Is the Road to Hell Paved with Good Intentions? An Empirical Analysis of Budgetary Follow-up in the EU

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Abstract

We study the one-year-ahead budgetary projections from the Stability and Convergence Programmes of EU Member States since the start of the Economic and Monetary Union (EMU) until the start of the coronavirus crisis. We consider first budget-balance errors, which we then split into expenditure and revenue errors. Next, we split the latter two into "base", "growth" and "denominator" effects. The most important explanatory variable is the GDP growth error: more optimism in GDP growth projections produces more optimistic budgetary projections. This effect goes beyond a mechanical denominator effect on spending and revenues as shares of GDP; it also works through the numerator of these ratios. Our findings may call for delegating the construction of output projections to adequately equipped national independent fiscal institutions. Finally, we explore how independent fiscal institutions shape projection errors. Those with high media impact producing or assessing the macroeconomic forecast appear to lead to actual budgetary improvement relative to projections.

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1. Introduction

Accurate macroeconomic and budgetary projections are crucial for the fiscal instrument settings by the government and for the confidence of the private sector, and the financial markets in particular, in a country's public finances. Using the Stability and Convergence Programmes of 27 European Union (EU) countries since 1999,[1] we explore the errors in national budgetary projections and their driving factors. We focus on the so-called "first-release errors", i.e. the difference between the observation one year before and one year after the reference period. These need to be distinguished from the "*ex-post* errors", the latest vintage's value minus that in the year preceding the reference period. An advantage of using the first-release instead of *ex-post* errors is that the former compare values that are better comparable in terms of methodology than the values making up the *ex-post* errors, as methodological changes may gradually cumulate over time. Another advantage is that first-release errors form the basis for the real-time monitoring by the fiscal authorities and financial markets.

The contributions of this paper are the following: (1) we deploy the largest comprehensive dataset used so far for the purpose of exploring budgetary follow-up in the EU, covering the full available set of EU countries over the period since the start of the Economic and Monetary Union (EMU) until just before the coronavirus crisis; (2) this allows us to also consider sub-sample periods; (3) we analyse the driving factors of the components of the budget balance errors, namely the errors in revenues and expenditures, which we then decompose further into "base", "growth" and "denominator" effects. This decomposition gives a clearer perspective on the sources of the projection errors.

We find that the most important explanatory variable of the first-release budget error, as well as its components, is the first-release (real) GDP growth error. The result can be explained by the fact that budgetary projections are based on projections of economic growth and, the more optimistic (pessimistic) economic growth projections are, the more optimistic (pessimistic) budgetary projections can be. Further, we find that the first-release errors are quite persistent. However, the persistence is substantially larger during the first phase in the sample than during the second phase, potentially a result of improved scrutiny of the forecasts over last decade. The fact that over the second part of our sample Stability and Convergence Programmes were already submitted in April (instead of in the fall) may have contributed to this. In line with the intention of the European Semester, the earlier submission may have put pressure on governments to prepare for policies that are later validated through the formal budget for the coming year. Finally, we explore how the institutional setting, captured by the European Commission's Fiscal Rule Index, the Scope Index of Fiscal Institutions, the Medium-Term Budgetary Framework Index as well as by data on the features of existing independent fiscal institutions (IFIs) from the IMF Fiscal Council Dataset (2016), affects the first-release budget error. The presence of an

[1] Given the period covered, the EU 27 contains all current EU Member States with the exception of Croatia, but still including the United Kingdom.

IFI with high media impact producing or assessing the macroeconomic forecast appears to lead to actual budgetary improvement relative to projections.

The role of the first-release GDP growth error may yield some important policy lessons. Our results demonstrate that institutional settings generating more accurate GDP growth projections should also generate more accurate budgetary projections. More accurate GDP growth projections will lead to budgets subject to fewer corrections during implementation and afterwards, hence more budgetary stability, which should be conducive in terms of efficient allocation of public and private resources. More accurate budgeting also benefits a government's standing in the financial markets, which dislike erratic fluctuations in budgetary implementation.

How can GDP growth projections potentially be improved? In euro area countries, the "two-pack" reform of the Stability and Growth Pact requires these projections to be produced by an independent institution or to be endorsed by such an institution. While only a few countries use it, the former is preferable for various reasons. First, rejecting a budget is not done lightly, hence the government may exploit the wiggle room given by the independent institution. Second, based on the information it has, a truly independent fiscal institution is likely to provide an unbiased projection of GDP growth. Obviously, growth will generally turn out to differ from its projection, but on average the projection will be roughly correct. Third, mandating an IFI with the construction of the macro-projections, it will acquire the necessary analytical capacity, which will also benefit its other work.

This paper links to other papers studying the quality of macro and budgetary forecasts, many of them focusing on the EU or the euro area. Examples are Strauch *et al*. (2004), Brück and Stephan (2006), Jonung and Larch (2006), Beetsma *et al*. (2009), Frankel (2011), Pina and Neves (2011), Cimadomo (2012), Beetsma *et al*. (2013a,b), De Castro *et al*. (2013), Frankel and Schreger (2013), Gupta *et al*. (2017) and Flores *et al*. (2021). Several contributions investigate how fiscal rules, political factors and budgetary institutions influence the quality of the fiscal projections. Debrun *et al*. (2008) explore the role of national fiscal rules in EU countries. Von Hagen (2010) explores the role of institutions in sticking to fiscal plans. More specifically, Gilbert and De Jong (2017) find evidence of budgetary over-optimism for euro area countries whose budget deficits risk to exceed the 3% reference value, while no such effect is found for non-euro area countries. Merola and Pérez (2013) compare fiscal forecasting of governments and international institutions, and indicate that the information disadvantage of the latter inhibits their forecasting performance. This leads them and other studies mentioned above to suggest national IFIs as the natural candidate for fiscal forecasting.[2] Debrun and Kinda (2017) find that well-designed IFIs are associated with more accurate macroeconomic and budgetary forecasts. Gootjes and De Haan (2021) show that, although fiscal plans are a-cyclical, their realizations are pro-cyclical. Fiscal rules reduce such pro-cyclicality (see also Larch *et al*., 2021).

[2] For an overview of the IFIs in the different EU member states and the role they have played in their early years of operation, see Jankovics and Sherwood (2017). See also Horvath (2018). Beetsma *et al*. (2022) analyse how IFIs can enhance fiscal transparency.

Beetsma *et al*. (2019) find for the EU that in the presence of an IFI fiscal forecasts are more accurate and potentially less optimistic. We extend the existing literature by using a more comprehensive dataset and decomposing the revenue and expenditure errors into their components, allowing to account for the mechanical ("denominator") effects of GDP growth errors on budget forecast errors.

The remainder of this paper is organized as follows. Section 2 presents the dataset, of which a descriptive analysis is provided in Section 3. Section 4 conducts the econometric analysis on the budget balance errors, while Section 5 analyses the decomposition of the latter into their components. Section 6 turns to the role of the IFIs. Finally, Section 7 concludes the paper.

2. The Data

The core of our data are the Stability and Convergence Programmes (SCPs) of 27 EU countries over the period 1998-2020. Each country submits a Stability Programme if it is a member of the euro area and a Convergence Programme if it is not a member of the euro area. In the past, these programmes had to be submitted in the fall of the year. Since 2011 they are submitted as part of the European Semester between mid and end April. This change was meant to strengthen multilateral fiscal surveillance at the EU level by asking member states to share budgetary plans earlier in the year and to allow the Commission and the Ecofin Council to put pressure on governments to correct policies that go astray.

The SCPs contain information on the budget balance, public expenditures, public revenues, public debt, interest payments nominal and real GDP and inflation. Reported are last-year values (first-release), current-year values (nowcast) and projections for at least the first three years into the future. The advantage of using the SCPs for the current study is their broad coverage and the fact that the figures are comparable across countries, because the reporting requirements are the same and the figures are vetted by Eurostat.

Besides the SCPs, we obtain *ex-post* (i.e. latest available) figures from the European Commission's AMECO database. These *ex-post* figures may for various reasons differ substantially from the earlier real-time figures. In particular, new information may become available after publication of the latter, which may lead to an adjustment of the original real-time figures. Figures may also be subject to revision because of changes in the methodology to construct them (Beetsma *et al*., 2013a).

Further, we obtain the Fiscal Rule Index from the European Commission (2020). Its construction is described in e.g. Debrun *et al*. (2008). It combines both the strength and coverage of all rules in existence, which could apply different government sectors or levels. Strength is based on (1) the statutory or legal base of the rule (the highest score being for a constitutional one); (2) the body that monitors the rule (an independent authority or the national parliament achieves the highest score); (3) the body that enforces the rule (again, an independent authority or the national parliament achieves the highest score); (4) the enforcement mechanism (automatic corrections and sanctions for non-compliance achieve the highest score); and (5) visibility in the media. Then strength is weighted by the share of general government finances covered by the rule and, finally, the resulting weighted scores are aggregated over all rules present. In case multiple rules apply to the same general government sub-sector their weights, except for that of the strongest, are halved.

We also obtain the Medium-term Budgetary Frameworks Index from the European Commission (2021). The index captures five dimensions, comprising the coverage and the level of detail of the targets or ceilings included in medium-term fiscal plans, the connectedness between these and the annual budgets, and the degree to which the parliament and IFIs are involved in the preparation of fiscal plans.

Turning to data relative to fiscal institutions, we obtain both the IMF Fiscal Council Dataset (2016) and the European Commission's (2021) Scope Index of Fiscal Institutions (SIFI). Through the IMF Fiscal Council Dataset we obtain time-varying information on key features of the existing fiscal councils, including on whether they produce or assess the macroeconomic forecasts used in the budgetary process, on their media impact, and on formal guarantees for their independence. The SIFI is instead an index produced by the European Commission since 2015. It is based on six groupings of the tasks of fiscal institutions: monitoring of compliance with fiscal rules, macroeconomic forecasting, budgetary forecasting and policy costing, sustainability assessment, promotion of fiscal transparency and normative recommendations on fiscal policy.

Finally, we obtain data on political variables from Armingeon *et al*. (2020), a widely used and regularly updated comprehensive dataset containing a large number of political variables. The dataset allows us to obtain information on changes in government,[3] government fragmentation, the political leaning of the government and changes in government ideological composition.

For fiscal measures and GDP growth measures published in different vintages, we can extract the following variables from the available data (where the subscript is the year to which the variable applies and the superscript is the vintage, i.e. the year in which the variable is published):

x_t^t : the *nowcast* is the (preliminary) value of x in t reported in vintage t.
x_t^{t+1} : the *first-release* value of x in t reported in vintage $t+1$.
$x_t^{t-\tau}$: the projection of x in t reported in the vintage τ years prior (i.e., the τ-years ahead forecast).
x_t^f : the *final* or *ex-post* value of x in t reported in the latest available vintage of the data.
$x_t^{t+1} - x_t^{t-1}$: first-release forecast error.

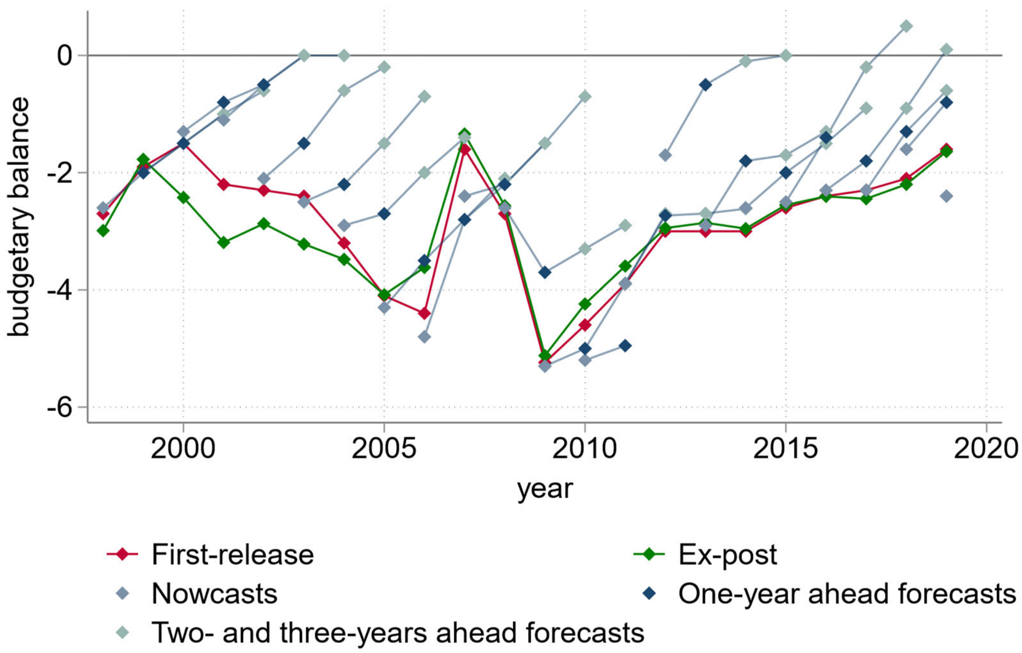
Fiscal variables are presented in percent of GDP, unless noted otherwise.

