WORKING PAPER
Büro des Fiskalrates

What drives forecast errors and ex-post-revisions of structural balances in the Euro area?

Susanne Maidorn
Lukas Reiss

Working Paper 2 / November 2017.

What drives forecast errors and ex-post-revisions of structural balances in the Euro area?

Susanne Maidorn* and Lukas Reiss†

Vienna, November 21, 2017

Abstract

Using vintages of the EC projections from autumn 2007 to spring 2016, we analyze both ex-post-revisions and forecast errors of the level of and the change in the structural balance in the EA-12. Our main findings are:

In general, ex-post revisions in structural balances were mainly driven by output gap revisions, while projection errors are to a significant extent driven by other factors. Not surprisingly, the role of potential output revisions shrinks when looking at the change in the structural balance, as revisions of annual potential growth tend to be smaller than level revisions.

Primarily due to other factors than potential growth revisions, the mean absolute projection errors on this indicator are sizeable, and for some countries they are above the official margin of error applied on the adjustment path to the MTO even in the autumn projections for the current year. While a more detailled analysis indicates a significant role of expenditure projections in this context, projection errors based on indicators similar to the "expenditure benchmark" in the SGP are substantially smaller than for the change in the structural balance.

These uncertainties may shed some doubt on how much the EU Fiscal Governance should rely on projections of "fiscal efforts".

Keywords: structural balance, potential output, EU fiscal governance, forecast error

JEL Classification: H62, H68

*Office of the Austrian Fiscal Advisory Council c/o Oesterreichische Nationalbank, email: susanne.maidorn@oenb.at

†Oesterreichische Nationalbank, Vienna, email: lukas.reiss@oenb.at.

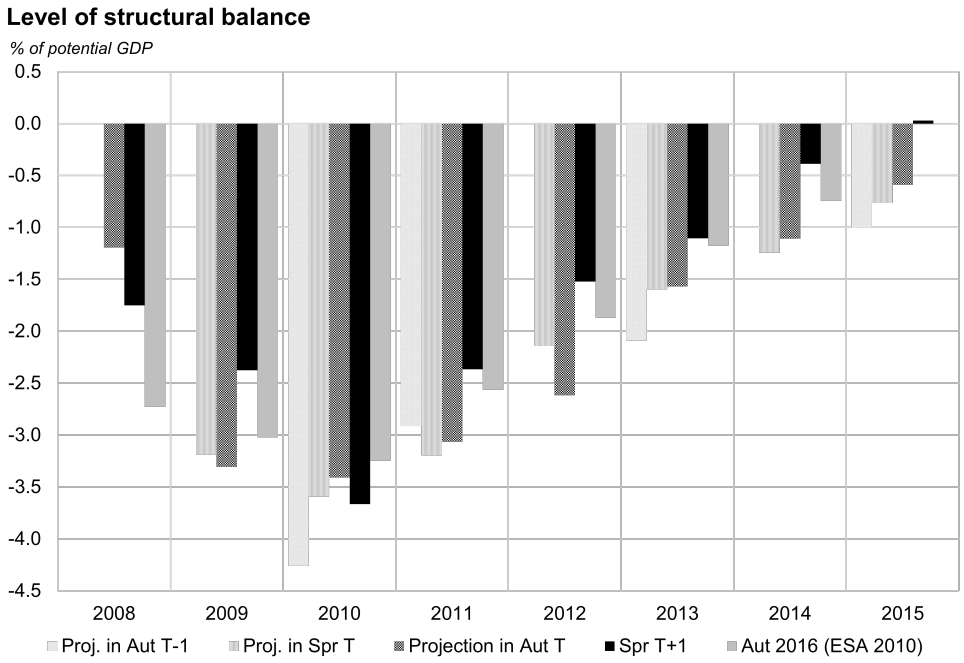
Disclaimer: This paper does not necessarily express the views of the Oesterreichische Nationalbank or the Austrian Fiscal Advisory Council. Please do not circulate the paper at this stage without permission.

The authors thank Othman Boubdallah, Astrid Lemmer and Jenni Pääkkönen for useful comments as well as Roberta de Stefani, Ernst Glatzer and Martin Schneider for helping to retrieve the real-time data used in this study.

1 Introduction

The concepts of output gaps and structural budget balances play an important role in the Stability and Growth Pact (for a detailed description of the SGP see EC, 2017). There is a medium-term target level for the structural balance in the so-called preventive arm of the SGP. Furthermore, estimates on the change in the structural balance are used by the European Commission (EC) for both ex-ante and ex-post-analysis of consolidation efforts (in both the preventive and the corrective arm of the SGP). This has been subject to strong criticism, partly due to large observed ex-post-revisions and forecast errors. The potential magnitude of these errors is indicated in figure 1.1, which shows different vintages of estimates of the structural balance for Austria. Even though vintages after which significant fiscal measures were implemented have been disregarded, the variation in the shown estimates is sizeable.

Figure 1.1: Revisions to the EC's estimates of the Austrian structural balance



This figure disregards projection vintages after which significant measures ($\geq$ 0.2% of GDP) were implemented for the relevant year (this affects the autumn $t-1$ projections for 2008, 2009, 2012 and 2014, and the spring t projection for 2008).

Source: AMECO database, own calculations.

In the general discussion, the criticism of structural balances is centred on the potential

output calculations by the EC (see Cohen-Setton, 2013, for an overview of blog entries by prominent economists discussing structural balances in the Euro area). There has been plenty of literature on output gap uncertainty and its implications for fiscal policy:[1] Koske and Pain (2008), Bouis et al. (2012), Kempkes (2014), Ley and Misch (2014) and de Cos et al. (2016) are among them. They all look at implications of revisions of macro variables for fiscal variables (including structural balances) by applying standard elasticities, but do not analyze actual revisions to structural budget balance estimates and its components.

However, uncertainties related to cyclical adjustment of fiscal variables do not only stem from output gaps and potential output, but also from budgetary elasticities which measure the response of the budget balance to a 1pp change in the output gap. Therefore, Kremer and Stegarescu (2009), Hughes-Hallett et al. (2012), Virkola (2014) and Tereanu et al. (2014) analyze actual revisions to cyclically adjusted fiscal variables. In their paper on possible safety margins for the application of structural budget balance rules, Kremer and Stegarescu (2009) look at revisions to estimates of structural tax revenue of the German federal government from autumn $t-2$ to autumn $t-1$ for the years 2001 to 2008. They construct these revisions by using different vintages of official tax revenue projections adjusted for new discretionary measures and linking that to a trend output computed by HP-filtering ($\lambda = 100$) real GDP projections included in the respective federal budget documents (and applying the revenue elasticity for Germany from Girouard and Andre, 2005). They find revisions between around -0.5% and $+0.5\%$ of GDP, as well as a positive auto-correlation of the revisions. Therefore they suggest a safety margin of close to 1% of GDP for the German federal budget balance rule.[2]

Hughes-Hallett et al. (2012) analyze revisions of cyclically adjusted balances from different vintages of the OECD Economic Outlooks for 19 OECD members (including the EU-15

[1] There are also numerous papers discussing output gap uncertainty without looking at fiscal policy like Orphanides and van Norden (2002) or Marcellino and Musso (2011).

[2] There have been several more policy briefs / case studies / blog entries on structural balance revisions for certain countries; see for example Hers and Suyker (2014) for the Netherlands.

except Luxembourg). They compare various December vintages to the "final" vintage of December 2008 and find that the average root-mean-squared-error is not only far above 1pp for the projections for the current year (i.e. projection in December of t for year t), but also for the first ex-post vintages. Furthermore, they show that the OECD estimates perform poorly against self-constrcuted estimates linking the OECD budgetary elasticties and headline balance figures to output gaps estimated by HP filtering ($\lambda = 100$) real GDP.

Virkola (2014) studies real-time uncertainty of output gap and structural budget balance estimates for EU countries by means of the difference between EC and IMF forecasts from 2000 to 2013. The real-time estimates of the structural balance by the EC are significantly more negative than the estimates by the IMF over the sample period. About half of the difference is due to smaller output gap estimates by the EC. Tereanu et al. (2014) compare the autumn projection of $t-1$ to the first ex-post release in $t+1$ in the cyclically adjusted primary balance (CAPB) for the EU-27 based on real time data of European Commission forecasts for 2003 to 2012. They show that especially for 2009 revisions in both potential output and cyclically adjusted primary balances were massive for most European countries. Furthermore, while in the EU aggregate revisions to potential output largely explained revisions in the CAPB (with a "contribution" of 2pp for 2009), other factors played a large role for individual countries.

Another strand of related literature analyzes revisions and forecast errors of (unadjusted) headline budget balances. Beetsma et al. (2011) look at governments' forecasts from Stability and Convergence Programs 1998-2008 (which were typically published in autumn during this period) for the EU-15 without Luxembourg. They find that on average autumn $t-1$ projections were more optimistic than the one of autumn t and that both projections were too optimistic compared to actual outturns. Castro et al. (2013) take budgetary ex-post notifications for the years 1995–2008 (they are typically identical to databases of international organizations) and find the first ex-post release (i.e. spring

$t+1$) to be too optimistic, which is also attributable to (methodological) Eurostat decisions. Paloviita and Ikonen (2016) look at determinants of budget balance forecast errors (of estimations in $t-1$) in euro area countries based on real-time and revised data of the IMF 2004 to 2015. In a set of differently specified regression analyses revisions of budget balance nowcasts in $t-1$ have a significant effect on forecast errors of the budget balance in t. Ouput gaps seem to explain budget balance forecast errors poorly, but when decomposing them into potential growth and real GDP growth, expectations and forecast errors of these variables have a clear impact, too.

Building up on these papers, we will analyze revisions (of both projections and ex-post data) of structural balance estimates by the European Commission for the EA-12 countries for the years 2004 to 2015. Our contribution will be two-fold:

1. In a first step we compare structural balance revisions to the mechanical impact of potential output revisions in a similar way to Tereanu et al. (2014). However, we will not only do so for the level of the structural balance, but also for the change compared to the previous year (and to year $t-2$) as the change in the structural balance also plays a crucial role in the SGP (see section 2).

2. Furthermore, we try to shed some light on the residual from the first step (i.e. revisions to the change in the structural balance not stemming from potential output revisions) by looking at the contribution of expenditure projections (and ex-post revisions of expenditure data) to revisions of structural balances.

The rest of the paper is structured as follows: Section 2 introduces the notation used in this paper and discusses the use of potential output and structural balances in the SGP to explain which indicators are analyzed in our study. Section 3 decomposes revisions of structural balances into the impact of potential output and other factors than potential output and section 4 analyzes the contribution of expenditure projections and data revisions to the uncertainty surrounding structural balances. Finally, section 5 concludes.

2 On the choice of analyzed indicators

We derive the choice of analyzed indicators from what is used in the SGP to measure consolidation needs and fiscal efforts.

2.1 The use of cyclically adjusted fiscal variables in the SGP

Estimates or projections of cyclically adjusted fiscal variables appear in the Stability and Growth Pact in two different ways:

1. The structural budget balance is used for computing whether the structural balance target (MTO) has been achieved. It is also used in the debt rule ("cyclically adjusted change in the debt ratio", for details see chapter 2.2.1.2. in EC, 2017).

2. The change in the structural balance and related indicators are used to measure the annual fiscal effort on the adjustment path towards the MTO and in Excessive Deficit Procedures (EDP).

(1.) is probably the most prominent cyclically adjusted fiscal variable of the SGP, also thanks to the requirement of the so-called "Fiscal Compact" to implement structural balance rules into national legislation. So part of our analysis will be dedicated to uncertainties surrounding the level of the structural balance sb_t.

However, non-compliance with (some of) the criteria in (2.) is a necessary condition to get a financial sanction in the preventive arm (interest-bearing deposit) or in the corrective arm (fines) of the SGP.[3] Because of the importance of estimated fiscal efforts in the SGP section 3 addresses revisions not only to the level, but also to the change in the structural balance. Fiscal efforts are assessed on a year-to-year basis, so $sb_t - sb_{t-1}$ is relevant. But it is also assessed on cumulated terms: A two-year-average is analyzed on the adjustment path to the MTO, and multi-year-averages are looked at in EDPs (as long as the EDP

[3]The only exception is the non-interest bearing deposit in the corrective arm (see chapter 2.2.4 in EC, 2017), which theoretically could be imposed after sizeable breaches of the deficit or debt criterion in the corrective arm, even though the criteria of the preventive arm have been met.

lasts longer than one year). Therefore, our analysis on changes in structural balances will focus on $sb_t - sb_{t-2}$ (while results for $sb_t - sb_{t-1}$ will be shown in the appendix).

Increasing awareness of estimation uncertainty related to structural balances and shortcomings of the change in structural balances to reliably and accurately capture discretionary policy (see for example Larch and Turrini, 2009) led the EC to partly rely on additional indicators. The change in the structural balance is complemented by "expenditure benchmarks" in the preventive (EC, 2017, on the adjustment path to the MTO, chapter 1.3.2.6 in) and in the corrective arm (for the assessment of effective action in EDPs, see chapter 2.3.2 in EC, 2017). While they differ in some details, these two "expenditure benchmarks" have in common that potential growth estimates in these indicators are fixed ex ante ("frozen"), and that consolidation on the revenue side is measured by estimates on discretionary revenue measures. The first feature circumvents problems with revisions in potential growth and the latter avoids problems with tax elasticities. To account for these alternative consolidation indicators, we will calculate projection errors based on the "expenditure benchmark" in the corrective arm in section 4.

The assessment of fiscal efforts is not exclusively based on ex-post data. For example, several important effective action decisions in the corrective arm of the SGP have been based on projections (see for example Prammer and Reiss, 2016). Furthermore, the EC's assessment whether a country's reaction to an early warning in the preventive arm has been sufficient, would have to rely on a projection.[4] Projections (of both the EC and national governments) of (the changes in) structural balances are also part of the EC's assessment of governments' budgetary documents (Stability Programmes in spring and Draft Budgetary Plans in autumn), but there are no financial sanctions attached to these

[4]Early warnings are supposed to be issued during the European Semester's Spring Package. Countries have at most five months to take corrective measures after the European Commission's recommendation (page 56 in EC, 2017), implying that the EC's assessment would be conducted around the autumn projection (which is typically published in November). Note, however, that as of 2017 there has been only one early warning since the introduction of sanctions in the preventive arm (for the non-EA country Romania).

procedures.

