Acta Oeconomica,Vol. 66 (4), pp. 597–616 (2016)
DOI: 10.1556/032.2016.66.4.2

EFFECTS OF FISCAL RULES ON BUDGETARY OUTCOMES: THE CASE OF THE EUROPEAN UNION MEMBER STATES*

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(Received: 3 June 2015; revision received: 13 December 2015; accepted: 11 June 2016)

The aim of this paper is to investigate the influence of fiscal rules on the budgetary outcomes in 27 European Union countries. In particular, the paper focuses on assessing whether the impact of fiscal rules is statistically significant and numerically meaningful. In order to assess the influence, we use a dynamic panel data model. In our baseline model, we introduce the fiscal rule index as an explanatory variable. Our estimation rests on the fiscal reaction function. The analysis shows that the fiscal rule index positively affects the cyclically-adjusted primary balance and the cyclically-adjusted balance.

Keywords: dynamic panel, fiscal rule index, European Union

JEL classification indices: E62, H60, H62

1. INTRODUCTION

Recently, wider attention has been paid to aspects of fiscal policy. This special interest in fiscal policy is the result of severe economic turbulences and the need for government interventions in order to mitigate recession. Fiscal policy in the

* The author would like to thank Paweł Baranowski from the University of Lodz and the two unknown reviewers for their helpful comments and support during the preparation of this version of the article. Of course, any errors and all opinions expressed are those of the author.

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European Union (EU) is conducted at the country-specific level. Each country imposes its own numerical domestic rules in order to ensure the stability of public finances. But owing to real and potential problems with the maintenance of public finance discipline, European institutions, concerned with ensuring the proper functioning of the euro area, have imposed supranational rules. Those rules focus on maintaining fiscal discipline and conducting fiscal policy in an appropriate manner.

The aim of this paper is to determine whether numerical fiscal policy rules have a real impact. Our aim is to determine whether the influence of numerical fiscal constraints is statistically significant.

The main idea of this paper is to check the influence of fiscal rules on general government indicators. In order to do this, we employ a dynamic panel data model with the fiscal rule index as an explanatory variable. Next, we construct some regressions and try to determine the extent of the influence of this index on selected fiscal policy variables. Our approach is based on the fiscal reaction function. We work with 27 EU countries.

This paper is organised as follows. Section 2 surveys the literature. It especially emphasises the role of selected fiscal rules in assessment of the cyclicality of fiscal policy. Section 3 describes the data, methodology, and provides estimation outcomes and robustness check results. Section 4 provides conclusions.

2. FISCAL RULES AND THEIR INFLUENCE ON BUDGETARY OUTCOMES – LITERATURE REVIEW

A common definition of fiscal policy rules emphasises their permanent constraint on fiscal aggregates through simple numerical limits (Kopits – Symansky 1998). Fiscal rules are statutory or constitutional restrictions on fiscal policy, which ensure a specific limit on fiscal indicators such as the budgetary balance, government debt, government spending, or revenues (Kennedy et al. 2001). In this sense, fiscal rules are guidelines for maintaining fiscal discipline. Rules may be treated as permanent components of budgetary institutions (Alesina – Perotti 1999). Fiscal constraints constitute important institutional aspects; therefore, they may create a framework for conducting fiscal policy and for controlling public finance in a broader sense. Because fiscal rules are a certain institutional mechanism, they support fiscal discipline and credibility (IMF 2009).

The construction of fiscal rules should allow for maintaining stability in public finances. As Balassone – Franco (2001) emphasise, fiscal rules create certain margins for budgetary flexibility in "bad times". The main reasons for implementing fiscal rules are to ensure macroeconomic stability, take actions to reduce ex-

cessive deficit, enhance fiscal policy credibility, minimise negative externalities within international arrangements, and ensure fiscal sustainability (Kennedy et al. 2001). The IMF report (2009) presents three main objectives of fiscal rules (debt sustainability, government size, and economic stabilisation) and tries to assess the effectiveness and correlation of selected fiscal rules with specified goals.

Based on US data, Poterba (1994) argues that fiscal institutions and political factors play an important role in creating short-run deficit dynamics. Generally, the stronger the rules, the larger the government surplus or the lower the deficit (Bayoumi – Eichengreen 1995; Alesina – Bayoumi 1996). According to Fatas – Mihov's evidence (2006), fiscal policy in the US is a source of business cycle volatility, thus restricting fiscal policy leads to improvement in macroeconomic stability. Favero – Monacelli (2005) estimate regime-switching fiscal rules on the basis of the Markov-switching regression. According to them, the fiscal policy regime in the US can be described in terms of systematic rules and they empirically identify two fiscal regimes in the US. What's more, these authors emphasise that regime switches, in both fiscal and monetary policy, do not display any degree of synchronisation. The studies by Eichengreen – Bayoumi (1994) and Hallerberg – Wolff (2008) show the impact of the fiscal institutional framework on government bond yields.