[3] We worked with government changes and not also with elections as early results showed that the same results were obtained when using either elections or government changes.

3. Descriptive analysis

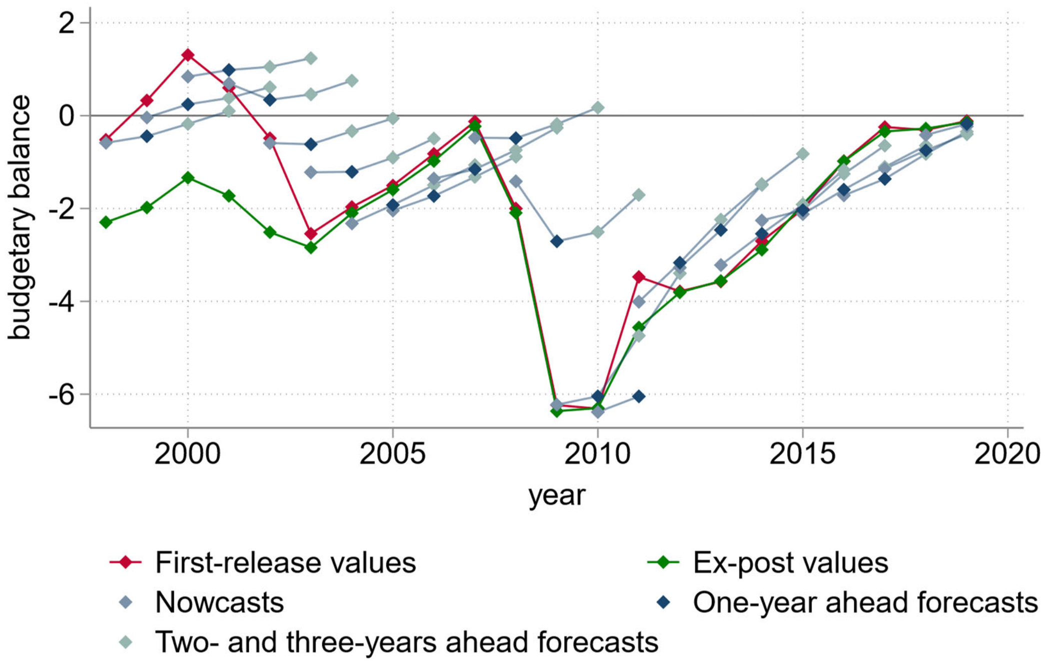
This section provides a descriptive analysis of the EU projection errors. Figure 1a depicts for Italy for each sample year t in blue the nowcast bb_t^t and the one-, two- and three-years ahead forecasts (bb_{t+1}^t, bb_{t+2}^t and bb_{t+3}^t) all taken from the SCP vintage year t, and in red the first-release value of the budgetary balance, bb_t^{t+1}, taken from the SCP vintage year $t+1$. The vertical difference between the red diamond and the dark blue diamond is the first-release forecast error in the budget balance. The figure clearly shows the good intentions embedded in the SCPs. Typically, the projected path of the budget balance exhibits an upward trend, indicating that the government becomes more ambitious about the budget balance the further out in time. This confirms an observation already made in earlier work (Beetsma *et al*., 2009). Comparing the projections into the future with the first-release values in the different years, the figure shows that the latter systematically fall below the earlier projections for the same year, indicating that the government's reported ambitions are not fulfilled. This is also the case when the comparison is made with the *ex-post* figures, which are depicted in green. Comparable figures conveying the same message can be constructed, for example, for Belgium and Portugal. While the pattern seen for Italy is less pronounced for the average EU member, especially in recent years, we still see a systematic pattern of increasing ambitions for the budget balance the further out is the projection (Figure 1b). We also see that the ambitions are often missed in a negative direction.

Figure 1a: Budget balance projections, first-release and *ex-post* for Italy



Notes: nowcasts are the figures reported in the reference year, first-release figures are reported in the year after the reference year, one-year (two-year, three-year) ahead forecasts are constructed in the year (two years, three years) preceding the reference year and the *ex-post* figures are the figures reported for the reference year in the most recent data vintage used.

Figure 1b: Budget balance projections, first-release and *ex-post* averaged over EU countries



Notes: see *Notes* to Figure 1a.

In the sequel we will work with first-release instead of *ex-post* figures. One reason is that in terms of methodology first-release date are closer to the original projections than are *ex-post* values. Another reason is that under EU fiscal surveillance any decision involving possible procedural steps is typically taken on the basis of first-release data. Finally, we can observe that with the exception of the first few years of our sample, first-release values are very close to *ex-post* figures.

To offer some further perspective on potential biases in the budget balance projections, Figure 2a depicts by country the averages, and the 95% confidence intervals around these averages,[4] of the first-release forecast errors for the budget balance, defined as $bb_t^{t+1} - bb_t^{t-1}$, over the full sample period. Note that, adopting this definition, an over-optimistic forecast will result in a negative forecast error, as the first-release value of the budgetary balance will be lower than the one-year ahead forecast (and *vice versa* for an over-pessimistic forecast). It is interesting to see that the average error across all the countries is very close to zero. Hence, in contrast to a somewhat widely held view, we find in the aggregate no over-optimism bias of EU countries.[5] However, it is true that at the level of individual

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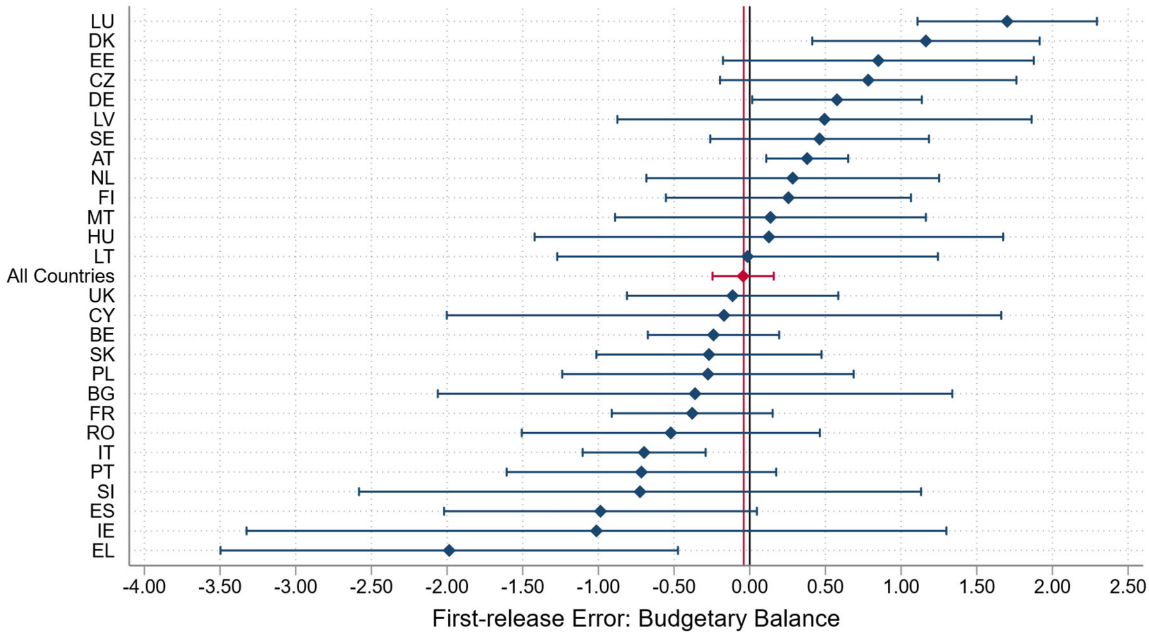
[4] Specifically, confidence intervals have been created as the interval of plus/minus 1.96 standard errors around the mean.

[5] This result does not mean forecast errors are irrelevant from the EU perspective – recall the initial gross underestimation of the 2009 Greek budget deficit, which marked the start of the unrest in the euro area sovereign debt market, eventually resulting in the euro area debt crisis. Budgetary policy remains a prerogative of member states where systematic policy mistakes may spill over to other countries and affect the stability of the economic union as a whole.

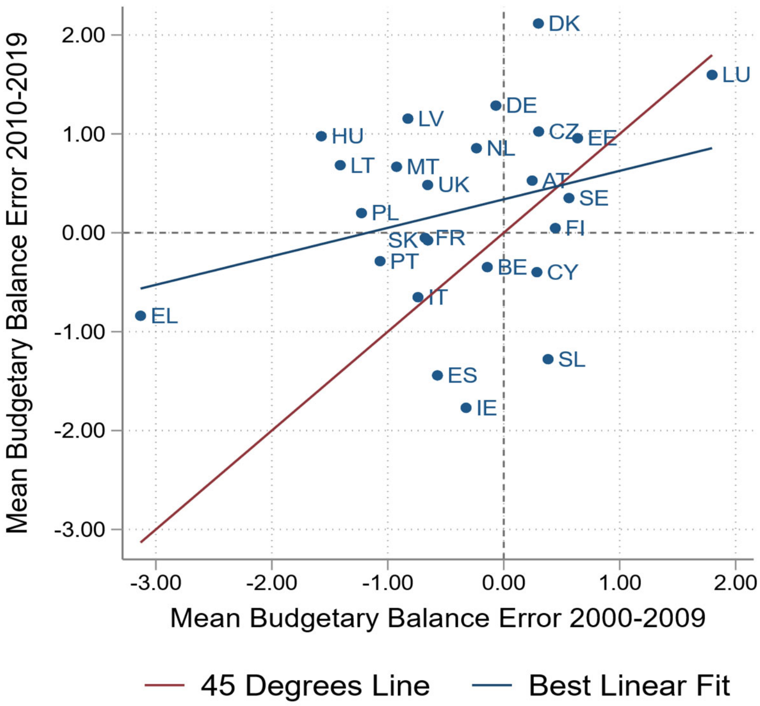
countries there may be systematic over-optimism or over-pessimism. Most systematically over-pessimistic is Luxemburg, which is too gloomy by on average 1.75% of GDP. Most systematically over-optimistic is Greece, which is over-optimistic by 2% of GDP on average. It should be noted though that not many of these averages are significant, due to the rather wide confidence intervals around the averages. One might wonder to what extent the pattern in Figure 2a is driven by the crisis years 2009 – 2012. Large, negative first-release forecasts errors are observed in particular in 2009, while in 2011 the average error is positive and quite large. However, leaving out these years results in a pattern that is still similar to that in Figure 2a (see Appendix D). Splitting the sample period into the two sub-periods 1999-2008 and 2009-2019, we observe that the first subperiod is characterized by an average degree of over-optimism, while the second sub-period is characterized by an average degree of over-pessimism. Both averages are quite small, though. Figure 2b plots by country the average over-optimism in the second sub-period against that in the first sub-period. There is a positive relationship in over-optimism between the two sub-periods, but it is far from perfect. A diehard in terms of conservatism is Luxemburg, while Greece is a diehard in terms of over-optimism.

Fig. 2a: Averages and Stand. Dev. First-Release Forecast Errors Budget Balance (1999-2019)



Notes: AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czech Republic, DE = Germany, DK = Denmark, EE = Estonia, EL = Greece, ES = Spain, FI = Finland, FR = France, HU = Hungary, IE = Ireland, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = the Netherlands, PL= Poland, PT = Portugal, RO = Romania, SE = Sweden, SI = Slovenia, SK = Slovakia, UK = United Kingdom.

Fig. 2b: Averages First-Release Forecast Errors Budget Balance



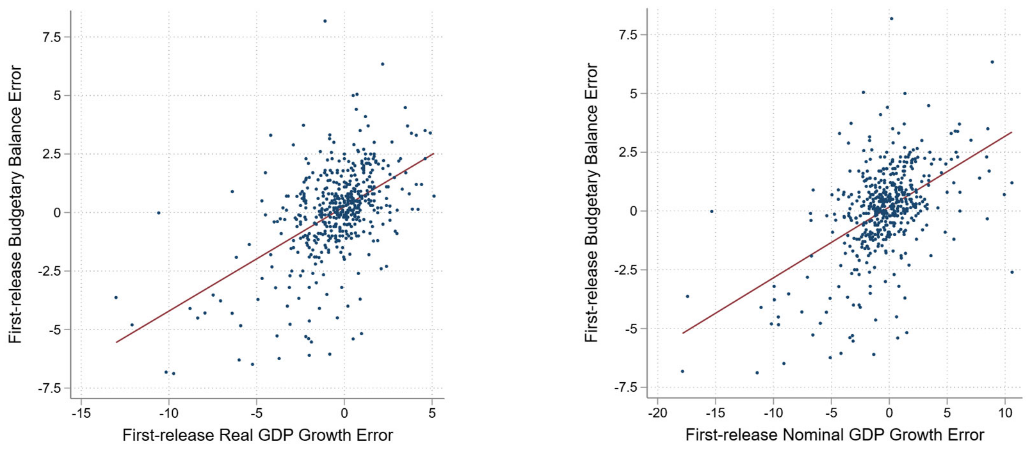
Notes: see *Notes* to Figure 2a.