2.2 Data and indicators

Our analysis is based on the EC economic projections from spring 2004 to spring 2016, which we will use for analyzing the structural balance estimates for 2004 to 2015[5]. We retrieved 25 different vintages (we neglect "winter forecasts" conducted in some of these years) from AMECO[6] for the following datasets: real potential output PO, nominal GDP NY, headline budget balance B, interest payments INT, expenditure ratio $e := \frac{E}{Y}$, output gap og, cyclically adjusted balance cab, structural balance sb, cyclically adjusted expenditure ratio cae and the structural expenditure ratio se (the latter five variables are expressed as ratios to nominal potential GDP).[7]

Vintages from autumn 2014 onwards do not include structural balance estimates for the years before 2010 (budget balances of these years have been partly revised due to the change-over to ESA 2010). Estimates for cyclically adjusted budget balances would be available for more vintages, but they are quite noisy for 2008 and after, mainly due to financial sector support measures which were recorded as deficit-increasing. Therefore, we treat spring 2014 as "final release" for the years until 2012 (later years are not included when comparing projections to the "final release"). Furthermore, there are no structural balance projections from vintages before spring 2007 in our database. Therefore, we use cyclically adjusted balances instead for years before 2008. For these years one-offs are less noisy due to the much smaller role of capital transfers related to financial sector support.

[5]Thus the years 2004 to 2012 are included for ex-post revisions, whereas the years 2004 to 2015 are analyzed for forecast revisions.

[6]Vintages from autumn 2007 were retrieved via the internal version of the Statistical Data Warehouse of the ECB; earlier vintages were provided by ECB staff.

[7]Note that there has been a change to the calculation of the cyclically adjusted and the structural expenditure ratio by the EC, for details (and the transformations conducted to the raw series) see appendix B.1.

We will do **four different** types of **vintage comparisons** to answer the following questions:

1. How "reliable" are **projections** (autumn $t-1$, spring t, autumn t) compared to the **first ex-post release** (spring $t+1$)?

2. How "reliable" is the **first ex-post release** (spring $t+1$) compared **to later vintages** (F), here the spring 2014 release?

The first projection vintage we use is autumn $t-1$ (EC projections for year t would actually be available from autumn $t-2$), as this is typically the first vintage for which a (draft) budget for year t is available; it is also the relevant vintage for the recently introduced analysis of the so-called "Draft Budgetary Plans". As projection errors for autumn $t-1$ can be argued to be partly driven by discretionary measures passed after the projection cut-off, we will focus our descriptions on projections from autumn t.

It is also worth mentioning that potential output revisions in the time span we cover have been partly induced by major methodical changes, i.e. a change in the estimation of trend total factor productivity in autumn 2010 (D'Auria et al., 2010) and a change in the calculation of the trend unemployment rate in spring 2014 for a majority of countries (Havik et al., 2014).

2.3 Notation

Capital letters refer to millions of EUR, while small letters refer to ratios to nominal GDP (resp. the ratio to nominal potential GDP) and small letters with hats refer to growth rates. Let the subscript t denote the year for which the respective variable was projected (or in which it was "observed") and let superscripts denote the projection vintage used, where A refers to autumn, S to spring, t to the year of the vintage and F is the final vintage used for the analysis (which is spring 2014).[8] So, for example, B_t^{At} would be

[8]We choose spring 2014 as "final" vintage due to lack of availability of official data on structural balances before 2010 in later vintages and due to the large ESA-2010-induced revisions of fiscal data in some countries.

the autumn t projection of the budget balance (in million EUR) for the current year t, $sb_t^F - sb_t^{St+1}$ would denote the final revision of the structural balance (as a ratio to potential GDP) of year t compared to the first ex-post release, and $\widehat{y}_t^{St+1} - \widehat{y}_t^{St}$ would stand for the revision of real GDP growth in year t from the spring projection in t to the first ex-post release.

3 The mechanical contribution of output gaps to structural balance revisions

3.1 Calculating the mechanical impact of output gap revisions

The estimated ratio of the structural balance to nominal potential GDP is computed by subtracting temporary measures $\frac{TM_t}{NY_t}$ and the cyclical component ϕog_t from the headline budget balance (as a ratio to GDP):

$$sb_t = \frac{B_t - TM_t}{NY_t} - \phi og_t = b_t(Y_t, X_t) - tm_t(X_t) - \phi og_t, \tag{3.1}$$

where Y_t is real GDP, X_t is a composite variable capturing all other factors influencing headline budget balances (including the composition of GDP) and ϕ is the sensitivity of the budget balance (as a ratio to GDP) to the output gap (i.e. $\phi := \frac{db}{dog}$; called "semi-elasticity" by the EC). We decompose structural balance revisions from vintage r to vintage s into the mechanical contribution of potential output rev_sb_PO and other factors:[9]

$$sb_t^s - sb_t^r \quad = \quad rev\_sb\_PO_t^{s,r} + rev\_sb\_NonPO_t^{s,r}. \tag{3.2}$$

[9]This decomposition is taken from the unpublished paper by Reiss (2017), which compares the revisions of potential output estimates by EC, OECD and IMF, but which does not look at revisions to actual fiscal variables.

We define $rev\_sb\_PO_t^{s,r}$ as the revision to sb for given X_t:

$$rev\_sb\_PO_t^{s,r} := \left(sb_t^s - sb_t^r\right)|_{X_t^s = X_t^r} \approx \frac{\partial b}{\partial \widehat{y}} \left(\sum_{\text{year}(r) \leq q \leq t} \left(\widehat{y}_q^s - \widehat{y}_q^r\right) \right) - \phi \left(og_t^s - og_t^r\right) \quad (3.3)$$

In the first term on the RHS of equation 3.3, summation over different years is restricted to start in year r at the earliest. This is motivated by the assumption that revisions to actual GDP growth in t should only translate into the budget balance in t as long as year t is not over. Thus, when comparing a projection in year t for year t with the first ex-post release in $t+1$ (i.e. $year(r) = t$ and $year(s) = t+1$), the projection error in GDP growth for t is assumed to translate into the budget balance, but an ex-post revision of GDP growth in $t-1$ should not.[10] When comparing two ex-post-vintages (like in our paper spring $t+1$ with the final release), it holds that $\text{year}(r) = q > t$ and the first term on the right hand side of equation 3.3 equals zero.

In line with the OECD/EC method of cyclical adjustment, we assume that the size of the effect of a GDP growth revision on the headline budget balance is given by the budgetary semi-elasticity ϕ, i.e. a 1pp forecast error in the GDP growth rate for the current year should translate into a forecast error of ϕ for the budget balance as a ratio to GDP.

Projection errors in $rev\_sb\_NonPO_t^{s,r}$ (labelled $NonPO$ in the following figures and tables) should mainly contain causes of error like lack of information on discretionary measures, a wrong evaluation of known measures, problems with tax elasticities etc. If the contribution of $NonPO$ is non-zero in the analysis of ex-post-revisions, this may be due to revisions of fiscal data, a change in the assessment of measures as temporary (and therefore to be taken out of the structural balance), or revisions to budgetary elasticities.

[10] The sum in the first term on the RHS of 3.3 stops at year t as revisions to GDP growth in year $t+1$ should not have an automatic effect on the budget balance in year t.

Equivalently, we split the revision of the change in the structural balance as follows:

$$\begin{aligned} dsb_t^s - dsb_t^r &= \left(sb_t^s - sb_{t-1}^s\right) - \left(sb_t^r - sb_{t-1}^r\right) \\ &= rev\_dsb\_PO_t^{s,r} + rev\_dsb\_NonPO_t^{s,r}, \qquad (3.4) \\ d2sb_t^s - d2sb_t^r &= \left(sb_t^s - sb_{t-2}^s\right) - \left(sb_t^r - sb_{t-2}^r\right) \\ &= rev\_d2sb\_PO_t^{s,r} + rev\_d2sb\_NonPO_t^{s,r}. \qquad (3.5) \end{aligned}$$

Using $\widehat{y}_t \approx \widehat{po}_t + og_t - og_{t-1}$, the expressions for $rev\_sb\_PO_t^{s,r}$, $rev\_dsb\_PO_t^{s,r}$ and $rev\_d2sb\_PO_t^{s,r}$ can be rearranged as functions of potential growth and output gap revisions. $rev\_dsb\_PO_t^{s,r}$ for the case $r \leq t$ (i.e. projection errors) is very similar to the so-called "α-correction" in the meanwhile sidelined "adjusted change in the structural balance" (annex 5 in EC, 2016):

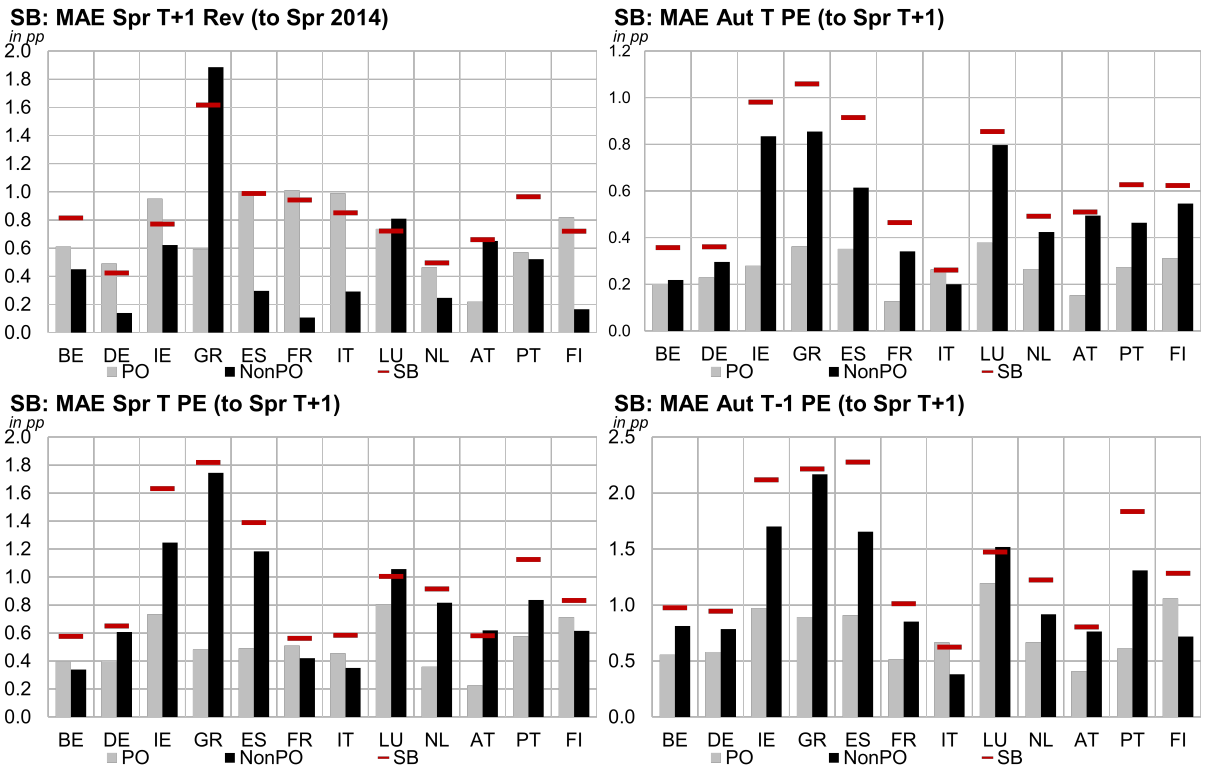
$$\begin{aligned} rev\_dsb\_PO_t^{s,r}|_{r\leq t} &= rev\_sb\_PO_t^{s,r} - rev\_sb\_PO_{t-1}^{s,r} \\ &\approx \phi \left(\sum_{\text{year}(r)\leq q\leq t} (\widehat{y}_q^s - \widehat{y}_q^r) - \sum_{\text{year}(r)\leq q\leq t-1} (\widehat{y}_q^s - \widehat{y}_q^r) \right) \\ &\quad -\phi \left((og_t^s - og_t^r) - \left(og_{t-1}^s - og_{t-1}^r\right) \right) \\ &\approx \phi(\widehat{y}_q^s - \widehat{y}_q^r) - \phi \left((og_t^s - og_t^r) - \left(og_{t-1}^s - og_{t-1}^r\right) \right) \\ &= \phi \left(\widehat{po}_t^s - \widehat{po}_t^r \right). \qquad (3.6) \end{aligned}$$

Note that the semi-elasticities applied by the European Commission have changed over the time span we cover, mostly in 2013 (Mourre et al., 2013) and 2014 (Mourre et al., 2014). We therefore choose to apply the implicit semi-elasticity of the respective later vintage, which is computed as $\phi_t^s = \frac{b_t^s - cab_t^s}{og_t^s}$.

3.2 Results on the mechanical impact of potential output revisions

Figures A.1, A.2 and A.3 show *mean* ex post revisions (revisions of spring $t+1$ estimates in spring 2014) and projection errors (comparison of $t-1$ and t projections to spring $t+1$) of structural balances and the change in structural balance, while figures 3.1, A.4 and 3.2 show *mean absolute* revisions resp. projection errors.[11] The red lines indicate revisions of the three indicators (sb_t, $sb_t - sb_{t-1}$, $sb_t - sb_{t-2}$), while the two solid bars show the mechanical impact of potential output revisions (grey) and the impact of other factors (black).

