REAL-TIME ANALYSIS OF THE REVISIONS TO THE STRUCTURAL POSITION OF PUBLIC FINANCES

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Abstract

Estimating the role of the business cycle on the General Government budget balance plays a key role on the real-time analysis of fiscal policy, especially under the Stability and Growth Pact framework. This paper studies, for a group of EU countries and the United Kingdom, the revisions in the structural balance estimated by the European Commission between its first publication and the most recent figures. The results suggest that revisions were negative (i.e. the budget balance measured ex-post is, on average, less favourable than assessed in real time) and significant for the period prior to 2008, but relatively smaller for later years. Overall, revisions are procyclical but negative on average. Furthermore, data revisions (on public expenditure and revenues as well as GDP growth) are as important as errors in estimating the unobservable potential GDP. According to these findings, the structural efforts required by the EU framework were in general insufficient during the boom up to 2008, since they were based on too optimistic estimates of the structural balances. However, there is no evidence of similar real-time errors in the assessment of fiscal positions during the crisis and the posterior recovery.

Keywords: public accounts, business cycle, real-time revisions.

JEL classification: H68, E32.

Resumen

La estimación de los efectos del ciclo económico sobre la capacidad de financiación de las Administraciones Públicas desempeña un papel fundamental en el análisis de la política fiscal en tiempo real, especialmente en el marco del Pacto de Estabilidad y Crecimiento (PEC). Este artículo explora, para un conjunto de países de la UE y el Reino Unido, las revisiones del saldo estructural estimado por la Comisión Europea entre su primera publicación y la estimación actual. Los resultados sugieren que las revisiones son negativas y significativas a lo largo del período anterior a 2008, pero relativamente menores a partir de entonces. Las revisiones muestran un comportamiento procíclico, pero a la vez son negativas en media. Asimismo, cambios en los datos publicados (gastos e ingresos públicos y crecimiento del PIB) explican tanto o más que las revisiones en las estimaciones del PIB potencial. De acuerdo con esta evidencia, las recomendaciones de política fiscal que emanaron del PEC durante la expansión hasta 2008 estuvieron basadas en estimaciones excesivamente optimistas del componente estructural del saldo fiscal, a la luz de las revisiones posteriores. Sin embargo, durante la crisis y la posterior recuperación, dichas estimaciones no han sufrido revisiones significativas.

Palabras clave: cuentas públicas, ciclo económico, revisiones en tiempo real.

Códigos JEL: H68, E32.

Contents

1 Introduction

In order to provide a proper evaluation of the fiscal position and the sustainability of public finances it is essential to take into account the economy's cyclical position and its effects on public sector accounts. Increased (decreased) revenues and lower (higher) expenditures during the cyclical upswing (downswing) can generate the illusion of a better (worse) fiscal position compared to the true underlying situation. In fact, the positive correlation between the public fiscal balance and the economy's cyclical position (Chart 1) suggests the presence of a strong cyclical component in fiscal positions which should not be taken into account when assessing the fiscal position that determines the long run sustainability of public finances.

How much of a public fiscal balance results from current cyclical position, and how much results from fiscal policy per se? The cyclically adjusted balance is considered to be a good indicator of the fiscal position. In particular, fiscal balances are adjusted for effects related to the deviation between the levels of real gross domestic product and potential output (known as output gap). However, subtracting the cyclical component of the budget balance, calculated through the output gap, is not enough to reach an adequate assessment of the fiscal position. The effect of other transitory factors should be subtracted as well. Therefore, analysing the structural balance, which corrects for both the cyclical component and the effect of non-recurrent elements (one-offs), is key to study the fiscal policy stance. In sum, the structural balance can be obtained through a three-step process: (i) identification and correction of one-offs; (ii) estimation of the cyclical component, multiplying the output gap by the elasticity of the fiscal balance with respect to the economic cycle; (iii) subtraction of the cyclical component calculated in (ii) from the fiscal balance corrected from one-offs obtained in (i).[1]

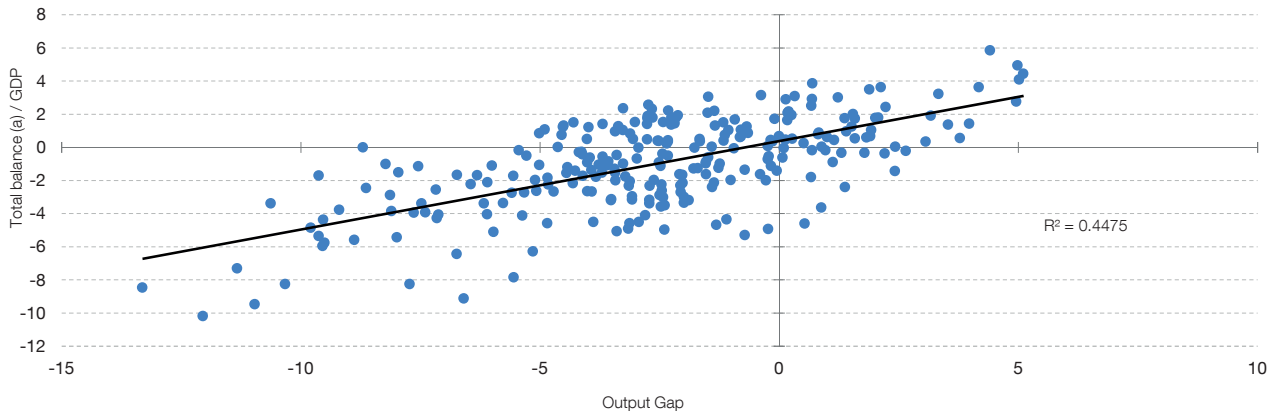
Structural balances allow a better assessment of the fiscal position and thus fiscal sustainability concerns. So, the comparison between the structural balance and a reference point, such as the debt-stabilizing fiscal balance, shows to what extent the current fiscal policy could be maintained without any government tax or public spending adjustment, or the necessary fiscal effort in order to correct imbalances. In this sense, the structural balance is the most accurate reference for fiscal policy, as it does include neither the effect of the economic cycle nor the effect of non-recurrent elements, which are both temporary and do not require any fiscal adjustment.

The EU fiscal rules framework and the initial Stability and Growth Pact (SGP) were mainly focused on observed government balances. However, in the early 2000s, greater emphasis was given to cyclically adjusted and structural measures, due, to a large extent, to the controversy about public deficits in Germany and France exceeding the 3% of GDP norm. Since then, the EU's fiscal framework evolved towards the so-called second

1 See the Box 1.3 of Vademecum on the Stability and Growth Pact. 2019 Edition.

Chart 1

RELATIONSHIP BETWEEN GOVERNMENT TOTAL BALANCE AND THE CYCLICAL POSITION



SOURCE: European Commission.
NOTE: Greece and Ireland are excluded in order to avoid outliers.

a Net of non-recurrent elements.

generation fiscal rules, confirming the key role of structural balances in the Six-Pack and Two-Pack reforms carried out at the beginning of 2010, together with other innovations, such as the introduction of a net spending rule (see Eyraud *et al.*, 2018).

In the SGP, the Medium Term Objective (MTO) works as a reference for the preventive arm and it is defined in terms of structural balance. It is designed to allow automatic stabilizers to act during booms as well as recessions, but without exceeding the limit of 3% of GDP established by the Maastricht Treaty. Structural balances also play an important role within the corrective arm of the pact, or excessive deficit procedure, since the required annual fiscal adjustments to get the government deficit below the reference level of 3% of GDP are defined in terms of changes in structural balances.

The structural balances' adequacy to fulfil these objectives mainly depends on the accuracy of the available data in real time, when decisions are taken, and not on revised data which are published years later. In the case of large discrepancies, it could be argued that real-time information about structural balances is too preliminary and thus more time is required to measure accurately the real structural position of public finances. However, the assessment of the situation of public finances needs to be done in real time. Therefore, a detailed analysis of the ex-post revisions of real-time structural balance estimates is crucial for a proper tracking and evaluation of fiscal policy.

The structural balance revisions can be decomposed into the revisions of the total government balance (net of non-recurrent elements) and of the cyclical component. Likewise, revisions of the latter can be due to revisions in real GDP and in potential GDP

estimates.[2] Therefore, identifying the relative contributions of all these elements to the total revision, as well as their evolution over time, will allow to evaluate the suitability and stability of real-time structural balance estimates as indicators of the current fiscal policy underlying position and as long-term fiscal sustainability indices.

This paper dissects the revisions of structural balances estimated by the European Commission in the context of the SGP framework between their first publication and the latest data available for a set of 15 countries over the period 2003-2015. The results of the analysis suggest that revisions are significant prior to the crisis (2003-2007), but relatively smaller since then (2008-2015). In particular, the structural balance is revised downwards on average by 0.55 pp of GDP during the whole period, but by 1.29 pp during the 2003-2007 boom and by only 0.09 pp afterwards. In line with previous analyses, we found that revisions tend to be procyclical (in the sense of real-time errors in estimated structural balances being correlated with the business cycle), but negative on average.[3] However, contrary to conventional wisdom, these revisions are only partially due to errors in real-time estimation of unobservable variables, such as potential GDP. Indeed, both revisions in fiscal balances and the strong procyclical pattern of revisions in real GDP growth are chiefly responsible for the negative average real-time bias found. Fiscal data revisions are particularly notable in the boom prior to the global financial crisis,[4] but they seemed to have decreased significantly later on. In turn, the growth of real GDP is typically revised upwards during booms and downwards during recessions.

In terms of fiscal policy implications, the detailed analysis of the fiscal balances across European countries suggests that the structural balance was clearly overestimated in real time during the period before 2007, which implies a worse fiscal position than that initially estimated in real time. This pattern accentuated the perception of the worsening in public sector accounts during the following years and the magnitude of the required subsequent correction, which was partially driven by the downward revision in structural balances with respect to their initial real-time figures. However, in light of the smaller revisions observed for the following years, the real-time assessment of fiscal positions in the aftermath of the global financial crisis seems more appropriate, in particular given the dimension of the deterioration of fiscal positions in some countries.

Finally, the Spanish case is analyzed in more detail, comparing the real-time series with the current figures. Data broadly confirm the aforementioned results for the whole set of countries. However, in Spain, the structural effort during the sovereign debt crisis (2011-2013) was slightly greater to the one published in real time due to an underestimation of the real GDP fall during those years.

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2 Revisions of the cyclical balance also include a component (residual) that includes variations in the GDP deflator and in the elasticity of fiscal balance with respect to the cyclical position (see Appendix). The contribution of this residual to the total revisions is, in general terms, close to zero.

