The effect of fiscal rules on the cyclicality of fiscal policy[1]

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Introduction

The financial crisis resulted in the gradual slowdown of output growth in the majority of countries. An effort of monetary policies to boost the output and mitigate the impact of financial crisis led to decrease in interest rates. The monetary policy expansion, however, reached the restriction in the form of near zero interest rates, and thus, strengthened the role of national fiscal policies. However, fiscal policy tools are not limitless and, similarly to monetary policy, they can be bounded by available fiscal space. Therefore, plausible solutions to achieve debt sustainability, particularly fiscal rules, are being frequently discussed. The importance of fiscal policy rules can be observed through an increase of their amount in the last two decades as well as through the increasing number of theoretical and empirical studies focusing on fiscal rules.

Although the primary role of fiscal rules is to address the debt sustainability issue and budgetary discipline, the impact of fiscal rules on the cyclicality of fiscal policy is also frequently discussed. The ability of fiscal rules to improve budgetary discipline is well supported by the empirical literature. However, when it comes to the effects of fiscal rules on the ability of fiscal policy to smooth the business cycle, the empirical findings differ (Fatás et al. (2006)). On the one hand, Nerlich et al. (2015) or Alberola et al. (2016) find that the presence of fiscal rules dampens the pro-cyclical response of fiscal policy in OECD or EU countries. On the other hand, Fatás et al. (2006) argue that fiscal rules deepen pro-cyclicality of fiscal policy. Despite the fact that the impact of fiscal rules on the cyclical stance of fiscal policy is not supported by the economic theory, its practical significance is justified. Moreover, one can expect that the effects of fiscal rules on the cyclicality differ depending on the available fiscal space. We test and discuss this idea in the paper.

To assess the role that fiscal rules play in affecting fiscal cyclicality, we estimate dynamic fiscal reaction function using government expenditures as an indicator of fiscal cyclicality. This decision is based on the recommendation of Kaminsky et al. (2004) who claim that more traditional indicators, such as fiscal balance in ratio to GDP, are affected by business cycle fluctuations. Therefore, it is difficult to identify the cyclical response of fiscal policy tools which possess the information on the true fiscal stance of fiscal policy. Moreover, Fatás et al. (2006) support the use of government spending to assess the impact of fiscal rules. They argue that showing the possible impact of fiscal rules on the expenditure behavior is more challenging and policy relevant than showing the same impact on the budget which is often targeted by fiscal rules. Due to the heterogeneity in the cyclical behavior of government expenditure components (Lane, 2003), we separately analyze the cyclicality of government consumption and investment expenditures.

Methodology and model specification

In the following text we introduce dynamic panel model specification in order to evaluate the effect of fiscal rules on the cyclicality of fiscal policy. The effect of fiscal rules is analyzed by the following relationship

$$G_{i,t} = \alpha_i + \mu_t + \gamma G_{i,t-1} + \beta Y_{i,t} + \lambda (Y_{i,t} \times \mathrm{FRI}_{i,t}) + \theta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $G_{i,t}$ represents government consumption or investment expenditures expressed as a rate of growth, $Y_{i,t}$ is an indicator of economic cycle: growth rate of GDP, $X_{i,t}$ includes control variables, $\varepsilon_{i,t}$ is disturbance, μ_t are time effects and α_i are fixed effects. Variable $\mathrm{FRI}_{i,t}$ is the fiscal rule index created by the European commission.

The fiscal rule index is a comprehensive score, a summary indicator of the fiscal rules strength which is constructed for all EU countries. The index is based on the fiscal rule strength indices calculated for each fiscal rule. Those indices are based on five criteria: legal base, binding character, monitoring and enforcement bodies, correction mechanisms, and resilience to shocks. The reason to use fiscal rule index is that the fiscal rule itself is not sufficient to ensure budgetary responsibility without being implemented in legislation or with excessive flexibility in possibility to modify fiscal rule over time. The fiscal rule strength index credibly reflects trustworthiness of the commitment of the government to achieve budgetary responsibility. We expect that the positive changes in the strength of fiscal rule will force the government to re-evaluate the expenses due to changes in output.

