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The cyclically-adjusted budget balance used in the EU fiscal framework: an update

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CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

The cyclically-adjusted budget balance (CAB) has taken the central stage in the revised EU framework for fiscal surveillance. With the 2005 reform of the Stability and Growth Pact (SGP) the balance adjusted for cyclical effects has become a key indicator. Corrected also for one-off measures and labelled then structural balance, it is the main indicator used for the assessment of country-specific medium-term fiscal objectives under the "preventive arm" of the SGP and of the fiscal adjustment imposed to Member States in excessive deficit position under the "corrective arm" of the SGP. The CAB allows for decomposing the fiscal position into the automatic reaction of the budget to changes in economic activity and the impact of discretionary fiscal policy, mostly in the hand of government. It may also be useful to assess fiscal sustainability issues. The CAB is part of the "top down" approaches to identify discretionary fiscal policy by directly correcting the actual budget balance, as opposed to "bottom up" approaches, which identify the discretionary nature of individual measures and then aggregate them.

The Commission has recently improved the computation methodology of the CAB used in the EU framework of fiscal surveillance. Its amendments have been reviewed by the Output Gap Working Group (OGWG) in the first half of 2012 and endorsed by the Economic Policy Committee (EPC) on 27 June 2012. The revised methodology has been fully up and running since the release of the Commission Winter 2013 Forecast in February 2013. The first improvement consists in employing a semi-elasticity parameter instead of the usual budgetary sensitivity parameter, since it correctly measures the reaction of the balance-to-GDP ratio to cyclical conditions. The second amendment is the update of the decade-old data underlying the computation of the CAB. The paper reviews and explains in detail the recent improvements brought to the CAB methodology and describes the impact thereof on the CAB results. While the output gap is an essential driver of the CAB, its estimation – covered in detail by other Commission contributions – remains outside the scope of this paper, which focuses on the link between the CAB and the output gap.

Regarding the first improvement, the semi-elasticity is now used to measure the cyclical part of the balance and to derive the CAB and its components. This is consistent with the correct CAB concept, namely, the budget balance-to-GDP ratio that would prevail if the economy was at potential. This approach differs from the previous concept, based on fiscal sensitivity, which expresses the CAB in percentage of actual GDP instead of potential GDP. While the previous method was a fairly satisfactory approximation of the correct CAB concept, the error in the revenue and expenditure components of the CAB was quite large. The increasing attention being devoted to the composition of fiscal adjustment, besides its size, therefore represents a further strong motivation to use semi-elasticity. Since a large part of cyclical revenues move alongside with the cyclical swings in GDP, the cyclically-adjusted revenue-to-GDP ratio would hardly change. In contrast, most public expenditure does not exhibit a cyclical pattern, resulting in a large impact in terms of the cyclically-adjusted expenditure expressed as a percentage of GDP, mostly driven by the cyclical effect on the denominator (i.e. potential output). The one-to-one cyclical reaction of revenues with respect to GDP compared to the small cyclical reaction of expenditures implies that the large "error" made on the revenue side of the budget with the sensitivity method (i.e. not "incorporating" the cyclical effect on GDP) is offset by an "error" of the same magnitude on the expenditure side, so the two (broadly) offset in the measurement of the CAB.

Regarding the second improvement, the weighting parameters associated with the individual OECD/ECFIN elasticities were updated, after having remained unchanged for almost a decade. The updated weighting parameters are: i) the share of specific taxes/expenditures in total taxes/expenditures (i.e. the structure of taxes and spending), and ii) the size of total taxes and total expenditures as a percentage of GDP. Some inconsistencies in the calculation period of the weighting parameters have been corrected. In addition, the paper discusses the options for the choice of the benchmark period used to compute the weighting parameters and for the frequency of their updates. It reaches the conclusion that the average value over the last ten years should be taken as the benchmark period. The tax structure, on the one hand, and the revenue and expenditure ratios, on the other hand, were updated consistently using a 10-year average over 2002 – 2011. The paper also concludes that the parameters should be updated with a regular multi-annual frequency (i.e. every six years).

While updating the elasticity of individual tax and expenditure categories with respect to the output gap appears inevitable also in the future, it will be carried out, under the watch of the OGWG, over the next two years mostly likely by the OECD. This will require complex and time-consuming simulations using detailed information of the change in the tax codes and micro data on household income, since it means computing both the elasticity of individual tax revenues /expenditures with respect to their base and the reaction of the different tax/expenditure bases to the output gap.

The main lessons from the revision of the CAB methodology are confirmed by the analysis of the empirical results:

- *The shift from sensitivities to semi-elasticities has only second-order effects on the conventional CAB estimates. However, the new method leads to far more different outcomes as far as the estimated cyclical components of revenues and expenditures are concerned. As a consequence, the assessment of fiscal policy based on the composition of the fiscal adjustment is substantially altered.*

- *The update of weighting parameters does not alter substantially the estimated CAB, even in cases where the output gap is particularly large. Results are also robust with respect to the change in the calculation period 2002-2011 instead of 1995-2004. This 2002-2011 benchmark is, therefore, seen as a good compromise between the need to take recent developments in the revenue weights into account and to correct for short-term cyclical fluctuations.*

- *The budgetary semi-elasticity is averaging out to 0.53 for the EU and ranges from 0.30 to 0.61 across Member States, suggesting significant differences in the cyclicality of the budget balance.*

- *The semi-elasticity for revenue is close to zero, ranging from -0.13 to 0.04, since revenue is almost as cyclical as GDP, except for non-tax revenue. Therefore, the revenue-to-GDP ratio moves only slowly with the business cycle, especially in Member States where non-tax revenue is relatively low.*

- *In contrast, the semi-elasticity for expenditure is ranging from -0.38 to -0.67, which accounts for the larger part of the disparity in the budgetary semi-elasticity across Member States. Its value broadly corresponds to the share of total expenditures in GDP. This mirrors the fact that the elasticity of the expenditure-to-GDP ratio to the output gap is close to minus one. Indeed, the cyclical effect of the denominator (GDP) largely dominates the low cyclicality of expenditure in level, given the small share of unemployment-related expenditure in total expenditure.*

The appendix presents step by step how the CAB elasticity is derived from the individual elasticities and the weighting parameters. It also indicates the data sources.