3 The literature has mainly focused on the contribution of output gap revisions. See, for example, Kempkes (2014), Eyraud *et al.* (2018) and Kangur *et al.* (2019) -for the average negative bias, and Hernández de Cos *et al.* (2016), Darvas *et al.* (2018) and Coibion *et al.* (2018) -for the procyclicality or revisions.

4 As already found in González-Mínguez and Ulloa (2007).

The remainder of the paper is organized as follows. Section 2 describes the data and the methodology employed. Section 3 analyses the revisions of each of the public sector balances, while section 4 describes the implications of such revisions for economic policy recommendations. In section 5 we tackle the Spanish case. Finally, Section 6 provides the main conclusions of the study.

2 Data and methodology

The database used was obtained from the publicly available information published by the European Commission (EC), pertaining to 14 EU countries and the United Kingdom over the period 2003-2019.[5] Every Spring and Autumn, the European Commission Services produce a new release with data and forecasts for a wide set of variables: GDP, output gap, government fiscal balance (distinguishing between the cyclical component and the cyclically adjusted balance), primary fiscal balance and structural balance. We collect information on all releases since Spring 2000 until Autumn 2020. Thus, for each variable, country and year (e.g., the structural balance of 2005 in the UK) we have a series of estimates of the same variable, made at different points in time.

To avoid mixing forecast errors with data revisions, we ignore the former and focus only on those years for which there is already an official estimate of fiscal and macroeconomic data. The first official estimate of year t is released on Spring of t+1. This is what we call real-time estimate.[6] It includes not only observed data (e.g., GDP, fiscal balance), but also the real-time estimates by the EC of non-observed variables, like the output gap or the structural balance. We are interested here on revisions of these estimates of the structural balance since the first real-time estimate at Spring of t+1. Then, the revision of the structural balance is defined as the difference between the current estimate and the initial one, this is:

$$REV_{it}^{SB} = SB_{it}^{L} - SB_{it}^{RT} \quad (1)$$

where REV_{it}^{SB} represents the structural balance revision of year t in country i, SB_{it}^{L} is the latest estimate of the structural balance for year t in country i, published in Autumn 2020, and SB_{it}^{RT} is the structural balance published in real time, i.e. the one published in Spring of year t+1.[7]

As mentioned in the previous section, the European Commission estimates the structural balance (SB) subtracting the cyclical balance (CB) and non-recurrent elements (one-offs) from the fiscal balance. The cyclical balance is estimated multiplying the output gap (estimated according to Havik *et al.*, 2014) by the semi-elasticity of the budget balance to the output gap. That semi-elasticity, in turn, is estimated weighing the corresponding

5 The EU countries are: Austria (AT), Belgium (BE), Germany (DE), Denmark (DK), Greece (EL), Spain (ES), Finland (FI), France (FR), Ireland (IE), Italy (IT), Luxembourg (LU), Netherlands (NL), Portugal (PT) and Sweden (SE).

6 We are interested in revisions of real-time estimates of the structural balance because of their impact on real-time fiscal policy recommendations. In the usual EC timetable, country recommendations for year t are made on the basis of information up to Spring of t-1 and, thus, they are not based on data for year t but on forecasts. However, the impact of this on the validity of our analysis is limited for two main reasons. First, forecasts for year t are conditional on data available up to t-1, which is the information set that we consider. Second, recommendations are not based on purely temporary factors, but on an assessment of the fiscal structural position of each country and the sustainability of its public finances which typically do not change abruptly from one year to another. Thus, recommendations are largely based on observed data, that we analyse, and less so on forecasts, that we do not analyse.

7 Notice that revisions have different horizons, depending on the year. For example, the revision of 2003 data refers to the difference between the current estimate for that year (in Autumn 2020) and the original estimate in Spring 2004, whereas the revision of 2004 data is the difference between Autumn 2020 estimate and Spring 2005 estimate. Below, we show evidence of how this affects revisions.

semi-elasticities of each of the different sources of income (personal and business income taxes, indirect taxes, social contributions and others) and expenditure (i.e. unemployment benefits).[8] Non-recurrent elements are changes in the budget balance with a significant size (not lower than 0.1% of GDP), which are purely time-limited and non-recurrent. Examples of non-recurrent elements include state-aid bailouts during the 2008-2012 crisis or revenues derived from an exceptional tax amnesty. Because of its temporary nature, these kind of measures do not affect the structural balance.[9]

Hereinafter, total balance will always be considered as corrected from non-recurrent elements. Therefore, the structural balance is defined as the difference between the total government balance (TB) and its cyclical component (CB):

$$SB_{it}^{k} = TB_{it}^{k} - CB_{it}^{k} \quad (2)$$

All fiscal balances are typically presented as a percentage of GDP, to make them comparable and easier to analyze. Hence, revisions should also be expressed as a percentage of GDP. But then they will become affected by revisions in GDP itself. There are two effects of GDP revisions here. First, as part of the output gap definition, revisions in GDP alter the cyclical component of the fiscal deficit and therefore the structural balance. Second, as the denominator in the ratio of fiscal balance to GDP, revisions in GDP alter the ratio without any change in the numerator. We need to analyze the first effect, but we want to avoid the second one.[10] For that, we consider all fiscal variables expressed in national currency and then divide them always by the latest estimate available of the GDP of the corresponding year (Autumn 2020). In this way, GDP revisions that do not alter the output gap will not affect our estimated revisions of fiscal balances to GDP. This also simplifies the analysis of the decomposition of the structural balance revisions into their components.[11,12]

Structural balance revisions can be decomposed into revisions of total balance (REV_{it}^{TB}) and revisions of the cyclical balance (REV_{it}^{CB}), which are decomposed, in turn, into revisions of real GDP (REV_{kit}^{Y}), revisions of real potential GDP ($REV_{it}^{Y^{POT}}$) and a residual that includes variations in the GDP deflator and the elasticity of total balance with respect to the cyclical position of the economy.[13] That is:

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8 See Mourre *et al.* (2014).

9 The budget balance and the cyclically-adjusted balance are available for the whole sample, but the structural balance, and consequently, non-recurrent elements, are not always available in AMECO. Hence, an assumption is needed in those cases. For each country and year, when one-offs are not available in a given vintage, they are assumed to be equal to the value in the closest previous vintage if available. Otherwise, they are assumed equal to zero.

10 For example, in the case of the UK, the total balance to GDP ratio for 2009 published in Spring 2010 was -11.5%. The current estimate (Autumn 2020) of 2009 total balance to GDP ratio is -10.0% (+1.5pp revision). However, this large positive revision does not reflect a much improved fiscal balance (the current estimate of 2009 public deficit in UK, in monetary terms, is just 3% below the one estimated in Spring 2010), but a significant upward revision in the denominator (nominal GDP was revised up by 11%, largely on account of the methodological change to ESA 2010, carried out in 2014). At the same time, potential GDP was also revised up by 12%, meaning that the output gap and the cyclical component barely changed.

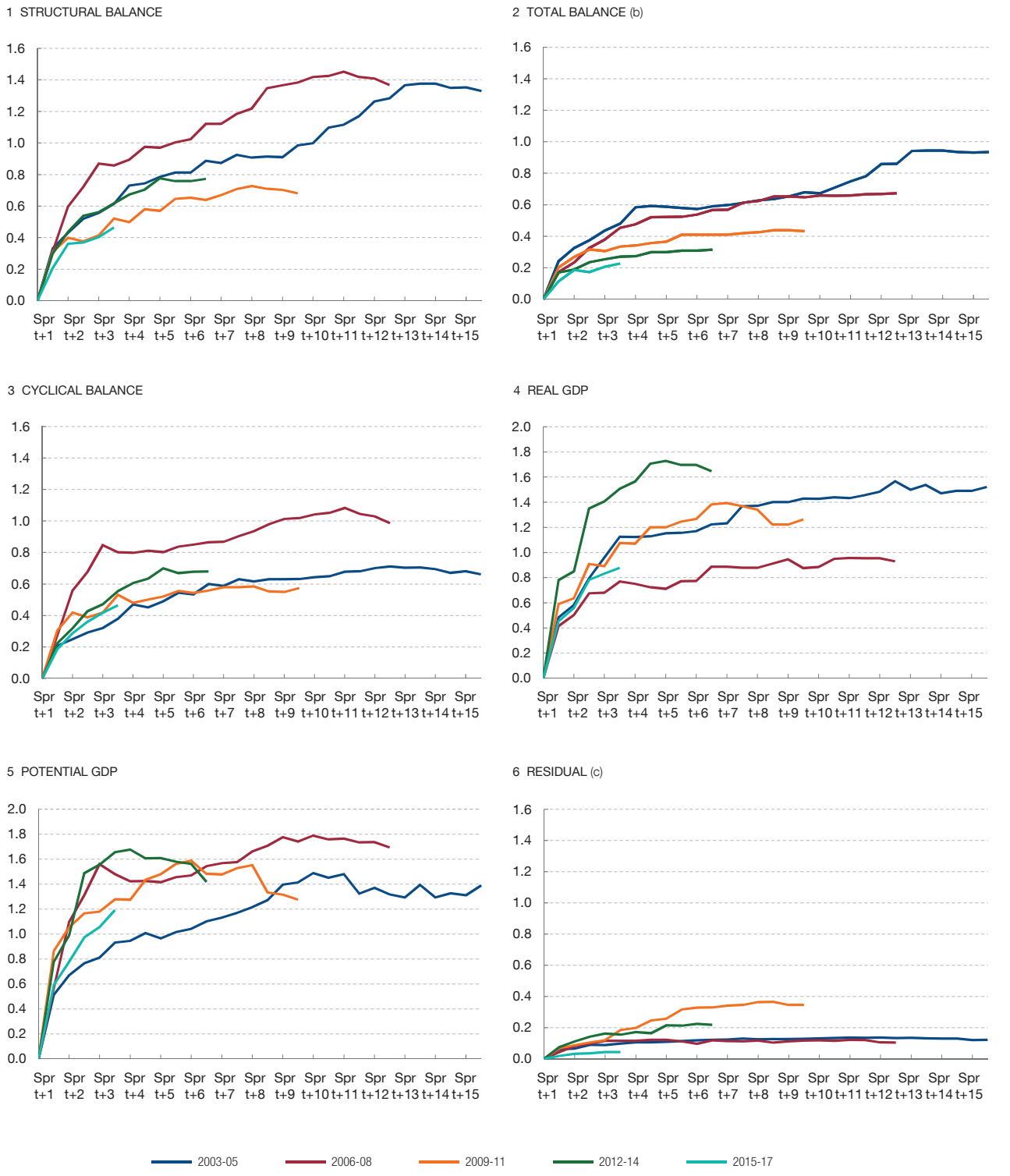
11 See Appendix for further details.