Individual fixed effects tackle the problem of heterogeneity between countries. Common shocks, and hence the problem of cross-sectional dependence is addressed by the inclusion of time effects. In addition we include lagged dependent

1 *This article is a summary of a dissertation entitled "Fiscal rules, fiscal space, and pro-cyclical fiscal policy". The dissertation was granted second place in the NBS Governor's Award for an outstanding dissertation thesis or diploma thesis in the area of monetary economics, macroeconomics, financial economics, or financial stability.*

variable which absorbs the inertia in government consumption or investment.

To reduce omitted variable bias we estimate also the model with additional control variables. The stabilization motive of government is the reason to include debt to GDP ratio (Bohn, 1998). Golinelli et al. (2007) emphasize that the results must be interpreted with caution when debt to GDP ratio is missing. By including the inflation we expect to reduce the bias of the cyclicality parameter (Persson, 1997). Moreover, Fatás et al. (2003) argue that the inclusion of inflation ensures that the co-movement between government spending and output is not affected by monetary instability in the times of high inflation but rather by fiscal policy. Finally, terms of trade growth (ToT) should capture the effect of the external shocks on fiscal cyclicality. All three control variables are considered to be standard in related empirical studies of fiscal cyclicality (Egert, 2010; Lledo et al., 2009).

The cyclicality of fiscal policy is expressed by the coefficient β. Interpretation of the coefficient is following: if $\beta > 0$ ($\beta < 0$), then fiscal policy is pro-cyclical (counter-cyclical); fiscal policy is a-cyclical if $\beta = 0$. Interacting GDP growth with the fiscal rule index allows us to evaluate the impact of fiscal rules on the cyclical behavior of government consumption and investment expenditures. The evolution of cyclical behavior is given by two parameters

$$\frac{\delta E\left[G_{i,t} \mid G_{i,t-1}, Y_{i,t}, \mathrm{FRI}_{i,t}, X_{i,t}\right]}{\delta Y_{i,t}} = \beta + \lambda \mathrm{FRI}_{i,t} \qquad (2)$$

It implies that the cyclicality parameter is not constant but depends on the level of fiscal rule index.

To assess the asymmetrical impact of fiscal rules on the cyclicality across the regime of high and low fiscal space we extend the model specification. The extended model takes into account government debt (fiscal balance) and the fiscal rule index. Since the interaction of both variables with GDP growth is difficult to interpret, we analyze the simplified version of interaction

$$G_{i,t} = a_i + \mu_t + \gamma G_{i,t-1} + \beta Y_{i,t} + \lambda_1 (Y_{i,t} \times \mathrm{FRI}_{i,t} \times D^{l}_{i,t-1}) + \\ + \lambda_2 (Y_{i,t} \times \mathrm{FRI}_{i,t} \times D^{h}_{i,t-1}) + \theta \mathrm{FRI}_{i,t} + \varepsilon_{i,t} \qquad (3)$$

where $D^{l}_{i,t-1} = 1$ if fiscal space (represented by government debt or fiscal balance) in a country i and period t–1 is below the threshold, otherwise $D^{l}_{i,t-1} = 0$. Similarly, $D^{h}_{i,t-1} = 1$ if fiscal space in a country i and period t–1 is above the threshold. Notice that λ_1 captures the effect of fiscal rule index on the cyclicality of government spending when fiscal space is lower than threshold level. The coefficient λ_2 captures the cyclical effect of fiscal rule index when fiscal space is higher than threshold level. This specification allows to detect the asymmetrical impact of fiscal rules on the cyclicality between the regime of high and low fiscal space. The asymmetrical impact is examined for the three threshold levels of government debt to GDP ratio (30%, 60%, 100%) and the three threshold levels of fiscal balance in ratio to GDP (-4%, -2%, 0%). We analyze only government consumption expenditure[2] and exclude control variables[3].

Endogeneity problem stemming from the reversed causality is addressed by GMM estimation method with internal instruments. More specifically, both specifications are estimated by two-step system GMM estimator where lags of differenced covariates represent the instruments in the equation defined in levels. It is recommended to reduce the number of lags of endogenous variables (Roodman, 2006) to avoid the problem of proliferation due to large time dimension. Following the rule of thumb in Roodman (2006), the number of instruments cannot exceed the number of the countries. The lag restriction for the lagged dependent variable is 1-2 and 2-3 for GDP growth (similarly to Golinelli et al., 2007). It is also recommended to include year dummies which, to some extent, decrease the cross-sectional dependence of error term. The cross-sectional independence is assumed by Arellano-Bond (A-B) test of autocorrelation and is also required by the robust estimation of standard errors.