An obvious question is to what extent systematic biases in budget balance projections may be explained by systematic biases in GDP growth projections: the logic is that governments plan their taxes and expenditures on the basis of projected GDP growth. If the growth projection is over-optimistic, then realized tax revenues will on average fall short of projected revenues, leading to a negative first-release budget balance error. Even if GDP growth projections are unbiased, budgetary forecast errors could be systematically biased if the government uses a systematically too high revenue elasticity. A projected increase in GDP growth would then result in an exaggerated projected increase in revenues.[6] Figure 3(a) shows a scatter plot of the relationship between the first-release budget balance error and the first-release real GDP growth error. As expected, the two errors are positively correlated. Figure 3(b) depicts the corresponding figure with nominal GDP growth, which exhibits a similar pattern. Hence, the main conclusion is that budgetary and GDP growth errors are closely connected, a result that will emerge also from our econometric analysis below.

[6] Use of a too high revenue elasticity raises the average absolute value of the budget balance forecast error, not the average value itself when projections of GDP growth are unbiased. Above-average growth then produces a too high revenue forecast, while below-average growth produces a too low forecast.

Figure 3: Scatter plots of first-release errors in the budgetary balance and in GDP growth

(a) Real GDP growth **(b) Nominal GDP growth**



Notes: the figure excludes three data points, namely Greece in 2009, Ireland in 2010 and Slovenia in 2013. In these instances, the countries recorded a first-release error in the budget balance of respectively -9.8%, -20.8% and -12.2%.

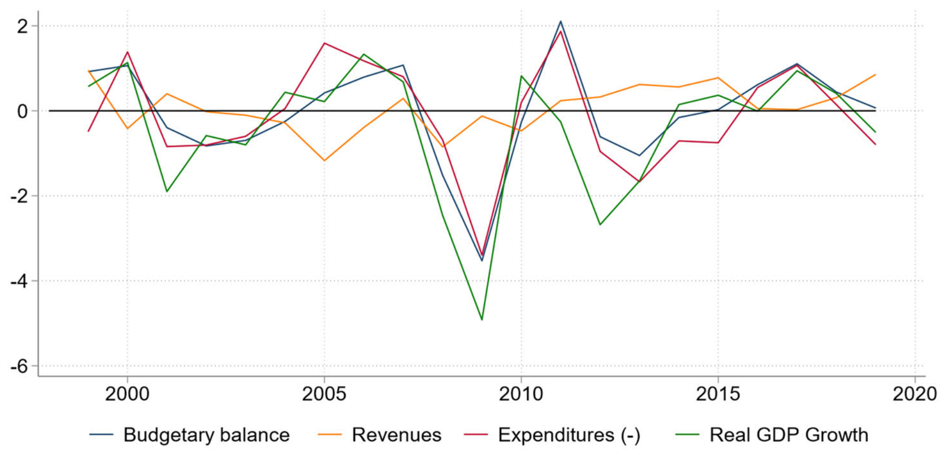
In the sequel, we will also analyse the decomposition of first-release budget balance errors into first-release revenues and spending errors. Hence, Table 1 reports the variance-covariance matrix of the first-release error in the budget balance, the first-release error in revenues, $rev_{i,t}^{t+1} - rev_{i,t}^{t-1}$, and the negative of the first-release error in expenditures, $exp_{i,t}^{t-1} - exp_{i,t}^{t+1}$. The variance of the first-release spending errors is higher than that of the budget balance, which in turn is higher than that of revenues. The positive covariance between the first-release budget balance and the first-release revenues error indicates that when actual revenues exceed their projection this contributes to the budget balance exceeding its projection. Similarly, the positive covariance between the first-release budget balance and the negative of the first-release spending error indicates that when actual spending falls short of its projection, this also contributes to the budget balance exceeding its projection. Spending errors contribute most to the budget balance errors, which is clear from its co-variance with the budget balance error being about four times higher in absolute magnitude than the covariance of the budget balance and the revenues error. A plausible explanation for this larger role of spending errors is that spending is relatively insensitive to unforeseen changes in the business cycle (see Larch and Salto, 2005). Most spending growth is pre-determined through benefit programs and other commitments and will not react, at least not in the short run, to an unexpected change in GDP growth. Hence, a slowdown in growth, or even negative growth, will lead to an increase in the spending ratio of GDP and, because revenues are strongly correlated with growth, produce a deterioration of the budget balance as a share GDP. In a way, the higher covariance of the spending error with the budget balance error is a reflection of the role of the automatic stabilizers. Finally, the negative entry in the table indicates a positive covariance between the revenues and the spending errors. Hence, if actual spending exceeds its projection, then actual revenues tend to exceed their projection, and *vice versa*. The mechanism could run from spending towards revenues: actual spending exceeding its projection would lead revenues to be raised above their projection. *Vice versa*, deviations of actual revenue from their projection could drive spending adjustments. First, through a spending reduction governments may try to make up for a budgetary shortfall caused by a revenue shortfall. Second, windfall revenues may not be used for building buffers, but lead to more spending. We find that the covariance between the errors in revenues and expenditures is -3.71 when the forecast error in the budget balance is positive and -2.97 when the error is negative or equal to zero. The larger absolute size of the covariance when the budget balance error is positive suggests that revenues might be a stronger driver of spending when the former exceed their forecast than when they fall short of their forecast. Leaving out the crisis years 2009 – 2012 yields a qualitatively similar variance-covariance matrix, but the variance of the budget balance error is smaller now and so are (in absolute terms) the covariances between the budgetary balance error and the expenditures error and between the budget balance error and the revenues error. However, the contribution to the variance in the budget balance error is still dominated by the covariance between the budgetary balance error and the expenditures error (see Appendix D).

Table 1: Variance-covariance matrix of the first-release errors

First-release error	*Budgetary balance*	*Revenues*	*Expenditures (-)*
Budgetary balance	5.18	1.12	4.05
Revenues		4.13	- 3.01
Expenditures			7.04

To close this section, Figure 4 depicts the average first-release errors in the budget balance, revenues, (minus) expenditures and real GDP growth over time. The average first-release error in the budget balance is closely tracked by the average first-release error in (minus) spending, but less closely by the first-release error in revenues, in line with the much higher covariance between the budget balance error and the negative of the spending error than between the budget balance error and the revenues error. The strong relationship between the budget balance error and the negative of the spending error is particularly striking during the global finance crisis (GFC) in 2009. As already pointed out, it illustrates the operation of the automatic stabilizers, rather than a mistake in planning: when GDP falls sharply compared to its forecast, spending plans are not adjusted or are adjusted with a delay, while revenues decline broadly in line with actual GDP. We can also observe a positive correlation between the budget balance error and real GDP growth error. The commonality between the two is particularly strong during the GFC in 2009.

Figure 4: Average first-release errors in the budget balance, revenues, (minus) expenditures and real GDP growth over time



Notes: The figure displays the evolution over time of the average first-release errors across all countries. The error in expenditures is multiplied by (-1), so that all data points below zero indicate that on average the forecasts in question were over-optimistic (as the first-release values of revenues and expenditures were respectively below or above the forecast values).

4. Econometric analysis of budget balance errors

In this section we turn to our econometric analysis of the first-release errors of the budget balance. To this end, we estimate models of the general format:

$$bb_{i,t}^{t+1} - bb_{i,t}^{t-1} = \alpha_i + \beta_t + \delta_1\left(bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}\right) + \delta_2\left(bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}\right) + \delta_3(y_{i,t}^{t+1} - y_{i,t}^{t-1}) + \delta_4 d_{i,t-1}^{t-1} + \delta_5 fri_{i,t-1} + \delta_6 govchan_{i,t} + \delta_7 govtype_{i,t-1} + \varepsilon_{it} \quad (1)$$

in which the first-release error of the budget balance is regressed on a country-specific constant α_i, a time-fixed effect β_t, the lag of the first-release error, $bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}$, the lagged projection of the change in the budget balance, $bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$, the first-release error in real GDP growth, $y_{i,t}^{t+1} - y_{i,t}^{t-1}$, the debt-to-GDP ratio $d_{i,t-1}^{t-1}$ at the moment the budgetary projection was made, the European Commission's fiscal rule index, $fri_{i,t-1}$, the number of government changes, $govchan_{i,t}$, and the government type, $govtype_{i,t-1}$. This latter variable increases in government fragmentation, from 1 (single-party majority), to 5 (multi-party minority) and then to 7 (technocratic government). We include the fiscal rule index, because *a priori* one would expect that tighter fiscal rules would go along with tighter monitoring of budgetary policy, reducing opportunities for deviations from budgetary plans. Government changes, by contrast, increase the likelihood of a break with existing commitments. This is also the case for more government fragmentation, which gives rise to stronger incentives to deviate from existing commitments by giving in to demands from dissident factions in order to keep them on board of the government. We experimented with a much broader set of political variables. However, other political variables turned out not to play any role and, hence, in the following we do not include them in the analysis – see also below.

Table 2 reports the estimates for specific variants of (1). Estimation is via OLS or IV to instrument the real GDP growth error, with standard errors clustered at the country level. The most parsimonious variant is reported in Columns (1) and (2), and leaves out the political variables. Column (1) is based on OLS, and Column (2) on IV, because a feedback from the first-release budget balance error onto the first-release real GDP growth error cannot be excluded: an unanticipated fiscal expansion could lead to an unanticipated increase in real growth. In the case of IV, we instrument the forecasting error in real GDP growth for a given country with the average forecast error in real GDP growth in all the other countries (*j*) in the sample in the same year (i.e., the variable $\bar{y}_{j,t}^{t+1,t-1}$). The differences in the estimates between the two columns are extremely small. The lagged dependent variables are highly significant with a coefficient of 0.14, a value sufficiently low to suggest that the standard dynamic-panel bias is rather small.[7] The first-release error in real GDP growth enters with a coefficient of around 0.26, which is highly significantly different from zero. An improvement of real growth relative to its projection in $t-1$ of 1 % - point improves the budget balance by more than a quarter of a percentage point relative to the projection. An increase in the debt-to-GDP ratio by 1 % - point improves the first-release error by 2.3 basis points, a highly significant effect. Column (3) replaces the first-release error in real GDP growth with that in nominal GDP growth, $yn_{i,t}^{t+1} - yn_{i,t}^{t-1}$. The coefficient estimates on the retained variables remain roughly identical. The coefficient on the first-release error in nominal GDP growth is highly significantly different from zero, though in size about two-thirds of that on first-release error in real GDP growth.

Columns (4) and (5) add the fiscal rule index and the political variables to the baseline specification in Columns (1) and (2).[8] The data used in these specifications is restricted to the time period 2000-2018, as the variable $govchan_{i,t}$ is available only up to 2018 (Armingeon *et al*., 2020). Again, OLS and IV yield very similar estimates. In addition, the coefficient estimates remain close to those reported in Columns (1) and (2). An increase in the fiscal rule index seems to increase over-

[7] In order to formally test the potential relevance of the Nickell bias for our dynamic panel specification, we also implemented the bias-corrected estimates suggested by Bruno (2005), who derives the Nickell bias approximation formulas to accommodate unbalanced panels. The resulting estimates of the above-specified models for the budgetary balance and real GDP growth forecast errors are very similar to the baseline results we document in this section.

[8] The Armingeon *et al*. (2020) database contains a wide range of political variables. In addition to the variables for which we present the results here, we also tried specifications with elections in periods t-1 and t+1, a dummy equal to one in the case of a new government with a different ideological composition than the previous incumbent government (to capture the idea that a government of a different political leaning could be less keen to stick to the fiscal plans of the incumbent government), and an index for the government political color (left-right). We added one-by-one the candidate political variables to the baseline model for the budget balance error and retained only the variables for which the coefficients were statistically significant or close to statistical significance.

optimism. Some caution is warranted though: an increase in the index should not necessarily be read as a strengthening of the fiscal rules. In addition the effect of the fiscal rule index could be to bring first releases and forecasts more in line with each other. A change in the government between periods $t-1$ and t results into a worsening in the first-release budget balance relative to the projection, possibly because once elected a new government immediately takes policy actions leading to a deviation from the previous government's plans. In particular, the new government may want to honour spending promises to its constituency. A more fragmented government produces a deterioration of the first-release error. Plausibly, a more fragmented government makes more demands on the public budget to keep all factions satisfied, resulting into an over-optimism bias to generate the necessary budgetary room. In view of the fact that IV gives results very similar to OLS, while IV is more defendable because of the risk of feedback effects, in the following we continue our estimations with IV only.

