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Bachelor Thesis

**Measuring Fiscal Policy Stance in Real Time and Ex Post
in the European Union Member States**

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Abstract

We study the sensitivity of discretionary fiscal policy to the business cycle in the European Union in 2007 – 2018. We focus on the intended and realized fiscal policy stance that depends on the accuracy of output gap estimates. Using the European Commission Economic Forecasts' reports we compile a dataset with real time, mid-year and ex post estimates. We run panel-data regressions with fixed effects for three stages of fiscal policy: budget planning, budget implementation and budget revision – and provide results for four country subsets and three periods relative to the great financial and economic crisis.

We find the intended fiscal policy in EU-27 to be acyclical in 2007 – 2018 except for the crisis period, which required strong countercyclical response. Throughout a year, fiscal plans were updated procyclically if economic growth had been overestimated. The realized fiscal policy was procyclical after 2009.

We conclude that EU-27 prioritise fiscal discipline over stabilizing the current economic situation and remain passive unless volatility is exceptional. However, even an intentionally acyclical fiscal policy turns procyclical after data have been revised. This attests to serious estimation and forecast inaccuracy that results in a trade-off between fiscal and economic stability.

Keywords: European Union, fiscal policy stance, cyclical sensitivity, real time data, ex post data, global crisis

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1. Abbreviations

- CA(P)BB** - cyclically adjusted (primary) budget balance
- CEEC** – Central and Eastern European countries
- CLR** – conditional likelihood ratio test
- DEBT** – gross government debt
- EC** – European Commission
- ECB** – European Central Bank
- EMU** – Economic and Monetary Union
- EU** – European Union
- FE** – forecast error
- GDP** – gross domestic product
- GMM** – generalized method of moments
- IV** – instrumental variable regression
- MAE** – mean absolute error
- MC** – Maastricht Treaty criterion (3% public deficit limit)
- ME** – mean error
- OECD** – Organisation for Economic Co-operation and Development
- OG** – output gap
- PIIGS** - Portugal, Italy, Ireland, Greece, Spain
- RE** – revision error
- SBB** – structural budget balance
- SGP** – Stability and Growth Pact

2. Introduction

The classical Keynesian theory posits that fiscal policy is a stabilization tool that neutralizes aggregate demand shocks and moves the economy closer to its optimal level in the medium term. Fiscal policy is acyclical if policymakers do not act upon a change in cyclical conditions and instead rely on automatic stabilizers to dampen demand shocks. Active fiscal policy, or discretionary, is either procyclical or countercyclical; it means reaction of policymakers to cyclical demand fluctuations in the form of changing tax rates or government expenditure.

Fiscal policy can be decomposed into three stages that correspond to the annual budget cycle: budget planning for the following year, budget implementation, and ex post control that takes place several years after the implementation (Beetsma, Giuliadori, & Wierts, 2009). The three stages rely on different data vintages – real time, real time updated, and ex post – which reflect the increasing amount of information available with each stage of the budgetary process. The new information most often arises from changes in gross domestic product (GDP) estimates, as shown below, yet methodological changes and ad-hoc policy measures, undertaken after budget planning, may also play a role (Beetsma et al., 2009).

The most common indicator of discretionary fiscal policy is the structural budget balance, which is a function of the output gap. In real time policymakers face uncertainty in estimating the output gap, yielding subsequent corrections in estimates of both the output gap and structural budget balance. For the European Union (EU) member states, the mean absolute revisions in the output gap estimate were sizeable in 2003 – 2012, on average being 1.3% of GDP. Frequently, they were the largest contributor to revisions in the structural budget balance, on average equalling 1.75 % of GDP over the sample period (Tereanu, Tuladhar, & Simone, 2014).

The revisions of such magnitude may alter fiscal policy stance, which depends on the economy's proximity to the equilibrium state and the size of revisions. The latter is magnified during the crisis periods due to increased uncertainty (Paloviita & Kinnunen, 2011). For example, for the EU, revisions in both the output gap and structural budget balance estimates rose to 3% of GDP in 2008 - 2009 (Tereanu et al., 2014). Given that, during the crisis fiscal stance is most likely to change from countercyclical to procyclical or vice versa when viewed ex post and ex ante (Paloviita & Kinnunen, 2011).

The possibility of reversing the cyclical position after new information about the economic situation becomes available casts doubt on the effectiveness of fiscal policy as a stabilization tool. It also undermines credibility of the budgetary process and effective consolidation thereafter if budget adjustments contain political or institutional bias (Beetsma et al., 2009; Cimadomo, 2011). Therefore, the effect of data revision on fiscal stance has been extensively studied over the last two decades, yet the consensus has not been reached.

In this paper we want to analyse fiscal policy stance in each stage of the budgetary process, represented by three data vintages, establish the significance of data imprecision in the realized fiscal policy and record any cross-country and time differences. We therefore pose three research questions:

1. What is the fiscal policy stance at the time of budget planning and how does it change during the calendar year in response to changes in cyclical conditions in EU countries in 2007-2018?

2. How does the fiscal policy stance differ when assessed with real time and revised data in EU countries in 2007-2018?

3. How does the fiscal policy stance differ across different sets of EU countries and time periods?

We contribute to the previous research by, first, extending the set of EU members from the largest of EU-15, covered in the literature, to EU-27. Secondly, we analyse cross-country heterogeneity from new dimensions, such as the periphery location and year of EU accession. Thirdly, we extend the real time dataset (the latest ending in 2010) by eight additional years and test for differences in fiscal policy stance before and after the global financial and economic crisis, which has not been covered before in full.

We obtain the answers by running panel-data regression with fixed effects for the planned, adjusted and realized fiscal policy. We find the planned fiscal stance to be acyclical over the whole sample period, but countercyclical for the crisis period and the post-crisis period during expansions. During the budget year, fiscal stance is procyclical if economic growth is overestimated in the planning stage. The realized fiscal stance is procyclical during recessions and countercyclical during expansions, demonstrating the loss of planned acyclicity as a result of data revisions. Only EU-12 maintain acyclical fiscal policy both in real time and ex post. The remaining states pursue acyclical policy in real time but, assessed

ex post, realize it only in good times, while during bad times ex post fiscal stance is procyclical.

The remainder of this paper is structured as follows. We begin by reviewing the existing empirical findings in section 3. We then describe the main variables and methodology in sections 4 and 5, respectively, and discuss limitations of our research design in section 7. We present the obtained results in section 6 and discuss them in section 8. Section 9 concludes.

3. Review of Literature

Research on fiscal policy with real-time data appeared only in the 2000s when Loukoianova, Vahey, and Wakerly (2002) compiled a real time dataset for the United States. However, it was not until 2005 when the results of research based on real time data had been published. Forni and Momigliano (2005) were the first to provide real time estimates of fiscal policy stance. Since then, research with real time data has proliferated into four main branches, as reviewed by Cimadomo (2016). The first subject of research is the size of revisions in fiscal variables and estimation of the prediction bias; the second subject is comparison of ex ante and ex post measurements of fiscal stance; next, modelling the fiscal reaction function with political and institutional determinants; finally, using real time fiscal policy data to study fiscal shocks in the VAR model. In view of our research interest, we narrow down the further discussion to the strands of real time and ex post fiscal stance and fiscal reaction functions.

3.1. Fiscal Policy Stance

For the samples of industrialized countries, most authors find the planned budgetary position to be strongly countercyclical (Forni & Momigliano, 2005; Golinelli & Momigliano, 2006; Bernoth, Hughes Hallet, & Lewis, 2008; Pina, 2009; Paloviita & Kinnunen, 2011; Cimadomo, 2012). In the budget implementation stage, policymakers incline to countercyclical expenditure in bad times, possibly giving in to the pressure of a negative economic environment, and choose neutrality in good times, availing themselves of the so-called “growth dividend” (Golinelli & Momigliano, 2009).

Beetsma and Giuliadori (2010), however, do not support these conclusions, presenting evidence of a different policymakers’ behaviour. For example, the authors find symmetrically neutral fiscal stance during the planning stage and procyclical budget

adjustment in the implementation stage for the sample of European members of the Organisation for Economic Co-operation and Development (OECD) in 1995 - 2006. The authors hypothesise that such an adjustment may be attributed to the possibility of additional spending after the plans are approved. If it happens in the context of stronger economic growth, such leniency in good times requires fiscal contraction in bad times, yielding procyclical adjustment to weaker growth.

Beetsma and Giuliadori (2010) also find systematic differences in cyclical positions for European and non-European OECD countries (the US, Canada, Japan, Norway, Australia) with the latter showing countercyclical fiscal response in the planning stage and acyclical budget adjustment, symmetric over the cycle. The opposite results were obtained by Golinelli and Momigliano (2006), who find non-European OECD members to have neutral fiscal stance in the planning stage in 1988 - 2006. When less developed economies are concerned, Lewis (2013) provides evidence of fiscal stance in the budget planning stage for 10 Central and Eastern European countries (CEECs) and finds them to act countercyclically. Contrary to the sample of 14 Western European countries, countercyclicality remains in the ex post stage in CEECs.

Paloviita and Kinnunen (2017) investigate the difference between periphery countries (Greece, Ireland, Italy, Portugal and Spain) and the group of Austria, Belgium, Finland, France, Germany and the Netherlands in the budget planning stage in 1997 – 2010. The authors record countercyclical fiscal stance for both subsamples, yet the periphery countries stood out with the greater sensitivity of fiscal position to the cycle. In addition to cross-country differences, Paloviita and Kinnunen (2011) illustrate time heterogeneity in the planned and adjusted budgetary positions with respect to the crisis of 2008, touched upon in the literature for the first time. For 12 European members of the OECD in 1997 - 2010, the authors find strong countercyclicality during the crisis and acyclicity before it for both stages. They ascribe the increased cyclical sensitivity of the budget to greater uncertainty, faced in real time. Forecast errors were amplified, which called for more drastic budget adjustments in the implementation stage to stabilize the volatile economic environment.

Unlike the budget planning stage, the ex post stage has not received a uniform conclusion about its typical fiscal stance. For example, Golinelli and Momigliano (2009) and Pina (2009) report acyclicity or weak countercyclicality for Economic and Monetary Union (EMU) states in 1994 – 2008 and 1987 – 2006 respectively, but Bernoth et al. (2008) and Cimadomo (2012) observe procyclical discretionary fiscal policy in developed countries in 1994 - 2006. So do Candelon, Muysken and Vermeulen (2010) for EMU states in 1980 –

2002. Moreover, Candelon et al. (2010) point out that procyclicality is only prone to large states, whereas small states retain acyclical fiscal stance. In addition to testing for cross-country differences, the authors compare ex post fiscal stance before and after the Maastricht Treaty in 1992 and find no significant difference. Time-invariance of fiscal stance has also been confirmed by Golinelli and Momigliano (2009) for EMU states in 1994 – 2008.

Appendix 1 summarizes findings of existing literature on fiscal policy stance over different data vintages and subsamples.

3.2. Additional Fiscal Policy Determinants

Literature surveys on the topic (Golinelli & Momigliano, 2009; Cimadomo, 2011, 2016) indicate that cyclical sensitivity of discretionary fiscal policy is specific to the choice of a vintage, model, country group, and period. The same is true for other fiscal policy determinants, such as policy inertia, debt sustainability concerns, presence of fiscal rules, and political opportunism before parliamentary elections. Below we present existing evidence on the role of these factors in discretionary fiscal policy.

According to all previous research, policymakers generally tend to be long-term oriented and highly persistent in the planned fiscal policy ex ante, owing to common practices in the institutional setup they are working in (Beetsma & Giuliodori, 2010; Paloviita & Kinnunen, 2011; Cimadomo, 2012). High persistence implies smaller room for discretionary policy measures, although inertia loses significance in critical circumstances. For example, the 2008 crisis period witnessed higher agility in the budgetary process (Paloviita & Kinnunen, 2017). Policy persistence also differs across countries, as exemplified by Lewis (2013), who found 10 CEECs countries to be less inert than Western European countries.

Most authors have found debt sustainability concerns to be insignificant in the budget planning stage (Forni & Momigliano, 2005; Cimadomo, 2012; Beetsma & Giuliodori, 2010). On the contrary, Golinelli and Momigliano (2006) and Pina (2009) demonstrate evidence of consolidation efforts in developed countries in 1988-2006. Paloviita and Kinnunen (2017) confirm the significance of the indebtedness level in the planning stage for 11 EU countries in 1997 – 2010 and find the effect of debt on the structural balance to be twice as large in the periphery countries as in the remaining countries. In the ex post stage, debt sustainability concerns do not affect discretionary fiscal policy (Forni & Momigliano, 2005; Pina, 2009; Cimadomo, 2012).

The role of elections in the budgetary process has been ambiguous. Bernoth et al. (2008) and Pina (2009) indicate pre-electoral fiscal loosening only in the ex post stage, whereas Beetsma and Giuliadori (2010) obtain significant results only for the planning stage, when opportunistic expenditure is meant to increase voter support. Golinelli and Momigliano (2006) confirm this result but only for the period of favourable economic conditions. The authors speculate that it might be easier to hide electoral spending when budgets improve. Cimadomo (2012) and Lewis (2013) find no opportunistic loosening in either vintage.

The most common fiscal rules that have entered fiscal reaction functions pertain to the EU membership, for instance, the Maastricht Treaty and Stability and Growth Pact criterion of the 3% deficit limit. Most authors confirm policymakers' intention to keep budgetary positions within the required limit, however its significance depends on the choice of vintage. For example, Golinelli and Momigliano (2006), Beetsma and Giuliadori (2010) and Cimadomo (2012) find that fiscal rules matter only in the planning stage, whereas Bernoth et al. (2008) and Pina (2009) also record budget tightening in the ex post stage. As Golinelli and Momigliano (2006) show, the importance of fiscal rules in the budgetary process varied with time, being the greatest in 1993 – 1997, in the first years of the EMU.

Now we proceed to the next section, where we describe data underlying the present analysis: secondary sources, sample composition, the choice of the main indicators and control variables relevant to discretionary fiscal policy.

4. Data and Sample Description

4.1. Data Sources

To compile a real time dataset, we retrieve data for all variables, except for election years, from the European Commission Directorate-General for Economic and Financial Affairs (DG ECFIN) semi-annual Economic Forecasts' reports (Spring and Autumn). Parliamentary election data is extracted from the International Institute for Democracy and Electoral Assistance (IDEA), accessed online.