Figure 3.1: Mean absolute revisions to level of the structural balance

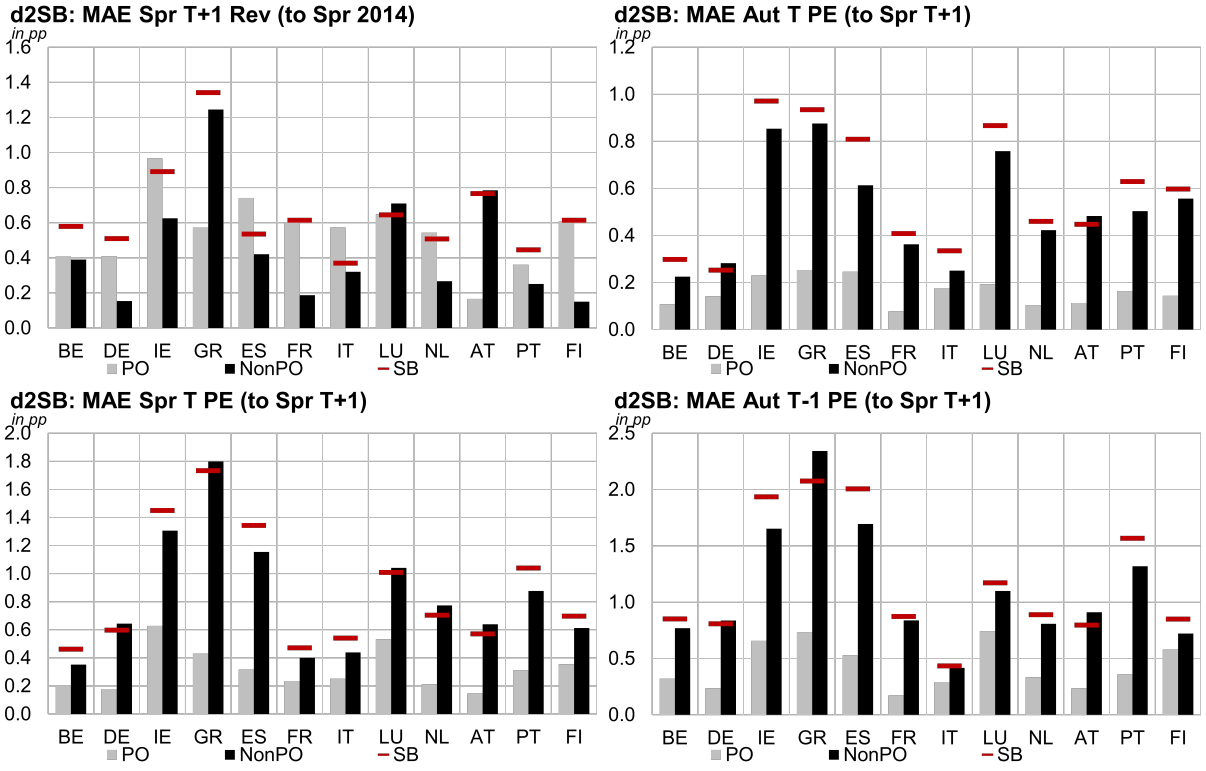


Source: Own calculations.

For the level of the structural balance, ex-post mean absolute errors tend on average to be mainly driven by output gap revisions, except for a few countries with sizeable ex-post

[11] The tables A.1 to A.12 in the appendix show the numerical output used in these figures as well as unweighted averages across countries for the years 2004 to 2015.

Figure 3.2: Mean absolute revisions to the change in the structural balance to $t-2$



Source: Own calculations.

headline deficit revisions (GR, LU, PT, AT) or large changes in budgetary elasticities (IE) (see top left panel in figure 3.1). Figure 3.3 and table A.1 indicate that this large role of output gap revisions is mostly due to the large ex-post-revisions of pre-crisis (i.e. years 2004 to 2007 in our paper) potential output estimates.

Mean absolute projection errors in structural balances, however, are to a large extent driven by other factors than potential output revisions (see top right and bottom panels of figure 3.1). This is also the case for projections conducted for the current year, where measures implemented after the projection cut-off-date should play a rather minor role, leaving genuine projection errors as the main source of error. Mean ex-post revisions (comparison of spring $t+1$ to spring 2014[12]) are mostly negative, while projections in autumn t were on average too low. The latter fact is driven by other factors than potential output in most countries.

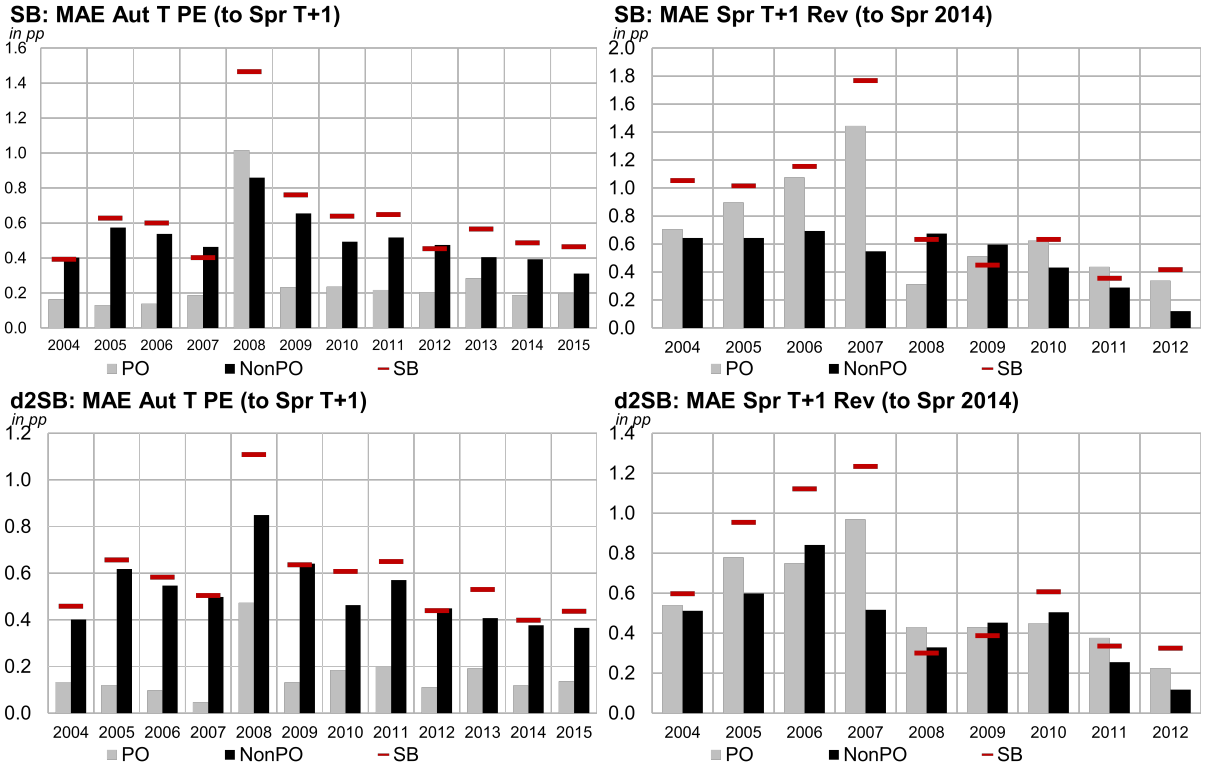
[12]Note, however, that all comparisons to a "final" release (in our case spring 2014) depend heavily on the properties of this one release, and should therefore be interpreted with some caution.

Looking at the change in structural balances, both mean absolute ex-post revisions and projection errors are sizeable. Ex-post revisions of $sb_t - sb_{t-2}$ are larger than 0.5 in all countries (except IT) and dominated by revisions of potential output in most cases (see top left panel in figure 3.2), which is to some extent driven by the large revisions to pre-crisis potential growth (figure 3.3). Mean absolute projection errors, i.e. the revision of estimates in $t-1$ and t at spring $t+1$, are, without exception, mostly due to other factors than potential output revisions. This result holds for both, $sb_t - sb_{t-1}$ and $sb_t - sb_{t-2}$, and is even true for the projections in autumn t (figures A.4 and 3.2). Figure 3.3 shows that this is even true for the projections for the year 2008, when potential growth revisions (i.e. between autumn 2008 and spring 2009) were exceptionally high. Projection errors of autumn $t-1$ should not be over-interpreted, however, because of discretionary measures implemented after the projection cut-off, which partly explains the very large size of the $NonPO$ bars.

Restricting the analysis to mean absolute errors suffers from two problems. First, large mean absolute errors may be driven by outliers. Second, mean absolute errors are not additive (i.e. $mae(a+b) \neq mae(a) + mae(b)$), so the bars in figures 3.1 to 3.2 cannot be interpreted as contributions to overall projection errors (as potential-output-related errors and other factors may partly cancel out).

To circumvent the problems of outliers, we analyze the share of projection errors resp. revisions beyond the margins of error used by the EC in the preventive arm of the SGP. In the assessment of compliance with the preventive arm, a deviation from the MTO or from the appropriate path towards it is deemed to be significant if it is larger than 0.5% of GDP in a single year or cumulated over two years (chapter 1.3.2.7 in EC, 2017). Table 3.1 shows the percentage of cases over all countries and years where the revision of the structural balance (2^{nd} column) or one of the two components, potential output

Figure 3.3: Mean absolute revisions by year



Source: Own calculations.

(3rd column) or other factors (4th column), alone exceeds the threshold of 0.5% of GDP. The rightmost column gives the percentage of revisons of structural balances that are dominated by other factors than potential output.

Table 3.1: Share of observations where projection errors/revisions were large

	$sb \geq 0.5$ resp. $d2sb \geq 0.5$	all cases $PO \geq 0.5$	all cases $NonPO \geq 0.5$	only cases where $sb \geq 0.5$ $NonPO \geq PO$
sb^{St+1} vs sb^{F}	0.56	0.55	0.30	0.28
sb^{At} vs sb^{St+1}	0.47	0.15	0.40	0.76
sb^{St} vs sb^{St+1}	0.66	0.36	0.57	0.73
sb^{At-1} vs sb^{St+1}	0.76	0.55	0.70	0.68
$d2sb^{St+1}$ vs $d2sb^{F}$	0.45	0.48	0.25	0.31
$d2sb^{At}$ vs $d2sb^{St+1}$	0.49	0.07	0.40	0.90
$d2sb^{St}$ vs $d2sb^{St+1}$	0.65	0.22	0.58	0.84
$d2sb^{At-1}$ vs $d2sb^{St+1}$	0.69	0.34	0.68	0.82

Source: Own calculations.

According to the latest forecast for an ex ante evaluation, i.e. autumn t, in 47% of the

cases revisions in spring $t+1$ exceed the 0.5% margin. Looking at the decomposition of forecast errors into the contribution of potential output and other factors, the latter perform much worse with 40% individual breaches of the 0.5% margin. Thus, not surprisingly, 76% of structural balance revisions of more than 0.5 pp are dominated by other factors than potential output. As late as in autumn t, there is a high chance of a misperception of a significant non-achievement of the MTO or vice versa an achievement of the MTO that turns into a significant deviation at spring $t+1$[13].

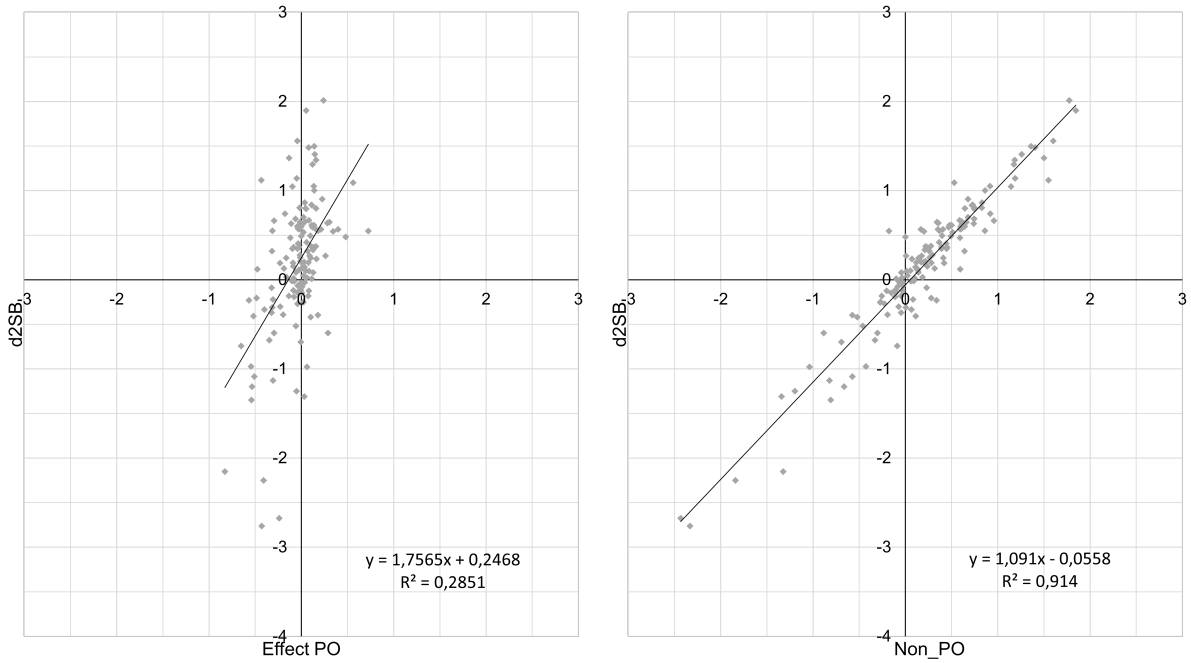
Ex-post revisions of spring $t+1$ estimates of structural balances exceed 0.5 pp in 56% of the cases, 28% of which are dominated by other factors than potential output. The contribution of potential output to ex-post revisions is greater than 0.5 pp in 55% of the cases. Note, however, that this result is also driven by the large ex-post-revisions of pre-crisis structural balances (table A.1).

Our results are similar for the change in structural balances, see bottom panel of table 3.1. Revisions of $d2sb_t$ exceed 0.5 pp in 49% of the cases, whereas the contribution of potential output is revised by more then 0.5 pp in only 7% of the cases when looking at forecast errors of autumn t estimates. The breaches of the 0.5% margin are dominated by other factors in even 90%. In autumn t, when few additional discretionary measures will be implemented, a wrong assessment of a risk of a significant deviation is very likely because of the uncertainty of estimates on implemented discretionary measures.

As with ex-post revisions of the level of structural balances, revisions of spring $t+1$ estimates of the change in the structural balance are still substantial and exceed 0.5 pp in 45% of the cases. The contribution of potential output to ex-post revisions on its own exceeds this threshold in 48% of the cases.

[13] As mentioned before, autumn t projection errors should not be driven by policy measures implemented after the projection cut-off, but by uncertainty concerning impact estimates on discretionary measures, expenditure policies or because of misspecified fiscal elasticities.

Figure 3.4: Drivers of projection errors for $sb_t - sb_{t-2}$: the role of potential growth (autumn t versus spring $t+1$)



Source: Own calculations.

Another way to look at the relative role of revisions to potential output and other factors are scatter plots like in figure 3.4, which show the error of the autumn t projection for $d2sb_t$ on the x-axis and the effect of potential output revisions (left panel) resp. other factors (right panel) on the y-axis. They show that other factors than potential output explain a large share of the revision of the change in structural balances, and that the large R^2 is not driven by outliers. So when considering single revisions of all countries and years, structural balance revisions match revisions of other factors than potential output very well.