Table 2: First-release budget balance error, $bb^{t+1}_{i,t} - bb^{t-1}_{i,t}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$bb^{t}_{i,t-1} - bb^{t-2}_{i,t-1}$	0.143***	0.142***	0.146***	0.122***	0.121***	0.168***	0.275***	0.035	0.426***	-0.027
	(0.031)	(0.031)	(0.031)	(0.036)	(0.036)	(0.032)	(0.101)	(0.033)	(0.089)	(0.034)
$y^{t+1}_{i,t} - y^{t-1}_{i,t}$	0.259***	0.265***		0.265***	0.274***	0.313**	0.269***	0.254***	0.371***	0.463***
	(0.065)	(0.067)		(0.071)	(0.074)	(0.133)	(0.045)	(0.093)	(0.075)	(0.179)
$yn^{t+1}_{i,t} - yn^{t-1}_{i,t}$			0.162***							
			(0.039)							
$bb^{t-1}_{i,t} - bb^{t-1}_{i,t-1}$	-0.203***	-0.203***	-0.200***	-0.233***	-0.233***	-0.275*	0.270	-0.150**	0.242	-0.058
	(0.075)	(0.075)	(0.076)	(0.083)	(0.083)	(0.164)	(0.237)	(0.067)	(0.229)	(0.143)
$d^{t-1}_{i,t-1}$	0.023***	0.023***	0.022***	0.026***	0.026***	0.021***	0.072***	0.048***	0.051**	0.042*
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.026)	(0.017)	(0.022)	(0.022)
$fri_{i,t-1}$				-0.340*	-0.343*					
				(0.205)	(0.205)					
$govchan_{i,t}$				-0.464**	-0.464**					
				(0.186)	(0.186)					
$govtype_{i,t-1}$				-0.124**	-0.124**					
				(0.056)	(0.056)					
N	458	458	457	432	432	296	189	269	147	149
R2	0.472	0.472	0.487	0.496	0.496	0.50	0.714	0.389	0.739	0.4
Adjusted R2	0.407	0.407	0.418	0.429	0.429	0.42	0.639	0.285	0.68	0.267
N. of countries	27	27	27	27	27	15	27	27	15	15
Time period	2000-2019	2000-2019	2000-2019	2000-2018	2000-2018	2000-2019	2000-2009	2010-2019	2000-2009	2010-2019
Estimation method	OLS	IV	IV	OLS	IV	IV	IV	IV	IV	IV

Notes: Standard errors are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. Time and country fixed effects are included in all specifications (although the estimates are not reported), N = number of observations, N. of countries = number of countries.

Finally, Column (6) reruns the regression in Column (2) on the subsample of the first fifteen EU member countries. The new estimates are generally close to those in Column (2). The negative coefficient on $bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$ increases a bit in absolute magnitude, but becomes statistically less significantly different from zero.

Next, we turn to the subsample periods. We split the full sample into the subperiods 2000 – 2009 and 2010 – 2019. The former is the period preceding the GFC and the period of the severe downturn caused by the GFC. The second subperiod contains the recovery from the GFC, the euro area debt crisis and the revisions of the EU fiscal framework with the two- and the six-pack. The second subperiod ends just before the corona crisis. We consider both the full set of 27 sample countries and the subset of the first 15 EU member states. There are some interesting differences between the two sub-periods. First, the lagged dependent variable is positive and (highly) significant during the first subperiod and insignificant during the second subperiod. Second, the projected improvement in the budget balance $bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$ exerts a significantly negative effect only during the second sub-period when considering all 27 countries. Overall, the comparison between the two subperiods suggests that the first-release budget errors have a somewhat less systematic character during the second period than during the first period. Appendix A depicts in more detail the evolution over time of the coefficient estimates for a rolling estimation window of 10 years. There is a gradual decline in the importance of the lagged first-release budget balance error and a somewhat steep reduction in the coefficient of the projected improvement in the budget balance early on. The coefficient on the real output growth error is very stable over time, which emphasizes the role of this error for the budget balance error. The coefficient on the debt ratio starts as positively significantly different from zero, then declines and after that increases to stay positive and significantly different from zero. The confidence interval around its coefficient tightens sharply during the second part of the sample.

An important determinant of the first-release budget balance error is the first-release real GDP growth error. Because of the relevance of this variable, it is useful to get a handle on what could drive it, and for this purpose we use similar controls as in the model for the first-release budget balance errors. Table 3 reports the estimates of variants of the following regression framework:

$$y_{i,t}^{t+1} - y_{i,t}^{t-1} = \alpha_i + \beta_t + \delta_1\left(y_{i,t-1}^{t} - y_{i,t-1}^{t-2}\right) + \delta_2 y_{t-1}^{t-1} + \delta_3(y_{i,t}^{t-1} - y_{i,t-1}^{t-1}) + \delta_4 d_{i,t-1}^{t-1} + \delta_5 fri_{i,t-1} + \delta_6 govchan_{i,t} + \delta_7 govtype_{i,t-1} + \varepsilon_{it} \quad (2)$$

The first lag always exerts a highly significant positive effect, hence there is substantial persistence in the first-release error of real GDP growth. The persistence is higher than that for the first-release error of the budget balance. The real GDP growth rate at the moment the projection is made, y_{t-1}^{t-1}, is always significantly negative suggesting that higher growth at the moment the forecast is made leads to more over-optimism in the forecast, possibly because the forecasters extrapolate to good or bad momentary performance of the economy. Including instead the projected change in the real GDP growth rate, $y_{i,t}^{t-1} - y_{i,t-1}^{t-1}$, we find that this variable exerts a strong positive effect on the first-release GDP error. The fiscal rule index and the debt ratio play no role, however. Neither do the political variables, which suggests that the coefficients of these variables reported in Table 2 capture their full effect on the budget balance forecast errors.

Table 3: First-release forecast error in real GDP growth ($y_t^{t+1} - y_t^{t-1}$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$y_{t-1}^{t} - y_{t-1}^{t-2}$	0.522***	0.394***	0.515***	0.520***	0.521***	0.733***	0.328***
	(0.116)	(0.091)	(0.120)	(0.122)	(0.119)	(0.223)	(0.066)
y_{t-1}^{t-1}	-0.328***		-0.323***	-0.321***	-0.330***	-0.446**	-0.266***
	(0.103)		(0.106)	(0.111)	(0.103)	(0.195)	(0.073)
$y_t^{t-1} - y_{t-1}^{t-1}$		0.291**					
		(0.136)					
$fri_{i,t-1}$			0.187*				
			(0.111)				
$d_{i,t-1}^{t-1}$				0.001			
				(0.007)			
$govchan_{i,t}$					-0.051		
					(0.126)		
$govtype_{i,t-1}$					0.113		
					(0.084)		
N	460	460	460	458	434	191	269
Adjusted R2	0.585	0.564	0.586	0.583	0.589	0.681	0.531
N. of countries	27	27	27	27	27	27	27
Period	2000-2019	2000-2019	2000-2019	2000-2019	2000-2018	2000-2009	2010-2019

Notes: Estimates are obtained with OLS, with standard errors clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. Time- and country-fixed effects are included in all specifications (although the estimates are not reported), N. of countries = number of countries.

5. Decomposing first-release budget balance errors

In this section we try to dig deeper into the driving factors behind the components of the first-release budget balance errors. We do this in two steps. First, we start by splitting the first-release budget balance errors into first-release revenues and spending errors. Then, we turn to more closely investigating the components of these errors.

5.1 First-release errors in revenues and spending

We can write the first-release budget balance error as the first-release revenues error minus the first-release spending error, i.e. $bb_{i,t}^{t+1} - bb_{i,t}^{t-1} = \left(rev_{i,t}^{t+1} - rev_{i,t}^{t-1}\right) - \left(exp_{i,t}^{t+1} - exp_{i,t}^{t-1}\right)$, each of which we can then analyse separately. Here, $rev_{i,t}^{\tau}$ stands for the revenues – GDP ratio and $exp_{i,t}^{\tau}$ for the spending – GDP ratio. The format of the regressions is the similar to that of equation (1), replacing $bb_{i,t}^{t+1} - bb_{i,t}^{t-1}$ as outcome variable by $rev_{i,t}^{t+1} - rev_{i,t}^{t-1}$ or $exp_{i,t}^{t+1} - exp_{i,t}^{t-1}$, while initially keeping the right-hand side of the new regressions the same as (1), after which we then also split the budget balance variables on the right-hand side into the corresponding ones in revenues and expenditures.

Tables 4a and 4b report the estimates for revenues and spending, respectively. Consider Column (1) first. The lagged first-release budget balance error is insignificant in the revenue equation and comes in with a significantly negative coefficient in the spending equation. That is, an unexpectedly good budgetary performance in period *t*-1 implies a reduction in spending compared to its projection, which is the result of the persistence in the first-release spending error (see below). The first-release GDP error is negative and highly significant for both revenues and expenditures. The effect on spending is larger in absolute magnitude, which explains why the variable is positive and significant in the regression for the first-release budget balance error. In the following sub-section we will delve deeper into the role of the first-release GDP error. An in *t*-1 projected improvement in the budget balance also exerts a significant negative effect on both first-release errors, implying an unexpected reduction in both revenues and spending, with the former dominating the latter, which explains why the variable entered with a negative (and significant) sign in the equation for the first-release budget error. The debt ratio in period *t*-1 is insignificant in both equations.

We now split the budget balance variables on the right-hand side, Column (2), and find that both first-release errors are persistent with coefficients that are roughly equal. The lagged first-release error in revenues (spending) helps to explain the first-release error in revenues (spending). However, there are no “cross effects” from spending to revenues and *vice versa*. The coefficient estimates of the first-release GDP error are roughly unchanged compared to Column (1). On both the first-release in revenues and spending equation, the projected increase in revenues in *t*-1 exerts a significant and negative effect, while the projected increase in spending has no effect. The debt ratio now exerts a significantly negative effect on the spending error: higher indebtedness lowers first-release spending relative to its projection, along this channel improving the budget balance relative to its projection.

Turning to Column (3), the fiscal rule index and the number of government changes are not significant. The type of government exerts a significantly (at the 5% level) negative effect on the first-release revenues error and no effect on the first-release spending error. The estimates of the coefficients on the other variables are essentially unchanged. Finally, replacing the first-release real GDP growth with the nominal GDP growth error leaves the estimates essentially unchanged. Only the *t*-1 projected increase in spending now exerts a significant positive effect on the first-release revenue error.

Table 4a: First-release errors in revenues, $rev_{i,t}^{t+1} - rev_{i,t}^{t-1}$

	(1)	(2)	(3)	(4)
$bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}$	0.021			
	(0.040)			
$rev_{i,t-1}^{t} - rev_{i,t-1}^{t-2}$		0.212***	0.206***	0.212***
		(0.066)	(0.068)	(0.070)
$exp_{i,t-1}^{t} - exp_{i,t-1}^{t-2}$		0.055	0.057	0.060*
		(0.036)	(0.036)	(0.034)
$y_{i,t}^{t+1} - y_{i,t}^{t-1}$	-0.292***	-0.234***	-0.225***	
	(0.087)	(0.086)	(0.084)	
$yn_{i,t}^{t+1} - yn_{i,t}^{t-1}$				-0.177***
				(0.052)
$bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$	-0.514***			
	(0.110)			
$rev_{i,t}^{t-1} - rev_{i,t-1}^{t-1}$		-0.559***	-0.565***	-0.565***
		(0.149)	(0.154)	(0.158)
$exp_{i,t}^{t-1} - exp_{i,t-1}^{t-1}$		0.176	0.179	0.222*
		(0.114)	(0.116)	(0.118)
$d_{i,t-1}^{t-1}$	0.015	0.007	0.008	0.009
	(0.011)	(0.009)	(0.012)	(0.011)
$fri_{i,t-1}$			-0.071	-0.087
			(0.185)	(0.188)
$govchan_{i,t}$			-0.097	-0.127
			(0.141)	(0.141)
$govtype_{i,t-1}$			-0.152**	-0.139**
			(0.072)	(0.068)
N	455	452	426	425
R2	0.308	0.387	0.39	0.399
Adjusted R2	0.224	0.309	0.303	0.313
N. of countries	27	27	27	27
Time period	00-19	00-19	00-18	00-18
Estimation method	IV	IV	IV	IV

Notes: Standard errors are clustered at the country level. * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Time- and country-fixed effects are included in all specifications (although the estimates are not reported), N. of countries = number of countries.