Gali – Perotti (2003) conclude that discretionary fiscal policy in EMU has become more counter-cyclical over time. The analysis of the rules' implementation (the Stability and Growth Pact and the Maastricht Treaty) does not support the view that fiscal rules in EMU countries stabilise fiscal policy more than in non-EMU countries. However, fiscal arrangements contributed to more disciplined public finances. Buti et al. (2003) analyse the properties of the Stability and Growth Pact in the context of European fiscal rules. The fundamentals of designing supranational fiscal rules in the EU and the theoretical context of fiscal constraint requirements are presented in Buti – van den Noord (2004). However, euro area membership can generate external effects (moral hazard and free riding problems) due to a lack of discipline in public finances, resulting in high deficits (see de Grauwe 2000; Buti – Franco 2005 for details). What's more, countries may exhibit internal fiscal rule avoidance, which leads to creative accounting and problems with budgetary discipline. For example, a brief history of the development of the Greek fiscal crisis is presented by Kaplanoglou – Rapanos (2011), who emphasise the weak institutional framework as the main source of the country's turbulences. Thus, appropriate fiscal institutions are one of the most important aspects determining the effectiveness of fiscal rules (Wyplosz 2012).

Turrini (2008) analyses the behaviour of fiscal policy in 10 euro zone countries by using separate fiscal reaction functions. He points out that fiscal policy generates a pro-cyclical bias in good times, which is shaped by the expenditure side

of the budget. Thus, expenditure rules are perceived as a tool that prevents the escalation of the expenditure side of the budget. Deroose et al. (2006) find a statistically significant influence of the expenditure rule index on expenditure outcomes. Wierts (2008a) tries to assess the position of national expenditure rules in reducing expenditure bias, based on the example of 15 European Union countries during 1998–2005. According to his study, a higher institutional strength of expenditure rules leads to more neutral responses of revenue shocks. Holm-Hadulla et al. (2010) focus on the effects of expenditure rules on government spending behaviours. Their analysis (European Union countries during years 2002–2008) shows a pro-cyclical nature of government expenditures in reaction to unexpected changes in the output gap. Their research shows that spending with a high level of budgetary flexibility generates a higher pro-cyclical bias. It should be noted that expenditure rules generate maximal counter-cyclicality, when the target is expressed in nominal terms, but when the target is defined as a GDP ratio, it may entail a pro-cyclical bias (Ayuso-i-Casals 2012).

Bohn – Inman (1996) state that balanced budget rules increase the average budget balance, i.e. they reduce the propensity to generate deficit. Inman (1996) draws attention to the effectiveness and adequate construction of the balanced budget rule. Generally, fiscal rules (in the form of European arrangements) lead to an increase in the cyclically-adjusted primary balance and support fiscal discipline (Debrun et al. 2008; Afonso – Hauptmeier 2009). In other words, fiscal rules improve the discretionary position of fiscal policy due to numerical constraints and increase in structural surplus.

It should be mentioned that fiscal rules also face criticism. Rules may encourage pro-cyclical fiscal policy or may encourage creative accounting, which reduces the overall transparency of the budget (Debrun et al. 2008). However, the existence of fiscal rules and their combination with an appropriate monetary policy ensure macroeconomic stabilisation. As Combes et al. (2014) emphasise, the combination of inflation targeting (with monetary policy rule) and fiscal rules seems to provide more disciplined macroeconomic policies than each of these institutions operating separately. Both institutions have a positive impact on fiscal performance and inflation. The effect of these two rule-based policies is an improvement in macroeconomic outcomes.

The recent debate has focused on optimal fiscal rules. The features of an ideal fiscal rule are specified by Inman (1996), Kopits – Symansky (1998), Kopits (2001), Kell (2001), Wyplosz (2002), Buiter (2003), Buiter – Grafe (2004), Emmerson et al. (2004), and Birashi (2008), who focus mainly on the "ideal" institutional aspects of fiscal rules. The problem of the optimal fiscal rule and its optimal combination with monetary policy rule is emphasised by Schmitt-Grohe – Uribe (2004, 2007). The latter study focuses on optimal and simple feedback rules,

which are determined by maximising a second-order welfare approximation of the analysed model. The assessment of the optimal fiscal policy rule in EMU, in the context of a microfounded New Keynesian model, is discussed by Kirsanova et al. (2007). According to this study, the gains from fiscal stabilisation are very significant in a monetary union. Their paper emphasises the meaning of fiscal restrictions for better managing the euro area. However, as Mihályi (2011) points out, the difficulties in hardening the soft budget constraint mechanism exist in the euro zone and the appropriate reforms of the governance system are weakened.