We retrieve real time data from the European Commission (EC) reports for two reasons. First, the reports contain data based on which the EC assesses fiscal policy stance and accordingly corrects it. The procedure of data collection is as follows. Before publication of the report, member states submit their forecasted indicators to the commission. Then, estimates are compared to the ones independently forecasted by the EC. If discrepancies are

significant and the indicators are misaligned with EU economic objectives, the EC corrects the submitted forecasts. The final estimates are used in drawing budgetary plans for the next year and in fiscal surveillance under the Stability and Growth Pact (SGP), namely assessment of the underlying fiscal policy and its compliance with the medium-term objectives (Angerer, 2015). Therefore, any revisions in the data directly affect how the EC will correct the target for national fiscal policy depending on its deviation from the medium-term objectives.

Secondly, the EC calculates the output gap and structural budget balance according to the same methodology for all member states, which makes variables comparable across countries.

4.2. Sample

The dataset is compiled for 27 EU countries. We exclude Croatia from the analysis, since it became the EU member only in 2013. For EU-25 member states, except for Bulgaria and Romania, we retrieve data for projection vintages from Autumn 2006 till Autumn 2018. Due to later EU accession, real time data for Bulgaria and Romania were available only from Spring 2007. In total, we compile the dataset from 25 vintage reports.

Within the sample, we group data into subsamples by 1) periods: 2007-2008, 2009-2010, 2011-2018; and 2) country groups: EU periphery countries (referred as PIIGS - Portugal, Italy, Ireland, Greece, Spain), new member states that joined the EU after 2004 (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia), and the remaining EU countries that joined the EU earlier (Austria, Belgium, Denmark, Germany, Finland, France, Luxembourg, Netherlands, Sweden, United Kingdom).

4.3. Indicators of Fiscal Policy and Economic Cycle

The key indicator of discretionary fiscal policy is the cyclically adjusted (primary) budget balance (CA(P)BB), which is the actual government budget balance (net of interest payments) corrected for elements related to economic and business cycles. Although the use of CA(P)BB as the dependent variable has been common to our predecessors (Beetsma & Giuliodori, 2010; Cimadomo, 2012), we use the structural budget balance (SBB) as percent of GDP as a discretionary policy indicator. SBB is CABB after deduction of one-off and temporary budget items (European Central Bank [ECB], 2014). It is the structural budget that lies at the core of fiscal surveillance under the SGP (Mourre, Isbasoiu, Paternoster, & Salto,

2013). Therefore, the quantitative results of our research will be immediately applicable to the estimates provided by the European Commission.

The key indicator of cyclical conditions used in the framework of EU fiscal surveillance is the output gap, denoted as OG (Larch & Turrini, 2009). Contrary to real GDP growth, alternatively used in fiscal stance research, OG directly indicates cyclical conditions, which makes it more favourable for assessing fiscal stance (Golinelli & Momigliano, 2009).

We retrieve current-year estimates and one-year-ahead forecasts for SBB and OG from 25 EC reports for the period from 2006 to 2018. Since 2015 the EC has been reporting fiscal policy indicators as a share of potential GDP instead of nominal GDP. Therefore, we convert SBB as a share of potential GDP to SBB as a share of nominal GDP for the years of 2015-2018 to have SBB consistently measured in the sample.

4.4. Control Variables

To control for potential omitted variable bias, we retrieve the following variables: the current-year gross government debt to GDP ratio (denoted as DEBT) as an indicator of long-term fiscal stability; parliamentary election years (denoted as a binary variable D^{Election} ; one is assigned if elections are planned during the following year) to account for potential political bias in the run-up of elections; and the compliance of the current-year government net lending or net borrowing to GDP with the Maastricht Treaty (denoted as a binary variable D^{MC} ; one is assigned if the public deficit exceeds the 3% of GDP budget deficit threshold).

Throughout the paper we apply the following notation for all the respective variables: the current-year t estimate released in real time t (denoted as $X_{i,t}^t$); the one-year ahead t forecasted value in real time $t-1$ (denoted as $X_{i,t}^{t-1}$); the last-year $t-1$ value estimated in the current-year t (denoted as $X_{i,t-1}^t$); the last-year estimate released in real time $t-1$ (denoted as $X_{i,t-1}^{t-1}$); the current-year t estimate released in the Spring report (denoted as $X_{i,t}^{mt}$); the ex post data for a year t retrieved from the Autumn report published in the year $t+2$ (denoted as $X_{i,t}^{t+2}$). A superscript denotes a vintage report from which the respective variable is retrieved, while the respective subscript denotes the year to which the variable corresponds.

4.5. Descriptive Statistics

We perform a summary analysis for the structural budget balance and key explanatory variables – the output gap and public debt. For each of the variables, the following

relationships between ex ante and ex post data are retrieved (both for one-year-ahead forecasts and for total revisions over the following two years):

$$SBB_{i,t}^t = SBB_{i,t}^{t-1} + SBB_{i,t}^{FE} \quad (1)$$

$$OG_{i,t}^t = OG_{i,t}^{t-1} + OG_{i,t}^{FE} \quad (2)$$

$$SBB_{i,t}^{t+2} = SBB_{i,t}^t + SBB_{i,t+2}^{RE} \quad (3)$$

$$OG_{i,t}^{t+2} = OG_{i,t}^t + OG_{i,t+2}^{RE} \quad (4)$$

$$DEBT_{i,t}^{t+2} = DEBT_{i,t}^t + DEBT_{i,t+2}^{RE} \quad (5)$$

$SBB_{i,t}^{FE}$, $OG_{i,t}^{FE}$, $SBB_{i,t+2}^{RE}$, $OG_{i,t+2}^{RE}$, and $DEBT_{i,t+2}^{RE}$ correspond to forecast (FE) and revision (RE) errors for which we calculate mean errors (ME) and mean absolute errors (MAE) over the whole sample and respective subsamples.

In addition, for each country we regress SBB and OG one-year-ahead FEs on their lagged values to test for a systematic forecast bias and autocorrelation of the dependent variable (Beetsma & Giuliadori, 2010):

$$SBB_{i,t}^{FE} = \beta_0 + \beta_1 SBB_{i,t-1}^{FE} + u_{i,t} \quad (6)$$

$$OG_{i,t}^{FE} = \beta_0 + \beta_1 OG_{i,t-1}^{FE} + u_{i,t} \quad (7)$$

Under the zero hypothesis, if $\beta_0 = 0$, there is no systematic bias in the forecasted errors of the respective country i ; if $\beta_1 = 0$, the dependent variable is not correlated with its own lag and subsequent forecast errors are independent of each other.

In the following section, we describe model specifications for each stage of discretionary fiscal policy assessment: budget planning, budget adjustment and an ex post stage with revised data estimates. We also discuss the hypothetical effects of fiscal policy determinants.

5. Methodology

Government authorities face two separate stages in fiscal policy planning. The first is budget planning for the following year, which takes place at the end of each year and is based on the expected next year's economic situation. This stage is reflected in the EC Autumn reports, which are published in October or November (the month differs across different years of the sample period). The second is the budget adjustment stage, which takes place throughout the respective budget year. This stage is represented by the EC Spring issues,

which are published in April or May and contain adjustments made to the government budget plans of the respective year.

We analyse both stages separately: the budget planning stage (based on Autumn reports) and budget adjustment stage (based on both Spring and Autumn reports). We adopt the two-stage approach from the methodology of Beetsma and Giuliadori (2010) and following Cimadomo (2012) supplement the analysis using ex post data.

The Hausman test is performed for each equation to choose between fixed-effects and random-effects estimation. Country effects are added to control for fiscal stance heterogeneities and systematic biases, for example, different institutional structures and public governance practices (Paloviita & Kinnunen, 2011). We also add time effects to account for time-variant factors that are common for all EU members, for example, changes made to the methodology of the output gap calculation during the sample period (Beetsma & Giuliadori, 2010).

5.1. Budget Planning Stage

The basic regression equation in this stage is based on the forward-looking idea, when planning occurs now, at time $t-1$, for the next year t :

$$SBB_{i,t}^{t-1} = \beta_0 + \beta_1 OG_{i,t}^{t-1} + \beta_2 DEBT_{i,t-1}^{t-1} + \beta_3 SBB_{i,t-1}^{t-1} + u_{i,t} \quad (8)$$

Here, the discretionary fiscal policy indicator is expressed as the SBB value forecasted for the next year t in the year $t-1$ ($SBB_{i,t}^{t-1}$). It depends on the economic situation next year ($OG_{i,t}^{t-1}$), expected at time $t-1$, and the current government debt level ($DEBT_{i,t-1}^{t-1}$). Fiscal policy persistence is expressed as the current-year estimate of SBB (or the lagged value of the dependent variable; $SBB_{i,t-1}^{t-1}$). The error term is denoted as $u_{i,t}$.

A one-year-ahead forecast of the output gap is an indicator of expectations in economic development. A positive β_1 coefficient denotes countercyclical discretionary fiscal policy, i.e. during a recession SBB decreases as the government increases its spending or lowers tax rates to boost the economy, and during an expansion SBB increases due to budget tightening. A negative β_1 indicates that fiscal policy is procyclical and the government moves its fiscal stance into the direction of the underlying economic cycle. If the β_1 coefficient is statistically insignificant, discretionary fiscal policy is acyclical.

We expect to obtain a countercyclical response during the planning stage as most authors did before (Golinelli & Momigliano, 2006; Pina, 2009; Cimadomo, 2012). Nevertheless, we do not exclude the possibility of a different outcome for our country set and period, since these are one of the factors that explain divergent results in the existing literature (Golinelli & Momigliano, 2009; Cimadomo, 2016).

A positive β_2 coefficient before the DEBT variable means that the greater current-year government indebtedness is, the stronger fiscal consolidation efforts are planned next year. This corresponds to the economic theory and findings provided by Golinelli and Momigliano (2006) and Pina (2009) over the period from 1988 to 2006. However, Beetsma and Giuliadori (2010) and Cimadomo (2012) find that, over the period from 1995 to 2006, the current debt level did not impact discretionary fiscal policy. The conflicting results might be explained by differences in the methodology and sample chosen for the analysis. Thus, the relation between the current debt level and planned discretionary policy is ambiguous. Besides, it is interesting to see how member states changed their consolidation efforts after the global financial and economic crisis and excessive deficit procedures in 2009.

We expect a positive sign for the β_3 coefficient, standing for fiscal policy persistence, since previous studies have shown its strongly significant and dominating effect on the planned policy (Beetsma & Giuliadori, 2010; Paloviita & Kinnunen, 2011; Cimadomo, 2012). Still, there might be deviations in the degree of persistence over different time periods and among different countries.

Next, we add two binary variables to the regression, which account for potential political bias, linked to upcoming parliamentary elections, and current noncompliance with the Maastricht Treaty.

$D_{i,t}^{Election}$: D = 1 if elections are planned for the forecasted year t; D = 0 otherwise;

$D_{i,t-1}^{MC,t-1}$: D = 1 if the 3% deficit level is exceeded in the year t-1; D = 0 otherwise.

Same as Beetsma and Giuliadori (2010), we assume that only the intercept changes for both the election and Maastricht criterion dummies. Thus, we write the extended regression equation for the budget planning stage for the following year t as:

$$SBB_{i,t}^{t-1} = \beta_0 + \beta_1 OG_{i,t}^{t-1} + \beta_2 DEBT_{i,t-1}^{t-1} + \beta_3 SBB_{i,t-1}^{t-1} + \beta_4 D_{i,t}^{Election} + \beta_5 D_{i,t-1}^{MC,t-1} + u_{i,t} \quad (9)$$

We expect to obtain a negative β_4 coefficient for the election variable, indicating that more expansionary fiscal policy is planned if elections are expected next year, since policymakers are inclined to increase voter support through opportunistic spending (Beetsma & Giuliadori, 2010).

Given the provisions of the Maastricht Treaty and Stability and Growth Pact, member states exceeding the 3% deficit limit this year are expected to tighten the budget next year to avoid budget penalty. For this reason, we use the lagged MC variable and expect a positive sign for the β_5 coefficient.

In addition, we are interested to see whether fiscal institutions respond differently to positive and negative output gap forecasts. Thus, we introduce two additional variables: $posOG_{i,t}^{t-1} = OG_{i,t}^{t-1}$ if $OG_{i,t}^{t-1} > 0$ and $posOG_{i,t}^{t-1} = 0$, otherwise; $negOG_{i,t}^{t-1} = OG_{i,t}^{t-1}$ if $OG_{i,t}^{t-1} < 0$ and $negOG_{i,t}^{t-1} = 0$, otherwise.

The regression equation for the planning stage with positive and negative OG variables is as follows:

$$SBB_{i,t}^{t-1} = \beta_0 + \beta_1 posOG_{i,t}^{t-1} + \beta_2 negOG_{i,t}^{t-1} + \beta_3 DEBT_{i,t-1}^{t-1} + \beta_4 SBB_{i,t-1}^{t-1} + \beta_5 D_{i,t}^{Election} + \beta_6 D_{i,t-1}^{MC,t-1} + u_{i,t} \quad (10)$$

Next year's budget planning is based on the forecast of the next year's output gap, which reflects economic development expected next year. At the same time, the next year's output gap and fiscal position might be mutually dependent. To deal with potential endogeneity in the model ($corr(OG_{i,t}^{t-1}; u_{i,t}) \neq 0$), we introduce the panel data two-stage least squares instrumental variable regression. We apply the current-year output gap ($OG_{i,t-1}^{t-1}$) estimate and the unweighted average of the current-year OG estimates of the whole sample, except for the respective country i (Cimadomo, 2012; Beetsma & Giuliadori, 2010; Pina, 2009). In each equation, relevance and exogeneity of the instruments are tested with the Underidentification test and the Sargan-Hansen test of overidentifying restrictions, respectively. Other previously used instruments (long-term and short-term interest rate forecasts over the sample countries except for the respective country i) do not provide any significant impact on the regressors neither qualitatively, nor quantitatively (Beetsma & Giuliadori, 2010). Similarly, the forecasted values of positive and negative OGs are instrumented with the respective current-year estimates of OG.