12 In any case, the main results found here also apply when the analysis is done with the original fiscal to GDP ratios.

13 See Appendix.

Chart 2

REVISIONS OF THE STRUCTURAL BALANCE AND ITS COMPONENTS PANEL A: MEAN (a)

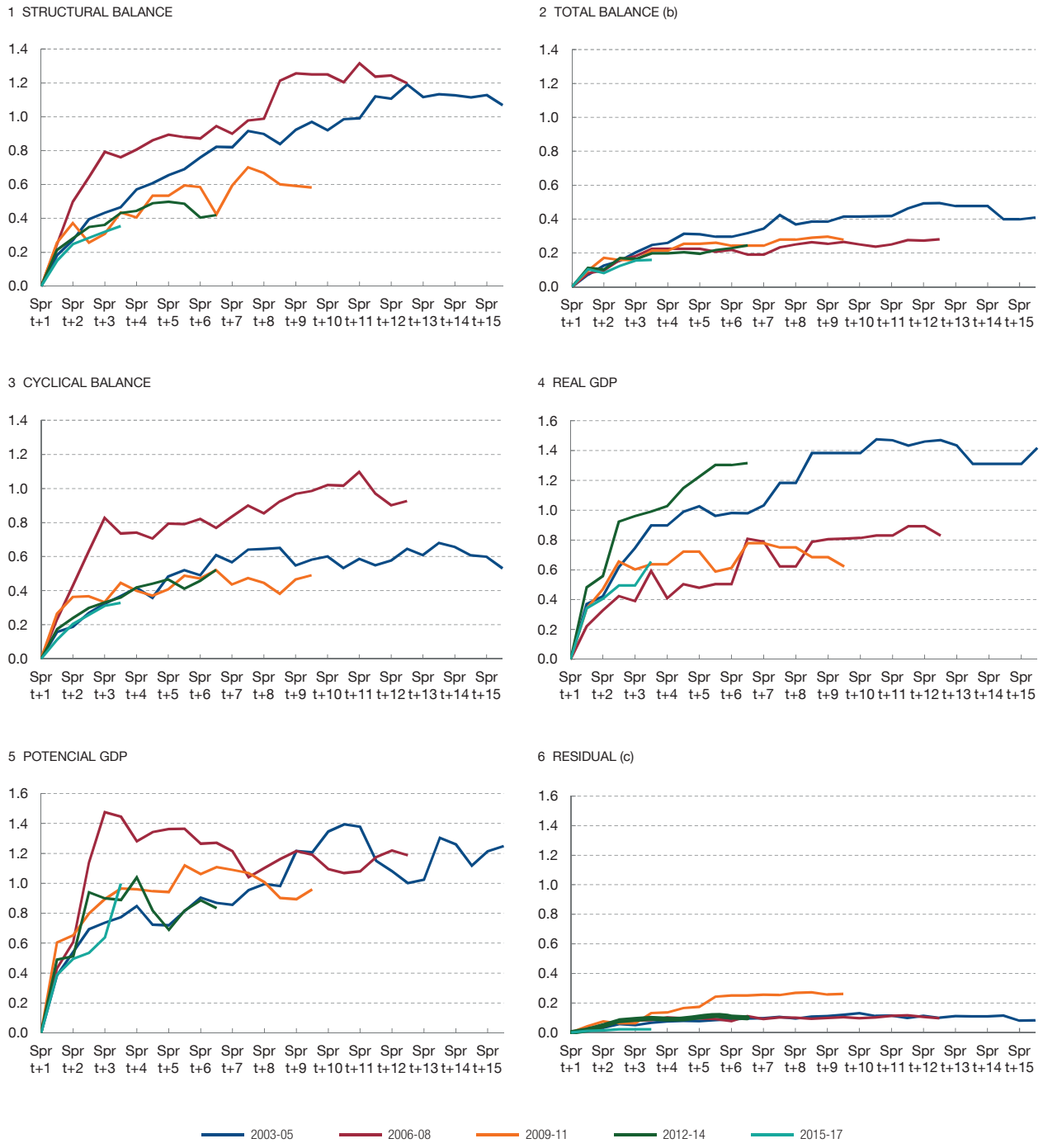


SOURCE: Own calculations based on European Commission data.

a Mean absolute revision at different horizons, for all countries and group of years, expressed as a percentage of each year GDP estimated at Autumn 2020.
b Net of non-recurrent elements.
c Change in cyclical balance not explained by real GDP or potential GDP.

Chart 2 (Con't)

REVISIONS OF THE STRUCTURAL BALANCE AND ITS COMPONENTS PANEL B: MEDIAN (a)



SOURCE: Own calculations based on European Commission data.

a Median absolute revision at different horizons, for all countries and group of years, expressed as a percentage of each year GDP estimated at Autumn 2020.
b Net of non-recurrent elements.
c Change in cyclical balance not explained by real GDP or potential GDP.

$$REV_{it}^{SB} = REV_{it}^{TB} - REV_{it}^{CB} \quad (3)$$

$$REV_{it}^{CB} = REV_{it}^{Y} - REV_{it}^{Y^{POT}} + Residual_{it}^{CB} \quad (4)$$

Where all revisions are expressed as a percentage of the current estimate of the GDP of the corresponding year.

To have an idea of how large are the revisions of the real-time estimate of the structural balance and their timing, Chart 2 shows the average size (in absolute terms) of the revisions of each component in our sample, from the first real-time estimate (at Spring of t+1) to different horizons. Specifically, the mean (Panel A) and the median (Panel B) for the whole sample of countries and several 3-year periods are represented. As it can be seen, revisions vary across years and there is still not enough history for the latter years. However, the evidence indicates that the structural balance continues to be revised many years after the first publication of data, although revisions tend to be larger in earlier years. Overall, revisions close to or larger than 1% of GDP are not uncommon.

3 Decomposition of the revisions of the structural position

In analyzing the factors behind structural balance revisions, there is a trade-off. Since the structural balance continues to be revised many years into the future, if we want to be relatively sure that our current estimate is close to the final one, we can only analyze years that are far into the past. This limits the size of the sample and makes results dependent on particular events that may have happened in those years. If we want a larger sample, we must accept that our data will continue to be revised (with possible effects on the results) in future years. Given the evidence presented in Chart 2, we think a good compromise is to focus on years which have at least 5 years of data revisions. This means using the sample period 2003-2015.[14]

For those years and the whole sample of countries studied, the structural balance that was initially published was revised downwards on average. The Panel A of Table 1 shows that both the mean and median revisions for all the countries as a whole are negative. Specifically, the average revision of the structural balance is -0.55 pp of GDP, and the median revision is -0.43 pp (column 1). To put it into context, these average revisions are of the same order of magnitude than the annual structural effort required by the SGP under normal conditions, which is 0.50 pp of GDP. This confirms previous results that real-time estimates of the structural balance tend to be biased upwards, leading to an over-optimistic assessment of the fiscal position and the sustainability of public finances in the EU countries.[15]

Nonetheless, as it is shown in the Panels B and C of Table 1, these downwards ex-post revisions are mainly due to the period prior to the financial crisis of 2008. Specifically, the corresponding mean (median) revision for the period 2003-2007 is -1.29 pp (-1.12 pp). On the contrary, since 2008, the mean (median) revision was much smaller, -0.09pp (-0.21 pp). This is also evident in the first panel of Chart 3.

Regarding the decomposition of the revisions, Table 1 (columns 2 and 3 of Panel A) shows that they do not come only from the well-known uncertainty about the cyclical component (output gap) in real-time, but also from the downward revisions of the initially-published total government balance figures. Concretely, the mean (median) revisions of the total balance and the cyclical balance are -0.27 pp (-0.12 pp) and 0.29 pp (0.31 pp), respectively. Both negative revisions of the total balance and positive revisions of the cyclical balance contribute to a more negative estimate of the structural balance.[16]

Revisions of the total balance were also much larger in the expansionary years prior to the crisis of 2008 than in the period after. Specifically, the mean (median) revision during 2003-2007 is -0.48 pp (-0.15 pp), while it is -0.13 pp (-0.12 pp) from 2008 to 2015.[17] [18]

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14 Notice that the sample refers to the years analysed, not to the dates at which data were published. We use all releases available referring to the sample years selected.

15 See, for example, Kempkes (2014), Eyraud *et al.* (2018) and Kangur *et al.* (2019).

16 Given a fiscal balance, a higher cyclical balance implies that the structural component is lower, that is, a worse position of the public finances in comparison with the one initially estimated.

17 See also upper-right panel of Chart 3.

18 Similar figures are found for the total balance without the correction of non-recurrent elements (see last column in Table 1).

Table 1

DESCRIPTIVE STATISTICS OF THE REVISIONS OF THE STRUCTURAL BALANCE AND ITS COMPONENTS (a)(b)

	Revisions of:						Memo item
	SB (1)	TB (c) (2)	CB (3)	GDP contr. (4)	GDP^{POT} contr. (5)	Residual (6)	TB
PANEL A: 2003 - 2015							
min	-5.89	-5.32	-3.03	-3.14	-2.88	-1.20	-5.32
max	3.33	1.83	2.44	2.48	2.74	0.29	1.83
mean	-0.55	-0.27	0.29	0.27	-0.09	-0.08	-0.35
p10	-1.91	-1.04	-0.64	-0.62	-1.30	-0.42	-1.53
p25	-1.14	-0.45	-0.16	-0.11	-0.63	-0.13	-0.50
p50	-0.43	-0.12	0.31	0.31	-0.10	-0.02	-0.08
p75	0.13	0.17	0.78	0.77	0.47	0.04	0.14
p90	0.90	0.43	1.45	1.34	1.06	0.14	0.40
p95	1.23	0.98	1.79	1.67	1.39	0.20	0.90
PANEL B: 2003 - 2007							
min	-5.89	-5.32	-0.76	-1.15	-2.81	-0.54	-5.32
max	1.23	1.83	2.44	2.12	2.52	0.25	1.83
mean	-1.29	-0.48	0.81	0.47	-0.37	-0.03	-0.53
p10	-3.00	-2.06	-0.27	-0.45	-1.79	-0.17	-2.79
p25	-1.81	-0.69	0.26	0.07	-0.95	-0.08	-0.70
p50	-1.12	-0.15	0.74	0.45	-0.48	-0.02	-0.14
p75	-0.62	0.17	1.45	0.89	0.23	0.03	0.19
p90	0.20	0.43	1.96	1.40	1.06	0.12	0.47
p95	0.89	1.20	2.30	1.67	1.26	0.15	0.90
PANEL C: 2008 - 2015							
min	-4.52	-3.87	-3.03	-3.14	-2.88	-1.20	-5.14
max	3.33	1.49	1.61	2.48	2.74	0.29	1.59
mean	-0.09	-0.13	-0.04	0.15	0.09	-0.10	-0.25
p10	-1.12	-0.65	-0.96	-0.73	-0.74	-0.50	-1.10
p25	-0.62	-0.35	-0.31	-0.19	-0.42	-0.20	-0.44
p50	-0.21	-0.12	0.07	0.19	0.06	-0.02	-0.08
p75	0.35	0.17	0.47	0.62	0.58	0.07	0.09
p90	1.10	0.42	0.81	1.29	1.15	0.15	0.35
p95	1.84	0.76	0.97	1.69	1.46	0.22	0.94

