure 2 here >

Some more discussion on the euro area countries seems warranted; we chose 1997 as breakpoint, the year when the SGP was passed; basically the same results are obtained if we use 1999 (SGP into force) and largely also if we use 1995 as breakpoint. However, if we move back to 1992, the year when the Maastricht treaty was agreed upon, the observed pattern of changes in Table 7 disappears. A possible interpretation is that fiscal rules take time to gain acceptance and that it was the SGP, which ultimately strengthened the credibility and commitment envisaged in Maastricht treaty. It is at least difficult to think of any other reason that has affected almost all euro area countries alike. Ironically, a few years after the SGP started to showed a recognizable effect on fiscal policies (at least according to Table 7), the budget problems of several euro area countries (particularly France and Germany) and the lack of enforcement of the SGP have lead to a reform proposal by the Commission with extended escape clauses, such that the SGP is widely believed to have lost most of its credibility and bit.

But also for five non-euro area countries (Australia, Canada, Norway, Japan, USA) we observe a statistically significant reduction in volatility. This is remarkable, given the different nature of the rules: in Australia, they imply little more than an obligation to declare fiscal goals and to have fiscal policy reviewed by external auditors; in Canada's provinces, possible sanctions range from a reduction in salaries up to forced elections.

Overall, our tentative evidence is suggestive: fiscal rules appear to have indeed restricted the room for manoeuvre for discretionary fiscal policy. Our assessment is subject to some qualifications: the number of observations is small and the trend may have reversed in the late 1990s in some countries. It also provides no answer on why rules, so different in their nature, had similar effects. Detailed case studies of single countries may be an interesting extension in order to assess the exact way fiscal rules may have impacted upon fiscal behaviour.

VI. Conclusions

This paper studies extensively the link between fiscal rules, the use of discretionary fiscal policy and macroeconomic stability in terms of volatility of GDP per capita (and its components) and volatility of inflation, using a sample of 20 OECD countries. We use both a cross-section approach based on annual data and a panel approach based on quarterly data. Concerns with respect to the proper measurement of discretionary fiscal policy are addressed by using alternative variables (ranging from government consumption over the revenues side to the government's net primary lending) and two alternative approaches to extract the discretionary, i.e. the exogenous structural component of fiscal policy from the data. Concerns with respect to (remaining) endogeneity of our fiscal policy variable as a result of possibly reverse causality and measurement error are taken up as well: in the cross-section analysis we use (mainly time invariant) data on institutions (such as electoral system and political constraints) as instrumental variables; in the panel analysis we employ a system GMM approach to check the sensitivity of the results with respect to assuming exogeneity of our fiscal variable. We then provide some tentative analysis of whether the fiscal rules introduced in several OECD countries since the early 1990s have altered the extent to which governments use discretionary fiscal policy.

We identify three empirical regularities: i) There remains little doubt that aggressive use of fiscal policy exerts a statistically significant and economically sizeable effect on volatility of GDP. Since we find a destabilizing effect on all GDP components, the effect of fiscal policy goes beyond amplifying business cycles by just adding noise to the output series: Fiscal shocks are propagated through the whole economy and spill over to 'private' GDP components as well. This enforces the results obtained by Fatas and Mihov (2003a) and suggests that reduced use of fiscal policy over time is another source of the change in business cycle volatility observed in many studies.

ii) In contrast to a recent study by Rother (2004), we find no evidence that discretionary fiscal policy exerts a direct destabilizing effect on inflation. No matter which measure or approach is used, the fiscal variable turns out insignificant. Since the volatility of the output gap (or equivalently, the volatility of output) is found to be an important determinant of inflation volatility, however, fiscal policy exerts an indirect destabilizing effect on inflation.

iii) Comparing the volatility of discretionary fiscal policy in OECD countries before and after the introduction of fiscal rules, we find surprisingly consistent results: In most countries the use of discretionary fiscal policy was reduced; in many cases this reduction is statistically significant. This is surprising, since the rules considered are rather different in their nature and with respect to the possibilities of legal enforcement. In-depth studies of single countries may yield interesting answers on the question how fiscal rules have exactly altered the conduct of fiscal policy.