5.2. Budget Implementation Stage

The main task of this stage is to see if discretionary fiscal policy is adjusted during the budget year after new information about the economic situation becomes available and how it is adjusted. First, we need to calculate three errors made at the time of planning the budget for the year t :

1. The current-year SBB forecast error as the difference between the current-year SBB estimate made in real time t and the respective one-year-ahead SBB forecast made last year at $t-1$: $FE_SBB_{i,t} = SBB_{i,t}^t - SBB_{i,t}^{t-1}$;
2. The previous-year SBB revision error as the difference between the last-year SBB value estimated in the current year t and the real time estimate of the last-year SBB value estimated in $t-1$: $RE_SBB_{i,t-1} = SBB_{i,t-1}^t - SBB_{i,t-1}^{t-1}$;
3. The current-year OG forecast error released in spring as the difference between the current-year estimate reported in the Spring report and the respective one-year-ahead OG forecast reported in the previous Autumn report: $FE_OG_{i,t}^{mt} = OG_{i,t}^{mt} - OG_{i,t}^{t-1}$.

The basic regression equation for the budget year t is:

$$FE_SBB_{i,t} = \beta_0 + \beta_1 RE_SBB_{i,t-1} + \beta_2 FE_OG_{i,t}^{mt} + \beta_3 SBB_{i,t}^{t-1} + u_{i,t} \quad (11)$$

The budget plan is adjusted based on revisions of the previous year's fiscal stance made in the current budget year ($RE_SBB_{i,t-1}$), fiscal plans for the current year ($SBB_{i,t}^{t-1}$) made last year, and new information about cyclical conditions available during the current budget year ($FE_OG_{i,t}^{mt}$). The error term is denoted as $u_{i,t}$.

The β_1 coefficient before the revision error in the last year's fiscal stance is expected to be positive because both the current-year and last-year estimates of the structural balance adjustments tend to follow the same trend as new information becomes available (Beetsma & Giuliodori, 2010). If the previous year's fiscal stance has been overestimated (underestimated), next year, it is adjusted downwards (upwards). Therefore, it is reasonable to expect that the current year's budget projections are corrected in the same direction.

The OG forecast error (expressed as the current year's adjustment to the one-year-ahead OG estimate forecasted in the previous year) represents unforeseen economic developments during the budget year. The interpretation of the β_2 coefficient is the same as in the planning stage for the OG variable. A positive sign indicates countercyclical fiscal

response, a negative sign – procyclical response. If the coefficient is not statistically significant, the fiscal reaction is considered acyclical. Similarly, as in the first stage of the analysis, we introduce two additional variables for positive and negative OG forecast errors:

$posFE_{i,t}^{mt} = FE_{OG_{i,t}^{mt}}$ if $FE_{OG_{i,t}^{mt}} > 0$ and $posFE_{OG_{i,t}^{mt}} = 0$, otherwise;

$negFE_{OG_{i,t}^{mt}} = FE_{OG_{i,t}^{mt}}$ if $FE_{OG_{i,t}^{mt}} < 0$ and $negFE_{OG_{i,t}^{mt}} = 0$, otherwise.

The regression equation for the budget implementation stage with positive and negative OG forecast error variables is as follows:

$$FE_SBB_{i,t} = \beta_0 + \beta_1 RE_SBB_{i,t-1} + \beta_2 posFE_OG_{i,t}^{mt} + \beta_3 negFE_OG_{i,t}^{mt} + \beta_4 SBB_t^{t-1} + u_{i,t} \quad (12)$$

The budget adjustment stage has not been extensively studied before (see Pina, 2009; Paloviita & Kinnunen, 2011; Beetsma & Giuliodori, 2010), and the observed fiscal stance varied depending on the economic cycle and a set of countries. Therefore, we cannot objectively form an expectation for the β_2 coefficient.

In practice, the more over-optimistic and imprecise fiscal plans for the current fiscal year are projected in the planning stage, the more SBB is adjusted during the budget implementation stage. If the projected SBB value is overestimated in the planning process, it is reasonable to expect its downsizing during the respective budget year (Beetsma & Giuliodori, 2010; Paloviita & Kinnunen, 2011). Thus, we should expect a negative β_3 coefficient. Most likely due to political considerations, fiscal authorities tend to make exaggerated fiscal projections in the planning stage and are less keen on keeping up with the plans the following year (Beetsma & Giuliodori, 2010). These findings are evident particularly for the EU countries in the sample.

Like in the planning stage, we add binary variables for elections and compliance with the Maastricht Treaty to the regression. For compliance with the Maastricht criterion, the previous-year MC revision error is computed as: $RE_D_{i,t-1}^{MC} = D_{i,t-1}^{MC,t} - D_{i,t-1}^{MC,t-1}$.

The expanded regression equations for the budget year t are the following:

$$FE_SBB_{i,t} = \beta_0 + \beta_1 RE_SBB_{i,t-1} + \beta_2 FE_OG_{i,t}^{mt} + \beta_3 SBB_t^{t-1} + \beta_4 D_{i,t}^{Election} + \beta_5 RE_D_{i,t-1}^{MC} + u_{i,t} \quad (13)$$

$$FE_SBB_{i,t} = \beta_0 + \beta_1 RE_SBB_{i,t-1} + \beta_2 posFE_OG_{i,t}^{mt} + \beta_3 negFE_OG_{i,t}^{mt} + \beta_4 SBB_t^{t-1} + \beta_5 D_{i,t}^{Election} + \beta_6 RE_D_{i,t-1}^{MC} + u_{i,t} \quad (14)$$

The expected signs for the election and Maastricht criterion variables are the same as in the regression for the budget planning stage.

Here, in the budget adjustment stage, we do not face an endogeneity issue. According to Beetsma and Giuliodori (2010), it is reasonable to assume that it takes more than six months for a potential error in the current fiscal position to affect the output gap. Hence, we run a panel data regression with fixed effects.

5.3. Ex Post Data Regression

Regression equations containing revised estimates are written for ex post data published at $t+2$. We cannot use the latest available ex post data for all the years as the period covered in the EC Economic Forecast reports spans only from the year $t-3$ to $t+2$ and data for the year t and $t-1$ have to be retrieved from the same report. Thus, to access all the necessary data points, we take the ex post data from the year $t+2$ report.

The ex post data analysis is organized in the same way as the planning stage analysis. As we do not employ one-year-ahead OG forecasts in the ex post stage regressions, there is less room for reverse causality that potentially arises from the forecasted SBB's feedback to the forecasted OG. Nevertheless, a different kind of endogeneity bias is likely to exist, coming from the inclusion of the lagged dependent variable to the set of explanatory variables. In such dynamic panels, the generalized method of moments (GMM) is typically employed. We, however, stick to the fixed-effects estimation procedure, since the GMM estimation provides unstable results when T is small. Yet, the GMM is used to test robustness of the results (Section 7.2).

The basic regression equation for the year t retrieved ex post:

$$SBB_{i,t}^{t+2} = \beta_0 + \beta_1 OG_{i,t}^{t+2} + \beta_2 DEBT_{i,t-1}^{t+2} + \beta_3 SBB_{i,t-1}^{t+2} + u_{i,t} \quad (15)$$

We add the election dummy and compliance to the Maastricht Treaty dummy to the regression:

$$SBB_{i,t}^{t+2} = \beta_0 + \beta_1 OG_{i,t}^{t+2} + \beta_2 DEBT_{i,t-1}^{t+2} + \beta_3 SBB_{i,t-1}^{t+2} + \beta_4 D_{i,t}^{Election} + \beta_5 D_{i,t-1}^{MC,t+2} + u_{i,t} \quad (16)$$

Previous literature has been inconclusive with respect to fiscal policy stance when ex post data are used, and no majority view can be gleaned. Therefore, we expect an ambiguous coefficient for cyclical sensitivity. The rest of the variables in the ex post stage, however, have the same expected signs and intuitive explanations as in the planning stage analysis.

Again, two additional OG variables are introduced based on the sign of the OG value to see whether fiscal authorities respond asymmetrically during the periods of economic recession and growth: $posOG_{i,t}^{t+2} = OG_{i,t}^{t+2}$ if $OG_{i,t}^{t+2} > 0$ and $posOG_{i,t}^{t+2} = 0$, otherwise; $negOG_{i,t}^{t+2} = OG_{i,t}^{t+2}$ if $OG_{i,t}^{t+2} < 0$ and $negOG_{i,t}^{t+2} = 0$, otherwise.

The regression equation for the ex post stage with positive and negative OG variables is as follows:

$$SBB_{i,t}^{t+2} = \beta_0 + \beta_1 posOG_{i,t}^{t+2} + \beta_2 negOG_{i,t}^{t+2} + \beta_3 DEBT_{i,t-1}^{t+2} + \beta_4 SBB_{i,t-1}^{t+2} + \beta_5 D_{i,t}^{Election} + \beta_6 D_{i,t-1}^{MC,t+2} + u_{i,t} \quad (17)$$

We begin the next section with discussing the accuracy of the key variables across countries and periods and finish with empirical findings stage by stage.

6. Results

6.1. Descriptive Statistics

Over the whole sample period, EU-27 countries tend to overestimate the one-year-ahead SBB forecast, which on average is downsized by 0.1pp the year after (Table 1). The absolute value of the SBB forecast error equals 1pp. However, there are remarkable differences in the magnitude of the SBB forecast errors between countries and their subsets. Old EU countries, followed by new EU states, account for much smaller SBB forecast errors than the PIIGS country set. On average, the latter one overestimate the one-year-ahead SBB forecast by 0.45pp with the absolute error amounting to 1.26pp. What is more, all PIIGS countries, except for Italy, adjust the forecasted SBB by more than 1.2pp in absolute terms.

The largest outlier of the PIIGS is Greece with more than 1.9pp absolute change made to the SBB forecast (Table 1).

Table 1 reports that none of the EU-27 countries show systematic bias stemming from SBB forecast errors. We also do not record significant autocorrelation. The only countries that show evidence of serial correlation in SBB forecast errors are Malta, Portugal and weakly Luxembourg. As for one-year-ahead OG forecast errors, we observe some evidence of systematic bias in Poland, Greece and Belgium, but we do not record autocorrelation, except for Lithuania and Portugal.

Table 1. Forecast errors of SBB and OG one-year-ahead projections

Country	$SBB_{i,t}^{FE}$				$OG_{i,t}^{FE}$			
	ME	MAE	t-stat(β_0)	t-stat(β_1)	ME	MAE	t-stat(β_0)	t-stat(β_1)
Austria	0.02	0.43	-0.00	-1.11	0.05	0.58	0.12	-0.64
Belgium	-0.16	0.79	-0.41	0.38	0.25	0.52	2.37**	-1.41
Denmark	0.29	0.94	1.07	0.16	-0.46	1.08	-1.38	-0.89
Finland	-0.13	1.05	-0.70	-1.53	-0.21	0.83	-0.52	-0.01
France	-0.43	0.72	-1.35	-0.91	0.18	0.58	0.55	0.27
Germany	0.32	0.62	0.86	-0.04	0.20	0.75	0.66	-1.24
Luxembourg	0.53	1.16	1.80	-2.19*	0.11	0.76	0.20	-0.46
Netherlands	-0.30	0.90	-0.76	-1.46	0.02	0.63	0.08	-0.88
Sweden	0.19	0.62	0.58	0.17	-0.08	0.83	-0.27	-0.56
United Kingdom	-0.44	1.09	-1.28	-0.95	0.13	0.73	0.33	0.02
Mean: Old EU	-0.01	0.83			0.02	0.73		
Bulgaria	-0.41	1.19	-0.43	1.21	0.37	0.95	1.40	-1.50
Cyprus	0.31	1.65	0.35	0.35	-0.13	0.75	-0.43	-1.16
Czech Republic	0.27	1.08	0.68	-0.67	0.06	0.74	0.03	-1.38
Estonia	-0.14	1.04	-0.62	-0.22	0.38	1.37	0.53	-0.49
Hungary	0.23	0.54	1.46	-1.56	-0.05	0.92	-0.20	-1.09
Latvia	0.46	1.55	0.30	0.82	0.22	1.43	0.15	-0.93
Lithuania	-0.21	1.09	-0.33	0.94	0.18	1.76	0.33	-1.94*
Malta	0.10	0.70	0.29	4.82***	0.10	0.40	0.46	-0.45
Poland	-0.38	0.95	-0.77	-0.54	0.56	0.66	4.74***	-1.31
Romania	-0.13	0.78	0.32	1.52	0.06	1.28	-0.41	-1.03
Slovakia	-0.46	0.91	-0.84	1.42	0.33	1.00	1.29	-1.16
Slovenia	0.02	0.97	-0.07	-1.16	-0.03	0.93	-0.28	-0.32
Mean: New EU	-0.02	1.04			0.17	1.01		
Greece	-0.10	1.93	-0.19	-1.57	-1.19	1.51	-3.08**	-1.32
Ireland	-0.51	1.22	-0.44	1.46	0.08	0.83	0.07	-1.42
Italy	-0.17	0.39	-1.30	0.48	-0.38	0.73	-1.67	-1.06
Portugal	-0.66	1.28	-0.97	2.51**	0.11	0.68	0.59	-2.19*
Spain	-0.80	1.50	-1.33	0.04	-0.44	0.74	-1.59	0.30
Mean: PIIGS	-0.45	1.26			-0.36	0.90		
Mean: Total	-0.10	1.00			0.01	0.89		

Notes: ME – mean error. MAE – mean absolute error. $X_{i,t}^{FE}$ – forecast error of variable X as the difference between the current-year X estimate made in real time t and the respective one-year-ahead X forecast made last year at t-1. SBB – structural budget balance to GDP ratio. OG – output gap to potential GDP ratio. DEBT – gross government debt to GDP ratio. t-statistics retrieved from the following regressions: $SBB_{i,t}^{FE} = \beta_0 + \beta_1 SBB_{i,t-1}^{FE} + u_{i,t}$ and $OG_{i,t}^{FE} = \beta_0 + \beta_1 OG_{i,t-1}^{FE} + u_{i,t}$. Estimates obtained by a pooled OLS regression accounted for robust standard errors. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period: 2007-2018.

On average, EU-27 countries underestimate the one-year-ahead OG forecast by 0.01pp, and the absolute adjustment made to the forecast amounts to 0.89pp (Table 1). In comparison with the SBB forecast error, output gap projections are slightly more precise. However, the direction of OG forecast errors differs between country subsets. Old EU and new EU member states on average underestimate the OG forecasted value, while PIIGS countries overestimate their OG forecasts by 0.36pp. However, the PIIGS mean error is inflated by Greece overestimation of the next year's OG, which is systematic at the 5% significance level.

Total revision errors of the current-year SBB and OG estimates differ across country sets in the same way as the respective forecast errors (Appendix B). On average, all countries revise SBB estimates downward and OG estimates upward in two years' time. PIIGS account for the largest SBB revision errors and, contrary to old and new EU countries, overestimate OG.