Table 4b: First-release errors in spending, $exp_{i,t}^{t+1} - exp_{i,t}^{t-1}$

	(1)	(2)	(3)	(4)
$bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}$	-0.121***			
	(0.044)			
$rev_{i,t-1}^{t} - rev_{i,t-1}^{t-2}$		0.058	0.071	0.082
		(0.081)	(0.088)	(0.093)
$exp_{i,t-1}^{t} - exp_{i,t-1}^{t-2}$		0.190***	0.172***	0.184***
		(0.038)	(0.044)	(0.043)
$y_{i,t}^{t+1} - y_{i,t}^{t-1}$	-0.557***	-0.500***	-0.501***	
	(0.088)	(0.083)	(0.087)	
$yn_{i,t}^{t+1} - yn_{i,t}^{t-1}$				-0.348***
				(0.054)
$bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$	-0.312***			
	(0.097)			
$rev_{i,t}^{t-1} - rev_{i,t-1}^{t-1}$		-0.360***	-0.347***	-0.341**
		(0.126)	(0.127)	(0.139)
$exp_{i,t}^{t-1} - exp_{i,t-1}^{t-1}$		-0.003	-0.047	0.020
		(0.131)	(0.127)	(0.133)
$d_{i,t-1}^{t-1}$	-0.008	-0.016**	-0.018**	-0.015***
	(0.008)	(0.007)	(0.007)	(0.005)
$fri_{i,t-1}$			0.293	0.241
			(0.226)	(0.230)
$govchan_{i,t}$			0.360	0.293
			(0.226)	(0.239)
$govtype_{i,t-1}$			-0.030	-0.009
			(0.092)	(0.094)
N	455	452	426	425
R2	0.458	0.496	0.502	0.505
Adjusted R2	0.393	0.432	0.431	0.434
N. of countries	27	27	27	27
Time period	00-19	00-19	00-18	00-18
Estimation method	IV	IV	IV	IV

Notes: Standard errors are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. Time- and country-fixed effects are included in all specifications (although the estimates are not reported), N. of countries = number of countries.

5.2 Decomposition into "base", "growth" and "denominator" effects

In this sub-section we delve deeper into the driving forces behind the revenues and spending errors. The reason is that the forecast errors are all defined in terms of ratios to GDP. Hence, any change in GDP will have a mechanical effect on these ratios. With the decomposition of the errors below we can purge this mechanical "denominator" effect and see if GDP growth errors also affect other components of the budget balance error that are more closely under the influence of the fiscal authorities. The first-release errors can be decomposed as follows (see Beetsma *et al*., 2013, or Appendix C):

$$x_t^{t+1} - x_t^{t-1} = \frac{1+g_{x,t}^{t-1}}{1+yn_t^{t-1}}\left(x_{t-1}^{t+1} - x_{t-1}^{t-1}\right) + \frac{x_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}\left(g_{x,t}^{t+1} - g_{x,t}^{t-1}\right)$$

$$- \frac{x_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}\left(yn_t^{t+1} - yn_t^{t-1}\right) - \frac{x_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}\left(g_{x,t}^{t+1}yn_t^{t-1} - g_{x,t}^{t-1}yn_t^{t+1}\right) \quad (3)$$

where $x = rev$ or $x = exp$. The first term on the right-hand is the so-called "base effect", which captures the update of the value of a variable pertaining to a given year as time passes by. Updating could take place as a result of new information coming in or because of changes in construction methodology. Hence, the base effect would mostly be the result of "mechanical" adjustment, rather than deliberate policy choices. The second term is the so-called "growth" effect, which includes $g_{x,t}^{t+1} - g_{x,t}^{t-1}$, the difference between the first-release nominal growth in revenues or spending (in euros) and the projected nominal growth in revenues or spending (in euros), and a weighting factor composed of the fraction of revenues or spending as share of GDP, x_{t-1}^{t+1}, divided by the product of the gross projected and first-release nominal GDP growth rates, yn_t^{t-1} and yn_t^{t+1}. We are particularly interested in whether and how GDP growth errors affect this growth effect in revenues or spending, which we would *a priori* expect to be under the government's control. The third term (*including* the minus sign) is the "denominator" effect, with the first-release error in nominal GDP growth, $yn_t^{t+1} - yn_t^{t-1}$. This term features the same weighting factor as the growth effect. When first-release nominal GDP growth exceeding its projection, the denominator of the revenues or spending ratio is higher than projected, thereby resulting into a mechanical negative effect on the first-release errors on the left-hand side. The final term in (3) is a residual term that is generally small, as it is the difference between two products of growth rates.

Figure 6 depicts the average of each of the components, except the residual, over all countries at each point in time. All three components (base, growth and denominator effects) play on average a role of comparable magnitude in explaining the first-release errors in revenues and spending. However, the denominator effect hardly plays any role driving the budget balance error. This is confirmed by taking the averages over all observations in Table 5. This is due to the fact that the denominator effect exerts a similarly-sized but opposing effect on both the revenues and spending errors. Hence, because the denominator effects of revenues and spending essentially cancel against each other, overall the denominator effect plays only a minor role in the budget balance error.[9] The table also suggests that,

[9] The denominator effect is the result of the GDP growth error. The preceding conclusion may appear counterintuitive in view of the results reported in Table 5. However, the denominator effect is a mechanical effect of the GDP growth error, while the latter also affects the spending and revenues levels directly – see below.

for given GDP growth forecasts, revenues are over-projected and spending is under-projected (as the respective growth effects are smaller and larger than zero).

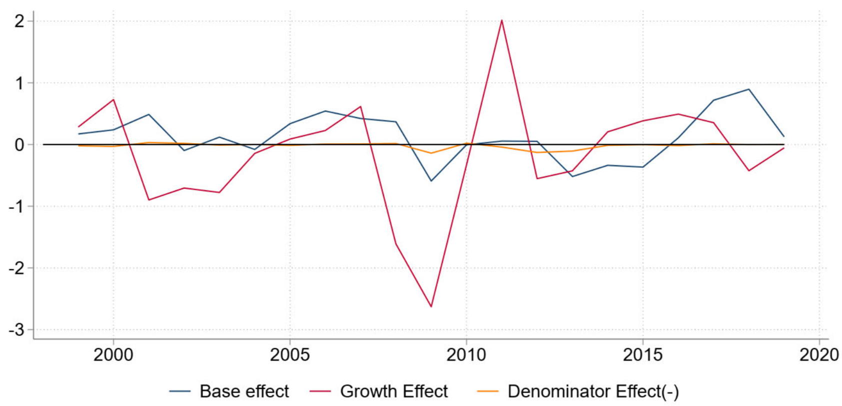
Table 5: Averages of the forecast errors and their components

	Budgetary balance	Revenues	Expenditures
Overall error	-0.06	0.07	0.14
Base effect	0.12	-0.09	-0.21
Growth effect	-0.14	-0.06	0.08
Denominator effect	0.02	-0.22	-0.24

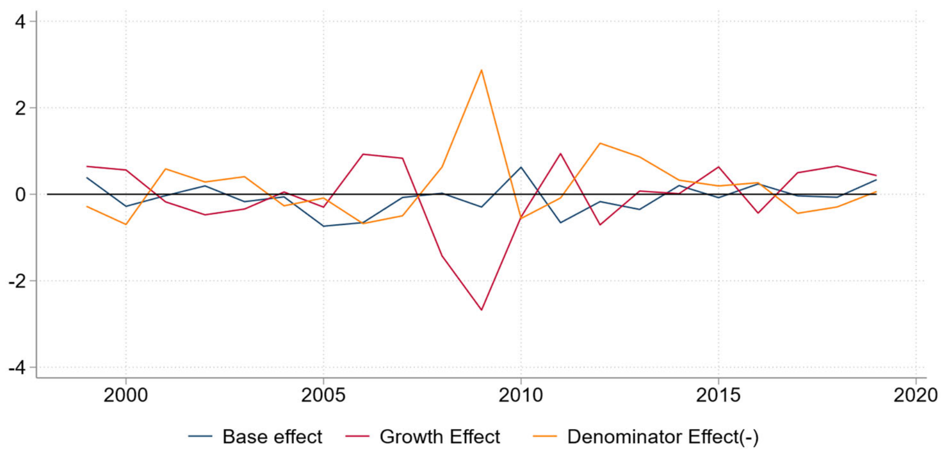
Notes: The denominator effect needs to be subtracted from the sum of the other two effects to arrive at the overall error. A difference may result because of rounding errors.

Figure 6: Decomposed errors, averages over time

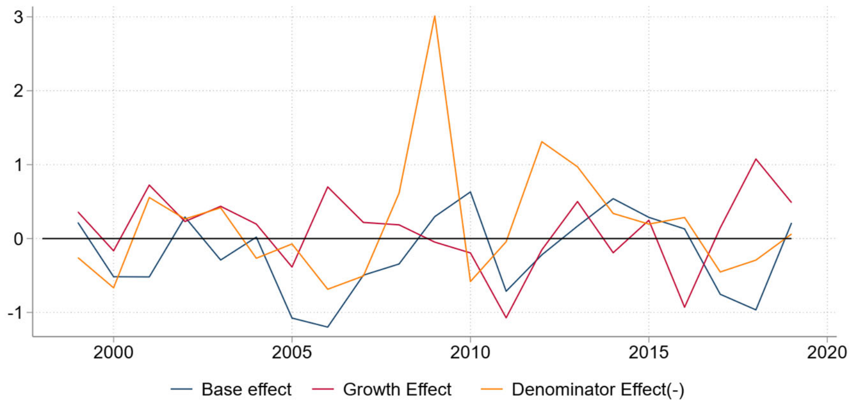
(a) Budgetary balance



(b) Revenues



(c) Expenditures



Notes: Negative components in the budgetary balance and revenues errors point at over-optimistic forecasts, as they drive the budgetary balance or revenues to be lower than forecast. By contrast, over-optimistic errors are positive when considering expenditures. They point at government spending turning out higher than forecast. In each graph, the denominator effects are plotted after being multiplied by (-1), so that this interpretation holds for all components of a given error.

The regression framework remains analogous to that before, deploying the same right-hand specifications. The coefficient estimates can then immediately be interpreted in terms of the contribution to the first-release budget balance error. Hence, the regression equations will take the format:

$$z_{i,t+1} = \alpha_i + \beta_t + \delta_1\left(bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}\right) + \delta_2\left(bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}\right) + \delta_3(y_{i,t}^{t+1} - y_{i,t}^{t-1}) + \delta_4 d_{i,t-1}^{t-1} + \delta_5 fri_{i,t-1} + \delta_6 govchan_{i,t} + \delta_7 govtype_{i,t-1} + \varepsilon_{it}, \quad (4)$$

for $z_{i,t+1} \in \left\{expbe_{i,t+1}, revbe_{i,t+1}, revge_{i,t+1}, expge_{i,t+1}\right\}$, where $expbe_{i,t+1} = \frac{1+g_{exp,t}^{t-1}}{1+yn_t^{t-1}}(exp_{t-1}^{t+1} - exp_{t-1}^{t-1})$ and $revbe_{i,t+1} = \frac{1+g_{rev,t}^{t-1}}{1+yn_t^{t-1}}(rev_{t-1}^{t+1} - rev_{t-1}^{t-1})$ are the base effects and $revge_{i,t+1} = \frac{rev_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}\left(g_{rev,t}^{t+1} - g_{rev,t}^{t-1}\right)$ and $expge_{i,t+1} = \frac{exp_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}\left(g_{exp,t}^{t+1} - g_{exp,t}^{t-1}\right)$ are the growth effects, respectively. The base and growth effects of the budget balance are just the difference between the corresponding ones for revenues and spending. Since the denominator effect is a mechanical consequence resulting from the nominal GDP growth forecast error that in effect we already discussed above, we will not discuss it further below. The crucial question of the current exercise is whether there are factors beyond the mechanical denominator effect driving the forecasting errors.

We discuss the base effect regressions first (see Table 6). The updating between *t*-1 and *t*+1 of revenues and spending in *t*-1 overlaps partially with the updating between *t*-2 and *t* for the same year *t*-1. Hence, $rev_{i,t-1}^{t} - rev_{i,t-1}^{t-2}$ enters highly significantly in the regression for $revbe_{i,t+1}$, while $exp_{i,t-1}^{t} -$

$exp^{t-2}_{i,t-1}$ is highly significant in determining $expbe_{i,t+1}$. An improvement in the first-release error of output causes a downward base adjustment in spending. A higher debt ratio exerts a significantly positive effect on the size of the base effect in spending. Finally, a change in government lowers the base effect in revenues.