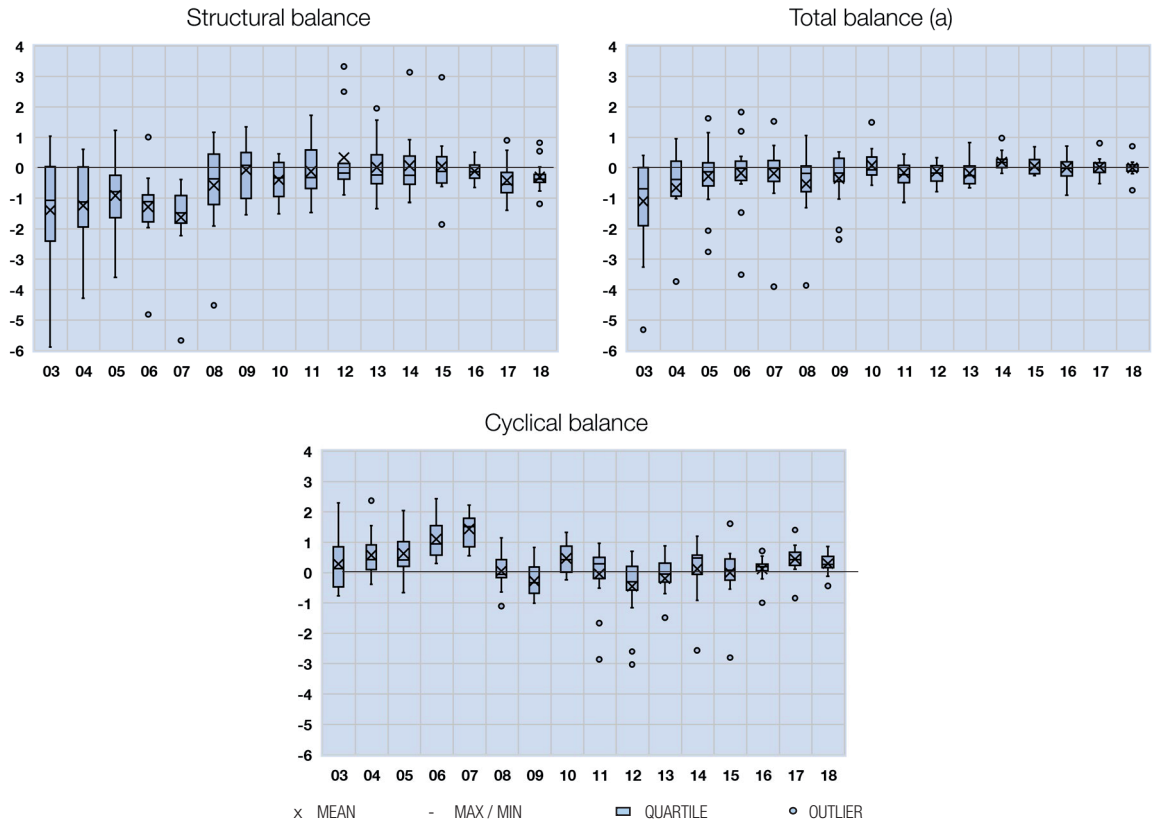
SOURCE: Own calculations based on European Commission data.

a All variables are expressed as a ratio over the GDP estimated in Autumn 2020.
b For the mean and only for the mean: (1)=(2)-(3) and (3)=(4)-(5)+(6).
c Net of non-recurrent elements.

However, Chart 4 shows that this pattern is not general across countries, which explains why the difference between subperiods almost disappears when calculated in terms of the median. Downward revisions for the period before 2008 are particularly high in Greece, Portugal, Belgium and Austria. They are smaller for the other countries, with

Chart 3

DECOMPOSITION OF THE REVISIONS OF THE STRUCTURAL BALANCE BY YEAR



SOURCE: Own calculations based on European Commission data.

a Net of non-recurrent elements.

the exception of Luxembourg, where the balance is revised upwards. In the post-crisis period, the revisions also tend to be negative, although the magnitude is clearly lower than before.

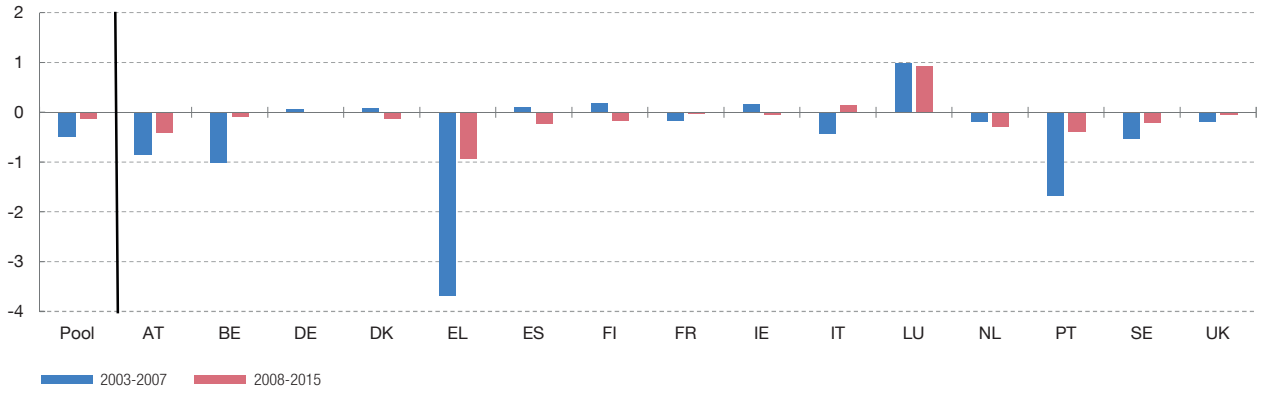
Turning to the cyclical balance, its average revision is 0.29 pp of GDP upwards and the median is 0.31 pp (see column 3 of Table 1), thus contributing to the overvaluation of the position of public finances in real time. However, once again, revisions occur mainly in the expansionary years prior to 2008. Concretely, the mean (median) revision of the cyclical balance is 0.81 pp (0.74 pp) for the period 2003-2007 and -0.04 pp (0.07) for the period 2008-2015.[19]

The revisions of the estimated real-time cyclical balances suggest a strong procyclical behavior, that translates also into structural balance revisions. Thus, the cyclical (structural) balance tend to be revised upwards (downwards) during the years

19 See also lower panel of Chart 3.

Chart 4

AVERAGE REVISION OF THE TOTAL GOVERNMENT BALANCE (a) BY SUB-PERIOD AND BY COUNTRY



SOURCE: Own calculations based on European Commission data.

a Net of non-recurrent elements.

Table 2

CORRELATIONS BETWEEN REVISIONS AND BUSINESS CYCLE (2003-2015)

	Revisions of:					Total balance
	Structural balance	Total balance (a)	Cyclical balance	Real GDP	Potential GDP	
Real GDP growth	-0.345***	0.048	0.542***	0.448***	-0.043	0.016
Output gap	-0.672***	-0.135	0.820***	0.347***	-0.359***	-0.159*

SOURCE: Own calculations based on European Commission data.
NOTE: * p<0.05, ** p<0.01, *** p<0.001.

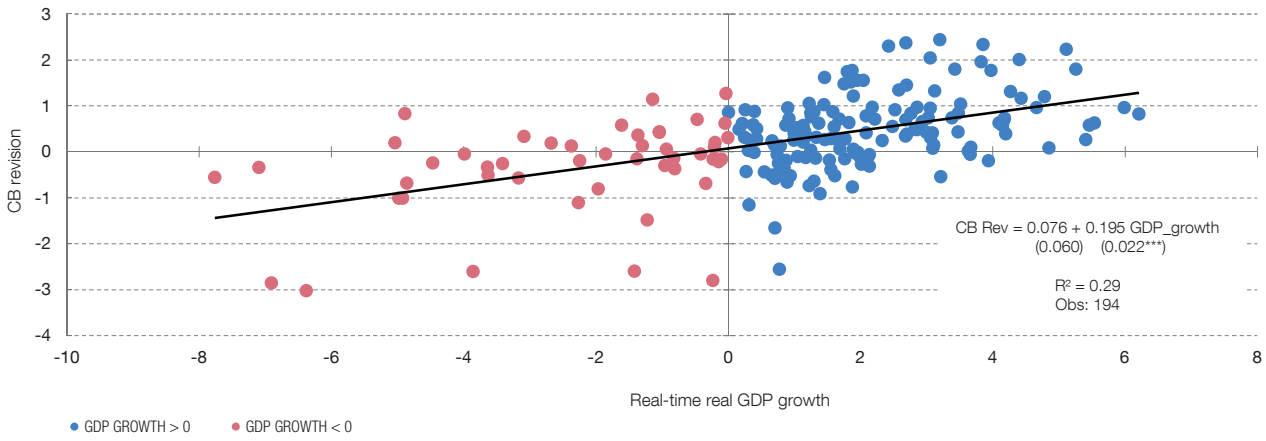
a Net of non-recurrent elements.

prior to the financial crisis (2003-2007) and downwards (upwards) when GDP fell (2009 and 2012-2013). In fact, Table 2 shows that there is a positive and significant correlation of 54 % between revisions of the cyclical balance and GDP growth. Quantitatively, an initial estimate of real GDP growth of one percentage point is associated with a revision of 0.20 pp in the cyclical balance (see the regression in Chart 5). The correlation is even larger with the output gap (82%, see Table 2), since potential GDP corrections are not correlated with GDP growth but they are with output gap. On the contrary, total balance revisions do not show any cyclical behavior.

The procyclical behaviour of the cyclical balance revisions is observed across most countries in the sample, as can be seen in Chart 6. However, procyclicality is asymmetric. As the second panel in Chart 6 shows, upward revisions when output gap is positive

Chart 5

IMPACT OF GDP GROWTH ON THE REVISION OF THE CYCLICAL BALANCE (2003-2015)



SOURCE: Own calculations based on European Commission data.
NOTE: * p<0.05, ** p<0.01, *** p<0.001.

are greater on average than downward revisions when output gap is negative. In terms of the sign of real GDP growth (panel 1 of Chart 6), revisions are more symmetric, but it must be noticed that real GDP trends upward, thus, periods of positive real GDP growth are more frequent than periods of decline.[20] This asymmetry is what explains the average positive revision of cyclical balances in our sample and is partly conditioned by what happened in the economic expansion prior to 2008 (see lower panel of Chart 3). Thus, to the extent that this period was exceptional, one should be careful when extrapolating our results into the future.