Appendix B also presents total revision errors in the current government debt to GDP ratio estimate. On average, old EU and PIIGS countries revise current indebtedness upwards, but new EU member states revise downwards. Again, PIIGS account for a much larger absolute revision error than old EU and new EU subsamples - 4.49pp, 1.92pp and 1.83pp, respectively.

Appendix C shows the dynamics of forecast and revision errors over sample subperiods: 2007-2008, 2009-2010 and 2011-2018. SBB forecast errors were negative on average before the global financial and economic crisis and even more negative during the crisis (-0.2pp and -1.4pp, respectively) meaning that one-year-ahead SBB forecast made in real time were overestimated on average. SBB revision errors slightly decreased in absolute terms but stayed negative during the crisis. Since 2011, forecast adjustments and total revisions made to SBB have been smaller in absolute terms and positive on average for all country subsamples, signifying real time underestimation of the indicators.

Prior to the financial crisis, OG estimates contained substantial downward bias. Mean forecast and revision errors were slightly below 1pp and 4pp, respectively, which means EU-27 countries underestimated the degree of economy overheating. By contrast, during the crisis current-year and forecasted OG estimates were biased upward by 1pp on average. After 2011 all EU-27 member states, except for the PIIGS countries, have underestimated the OG forecasts and current-year estimates by 0.2pp and 0.5pp, respectively. At the same time, PIIGS have still overestimated one-year-ahead OG forecasts by 0.4pp and current-year estimates by 1pp on average (Appendix C).

As might be expected, PIIGS countries have always had relatively much larger revision errors of the government debt estimates, compared to old EU and new EU subsamples. Even though after 2011 revision errors of DEBT estimates decreased and turned negative, PIIGS countries still seem to provide more imprecise estimates of the public debt level than the other EU countries (Appendix C).

6.2. Budget Planning Stage

In real time planned fiscal policy of EU-27 countries is acyclical. The coefficient of the one-year-ahead OG forecast has the expected positive sign, indicating countercyclicality; however, in all the country sets the coefficient is statistically insignificant (Table 2).

For all EU-27 member states, the current government indebtedness level plays some role in budget planning. The debt variable coefficient is positive and statistically significant at the 10% significance level (Table 2, Columns 1-2). However, among the three subsamples only PIIGS have a significant and positive debt coefficient (Table 2, Column 8), meaning that the higher current government indebtedness is, the higher fiscal contraction is planned next year in real time.

Table 2. Estimates of the budget planning stage

Regressand:	All countries		Old EU		New EU		PIIGS	
$SBB_{i,t}^{t-1}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$OG_{i,t}^{t-1}$	0.0442	0.0485	0.1104	0.1080	0.1123	0.1119	0.0635	0.0633
$DEBT_{i,t-1}^{t-1}$	0.0041*	0.0040*	0.0015	0.0013	-0.0024	-0.0021	0.0042	0.0062**
$SBB_{i,t-1}^{t-1}$	0.8477***	0.8553***	0.8420***	0.8544***	0.8002***	0.7869***	0.9400***	0.9520***
$D_Election_{i,t}$		-0.0071		0.1431		-0.1479		0.1385
$D_MC_{i,t-1}^{t-1}$		0.0978		0.1448		-0.1124		0.2330
Method	RE IV	RE IV	RE IV	RE IV	RE IV	RE IV	RE IV	RE IV
Country effect	Y	Y	Y	Y	Y	Y	Y	Y
Time effect	Y	Y	Y	Y	Y	Y	Y	Y
Hansen J statistic	0.15		0.91		0.24		0.931	
	(p=0.70)		(p=0.34)		(p=0.62)		(p=0.33)	
Kleibergen-Paap rk	88.36		48.39		41.05		17.91	
LM statistics	(p<0.01)		(p<0.01)		(p<0.01)		(p<0.01)	
R2 – within	0.88	0.88	0.92	0.93	0.82	0.83	0.94	0.94
N obs.	322	322	120	120	142	142	60	60

Notes: $SBB_{i,t}^{t-1}$ – one-year-ahead structural budget balance to GDP ratio (SBB) forecasted in real time $t-1$. $OG_{i,t}^{t-1}$ – one-year-ahead output gap to potential GDP ratio (OG) forecasted in real time $t-1$. $DEBT_{i,t-1}^{t-1}$ – current-year estimate of the government debt to GDP ratio released in real time $t-1$. $SBB_{i,t-1}^{t-1}$ – current-year estimate of SBB released in real time $t-1$. $D_{i,t}^{Election} = 1$ if elections are planned for the forecasted year t ; $D = 0$ otherwise. $D_{i,t-1}^{MC,t-1} = 1$ if the 3% deficit level is exceeded in the year $t-1$; $D = 0$ otherwise. G2SLS random-effects instrumental variables (RE IV) regression: $OG_{i,t}^{t-1}$ instrumented with the current-year estimate of OG, $OG_{i,t-1}^{t-1}$, and its unweighted average of the whole sample, except for country i . Robust standard errors accounted for heteroskedasticity. Hansen J statistic of the Sargan-Hansen test – under the joint H0: instruments are exogenous (not correlated with the residual). Kleibergen-Paap rk LM statistic of the underidentification test – under the joint H0: instruments are not relevant (not correlated with the endogenous regressor). Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the forecasted year t : 2007-2018.

As expected, all EU countries and the respective subsamples show strong persistence in government budget planning. The coefficient of the current-year SBB estimate is positive at the 1% significance level (Table 2). For the PIIGS subsample, fiscal persistence is the highest of all the country subsets. At the same time, neither planned parliamentary elections, nor noncompliance with the Maastricht Treaty seems to affect the budget planning for the following year, when assessed in real time.

Table 3. Estimates of the budget planning stage with positive and negative OG forecasts

Regressand:	All countries		Old EU		New EU		PIIGS	
$SBB_{i,t}^{t-1}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$posOG_{i,t}^{t-1}$	0.1326	0.1433	0.5916	0.4580	-0.1555*	-0.1737	0.6942	0.7899
$negOG_{i,t}^{t-1}$	0.0326	0.0356	0.0901	0.0901	0.1542	0.1550	-0.0013	0.0139
$DEBT_{i,t-1}^{t-1}$	0.0041*	0.0040*	0.0012	0.0011	-0.0033	-0.0033	0.0041***	0.0046***
$SBB_{i,t-1}^{t-1}$	0.8504***	0.8581***	0.8374***	0.8492***	0.8006***	0.7955***	0.9407***	0.9693***
$D_Election_{i,t}$		-0.0133		0.1395		-0.1264		0.0785
$D_MC_{i,t-1}^{t-1}$		0.0921		0.1184		-0.0620		0.2767
Method	RE IV	RE IV	RE IV	RE IV	RE IV	RE IV	RE IV	RE IV
Country effect	Y	Y	Y	Y	Y	Y	Y	Y
Time effect	Y	Y	Y	Y	Y	Y	Y	Y
Hansen J statistic	3.03		2.82		1.35			
	(p=0.22)		(p=0.24)		(p=0.51)			
Kleibergen-Paap rk	39.95		9.56		22.92		11.04	
LM statistic	(p<0.01)		(p=0.02)		(p<0.01)		(p=0.01)	
R2 – within	0.88	0.88	0.92	0.92	0.83	0.83	0.94	0.94
N obs.	322	322	120	120	142	142	60	60

Notes: $SBB_{i,t}^{t-1}$ – one-year-ahead structural budget balance to GDP ratio (SBB) forecasted in real time $t-1$. $pos(neg)OG_{i,t}^{t-1}$ – positive (negative) one-year-ahead output gap to potential GDP ratio (OG) forecasted in real time $t-1$. $DEBT_{i,t-1}^{t-1}$ – current-year estimate of the government debt to GDP ratio released in real time $t-1$. $SBB_{i,t-1}^{t-1}$ – current-year estimate of SBB released in real time $t-1$. $D_{i,t}^{Election} = 1$ if elections are planned for the forecasted year t ; $D = 0$ otherwise. $D_{i,t-1}^{MC,t-1} = 1$ if the 3% deficit level is exceeded in the year $t-1$; $D = 0$ otherwise. G2SLS random-effects instrumental variables (RE IV) regression: $OG_{i,t}^{t-1}$ instrumented with the current-year estimate of OG, $OG_{i,t-1}^{t-1}$, and its unweighted average of the whole sample, except for country i . Robust standards errors accounted for heteroskedasticity. Hansen J statistic of the Sargan-Hansen test – under the joint H_0 : instruments are exogenous (not correlated with the residual). Kleibergen-Paap rk LM statistic of the underidentification test – under the joint H_0 : instruments are not relevant (not correlated with the endogenous regressor). Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the forecasted year t : 2007-2018.

When positive and negative OG forecasts are analysed separately, the total set of EU countries reacts acyclically to both positive and negative OG forecasts (Table 3, Columns 1-2). However, for new EU countries, the reaction is weakly procyclical at the 10% significance level when the OG forecast is positive (Table 3, Columns 5-6), i.e. when the economy is expected to overheat, new EU member states show fiscal loosening in their fiscal plans. At the same time, when the forecasted OG is negative (an expected downturn), new EU react acyclically. Old EU and PIIGS countries have acyclical fiscal response to both positive and negative OGs, assessed in real time (Table 3, Columns 3-4 and 7-8). For the rest

of explanatory variables, signs and significance levels remain the same as described for the coefficients of Table 2 findings.

Next, we proceed with data analysis for sub-periods before, during and after the great financial and economic crisis (Table 4). First, the results of the subsample 2007-2008 should be treated with caution since the instrumental variables might be correlated with the error term and, therefore, they might not be truly exogenous leading to biased estimates of the regression (the p-value of Hansen J statistics is below the 10% level) (Table 4, Column 1).

Table 4. Estimates of the budget planning stage: dynamics over the sample period

Regressand:	2007-2008		2009-2010		2011-2018	
	(1)	(2)	(3)	(4)	(5)	(6)
$SBB_{i,t}^{t-1}$						
$OG_{i,t}^{t-1}$	0.0196		0.1388**		0.0307	
$posOG_{i,t}^{t-1}$		-0.0993		-0.7504***		0.3858**
$negOG_{i,t}^{t-1}$		0.1057		0.2088***		-0.0192
$DEBT_{i,t-1}^{t-1}$	0.0019	0.0029	-0.0040	-0.0099	0.0034	0.0027
$SBB_{i,t-1}^{t-1}$	0.8300***	0.8569***	0.8798***	0.8573***	0.7972***	0.7950***
$D_Election_{i,t}$	0.0391	0.0294	-0.0431	0.1713	0.0191	0.0079
$D_MC_{i,t-1}^{t-1}$	0.1550	0.2796	-0.2046	-0.1794	0.0006	0.0002
Method	RE IV	RE IV	RE IV	RE IV	RE IV	RE IV
Country effect	Y	Y	Y	Y	Y	Y
Time effect	N	N	N	N	Y	Y
Hansen J statistic	2.91	2.48	0.274	3.07	0.81	2.02
	(p=0.09)	(p=0.29)	(p=0.60)	(p=0.22)	(p=0.37)	(p=0.36)
Kleibergen-Paap rk	19.89	9.49	26.49	7.23	58.44	34.73
LM statistic	(p<0.01)	(p=0.02)	(p<0.01)	(p=0.06)	(p<0.01)	(p<0.01)
R2 – within	0.75	0.73	0.95	0.96	0.80	0.80
N obs.	52	52	54	54	216	216

Notes: $SBB_{i,t}^{t-1}$ – one-year-ahead structural budget balance to GDP ratio (SBB) forecasted in real time t-1. $OG_{i,t}^{t-1}$ – one-year-ahead output gap to potential GDP ratio (OG) forecasted in real time t-1. $pos(neg)OG_{i,t}^{t-1}$ – positive (negative) one-year-ahead OG forecasted in real time t-1. $DEBT_{i,t-1}^{t-1}$ – current-year estimate of the government debt to GDP ratio released in real time t-1. $SBB_{i,t-1}^{t-1}$ – current-year estimate of SBB released in real time t-1. $D_{i,t}^{Election} = 1$ if elections are planned for the forecasted year t; $D = 0$ otherwise. $D_{i,t-1}^{MC,t-1} = 1$ if the 3% deficit level is exceeded in the year t-1; $D = 0$ otherwise. G2SLS random-effects instrumental variables (RE IV) regression: $OG_{i,t}^{t-1}$ instrumented with the current-year estimate of OG, $OG_{i,t-1}^{t-1}$, and its unweighted average of the whole sample, except for country i. Robust standards errors accounted for heteroskedasticity. Hansen J statistic of the Sargan-Hansen test – under the joint H0: instruments are exogenous (not correlated with the residual). Kleibergen-Paap rk LM statistic of the underidentification test – under the joint H0: instruments are not relevant (not correlated with the endogenous regressor). Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the forecasted year t: 2007-2018.

The whole set of EU countries shows acyclicity in fiscal planning before and after the global financial and economic crisis (Table 4, Columns 1 and 5), but during the crisis they performed countercyclical fiscal budgeting. The coefficient of the OG forecast is positive and significant at the 5% significance level (Table 4, Column 3). However, fiscal response during the crisis is asymmetric to positive and negative OG forecasts. When recession hit the economy and the forecasted OG was negative, fiscal authorities planned their fiscal balances countercyclically to the economic cycle (Table 4, Column 4). The coefficient for the negative

OG forecast is positive and significant at the 1% level. However, eight EU countries¹ still had positive OG forecasts for the year 2009 that turned negative only in 2010 (assessed in real time). The evidence shows that, for positive OG forecasts, fiscal policies were planned procyclically during the crisis, affecting even more fiscal stability of the respective countries. What is more, the procyclical response to positive OG forecast in 2009-2010 was almost four times larger in absolute terms than the countercyclical response to negative OGs. After the crisis EU countries planned their budget countercyclically to positive OGs and acyclically to negative ones (Table 4, Column 8).

Interestingly, the current public debt level is not significant in fiscal planning in all subperiods, even during the crisis (Table 4). The concern for the current indebtedness level seems to be country specific. As shown by the country groups analysis, only PIIGS consider the debt level at the time of budget planning for the following year (Table 3, Columns 7-8).

Similarly, as for the whole sample, fiscal policy planning is highly persistent in each of the sub-periods, although the degree of persistence slightly decreased after the crisis (Table 4). Again, planned elections and noncompliance with the Maastricht criterion are irrelevant in budget planning in all the periods.