The causality between fiscal rules and fiscal outcomes is a separate issue. According to OECD (2013), this relationship has been weak, especially after 2008, i.e. during the crisis and in post-crisis times. On the other hand, it is possible to observe a reverse causality – where performance determines rules – when countries with a potential high impact of fiscal institutions on policy reveal their strong preferences by adopting strengthened institutions (IMF 2013). Debrun – Kumar (2007) argue that reverse causality may bias the quantitative analysis of the impact of institutions on outcomes because fiscal institutions may be time-inconsistent and perform in the following way: "from good outcomes to good institutions". The authors confirmed the evidence of an endogeneity bias in analysing the causality of rules on fiscal outcomes.

3. DATA DESCRIPTION AND ECONOMETRIC ESTIMATION

3.1. Data description

Our sample consists of annual data and covers the period from 2000 to 2012 for 27 European Union member states. Croatia was omitted due the lack of a complete data set. The fiscal data were derived from the AMECO database and Eurostat. General consolidated gross debt is presented as a GDP ratio. The cyclically-adjusted primary balance (CAPB) and cyclically-adjusted balance (CAB) are presented as a percentage of trend GDP. The output gap was computed on the basis of HP filter and by using the Eurostat data (real GDP, reference year 2005).

Data related to the fiscal rule index came from the official database of the European Commission. The fiscal rule index (henceforth FRI) is a standardised and time-varying measure constructed and calculated by the European Commission itself. This measure is based on information collected in a special survey filled in by member states. The questionnaire deals with the definition of each implemented rule, its description, and coverage. The FRI is calculated on the basis of the so-called fiscal rule strength index (FRSI), which takes into account

Table 1. Descriptive statistics

	Mean	Max.	Min.	Std. Dev.	Obser.
CAB (cyclically-adjusted balance)	–3.03	5.82	–28.27	3.75	351
CAPB (cyclically-adjusted primary balance)	–0.60	9.20	–25.13	3.62	351
DEBT (public debt)	52.41	170.31	3.69	29.83	351
FRI (fiscal rule index)	0.44	3.26	–1.01	0.99	351
GAP (output gap)	0.06	10.01	–11.68	3.75	351

Source: Author's own calculation.

five criteria: the statutory/legal basis of the rule, the mechanisms for monitoring the rule's compliance and enforcement, the room for revising objectives, the existence of pre-defined enforcement mechanism, and the media visibility of the rule.[1] *Table 1* presents selected descriptive statistics of our dataset.

3.2. Methodology

In order to assess the effects of fiscal rules on the behaviour of fiscal variables, we employ an approach based on the fiscal reaction function (Bohn 1998). Our aim is to check whether the parameters related to the fiscal rule index have a statistically significant influence on the dependent variables included in estimated equations. We use panel data due to the short sample of our countries.

Our work was inspired by the European Commission's (2009, 2006) study extending the fiscal reaction function by the presence of the index for fiscal rules. The European Commission approach (2009) was to estimate the model by using fixed effects. In contrast, Holm-Hadulla et al. (2010) used a two-stage least squares estimation including country- and time-fixed effects. Afonso – Guimarães (2014) also estimated the fiscal reaction function by using the fixed effects OLS regressions and the 2SLS estimator. On the other hand, Golinelli – Momigliano (2008) extended the standard equation of the fiscal reaction function by the presence of the so-called CAPB/PB model. Wierts (2008b) included a review of estimates of the fiscal reaction function for individual countries and group of countries (panel data). He concluded that according to the studies of Judson – Owen (1999) and Galí – Perotti (2003), it is possible to estimate the fiscal reaction function with least squares dummy variables that perform just as well as the other available estimators, including GMM estimation.

[1] Detailed information about the construction of the European fiscal rule index is presented, e.g., in European Commission (2006), Ayuso-i-Casals et al. (2007).

Indeed, we derived our equation from the European Commission (2009). However, we decided to use one of the methods of dynamic panel data estimation because in our estimated equation, we have a lagged dependent variable. Because the proposed equation of the fiscal reaction function is a dynamic equation, the standard fixed effects estimator is biased and inconsistent.[2] Thus, even if it is possible to use the least squares dummy variable estimator as suggested by Judson – Owen (1999), in order to deal with this bias, we use GMM estimation in our baseline specification. Our baseline approach is to use the system-GMM instead of the first-differenced GMM by Arellano – Bond (1991) because our datasets include a small range of periods and, what is more, the number of panels is higher than the number of periods (i.e. 27 countries and only 13 years). The estimator includes extra lagged differenced variables as instruments in the level equations, thus it may generate substantial efficiency gains when the time sample (length) is relatively short. The system estimator was developed by Blundell – Bond (1998) who, based on the work of Arellano – Bover (1995), introduced additional moment conditions. This estimator improves the precision in relation to the differenced GMM by Arellano – Bond (1991), but also reduces the finite sample bias (see Blundell et al. 2000). We decided to employ the system-GMM estimator for our baseline estimations; however, the alternative dynamic panel data estimators and other panel data estimators are used for robustness check.