The revisions of the cyclical balance can be decomposed into revisions of real GDP, potential GDP and a residual (see equation 4 in Section 2). As could be expected, the contribution of residuals is, in general, very small (see Table 1 and Chart 7). The main contribution to average cyclical balance revisions comes from corrections in real GDP, with a mean (median) revision in our sample of 0.27 pp (0.31 pp), whereas the corresponding figure for potential GDP revisions is -0.09 pp (-0.10 pp).

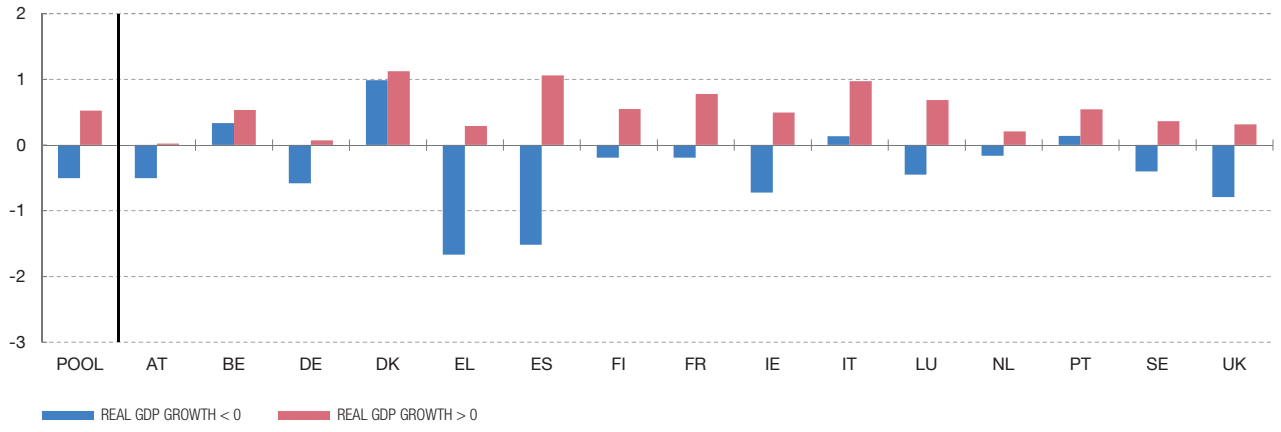
The problems of real-time measures of potential GDP are well known and, in fact, in our sample there are significant revisions at times. However, there does not seem to be a clear long-term bias in this respect, so they do not contribute to a systematic over-optimism of fiscal position assessments in real-time. However, revisions are negatively correlated with the output gap, which means that potential GDP tends to be over-estimated towards the end of expansions and under-estimated towards the end of contractions and

20 In fact, the asymmetry reappears when revisions are compared across periods of real GDP growth above or below the average.

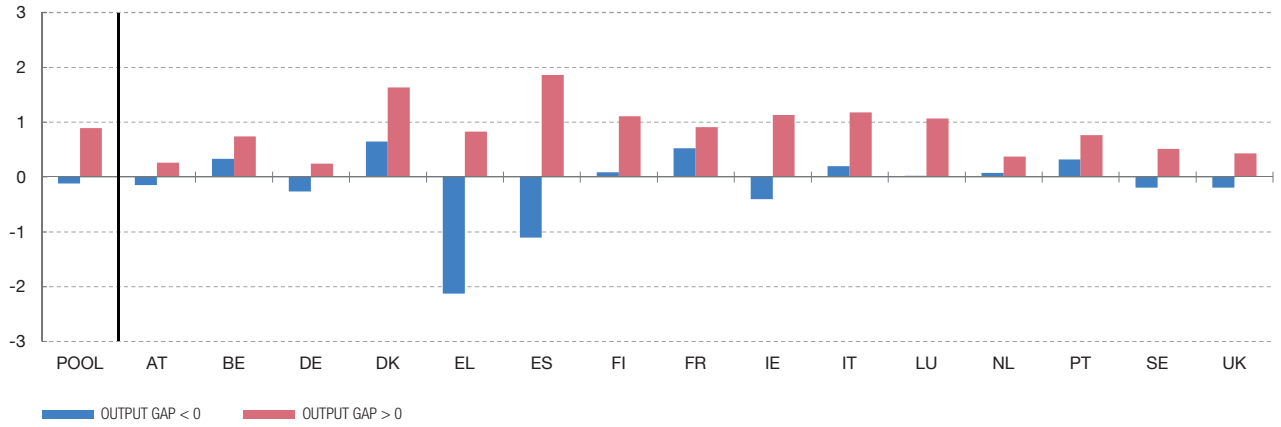
Chart 6

AVERAGE REVISION OF THE CYCLICAL BALANCE (2003-2015)

1 BY GDP GROWTH AND COUNTRY



2 BY OUTPUT GAP AND COUNTRY



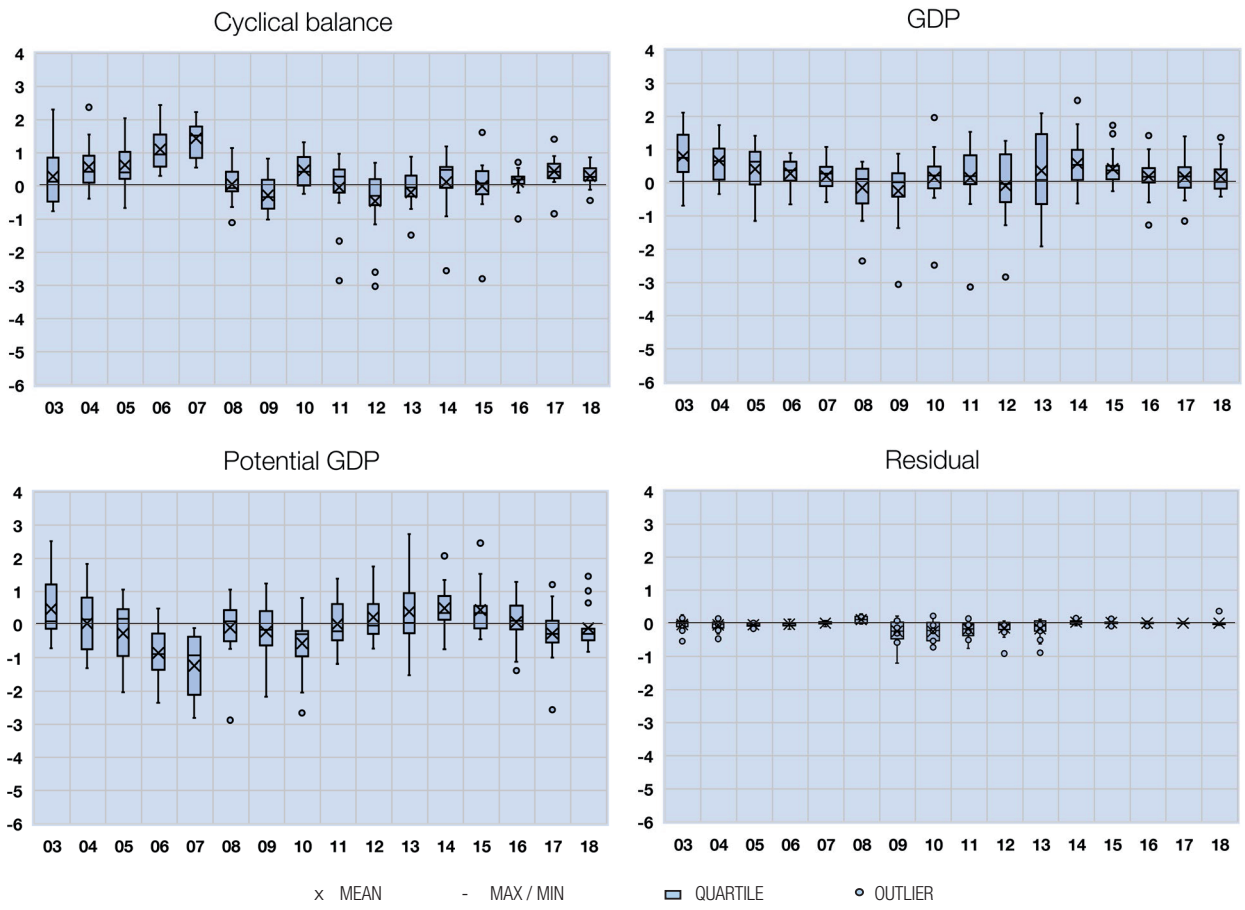
SOURCE: Own calculations based on European Commission data.

beginning of expansions. Thus, the highest real-time errors in this variable happened around turning points in the business cycle (i.e., 2007 and 2014 in our sample), which is consistent with the fact that estimates of potential GDP rely heavily on expected future growth rates and these are more difficult to predict precisely around turning points. As an illustration, the correction in 2007 was particularly large. Chart 8 shows that, across countries, there is a positive relationship between the fall in average real GDP growth after 2007 and the size of the downward revision of the level of potential GDP in that year.

The real-time measurements of real GDP also suffer non-negligible revisions (see upper-right panel of Chart 7). These are positively correlated with the business cycle. In expansions, when real GDP is growing, it tends to be revised upwards, whereas in contractions, when real GDP is falling, it tends to be revised downwards. As Chart 9

Chart 7

DECOMPOSITION OF THE REVISIONS OF THE CYCLICAL BALANCE BY YEAR



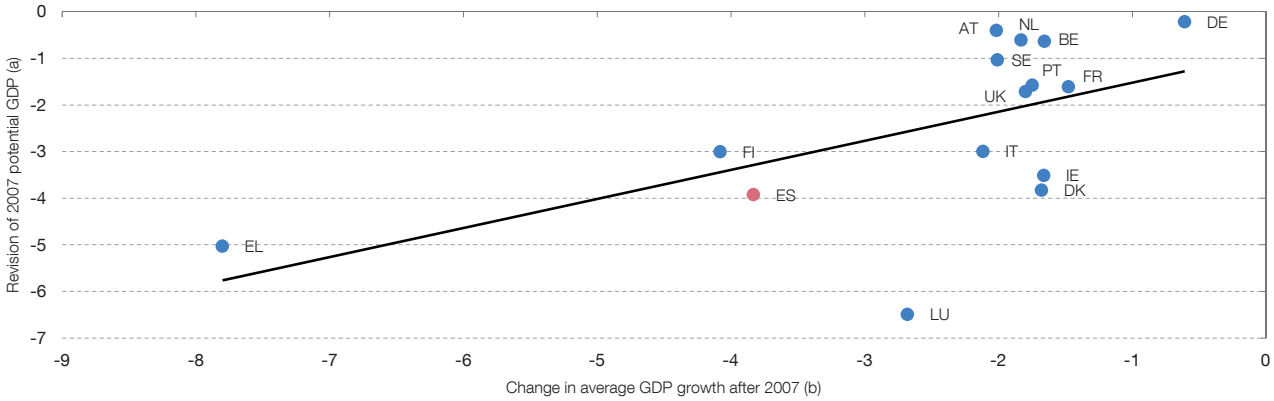
SOURCE: Own calculations based on European Commission data.

shows, there is considerable country heterogeneity, but the underestimation of real GDP expansions occurs in all countries in our sample except Greece. Since real GDP trends upwards on average, this introduces a long term bias in real-time estimates of the cyclical and structural balances (see Table 1).