6.3. Budget Implementation Stage

We proceed with the description of adjustments made to the previous-year fiscal plans after new information about the cycle becomes available during the year (Table 5). For the full sample and country groups, revisions in the previous year's budget estimates have a strongly significant and positive effect on the budget adjustments during the year. The size of the effect is similar across different subsamples, excluding PIIGS, where it is relatively low and significant only at the 5% level (Table 5, Column 8).

When information about the economic situation is updated, EU-27 fiscal authorities adjust budget plans in a procyclical way. The coefficient for the output gap revision is negative and significant at the 1% level. However, the procyclical reaction can only be attributed to old EU countries and PIIGS, since new EU countries respond acyclically (Table 5).

¹ Czech Republic, Germany, Greece, Lithuania, Malta, Romania, Slovakia and Slovenia

With respect to the optimism of fiscal plans, the effect is expectedly negative and strongly significant at the 1% level for the whole sample (Table 5). Here, old EU countries do not contribute to the effect showing that revisions in their budget plans cannot be explained by inaccurate fiscal projections. New EU members and PIIGS, in turn, adjust plans downwards when last year's forecasts seem to be overoptimistic. Their coefficients are negative and significant at the 5% level.

Table 5. Estimates of the budget implementation stage

Regressand:	All countries		Old EU		New EU		PIIGS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$FE_SBB_{i,t}$	0.7281***	0.7082***	0.7189***	0.7009***	0.7388***	0.7374***	0.7064***	0.5669**
$FE_OG_{i,t}^{mt}$	-0.3471***	-0.3513***	-0.4389***	-0.4495***	-0.2271	-0.2287	-0.4537***	-0.3940**
$SBB_{i,t}^{t-1}$	-0.2251***	-0.2201***	-0.0656	-0.0663	-0.2893**	-0.2875**	-0.2880**	-0.2848**
$D_Election_{i,t}$		-0.1279		-0.0824		0.0314		-0.5205
$RE_D_{i,t-1}^{MC}$		-0.2414		-0.1370		-0.0600		-1.5731*
Method	FE	FE	FE	FE	FE	FE	FE	FE
Country effect	Y	Y	Y	Y	Y	Y	Y	Y
Time effect	Y	Y	Y	Y	Y	Y	Y	Y
R2 – within	0.73	0.73	0.77	0.77	0.74	0.74	0.82	0.85
N obs.	322	322	120	120	142	142	60	60

Notes: $FE_SBB_{i,t}$ – the current-year structural budget balance to GDP ratio (SBB) forecast error. $RE_SBB_{i,t-1}$ – the previous-year SBB revision error. $FE_OG_{i,t}^{mt}$ – the current-year output gap to potential GDP ratio (OG) forecast error released in Spring. $SBB_{i,t}^{t-1}$ – the one-year-ahead forecast of SBB released in real time $t-1$. $D_Election_{i,t} = 1$ if elections are planned for the current year t ; $D = 0$ otherwise. $RE_D_{i,t-1}^{MC} = 1$ if the 3% deficit level is exceeded in the year $t-1$; $D = 0$ otherwise. Fixed-effects (within group) regression (FE). Robust standards errors accounted for heteroskedasticity. Significance at the 10%, 5% and 1% level is denoted as *, **, and ***, respectively. Sample period of the forecasted year t : 2007-2018.

On average, EU countries do not adjust their fiscal positions with respect to forecast errors made to the assessment of compliance with the Maastricht Treaty. Only PIIGS show weak relation at the 10% significance level (Table 5, Column 8). However, the sign of the coefficient is negative meaning that the PIIGS governments tend to continue fiscal loosening and avoid consolidation efforts if the previous year's noncompliance with the MC was not detected last year. Elections do not exert any impact in this stage for all country sets.

When positive and negative output gaps are analysed separately (Table 6), the signs and significance of coefficients stay the same as in Table 5. The difference between the two sets of the results comes from asymmetric response of plan revisions to negative and positive forecast errors of the output gap. All the four country groups do not revise previous fiscal plans when the actual output gap estimate exceeds the forecasted one. On the contrary, budget adjustments are clearly procyclical when the output gap forecasts are overoptimistic, again owing to old EU states and PIIGS. Moreover, the magnitude of their response is almost twice as large as in the case of a single regressor for the OG revision.

Table 6. Estimates of the budget implementation stage with positive and negative OG forecasts

Regressand: $FE_SBB_{i,t}$	All countries		Old EU		New EU		PIIGS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$RE_SBB_{i,t-1}$	0.7299***	0.7104***	0.7471***	0.7390***	0.7317***	0.7309***	0.6510***	0.5384**
$posFE_OG_{i,t}^{mt}$	-0.1973	-0.2258	0.1057	0.0925	-0.3931	-0.3890	0.7744	0.5949
$negFE_OG_{i,t}^{mt}$	-0.3966**	-0.3926**	-0.7990***	-0.8056***	-0.1727	-0.1755	-0.6954**	-0.5993*
$SBB_{i,t}^{t-1}$	-0.2256***	-0.2207***	-0.0649	-0.0643	-0.2932**	-0.2918**	-0.3122**	-0.3039**
$D_Election_{i,t}$		-0.1218		-0.0922		0.0131		-0.5505
$RE_D_{i,t-1}^{MC}$		-0.2344		-0.0684		-0.0378		-1.3716*
Method	FE	FE	FE	FE	FE	FE	FE	FE
Country effect	Y	Y	Y	Y	Y	Y	Y	Y
Time effect	Y	Y	Y	Y	Y	Y	Y	Y
R2 – within	0.73	0.73	0.78	0.78	0.74	0.74	0.83	0.86
N obs.	322	322	120	120	142	142	60	60

Notes: $FE_SBB_{i,t}$ – the current-year structural budget balance to GDP ratio (SBB) forecast error. $RE_SBB_{i,t-1}$ – the previous-year SBB revision error. $pos(neg)FE_OG_{i,t}^{mt}$ – positive (negative) current-year output gap to potential GDP ratio (OG) forecast error released in Spring. $SBB_{i,t}^{t-1}$ – the one-year-ahead forecast of SBB released in real time $t-1$. $D_Election_{i,t} = 1$ if elections are planned for the current year t ; $D = 0$ otherwise. $RE_D_{i,t-1}^{MC} = 1$ if the 3% deficit level is exceeded in the year $t-1$; $D = 0$ otherwise. Fixed-effects (within group) regression (FE). Robust standard errors accounted for heteroskedasticity. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the forecasted year t : 2007-2018.

Finally, when dividing the sample by three periods relative to the great financial and economic crisis, we obtain the following results for the full country set (Table 7). Before the crisis, fiscal plans were not revised when new information about cyclical conditions became available implying an acyclical reaction. The only factor that could predict the size and direction of budget adjustment was revision in the last year's budget estimate. The coefficient is positive and significant at the 1% significance level.

During and after the crisis (Table 7, Columns 3-6), revisions in previous year's budget estimates remain strongly significant, but their effect is notably smaller, compared to the pre-crisis period. Also, during these years fiscal plan optimism gains significance at the 1% level and is expectedly negative. During the crisis particularly, the magnitude of adjustments caused by overly optimistic forecasts is almost four times larger than in the post-crisis period.

As for revisions in the OG forecasts, they start to matter in budget adjustment only during and after the crisis period. The reaction of policymakers is procyclical at the 5% and 1% significance levels, respectively (Table 7, Columns 3 and 4). The procyclical reaction can be attributed to the period when forecast errors of OG are negative, meaning overoptimistic last-year forecasts of OG (Table 7, Columns 4 and 6). Elections influence budget adjustment only after the crisis. The coefficient is negative, implying fiscal loosening in the run-up of elections, but weakly significant (at the 10% significance level).

Table 7. Estimates of the budget implementation stage: dynamics over the sample period

Regressand:	2007-2008		2009-2010		2011-2018	
	(1)	(2)	(3)	(4)	(5)	(6)
$FE_SBB_{i,t}$						
$RE_SBB_{i,t-1}$	1.0384***	1.0108***	0.5460**	0.5568**	0.6781***	0.6837***
$FE_OG_{i,t}^{mt}$	0.7452		-0.2394**		-0.2953***	
$posFE_OG_{i,t}^{mt}$		0.3965		0.2077		-0.1299
$negFE_OG_{i,t}^{mt}$		2.0914		-0.3422*		-0.3672***
$SBB_{i,t}^{t-1}$	-0.2509	-0.1293	-0.8804***	-0.8886***	-0.2529***	-0.2544***
$D_Election_{i,t}$	-0.2310	-0.2759	-0.0351	0.0114	-0.1836*	-0.1759*
$RE_D_{i,t-1}^{MC}$	0.5746	0.4641	-0.8287*	-0.8999*	-0.1607	-0.1436
Method	FE	FE	FE	FE	FE	FE
Country effect	Y	Y	Y	Y	Y	Y
Time effect	N	N	N	N	Y	Y
R2 – within	0.79	0.80	0.94	0.94	0.59	0.59
N obs.	52	52	54	54	216	216

Notes: $FE_SBB_{i,t}$ – the current-year structural budget balance to GDP ratio (SBB) forecast error. $RE_SBB_{i,t-1}$ – the previous-year SBB revision error. $FE_OG_{i,t}^{mt}$ – the current-year output gap to potential GDP ratio (OG) forecast error released in Spring. $pos(neg)FE_OG_{i,t}^{mt}$ – positive (negative) current-year OG forecast error released in Spring. $SBB_{i,t}^{t-1}$ – the one-year-ahead forecast of SBB released in real time $t-1$. $D_Election_{i,t} = 1$ if elections are planned for the current year t ; $D = 0$ otherwise. $RE_D_{i,t-1}^{MC} = 1$ if the 3% deficit level is exceeded in the year $t-1$; $D = 0$ otherwise. Fixed-effects (within group) regression (FE). Robust standards errors accounted for heteroskedasticity. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the forecasted year t : 2007-2018.

Errors in the assessment of compliance with the Maastricht criterion influenced budget adjustments only during the crisis period. The coefficient is negative and significant at the 10% significance level (Table 7, Columns 3-4). At least some EU-27 governments continued fiscal loosening and postponed consolidation efforts during the crisis if the previous year's noncompliance with the MC had not been detected the year before.

6.4. Ex Post Stage

After data revision, EU-27 countries on average show strong procyclicality in discretionary fiscal policy. The output gap estimate has a negative coefficient at the 1% significance level (Table 8, Columns 1-2). However, it comes from PIIGS and new EU member states (Table 8, Columns 5-8) and reveals itself only during the periods of economic recession (Appendix D). Old EU states show acyclical reaction to the underlying economic cycle.

Assessing ex post, EU-27 fiscal authorities seem to be more concerned about their public debt sustainability than during real time fiscal budgeting. The DEBT variable coefficient is positive and significant at the 1% level (Table 8, Columns 1-2). Only new EU states do not account for the current debt level in fiscal planning when ex post measures are applied (Table 8, Columns 5-6).

Strong persistence in the planned fiscal position is still evident for all EU countries and respective subsamples, and it is around 30% smaller than in real time (Table 2 and 8). The greater ex post flexibility might be explained by removal of over-optimism bias and volatility in the data.

Table 8. Estimates of the ex post regression

Regressand:	All countries		Old EU		New EU		PIIGS	
$SBB_{i,t}^{t+2}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$OG_{i,t}^{t+2}$	-0.2503***	-0.2489***	0.0385	0.0352	-0.2115**	-0.2063**	-0.3167*	-0.2826*
$DEBT_{i,t-1}^{t+2}$	0.0315***	0.0327***	0.0433**	0.0439*	0.0190	0.0181	0.0255	0.0419*
$SBB_{i,t-1}^{t+2}$	0.5810***	0.5779***	0.5273***	0.5310***	0.4598***	0.4773***	0.6277***	0.6197***
$D_Election_{i,t}$		-0.2702*		0.1623		-0.4059		-0.6364
$D_MC_{i,t-1}^{t+2}$		-0.1207		-0.0417		0.1293		-1.2589**
Method	FE	FE	FE	FE	FE	FE	FE	FE
Country effect	Y	Y	Y	Y	Y	Y	Y	Y
Time effect	Y	Y	Y	Y	Y	Y	Y	Y
R2 – within	0.78	0.78	0.60	0.61	0.77	0.78	0.91	0.92
N obs.	268	268	100	100	118	118	50	50

Notes: $SBB_{i,t}^{t+2}$ – structural budget balance to GDP ratio (SBB) for the year t released at $t+2$. $OG_{i,t}^{t+2}$ – output gap to potential GDP ratio (OG) for the year t released at $t+2$. $DEBT_{i,t-1}^{t+2}$ – government debt to GDP ratio for the year $t-1$ released at $t+2$. $SBB_{i,t-1}^{t+2}$ – SBB for the year t released at $t+2$. $D_{i,t}^{Election} = 1$ if elections took place in the year t ; $D = 0$ otherwise. $D_{i,t-1}^{MC,t+2}$ if the 3% deficit level is exceeded in the year $t-1$ based on the data reported at $t+2$; $D = 0$ otherwise. Fixed-effects (within group) regression (FE). Robust standards errors accounted for heteroskedasticity. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the year t : 2007-2016.

There is a weak relationship between the planned SBB and political elections for the whole set of countries (Table 8, Column 2). The election variable enters the regression with a negative sign indicating fiscal loosening before elections. However, planned elections do not seem to affect fiscal budget plans when different country groups are analysed separately.

Assessed ex post, PIIGS perform expansionary fiscal policy if they were noncompliant with the Maastricht Treaty last year. The MC variable enters the regression with a negative sign and significant at the 5% level (Table 8, Column 8). What is more, the coefficient is much larger in absolute terms than in real time assessment (Table 2).

Next, we proceed with the ex post analysis for different sample subperiods (Table 9). For the first two periods (2007-2008, 2009-2010), positive and negative OGs are not added to the regression due to a small number of observations with different OGs: one observation with a negative OG over the period of 2007-2008 and two observations with a positive OG over the period of 2009-2010.

Before the global financial and economic crisis, EU-27 member states acted countercyclically to the economic cycle, but, starting from the crisis period, their fiscal plans have been strongly procyclical (Table 9, Columns 1-3). Besides, after the crisis fiscal

authorities act countercyclically when OG is positive and procyclically when OG is negative (Table 9, Column 4).