Table 6: Estimates for the base effect of revenues and expenditures

	$\boldsymbol{revbe_{i,t}}$			$\boldsymbol{expbe_{i,t}}$		
	(1)	(2)	(3)	(4)	(5)	(6)
$bb^{t}_{i,t-1} - bb^{t-2}_{i,t-1}$	0.068*			-0.517***		
	(0.039)			(0.125)		
$rev^{t}_{i,t-1} - rev^{t-2}_{i,t-1}$		0.323***	0.325***		-0.235***	-0.235***
		(0.033)	(0.033)		(0.083)	(0.084)
$exp^{t}_{i,t-1} - exp^{t-2}_{i,t-1}$		-0.002	-0.002		0.600***	0.604***
		(0.033)	(0.032)		(0.112)	(0.110)
$y^{t+1}_{i,t} - y^{t-1}_{i,t}$	-0.091*	-0.063		-0.158**	-0.113*	
	(0.053)	(0.051)		(0.062)	(0.059)	
$yn^{t+1}_{i,t} - yn^{t-1}_{i,t}$			-0.054*			-0.082***
			(0.029)			(0.028)
$bb^{t-1}_{i,t} - bb^{t-1}_{i,t-1}$	-0.023			-0.358***		
	(0.152)			(0.121)		
$rev^{t-1}_{i,t} - rev^{t-1}_{i,t-1}$		0.151	0.150		-0.237**	-0.242**
		(0.148)	(0.151)		(0.097)	(0.101)
$exp^{t-1}_{i,t} - exp^{t-1}_{i,t-1}$		0.018	0.034		0.206*	0.230**
		(0.095)	(0.096)		(0.113)	(0.117)
$d^{t-1}_{i,t-1}$	0.004	0.002	0.002	0.016***	0.011***	0.010***
	(0.007)	(0.004)	(0.004)	(0.006)	(0.003)	(0.003)
$fri_{i,t-1}$	0.029	0.051	0.048	0.004	0.036	0.027
	(0.130)	(0.111)	(0.111)	(0.132)	(0.117)	(0.118)
$govchan_{i,t}$	-0.128	-0.181**	-0.189**	0.023	-0.034	-0.041
	(0.089)	(0.078)	(0.081)	(0.093)	(0.083)	(0.090)
$govtype_{i,t-1}$	-0.056	-0.050	-0.046	-0.091	-0.081*	-0.075
	(0.067)	(0.049)	(0.049)	(0.069)	(0.045)	(0.046)
N	429	426	425	429	426	425
R2	0.197	0.386	0.389	0.492	0.606	0.611
Adjusted R2	0.089	0.298	0.302	0.423	0.55	0.555
N. of countries	27	27	27	27	27	27
Time period	00-18	00-18	00-18	00-18	00-18	00-18
Estimation method	IV	IV	IV	IV	IV	IV

Notes: Standard errors are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. Time and country fixed effects are included in all specifications (although the estimates are not reported), N. of countries = number of countries.

Table 7a reports the results for the regressions for the growth effect in revenues. Column (1) shows that the latter is positively related to the first-release error in real GDP growth. Further, the larger is the period $t-1$ projected increase in the period t budget balance ratio, $bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$, the lower is the revenues growth effect. This suggests that the more ambitious is the period $t-1$ projected increase in the period t budget balance ratio, the more over-optimistic it is, as the realization of revenues growth in period t as measured in period $t+1$ falls by a larger margin short of its projection in period $t-1$. Turning to Columns (2) and (3), we observe that the revenues growth effect is negatively related to the projected increase in the revenue ratio, $rev_{i,t}^{t-1} - rev_{i,t-1}^{t-1}$ and positively related to the projected increase in the spending ratio, $exp_{i,t}^{t-1} - exp_{i,t-1}^{t-1}$. The split into the roles of the projected increases in the revenue and spending ratios refines the estimation of the effect of the projected increase in the period t budget balance ratio reported in Column (1). Again, the larger is (nominal or real) GDP growth relative to its projection, the more revenues turn out to grow relative to their projection. This is not surprising as GDP growth generally leads to more revenue growth. A more fragmented government leads to a more negative growth effect in revenues, possibly because the government finds it harder to implement projected unpleasant measures, viz. the projected growth in revenues. The final column in Table 7a drops the weighting factor in front of $g_{rev,t}^{t+1} - g_{rev,t}^{t-1}$, so it puts the "entire" growth effect on the left-hand side of the regression. The idea is that this way we get a direct estimate of the effect of the first-release error in nominal GDP growth via the growth effect of revenues on the first-release error of the budget balance, thus using equations (3) and (4). Hence, the regression in this column repeats that in the previous column, except for the change in the dependent variable. The estimates show that a one-percentage point first-release error in nominal GDP growth produces a 0.7 percentage point improvement in the budget balance via the channel of the growth effect of the revenues.

We turn now to the growth effect of expenditures. The estimates are reported in Table 7b. A higher lagged first-release budget balance error has a more positive expenditure growth effect (Column (1)). The effect runs along both the revenues and spending sides (Columns (2) and (3)). A spending ratio in period $t-1$ higher than anticipated produces a lower spending growth effect in period t, possibly because the government wants to correct the previous period's excess spending. This in turn may be driven by the desire to remain within the correction horizon allowed by the SGP. By contrast, a higher revenue ratio in period $t-1$ has the opposite effect; it induces the government to spend part of the unanticipated room. Likewise, higher (real or nominal) GDP growth in period t creates more room to spend, having a positive effect on the growth effect in spending, possibly due to political pressure to spend more. A period $t-1$ projected increase in the spending ratio between periods $t-1$ and t exerts a negative influence on the growth effect. A larger projected increase in the expenditure ratio $exp_{i,t}^{t-1} - exp_{i,t-1}^{t-1}$ goes together with more over-optimism about spending, hence a larger first-release short-fall of spending growth from its projection. A higher debt ratio in period $t-1$ implies a lower growth effect in spending, hence induces the government to correct spending growth relative to the projection in period $t-1$.

Table 7a: Estimates for the growth effect of revenues

	$revge_{i,t}$			$g_{rev,t}^{t+1} - g_{rev,t}^{t-1}$
	(1)	(2)	(3)	(4)
$bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}$	-0.053			
	(0.037)			
$rev_{i,t-1}^{t} - rev_{i,t-1}^{t-2}$		-0.099	-0.110*	-0.282*
		(0.065)	(0.061)	(0.158)
$exp_{i,t-1}^{t} - exp_{i,t-1}^{t-2}$		0.064**	0.063**	0.165**
		(0.030)	(0.028)	(0.067)
$y_{i,t}^{t+1} - y_{i,t}^{t-1}$	0.283***	0.306***		
	(0.065)	(0.070)		
$yn_{i,t}^{t+1} - yn_{i,t}^{t-1}$			0.245***	0.696***
			(0.038)	(0.118)
$bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$	-0.505***			
	(0.085)			
$rev_{i,t}^{t-1} - rev_{i,t-1}^{t-1}$		-0.682***	-0.687***	-1.874***
		(0.095)	(0.097)	(0.295)
$exp_{i,t}^{t-1} - exp_{i,t-1}^{t-1}$		0.229***	0.172***	0.484***
		(0.066)	(0.063)	(0.172)
$d_{i,t-1}^{t-1}$	0.013***	0.009	0.006	0.011
	(0.005)	(0.006)	(0.007)	(0.021)
$fri_{i,t-1}$	-0.180	-0.175	-0.153	-0.415
	(0.142)	(0.131)	(0.133)	(0.358)
$govchan_{i,t}$	-0.026	0.001	0.049	0.149
	(0.110)	(0.118)	(0.122)	(0.347)
$govtype_{i,t-1}$	-0.094**	-0.085*	-0.103**	-0.289**
	(0.040)	(0.048)	(0.051)	(0.130)
N	428	425	425	425
R2	0.477	0.513	0.540	0.551
Adjusted R2	0.406	0.443	0.474	0.487
N. of countries	27	27	27	27
Time period	00-18	00-18	00-18	00-18
Estimation method	IV	IV	IV	IV

Notes: Standard errors are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. Time and country fixed effects are included in all specifications (although the estimates are not reported), N. of countries = number of countries.

Table 7b: Estimates for the growth effect of expenditures

	$expge_{i,t}$			$g_{exp,t}^{t+1} - g_{exp,t}^{t-1}$
	(1)	(2)	(3)	(4)
$bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}$	0.417***			
	(0.114)			
$rev_{i,t-1}^{t} - rev_{i,t-1}^{t-2}$		0.335**	0.328**	0.567**
		(0.131)	(0.131)	(0.230)
$exp_{i,t-1}^{t} - exp_{i,t-1}^{t-2}$		-0.427***	-0.423***	-0.725***
		(0.118)	(0.117)	(0.161)
$y_{i,t}^{t+1} - y_{i,t}^{t-1}$	0.129**	0.133**		
	(0.052)	(0.058)		
$yn_{i,t}^{t+1} - yn_{i,t}^{t-1}$			0.128***	0.372***
			(0.041)	(0.104)
$bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$	0.063			
	(0.095)			
$rev_{i,t}^{t-1} - rev_{i,t-1}^{t-1}$		-0.075	-0.079	-0.370
		(0.133)	(0.126)	(0.263)
$exp_{i,t}^{t-1} - exp_{i,t-1}^{t-1}$		-0.191*	-0.225**	-0.483**
		(0.098)	(0.099)	(0.217)
$d_{i,t-1}^{t-1}$	-0.022***	-0.024***	-0.025***	-0.057***
	(0.007)	(0.006)	(0.006)	(0.012)
$fri_{i,t-1}$	0.166	0.174	0.176	0.409
	(0.217)	(0.218)	(0.213)	(0.482)
$govchan_{i,t}$	0.252	0.270	0.296	0.803
	(0.230)	(0.246)	(0.249)	(0.508)
$govtype_{i,t-1}$	0.056	0.059	0.048	0.068
	(0.087)	(0.084)	(0.085)	(0.184)
N	428	425	425	425
R2	0.263	0.277	0.287	0.290
Adjusted R2	0.163	0.173	0.185	0.189
N. of countries	27	27	27	27
Time period	00-18	00-18	00-18	00-18
Estimation method	IV	IV	IV	IV

Notes: Standard errors are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. Time and country fixed effects are included in all specifications (although the estimates are not reported), N. of countries = number of countries.

The final column in Table 7b puts the "entire" growth effect of expenditures on the left-hand side of the regression, so as to a direct estimate of the effect of the first-release error in nominal GDP growth via the growth effect of spending on the first-release error of the budget balance. The estimates show that a one-percentage point first-release error in nominal GDP growth produces a 0.4 percentage point deterioration in the budget balance via the channel of the growth effect of the spending. Hence, taking the results in Tables 7a and 7b together, a one-percentage point first-release error in nominal

GDP growth produces, via the growth effects of revenues and spending, an overall improvement in the first-release error of the budget balance of 0.3.

6. The role of the IFIs

This section explores the role of IFIs in determining first-release forecast errors. Since the variation over time of information related to IFIs is generally limited, we drop the country-fixed effects from our baseline regression framework and add information on IFIs. It should be noted, though, that any effect detected through IFI variables needs to be interpreted with care, as such effect may also (partly) be driven by time invariant factors. Table 8 reports the results, where $ifi_{i,t}$ is a dummy for the presence of an IFI, $ifi\_macro_{i,t-1}$ is a dummy with value 1 when an IFI produces or assesses the macroeconomic forecast used in the budgetary process and $ifi\_himedia_{i,t}$ is a dummy with value 1 when an IFI with high media impact produces or assesses the macroeconomic forecast. The data on IFIs are obtained from the IMF Fiscal Council dataset which we update to match the sample period of our other data. For convenience, Column (1) repeats the baseline regression. As a stepping stone for the regression with a fiscal council dummy in Column (3), we drop the country fixed effects in Column (2). In particular, the lagged debt ratio switches from a significant positive to a significant negative sign, indicating that it partly takes over the role of the country fixed effects in Column (1). The negative sign on the lagged debt ratio in Column (2) suggests that it is the high debt countries that are relatively over-optimistic in their budgetary projections. The government type loses significance in Column (2). Column (3) includes the lagged fiscal institution dummy. The estimates suggest that its presence is conducive to better realized budgetary performance relative to what was projected. This effect seems to be mainly present for IFIs with high media impact. Reassuringly, the coefficient estimates of the baseline variables are essentially unaffected in terms of significance or insignificance by the inclusion of dummies related to IFIs.

In Table 9 we split the regressions in Table 8 into regressions for revenues and spending. Column (1) features as dependent variable the revenue forecast error $rev_{i,t}^{t+1} - rev_{i,t}^{t-1}$, while Column (2) features as dependent variable the spending forecast error $exp_{i,t}^{t+1} - exp_{i,t}^{t-1}$. The existing results are unaffected, while the presence of an IFI significantly improves the revenues realization relative to its forecast. No significant effect on the forecast error of spending is found. We can decompose the forecast errors further to explore the role of IFIs for the base effect and the growth effect. However, in none of the cases is the influence of an IFI being present significantly different from zero.