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Appendix

Data: Definition of variables, sources and samples

Unless stated otherwise, data were taken from the OECD Economic Outlook Database. Series for West Germany as of 1991 were partly chained using data of the reunified Germany. Quarterly data for population had to be interpolated. Variables on fiscal decentralization were kindly provided by Markus Eller. Cross-country dimension and time dimension: see Table A1.

DEP dependency ratio, i.e. ratio of people younger than 15 and older than 64 to working age population (people from 15 to 64) in per cent. Source: World Development Indicators.

EXP real primary expenditures in millions of Euros (base year 1995), general government total disbursements exc. gross interest payments, converted into real terms with GDP deflator .

FD^{EXP} share of sub-national government expenditures in general government expenditures net of intergovernmental transfers; Source: World Bank, IMF.

FD^{REV} share of sub-national government revenues in general government revenues; Source: World Bank, IMF.

GAP output gap in per cent of potential output, $GAP = 100\times(GDP\text{-}GDP^*)/GDP^*$.

GC real general government consumption in millions of Euros (base year 1995).

GDP p.c. real GDP per capita in 1995$ per person (base year 1995, 1995 PPPs of the OECD); $GDP\ p.c. = GDP^{**}/POP$

GDP real GDP in millions of Euros (base year 1995).

GDP^* real potential output in millions of Euros (base year 1995).

GDP^{**} real GDP in millions of 1995$ (base year 1995, 1995 PPPs of the OECD).

D general government gross financial liabilities in per cent of GDP.

GM adjusted money growth, defined as money growth (based on M1) minus real GDP growth. Source: data on M1 taken from IFS.

GS real general government spending in millions of Euros (base year 1995); *GS* = *CG*+*IG*.

GSIZE government size in per cent of GDP, $GSIZE = 100 \times GS/GDP$.

IG real general government fixed capital formation in millions of Euros (base year 1995).

MAJ zero-one dummy for electoral system (1 for majoritarian, 0 for proportional). Source: Person and Tabellini (2001).

NEER index of nominal effective exchange rate (1995=100).

NEL number of elections. Source: Database of Political Institutions.

NL real primary deficit (net lending) of general government in per cent of GDP; $NL = (REC\text{-}EXP)/GDP$.

NLA *NL*, cyclically adjusted (by OECD) and expressed in per cent of potential output.

OIL oil price in US-$ per barrel; Source: IFS.

PCON index of political constraints, based on Henisz (2000) and taken from the author's Webpage.

POP population in million persons.

PRES zero-one dummy for regime (1 for presidential, 0 for parliamentary). Source: Person and Tabellini (2001).

REC real primary receipts (base year 1995), general government total receipts exc. gross interest receipts in millions of Euros, converted into real terms with GDP deflator.

TRADE imports plus exports of goods and services in per cent of GDP.

URB urbanization rate, i.e. urban population as share of total population in per cent. Source: World Development Indicators.

π rate of inflation, measured as relative change in GDP deflator in per cent.

GMM system estimation of model (4)

The original specification of equation (4) in levels is given by

$$\ln \sigma_{i,t}^{\Delta \ln y} = \alpha_i + \gamma \ln \sigma_{i,t}^{FP} + \delta \mathbf{W}_{i,t} + \eta_t + \varepsilon_{i,t} . \tag{A1}$$

Each equation in levels is supplemented by an equation in first differences

$$\Delta \ln \sigma_{i,t}^{\Delta \ln y} = \gamma \Delta \ln \sigma_{i,t}^{FP} + \delta \Delta \mathbf{W}_{i,t} + \Delta \eta_t + \Delta \varepsilon_{i,t} . \tag{A2}$$

The cross-section dimension i runs from 1 to N, the time dimension t from 1 to T_i (unbalanced panel). For the sake of brevity, we restrict our attention to the variable $\ln \sigma_{i,t}^{FP}$ here; for *GSIZE* (which is contained in **W**), exactly the same lag structure is used (and *URB*, *DEP*, and *POP* are used as additional instruments).

In equation (A2) $\ln \sigma_{i,t-2}^{FP}$ and all previous lags are used as instruments for $\Delta \ln \sigma_{i,t}^{FP}$ assuming that $\mathrm{E}[\varepsilon_{i,t}\, \varepsilon_{i,s}] = 0$ for $i = 1, \ldots, \mathrm{N}$ and $s \neq t$ and exploiting the moment conditions that

$E[\ln\sigma^{FP}_{i,t-s}\,\varepsilon_{i,t}] = 0$ for $t = 3,\ldots,1999$ and $s \geq 2$. As a result of differencing and lagging (of the instruments), only T_i-2 equations in first differences remain.