In our model, we decide to employ the system two-step GMM estimator rather than the one-step estimator. Our approach is based on Windmeijer's (2005) inferences, whose correction procedure of the system two-step GMM estimator generates an increase in precision in comparison to both the system one-step GMM estimator and the two-step first-differenced GMM estimator by Arellano – Bond (1991).

The general dynamic panel data equation of our model is as follows:

$$y_{i,t} = \alpha_0 + \alpha_1 + \gamma_1 y_{i,t-1} + \beta_1 FRI_{i,t} + \beta_2 GAP_{i,t-1} + \beta_3 DEBT_{i,t-1} + \beta_4 x_{i,t} + \xi_{i,t}$$

where:
$y_{i,t}$ is the dependent fiscal variable in country i in time t,
$FRI_{i,t}$ is the fiscal rule index in country i in time t,
$GAP_{i,t-1}$ is the lagged output gap (percentage of trend GDP) in country i in time $t–1$,
$DEBT_{i,t-1}$ is the lagged debt (in relation to nominal GDP) in country i in time $t–1$,

[2] According to the observations of, e.g., Nickell (1981), the OLS estimates of the lagged dependent variable's coefficient in a dynamic panel model are biased due to the correlation between the fixed effects and the lagged dependent variable.

$x_{i,t}$ is the set of other control variables in country i in time t,
α_1 is the country-specific fixed effects,
$\gamma_1, \beta_1, \beta_2, \beta_3, \beta_4$ are the parameters of the model, and
$\xi_{i,t}$ is the error term.

We extend the European Commission's approach by including the additional set of variables and changing the method of estimation. As a result, we built a baseline equation that shows the response of the cyclically-adjusted primary balance (CAPB) to (i) the lagged dependent variable, (ii) the fiscal rule index, i.e. the level of fiscal constraints, (iii) the lagged debt, (iv) the cyclical fluctuations presented by the size of the lagged output gap, (v) the impact of elections (dummy variable), and (vi) the dummy variable for Ireland in 2010.

We concentrate on the cyclically-adjusted primary balance because our intention is to check the influence of the FRI on strict fiscal policy discretionary measures. In our baseline estimation, we would like to avoid the analysis of the influence of rules on the cyclical components of the budget balance, which are generated by automatic stabilisers. Our special interest is the β_1 parameter, which investigates the impact of the fiscal rule index on the dependent variable in the current period.[3]

We decided to use the lagged output gap ($GAP_{i,t-1}$) instead of the current output gap ($GAP_{i,t}$) because we incorporate the fact that it takes some time for fiscal policy to react to changes in economic activity. So, in our opinion, the lagged output gap has a wider influence on the behaviour of fiscal variables than the current development of economic activity.

In our model, we include a special dummy variable, ir_{2010}, which describes the large outlier in our dataset for Ireland in 2010. In 2010, the situation in public finances was the worst in Ireland in the European Union (i.e. the deficit was higher than 30% of GDP and the ratio of CAPB to GDP was about 25.1%).

In our analysis, we include the impact of parliamentary elections ELE_p (i.e. elections for parliamentary chambers) on structural balance (we omit presidential elections, senate elections, or referendums). This dummy variable equals 1 in the election year and 0 otherwise. The information covering the dates of the chamber elections comes from the Inter-Parliamentary Union database.

[3] We use the F-test for investigating whether the coefficients are the same (specification based on panel IV fixed effects approach); in fact, we test the existence of a homogenous panel. We reject null in both cases and investigate the need for introducing individual effects (units). This means that an individual effect obtains its own intercept, while the slope coefficients are the same (results not reported here).

3.3. Results for the baseline model

In our baseline equation, which includes the entire sample, the estimated parameter measuring the influence of the FRI on the CAPB is consistent with our intuition, but is not statistically significant. The initial results are included in column I of *Table 2*. The influence of the numerical fiscal rule index on the CAPB is positive, which means that an increase in the value of the FRI results in an increase in the cyclically-adjusted primary balance. Generally, an increase in the FRI results in the improvement of a country's budgetary balance, and increases the structural surplus. The model shows the negative impact of the output gap on the CAPB. Also, the dummy variable for Ireland is found to be significant for our estimation. The analysis of the dataset suggests that, probably, our outcome is an effect of the range of the sample and problems with proper estimation. Thus, we decided to change the range of the sample and re-estimate our model.

Our results are quite similar to the estimations prepared by the European Commission (2009), which uses the OLS with time- and country-fixed effects (heteroscedasticity robust and adjusted for clusters standard errors). The European Commission (2009) dataset for 27 EU countries during 1990–2008 estimates the parameter measuring the influence of the FRI on the CAPB as 0.48 (note, that in our study we were not able to find a statistically significant impact of the FRI on the CAPB for the whole sample).