Table 8: Including indicators of IFIs

	(1)	(2)	(3)	(4)	(5)
$bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}$	0.121***	0.232***	0.210***	0.217***	0.202***
	(0.036)	(0.041)	(0.042)	(0.041)	(0.041)
$bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$	-0.233***	-0.198**	-0.183**	-0.216**	-0.215**
	(0.083)	(0.087)	(0.088)	(0.093)	(0.093)
$y_{i,t}^{t+1} - y_{i,t}^{t-1}$	0.274***	0.222***	0.227***	0.240***	0.237***
	(0.074)	(0.057)	(0.055)	(0.060)	(0.060)
$d_{i,t-1}^{t-1}$	0.026***	-0.006***	-0.009***	-0.007**	-0.007**
	(0.008)	(0.002)	(0.002)	(0.003)	(0.003)
$fri_{i,t-1}$	-0.343*	0.023	-0.038	0.011	-0.035
	(0.205)	(0.155)	(0.155)	(0.188)	(0.182)
$ifi_{i,t-1}$			0.585***		
			(0.195)		
$ifi\_macro_{i,t-1}$				0.217	
				(0.180)	
$ifi\_himedia_{i,t-1}$					0.525***
					(0.186)
$govchan_{i,t}$	-0.464**	-0.449**	-0.456**	-0.482**	-0.485**
	(0.186)	(0.190)	(0.190)	(0.208)	(0.202)
$govtype_{i,t-1}$	-0.124**	0.016	-0.007	0.020	-0.002
	(0.056)	(0.084)	(0.078)	(0.090)	(0.081)
N	432	432	432	378	378
Adjusted R2	0.429	0.420	0.430	0.418	0.425
N. of countries	27	0.384	27	27	27
Time period	2000-2018	2000-2018	2000-2018	2000-2016	2000-2016
Time fixed-effects	Yes	Yes	Yes	Yes	Yes
Country fixed-effects	Yes	No	No	No	No

Notes: Standard errors are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. N. of countries = number of countries.

Table 9: Indicators of IFIs splitting between revenues and spending

Dependent variable	$rev_{i,t}^{t+1} - rev_{i,t}^{t-1}$	$exp_{i,t}^{t+1} - exp_{i,t}^{t-1}$
	(1)	(2)
$rev_{i,t-1}^{t} - rev_{i,t-1}^{t-2}$	0.268***	0.035
	(0.059)	(0.085)
$exp_{i,t-1}^{t} - exp_{i,t-1}^{t-2}$	0.054	0.250***
	(0.036)	(0.046)
$y_{i,t}^{t+1} - y_{i,t}^{t-1}$	-0.222**	-0.456***
	(0.076)	(0.070)
$rev_{i,t}^{t-1} - rev_{i,t-1}^{t-1}$	-0.582***	-0.396***
	(0.167)	(0.130)
$exp_{i,t}^{t-1} - exp_{i,t-1}^{t-1}$	0.088	-0.031
	(0.100)	(0.148)
$d_{i,t-1}^{t-1}$	-0.002	0.007**
	(0.002)	(0.003)
$fri_{i,t-1}$	-0.141	-0.117
	(0.116)	(0.186)
$govchan_{i,t}$	-0.111	0.333
	(0.132)	(0.231)
$govtype_{i,t-1}$	-0.033	-0.024
	(0.052)	(0.075)
$ifi_{i,t-1}$	0.401*	-0.157
	(0.221)	(0.268)
N	426	426
R2	0.326	0.300
Adjusted R2	0.277	0.249
N. of countries	27	27
Time period	00-19	00-19
Estimation method	IV	IV
Time fixed-effects	Yes	Yes
Country fixed-effects	No	No

Notes: Standard errors are clustered at the country level. * p<0.10, ** p<0.05, *** p<0.01. N. of countries = number of countries.

7. Concluding remarks

In this paper we exploited data from the European Union's Stability and Convergence Programmes over the period since the start of EMU until just before the coronavirus crisis to explore to what extent budgetary projections are followed up, and what are the driving forces of the degree of follow-up. We delved deeper by also exploring the driving forces behind the first-release errors in revenues and expenditures, and then exploring the base, growth and denominator effects which make up these errors. Throughout, the first-release GDP growth error plays a crucial role driving the first-release error of the budget balance as well as the components of these first-release errors. This is not surprising: budgetary projections are based on projections of economic growth, and the more optimistic economic growth projections are, the more optimistic budgetary projections can be. We also find that the effect of errors in economic growth projections goes beyond the mechanical denominator effect. A positive error in economic growth produces positive growth effects in both revenues and spending, but more so in the former.

The empirical confirmation of this statement points to an important governance lesson: institutional settings conducive to more accurate GDP growth projections should lead to more accurate budgetary projections. This has benefits in terms of planning on the government's side. It also benefits a government's standing in the financial markets, which do not like the budgetary uncertainty created by inaccurate budgetary projections. The SGP's ”six-pack” reform mandates GDP growth projections to be constructed by an independent institution or to be endorsed by such an institution. Compared to the former, the latter is sub-optimal, because a rejection of a government's macro-projections is a major verdict, which is not lightly issued. Hence, the government will generally be allowed some wiggle room. Outsourcing the construction of the macro-projections seems the preferable route: a truly independent fiscal institution will provide an unbiased projection of GDP growth, conditional on the information it has, because it is at a sufficient distance from the political fray. Moreover, by constructing the macro-projections itself, an independent fiscal institution acquires the analytical capacity to perform such projections, from which it will also benefit in its other work. It might even be better if the independent fiscal institution were made responsible also for the budgetary projections, because even with truly unbiased macro-projections governments may find ways to tweak budgetary projections into their preferred direction, for example by deploying estimates of tax elasticities that differ from the actual ones.

We explore also how political factors and independent fiscal institutions affect projection errors. Political factors do not play a substantial role, but to the extent that they do play a role, their effects go into the expected direction. Both a preceding change in the government and a more fragmented government produce a deterioration of budgetary performance relative to what was forecast. By contrast, independent fiscal institutions with high media impact producing or assessing the macroeconomic forecast appear to lead to better budgetary performance relative to projections.

In the near future particular attention may need to be paid to the relationship between structural reform and growth. Improving growth forecasts does not merely involve a more prudent assessment within a given model of the economy. It also requires a prudent assessment of how planned reforms affect this model. Optimistic growth forecasts often reflect a sanguine assessment of the expected effects of planned structural reforms rather than optimism about the cycle. This issue can be expected to increase in importance in the coming years with the implementation of the EU's Recovery and Resilience Plans.

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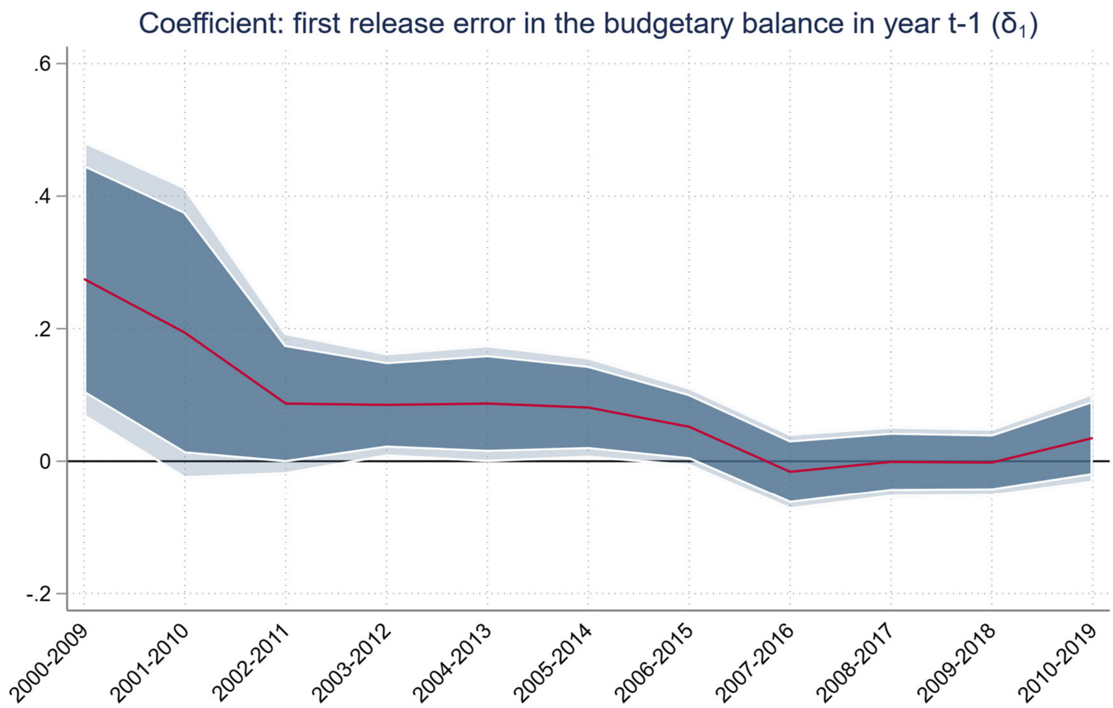
Appendix

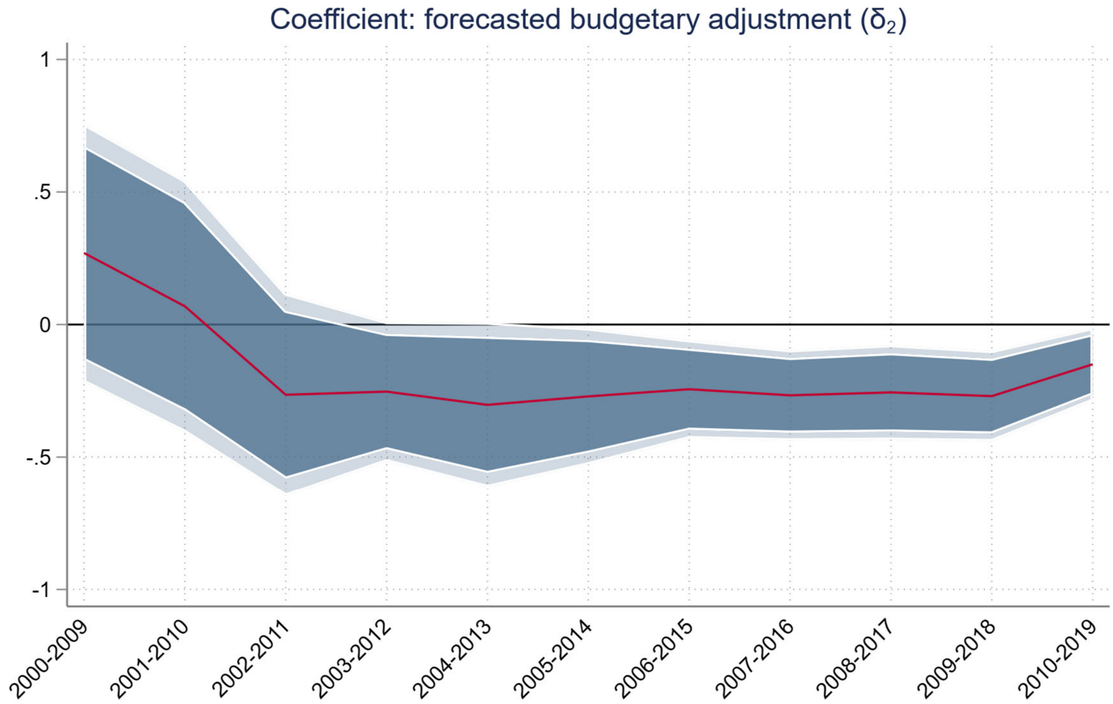
A: Coefficient estimates for a rolling window

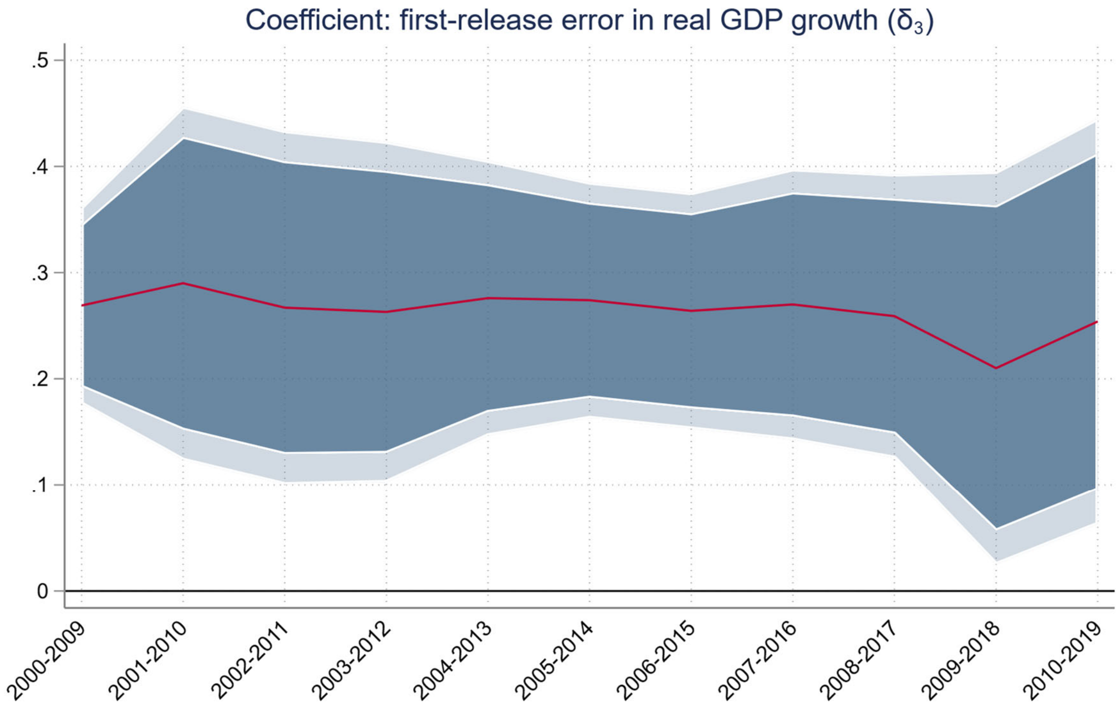
The regression specification is:

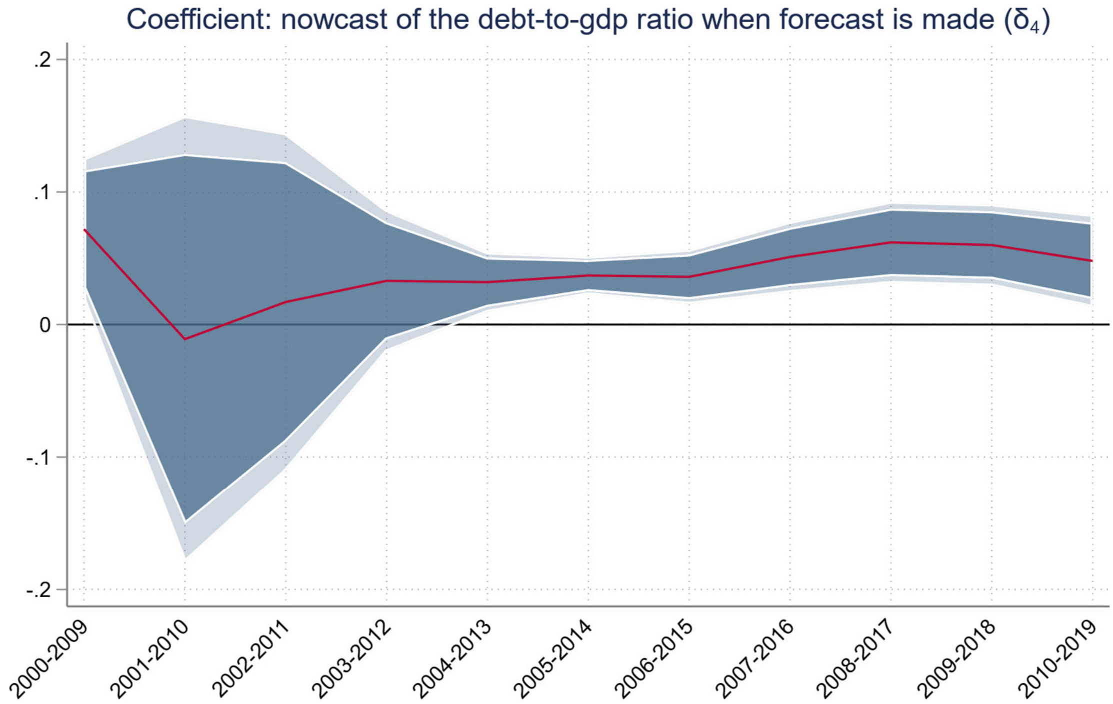
$$bb_{i,t}^{t+1} - bb_{i,t}^{t-1} = \alpha_i + \beta_t + \delta_1\left(bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}\right) + \delta_2\left(bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}\right) + \delta_3(y_{i,t}^{t+1} - y_{i,t}^{t-1}) + \delta_4 d_{i,t-1}^{t-1} + \varepsilon_{it}$$

The figures below depict the coefficient estimates for a rolling estiimation window of 10 years.




Coefficient: forecasted budgetary adjustment (δ_2)
1
.5
0
-.5
-1
2000-2009
2001-2010
2002-2011
2003-2012
2004-2013
2005-2014
2006-2015
2007-2016
2008-2017
2009-2018
2010-2019


Coefficient: first-release error in real GDP growth (δ_3)
.5
.4
.3
.2
.1
0
2000-2009
2001-2010
2002-2011
2003-2012
2004-2013
2005-2014
2006-2015
2007-2016
2008-2017
2009-2018
2010-2019



Coefficient: nowcast of the debt-to-gdp ratio when forecast is made (δ4)
.2
.1
0
-.1
-.2
2000-2009
2001-2010
2002-2011
2003-2012
2004-2013
2005-2014
2006-2015
2007-2016
2008-2017
2009-2018
2010-2019

B. Derivation of decomposition in (3)

$$x_t^{t+1} - x_t^{t-1} = x_{t-1}^{t+1}\frac{1+g_{x,t}^{t+1}}{1+yn_t^{t+1}} - x_{t-1}^{t-1}\frac{1+g_{x,t}^{t-1}}{1+yn_t^{t-1}}$$
$$= (x_{t-1}^{t+1} - x_{t-1}^{t-1})\frac{1+g_{x,t}^{t-1}}{1+yn_t^{t-1}} + x_{t-1}^{t+1}\left(\frac{1+g_{x,t}^{t+1}}{1+yn_t^{t+1}} - \frac{1+g_{x,t}^{t-1}}{1+yn_t^{t-1}}\right)$$
$$= \frac{1+g_{x,t}^{t-1}}{1+yn_t^{t-1}}(x_{t-1}^{t+1} - x_{t-1}^{t-1}) + \frac{x_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}\left(g_{x,t}^{t+1} - g_{x,t}^{t-1}\right)$$
$$- \frac{x_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}(yn_t^{t+1} - yn_t^{t-1})$$
$$- \frac{x_{t-1}^{t+1}}{(1+yn_t^{t+1})(1+yn_t^{t-1})}\left(g_{x,t}^{t+1}yn_t^{t-1} - g_{x,t}^{t-1}yn_t^{t+1}\right)$$

C. Estimates of the decomposition of the first-release error in the budget balance

The table below reports the results obtained when estimating:

$$x_{i,t}^{t-1,t+1} = \alpha_i + \beta_t + \delta_1\left(bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}\right) + \delta_2\left(bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}\right) + \delta_3(y_{i,t}^{t+1} - y_{i,t}^{t-1}) + \delta_4 d_{i,t-1}^{t-1} + \varepsilon_{it}$$

(in columns 1-4) and

$$x_{i,t}^{t-1,t+1} = \alpha_i + \beta_t + \delta_1\left(bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}\right) + \delta_2\left(bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}\right) + \delta_3(y_{i,t}^{t+1} - y_{i,t}^{t-1}) + \delta_4 d_{i,t-1}^{t-1}$$
$$+ \delta_5 fri_{i,t-1} + \delta_6 govchan_{i,t} + \delta_7 govtype_{i,t-1} + \varepsilon_{it}$$

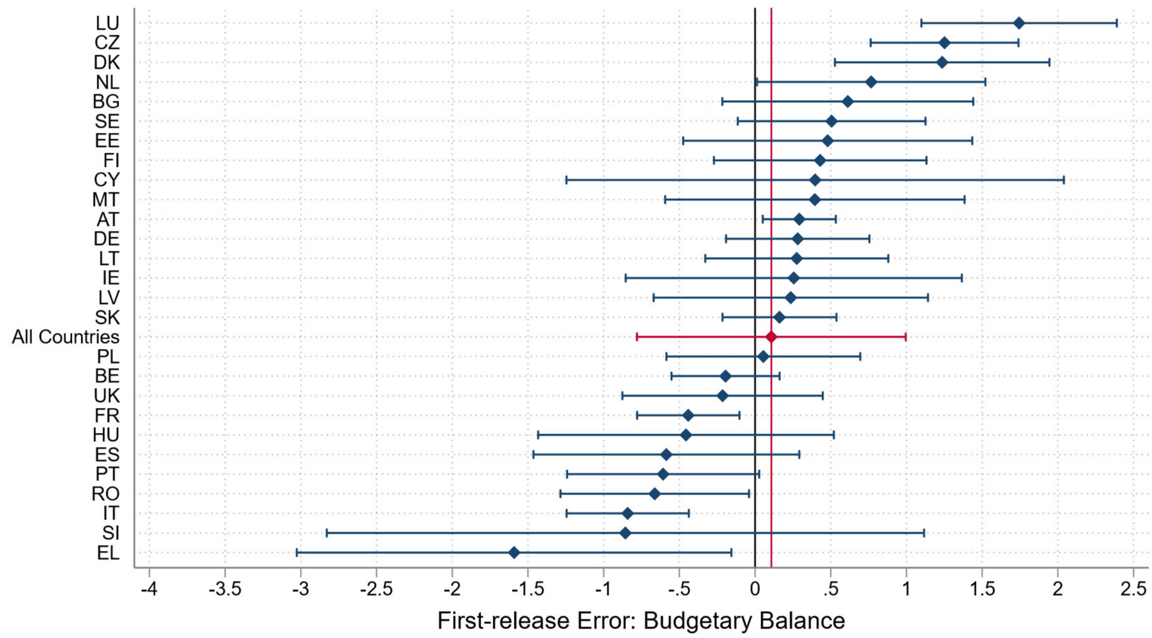
(in columns 5-8), with $x_{i,t}^{t-1,t+1}$ respectively equal to (i) the first-release budgetary balance error ($bb_{i,t}^{t+1} - bb_{i,t}^{t-1}$), (ii) the growth effect of the first-release budgetary balance error ($bbge_{i,t}$), (iii) the denominator effect of the first-release budgetary balance error ($bbden_{i,t}$), and (iv) the base effect of the first-release budgetary balance error ($bbbe_{i,t}$). It is interesting to notice that the sign and magnitude of the overall effects of the different factors appears to be dominated by their impact on the growth effect, with the exception of the effect of lagged errors, which have an opposing impact on the growth and base effect (and the latter dominates).

	$bb_{i,t}^{t+1} - bb_{i,t}^{t-1}$	$bbge_{i,t}$	$bbden_{i,t}$	$bbbe_{i,t}$	$bb_{i,t}^{t+1} - bb_{i,t}^{t-1}$	$bbge_{i,t}$	$bbden_{i,t}$	$bbbe_{i,t}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$bb_{i,t-1}^{t} - bb_{i,t-1}^{t-2}$	0.142***	-0.471***	-0.025**	0.606***	0.121***	-0.471***	-0.025**	0.585***
	0.031	0.096	0.008	0.092	0.036	0.106	0.008	0.099
$y_{i,t}^{t+1} - y_{i,t}^{t-1}$	0.265***	0.148**	-0.025**	0.065	0.274***	0.154**	-0.026**	0.067
	0.067	0.047	0.01	0.039	0.074	0.053	0.01	0.04
$bb_{i,t}^{t-1} - bb_{i,t-1}^{t-1}$	-0.203**	-0.550***	-0.006	0.346**	-0.233**	-0.568***	-0.006	0.335**
	0.075	0.118	0.010	0.115	0.083	0.125	0.01	0.117
$d_{i,t-1}^{t-1}$	0.023**	0.032***	0.000	-0.012***	0.026***	0.035***	0.000	-0.012***
	0.007	0.007	0.000	0.002	0.008	0.008	0.000	0.003
$fri_{i,t-1}$					-0.343	-0.346	0.005	0.025
					0.205	0.209	0.011	0.062
$govchan_{i,t}$					-0.464*	-0.277	0.022*	-0.151*
					0.186	0.207	0.01	0.071
$govtype_{i,t-1}$					-0.124*	-0.15	-0.002	0.035
					0.056	0.082	0.004	0.049
N	458	454	456	455	432	428	430	429
R2	0.469	0.394	0.432	0.682	0.496	0.403	0.45	0.682
Adjusted R2	0.405	0.32	0.364	0.644	0.429	0.322	0.376	0.639
N. of countries	27	27	27	27	27	27	27	27
Time period	00-19	00-19	00-19	00-19	00-18	00-18	00-18	00-18
Estimation method	IV	IV	IV	IV	IV	IV	IV	IV

Notes: Standard errors are clustered at the country level. * $p<0.05$, ** $p<0.01$, *** $p<0.001$. Time and country fixed effects are included in all specifications (although the estimates are not reported), N. of countries = number of countries.

D: Leaving out crisis years 2009-2012

Averages and Stand. Dev. First-Release Forecast Errors Budget Balance – excluding 2009-2012



Variance-covariance matrix of the first-release errors excluding 2009-2012

First-release error	*Budgetary balance*	*Revenues*	*Expenditures (-)*
Budgetary balance	3.14	0.76	2.37
Revenues		3.77	- 3.00
Expenditures			5.37