In (A1) lagged first differences ($\Delta\ln\sigma^{FP}_{i,t-1}$) are used as instruments[13] for $\ln\sigma^{FP}_{i,t}$, based on the assumption that $E[\alpha_i\,\Delta\ln\sigma^{FP}_{i,2})] = 0$ for $i = 1,\ldots,N$, which (together with the standard assumptions for (A2)) yields the additional moment conditions $E[\upsilon_{i,t}\,\Delta\ln\sigma^{FP}_{i,t-1}] = 0$ for $i = 1,\ldots,N$ and $t = 3,\ldots,T_i$, where $\upsilon_{i,t} = \alpha_i + \varepsilon_{i,t}$.[14] Using Monte Carlo studies, Blundell and Bond (1998) demonstrate that the finite sample bias of the GMM estimator based on first differences only can be reduced substantially with the system GMM estimator.

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[13] Note that there are no instruments for the first observation $\ln\sigma^{FP}_{i,2}$ available; as a result of differencing, T_i-1 equations remain.

[14] This requires the first moment of $\ln\sigma^{FP}_{i,t}$ to be stationary (which is fulfilled here).

Table A1.
Overview of annual and quarterly samples for alternative fiscal variables

	Annual data						*Quarterly data*
	GC	*GS*	*EXP*	*REC*	*NL*	*NLA*	*GC*
AUS	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1989 (14)	1961q3 (166)
AUT	1963 (40)	1963 (40)	1966 (37)	1972 (31)	1972 (31)	1974 (29)	1961q3 (166)
BEL	1963 (40)	1963 (40)	1972 (31)	1972 (31)	1972 (31)	1973 (30)	1981q2 (87)
CAN	1964 (39)	1964 (39)	1983 (20)	1983 (20)	1983 (20)	1982 (21)	1962q3 (162)
CHE	1963 (40)	1963 (40)	-	-	-	-	1961q3 (166)
DEU	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1971 (32)	1961q3 (166)
DNK	1963 (40)	1973 (30)	1973 (30)	1973 (30)	1973 (30)	1981 (22)	-
ESP	1963 (40)	-	1966 (37)	1966 (37)	1966 (37)	1981 (22)	1961q3 (166)
FIN	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1978 (25)	1976q3 (106)
FRA	1966 (37)	1966 (37)	1972 (31)	1972 (31)	1972 (31)	1978 (25)	1964q3 (154)
GBR	1963 (40)	1964 (39)	1972 (31)	1972 (31)	1972 (31)	1981 (22)	1961q3 (166)
IRE	1963 (40)	1963 (40)	1979 (24)	1979 (24)	1979 (24)	1981 (22)	-
ISL	1963 (40)	1963 (40)	1972 (31)	1972 (31)	1972 (31)	1981 (22)	-
ITA	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1965 (38)	1971q2 (127)
JPN	-	-	-	-	-	-	1961q3 (166)
KOR	-	-	-	-	-	-	1971q3 (126)
MEX	1963 (40)	1982 (21)	-	-	-	-	1961q3 (166)
NLD	1963 (40)	1963 (40)	1971 (32)	1972 (31)	1972 (31)	1974 (29)	1978q3 (98)
NOR	1963 (40)	1964 (39)	1964 (39)	1977 (26)	1977 (26)	1979 (24)	1961q3 (166)
NZL	1964 (39)	1964 (39)	1993 (10)	1993 (10)	1988 (15)	1994 (9)	-
SWE	1963 (40)	1963 (40)	1965 (38)	1972 (31)	1972 (31)	1971 (32)	1961q3 (166)
USA	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1963 (40)	1981 (22)	1961q3 (166)
No.	20	19	18	18	18	18	18

Notes: Starting year of adjusted samples (number of observations); all series go up to 2002 (2002q4).
In the estimations of the models for inflation volatility, the annual samples are almost the same; only MEX had to be excluded due to missing data on the output GAP. In the quarterly samples, BEL, CHE, ESP, MEX, and KOR had to be excluded, again due to missing output GAP data. (Overall, the samples also reflect limited data availability of other variables used in the estimation such as institutional variables; JPN, for example, could be included in the quarterly analysis where no institutional variables are required).