Before 2004, 12 of the analysed countries were outside the European Union. Ten countries acceded in 2004 and two in 2007. In order to check whether the enlargement in 2004 had an influence on fiscal policy in the European Union as a whole, we shorten our sample. The results are presented in column II of *Table 2*. The estimated average influence of the FRI on the CAPB is quantitatively larger. After 2004, the analysed countries paid greater attention to maintaining the fiscal constraints guaranteed by the Maastricht Treaty and the Stability and Growth Pact. During the years 2004–2012, an increase in the FRI by one unit results in the improvement of the CAPB to GDP ratio by an average of 0.73 percentage points. Our goal was also to compute the influence of the crisis on the performance of the FRI. Unfortunately, we were not able to get satisfactory and correct estimations, probably due to the short sample of our dataset and problems with the Sargan test (results not reported here).

In columns III–V of *Table 2,* we present the results for the cyclically-adjusted balance (CAB) as a dependent variable. Intrigued by the relatively low impact of the FRI on the CAPB, we decided to compare those results with outcomes from the dynamic panel data, with the CAB as a dependent variable. This variant of the analyses of the influence of the FRI is larger than in the previous approach (compare the results in columns I–II and III–V). Since 2004, an increase of FRI by one

Table 2. Baseline estimates of the fiscal reaction function for CAPB and CAB

	CAPB		CAB		
	I	II	III	IV	V
const.	–2.547*** (0.647)	–2.927*** (0.747)	–2.682*** (0.763)	–3.146*** (0.712)	–3.585*** (1.129)
$dep.var_{i,t-1}$	0.609*** (0.110)	0.570*** (0.137)	0.541*** (0.084)	0.560*** (0.120)	0.555*** (0.154)
$FRI_{i,t}$	0.429 (0.375)	0.729* (0.424)	0.719*** (0.271)	0.894*** (0.324)	1.014** (0.499)
$GAP_{i,t-1}$	–0.173*** (0.056)	–0.162* (0.087)	–0.184*** (0.057)	–0.179** (0.079)	–0.148** (0.068)
$DEBT_{i,t-1}$	0.043*** (0.011)	0.045*** (0.015)	0.025** (0.012)	0.030** (0.012)	0.032** (0.0144)
ir_{2010}	–22.574*** (5.034)	–20.139*** (0.861)	–26.881*** (5.988)	–21.521*** (1.540)	–21.673*** (1.996)
ELE_p	–0.565* (0.342)	–0.645** (0.325)	–0.560** (0.239)	–0.567 (0.347)	–0.530 (0.326)
countries (no.)	27				
observations	350	243	350	243	162
period	2000–2012	2004–2012	2000–2012	2004–2012	2007–2012
Sargan test statistic	24.791	22.432	20.364	19.939	15.478
p-value	0.474	0.169	0.728	0.277	0.162
AR_1*-statsistic*	–2.980	–2.515	–3.112	–2.624	–2.045
p-value	0.003	0.012	0.002	0.009	0.041
AR_2*-statistic*	–0.252	–0.716	–0.416	–0.864	–0.932
p-value	0.801	0.474	0.678	0.387	0.351
instruments (no.)	32	24	32	24	18

Note: The robust standard error values are presented in parentheses. AR_1 and AR_2 denote the values of the statistic for the Arellano-Bond test for serial correlation. The Sargan statistic denotes the value of the Sargan test of over-identifying conditions, which value is computed using GMM-type of standard error. Signs *, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.
Source: Author's own calculation.

unit has resulted in an average increase of the cyclically-adjusted balance to GDP ratio by 0.89 percentage points. We find a positive and statistically significant impact of the FRI on the CAB since 2007. According to our results, the increase of FRI by one unit has resulted in the average increase of the CAB by 1.01 percentage points. It means that during the crisis, fiscal constraints played an important role in public finances. Unfortunately, we are not able to find the similar relation for the CAPB. Our results show that the impact of the FRI is numerically more meaningful when the dependent variable is the CAB rather than the CAPB.

The impact of the dummy variable for Ireland on our average outcomes is significant and relatively large. Because of the situation in Ireland in 2010, the average structural balance in that country was lower by more than 20 percentage points in comparison to the other periods and countries. We observe the statistically significant impact of parliamentary elections on the CAPB. For example, during years 2000–2012, the impact of this type of elections reduced the cyclically-adjusted primary balance by 0.565 percentage points on average in comparison to the years without this type of elections. When we shorten the sample, the impact is larger. In accordance with our outcomes, the impact of parliamentary elections on the cyclically-adjusted balance is statistically significant only over the 2000–2012 period. When we shorten the sample, we are not able to receive the statistically significant reaction.