Table 9. Estimates of the ex post regression: dynamics over the sample period

Regressand:	2007-2008	2009-2010	2011-2016	
$SBB_{i,t}^{t+2}$	(1)	(2)	(3)	(4)
$OG_{i,t}^{t+2}$	0.2651**	-0.7274***	-0.2353**	
$posOG_{i,t}^{t+2}$				0.6593***
$negOG_{i,t}^{t+2}$				-0.3467***
$DEBT_{i,t-1}^{t+2}$	0.2467	0.1331***	-0.0012	0.0049
$SBB_{i,t-1}^{t+2}$	0.4021**	0.0532	0.5839***	0.5849***
$D_Election_{i,t}$	0.1550	-0.0637	-0.2946**	-0.2458*
$D_MC_{i,t-1}^{t+2}$	-0.7231	0.3090	0.1931	0.1611
Method	FE	FE	FE	FE
Country effect	Y	Y	Y	Y
Time effect	N	N	Y	Y
R2 – within	0.35	0.76	0.74	0.77
N obs.	52	54	162	162

Notes: $SBB_{i,t}^{t+2}$ – structural budget balance to GDP ratio (SBB) for the year t released at $t+2$. $OG_{i,t}^{t+2}$ – output gap to potential GDP ratio (OG) for the year t released at $t+2$. $pos(neg)OG_{i,t}^{t+2}$ – positive (negative) OG for the year t released at $t+2$. $DEBT_{i,t-1}^{t+2}$ – government debt to GDP ratio for the year $t-1$ released at $t+2$. $SBB_{i,t-1}^{t+2}$ – SBB for the year t released at $t+2$. $D_Election = 1$ if elections took place in the year t ; $D = 0$ otherwise. $D_MC_{i,t-1}^{t+2}$ if the 3% deficit level is exceeded in the year $t-1$ based on the data reported at $t+2$; $D = 0$ otherwise. Fixed-effects (within group) regression (FE). Robust standards errors accounted for heteroskedasticity. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the year t : 2007-2016.

The previously reported importance of the public indebtedness level assessed ex post can be ascribed to the crisis period solely (Table 9, Column 2), while in the remaining periods the debt sustainability issue is statistically insignificant. Conversely, long-term orientation in fiscal planning was evident before and after the crisis period, while during the crisis EU fiscal authorities were not persistent in their fiscal plans, assessed ex post.

The political bias is evident only for the period after the financial crisis (Table 9, Column 3-4). However, each of the previous two periods consists of only two consecutive years. Hence, the samples might be too small to assess the importance of planned parliamentary elections, as they take place on average every four years.

Noncompliance with the Maastricht Treaty does not affect fiscal budget planning in none of the sample subperiods, assessed ex post.

7. Limitations and Robustness Checks

7.1. Limitations

The chosen research design has several limitations, such as data availability, a lagged dependent variable as a regressor, instrument weakness and cross-sectional dependence among entities.

First, even though we use a larger dataset in comparison to previous studies (Golinelli & Momigliano, 2006; Beetsma & Giuliadori, 2010; Cimadomo, 2012), it is still rather small from both cross-sectional and time series perspectives ($N = 27$, $T = 12$). It might affect the accuracy and conclusiveness of estimates, especially for country and time subsamples. As the real time dataset for EU-27 countries includes the latest available datapoints, the sample size cannot be enlarged in the present time. So, when additional data become available, we encourage more extended research on the subject to be conducted.

Next, we are concerned with inclusion of the lagged dependent variable to the set of explanatory variables. On the one hand, it is a relevant control variable standing for persistence of discretionary fiscal policy over the years. On the other hand, the inclusion of the lagged dependent variable gives rise to an endogeneity problem. To deal with this issue, the generalized method of moments (GMM) is typically used, owing to its broader set of instruments (moment conditions) that make estimation more efficient. Under the GMM, the lagged dependent variable in first differences is also instrumented with its own lagged values. On this ground, we perform GMM estimation as a robustness check (Section 7.2.).

Another limitation is related to potentially weak instruments. Even if the overidentification test does not reject the null hypothesis of instrument validity, it does not necessarily mean that the instruments are relevant. The instruments can be weakly correlated with endogenous variables leading to biased IV regression results. For the budget planning stage, we perform a random-effects IV regression for which weak identification tests are not yet available. By contrast, some weak identification tests (like the conditional likelihood ratio (CLR) test or the Lagrange multiplier K test) are available for GMM estimation. Therefore, for the total sample, we perform instrument weak identification testing under the GMM specification (Appendix E). Both the CLR and K tests show that the employed instruments are strongly relevant as a group in the GMM model. Unfortunately, for country and time subsamples, weak identification tests could not be performed as GMM estimation for smaller samples might lead to inaccurate results.

Lastly, we acknowledge possible cross-sectional dependence among countries, since EU member states are closely integrated from economic, political, and institutional perspectives, and smaller economies significantly depend on the core economies. Such mutual dependence vents into cross-country correlation among individual responses to unobserved factors. If this is the case, ignorance of cross-sectional dependence might lead to inconsistent and biased panel estimates (Sarafidis & Wansbeek, 2012). However, the topic in cross-sectional dependence is relatively recent. Modern analytical packages do not allow users to combine instrumental variables and random-effects while controlling for cross-sectional dependence. It limits our ability to account for possible entity interdependence consistently for all stages of the analysis. As the issue is not accounted for in this paper, we acknowledge possible inconsistency and bias of panel estimates.

7.2 Robustness Check

We perform estimation of the difference GMM and the forward orthogonal deviation GMM (Appendix E)¹ to control for potential endogeneity when the lagged dependent variable is among regressors. The GMM approach is run only for the whole EU-27 sample and not for any of the subsamples, in which the number of observations does not suffice to obtain reliable GMM results.

Overall GMM estimates are in line with the main regression estimates for all the three stages. There are just two meaningful exceptions. First, the current-year debt estimate turns out to be insignificant in real time budget planning. Conversely, the DEBT variable is statistically significant at the 10% level with the random-effects IV estimator (Appendix E, Table E1). Secondly, with the GMM estimator, parliamentary elections planned during the fiscal year do not seem to affect fiscal plans, assessed ex post, while the within group estimator reveals a political bias at the 10% significance level (Appendix E, Table E3).

¹ The system GMM is not performed, since the set of countries is small relative to the number of instruments used in the system, which makes GMM overidentification restrictions weak.

8. Discussion

8.1. Cyclicality

8.1.1. Budget Planning Stage

Even though most academics in fiscal policy have recorded countercyclicality in the planning stage (Golinelli & Momigliano, 2006; Pina, 2009; Cimadomo, 2012), our results do not confirm this evidence. Old EU states and PIIGS always act acyclically, which is consistent with the observation of Beetsma and Giuliadori (2010). In new EU states, fiscal policy stance is asymmetric to the economic cycle: in downturns, fiscal plans are acyclical, whereas, in expansions, fiscal plans are weakly procyclical. As the analysis below will show, their procyclicality is most likely to occur in 2009-2010 owing to misalignment of actual measures and plans.

When we evaluate different periods separately, we find that EU-27 fiscal policy stance changes over time. In fact, only before the global financial and economic crisis, European policymaking was planned to be acyclical.

When the crisis hit, EU-27 were forced to actively manage fiscal policy to stabilize the economic environment, which supports the findings by Paloviita and Kinnunen (2011). Most plausibly, it is related to the “European Economic Recovery Plan” (EERP), initiated by the EC to stimulate demand with coordinated fiscal measures (Schuknecht, Moutot, Rother, & Stark, 2011). However, the response is asymmetric over the business cycle: procyclical in the forecasted expansion and countercyclical in the forecasted recession. Even though the global financial and economic crisis was unprecedented, eight EU member states expected positive output gaps for the year 2009. Despite such forecasts they were obliged to participate in the EU-wide fiscal stimulus scheme. Thus, we observe fiscal loosening in the context of the forecasted expansion (procyclicality), which, in 2010, most likely turned into the forecasted recession (countercyclicality).

In the post-crisis recovery period, EU-27 resumed acyclical policy in the expectation of a slowdown and planned countercyclical response to the expected economy overheating (budget tightening). Such policy is likely to reflect an exit out of the EERP, planned to improve budget positions, severely undermined during the crisis, and return to long-term fiscal sustainability. The exit measures were primarily related to the withdrawal of fiscal stimuli and other expenditure

8.1.2. Budget Implementation Stage

Same as Beetsma and Giuliadori (2010), we record procyclical budget adjustment, but only when economic conditions were overestimated in the previous period. It means that if the present economic outlook worsens, budget contracts. However, this finding is only valid for the subsamples of old EU members and PIIGS. Even though it is not aligned with the planned acyclical policy, it corresponds to the SGP provision for avoiding excessive deficits. New EU states did not react to changes in the economic outlook and had acyclical fiscal stance as was planned the year before.

Relative to the crisis period, we confirm Paloviita and Kinnunen's (2011) results, namely procyclical budget adjustment during and after the crisis. Again, it is present only when economic growth is overestimated. As found in the planning stage, EU-27 policymakers tightened budgets on the eve of an expected expansion, reflecting the need and opportunity to consolidate. Here, procyclical budget adjustment might not be viewed as a serious deviation from the fiscal plan, since it results in lower deficit, as the SGP requires. Yet, lower government demand during a slowdown worsens economic instability, which should be weighed against fiscal sustainability gains.

8.1.3. Ex Post Stage

Assessing fiscal policy stance of EU-27 with revised data, we find strong procyclicality, which is aligned with the results of Bernoth et al. (2008) and Cimadomo (2012) but contradicts Forni and Momigliano (2005) and Pina (2009), who report acyclicity. In the further analysis, we obtain acyclicity for old EU states and procyclicality for PIIGS and new EU members. Since old EU states have more precise data (Appendix B), it seems that procyclicality in the remaining countries might be the consequence of inaccurate OG and SBB assessment, whose mean errors far exceed the sample average (Appendix B). It can also be inferred from the budget implementation stage, when overoptimistic SBB forecasts are significantly conducive to larger budget deficits in new EU states and PIIGS (Table 5, Columns 5-8).

When the two stages of the business cycle are considered separately, procyclicality in new EU states and PIIGS remains only in recessions, which contradicts the common remark of procyclical spending in expansions, as assessed with ex post data (Cimadomo, 2012; Candelon et al., 2010). It is notorious that downturns amplify uncertainty and bias forecasting even more. However, old EU states still do not show any kind of cyclicity even in recessions while new EU countries and PIIGS do. This indicates that new EU members' and

PIIGS's inaccuracy does not leave room for sudden volatility, contrary to old EU states, and contributes to the wrong policy judgement. Therefore, these countries should improve their estimation procedures to avoid an ex post procyclicality trap.

As for time differences, we are the first to provide evidence on the ex post cyclicity of EU-27 fiscal policy relative to the crisis. In 2007 - 2008, the union ran countercyclical policy (fiscal tightening) in response to positive OG projections, which comprise almost the whole subsample. In this period, OG estimates were largely underestimated (Appendix C) and, given inherently negative relation between SBB and OG, SBB overestimation makes fiscal policy seem countercyclical.

When the crisis hit, ex post fiscal policy turned procyclical, driven by downward data revision (Appendix C). In real time, the planned policy was to be strongly countercyclical. Given the discrepancy between the real time and ex post findings, it appears that in case the economic conditions were far worse than policymakers assessed in real time, budgets would grow, indicating either contraction or an insufficient fiscal stimulus necessary to combat the demand fluctuations. It could be the case that suboptimal expenditure was evident but, due to weak budget positions, no additional resources could be freed for stabilization purposes.

After the crisis, fiscal policy is asymmetric over the cycle stages: procyclical when the OG forecasts are negative and countercyclical when the OG forecasts are positive. Compared to the intended acyclical policy, we observe a discrepancy only when we consider the expected recessions. This means that in the expectation of a slowdown policymakers overstate the next-year deficit to the extent of budget growth upon revision, which represents procyclical policy. When expansions are expected, both vintages show countercyclical policy (budget consolidation), in line with the EU objective to regain fiscal sustainability by cutting government expenditure (van Riet, 2010). Yet, the ex post effect on fiscal stance is much stronger than in real time, which is advantageous in this context.

8.1.4. Linkages Between the Three Stages

Our analysis proved the hypothesized discrepancy between the intentional fiscal policy in the EU and the realized one (Table 10). Generally, following the SGP provisions, EU-27 prioritize fiscal sustainability and sound fiscal positions and therefore abstain from stabilization policy, except for periods of extreme volatility, such as the one witnessed in 2009. However, due to the presence of implementation lags and revision of the economic assessment (typically biased by more than 1 pp of GDP), the realized policy is quite different from the intentional one and is specific to a country set.

Table 10. Fiscal policy stance in the three budget stages: cross-country and time differences

Stage	Country group				Period		
	EU-27	Old EU	PIIGS	NEW EU	2007-2008	2009-2010	2011-2018*
Budget Planning	AC	AC	AC	PC in expansions AC in recessions	AC	CC	CC in expansions AC in recessions
Budget Adjustment	PC if OG forecast is overestimated Otherwise, AC			AC	AC	PC if OG forecast is overestimated Otherwise, AC	
Ex Post	PC	AC	PC in recessions AC in expansions		CC	PC	CC in expansions PC in recessions

Notes: The table summarizes results for fiscal stance when positive and negative OG forecasts and forecast errors are considered. Acyclical, countercyclical and procyclical discretionary fiscal policy is denoted as AC, CC and PC, respectively. OG stands for the output gap. *Sample period for the planning and adjustment stages is 2007-2018, for the ex post stage – 2007-2016.

Old EU states adjust plans procyclically if economic growth is overstated. In two years, when SBB and OG estimates are revised, the outcome is acyclical, i.e. the plan was realized and in the course of its implementation, budget deficit decreased.

New EU states do not adjust plans when the economic outlook is reassessed. However, upon estimate revision, they happen to conduct procyclical policy (budget contraction) when a slowdown is expected. PIIGS adjust plans procyclically if economic growth is overstated. After SBB and OG estimates are revised, they conduct procyclical policy when a recession is expected, same as new EU states. In the end, the two subsets realize acyclical policy only in the expectation of good times. In recessions, their budget positions improve in the short term, but possibly at the expense of long-term worsening if fiscal contraction results in adverse structural changes.

On balance, the occurrence of ex post procyclicality attests to considerably biased estimation and forecasting procedures, typical of new EU and PIIGS. To avoid the trade-off between fiscal and economic stability like old EU countries, it is advisable for the two subsets to ensure accuracy and prudence of their estimation procedures, which might aid realization of the preferred acyclical fiscal policy.