Table A2.
Fiscal policy and volatility of private GDP per capita – *Estimation results for model (3)*

	σ_i^{GC}		σ_i^{GS}		σ_i^{EXP}	
	OLS	IV	OLS	IV	OLS	IV
σ_i^{FP}	0.362	0.431	0.368	0.427	0.298	0.310
	(0.060)	(0.038)	(0.008)	(0.008)	(0.004)	(0.004)
GSIZE	0.012	0.019	0.006	0.001	0.005	0.016
	(0.373)	(0.280)	(0.355)	(0.939)	(0.679)	(0.417)
GDP p.c.	-0.180	-0.180	-0.357	-0.301	-0.043	-0.045
	(0.187)	(0.171)	(0.014)	(0.016)	(0.788)	(0.807)
TRADE	-0.001	-0.001	-0.001	0.000	0.000	0.000
	(0.824)	(0.650)	(0.662)	(0.803)	(0.995)	(0.887)
Adjusted R^2	0.279		0.528		0.238	
OID (p-val.)		(0.369)		(0.147)		(0.577)
observations	20	20	19	19	18	18

	σ_i^{REC}		σ_i^{NL}		σ_i^{NLA}	
	OLS	IV	OLS	IV	OLS	IV
σ_i^{FP}	0.392	0.413	0.637	0.824	0.314	0.309
	(0.001)	(0.007)	(0.005)	(0.014)	(0.032)	(0.061)
GSIZE	-0.014	-0.015	-0.023	-0.006	-0.017	-0.014
	(0.349)	(0.457)	(0.128)	(0.785)	(0.436)	(0.501)
GDP p.c.	0.114	0.135	-0.129	-0.133	0.163	0.165
	(0.476)	(0.475)	(0.467)	(0.543)	(0.489)	(0.464)
TRADE	0.001	0.001	0.001	0.000	0.000	0.000
	(0.243)	(0.236)	(0.680)	(0.964)	(0.937)	(0.959)
Adjusted R^2	0.391		0.282		0.109	
OID (p-val.)		(0.213)		(0.420)		(0.171)
observations	18	18	18	18	18	18

Notes: Dependent variable is $\ln \sigma_i^{\Delta \ln y^*}$, where y^* is *GDP* excluding government spending (*GS*) per capita (excluding government consumption (*GC*) for the model using σ_i^{GC}). See also Table 3.

Table 1.
Correlations between the country-specific standard deviations of structural, exogenous component of alternative measures of fiscal policy

	σ_i^{GC}	σ_i^{GS}	σ_i^{EXP}	σ_i^{REC}	σ_i^{NL}	σ_i^{NLA}
σ_i^{GC}	1	0.837	0.700	0.379	0.362	0.298
σ_i^{GS}	0.837	1	0.628	0.427	0.626	0.414
σ_i^{EXP}	0.700	0.628	1	0.836	0.712	0.579
σ_i^{REC}	0.379	0.427	0.836	1	0.624	0.561
σ_i^{NL}	0.362	0.626	0.712	0.624	1	0.720
σ_i^{NLA}	0.298	0.414	0.579	0.561	0.720	1

Notes: Pairwise correlations, using the maximum number of (overlapping) observations available (see Table A1).

Table 2.
Fiscal policy and volatility of GDP per capita – Estimation results for model (3) using alternative measures of fiscal policy

	σ_i^{GC}		σ_i^{GS}		σ_i^{EXP}	
	OLS	IV	OLS	IV	OLS	IV
σ_i^{FP}	0.376	0.428	0.362	0.444	0.343	0.379
	(0.056)	(0.041)	(0.007)	(0.010)	(0.003)	(0.001)
GSIZE	-0.003	0.000	-0.011	-0.017	-0.011	0.002
	(0.819)	(0.995)	(0.054)	(0.097)	(0.406)	(0.923)
GDP p.c.	-0.186	-0.179	-0.365	-0.298	-0.100	-0.086
	(0.164)	(0.161)	(0.014)	(0.021)	(0.530)	(0.645)
TRADE	0.000	-0.001	0.000	0.000	0.000	0.000
	(0.875)	(0.765)	(0.879)	(0.828)	(0.926)	(0.890)
Adjusted R^2	0.389		0.580		0.371	
OID (p-val.)		(0.252)		(0.126)		(0.402)
observations	20	20	19	19	18	18