To sum up, the negative average revision of real-time structural balances (which means a worse fiscal position than initially estimated) is explained by a combination of worse figures for total fiscal balances in some countries and upward revisions in real GDP. To be more concrete, although both real GDP and potential GDP are revised procyclically (upwards during expansions and downwards during contractions), potential GDP revisions happened mainly around turning points and offset each other, showing no systematic bias in the whole period considered (2003-2015). However, real GDP is typically revised upwards when GDP is growing and since it grows in the long term this means there is a positive average revision in the long term. These results are mainly

Chart 8

REVISION OF THE 2007 POTENTIAL GDP AND AVERAGE CHANGE IN REAL GDP GROWTH BY COUNTRY

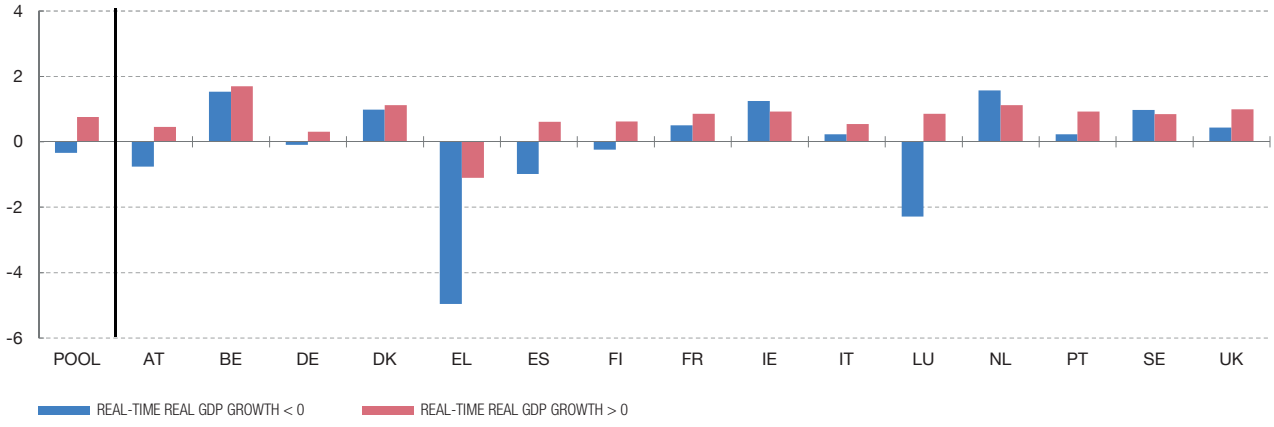


SOURCE: Own calculations based on European Commission data.

a Current estimate of potential GDP in 2007 minus estimate in real-time (Spring 2008), in percentage of GDP.
b Average real GDP growth in 2008-15 minus average real GDP growth in 2003-07, in percentage.

Chart 9

AVERAGE REVISION OF REAL GDP BY INITIAL ESTIMATE OF REAL GDP GROWTH AND BY COUNTRY (2003-2015)



SOURCE: Own calculations based on European Commission data.

driven by the expansionary years of 2003-2007. To the extent that this period can be considered exceptional, these results should be taken with caution.

4 Fiscal policy implications

Public debt sustainability depends on the current level of debt and current and future values of the fiscal balance. In the absence of new measures, the fiscal balance would tend towards its structural level, as transitory factors (including the cyclical component) are expected to cancel out and vanish in the long run. This is why the sustainability of public finances is usually evaluated in terms of the structural balance. In this way, the Stability and Growth Pact establishes a medium-term objective (MTO), for the structural balance of each country, that guarantees debt sustainability. Deviations of the observed structural balance from the aforementioned MTO determine whether fiscal policy needs to be adjusted, by introducing measures either on the revenue or the expenditure side. On that basis, the European Commission and the European Council issue recommendations that determine the design of fiscal policy of member states.

Since these recommendations are made in real-time, they depend on real-time estimates of structural balances. The existence of significant revisions implies that fiscal policy recommendations which were considered as appropriate in real-time, may turn out to be inappropriate later on when data and estimates are revised. The following is an overview of the evolution of fiscal policy recommendations in EU countries from 2003 to 2019 through the lens of the structural balance revisions.

Chart 10 plots the simple average, across the 15 countries analyzed, of the real-time and latest estimates of the structural balance and its components. During the period prior to the financial crisis of 2008 (2003-2007) real-time estimates of the structural balance were generally close to zero (although not in every case). Therefore, overall, no fiscal consolidation measures were considered necessary. Ex-post, those estimates were revised down by 1.3 pp of GDP on average, oscillating from 0.0 pp in the case of Germany to -4.5 pp in Greece (see Chart 11). Firstly, government deficits during the boom turned out to be significantly greater afterwards in some countries (especially in Greece and Portugal). Secondly, the great economic expansion during those years was underestimated in real time in the majority of countries according to the posterior upward GDP revisions. Finally, as shown in Chart 8, in those countries where growth was particularly high, the structural side of the expansion was overestimated (potential growth) and the cyclical component of the expansion was underestimated. Therefore, ex post, it can be said that the assessment of fiscal positions made at the time was too optimistic, which prevented governments from adopting additional measures.

In Autumn 2008, when the financial crisis started to impact economic growth, the latest estimate of the structural balance for 2007 in the 15 countries in our sample was close to zero on average (-0.3% of GDP),[21] with only five countries (Greece, UK, France, Portugal and Italy) below -1.5%. Thus, theoretically, there was enough space for fiscal impulses to offset negative economic developments. In fact, between 2008 and 2009 there was a fiscal

21 Slightly revised down from the 0.2% estimated in Spring 2008 (real-time estimate, in our definition).

Chart 10

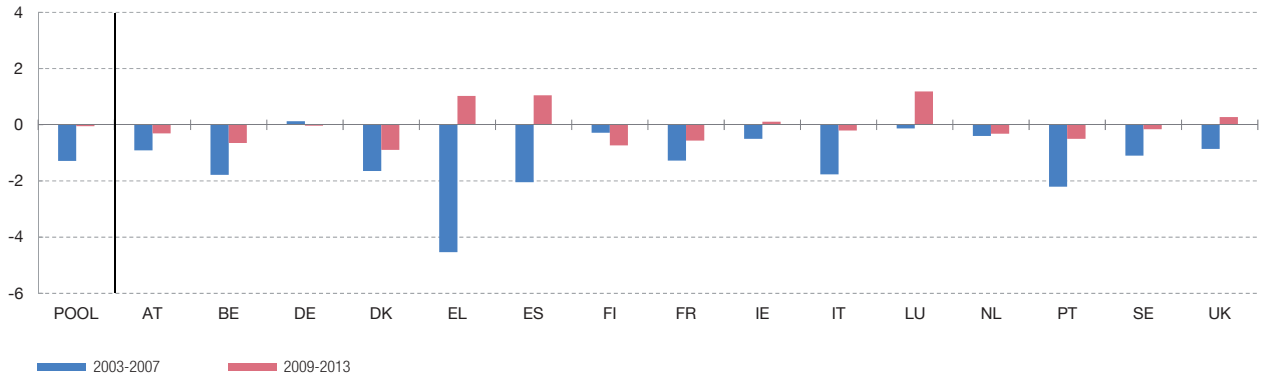
EVOLUTION OF THE STRUCTURAL BALANCE AND ITS COMPONENTS (SIMPLE AVERAGE OF 14 EU COUNTRIES PLUS UK)

SOURCE: Own calculations based on European Commission data.

a Net of non-recurrent elements.
b Real GDP and potential GDP are rescaled to 100 = last estimate of 2010 real GDP.

Chart 11

REVISION OF THE STRUCTURAL BALANCE BY COUNTRY



SOURCE: Own calculations based on European Commission data.

impulse of around 3% of GDP on average, according to the current estimate of the change in the structural balance in those years. This together with automatic stabilizers (for example, lower revenues due to the fall in economic activity and spending rises due to unemployment benefits), led to a 6 pp deterioration in the average total balance (see upper-right panel in Chart 10).

In Spring 2010, the effects of the crisis, the approved stimulus and the new estimates of structural balances revealed the sustainability problems of public finances in some countries. On average, the 2009 structural balance was estimated at -4.3% of GDP then, with five countries (Greece, Ireland, Spain, UK and Portugal) exceeding -7%. This led to the implementation of important fiscal adjustment measures in countries such as Greece, Spain, Ireland, Italy and Portugal. Overall, the structural deficit was reduced by 3 pp of GDP, between 2010 and 2013, in our sample.

In this sense, it has been argued that the application of budgetary stability rules in the EU, together with real-time unobservable measures, contributed to a more contractionary fiscal policy than desirable during the sovereign debt crisis in the euro area (see for example Fatas [2019] and Tooze [2019]). Decisions were influenced by many factors, including the absence of a common fiscal policy for the EU as a whole that complicated the response to a crisis with, as opposed to the later Covid19 crisis, very heterogeneous effects across countries. While the discussion about the adequacy of the fiscal consolidation undertaken in EU countries is beyond the scope of this paper, we just want to check whether errors in real-time estimates contributed or not to a possibly excessive fiscal tightening in those years. This would be correct if the estimated real-time structural balances were revised upwards later on (indicating that fiscal positions were not as bad as initially considered). In this sense, the evidence presented in Chart 11 is that revisions of 2009-2013 data were not significant, in general. Of the five countries (Greece, Spain, Ireland, Italy and Portugal) that undertook an

extraordinary fiscal tightening during those years, only the first two show an upward revision in structural balances and this was of a relatively minor size (1% of GDP) compared to the value of structural deficits in 2009 (14.6%, in Greece, and 8.7%, in Spain).[22]

After 2013, the pace of fiscal tightening moderated in our sample and revisions of real-time data were minor, with the exception of the years 2017-2018. Those were years of economic expansion and structural balances were again revised downwards. However, it is too early to draw conclusions on these years, since, according to the evidence, there may still be additional future revisions.