Our estimates suggest a negative and statistically significant impact of the lagged output gap on both the cyclically-adjusted primary balance and cyclically-adjusted balance. Thus, the outcomes highlight the pro-cyclical behaviour of fiscal policy, on average, in 27 EU states. However, the presence of strong fiscal constraints, both national and supranational, enforces the discipline in public finance. But, the negative impact of the output gap on structural balance is decreased when we shortened the sample. Probably, it is the effect of the better performance of the automatic stabilisers in the EU. On the other hand, the average impact of lagged debt on structural surplus is positive, but very low.

3.4. Extensions and robustness checks

Now we extend our analysis with a set of variables and use different methods of estimation to check for robustness. We employ additional variables and use extra lags of variables included in the baseline specification for the fiscal reaction function. The examples of model estimations are presented in *Tables 3* and *4*.

Table 3 presents the results for our baseline model obtained by employing alternative methods of estimation. Our finding is that the impact of the FRI on the CAPB is not statistically significant for the full sample (2000–2012) in different methods of estimation. In our analysis, we use alternative estimators for robustness check, including the pooled OLS, LSDV (country fixed-effects) with robust standard errors, IV estimator (2SLS estimation in which the lagged output gap variable is instrumented using its own lag and exogenous variables), the GMM estimator (two-step Arellano-Bond's dynamic panel estimator), and bias corrected fixed effects estimator. These estimators are often used in similar studies for robustness checks (e.g. Judson – Owen 1999 and Afonso – Guimarães 2014). The impact of the FRI on the CAB is robust for the whole sample and all analysed

Table 3. Results for robustness checks

	Arellano-Bond two-step estimator	*Arellano-Bond two-step estimator*	*IV – 2SLS*	*IV – 2SLS*	*Pooled OLS*	*Pooled OLS*	*LSDV with robust errors*	*LSDV with robust errors*	Bias-corrected LSDV	Bias-corrected LSDV
	CAPB	***CAB***	***CAPB***	***CAB***	***CAPB***	***CAB***	***CAPB***	***CAB***	***CAPB***	***CAB***
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*
const.					–0.743*** (0.229)	–0.791*** (0.228)	–2.755*** (0.503)	–2.861*** (0.442)		
$dep.var_{i,t-1}$	*0.327*** (0.075)*	*0.356*** (0.074)*	*0.630*** (0.060)*	*0.622*** (0 .062)*	*0.693*** (0.028)*	*0.716*** (0.029)*	*0.648*** (0.052)*	*0.641*** (0.057)*	*0.714*** (0.042)*	*0.708*** (0.043)*
$FRI_{i,t}$	0.403 (0.407)	0.482** (0.230)	0.336 (0.270)	0.427* (0.248)	0.306*** (0.105)	0.347*** (0.106)	0.327 (0.296)	*0.412** (0.286)*	*0.340 (0.235)*	*0.417* (0.229)*
$GAP_{i,t-1}$	*–0.054 (0.071)*	*–0.097** (0.045)*	*–0.210*** (0.035)*	*–0.224*** (0.049)*	*–0.195*** (0.027)*	*–0.208*** (0.027)*	*–0.161*** (0.034)*	*–0.178*** (0.034)*	*–0.154*** (0.031)*	*–0.168*** (0.030)*
$DEBT_{i,t-1}$	0.115 (0.032)	0.061*** (0.015)	0.042*** (0.012)	0.027** (0.011)	0.011*** (0.004)	*0.000 (0.004)*	*0.050 *** (0.010)*	*0.035*** (0.010)*	*0.501*** (0.010)*	*0.038*** (0.010)*
ir_{2010}	*–18.105*** (0.673)*	*–19.343*** (0.969)*	*–20.460*** (1.065)*	*–21.478*** (1.095)*	*–18.451*** (1.863)*	*–19.110*** (1.841)*	*–20.252*** (0.231)*	*–21.279*** (0.481)*	*–20.256*** (1.889)*	*–21.318*** (1.836)*
ELE_p	*–0.515** (0.258)*	*–0.450*** (0.164)*	*–0.640*** (0.216)*	–0.633*** (0.210)	–0.688*** (0.224)	–0.675*** (0.221)	–0.626** (0.231)	–0.619** (0.223)	–0.633*** (0.224)	–0.627*** (0.217)
No. of observations	349	349	348	348	350	350	350	350	350	350
Sargan test statistic	21.611	11.533								
p-value	0.042	0.484								
AR_1-statsistic	–2.478	–2.558								
p-value	0.013	0.011								
AR_2-statistic	0.305	0.157								