Overall, the results in this section indicate that projection errors on structural fiscal variables are primarily driven by other factors than potential output. Therefore, indicators based on the structural balance should remain subject to large projection errors even when potential output is frozen (e.g. setting PO to 0, implying $SB = NonPO$ in all figures).

4 The role of expenditure projections and data revisions for fiscal effort measures

As explained in section 2.1, the alternative consolidation indicators in the SGP do not only rely on frozen potential growth, but also on the measurement of revenue-based adjustments via impact estimates on discretionary revenue measures. This allows the EC to circumvent the problem of revenue windfalls/shortfalls, which are defined by the EC as developments in (tax) revenue which cannot be explained by developments in output gap, nominal GDP and discretionary revenue measures (see for example annex 5 in EC, 2016). Note, however, that while the measurement of revenue-based adjustments via impact estimates on discretionary measures may decrease planning uncertainty (see below), it does not necessarily improve the estimation of the "true fiscal effort".

In the following we will analyze, how much government expenditure (the third "main ingredient" next to government revenue and potential output) influences projection errors and ex-post-revisions to the change in the structural balance.[14] Therefore, we construct two different indicators focusing on the measurement of expenditure-based consolidation efforts, which are both based on indicators used in the SGP framework.

4.1 Decomposing structural balance revisions again

The first indicator builds on the "expenditure benchmark" in the corrective arm of the SGP (chapter 2.3.2 in EC, 2017) by looking at revisions to the change in structural primary

[14] An analysis of the projection errors resp. revisions concerning the impact of discretionary revenue measures is outside the scope of this paper. Except for the introduction of new taxes and the abolishment of existing taxes, it is hard to verify estimates on the impact of discretionary measures ex-post, even for informed outsiders like the EC.

expenditure[15] divided by nominal potential GDP of the last available vintage:[16]

$$\Delta sb_t^s - \Delta sb_t^r \quad = \quad -\frac{\Delta SPE_t^s - \Delta SPE_t^r}{NPO_t^F} + rev\_dsb\_nonEBO_t^{s,r}. \tag{4.1}$$

The second indicator builds on the recently sidelined "adjusted change in the structural balance" (chapter 2.3.2.1 and annex 5 in EC, 2016) and looks at the revision to the change in the structural expenditure ratio, adjusted for the revision to potential growth multiplied by the structural expenditure ratio of the previous year (i.e. the "alpha-correction"):[17]

$$\Delta sb_t^s - \Delta sb_t^r \quad = \quad -\left(\Delta se_t^s - \Delta se_t^r - se_{t-1}^s \left(\widehat{po}_t^s - \widehat{po}_t^r\right)\right) + rev\_dsb\_nonEad_t^{s,r}. \tag{4.2}$$

Both $\left(\Delta se_t^s - \Delta se_t^r - se_{t-1}^s \left(\widehat{po}_t^s - \widehat{po}_t^r\right)\right)$ (labelled *E_ad* from now on) and $\frac{\Delta SPE_t^s - \Delta SPE_t^r}{NPO_t^F}$ (labelled *E_BO* from now on) are by construction not affected by (forecast) revisions in potential output except for changes to estimated structural spending on unemployment benefits. So the main reasons for projection errors in these two expressions should be wrong expert judgement, lack of information on discretionary measures, and in case of *E_ad* also projection errors concerning the GDP deflator and interest expenditure[18]. Ex-post-revisions should be driven by revisions to fiscal data and changes in the assessment of temporary measures.

If there were no new discretionary tax measures and budgetary elasticities were correct (and applied consistently for both revenue projections and cyclical adjustment), the revisions to *E_ad* and *E_BO* should be similar to the component *NonPO* (i.e. the residuum when looking at the mechanical contribution of potential output revisions) discussed in the previous section.

[15] $SPE_t^s = SE_t^s - INT_t^s$. Due to lack of real-time information on projections, we are not able to include an adjustment for investment matched by EU funds.

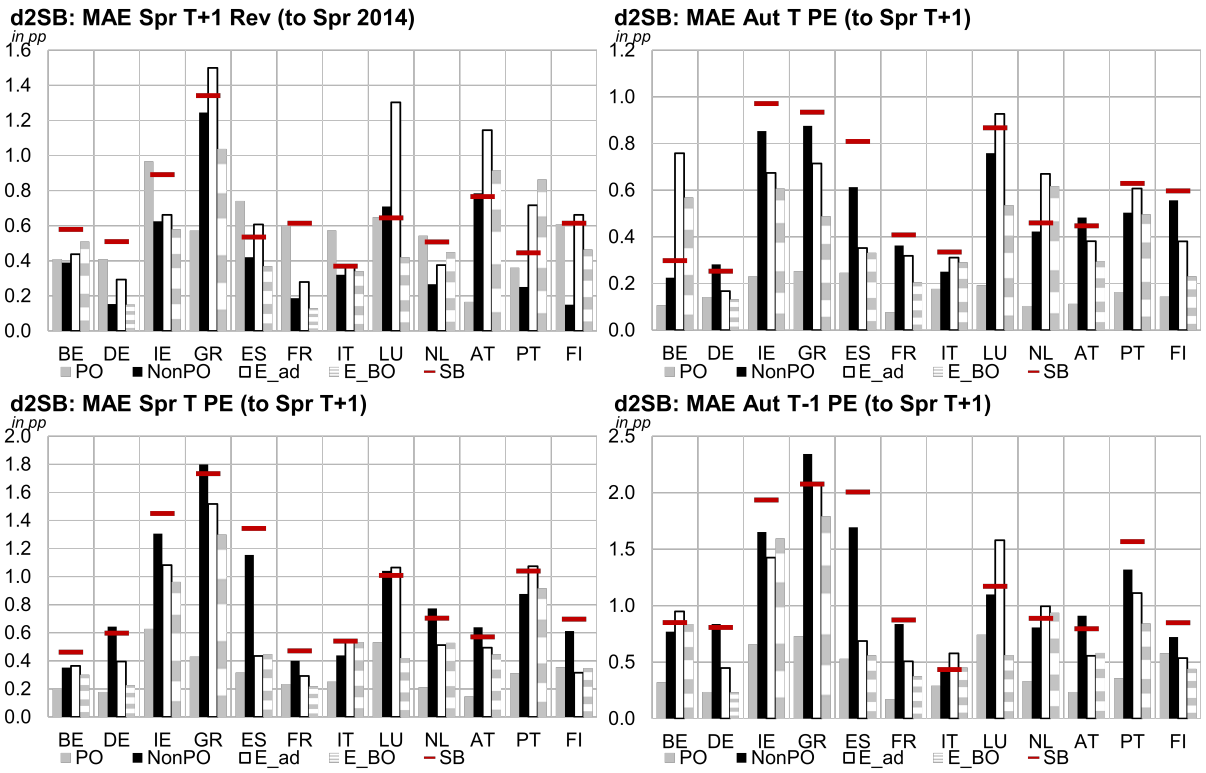
[16] A roughly equivalent indicator has previously been labelled as "bottom-up"-approach (chapter 2.3.2.1 in EC, 2016). Therefore, we use the label "BO".

[17] In line with section 3 we will replace $(\widehat{po}_t^s - \widehat{po}_t^r)$ by the revision to the change in the output gap when looking at ex-post-revisions (i.e. when decomposing $\Delta sb_t^F - \Delta sb_t^{St+1}$).

[18] As *E_BO* looks at primary (i.e. excluding interest) expenditure and as both vintages are divided by the same nominal GDP, the latter two factors do not affect *E_BO*.

4.2 Results on the role of expenditure projections and data revisions

Figure 4.1: Mean absolute revisions to the change in the structural balance to $t-2$



Source: Own calculations.

Concerning *ex-post* revisions, there is a common tendency among the analyzed countries that mean absolute errors of both, the change of factors other than potential output (black solid bars) and of the structural expenditure indicators, *E_ad* (white bars) and *E_BO* (grey dashed bars), are substantial and of comparable size. This holds for the change in t to $t-1$ as well as $t-2$ (see top left panel in figures A.5 and 4.1). The mean absolute errors of these expenditure indicators have roughly the same extent as the contribution of potential output.

As was shown in section 3.2, *projection errors* concerning the change in structural balances are clearly driven by other factors than potential output (black solid bars). Figure 4.1 indicates that this is not only due to unexpected revenue windfalls/shortfalls as pro-

jection errors to structural expenditures (E_ad and E_BO) are sizeable. As late as in autumn t, the mean absolute projection error was higher for the factor of structural expenditures than for total other factors (i.e. other than potential output revisions) in six countries (BE, IT, LU, NL, PT) and higher than 0.5 in five countries (BE, IE, LU, NL).

Table 4.1 gives an indication on the relative role of structural expenditure for projection errors concerning the change in the structural balance. When looking at autumn t, projection errors to the change in structural primary expenditures in terms of E_BO exceed 0.5% of GDP in 40% of the cases and dominate high revisions (i.e. larger than 0.5% of GDP) of the change in structural balances in 29% of the cases. Remarkably, revision uncertainty concerning structural expenditures is also substantial ex-post (i.e. after the first ex-post-release in spring $t+1$). While the share of revisions to the change of structural balances higher than 0.5 pp declines to 25%, revisions to E_BO exceed 0.5 pp in 44% of the cases and dominate revisions to the change in structural balances in 43% of the cases.

Table 4.1: Share of observations where projection errors/revisions were large

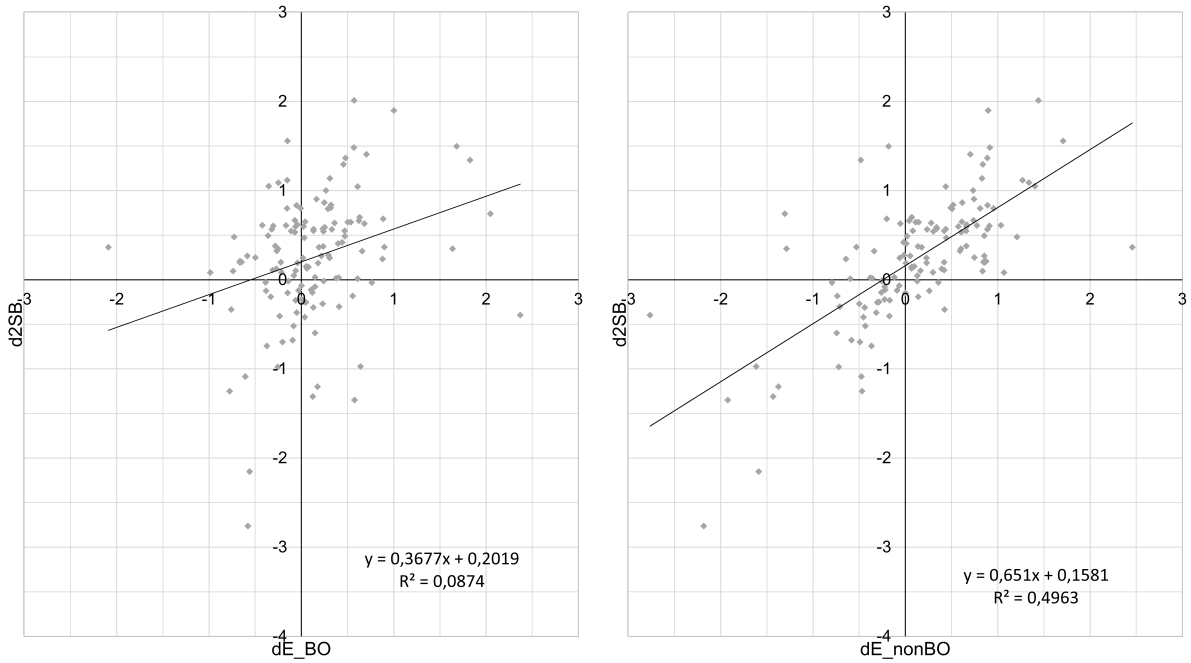
		all cases		only cases where $sb \geq 0.5$	
	$d2sb \geq 0.5$	$E\_BO \geq 0.5$	$E\_ad \geq 0.5$	$E\_BO \geq NonEBO$	$E\_ad \geq nonEad$
$d2sb^{St+1}$ vs $d2sb^{F}$	0.25	0.44	0.31	0.43	0.24
$d2sb^{At}$ vs $d2sb^{St+1}$	0.40	0.40	0.28	0.29	0.38
$d2sb^{St}$ vs $d2sb^{St+1}$	0.58	0.44	0.33	0.30	0.40
$d2sb^{At-1}$ vs $d2sb^{St+1}$	0.68	0.63	0.49	0.31	0.38

Source: Own calculations.

Figure 4.2 shows that the correlation of projection errors to structural expenditure (left panel) with projection errors to $d2sb_t = sb_t - sb_{t-2}$ is much weaker than with other factors than potential output revisions (right panel in figure 3.4[19]).

[19]This figure (in combination with table A.11 in the appendix) contains rich additional information on the nature of projections errors concerning the change in the structural balance. For example, in the bottom right panel, a presumeably not foreseen increase in revenues overcompensated structural expenditures that expanded more than expected in autumn t and resulted in upward revisions of $d2sb_t$. It is indeed the pre-crisis years 2006 and 2007 that are overrepresented in this quadrant (see also page 33 in EC, 2014). In cases at the top left panel, $d2sb_t$ turned out to be worse than expected in autumn t, although the expected growth in structural expenditures was overestimated, but this was supposedly counteracted by a weaker then expected growth in revenues. This applies for example to Greece in the years 2010 and 2011.

Figure 4.2: Drivers of projection errors for $sb_t - sb_{t-2}$: the role of expenditure projections (autumn t versus spring $t+1$)



Source: Own calculations.

So overall these results indicate that planning uncertainty on structural figures could be reduced when controlling for revenue windfalls/shortfalls (in addition to freezing potential output), but projection errors and revisions would still be sizeable.