The estimation is based on two-step system GMM estimator which is robust to heteroskedasticity and autocorrelation. To address the downward bias in the estimated standard errors, we use Windmeier correction. To obtain correct GMM estimates, exogeneity of instruments is necessary. In addition to A-B test we apply Hansen test of validity of instruments which is robust to heteroskedasticity.

Data

Annual data of nominal GDP, government consumption, investment and deflator GDP for EU 28 countries are based on AMECO database. Nominal variables are deflated by GDP deflator. The remaining control variables, such as debt to GDP ratio, fiscal balance in ratio to GDP, inflation (growth rate of index of consumer prices) and growth in terms of trade, are constructed using AMECO database. In the model we use first differences of log of real government expenditure component and real GDP. Such adjustment of variables is relatively standard in the related studies of cyclicality (Lane, 2003; Lledo et al, 2009; Guerguil et al, 2017). The estimation is based on the annual unbalanced data in 1996-2015.

Results

The results for the specification (1) are presented in Table 1. Government consumption expenditure is significantly pro-cyclical in both baseline model and the model with control variables (column (1) and column (2)). The cyclicality coefficient is slightly higher when the control variables are included. The coefficient for interaction of GDP growth and the fiscal rule index is negative in both cases. However, the coefficient is statistically significant only when controlling for stabilization motive, monetary effects and external shocks.

2 *The results for government investment expenditures do not provide significant results.*

3 *Otherwise, by including control variables, we would be forced to restrict year dummies.*

Table 1 Cyclical behavior of consumption depending on fiscal rules

Dependent variable	Consumption		Investment	
Column	(1)	(2)	(3)	(4)
Dependent variable (t-1)	0.146	0.120	0.189**	0.173
	(0.167)	(0.106)	(0.076)	(0.104)
GDP growth	0.790**	0.843***	2.013**	2.125**
	(0.333)	(0.200)	(0.843)	(0.861)
GDP growth*FRI	-0.323	-0.376***	-1.024**	-1.173**
	(0.227)	(0.129)	(0.494)	(0.512)
FRI	0.759	1.052***	2.812*	3.789**
	(0.576)	(0.341)	(1.576)	(1.787)
Debt (t-1)		-0.000		0.012
		(0.008)		(0.027)
Inflation		0.065**		-0.027
		(0.026)		(0.056)
ToT growth		-0.082		0.773*
		(0.107)		(0.439)
Constant	-0.541	-1.304	-0.717	-6.498
	(0.755)	(0.884)	(3.551)	(4.303)
Number of observations	530	529	530	529
Hansen test (p-val)	0.248	0.477	0.524	0.283
A-B test for AR(2) (p-val)	0.67	0.393	0.595	0.484
Number of instruments	28	28	28	28

*Significance: *** 1%, **5%, * 10%. Standard errors in parentheses are robust against heteroskedasticity and autocorrelation. Time effects are included but the results are not shown.*

Similarly to consumption, government investment (column (3) and column (4)) is pro-cyclical component of government expenditures and is higher when controlling for other factors. As expected the level of pro-cyclicality is considerably larger compared to consumption. This result is not unusual in related empirical studies (Égert (2012), Lane (2003)). Moreover, fiscal rules seem to be a valid tool for dampening the extremely high level of pro-cyclical response of government investment.

Hansen test for overidentifying restrictions confirms the validity of instruments for both variables. In terms of the A-B test, the instruments used are valid; the test does not indicate the presence of second order autocorrelation in residuals.

From the policy perspective it may seem relevant to know the threshold level when the cyclical stance of government consumption and investment changes from pro-cyclical to counter-cyclical. Following Calderón (2004) the threshold value is

$$FRI^{*}_{i,t} = -\frac{\beta}{\lambda} \qquad (4)$$

where $FRI_{i,t}$ is the threshold value of the fiscal rule index. Depending on the observed value of fiscal rule index the expenditure component is a-cyclical, counter-cyclical or pro-cyclical ($FRI = FRI^{*}_{i,t}$, $FRI > FRI^{*}_{i,t}$, $FRI < FRI^{*}_{i,t}$).