Table 3 continued

	Arellano-Bond two-step estimator	*Arellano-Bond two-step estimator*	*IV – 2SLS*	*IV – 2SLS*	*Pooled OLS*	*Pooled OLS*	*LSDV with robust errors*	*LSDV with robust errors*	Bias-corrected LSDV	Bias-corrected LSDV
	CAPB	***CAB***	***CAPB***	***CAB***	***CAPB***	***CAB***	***CAPB***	***CAB***	***CAPB***	***CAB***
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*
p-value	0.760	0.875								
instruments (no.)	18	18								
Hansen J-statistic (probability)			0.010 (0.919)	0.528 (0.467)						
Breusch-Pagan test (probability)							1.25 (0.263)	2.47 (0.116)		
Hausman test chi2 value (probability)							52.34 (0.000)	59.94 (0.000)		
R-squared			0.6840	0.6728	0.7481	0.7692	0.6607	0.6797		
Type of error	robust	robust	robust	robust	standard	standard	robust	robust	boot-strapped	boot-strapped

Note: The robust standard error values are presented in parentheses. AR_1 and AR_2 denote values of the statistic for the Arellano–Bond test for serial correlation. The Sargan statistic denotes the value of the Sargan test of over-identifying conditions, which value is computed using GMM-type of standard error. Bias corrected LSDV estimator – Bias correction initialised by Arellano–Bond estimator with 100 repetitions. Signs *, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

Source: Author's own calculation.

alternative estimators (we are able to observe a statistically significant relationship). Moreover, the impact of the lagged output gap and lagged debt variable on the CAPB is not statistically significant in the Arellano-Bond estimator.

Next, we extended the study and introduced additional dummy variables to broaden our analysis. We checked other specifications as robustness checks. To simplify our analysis, we used the baseline two-step system-GMM estimator in all cases, except for the subsample (2004–2012) and provided estimates for the CAPB as a dependent variable.

We employed additional dummy variable data called ELEp to express the impact of all types of elections (both early elections, and "normal" elections covering parliamentary elections, presidential elections, referendums, and elections to the European Parliament).[4] The new variable (ELE) has a larger range than the previous variable (ELEp). According to our results, when we replace the ELEp dummy variable with a new variable measuring the impact of all types of elections (ELE), the influence of this dummy on the CAPB proved statistically insignificant. In specification with the ELEp dummy variable, the impact of the FRI on the CAPB is also statistically insignificant.

In our baseline specification, Ireland proved to be an outlier due to the effect of the bank bailout. Therefore, we tried to examine the impact of another country's bailout examples on its public finance. During the analysed period, bank bailouts occurred in a few European countries. The scale of the bailouts should have had an impact on public finance. Therefore, we included additional dummy variables for implementing selected large-scale bailouts: Greece (gr_{b_o} – a dummy variable for 2010 and 2012), Portugal po_{b_o} – dummy variable for 2011), and Spain (es_{b_o} – dummy variable for 2012).[5] Surprisingly, the impact of the dummy variables for bailout years in Portugal turned out positive.

It should be noted that in 2010, the situation in public finances in most EU countries was difficult, thus we included the dummy variable $year_{2010}$ to reflect this specific year. According to our results, in 2010, in comparison to other observations in our time window, the CAPB in analysed countries was lower on average by 2.18 percentage points.

We also tried to examine the effect of money markets on public finance. Thus, we included additional variables in order to check the impact of the money market on public finance: $rstir_{i,t}$, short term real interest rate, and $rltir_{i,t}$, long term real interest rate. These variables had a positive impact on the CAPB, but in many cases, the impact was not statistically significant (most estimations are not presented in this paper).

[4] Data for elections in European countries were derived from the European Election Database.

[5] Data on the times of bailouts were derived from the information published on the IMF website.

Table 4. Robustness checks for baseline system-GMM estimator

	CAPB	CAPB	CAPB	CAPB	CAPB	CAPB	CAPB
	I	II	III	IV	V	VI	VII
const.	–2.061*** (0.705)	–2.689*** (0.618)	–2.920*** (0.792)	–2.866*** (0.735)	–2.881*** (0.720)	–3.040*** (0.835)	–2.247 (0.653)
$dep.vat_{i,t-1}$	0.491*** (0.124)	0.502*** (0.122)	0.507*** (0.132)	0.562*** (0.132)	0.564*** (0.126)	0.578*** (0.152)	0.453*** (0.073)
$FRI_{i,t}$	0.764** (0.376)	0.771** (0.383)	0.703 (0.561)	0.621 (0.463)	0.754* (0.455)	0.696 (0.436)	
$FRI_{i,t-1}$			0.359 (0.661)				0.696* (0.392)
$FRI_{i,t-2}$			0.045 (0.237)				
$GAP_{i,t}$	–0.098 (0.060)						
$GAP_{i,t-1}$	–0.093 (0.070)	–0.145* (0.081)	–0.159** (0.077)	–0.140* (0.084)	–0.174** (0.078)	–0.158* (0.089)	–0.266*** (0.077)
$GAP_{i,t-2}$	–0.149** (0.068)	–0.102 (0.080)	–0.091 (0.086)				
$DEBT_{i,t-1}$	0.028** (0.012)	0.039*** (0.013)	0.038** (0.016)	0.047*** (0.015)	0.044*** (0.015)	0.048*** (0.016)	0.034** (0.014)
ir_{2010}	–19.171*** (0.631)	–19.393*** (0.792)	–19.751*** (1.137)	–20.198*** (0.879)	–20.184*** (0.900)	–20.311*** (1.080)	
po_{b_o}						8.257*** (1.245)	
gr_{b_o}						–0.241 (2.000)	
es_{b_o}						–1.101 (1.219)	
ELE_{p}	–0.523* (0.313)	–0.609* (0.325)	–0.532 (0.359)		–0.644* (0.337)	–0.710** (0.349)	
ELE				–0.479 (0.317)			–0.498* (0.246)
$rltir_{i,t}$							
$rstir_{i,t}$					0.072** (0.031)		0.062 (0.038)
$year_{2010}$							–2.184 (0.662)
observations	243	243	243	243	243	243	243
period	2004–2012	2004–2012	2004–2012	2004–2012	2004–2012	2004–2012	2004–2012
Sargan test statistic	22.984	22.229	22.527	22.346	22.355	23.386	21.087
p-value	0.150	0.176	0.165	0.172	0.172	0.137	0.222
AR_1*-statsistic*	–2.335	–2.434	–2.356	–2.514	–2.554	–2.490	–2.129
p-value	0.020	0.015	0.019	0.012	0.011	0.013	0.033