22 Fatas (2019) suggests that the absence of an upward revision of 2009-2013 structural balances is the result of hysteresis effects. According to this, contractionary fiscal policy in those years would have led to a permanent deterioration in output compared to what would have happened otherwise. Thus, lower potential GDP estimated in real time would have being validated ex post only because of these hysteresis effects caused by excessively contractionary fiscal policy. Ten years after the contractionary period, this hypothesis requires very strong hysteresis effects.

5 The Spanish case

In this section we analyze in detail the evolution of the Spanish public accounts in the last two decades, comparing again the real-time information released in Spring of the year immediately after (t+1) with the current available data for each year t (published in Autumn 2020). As in the previous Section, in Chart 12, the information provided in the biannual European Commission economic forecasts is plotted for the total government balance and its components (structural balance and cyclical balance), and the output gap and its components (GDP and potential GDP).

Regarding the available information in real time, the high dynamism of the economy and the tax bases during the years prior to the 2008 crisis led to a rise in public revenues and to a correction of the financial needs of the public sector. Therefore, the Spanish economy shifted from a fiscal balance in 2003-2004 to a fiscal surplus during the three years prior to the crisis, which reached 2.2 pp of GDP in 2007. These figures were far from the fiscal deficit limit of 3% set by the Stability and Growth Pact. At the same time, high real-time estimates of potential GDP (influenced by the strong and sustained real growth of those years) made that the cyclical expansion translated only into a modest improvement of the output gap, which rose from -1.8% of GDP in 2003 to -0.4% in 2007. Consequently, the cyclical component of the government fiscal balance remained negative (-0.7% of GDP in 2003 and -0.2% in 2007) and all the observed fiscal surplus was considered structural. In the light of this evolution, at the time, Spain was considered to have the necessary fiscal space to counteract the negative impact on aggregate demand induced by the financial crisis.[23]

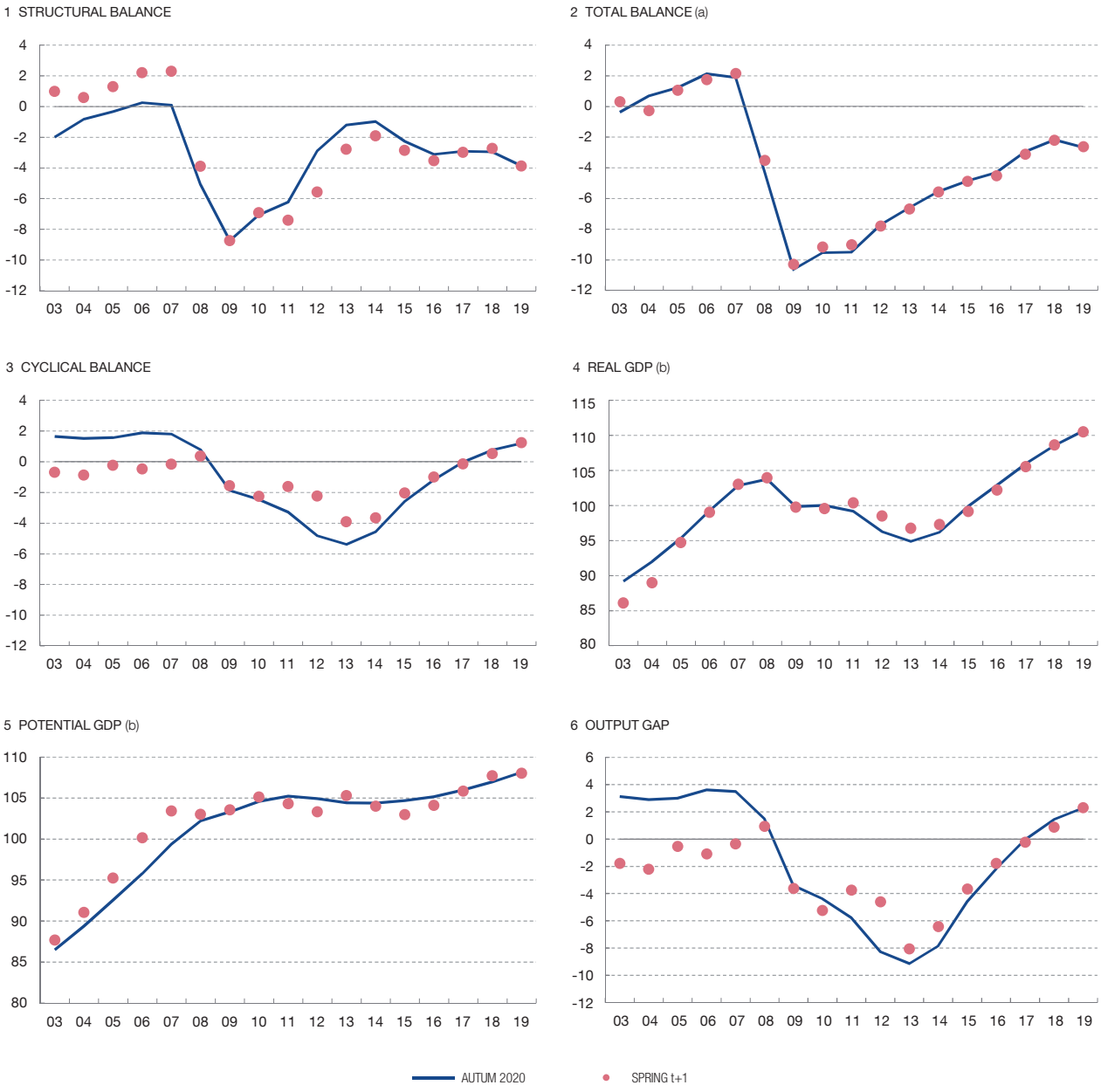
In fact, Spain's first line of response to the financial crisis was similar to that of other countries. Given that public finances in Spain were judged to be significantly robust at the beginning of the crisis, the available resources were considered to be enough to carry out fiscal stimulus measures. Hence, the government announced a set of stimulus packages aimed at pushing demand up, complementing the European Central Bank's (ECB) monetary policy. The plan included, among other measures, a tax reimbursement of €400 per taxpayer and a fund aimed at stimulating investment by the local authorities (State Fund for Local Public Investment), which began to be used in the second quarter of 2009. It also included tax cuts (Personal Income Tax and Corporate Tax, as well as the elimination of the property tax) and spending measures to support specific industries (cars, tourism and SMEs). In addition, the deterioration of the macroeconomic conditions, clearly reflected in the output gap reduction to -3.6% in 2009, activated the automatic stabilizers (as demonstrated by the drop in the tax bases and the rise in the unemployment benefits). This led to an increase in the cyclical deficit to 1.5%. Finally, considering all these changes, the government fiscal balance laid at -10.3% of GDP in 2009.

In 2009, in view of the significant deterioration of public finances in the majority of EU countries, the European Commission changed the emphasis of recommendations

23 Regarding the public debt, it decreased by 22 percentage points between 2000 and 2007, when it reached 35.8 % of GDP, one of the lowest levels then in the European Union.

Chart 12

EVOLUTION OF THE STRUCTURAL BALANCE AND ITS COMPONENTS IN SPAIN



SOURCE: Own calculations based on European Commission data.

a Net of non-recurrent elements.
b Real GDP and potential GDP are rescaled to 100 = last estimate of 2010 real GDP.

for the forthcoming years, from stimulus to fiscal austerity, and launched Excessive Debt Procedures in most countries. In the case of Spain, a correction of the excessive deficit (that was expected to reach 11.2% of GDP) was requested for years 2010-2013. The 2009-2013 Stability Program Update (SPU) of the Spanish Government already included several adjustment measures, which were later incorporated into the 2010 Budget Law. Nonetheless,

during the first semester of 2010, stimulus measures were still being applied.[24] In May 2010 a turning point was reached when, after the acceptance of a sovereign rescue package by Greece, austerity measures (Extraordinary Measures Plan) were implemented in Spain, comprising public sector wage cuts and freezing of pensions. It was completed in 2011 with a rise in taxes (in July the average VAT rate increased from 16 to 18% and in December marginal rates of the personal income tax were raised), a tightening of the working conditions of civil servants (including a wage freeze and a reduction in the number of public job openings), a cut in spending affecting several government programmes, an extension of the co-payment system for medicines, and a reduction in the renewable energy subsidies.[25] In this context, the Spanish government signalled its commitment to budgetary stability by including the "golden rule" to maintain structural balance over the business cycle in the Constitution and for all General Government subsectors.

In June 2012, the Eurogroup approved €100 bn in financial aid for the recapitalization of Spanish banks, with Spain's commitments under the program outlined in the Memorandum of Understanding on Financial-Sector Policy Conditionality (MoU). The consequences of this conditionality were the application of another austerity package in July 2012, including a second increase in the VAT rate and the approval of a law of budgetary stability (Organic Law 2/2012) which implied a deeper control over the budgets at all levels of Public Administration, including penalties for noncompliance.

Thus, the fiscal policy stance was notably contractionary in the years 2010-2013, with an average annual improvement in the structural balance of 1.5 pp of GDP, as measured in real-time. Therefore, despite the worsening of the economic cycle (the output gap decreased from -3.6% in 2009 to -8.1% in 2013, resulting in an increase in the cyclical deficit from 1.5% to 3.9% of GDP), the government fiscal deficit was reduced by 3.6 pp in those years.

Since 2014, there was a significant improvement in the macroeconomic conditions. The dynamism of economic activity contributed to narrow the output gap, which closed in 2017. Consequently, the cyclical balance reached the equilibrium at that time. Nonetheless, in spite of this situation, the budget balance did not fall below the - 3% of GDP hurdle (as requested by the Stability and Growth Pact) before the end of 2018. This was due to fiscal policy being slightly expansionary during 2015 and 2016 and broadly neutral in the following two years. It again turned slightly expansionary in 2019. This might be the result of the consolidation fatigue arising after the years of contractive fiscal policies, which was signaled already with the fiscal reforms introduced in 2015 and 2016. These introduced significant tax cuts (Personal Income Tax, Corporate Tax and VAT) which worsened the structural balance by almost 2 pp. In addition, since 2017 and specially in 2018 and 2019 government

24 Those measures included a new €5 bn fund for local investment (FEESL) that was announced in October 2009, a National Rural Development Programme, and, in April 2010, a package of measures including an infrastructure plan (Extraordinary Infrastructure Plan) and an additional economic stimulus plan (Spanish Plan to Boost the Economy and Employment).

25 A partial privatisation of the airport group Aena and the National Lottery was also carried out, although these measures are considered as non-recurrent elements and thus are not included in the current analysis.

spending rose significantly. This increase was essentially aimed to improve pensions and civil servants' wages. As a consequence, there was no structural improvement at all during the economic expansion of 2014-2019. At the end of this period, in 2019, the government fiscal balance stood at -2.6% of GDP and the structural balance estimated by the European Commission at -3.9%.