The threshold value for government investment is 1.966 in the model without control variables and 1.812 for the model with control variables. As compared to investment, the threshold value for consumption is higher; 2.446 for the model without control variables and 2.242 for the model with control variables. Despite the fact that government investments are more pro-cyclical this expenditure component achieves threshold at the lower level of fiscal rule index.

Consider now the cyclicality effects of fiscal rules depending on the regime of fiscal space (Table 2). The results in column (1) show that government consumption remains pro-cyclical, fiscal rules, however, significantly dampen the pro-cyclical stance when the level of government debt is above 60% of a threshold level. On the other hand, the impact of fiscal rules on the cyclicality below the 60% of a threshold level is insignificant. Although the significance level of interaction term decreases when we consider threshold level of 30% debt to GDP ratio (column (2)), the previous result remain qualitatively similar. When debt to GDP ratio is 100% (column (3)) the ability of

Table 2 Cyclical behavior of consumption depending on fiscal rules and fiscal space

Dependent variable	Consumption					
Fiscal space indicator	Government debt			Fiscal balance		
Threshold	60%	30%	100%	-2%	-4%	0%
Column	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable (t-1)	0.147	0.152	0.187*	0.258	0.237*	0.213***
	(0.120)	(0.128)	(0.095)	(0.152)	(0.132)	(0.074)
GDP growth	0.949***	0.825***	0.775***	0.580	0.563**	0.603***
	(0.230)	(0.290)	(0.253)	(0.372)	(0.270)	(0.146)
GDP growth*FRI (F. space (t-1) ≤ threshold)	-0.457***	-0.368*	-0.468***	-0.386*	0.146	-0.356***
	(0.136)	(0.201)	(0.130)	(0.214)	(0.295)	(0.089)
GDP growth*FRI (F. space (t-1) > threshold)	-0.121	-0.312	-0.105	-0.032	-0.354***	0.008
	(0.226)	(0.348)	(0.254)	(0.186)	(0.125)	(0.119)
FRI	0.742	0.994**	0.548	0.617	0.744**	0.740***
	(0.439)	(0.470)	(0.511)	(0.412)	(0.295)	(0.239)
Constant	-1.221**	-1.137**	-0.947*	-0.699	-0.945**	-0.755**
	(0.473)	(0.480)	(0.494)	(0.487)	(0.458)	(0.297)
Number of observations	529	529	529	530	530	530
Hansen test (p-val)	0.277	0.339	0.333	0.292	0.557	0.589
A-B test for AR(2) (p-val)	0.417	0.354	0.278	0.492	0.557	0.403
Number of instruments	28	28	28	28	28	28

*Significance: *** 1%, **5%, * 10%. Standard errors in parentheses are robust against heteroskedasticity and autocorrelation. Time effects until 2010 are included but the results are not shown.*

fiscal rules to dampen the pro-cyclicality is even slightly higher compared to previous cases.

Consider now an alternative indicator of fiscal space: fiscal balance in ratio to GDP. When the level of fiscal deficit is below -2% or 0% (column (4) and column (6)), fiscal rule index is again effective in achieving a-cyclical or counter-cyclical reaction of government consumption expenditures. The effect of fiscal rules is insignificant above the threshold level of fiscal deficit. However, the results in column (5) (threshold level of -4%) are in contrast with previous findings; the impact of fiscal rules on the cyclical stance is insignificant below the threshold and significant above it.

Conclusion

The empirical research confirming the positive fiscal policy effects on the real output is relatively rich. Depending on the cyclical stance, fiscal policy can either dampen business cycle or further reinforce economic fluctuations. Whereas the counter-cyclical fiscal policy stance is desirable, the pro-cyclical stance is not. Hence, it seems to be relevant to search for the determinants which help in decreasing pro-cyclical behavior. One possible alternative analyzed in the paper are potent fiscal rules.

Following the recommendation of Kaminsky et al. (2004), the analysis of fiscal policy cyclicality is restricted to the analysis of cyclicality of government expenditure components, particularly government consumption and investment. We estimated dynamic panel model for EU 28 countries which included interaction variable of GDP growth and the fiscal rule index.

Although government consumption and investment are highly pro-cyclical, the presence of potent fiscal rules decreases the pro-cyclical behavior of both expenditure components. Furthermore, we quantified the values of fiscal rule index which imply the a-cyclical behavior of both components. Finally, we find that fiscal rules are particularly efficient in decreasing pro-cyclicality when fiscal space of a country is limited.

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