5 Conclusions

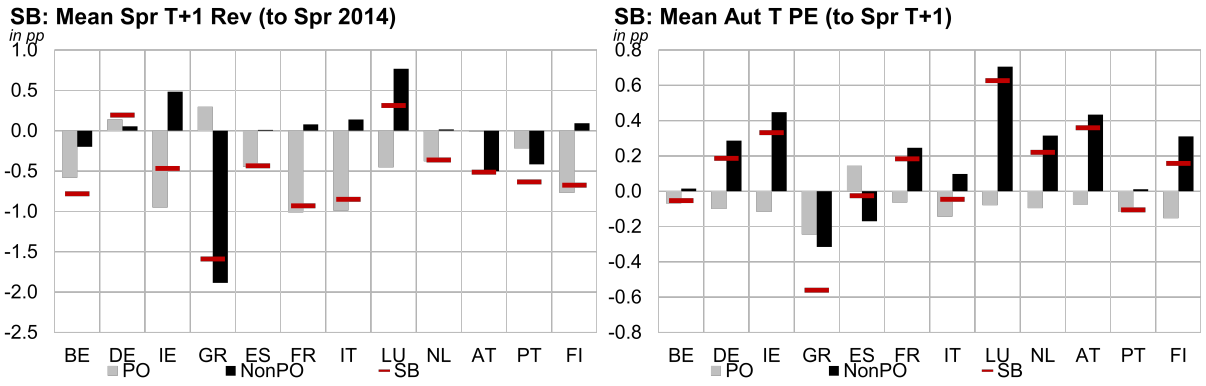
In general, ex-post revisions in the level of structural balances were mainly driven by output gap revisions, while projection errors are to a significant extent driven by other factors. When looking at the change in structural balance, which is an important indicator for consolidation efforts in the EU fiscal governance, the contribution of potential output revisions to projection errors is rather small. Therefore, only freezing potential output ex ante would do little to reduce projection errors related to consolidation efforts.

When additionally controlling for revenue windfalls/shortfalls (like in the SGP's "ex-

penditure benchmark") by measuring revenue-based fiscal adjustments via discretionary measures, uncertainty drops significantly. However, projection errors related to expenditure indicators are in many cases still beyond 0.5% of GDP in autumn t projections (when measures implemented after the projection cut-off-date should play a minor role). These uncertainties may shed some doubt on how much the EU Fiscal Governance should rely on projections of fiscal efforts.

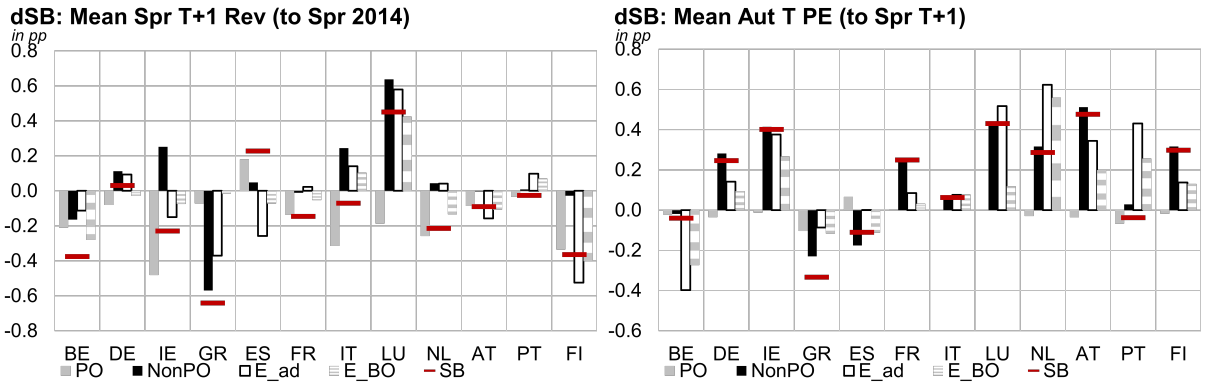
A Additional figures and tables

Figure A.1: Mean revisions to the level of the structural balance



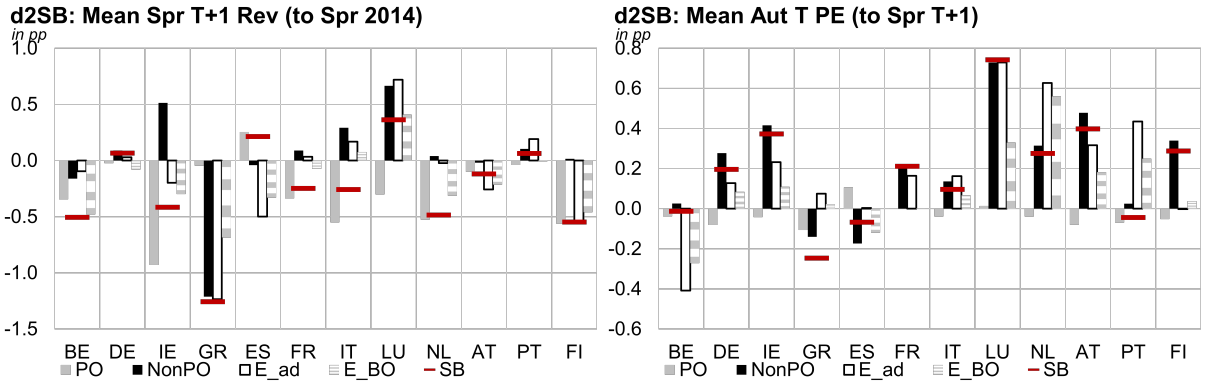
Source: Own calculations.

Figure A.2: Mean revisions to the change in the structural balance



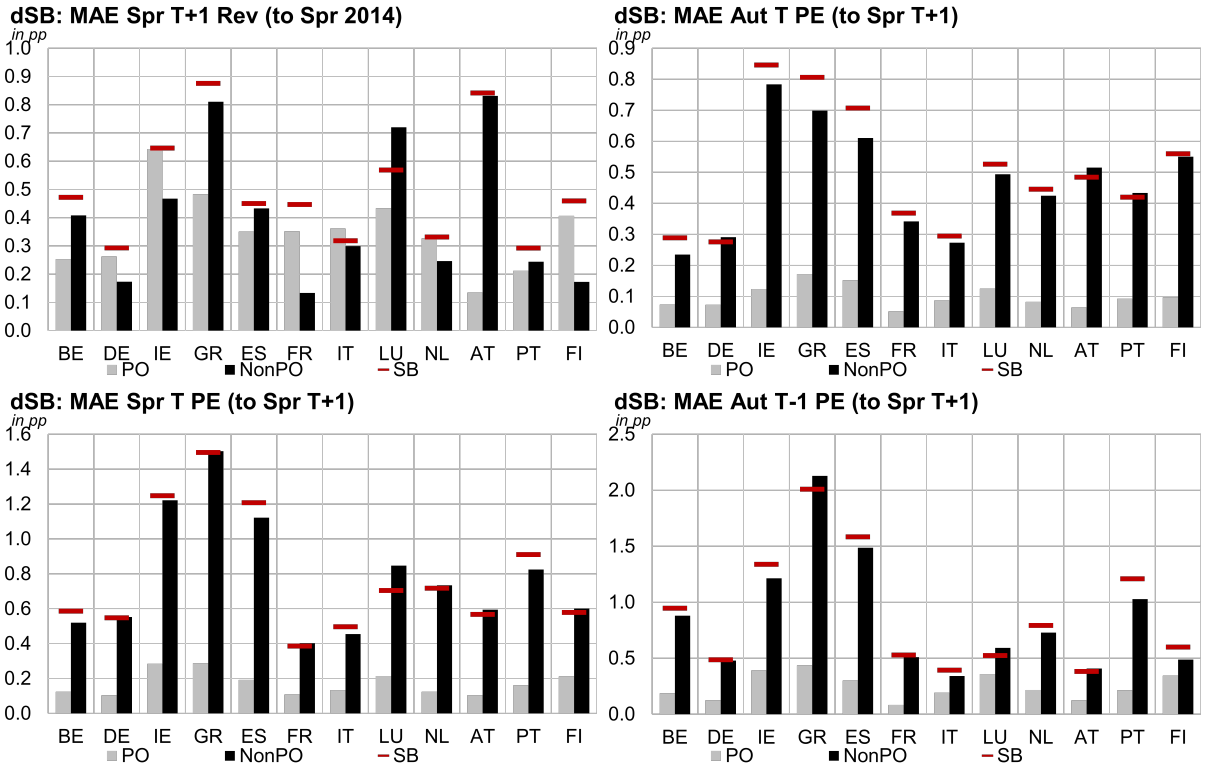
Source: Own calculations.

Figure A.3: Mean revisions to the change in the structural balance to $t-2$



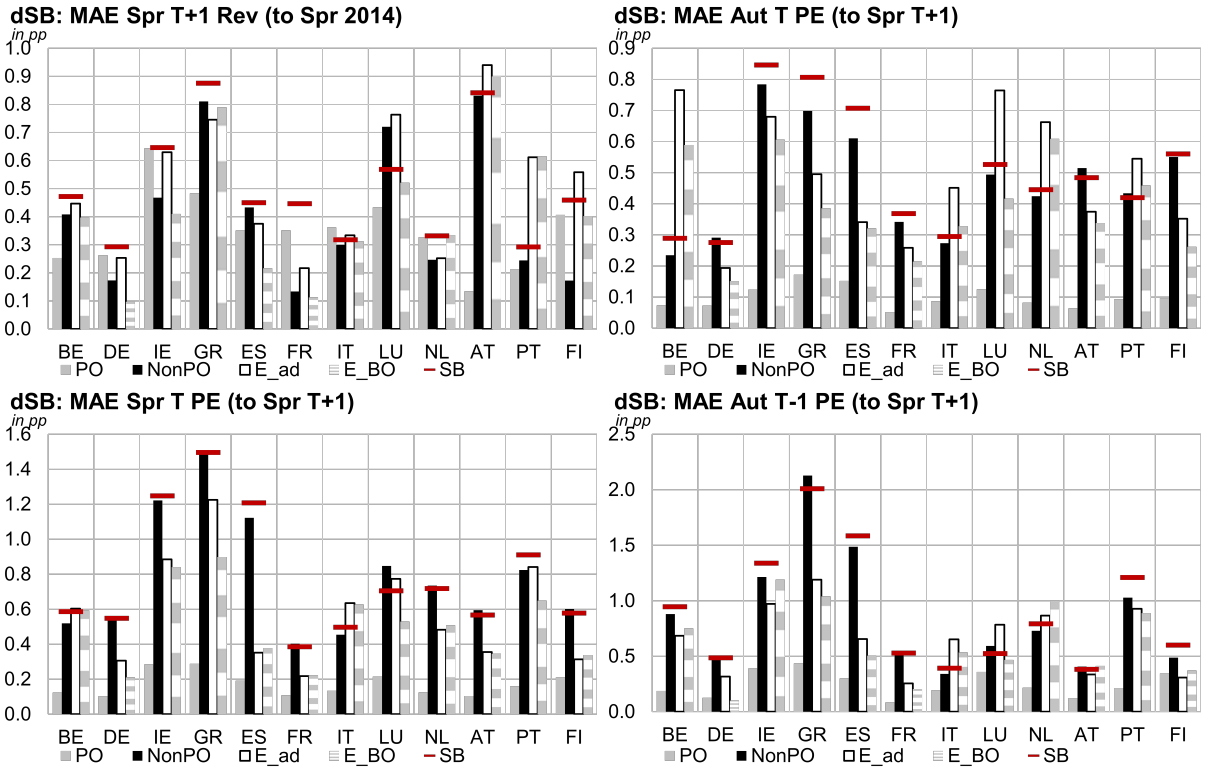
Source: Own calculations.

Figure A.4: Mean absolute revisions to the change in the structural balance



Source: Own calculations.

Figure A.5: Mean absolute revisions to the change in the structural balance



Source: Own calculations.

Table A.1: Level of struc. balance – revision from spring $t+1$ to final release

	Mean error			MAE			RMSE		
	SB	PO	NonPO	SB	PO	NonPO	SB	PO	NonPO
BE	-0.78	-0.58	-0.20	0.81	0.61	0.45	1.30	0.75	0.88
DE	0.19	0.14	0.05	0.42	0.49	0.14	0.53	0.56	0.17
IE	-0.47	-0.95	0.48	0.77	0.95	0.62	1.05	1.17	0.85
GR	-1.59	0.30	-1.89	1.62	0.59	1.89	2.29	0.74	2.38
ES	-0.43	-0.45	0.01	0.99	1.00	0.30	1.11	1.23	0.37
FR	-0.93	-1.01	0.08	0.94	1.01	0.11	1.17	1.24	0.14
IT	-0.85	-0.99	0.14	0.85	0.99	0.29	1.08	1.22	0.42
LU	0.31	-0.45	0.77	0.72	0.74	0.81	0.85	0.91	0.97
NL	-0.36	-0.38	0.02	0.50	0.46	0.25	0.59	0.56	0.32
AT	-0.51	-0.01	-0.50	0.66	0.22	0.65	1.06	0.30	1.06
PT	-0.63	-0.22	-0.42	0.97	0.57	0.52	1.11	0.66	0.60
FI	-0.68	-0.77	0.09	0.72	0.82	0.17	0.99	1.04	0.20
2004	-0.82	-0.43	-0.39	1.05	0.71	0.64	1.30	0.91	1.03
2005	-0.67	-0.56	-0.11	1.01	0.90	0.64	1.33	0.99	1.02
2006	-1.14	-1.08	-0.06	1.15	1.08	0.69	1.47	1.27	1.14
2007	-1.77	-1.44	-0.32	1.77	1.44	0.55	2.02	1.56	1.12
2008	-0.46	0.06	-0.53	0.63	0.31	0.68	1.02	0.38	1.16
2009	-0.13	0.06	-0.19	0.45	0.51	0.60	0.63	0.67	0.99
2010	-0.18	-0.56	0.37	0.63	0.62	0.43	0.74	0.75	0.64
2011	-0.08	-0.24	0.16	0.36	0.44	0.29	0.50	0.56	0.38
2012	0.20	0.16	0.04	0.42	0.34	0.12	0.67	0.51	0.25

Source: Own calculations.