	σ_i^{REC}		σ_i^{NL}		σ_i^{NLA}	
	OLS	IV	OLS	IV	OLS	IV
σ_i^{FP}	0.438	0.466	0.646	0.860	0.332	0.350
	(0.000)	(0.006)	(0.008)	(0.025)	(0.044)	(0.078)
GSIZE	-0.036	-0.033	-0.048	-0.026	-0.041	-0.033
	(0.027)	(0.130)	(0.015)	(0.358)	(0.072)	(0.150)
GDP p.c.	0.081	0.104	-0.164	-0.174	0.100	0.132
	(0.602)	(0.593)	(0.375)	(0.449)	(0.668)	(0.579)
TRADE	0.002	0.002	0.001	0.000	0.000	0.000
	(0.146)	(0.175)	(0.522)	(0.950)	(0.891)	(0.996)
Adjusted R^2	0.485		0.348		0.123	
OID (p-val.)		(0.113)		(0.342)		(0.168)
observations	18	18	18	18	18	18

Notes: Dependent variable is (the natural log) of the standard deviation of GDP per capita growth ($\sigma_i^{\Delta \ln y}$). All regressions contain a constant. σ_i^{FP} is the standard deviation of the respective measure of fiscal shocks. The p-values in parentheses are based on heteroscedasticity-robust standard errors. OID reports the p-value of the heteroscedasticity-robust test of overidentifying restrictions in the instrumental variable regression (see Wooldridge, 1998).

Table 3.

Fiscal policy (measured as σ_i^{NL}) and volatility of GDP components (per capita)

	consumption		investment		exports		imports	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
σ_i^{NL}	0.911	2.022	0.687	1.344	0.312	0.433	0.396	0.853
	(0.016)	(0.036)	(0.050)	(0.066)	(0.149)	(0.222)	(0.082)	(0.050)
GSIZE	-0.032	0.009	-0.027	0.002	-0.021	-0.017	-0.039	-0.032
	(0.244)	(0.879)	(0.333)	(0.959)	(0.209)	(0.424)	(0.026)	(0.217)
GDP p.c.	-0.384	-0.308	-0.079	-0.044	-0.425	-0.417	-0.377	-0.328
	(0.157)	(0.542)	(0.698)	(0.902)	(0.073)	(0.093)	(0.002)	(0.037)
TRADE	0.003	-0.001	0.002	0.000	0.000	-0.001	-0.001	-0.002
	(0.294)	(0.829)	(0.197)	(0.973)	(0.887)	(0.718)	(0.599)	(0.243)
Adjusted R^2	0.326		0.092		0.185		0.471	
OID (p-val.)		(0.852)		(0.419)		(0.172)		(0.444)
observations	18	18	18	18	18	18	18	18

Notes: Dependent variables are the (natural logs) of the growth rate of consumption (investment, exports, imports) per capita. See also Table 2.

Table 4.

Fiscal policy (measured as σ_i^{GC}) and volatility of GDP and its components – Panel estimates for model (4)

	GDP		'private' GDP		Consumption	
	LSDV	GMM	LSDV	GMM	LSDV	GMM
σ_i^{GC}	0.263	0.412	0.272	0.435	0.156	0.327
	(0.000)	(0.001)	(0.000)	(0.000)	(0.234)	(0.010)
GSIZE	0.024	0.010	0.031	0.026	0.034	0.028
	(0.295)	(0.446)	(0.153)	(0.074)	(0.134)	(0.271)
GDP p.c.	0.269	0.069	0.234	0.067	0.341	0.069
	(0.000)	(0.136)	(0.000)	(0.142)	(0.000)	(0.354)
TRADE	-0.003	0.002	-0.002	0.002	-0.002	0.001
	(0.599)	(0.242)	(0.677)	(0.071)	(0.708)	(0.746)
Adjusted R^2	0.535		0.547		0.466	
m_1 (p-val.)		(0.005)		(0.006)		(0.003)
m_2 (p-val.)		(0.841)		(0.705)		(0.257)
Sargan (p-val.)		0.005		0.005		0.135
Observations	149	320	149	320	148	318