8.2. Other Fiscal Policy Determinants

Contrary to literature (Forni & Momigliano, 2005; Cimadomo, 2012; Beetsma & Giuliodori, 2010), we find debt sustainability to be weakly significant in the budget planning stage, but only for the PIIGS subsample. Their concern for public finance sustainability is unsurprising, since for each of the PIIGS countries the public debt level far more exceeds the

60% debt ceiling, imposed by the Maastricht Treaty. Due to larger public indebtedness on average, PIIGS member states are more inclined to consolidate than the other EU countries to avoid potential EC sanctions for noncompliance with the debt criterion (Angerer, 2015). However, the effect of the current indebtedness is miniscule (less than 0.01pp). What is more, besides its low significance in the main regression, the DEBT variable is also insignificant in the GMM robustness check in all the specifications. Therefore, we might not reject a hypothesis of no fiscal sustainability concerns for EU-27 in the budget planning stage, as most previous authors found.

Assessing ex post, the current indebtedness level gains significance for old EU states and has a more pronounced effect on PIIGS, contradicting Forni and Momigliano (2005), Cimadomo (2012), and Pina (2009). Furthermore, its effect is the most significant and sizeable during the crisis, when the average EU debt biannually rose by 10 pp of GDP in 2009 and 2011 (van Riet, 2010).

In all the three stages, we find policymaking to be inert, supporting Beetsma and Giuliadori (2010), Paloviita and Kinnunen (2011), and Cimadomo (2012). Such fiscal persistence indicates an inflexible budgetary process, implementation lags and long-term orientation of policymakers (Beetsma & Giuliadori, 2010). The only period when it loses significance is the crisis, whose abrupt and turbulent nature required urgent and decisive counter-response.

The effect of elections on fiscal policy stance has been ambiguous in the literature. In our analysis, we also do not obtain strongly significant results. Instead, we find weak political opportunism in the budget implementation and ex post stages for the post-crisis period. We therefore suppose the effect of upcoming elections to be time-dependent. However, due to elections infrequency (one in four years on average) and a short sample period, the results might be distorted by inefficient estimates, derived from a small number of observations. Therefore, we cannot certainly state that opportunistic behaviour is present in the EU fiscal budgeting.

We find the Maastricht criterion to have no influence on budget planning, contrary to Cimadomo (2012), Pina (2009) and Beetsma and Giuliadori (2010). The insignificance of the 3% deficit limit in budget planning might be attributed to the SGP reform of 2005, which made fiscal surveillance more flexible. Approaching the 3% deficit limit becomes only a signal for an excessive deficit, however, the final decision also accounts for the current economic situation and necessity to conduct structural reforms (ECB, 2005). Hence, exceeding the 3% deficit limit is not always viewed as noncompliance, which justifies

insignificance of the Maastricht criterion in our analysis. Only for PIIGS, its effect is significant in the budget adjustment and ex post stages, revealing that, in real time, budget deficit is understated by appr. 1.4 pp of GDP.

To sum up, the analysis pointed out to the weakness of the SGP fiscal rules in controlling fiscal policymaking. The 3% deficit limit is ignored by all countries, except for PIIGS, in both vintages. The current indebtedness level seems to be more influential than the deficit criterion, but only during the crisis period. Only PIIGS negligibly, but consistently considered the accumulated debt in fiscal budgeting, irrespective of the vintage. Hence, it appears that the SGP fiscal rules matter in budget planning only when the risk of their violation becomes evident, namely when the economy operates much below its full potential and the output gap is deeply negative. In a more stable environment, the next year's fiscal plan is mainly based on the current year's budgetary position without significant adjustments. In the post-crisis period, we document some evidence of fiscal loosening in the run-up of elections, but further analysis for a longer sample period is required to state for sure.

9. Conclusions

This paper studies the sensitivity of discretionary fiscal policy to the business cycle in the European Union in 2007 – 2018. We focus on the intended and realized fiscal policy stance that is dependent on the accuracy of output gap estimates. Due to the uncertainty of estimating trend GDP and forecasting actual GDP, the output gap is measured imprecisely. Its inaccuracy enters the structural budget balance, an indicator that is used by the EC to assess and guide fiscal policy in member states. Each time new information about the economic situation appears, the view on the optimal fiscal policy changes.

On this ground, we compare fiscal stance across three stages of fiscal budget assessment (the real time budget planning at the end of the previous year, fiscal adjustments made during the budget year and revised fiscal stance, judged ex post) and across different sets of the EU member states and time periods.

Our analysis shows that EU-27 prioritise fiscal discipline over stabilizing the current economic situation and remain passive unless volatility is exceptional, like during the global crisis, when fiscal policy was planned contrary to the economic cycle. During the budget year, when new information about the economic conditions becomes available, fiscal plans are updated procyclically (old EU states and PIIGS), but only if economic growth is below its potential. New EU states do not adjust plans when the economic outlook is reassessed. The realized fiscal policy, which is evident after the last data revision, has been procyclical since

2009. Only old EU states showed acyclical fiscal stance in the ex post stage. PIIGS and new EU states conduct procyclical policy when an economic recession is expected.

We conclude that among EU-27 only old EU states realized the planned acyclical fiscal policy and achieved lower budget deficit. The rest of the countries realized their plans only in the expectation of good times. In recessions their policy is procyclical creating a trade-off between sound budget positions and short-term economic stability. The occurrence of ex post procyclicality in the old EU and PIIGS attests to considerably biased estimates and forecasts. To avoid the trade-off between fiscal and economic stability, it is advisable for the two subsets to ensure the accuracy and prudence of their estimation procedures, which might aid realization of the preferred acyclical fiscal policy.

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Appendices

Appendix A. Summary of previous findings

Table A. Summary of selected literature on fiscal policy stance in developed countries

Author(s) and year of publication	Sample	Data vintage	Results
Forni and Momigliano (2005)	19 OECD (EU14) in 1993-2003	Real time for OG; ex post for SBB	CC in recessions; AC in expansions
Golinelli and Momigliano (2006)	19 OECD (EU14) in 1988-2006	Real time for OG; ex post for SBB	CC for EU14; AC for non-EU
Bernoth et al. (2008)	EU14 in 1994-2006	Real time	CC
		Ex post	PC
Pina (2009)	EU15 in 1987-2006	Real time and mid-year	CC, weaker in expansions
		Ex post	AC
Beetsma and Giuliodori (2010)	19 OECD (EU14) in 1995-2006	Real time	AC
		Mid-year	PC in recessions
Candelon et al. (2010)	EMU states in 1980 – 2002	Ex post	PC for large states, AC for small states; no change in 1992
Paloviita and Kinnunen (2011)	EU12 in 1997-2010	Real time and mid-year	CC in 2008-2009; AC before 2008
Cimadomo (2012)	19 OECD (EU14) in 1995-2006	Real time	CC, higher in expansions
		Ex post	PC, higher in expansions
Lewis (2013)	10 CEECs in 1995-2008	Real time and ex post	AC
Paloviita and Kinnunen (2017)	PIIGS, Austria, Belgium, Finland, France, Germany and the Netherlands in 1997-2010	Real time	CC, stronger for PIIGS

Notes: AC – acyclical, CC – countercyclical, PC – procyclical fiscal stance. OG – output gap. SBB – structural budget balance. CEECs – Central and Eastern European countries. PIIGS – Portugal, Italy, Ireland, Greece and Spain.

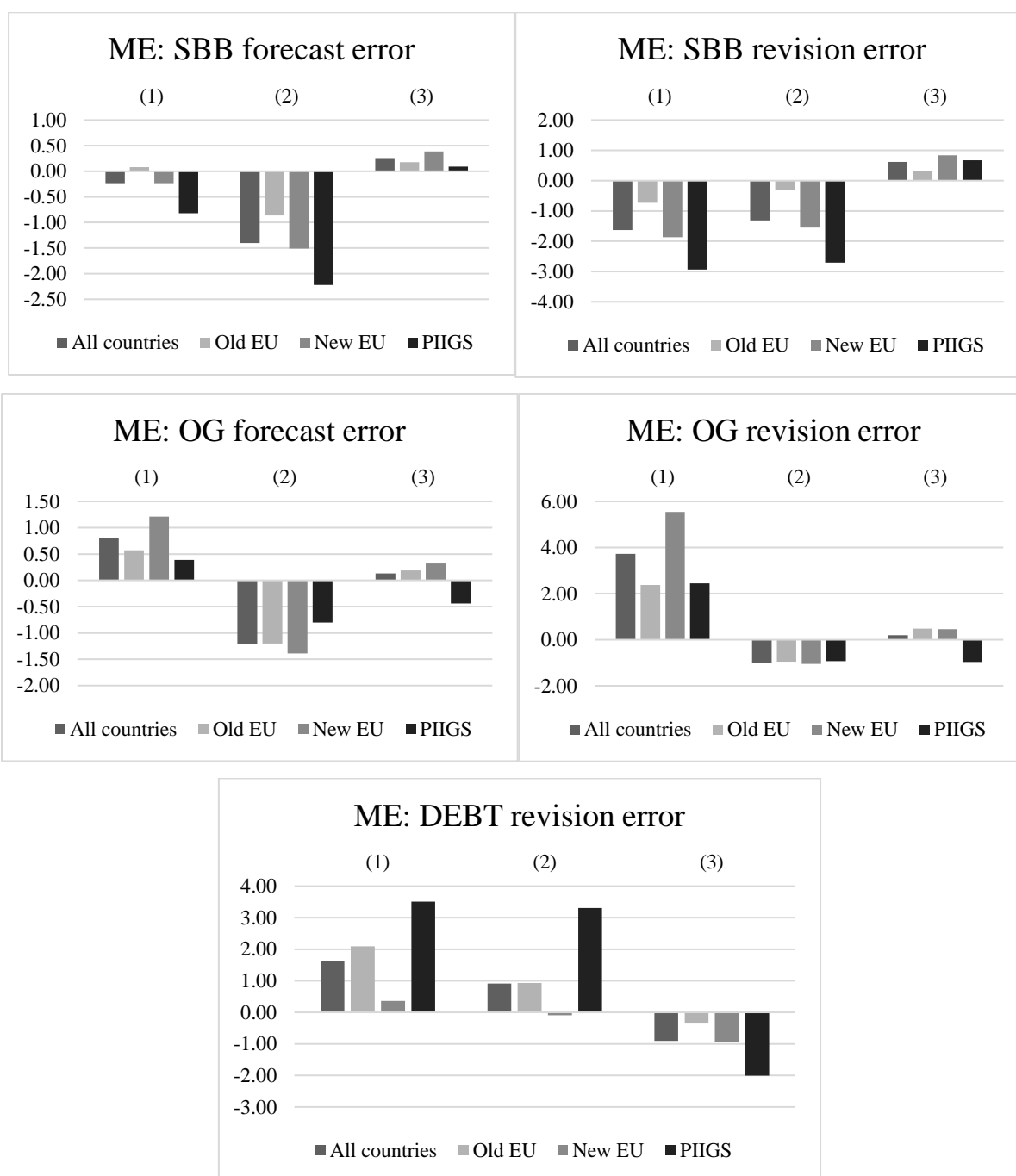
Appendix B. Total revision errors

Table B. Total revision errors of the current-year SBB, OG and DEBT estimates

Country	$SBB_{i,t}^{RE}$		$OG_{i,t}^{RE}$		$DEBT_{i,t}^{RE}$	
	ME	MAE	ME	MAE	ME	MAE
Austria	0.19	0.79	0.49	1.13	1.49	2.67
Belgium	-0.52	1.00	0.91	1.21	0.70	1.98
Denmark	0.51	1.28	-0.15	1.55	2.31	3.05
Finland	-0.53	1.19	0.51	1.93	-0.01	1.23
France	-0.78	1.00	1.00	1.34	0.31	1.13
Germany	0.29	0.49	0.63	1.47	0.35	1.81
Luxembourg	1.26	1.46	0.97	2.15	-0.46	0.68
Netherlands	-0.51	1.23	0.54	1.32	-0.66	3.16
Sweden	0.44	1.06	0.12	1.38	0.81	1.61
United Kingdom	-0.46	1.24	0.69	1.21	-0.78	1.88
Mean: Old EU	-0.01	1.07	0.57	1.47	0.41	1.92
Bulgaria	-0.82	2.00	1.36	2.11	-1.18	1.60
Cyprus	0.98	2.98	0.85	1.67	-1.60	4.16
Czech Republic	0.56	1.56	1.01	1.71	-0.99	2.05
Estonia	-0.64	1.14	2.08	3.30	-0.01	0.51
Hungary	0.50	0.86	0.38	1.62	1.32	2.60
Latvia	0.66	3.02	1.28	3.46	0.05	2.27
Lithuania	-0.33	1.75	1.76	3.64	-0.69	0.91
Malta	-0.13	0.99	0.31	1.01	-2.68	2.68
Poland	-0.79	1.24	1.27	1.49	-0.22	1.28
Romania	-0.70	1.57	0.97	2.37	0.19	0.99
Slovakia	-0.71	1.39	1.34	2.14	-0.55	0.87
Slovenia	-0.50	1.46	0.60	2.38	0.07	1.95
Mean: New EU	-0.15	1.66	1.10	2.24	-0.52	1.83
Greece	-0.58	3.72	-1.71	2.79	1.52	9.70
Ireland	-0.32	2.70	0.75	1.89	-2.77	6.13
Italy	-0.56	0.56	0.26	1.28	-0.91	1.63
Portugal	-1.14	1.39	0.51	1.19	3.24	3.62
Spain	-1.03	2.14	-1.20	1.94	-0.28	1.38
Mean: PIIGS	-0.73	2.10	-0.28	1.82	0.16	4.49
Mean: Total	-0.21	1.52	0.65	1.87	-0.05	2.36

Notes: ME – mean error. MAE – mean absolute error. $X_{i,t}^{RE}$ – total revision error of variable X for year t as the difference between vintage reports t+2 and t. SBB – structural budget balance to GDP ratio. OG – output gap to potential GDP ratio. DEBT – gross government debt to GDP ratio. Sample period: 2007-2018.

Appendix C. Mean forecast and revision errors: dynamics over time



Notes: ME – mean error. SBB – structural budget balance to GDP ratio. OG – output gap to potential GDP ratio. DEBT – gross government debt to GDP ratio. Periods 2007-2008, 2009-2010 and 2011-2018 denoted as (1), (2) and (3), respectively.