Table A.2: Level of struc. balance – projection error from spring t to spring $t+1$

	Mean error			MAE			RMSE		
	SB	PO	NonPO	SB	PO	NonPO	SB	PO	NonPO
BE	-0.23	-0.17	-0.06	0.58	0.40	0.34	0.75	0.55	0.44
DE	0.44	-0.14	0.58	0.65	0.40	0.61	0.80	0.54	0.71
IE	0.06	-0.08	0.14	1.63	0.73	1.25	2.28	1.06	1.61
GR	-0.81	-0.16	-0.65	1.82	0.48	1.74	2.77	0.61	2.46
ES	-0.63	0.05	-0.67	1.39	0.49	1.18	1.94	0.71	1.58
FR	-0.22	-0.26	0.04	0.56	0.51	0.42	0.71	0.64	0.54
IT	-0.47	-0.36	-0.10	0.58	0.45	0.35	0.73	0.64	0.45
LU	0.62	-0.22	0.85	1.00	0.81	1.06	1.14	1.10	1.28
NL	0.19	-0.23	0.43	0.91	0.36	0.82	1.00	0.53	0.92
AT	0.43	-0.10	0.53	0.58	0.23	0.62	0.64	0.37	0.70
PT	-0.63	-0.21	-0.42	1.13	0.58	0.84	1.31	0.69	1.15
FI	0.12	-0.21	0.33	0.83	0.71	0.62	1.03	0.91	0.71
2004	-0.25	-0.08	-0.16	0.76	0.37	0.69	1.20	0.46	1.06
2005	0.29	-0.21	0.51	0.72	0.32	0.77	0.89	0.39	0.93
2006	0.91	0.23	0.67	0.96	0.34	0.78	1.10	0.38	1.00
2007	0.23	-0.17	0.40	0.77	0.27	0.75	0.97	0.32	0.98
2008	-2.31	-1.70	-0.61	2.31	1.70	1.35	2.96	1.82	1.97
2009	-1.14	0.04	-1.18	1.56	0.46	1.60	2.44	0.56	2.24
2010	0.58	0.34	0.23	1.04	0.55	0.60	1.17	0.62	0.66
2011	-0.20	-0.57	0.37	0.93	0.66	1.15	1.19	0.74	1.39
2012	0.01	-0.31	0.32	0.76	0.39	0.73	0.88	0.44	0.89
2013	0.34	0.22	0.12	0.55	0.42	0.37	0.70	0.68	0.45
2014	0.23	0.06	0.18	0.60	0.29	0.58	0.66	0.42	0.66
2015	0.26	0.07	0.19	0.67	0.36	0.45	0.85	0.55	0.63

Source: Own calculations.

Table A.3: Level of struc. balance – projection error from autumn t to spring $t+1$

	Mean error			MAE			RMSE		
	SB	PO	NonPO	SB	PO	NonPO	SB	PO	NonPO
BE	-0.05	-0.07	0.02	0.36	0.20	0.22	0.53	0.29	0.30
DE	0.19	-0.10	0.29	0.36	0.23	0.30	0.45	0.33	0.36
IE	0.33	-0.12	0.45	0.98	0.28	0.84	1.15	0.43	0.95
GR	-0.56	-0.25	-0.32	1.06	0.36	0.85	1.31	0.45	1.04
ES	-0.03	0.14	-0.17	0.91	0.35	0.61	1.24	0.52	0.94
FR	0.18	-0.06	0.25	0.46	0.13	0.34	0.56	0.25	0.42
IT	-0.05	-0.14	0.10	0.26	0.26	0.20	0.38	0.40	0.26
LU	0.63	-0.08	0.71	0.85	0.38	0.80	1.01	0.64	1.00
NL	0.22	-0.10	0.32	0.49	0.27	0.42	0.64	0.35	0.54
AT	0.36	-0.07	0.43	0.51	0.15	0.50	0.60	0.26	0.60
PT	-0.11	-0.12	0.01	0.63	0.27	0.46	0.80	0.37	0.58
FI	0.16	-0.15	0.31	0.62	0.31	0.55	0.77	0.53	0.61
2004	0.00	-0.08	0.08	0.39	0.16	0.40	0.58	0.20	0.57
2005	0.48	0.06	0.41	0.63	0.13	0.57	0.79	0.17	0.70
2006	0.59	0.09	0.50	0.60	0.14	0.54	0.74	0.15	0.68
2007	0.14	-0.18	0.32	0.40	0.19	0.46	0.60	0.22	0.66
2008	-1.47	-1.02	-0.45	1.47	1.02	0.86	1.71	1.10	1.19
2009	0.17	0.02	0.15	0.76	0.23	0.66	0.93	0.35	0.80
2010	0.26	0.07	0.19	0.64	0.24	0.49	0.69	0.26	0.57
2011	-0.05	-0.18	0.13	0.65	0.22	0.52	0.86	0.28	0.72
2012	0.26	-0.17	0.43	0.45	0.21	0.47	0.60	0.27	0.64
2013	0.50	0.17	0.33	0.57	0.28	0.40	0.71	0.49	0.50
2014	0.06	0.02	0.05	0.49	0.19	0.39	0.62	0.25	0.48
2015	0.35	0.09	0.25	0.46	0.20	0.31	0.66	0.29	0.44

Source: Own calculations.

Table A.4: Level of struc. balance – projection error from autumn $t-1$ to spring $t+1$

	Mean error			MAE			RMSE		
	SB	PO	NonPO	SB	PO	NonPO	SB	PO	NonPO
BE	-0.22	-0.34	0.12	0.98	0.56	0.81	1.30	0.74	1.00
DE	0.54	-0.21	0.75	0.95	0.58	0.79	1.10	0.76	0.89
IE	-0.24	-0.38	0.14	2.12	0.97	1.70	2.88	1.27	2.10
GR	-0.90	-0.64	-0.27	2.21	0.89	2.17	3.43	1.10	2.91
ES	-0.79	0.18	-0.97	2.28	0.91	1.65	3.05	1.08	2.40
FR	-0.21	-0.40	0.19	1.01	0.51	0.85	1.32	0.63	1.08
IT	-0.39	-0.57	0.18	0.62	0.67	0.38	0.85	0.99	0.51
LU	0.97	-0.33	1.30	1.47	1.20	1.52	1.69	1.55	1.89
NL	-0.10	-0.30	0.20	1.22	0.67	0.92	1.62	0.81	1.25
AT	0.46	-0.25	0.71	0.80	0.41	0.76	0.87	0.59	0.93
PT	-1.14	-0.37	-0.76	1.83	0.61	1.31	2.29	0.80	1.78
FI	0.02	-0.61	0.64	1.28	1.06	0.72	1.61	1.37	0.93
2004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	0.07	-0.31	0.38	1.03	0.47	1.00	1.24	0.57	1.17
2006	1.28	0.40	0.88	1.31	0.40	0.94	1.49	0.49	1.12
2007	0.55	-0.06	0.61	0.92	0.26	0.83	1.24	0.32	1.13
2008	-2.26	-1.93	-0.33	2.40	1.93	1.78	3.22	2.04	2.48
2009	-3.76	-1.53	-2.23	3.76	1.53	2.48	4.51	1.72	3.35
2010	1.19	0.35	0.84	1.60	0.71	1.24	1.76	0.78	1.54
2011	-0.23	-0.46	0.23	0.87	0.54	1.13	1.13	0.73	1.30
2012	0.13	-0.66	0.79	0.95	0.66	1.06	1.09	0.75	1.31
2013	0.46	-0.16	0.62	0.83	0.62	0.92	1.01	0.81	1.10
2014	0.63	0.32	0.31	1.12	0.66	0.62	1.28	0.86	0.77
2015	0.11	0.15	-0.04	0.60	0.50	0.44	0.73	0.69	0.61

Source: Own calculations.

Table A.5: Change in struc. balance – revision from spring $t+1$ to final release

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	-0.38	-0.21	-0.16	-0.11	-0.28	0.47	0.25	0.41	0.45	0.40	0.98	0.31	0.83	0.76	0.86
DE	0.03	-0.08	0.11	0.09	-0.03	0.29	0.26	0.17	0.25	0.10	0.35	0.30	0.25	0.31	0.11
IE	-0.23	-0.48	0.25	-0.15	-0.08	0.65	0.64	0.47	0.63	0.41	0.75	0.77	0.65	0.73	0.55
GR	-0.64	-0.07	-0.57	-0.37	-0.02	0.88	0.48	0.81	0.75	0.79	1.57	0.56	1.24	0.97	0.96
ES	0.23	0.18	0.05	-0.26	-0.07	0.45	0.35	0.43	0.37	0.22	0.54	0.41	0.51	0.48	0.28
FR	-0.15	-0.13	-0.01	0.02	-0.05	0.45	0.35	0.13	0.22	0.11	0.48	0.39	0.15	0.28	0.15
IT	-0.07	-0.32	0.24	0.14	0.10	0.32	0.36	0.30	0.33	0.31	0.43	0.45	0.47	0.49	0.44
LU	0.45	-0.19	0.64	0.58	0.42	0.57	0.43	0.72	0.76	0.52	0.78	0.53	0.87	0.94	0.60
NL	-0.22	-0.26	0.04	0.04	-0.13	0.33	0.33	0.25	0.25	0.33	0.41	0.35	0.30	0.34	0.37
AT	-0.09	-0.09	0.00	-0.16	-0.11	0.84	0.13	0.83	0.94	0.90	1.40	0.16	1.42	1.52	1.54
PT	-0.03	-0.03	0.01	0.10	0.07	0.29	0.21	0.24	0.61	0.62	0.33	0.24	0.26	1.09	1.05
FI	-0.36	-0.34	-0.03	-0.52	-0.40	0.46	0.41	0.17	0.56	0.40	0.61	0.54	0.19	0.64	0.45
2004	-0.29	-0.16	-0.13	-0.33	-0.39	0.56	0.29	0.56	0.67	0.72	0.90	0.33	0.92	1.07	1.17
2005	-0.11	-0.40	0.29	0.30	-0.02	0.94	0.49	0.81	0.85	0.63	1.35	0.63	1.31	1.34	1.19
2006	-0.48	-0.39	-0.09	-0.06	-0.15	0.87	0.44	0.67	0.63	0.51	1.45	0.53	1.12	0.86	0.79
2007	-0.57	-0.54	-0.03	-0.01	-0.28	0.57	0.55	0.29	0.46	0.43	0.65	0.63	0.37	0.57	0.50
2008	0.04	0.14	-0.10	-0.28	0.16	0.18	0.35	0.30	0.43	0.39	0.25	0.43	0.34	0.51	0.54
2009	0.17	0.00	0.17	-0.16	-0.11	0.43	0.23	0.40	0.34	0.27	0.51	0.29	0.54	0.40	0.35
2010	-0.03	-0.27	0.23	0.20	0.24	0.37	0.35	0.35	0.53	0.50	0.48	0.42	0.42	0.90	0.79
2011	-0.01	-0.09	0.07	0.02	0.07	0.31	0.24	0.19	0.44	0.22	0.37	0.30	0.27	0.56	0.29
2012	0.22	0.20	0.02	-0.12	0.05	0.27	0.22	0.15	0.25	0.17	0.39	0.29	0.20	0.39	0.26

Source: Own calculations.

Table A.6: Change in struc. balance – projection error from spring t to spring $t+1$

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	0.12	0.01	0.11	-0.12	-0.04	0.59	0.12	0.52	0.60	0.59	0.90	0.15	0.83	0.89	0.92
DE	0.46	-0.05	0.52	0.21	0.10	0.55	0.10	0.55	0.31	0.21	0.60	0.14	0.64	0.34	0.26
IE	-0.03	0.07	-0.09	0.09	0.09	1.25	0.28	1.22	0.88	0.84	1.77	0.37	1.58	1.13	1.20
GR	-0.19	-0.15	-0.04	0.13	-0.04	1.50	0.29	1.50	1.23	0.90	1.98	0.32	1.94	1.37	1.10
ES	-0.68	0.03	-0.71	-0.22	-0.25	1.21	0.19	1.12	0.35	0.38	1.67	0.26	1.53	0.40	0.49
FR	0.00	-0.04	0.03	0.00	-0.06	0.39	0.11	0.40	0.22	0.22	0.50	0.14	0.55	0.27	0.30
IT	-0.21	-0.06	-0.14	-0.32	-0.32	0.50	0.13	0.45	0.64	0.63	0.59	0.16	0.55	0.96	0.90
LU	0.15	-0.02	0.18	-0.14	-0.40	0.70	0.21	0.85	0.77	0.53	0.82	0.28	0.94	0.92	0.64
NL	0.33	-0.04	0.37	0.48	0.51	0.72	0.12	0.73	0.48	0.51	0.84	0.17	0.84	0.58	0.64
AT	0.52	-0.02	0.55	0.23	0.03	0.57	0.10	0.59	0.35	0.35	0.61	0.14	0.64	0.47	0.40
PT	-0.39	-0.04	-0.35	0.19	0.04	0.91	0.16	0.82	0.84	0.65	1.13	0.20	1.12	1.13	0.86
FI	0.32	-0.04	0.36	0.23	0.19	0.58	0.21	0.60	0.31	0.34	0.68	0.26	0.69	0.44	0.45
2004	-0.03	-0.04	0.01	-0.25	-0.38	0.64	0.18	0.61	0.52	0.59	0.77	0.20	0.73	0.72	0.74
2005	0.56	0.05	0.52	-0.08	-0.12	0.77	0.13	0.69	0.38	0.36	0.89	0.16	0.80	0.55	0.44
2006	0.92	0.11	0.81	0.23	0.09	1.07	0.11	1.01	0.83	0.67	1.29	0.14	1.24	1.10	1.00
2007	0.17	-0.01	0.19	-0.46	-0.32	0.71	0.06	0.71	0.55	0.51	0.81	0.08	0.79	0.79	0.67
2008	-1.01	-0.42	-0.59	-0.41	-0.34	1.35	0.42	1.21	0.45	0.52	2.06	0.45	1.79	0.71	0.68
2009	-0.97	0.05	-1.02	-0.22	-0.03	1.36	0.13	1.38	0.82	0.91	1.90	0.17	1.86	1.10	1.06
2010	0.55	0.01	0.55	0.79	0.54	0.77	0.19	0.67	0.79	0.63	0.83	0.23	0.75	0.99	1.13
2011	-0.08	-0.19	0.11	0.94	0.71	0.91	0.22	0.99	0.94	0.84	1.19	0.28	1.29	1.12	1.00
2012	0.07	-0.12	0.19	0.42	0.15	0.57	0.15	0.64	0.52	0.35	0.70	0.19	0.81	0.72	0.47
2013	0.14	0.06	0.08	-0.08	-0.10	0.45	0.16	0.47	0.34	0.28	0.57	0.21	0.57	0.46	0.35
2014	-0.07	0.04	-0.11	-0.19	-0.06	0.42	0.13	0.51	0.46	0.37	0.51	0.18	0.63	0.60	0.55
2015	0.18	0.12	0.06	0.43	0.09	0.39	0.17	0.45	0.47	0.28	0.56	0.24	0.57	0.62	0.37

Source: Own calculations.