	investment		exports		imports	
	LSDV	GMM	LSDV	GMM	LSDV	GMM
σ_i^{GC}	0.182	0.451	0.155	0.235	0.035	0.303
	(0.124)	(0.003)	(0.098)	(0.008)	(0.626)	(0.000)
GSIZE	0.019	0.053	0.064	0.022	0.038	-0.000
	(0.122)	(0.082)	(0.000)	(0.203)	(0.000)	(0.987)
GDP p.c.	0.003	-0. 052	0.001	-0.020	0.550	-0.032
	(0.956)	(0.068)	(0.970)	(0.692)	(0.021)	(0.539)
TRADE	-0.004	0.006	0.004	-0.003	0.004	-0.001
	(0.445)	(0.049)	(0.309)	(0. 450)	(0.313)	(0.665)
Adjusted R^2	0.687		0.558		0.602	
m_1 (p-val.)		(0.013)		(0.013)		(0.003)
m_2 (p-val.)		(0.453)		(0.938)		(0.848)
Sargan (p-val.)		0.148		0.522		0.558
observations	142	298	148	318	148	318

Notes: p-values in parenthesis are bases on robust standard errors. Cross-sections dimension i = 18 countries; time dimension T_i is country-specific, ranging from 4 to 11 (depending on data availability). All models include individual- and time-specific fixed effects. GMM … one step GMM-system estimates (Blundell and Bond, 1998) using robust standard errors. m_1 (m_2) are the p-values of first (second) order serial correlation test. Sargan test (which assumes homoscedasticity) is the one-step version (p-values of Sargan test based on two-step residuals are close to one). To ensure comparability both LSDV and GMM estimates cover the same time period.

Table 5.
Fiscal policy and inflation volatility – Cross section and panel estimates of model (5)

	σ_i^{GC}		σ_i^{GS}		σ_i^{EXP}		σ_i^{REC}	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
σ_i^{FP}	1.140	1.246	1.499	1.343	0.564	0.371	0.503	0.435
	(0.247)	(0.225)	(0.190)	(0.211)	(0.014)	(0.155)	(0.118)	(0.277)
PID	0.319	0.324	0.324	0.322	0.094	0.103	0.085	0.091
	(0.058)	(0.051)	(0.048)	(0.045)	(0.000)	(0.000)	(0.016)	(0.017)
GSIZE	0.146	0.182	-0.021	-0.021	0.034	0.010	0.008	-0.018
	(0.163)	(0.131)	(0.201)	(0.192)	(0.037)	(0.739)	(0.556)	(0.487)
TRADE	-0.020	-0.022	0.179	0.193	-0.002	0.000	0.001	0.002
	(0.244)	(0.217)	(0.135)	(0.141)	(0.371)	(0.848)	(0.604)	(0.390)
σ_i^{GAP}	0.644	0.553	-1.872	-1.804	-1.222	-1.031	-0.668	-0.653
	(0.612)	(0.666)	(0.271)	(0.269)	(0.018)	(0.028)	(0.184)	(0.177)
σ_i^{NEER}	-1.724	-1.704	-0.638	-0.585	0.034	-0.001	0.016	-0.044
	(0.250)	(0.241)	(0.329)	(0.360)	(0.896)	(0.997)	(0.962)	(0.903)
σ_i^{GM}	-0.234	-0.227	1.010	1.124	0.307	0.290	0.189	0.189
	(0.612)	(0.626)	(0.549)	(0.505)	(0.020)	(0.012)	(0.119)	(0.175)
Adjusted R^2	0.464		0.514		0.874		0.810	
OID (p-val.)		(0.654)		(0.401)		(0.212)		(0.267)
observations	19	19	18	18	18	18	18	18