Table 4. continued

	CAPB I	CAPB II	CAPB III	CAPB IV	CAPB V	CAPB VI	CAPB VII
AR_2-*statistic*	–1.162	–0.944	–0.895	–0.443	–0.655	–0.246	0.104
p-value	0.245	0.345	0.371	0.658	0.512	0.806	0.917
instruments (no.)	26	25	27	24	25	27	25

Note: The robust standard error values are presented in parentheses. AR_1 and AR_2 denote the values of the statistic for the Arellano-Bond test for serial correlation. The Sargan statistic denotes the value of the Sargan test of over-identifying conditions, which value is computed using GMM-type of standard error. Signs *, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

Source: Author's own calculation.

Moreover, to show the impact of the business cycle fluctuation on public finance, we introduced additional lags in the output gap. In *Table 4,* we include the additional lags in the output gap to evaluate their impact on the CAPB. This approach demonstrated the impact of lags in fiscal policy in reaction to the business cycle. The results of the estimations show that when we include additional lags, the impact of the output gap on the CAPB is not becoming important; moreover, using more lags in one specification is not adequate due to their statistically insignificant impact on the CAPB.

In our equation, we employed lags in the FRI. This approach may be treated as an evaluation of the impact of multiyear fiscal frameworks on public finances. In many countries, fiscal rules are implemented in a budgetary process by using a top-down approach and the multiyear plans include about 3 years ahead. According to our results, the employed method of estimation shows the lack of a statistically significant impact of the lagged FRI on the CAPB.

4. CONCLUSIONS

We investigated the average influence of the fiscal rule index on fiscal variables over the 2000–2012 period in 27 EU countries. We checked the influence of fiscal constraints in sub-periods which include (i) the entire sample (2000–2012), (ii) the period after the first enlargement (2004–2012), and (iii) the period since the second enlargement (2007–2012), including the time of the crisis.

This paper is based on the European Commission (2006, 2009) approach, but it is extended with a few elements. We used dynamic panel data, included the crisis period in our analysis, divided the whole sample into sub-periods, implemented a special dummy variable for the parliamentary elections, and employed a dummy

variable for Ireland in 2010. We also compared the results obtained for the cyclically-adjusted primary balance (CAPB) as a dependent variable, with the results for the cyclically-adjusted balance (CAB) as the dependent variable.

We did not find a statistically significant influence of the FRI on the CAPB. However, the impact denotes the positive influence of fiscal constraints on the structural surplus. Thus, we decided to change the ranges of our samples. After this, we found a positive and statistically significant influence of the FRI on both the CAPB and CAB since 2004. Thus, the enlargements have strengthened the impact of the rule index on public finance, probably as a consequence of the importance of the fulfilment of the fiscal convergence criteria and stronger governance in public finance. Moreover, in our robustness checks, the impact of FRI was statistically significant only in cases with the CAB as a dependent variable (analysis based on full sample). But also we found that the lagged debt had a very low, but positive impact on the structural surplus. It should be pointed out that fiscal rules improve the public finance EU. On the other hand, the necessity of imposing institutional constraints on EU countries results from the Stability and Growth Pact and other arrangements. Therefore, the positive experience may strengthen the impact of institutions on outcomes.

According to our results, we should point out that the estimated impact is only the average impact of the FRI on structural surplus in relation to all EU countries. Our results show the growing importance of institutional constraints in the EU. It is consistent with the European Commission guidelines for fiscal policy, which should be based on specific numerical limitations.

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