Table A.7: Change in struc. balance – projection error from autumn t to spring $t+1$

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	-0.04	-0.02	-0.02	-0.40	-0.27	0.29	0.07	0.23	0.77	0.59	0.37	0.10	0.30	0.98	0.81
DE	0.25	-0.04	0.28	0.14	0.10	0.28	0.07	0.29	0.19	0.15	0.34	0.10	0.36	0.25	0.17
IE	0.40	-0.01	0.41	0.38	0.27	0.85	0.12	0.78	0.68	0.61	0.97	0.17	0.92	0.87	0.74
GR	-0.33	-0.10	-0.23	-0.09	-0.12	0.81	0.17	0.70	0.50	0.39	1.01	0.20	0.89	0.58	0.46
ES	-0.11	0.07	-0.18	0.00	-0.11	0.71	0.15	0.61	0.34	0.32	1.03	0.21	0.93	0.41	0.39
FR	0.25	0.00	0.25	0.09	0.03	0.37	0.05	0.34	0.26	0.21	0.44	0.08	0.41	0.34	0.26
IT	0.06	0.00	0.06	0.08	0.08	0.29	0.09	0.27	0.45	0.33	0.36	0.11	0.31	0.50	0.37
LU	0.43	0.00	0.43	0.52	0.12	0.53	0.12	0.49	0.76	0.42	0.65	0.14	0.66	0.97	0.54
NL	0.29	-0.03	0.32	0.62	0.56	0.45	0.08	0.42	0.66	0.61	0.53	0.10	0.52	0.90	0.92
AT	0.48	-0.04	0.51	0.34	0.20	0.48	0.06	0.51	0.37	0.34	0.57	0.09	0.59	0.49	0.43
PT	-0.04	-0.07	0.03	0.43	0.26	0.42	0.09	0.43	0.54	0.46	0.54	0.12	0.53	0.65	0.53
FI	0.30	-0.02	0.32	0.14	0.13	0.56	0.10	0.55	0.35	0.26	0.63	0.14	0.64	0.49	0.33
2004	0.16	-0.05	0.20	0.14	0.04	0.40	0.12	0.41	0.36	0.34	0.53	0.14	0.56	0.48	0.42
2005	0.49	0.05	0.44	0.09	0.02	0.59	0.05	0.55	0.47	0.48	0.67	0.06	0.63	0.70	0.63
2006	0.52	0.05	0.47	-0.05	-0.08	0.52	0.07	0.47	0.67	0.56	0.61	0.08	0.60	0.99	0.81
2007	0.12	-0.04	0.17	-0.21	-0.09	0.41	0.05	0.43	0.44	0.38	0.48	0.08	0.53	0.53	0.46
2008	-0.69	-0.24	-0.45	-0.22	-0.22	0.92	0.24	0.81	0.38	0.30	1.25	0.25	1.12	0.50	0.38
2009	0.18	0.04	0.15	0.38	0.33	0.70	0.08	0.64	0.58	0.55	0.81	0.13	0.77	0.75	0.91
2010	0.32	-0.01	0.33	0.57	0.26	0.51	0.12	0.44	0.61	0.40	0.59	0.17	0.52	0.73	0.53
2011	-0.10	-0.08	-0.03	1.00	0.69	0.59	0.12	0.57	1.00	0.69	0.77	0.14	0.73	1.07	0.80
2012	0.32	-0.03	0.35	0.39	0.25	0.40	0.07	0.41	0.44	0.35	0.52	0.11	0.53	0.58	0.46
2013	0.34	0.05	0.28	-0.03	0.01	0.37	0.10	0.35	0.24	0.23	0.47	0.15	0.44	0.32	0.27
2014	0.05	-0.01	0.07	0.26	0.21	0.28	0.08	0.30	0.40	0.31	0.34	0.10	0.35	0.47	0.37
2015	0.22	0.03	0.20	0.42	0.17	0.32	0.09	0.26	0.55	0.26	0.45	0.11	0.37	0.74	0.32

Source: Own calculations.

Table A.8: Change in struc. balance – projection error from autumn $t-1$ to spring $t+1$

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	0.24	-0.06	0.30	0.05	0.20	0.95	0.19	0.88	0.68	0.75	1.16	0.22	1.08	0.99	1.09
DE	0.35	-0.04	0.39	0.11	0.00	0.49	0.13	0.48	0.32	0.10	0.55	0.18	0.55	0.37	0.12
IE	-0.61	-0.05	-0.56	-0.79	-1.04	1.34	0.39	1.21	0.97	1.19	1.84	0.47	1.57	1.17	1.22
GR	0.33	-0.31	0.64	-0.10	-0.03	2.01	0.44	2.13	1.19	1.04	2.63	0.54	2.73	1.29	1.23
ES	-0.84	0.04	-0.88	-0.46	-0.45	1.58	0.30	1.49	0.66	0.50	2.20	0.36	2.00	0.87	0.64
FR	-0.15	-0.04	-0.11	-0.09	-0.14	0.53	0.08	0.51	0.25	0.21	0.87	0.13	0.87	0.34	0.30
IT	-0.16	-0.13	-0.03	-0.48	-0.53	0.39	0.19	0.34	0.65	0.53	0.48	0.25	0.44	1.04	0.86
LU	-0.14	-0.06	-0.08	-0.24	-0.39	0.52	0.36	0.59	0.78	0.47	0.58	0.43	0.78	0.98	0.58
NL	-0.21	-0.05	-0.16	-0.06	0.04	0.79	0.22	0.73	0.87	1.00	1.14	0.25	1.04	1.21	1.52
AT	0.23	-0.09	0.32	0.08	-0.10	0.38	0.12	0.41	0.34	0.41	0.45	0.17	0.47	0.42	0.47
PT	-0.93	-0.17	-0.75	-0.55	-0.64	1.21	0.21	1.03	0.93	0.89	1.63	0.26	1.44	1.44	1.24
FI	0.18	-0.15	0.33	0.10	0.07	0.60	0.34	0.49	0.31	0.37	0.72	0.40	0.56	0.41	0.49
2005	0.34	0.01	0.32	-0.15	-0.25	0.72	0.16	0.60	0.51	0.48	0.87	0.20	0.74	0.65	0.58
2006	0.81	0.14	0.67	-0.13	-0.26	1.00	0.14	0.91	0.94	0.84	1.30	0.17	1.19	1.19	1.12
2007	-0.09	0.03	-0.12	-0.47	-0.40	0.62	0.09	0.58	0.54	0.42	0.88	0.11	0.80	0.81	0.62
2008	-1.12	-0.50	-0.62	-0.62	-0.49	1.41	0.50	1.27	0.82	0.57	2.22	0.53	1.92	1.15	0.78
2009	-2.13	-0.47	-1.66	-0.74	-0.20	2.13	0.47	1.67	1.24	1.28	2.56	0.53	2.19	1.65	1.54
2010	1.00	0.03	0.97	-0.28	-0.68	1.05	0.27	0.97	0.86	0.78	1.72	0.34	1.90	1.37	1.55
2011	-0.37	-0.22	-0.15	0.63	0.54	0.83	0.23	0.88	0.63	0.64	1.07	0.34	1.14	0.76	0.92
2012	0.25	-0.26	0.50	0.07	-0.32	0.87	0.26	0.94	0.20	0.45	1.08	0.35	1.25	0.24	0.56
2013	0.00	-0.03	0.03	-0.19	-0.40	0.56	0.19	0.68	0.60	0.64	0.65	0.23	0.78	0.76	0.80
2014	-0.23	0.09	-0.32	-0.10	0.03	0.46	0.24	0.55	0.42	0.43	0.61	0.31	0.74	0.53	0.59
2015	-0.04	0.14	-0.17	0.00	-0.20	0.26	0.17	0.37	0.44	0.46	0.34	0.23	0.46	0.63	0.71

Source: Own calculations.

Table A.9: Change in struc. balance to $t-2$ – revision from spring $t+1$ to final release

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	-0.51	-0.34	-0.16	-0.10	-0.48	0.58	0.41	0.39	0.44	0.51	1.12	0.51	0.81	0.72	0.95
DE	0.07	-0.02	0.09	0.03	-0.08	0.51	0.41	0.15	0.29	0.15	0.58	0.49	0.20	0.37	0.19
IE	-0.42	-0.93	0.51	-0.20	-0.30	0.89	0.97	0.63	0.66	0.58	1.17	1.25	0.93	0.85	0.71
GR	-1.26	-0.05	-1.21	-1.23	-0.69	1.34	0.57	1.24	1.50	1.04	2.27	0.73	1.78	1.79	1.30
ES	0.21	0.25	-0.04	-0.50	-0.33	0.54	0.74	0.42	0.61	0.37	0.64	0.79	0.50	0.74	0.42
FR	-0.25	-0.34	0.09	0.03	-0.07	0.61	0.60	0.19	0.28	0.13	0.69	0.66	0.21	0.36	0.17
IT	-0.26	-0.55	0.29	0.17	0.08	0.37	0.57	0.32	0.37	0.34	0.52	0.76	0.44	0.53	0.51
LU	0.36	-0.30	0.67	0.72	0.41	0.64	0.65	0.71	1.30	0.42	0.80	0.75	0.84	1.52	0.52
NL	-0.49	-0.53	0.04	-0.02	-0.31	0.51	0.54	0.27	0.38	0.45	0.62	0.62	0.33	0.48	0.55
AT	-0.12	-0.10	-0.02	-0.26	-0.21	0.77	0.17	0.78	1.14	0.91	1.22	0.20	1.27	1.71	1.57
PT	0.06	-0.04	0.10	0.19	-0.01	0.45	0.36	0.25	0.72	0.86	0.66	0.38	0.44	1.34	1.54
FI	-0.55	-0.56	0.02	-0.55	-0.46	0.61	0.61	0.15	0.66	0.46	0.79	0.76	0.20	0.72	0.58
2004	-0.25	-0.21	-0.04	-0.32	-1.05	0.60	0.54	0.51	0.77	1.08	0.85	0.61	0.81	1.20	1.57
2005	-0.60	-0.55	-0.04	-0.02	-0.41	0.95	0.78	0.60	0.68	0.49	1.25	0.92	0.93	1.11	0.82
2006	-0.54	-0.75	0.21	0.21	0.05	1.12	0.75	0.84	1.12	0.75	1.67	0.89	1.43	1.56	1.13
2007	-1.23	-0.97	-0.27	-0.21	-0.53	1.23	0.97	0.52	0.65	0.67	1.72	1.07	1.02	0.99	0.95
2008	-0.17	0.00	-0.17	-0.32	-0.06	0.30	0.43	0.33	0.63	0.44	0.41	0.57	0.44	0.78	0.54
2009	0.17	0.08	0.09	-0.52	-0.12	0.39	0.43	0.45	0.65	0.26	0.51	0.57	0.68	0.88	0.39
2010	0.20	-0.28	0.48	0.06	0.15	0.61	0.45	0.50	0.65	0.51	0.87	0.54	0.73	1.17	1.02
2011	-0.11	-0.08	-0.03	-0.08	0.03	0.34	0.38	0.25	0.78	0.28	0.43	0.49	0.32	1.00	0.34
2012	0.17	0.13	0.05	-0.09	0.10	0.33	0.23	0.12	0.33	0.18	0.48	0.35	0.22	0.40	0.29

Source: Own calculations.

Table A.10: Change in struc. balance to $t-2$ – projection error from spring t to spring $t+1$

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	-0.07	-0.04	-0.03	-0.22	-0.23	0.46	0.20	0.35	0.36	0.30	0.59	0.27	0.50	0.43	0.39
DE	0.52	-0.12	0.64	0.34	0.14	0.60	0.18	0.64	0.40	0.23	0.67	0.24	0.73	0.43	0.29
IE	-0.01	-0.03	0.01	0.18	0.13	1.45	0.63	1.31	1.08	0.96	2.05	0.74	1.69	1.34	1.50
GR	-0.09	-0.22	0.12	0.64	0.18	1.73	0.43	1.80	1.52	1.30	2.19	0.54	2.25	1.80	1.60
ES	-0.55	0.08	-0.63	-0.20	-0.20	1.34	0.32	1.15	0.43	0.45	1.85	0.44	1.59	0.51	0.59
FR	-0.05	-0.03	-0.02	0.06	-0.10	0.47	0.23	0.40	0.29	0.22	0.56	0.31	0.54	0.36	0.30
IT	-0.20	-0.15	-0.05	-0.26	-0.35	0.54	0.25	0.44	0.55	0.53	0.59	0.34	0.53	0.85	0.85
LU	0.84	-0.04	0.88	0.46	0.06	1.01	0.53	1.04	1.06	0.42	1.23	0.61	1.25	1.31	0.55
NL	0.31	-0.11	0.43	0.51	0.47	0.70	0.21	0.77	0.51	0.53	0.84	0.31	0.87	0.62	0.65
AT	0.51	-0.08	0.59	0.10	-0.03	0.57	0.15	0.64	0.49	0.45	0.64	0.19	0.73	0.62	0.52
PT	-0.48	-0.06	-0.42	-0.05	-0.11	1.04	0.31	0.88	1.07	0.92	1.25	0.40	1.17	1.35	1.23
FI	0.24	-0.10	0.34	-0.18	-0.09	0.70	0.35	0.61	0.32	0.35	0.82	0.50	0.71	0.36	0.38
2004	-0.07	-0.24	0.17	-0.08	-0.49	0.49	0.34	0.50	0.52	0.65	0.59	0.45	0.69	0.56	0.93
2005	0.75	0.03	0.72	-0.10	-0.12	0.96	0.22	0.88	0.76	0.57	1.16	0.28	1.03	1.17	0.96
2006	0.86	0.07	0.79	0.26	-0.13	0.93	0.17	0.89	0.88	0.56	1.06	0.22	1.08	1.21	0.79
2007	0.35	0.03	0.32	-0.32	-0.22	0.89	0.17	0.83	0.69	0.59	1.20	0.22	1.07	0.90	0.73
2008	-1.41	-0.79	-0.62	-0.34	-0.37	1.72	0.79	1.37	0.44	0.43	2.47	0.86	1.98	0.61	0.55
2009	-0.94	0.08	-1.03	-0.18	-0.08	1.28	0.28	1.42	0.70	0.77	1.84	0.34	1.88	0.99	1.01
2010	0.49	0.03	0.46	0.87	0.63	0.90	0.35	0.70	0.97	0.86	0.97	0.43	0.80	1.34	1.60
2011	-0.02	-0.45	0.43	1.03	0.81	0.98	0.49	1.17	1.10	0.89	1.27	0.61	1.53	1.44	1.11
2012	0.10	-0.13	0.23	0.41	0.18	0.65	0.24	0.74	0.63	0.37	0.80	0.30	0.94	0.78	0.53
2013	0.36	0.26	0.10	-0.20	-0.04	0.53	0.30	0.42	0.42	0.19	0.65	0.44	0.48	0.50	0.24
2014	0.08	0.04	0.05	-0.16	-0.07	0.57	0.20	0.55	0.42	0.42	0.65	0.27	0.66	0.60	0.53
2015	0.46	0.16	0.30	0.59	0.23	0.66	0.23	0.53	0.62	0.43	0.92	0.34	0.79	0.84	0.52

Source: Own calculations.