	σ_i^{NL}		σ_i^{NLA}		σ_i^{GC}, panel estimates	
	OLS	IV	OLS	IV	LSDV	GMM
σ_i^{FP}	0.307	0.894	0.011	0.036	-0.165	0.090
	(0.617)	(0.293)	(0.953)	(0.846)	(0.105)	(0.359)
PID	0.248	0.236	0.245	0.247	0.253	0.402
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GSIZE	0.014	0.005	0.026	0.012	0.019	0.018
	(0.729)	(0.908)	(0.293)	(0.735)	(0.324)	(0.579)
TRADE	0.003	0.002	0.004	0.004	0.002	0.002
	(0.022)	(0.098)	(0.013)	(0.033)	(0.887)	(0.780)
σ_i^{GAP}	-1.017	-1.133	-0.913	-0.983	0.401	0. 157
	(0.062)	(0.039)	(0.192)	(0.146)	(0.018)	(0.008)
σ_i^{NEER}	-0.031	-0.146	0.047	0.049	0.122	0.186
	(0.905)	(0.579)	(0.791)	(0.788)	(0.274)	(0.084)
σ_i^{GM}	0.205	0.189	0.206	0.209	-0.110	-0.026
	(0.123)	(0.114)	(0.243)	(0.222)	(0.568)	(0.774)
Adjusted R^2	0.856		0.853		0.856	
OID (p-val.)		(0.567)		(0.605)		0.026 [1)]
observations	18	18	18	18	96	179

Notes: Cross-section estimates: see also Table 2. Panel estimates: Cross-section dimension i = 13 countries; time dimension T_i is country-specific, ranging from 4 to 11. [1)] is value of the one-step variant of Sargan test (again, The p-value of the two-step variant is close to one); p-values of tests for first order and second order serial correlation tests are 0.009 and 0.365, respectively.

Table 6.
Fiscal rules introduced in OECD countries since 1990

Australia: *Charter for Budget Honesty, 1998*
Rules: No legislated numerical rules; government is required to specify targets (no constraints on their nature).
Enforcement: Annual fiscal strategy statement; assessment by external auditors. No sanctions.

Austria: *Domestic Stability Pact, 2000*
Rule: Negotiated floors on budget balance for each government level; floors apply on average, over several years.
Enforcement: Possible fines (up to a ceiling), subject to unanimous decision from all interested parties.

Belgium: *Intergovernmental treaties, 1996 to 2002*
Rule: permissible deficits for federal government, Social Security, regions and local governments.
Enforcement: Permissible deficits based on recommendations of the High Council of Finance (a wise men committee), which are published in annual reports.

Canada: *Federal Spending Control Act, 1991-1996*
Rules: Limits on programme spending (except self-financing programmes); overspending in one year permitted if offset in following two years.
Enforcement: No explicit sanctions; assessment of compliance with the Act by Auditor General.

Debt Repayment Plan 1998
Rules/Enforcement: Federal government: no legislated rules, but "balanced budget or better" policy; provinces: balanced budget legislation (with sanctions including salary cuts for cabinet members or forced elections.)

Euro area/EU countries: *Maastricht Treaty, 1992; Stability and Growth Pact, 1997*
Rules: 3 per cent of GDP ceiling on general government net borrowing; 60 per cent of gross government debt-to-GDP ratio norm; "Close to balance or surplus" target.
Enforcement: Annual stability (euro area "ins") or convergence ("outs") programme, which is subject to an opinion from the Council. Excessive deficit procedure; from peer pressures, based on policy recommendations based on the Commission's assessment to non-remunerated deposits.

Japan: *Fiscal Structural Reform Act, 1997/1998*
Rules: Reduction of fiscal deficits to 3 per cent of GDP by 2003; termination of issuance of special deficit-financing bonds by 2003; numerical reduction targets for major expenditure areas over next three years.
Enforcement: No explicit sanctions.

Norway: *Fiscal Stability Guidelines, 2001*
Rules: Structural non-oil central-government budget deficit should equal 4 per cent of the Government Petroleum Fund over the cycle; discretionary easing or tightening during the cycle is allowed.
Enforcement: Reports of the structural fiscal balances including and excluding oil revenues, complemented with annual update of long-term projections; no sanctions.

Sweden: *Fiscal budget Act, 1996*
Rules: Nominal expenditure limits for subsequent three years on 27 expenditure areas (including social security); maintain a general government surplus of 2 per cent of GDP on average over the business cycle.
Enforcement: No explicit sanctions.

Switzerland: *Budget Objective 2001, 1998*
Rule: federal deficit capped at 2 per cent of revenues or 0.25 per cent of GDP by 2001; Debt Containment Rule
Enforcement: Expenditure excess to be financed by tax increase.

UK: *Code for Fiscal Stability, 1997*
Rules: Golden rule (over the cycle the government will borrow only to invest); sustainable investment rule (net debt as a proportion of GDP must be held stable over the cycle at a prudent level; defined as 40 per cent).
Enforcement: Annual reporting cycle (Pre-Budget Report, Economic and Fiscal Strategy Report, Debt Management Report); no explicit sanctions.