Appendix D. Estimates of the ex post stage

Table D. Estimates of the ex post stage with positive and negative OG forecasts

Regressand:	All countries		Old EU		New EU		PIIGS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$SBB_{i,t}^{t+2}$								
$posOG_{i,t}^{t+2}$	-0.1991**	-0.2020**	0.0123	0.0157	-0.1589	-0.1618	0.0968	0.2771
$negOG_{i,t}^{t+2}$	-0.2872***	-0.2831***	0.0506	0.0439	-0.2535**	-0.2430**	-0.3802*	-0.3618**
$DEBT_{i,t-1}^{t+2}$	0.0287***	0.0303***	0.0439*	0.0441*	0.0181	0.0178	0.0282*	0.0482**
$SBB_{i,t-1}^{t+2}$	0.5821***	0.5780***	0.5271***	0.5315***	0.4651***	0.4785***	0.6108***	0.5959***
$D_Election_{i,t}$		-0.2568*		0.1626		-0.3905		-0.7443
$D_MC_{i,t-1}^{t+2}$		-0.1316		-0.0322		0.0951		-1.4679**
Method	FE	FE	FE	FE	FE	FE	FE	FE
Country effect	Y	Y	Y	Y	Y	Y	Y	Y
Time effect	Y	Y	Y	Y	Y	Y	Y	Y
R2 – within	0.78	0.78	0.60	0.61	0.77	0.78	0.92	0.93
N obs.	268	268	100	100	118	118	50	50

Notes: $SBB_{i,t}^{t+2}$ – structural budget balance to GDP ratio (SBB) for the year t released at $t+2$. $pos(neg)OG_{i,t}^{t+2}$ – positive (negative) OG for the year t released at $t+2$. $DEBT_{i,t-1}^{t+2}$ – government debt to GDP ratio for the year $t-1$ released at $t+2$. $SBB_{i,t-1}^{t+2}$ – SBB for the year t released at $t+2$. $D_{i,t}^{Election} = 1$ if elections took place in the year t ; $D = 0$ otherwise. $D_{i,t-1}^{MC,t+2}$ if the 3% deficit level is exceeded in the year $t-1$ based on the data reported at $t+2$; $D = 0$ otherwise. Fixed-effects (within group) regression (FE). Robust standards errors accounted for heteroskedasticity. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample period of the year t : 2007-2016.

Appendix E. Robustness check: GMM estimation

Table E1. GMM estimation for the budget planning stage

Regressand:	Reference: RE IV				Difference GMM				Orthogonal deviation GMM			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$SBB_{i,t}^{t-1}$												
$OG_{i,t}^{t-1}$	0.0515		0.0485		0.0463		0.0157		0.0731		0.0449	
$posOG_{i,t}^{t-1}$		0.1093		0.1433		-0.2255		-0.0196		0.0644		0.1622
$negOG_{i,t}^{t-1}$		0.0419		0.0356		0.1036		0.0185		0.0713		-0.0047
$DEBT_{i,t-1}^{t-1}$	0.0038*	0.0038*	0.0040*	0.0040*	-0.0001	-0.0010	-0.0147	-0.0199	0.0037	0.0037	0.0045	0.0023
$SBB_{i,t-1}^{t-1}$	0.8729***	0.8751***	0.8553***	0.8581***	0.8291***	0.8543***	0.7659***	-0.7162***	0.8204***	0.8386***	0.8094***	0.8075***
$D_{i,t}^{Election}$	-0.0052	-0.0080	-0.0071	-0.0133	-0.0006	0.0493	0.0228	0.0412	-0.0016	0.0099	0.0574	0.0648
$D_{i,t-1}^{MC,t-1}$	0.2307	0.2322*	0.0978	0.0921	0.1354	0.1741	-0.0193	-0.0777	0.1284	0.2184	0.0612	0.1622
Time effect	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y
Hansen J statistic					22.69	22.66	11.31	9.08	20.19	21.58	11.14	11.27
					(p=0.30)	(p=0.75)	(p=0.91)	(p=1.00)	(p=0.32)	(p=0.80)	(p=0.85)	(p=1.00)
AR (2)					-0.20	0.03	0.52	0.77	-0.12	-0.14	0.10	-0.03
					(p=0.84)	(p=0.98)	(p=0.60)	(p=0.44)	(p=0.90)	(p=0.89)	(p=0.92)	(p=0.98)
CLR statistic					20.50		17.66		19.48		7.38	
					(p=0.45)		(p=0.58)		(p=0.36)		(p=0.80)	
K test chi2					0.99	0.92	0.97	2.74	0.52	0.62	2.02	4.16
					(p=0.61)	(p=0.82)	(p=0.62)	(p=0.43)	(p=0.77)	(p=0.89)	(p=0.36)	(p=0.24)
N instruments	2	2	2	2	25	34	36	45	23	34	34	45
N obs.	322	322	322	322	295	295	295	295	295	295	295	295

Notes: $SBB_{i,t}^{t-1}$ – one-year-ahead structural budget balance to GDP ratio (SBB) forecasted in real time t-1. $pos(neg)OG_{i,t}^{t-1}$ – positive (negative) one-year-ahead output gap to potential GDP ratio (OG) forecasted in real time t-1. $DEBT_{i,t-1}^{t-1}$ – current-year estimate of the government debt to GDP ratio released in real time t-1. $SBB_{i,t-1}^{t-1}$ – current-year estimate of SBB released in real time t-1. $D_{i,t}^{Election} = 1$ if elections are planned for the forecasted year t; $D = 0$ otherwise. $D_{i,t-1}^{MC,t-1} = 1$ if the 3% deficit level is exceeded in the year t-1; $D = 0$ otherwise. Two-step difference generalized method of moments (GMM) and orthogonal deviation transform GMM estimation. GMM-style instruments: lagged values of $OG_{i,t}^{t-1}$ ($posOG_{i,t}^{t-1}$, $negOG_{i,t}^{t-1}$) and $SBB_{i,t}^{t-1}$ (lagged at t-2). Standard instruments: $OG_{i,t-1}^{t-1}$, its unweighted average of the whole sample, except for country i, $DEBT_{i,t-1}^{t-1}$, $D_{i,t}^{Election}$ and $D_{i,t-1}^{MC,t-1}$. Robust standard errors accounted for autocorrelation and heteroscedasticity with finite-sample correction to the covariance matrix. Hansen J statistic of the Sargan-Hansen test – under the joint H0: instruments are exogenous. AR (2): the Arellano – Bond test for residual autocorrelation in first differences to identify autocorrelation in levels; under the H0: no autocorrelation. Instrument weak identification tests: the conditional likelihood ratio test (CLR) and the Lagrange multiplier K test; under the H0 hypothesis: instruments are strongly identified. G2SLS random-effects instrumental variables (RE IV) used as a reference for comparison. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample: EU-27 countries; period of the forecasted year t: 2007-2018

Table E2. GMM estimation for the budget implementation stage

Regressand: $FE_SBB_{i,t}$	Reference: FE				Difference GMM				Orthogonal deviation GMM			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$RE_SBB_{i,t-1}$	0.9284***	0.9036***	0.7082***	0.7104***	1.2071***	1.1832***	1.1337***	1.0112***	1.6325***	1.6247***	0.5124**	1.4268***
$FE_OG_{i,t}^{mt}$	0.0582		-0.3513***		-0.1350*		-0.3152**		-0.2379*		-0.2971**	
$posFE_OG_{i,t}^{mt}$		-0.3874*		-0.2258		-0.2281		-0.0596		-0.2411		-0.1987
$negFE_OG_{i,t}^{mt}$		0.1662		-0.3926**		-0.1135		-0.3636*		-0.2340		-0.6302**
$SBB_{i,t}^{t-1}$	-0.2187***	-0.2194***	-0.2201***	-0.2207***	-0.4030***	-0.4131***	-0.3633**	-0.4508***	-0.1802*	-0.1804*	-0.2175***	-0.1413
$D_Election_{i,t}$	-0.0975	-0.1171	-0.1279	-0.1218	-0.1283	-0.1416	-0.0778	-0.1275	-0.0773	-0.0783	-0.0603	-0.0427
$RE_D_{i,t-1}^{MC}$	-0.3191	-0.3286	-0.2414	-0.2344	-0.1826	-0.1771	-0.0220	-0.0873	0.4336	0.4234	-0.3054	0.5512*
Time effect	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y
Hansen J statistic					18.46	19.36	13.05	16.18	21.93	22.08	9.73	12.17
					(p=0.56)	(p=0.50)	(p=0.84)	(p=0.65)	(p=0.24)	(p=0.23)	(p=0.20)	(p=0.79)
AR (2)					-1.37	-1.32	-0.74	-0.54	-1.51	-1.51	0.17	-1.03
					(p=0.17)	(p=0.19)	(p=0.46)	(p=0.59)	(p=0.13)	(p=0.13)	(p=0.86)	(p=0.30)
N instruments	0	0	0	0	25	26	36	37	23	24	24	35
N obs.	322	322	322	322	295	295	295	295	295	295	295	295

Notes: $FE_SBB_{i,t}$ – the current-year SBB forecast error. $RE_SBB_{i,t-1}$ – the previous-year SBB revision error. $FE_OG_{i,t}^{mt}$ – the current-year OG forecast error released in Spring. $pos(neg)FE_OG_{i,t}^{mt}$ – positive (negative) current-year OG forecast error released in Spring. $SBB_{i,t}^{t-1}$ – the one-year-ahead forecast of SBB released in real time t-1. $D_Election_{i,t} = 1$ if elections are planned for the current year t; D = 0 otherwise. $RE_D_{i,t-1}^{MC} = 1$ if the 3% deficit level is exceeded in the year t-1; D = 0 otherwise. Two-step difference generalized method of moments (GMM) and orthogonal deviation transform GMM estimation. GMM-style instruments: $FE_SBB_{i,t}$, lagged up to t-2. Standard instruments: $FE_OG_{i,t}^{mt}$ ($posFE_OG_{i,t}^{mt}$, $negFE_OG_{i,t}^{mt}$), $SBB_{i,t}^{t-1}$, $D_Election_{i,t}$ and $RE_D_{i,t-1}^{MC}$. Robust standard errors accounted for autocorrelation and heteroscedasticity with finite-sample correction to the covariance matrix. Hansen J statistic of the Sargan-Hansen test – under the joint H0: instruments are exogenous. AR (2): the Arellano – Bond test for residual autocorrelation in first differences to identify autocorrelation in levels; under the H0: no autocorrelation. Fixed-effects (within group) regression (FE) used as a reference for comparison. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample: EU-27 countries; period of the forecasted year t: 2007-2018.

Table E3. GMM estimation for the ex post stage

Regressand:	Reference: FE				Difference GMM				Orthogonal deviation GMM			
$SBB_{i,t}^{t+2}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$OG_{i,t}^{t+2}$	-0.1063**		-0.2489***		-0.0536		-0.3056***		-0.0054		-0.2223***	
$posOG_{i,t}^{t+2}$		0.0072		-0.2020**		0.2073**		-0.1007		-0.0023		-0.1837*
$negOG_{i,t}^{t+2}$		-0.2238**		-0.2831***		-0.2587**		-0.4739***		-0.0117		-0.2625***
$DEBT_{i,t-1}^{t+2}$	0.0253***	0.0241***	0.0327***	0.0303***	0.0746***	0.0725**	0.0227	0.0106	0.0391***	0.0407***	0.0254**	0.0231**
$SBB_{i,t-1}^{t+2}$	0.6501***	0.6471***	0.5779***	0.5780***	0.6854***	0.6772***	0.6209***	0.5936***	0.8189***	0.8157***	0.5555***	0.5444***
$D_Election_{i,t}$	-0.3253*	-0.2860*	-0.2702*	-0.2568*	-0.1558	-0.1737	-0.2338	-0.2054	-0.1475	-0.1478	-0.1892	-0.1861
$D_MC_{i,t-1}^{t+2}$	-0.3048	-0.3749	-0.1207	-0.1316	0.3683	0.3970	0.2378	0.1578	0.6006*	0.5990	-0.1404	-0.1685
Time effect	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y
Hansen J statistic					11.45	11.94	4.66	5.02	4.10	4.40	5.48	5.77
					(p=0.12)	(p=0.10)	(p=0.32)	(p=0.28)	(p=0.66)	(p=0.62)	(p=0.14)	(p=0.12)
AR (2)					-1.23	-1.46	0.13	0.11	-1.39	-1.39	0.32	0.37
					(p=0.22)	(p=0.14)	(p=0.90)	(p=0.92)	(p=0.16)	(p=0.17)	(p=0.75)	(p=0.71)
N instruments	0	0	0	0	12	13	21	22	11	12	20	21
N obs.	268	268	268	268	241	241	241	241	241	241	241	241

Notes: $SBB_{i,t}^{t+2}$ – structural budget balance to GDP ratio (SBB) for the year t released at t+2. $OG_{i,t}^{t+2}$ – output gap to potential GDP ratio (OG) for the year t released at t+2. $pos(neg)OG_{i,t}^{t+2}$ – positive (negative) OG for the year t released at t+2. $DEBT_{i,t-1}^{t+2}$ – government debt to GDP ratio for the year t-1 released at t+2. $SBB_{i,t-1}^{t+2}$ – SBB for the year t released at t+2. $D_{i,t}^{Election} = 1$ if elections took place in the year t; $D = 0$ otherwise. $D_{i,t-1}^{MC,t+2}$ if the 3% deficit level is exceeded in the year t-1 based on the data reported at t+2; $D = 0$ otherwise. Two-step difference generalized method of moments (GMM) and orthogonal deviation transform GMM estimation. GMM-style instruments: $SBB_{i,t}^{t+2}$, lagged at t-2. Standard instruments: $OG_{i,t}^{t+2}$ ($posOG_{i,t}^{t+2}$, $negOG_{i,t}^{t+2}$), $DEBT_{i,t-1}^{t+2}$, $D_Election_{i,t}$ and $D_{i,t-1}^{MC,t+2}$. Robust standard errors accounted for autocorrelation and heteroscedasticity with finite-sample correction to the covariance matrix. Hansen J statistic of the Sargan-Hansen test – under the joint H0: instruments are exogenous. AR (2): the Arellano – Bond test for residual autocorrelation in first differences to identify autocorrelation in levels; under the H0: no autocorrelation. Fixed-effects (within group) regression (FE) used as a reference for comparison. Significance at the 10%, 5% and 1% level is denoted as *, ** and ***, respectively. Sample: EU-27 countries; period of the forecasted year t: 2007-2016.