The light blue line in Chart 12 refers to the evolution of the previous variables according to the latest released vintage (i.e. Autumn 2020). The comparison between the current and the real-time data shows that, in the case of Spain, revisions of the total fiscal balance are relatively minor, compared to what we found in Section 3 for some other countries (see also Chart 4). Therefore, revisions mainly affect the cyclical balance. Revisions of this component are particularly procyclical in Spain, with significant upward corrections of real-time data in the expansionary years before 2008 and downward corrections in the years 2011-2013 (see also Chart 6).[26]

In the period 2003-2007, the upward revisions were mainly due to downward revisions in potential GDP (-2.0 pp, on average, -3.9 pp, in 2007). However, real GDP growth in the years prior to 2005 was also initially underestimated, contributing to the underestimation of the cyclical component of the budget balance in those years. Specifically, in May 2005, the change of base year in Spanish National Accounts implied an upward revision of the whole GDP series, but also an upward revision of real GDP growth in 2001-2004 (by 0.5 pp per year, on average). As a result of both elements, the average output gap and cyclical balance in those years, rather than being slightly negative, as deemed at the time, is now considered to have been positive (3.2 and 1.7 pp of GDP, respectively). Consequently, the finally-estimated structural balance was significantly lower than it was thought during the boom and, as it was the case in the majority of countries analyzed, the stance of the Spanish fiscal policy was not contractionary enough during the years prior to 2008. This, in turn, conditioned the behavior of fiscal policy during the following crisis, as we saw above.

Revisions for the years 2009-2010 are very small, indicating that the very weak position of Spanish public finances at the time was correctly assessed in real-time and, therefore, measurement problems cannot be blamed for the decision to start tightening fiscal policy in 2010. Nonetheless, in 2011-2013 (a period of negative real GDP growth), revisions of the structural fiscal balance were again procyclical, this time underestimating the improvement achieved with the contractionary fiscal measures approved in those years. Potential GDP has been revised up for 2011 and, especially, 2012 (by 1.6 pp of GDP in the latter case). But real GDP revisions contributed again. In particular, in September 2014, a new change in base year for the Spanish National Accounts resulted once again in an upward revision of the whole series but, at the same time also in a downward revision of real GDP growth in 2011-2012 (by more than 1 pp in cumulated

26 Data for the expansionary period that started in 2014 are still too recent to be analysed with confidence.

terms). Thus, the real GDP fall between 2010 and 2013, that was previously estimated at 2.7%, was revised up to 3.9%. Consequently, though data revisions do not change the initial assessment that Spanish public finances needed a redress in 2009-2010, it is true that structural efforts during the years 2011-2012 were somewhat underestimated at the time.

6 Conclusions

Our analysis suggests that, on average, real-time structural balance estimates by the European Commission, for 14 EU countries plus the United Kingdom, and for the years 2003-2015, were optimistic. This real-time optimism in the fiscal position is mainly driven by the expansionary period 2003-2007. Interestingly enough, the average optimism bias cannot be simply explained by revisions in the unobserved output gap: revisions in fiscal variables also play a role, particularly before 2008 and in some countries such as Greece. Also, we find that procyclical revisions in the output gap are explained, at least partially, by revisions in real data on GDP regardless of potential output estimates. Revisions are asymmetric, with cumulated corrections in real-time data larger during expansions than during contractions, which explains the negative average revision of structural balances over time.

In terms of the policy implications, our findings confirm that the fiscal policy that was considered to be appropriate during the boom prior to the global financial crisis, and in the first year of that crisis, finally turned out to be too expansionary, particularly in certain countries. As a result, strong fiscal responses to the fall in domestic demand during 2009 led to vulnerable positions for these countries. Then, they had to tighten their fiscal policy while still being in a weak economic position, which contributed to delay the recovery. However, our evidence does not point to this procyclical contractionary fiscal policy being the result of inadequate assessment of structural positions in real time. Overall, we take this evidence to confirm the importance of accumulating enough fiscal buffers during the expansionary periods, especially because fiscal positions tend to be over-estimated in real time during those periods.

Regarding the Spanish case, the results are generally in line with those obtained for the whole pool of countries, although revisions of fiscal data are not particularly large in Spain, whereas procyclical revisions of the cyclical balance are especially marked.

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Appendix

Along the document, X_{it}^{k} stands for the value of the variable X in year t, for country i and release k. The European Commission publications have a biannual (Spring and Autumn) frequency, covering a wide range of variables and countries for those years available. Hence, for each variable, country and year, we have an estimate per vintage. We mainly focus on k=RT (first estimate, published in the Spring vintage of the year after the one it refers to) and k=L (last estimate available, published in Autumn 2020).

Furthermore, variables are always expressed as a ratio over the GDP estimated in the last publication $(X_{it}^{k}/GDP_{it}^{L})$. Therefore, revisions will not be influenced by GDP revisions but only by those of the variable itself.

$$REV_{it}^{X} = \frac{X_{it}^{L}}{GDP_{it}^{L}} - \frac{X_{it}^{RT}}{GDP_{it}^{L}} = \frac{(X_{it}^{L} - X_{it}^{RT})}{GDP_{it}^{L}} \tag{A1}$$

Moreover, fixing the GDP used to calculate the ratio also simplifies considerably the decomposition of the revisions of the structural balance into the corresponding part of each of its elements. Therefore:

$$REV_{it}^{SB} = \frac{(SB_{it}^{L} - SB_{it}^{RT})}{GDP_{it}^{L}} - \frac{\{(TB_{it}^{L} - CB_{it}^{L}) - (TB_{it}^{RT} - CB_{it}^{RT})\}}{GDP_{it}^{L}} = REV_{it}^{TB} - REV_{it}^{CB} \tag{A2}$$

where TB_{it}^{k} represents the total government balance corrected from non-recurrent elements and CB_{it}^{k} the cyclical balance.

Regarding the revisions to the cyclical balance, they can be decomposed into three components: changes in real GDP, in potential GDP and in the residual. To this end, the following definitions are used:

$$GDP_{it}^{k} = P_{it}^{k} \cdot Y_{it}^{k} \tag{A3}$$

$$GDP^{POT}{}_{it}^{k} = P_{it}^{k} \cdot Y^{POT}{}_{it}^{k} \tag{A4}$$

$$\frac{CB_{it}^{k}}{GDP_{it}^{k}} = OG_{it}^{k} \cdot \eta_{it}^{k} = \left(\frac{GDP_{it}^{k} - GDP^{POT}{}_{it}^{k}}{GDP_{it}^{k}} \right) \cdot \eta_{it}^{k} \tag{A5}$$

$$CB_{it}^{k} = (GDP_{it}^{k} - GDP^{POT}{}_{it}^{k}) \cdot \eta_{it}^{k} \tag{A6}$$

where P_{it}^{k} stands for the GDP deflator, Y_{it}^{k} represents real GDP and $Y^{POT}{}_{it}^{k}$ is the real potential GDP, with the output gap being measured as a percentage of GDP.

On the basis of the above, the revision of the cyclical balance can be decomposed as follows:

$$REV_{it}^{CB} = \frac{CB_{it}^{L} - CB_{it}^{RT}}{GDP_{it}^{L}} \tag{A7}$$

$$= \frac{\left(GDP_{it}^{L} - GDP^{POT}{}_{it}^{L}\right)}{GDP_{it}^{L}} \cdot \eta_{it}^{L} - \frac{\left(GDP_{it}^{RT} - GDP^{POT}{}_{it}^{RT}\right)}{GDP_{it}^{L}} \cdot \eta_{it}^{RT}$$

That can also be expressed as:

$$REV_{it}^{CB} = \frac{\left(Y_{it}^{L} - Y^{POT^{L}}_{it}\right)\cdot P_{it}^{L}}{GDP_{it}^{L}} \cdot \eta_{it}^{L} - \frac{\left(Y_{it}^{RT} - Y^{POT^{RT}}_{it}\right)\cdot P_{it}^{RT}}{GDP_{it}^{L}} \cdot \eta_{it}^{RT} \tag{A8}$$

After adding and subtracting $\left(Y_{it}^{RT} - Y^{POT^{RT}}_{it}\right).P_{it}^{L}.\eta_{it}^{L}/GDP_{it}^{L}$ and some algebra, the desired decomposition is obtained:

$$\begin{aligned} REV_{it}^{CB} &= \frac{\left(Y_{it}^{L} - Y_{it}^{RT}\right)\cdot P_{it}^{L}}{GDP_{it}^{L}}.\eta_{it}^{L} - \frac{\left(Y^{POT^{L}}_{it} - Y^{POT^{RT}}_{it}\right)\cdot P_{it}^{L}}{GDP_{it}^{L}} \cdot \eta_{it}^{L} \\ &+ \frac{\left(Y_{it}^{RT} - Y^{POT^{RT}}_{it}\right)}{GDP_{it}^{L}} \cdot \left(P_{it}^{L}\cdot\eta_{it}^{L} - P_{it}^{RT}\cdot\eta_{it}^{RT}\right) \\ &= REV_{it}^{Y} - REV_{it}^{Y^{POT}} + Residual_{it}^{CB} \end{aligned} \tag{A9}$$

The residual includes variations in the GDP deflator and in the elasticity of the fiscal balance with respect to the cyclical position[1].

All variables are measured in levels, including GDP and potential GDP. This creates problems when the GDP level changes due to methodological decisions. In order to avoid an effect of the methodological changes in the revisions, instead of using the levels published by the EC, we recalculate them according to the data revised five years before and the accumulated growth rates during those five years, estimated in real time and at present. Therefore, the real GDP variation in levels is calculated as follows:

$$Y_{it}^{L} - Y_{it}^{RT}\cdot\frac{Y_{it-5}^{L}}{Y_{it-5}^{RT}} = Y_{it}^{L} - Y_{it-5}^{L}\cdot\Pi_{j=0}^{4}\left(1+g_{it-j}^{RT}\right) \tag{A10}$$

where g_{it}^{k} represents the real GDP growth rate estimated in k. Then the level of potential GDP is calculated from the output gap published and the recalculated level of real GDP.

Therefore, those real GDP (potential GDP) revisions that are mentioned in the paper refer to revisions of the estimated real GDP (potential GDP) growth in the previous five years. Given that GDP revisions usually affect the last years, it allows us to capture, to a large extent, these revisions but avoiding the impact of methodological changes.

1 Changes in the deflator affect both the nominal GDP and the nominal potential GDP, with the opposite effects in the output gap and the cyclical balance, that almost offset one another. That is the reason to leave them as a residual in the decomposition.

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