Table A.11: Change in struc. balance to $t-2$ – projection error from autumn t to spring $t+1$

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	-0.01	-0.04	0.03	-0.41	-0.27	0.30	0.11	0.23	0.76	0.57	0.41	0.17	0.28	0.98	0.80
DE	0.20	-0.08	0.28	0.13	0.08	0.25	0.14	0.28	0.17	0.13	0.32	0.19	0.36	0.24	0.16
IE	0.37	-0.04	0.42	0.23	0.11	0.97	0.23	0.85	0.67	0.61	1.13	0.33	1.00	0.82	0.78
GR	-0.25	-0.11	-0.14	0.07	0.02	0.93	0.25	0.88	0.71	0.49	1.20	0.31	1.08	0.79	0.55
ES	-0.07	0.11	-0.17	0.00	-0.12	0.81	0.25	0.61	0.35	0.33	1.14	0.32	0.94	0.42	0.40
FR	0.21	0.00	0.21	0.16	0.00	0.41	0.08	0.36	0.32	0.21	0.49	0.12	0.43	0.40	0.24
IT	0.10	-0.04	0.14	0.16	0.07	0.34	0.18	0.25	0.31	0.29	0.41	0.24	0.31	0.37	0.34
LU	0.74	0.01	0.73	0.73	0.33	0.87	0.19	0.76	0.93	0.54	1.03	0.23	0.99	1.13	0.68
NL	0.28	-0.04	0.31	0.63	0.56	0.46	0.10	0.42	0.67	0.62	0.56	0.15	0.53	0.92	0.95
AT	0.40	-0.08	0.48	0.32	0.18	0.45	0.11	0.48	0.38	0.29	0.55	0.18	0.58	0.47	0.40
PT	-0.04	-0.07	0.02	0.43	0.25	0.63	0.16	0.50	0.61	0.50	0.75	0.22	0.63	0.74	0.66
FI	0.29	-0.05	0.34	0.00	0.04	0.60	0.14	0.56	0.38	0.23	0.64	0.23	0.62	0.53	0.29
2004	0.15	-0.05	0.19	0.18	-0.03	0.46	0.13	0.40	0.36	0.31	0.60	0.18	0.58	0.48	0.41
2005	0.56	0.09	0.47	0.06	0.05	0.66	0.12	0.62	0.53	0.44	0.77	0.14	0.71	0.79	0.66
2006	0.58	0.04	0.54	-0.10	-0.15	0.58	0.10	0.55	0.74	0.59	0.73	0.10	0.71	1.07	0.87
2007	0.26	-0.02	0.28	-0.11	0.00	0.50	0.05	0.50	0.46	0.45	0.73	0.06	0.71	0.57	0.55
2008	-0.92	-0.47	-0.45	-0.21	-0.26	1.11	0.47	0.85	0.45	0.30	1.43	0.50	1.18	0.55	0.37
2009	0.32	0.04	0.28	0.33	0.31	0.64	0.13	0.64	0.65	0.55	0.79	0.21	0.79	0.80	0.91
2010	0.21	-0.04	0.24	0.71	0.36	0.61	0.18	0.46	0.71	0.48	0.67	0.25	0.56	0.84	0.72
2011	-0.14	-0.16	0.02	0.88	0.53	0.65	0.20	0.57	0.88	0.53	0.87	0.26	0.74	0.92	0.59
2012	0.32	-0.06	0.38	0.42	0.26	0.44	0.11	0.45	0.50	0.44	0.58	0.15	0.61	0.72	0.61
2013	0.46	0.15	0.32	0.00	0.04	0.53	0.19	0.41	0.25	0.20	0.64	0.29	0.49	0.30	0.23
2014	0.05	0.00	0.05	0.25	0.17	0.40	0.12	0.38	0.41	0.37	0.47	0.17	0.48	0.50	0.41
2015	0.36	0.05	0.31	0.50	0.24	0.44	0.14	0.37	0.60	0.26	0.68	0.17	0.58	0.77	0.33

Source: Own calculations.

Table A.12: Change in struc. balance to $t-2$ – projection error from autumn $t-1$ to spring $t+1$

	Mean error					MAE					RMSE				
	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO	SB	PO	NonPO	E-ad	E-BO
BE	0.02	-0.12	0.14	-0.46	-0.39	0.85	0.32	0.77	0.95	0.84	1.10	0.38	0.97	1.29	1.14
DE	0.67	-0.13	0.80	0.26	0.14	0.81	0.24	0.84	0.45	0.23	0.92	0.34	0.93	0.53	0.30
IE	-0.14	-0.09	-0.05	-0.14	-0.25	1.93	0.66	1.65	1.42	1.59	2.56	0.81	2.09	1.85	2.03
GR	-0.10	-0.53	0.43	0.63	0.58	2.08	0.73	2.34	2.08	1.79	2.91	0.91	2.94	2.26	1.97
ES	-0.82	0.13	-0.95	-0.51	-0.54	2.01	0.53	1.69	0.69	0.56	2.73	0.61	2.38	1.05	0.75
FR	0.07	-0.06	0.13	0.08	-0.14	0.87	0.17	0.84	0.51	0.38	1.11	0.24	1.05	0.62	0.43
IT	0.02	-0.22	0.24	-0.21	-0.35	0.43	0.29	0.42	0.58	0.45	0.55	0.37	0.53	0.97	0.80
LU	1.03	0.01	1.02	0.72	0.16	1.17	0.74	1.10	1.58	0.56	1.39	0.85	1.48	1.72	0.83
NL	0.10	-0.09	0.20	0.68	0.64	0.89	0.33	0.81	0.99	0.94	1.32	0.39	1.18	1.04	1.11
AT	0.68	-0.18	0.86	0.22	-0.04	0.80	0.24	0.91	0.56	0.58	0.90	0.31	1.04	0.72	0.65
PT	-1.03	-0.24	-0.80	-0.46	-0.64	1.57	0.36	1.32	1.11	0.84	2.08	0.43	1.80	1.55	1.27
FI	0.39	-0.28	0.66	-0.06	-0.09	0.85	0.58	0.72	0.54	0.44	1.16	0.68	0.92	0.62	0.55
2005	0.69	-0.03	0.72	-0.06	-0.21	1.13	0.27	1.00	0.96	0.85	1.32	0.35	1.17	1.21	1.07
2006	1.24	0.23	1.02	-0.07	-0.46	1.24	0.25	1.05	0.88	0.62	1.45	0.28	1.24	1.19	0.80
2007	0.61	0.10	0.51	-0.37	-0.38	0.97	0.21	0.83	1.05	0.84	1.24	0.29	1.02	1.46	1.23
2008	-1.31	-0.89	-0.42	-0.62	-0.47	1.76	0.89	1.70	1.04	0.68	2.74	0.94	2.39	1.33	0.83
2009	-2.79	-0.71	-2.08	-0.81	-0.38	2.85	0.71	2.26	1.50	1.03	3.57	0.81	3.01	1.83	1.40
2010	1.11	0.05	1.06	0.73	0.39	1.52	0.48	1.44	1.24	1.23	1.84	0.60	1.99	1.81	1.94
2011	0.01	-0.41	0.42	1.29	0.96	0.77	0.44	1.13	1.29	0.96	1.05	0.67	1.30	1.41	1.31
2012	0.18	-0.37	0.54	1.07	0.38	0.91	0.44	0.99	1.07	0.42	1.11	0.56	1.33	1.29	0.60
2013	0.53	0.02	0.51	0.19	-0.10	0.77	0.36	0.90	0.80	0.66	0.94	0.44	1.04	1.05	0.83
2014	0.25	0.14	0.10	-0.09	0.03	0.66	0.38	0.55	0.52	0.51	0.77	0.52	0.73	0.72	0.72
2015	0.30	0.21	0.09	0.38	0.15	0.49	0.32	0.44	0.56	0.61	0.57	0.46	0.57	0.65	0.81

Source: Own calculations.

B Notes on the construction of indicators

B.1 Expenditure elasticities by the EC

We define the cyclically adjusted expenditure ratio in line with the more recent vintages in AMECO, namely as:

$$cae_t = e_t - \theta og_t, \tag{B.1}$$

where $\theta := \frac{de}{dog}$, i.e. the change in the expenditure ratio when output gap changes by 1pp. Until May 2012, the EC applied a different definition:

$$c\tilde{a}e_t = e_t - \frac{\vartheta OG_t}{Y_t}, \tag{B.2}$$

where $\vartheta := \frac{dE}{dOG}$, i.e. the change in expenditure in national currency when output gap changes by 1 unit of national currency. Therefore, vintages of before summer 2012 were transformed according to the new definition.

B.2 Construction of structural expenditure vintages

Vintages for structural expenditure (which are needed for the analysis in section 4) are only available for vintages since May 2012. So for vintages up to November 2011 a breakdown of one-offs into revenue and expenditure is not available. Therefore, we excluded years from the comparison of vintages if one (or both) vintage was before May 2012 unless

- total one-offs in that year were below 0.15% of GDP (in absolute value) and the share of expenditure-side one-offs in total one-offs was between 0 and 1 (e.g. there were no compensating revenue and expenditure one-offs) according to vintages after November 2011, or
- the share of expenditure-side one-offs was either very close to 0% of 100% according to vintages after November 2011.

References

Beetsma, R., B. Bluhm, M. Giuliodori, and P. Wierts (2011): "From First-Release to Ex-Post Fiscal Data: Exploring the Sources of Revision Errors in the EU," CEPR Discussion Papers 8413, C.E.P.R. Discussion Papers.

Bouis, R., B. Cournede, and A. K. Christensen (2012): "Implications of Output Gap Uncertainty in Times of Crisis," OECD Economics Department Working Papers 977.

Castro, F., J. J. Pérez, and M. Rodríguez-Vives (2013): "Fiscal Data Revisions in Europe," *Journal of Money, Credit and Banking*, 45, 1187–1209.

Cohen-Setton, J. (2013): "Blogs review: The structural balance controversy," `http://bruegel.org/2013/10/blogs-review-the-structural-balance-controversy/`, [Online; accessed 4-Sep-2017].

D'Auria, F., C. Denis, K. Havik, K. M. Morrow, C. Planas, R. Raciborski, W. Roger, and A. Rossi (2010): "The production function methodology for calculating potential growth rates and output gaps," European Economy - Economic Papers 420.

de Cos, P. H., A. Lacuesta, and E. Moral-Benito (2016): "An exploration of real-time revisions of output gap estimates across European countries," Banco de España Occasional Papers 1605.

EC (2014): "Public Finances in EMU 2014," European Economy 9/2014.

——— (2016): "Vade mecum on the Stability and Growth Pact – 2016 edition," European Economy - Institutional Paper 021, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

——— (2017): "Vade mecum on the Stability and Growth Pact – 2017 edition," European

Economy - Institutional Paper 052, Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

Girouard, N. and C. Andre (2005): "Measuring Cyclically-adjusted Budget Balances for OECD Countries," OECD Economics Department Working Papers 434.

Havik, K., K. M. Morrow, F. Orlandi, C. Planas, R. Raciborski, W. Roeger, A. Rossi, A. Thum-Thysen, and V. Vandermeulen (2014): "The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps," European Economy - Economic Papers 535.

Hers, J. and W. Suyker (2014): "Structural budget balance: A love at first sight turned sour," CPB Policy Brief 2014/07.

Hughes-Hallett, A., R. Kattai, and J. Lewis (2012): "How Reliable Are Cyclically Adjusted Budget Balances In Real Time?" *Contemporary Economic Policy*, 30, 75–92.

Kempkes, G. (2014): "Cyclical Adjustment in Fiscal Rules: Some Evidence on Real-Time Bias for EU-15 Countries," *FinanzArchiv / Public Finance Analysis*, 70, 278–315.

Koske, I. and N. Pain (2008): "The Usefulness of Output Gaps for Policy Analysis," OECD Economics Department Working Papers 621.

Kremer, J. and D. Stegarescu (2009): "Neue Schuldenregeln: Sicherheitsabstand fuer eine stetige Finanzpolitik," *Wirtschaftsdienst*, 89, 630–636.

Larch, M. and A. Turrini (2009): "The cyclically-adjusted budget balance in EU fiscal policy making: A love at first sight turned into a mature relationship," European Economy - Economic Papers 374.

Ley, E. and F. Misch (2014): "Real-time macro monitoring and fiscal policy," ZEW Discussion Papers 14-122, Center for European Economic Research.

Marcellino, M. and A. Musso (2011): "The reliability of real-time estimates of the euro area output gap," *Economic Modelling*, 28, 1842–1856.

Mourre, G., C. Astarita, and S. Princen (2014): "Adjusting the budget balance for the business cycle: the EU methodology," European Economy - Economic Papers 536.

Mourre, G., G.-M. Isbasoiu, D. Paternoster, and M. Salto (2013): "The cyclically-adjusted budget balance used in the EU fiscal framework: an update," European Economy - Economic Papers 478.

Orphanides, A. and S. van Norden (2002): "The Unreliability of Output-Gap Estimates in Real Time," *The Review of Economics and Statistics*, 84, 569–583.

Paloviita, M. and P. Ikonen (2016): "How to explain errors in budget balance forecasts in euro area countries? Empirical evidence based on real-time data," Bank of Finland Research Discussion Papers 17/2016.

Prammer, D. and L. Reiss (2016): "Reforms to the Stability and Growth Pact since 2011: Did the framework become stricter and less pro-cyclical?" *Monetary Policy and the Economy*, Q1/2016, 33–53.

Reiss, L. (2017): "On revisions and procyclicality of potential output estimates by OECD, IMF and EC," Mimeo.

Tereanu, E., A. Tuladhar, and A. Simone (2014): "Structural Balance Targeting and Output Gap Uncertainty," IMF Working Papers 14/107.

Virkola, T. (2014): "Real-Time Measures of the Output Gap and Fiscal Policy Stance," ETLA Reports 37, The Research Institute of the Finnish Economy.