USA: *Budget Enforcement Act, 1990 to 2002*
Rules: Medium-term nominal caps for discretionary spending; legislated changes to revenues or mandatory spending programmes should be budget neutral over a five-year horizon.
Enforcement: Sequestration procedures (cuts across-the-board).

Source: OECD (2002).

Table 7.
Fiscal rules and discretionary fiscal policy: evidence from selected OECD countries

	AUS	AUT	BEL	CAN	CHE	DEU	ESP	FIN
break T	1998	1997	1997	1996	1998	1997	1997	1997
σ_i^{GC}, $t < T$	1.542	0.613	0.838	1.021	0.685	1.440	0.863	0.836
σ_i^{GC}, $t \geq T$	1.137	0.511	0.514	0.746	0.901	0.863	0.266	0.802
$\Delta\sigma_i^{GC}$ in %	-26.2	-16.6	-38.7	-26.9	31.4	-40.0	-69.1	-4.2
LM (p-val.)[1)]	(0.004)	(0.181)	(0.163)	(0.000)	(0.106)	(0.012)	(0.001)	(0.520)

	FRA	GBR	ITA	JPN	NLD	NOR	SWE	USA
break T	1997	1997	1997	1998	1997	2001	1997	1990
σ_i^{GC}, $t < T$	0.432	1.185	0.961	0.697	0.725	1.805	1.203	0.825
σ_i^{GC}, $t \geq T$	0.376	1.112	0.666	0.619	0.595	1.618	1.817	0.753
$\Delta\sigma_i^{GC}$ in %	-12.9	-6.1	-30.6	-11.3	-18.0	-10.4	51.1	-8.7
LM (p-val.)	(0.006)	(0.042)	(0.006)	(0.014)	(0.319)	(0.015)	(0.002)	(0.005)

Notes: The sample periods range from 1980q1 to the last quarter of the year before T, and from Tq1 to 2002q4.
[1)] p-value of Breusch-Pagan Lagrange multiplier test for heteroscedasticity (level shift as of T), using the robust variance estimator suggested by Koenker and Basset (1982) (see also Greene, 2003, p. 224.)

Figure 1.
Fiscal policy and output volatility (1960 – 2000)

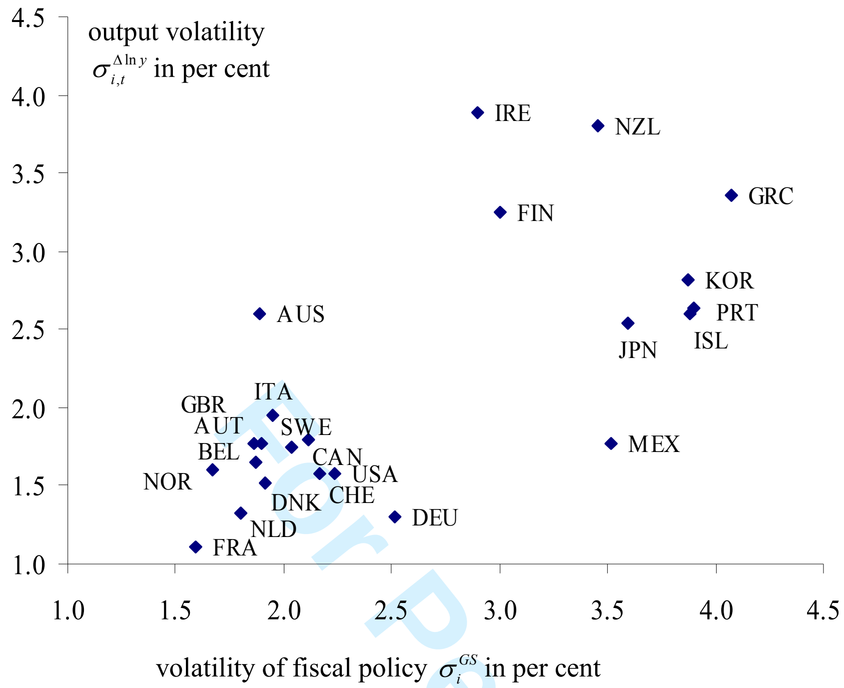

Figure 2.
Fiscal policy and output volatility before and after introduction of fiscal rules