1. INTRODUCTION

The cyclically-adjusted balance (CAB) helps clarify important aspects of fiscal policy. In particular, it entails the decomposition of the fiscal position into the automatic fiscal response of the budget to changes in economic activity and another representing discretionary fiscal policy. The CAB may also be useful to assess fiscal sustainability issues, for example by comparing the CAB against a debt-stabilizing fiscal balance. The heightened importance of the CAB mirrors the current concern of policy makers to avoid the well-documented mistakes made in assessing the potential output and the underlying fiscal position during historical crises. It also relates to the key part played by this indicator in designing the adequate consolidation strategy to exit the current debt crisis.

The CAB has taken the central stage in the EU fiscal framework for fiscal surveillance, both in its preventive and corrective arms. ([1]) With the 2005 reform of the Stability and Growth Pact (SGP) the budget balance adjusted for cyclical effects (and temporary measures) has become the key indicator for both the assessment of country-specific medium-term fiscal objectives (MTO) under the "preventive arm" and the assessment of 'effective action' in the context of the excessive deficit procedure (the "corrective arm"). The preventive arm of the SGP endeavours to ensure that policy setting is conducted so as to lead to healthy public finances over the short and longer terms. It requires that Member States attain a country-specific MTO for their budgetary position, which is set in terms of cyclically-adjusted budget balance net of one-off and temporary measures, also referred to as the 'structural balance'. For countries that are not at their MTO, an appropriate adjustment path of the structural balance towards the MTO should be defined and adhered to, with an annual improvement of 0.5% of GDP per year as a benchmark. By setting a budgetary target in those structural terms – i.e. cyclically-adjusted and net of one-off and temporary measures – the preventive arm of the Pact aims to ensure that the underlying fiscal position of Member States is conducive to medium-term sustainability, while allowing for the free operation of the automatic stabilisers. As regards the "corrective arm", the fiscal adjustment required for Member States incurring in excessive deficit situations is also measured in terms of the change in the balance adjusted for cyclical effects (and temporary measures). The minimum annual improvement is at least 0.5% of GDP as a benchmark in structural terms. ([2])

The importance of the CAB concept has been restated forcefully with the reform of the European economic governance since 2011. ([3]) First, the so-called Six-Pack of December 2011 reinforced the requirements in the preventive arm of the SGP by specifying when deviations from the adjustment path to the MTO in terms of cyclically-adjusted budget balance (net of one-off and temporary measures) are deemed to be significant. Such significant deviation from the MTO or the adjustment path towards it is reached when the structural balance has deviated from the required level by 0.5% of GDP in one year or cumulatively over two years. In case of repeated non-compliance, financial sanctions could kick in. Second, with the so-called fiscal compact of March 2012, 25 EU Member States committed to enshrining in national binding law rules mirroring those of the preventive arm of the SGP to limit their structural deficit, i.e. the CAB net of one-off and temporary measures. ([4]) Contracting parties should translate accordingly the MTO concept into their national law, through provisions of binding force and permanent character. Thus, in line with the SGP as reformed by the Six-Pack, a temporary deviation of the structural balance from the MTO or the adjustment path towards it will only be possible in exceptional

([1]) The official concept used in fiscal surveillance is the structural budget balance, which is the CAB corrected for the one-offs.

([2]) The structural balance is actually the core indicator of the efforts achieved to correct the excessive deficit. The entry/exit of EDP is based on nominal criteria (i.e. nominal deficit exceeding 3% of GDP or public debt exceeding 60% of GDP). However, the assessment of "effective action", which, when negative, leads to financial sanctions for euro area Member States, compares the effort made in terms of structural budget balance with the consolidation requirement set by the Council to correct the excessive deficit. This means that a Member State which has done the structural effort recommended would not face any sanction, even if the correction of the nominal deficit does not follow, for instance because of a deterioration of the macroeconomic scenario. In this case, the horizon for correcting the excessive deficit might be prolonged.

([3]) Another key innovation of the Six-Pack to reinforce the preventive arm of the SGP is the introduction of a new expenditure benchmark to provide (more) operational and policy guidance on how Member States move towards their MTO.

([4]) The "fiscal compact" corresponds to the fiscal provisions contained in the Intergovernmental Treaty on Stability, Coordination and Governance in Economic and Monetary Union (TSCG), signed by all EU countries except the Czech Republic and the UK in March 2012 and which entered into force on 1 January 2013.

circumstances. In case of significant observed deviations of the CAB from the MTO or the adjustment path towards it, correction mechanisms will be triggered automatically at the national level. For a detailed review of the role played by the CAB in fiscal surveillance, see European Commission (2006), Larch and Turrini (2009) and European Commission (2012).

The CAB is part of the "top down" approach to identifying discretionary fiscal policy by correcting the actual budget balance for non-structural elements. The annual change in the CAB is interpreted as the discretionary fiscal policy. By contrast, the "bottom-up" approach considers the sum of the budgetary impact of individual "discretionary" budgetary measures, which corresponds to the new measures adopted every year both on the revenue and expenditure side following a legislative or administrative decision. The two approaches differ in the benchmark used: the CAB benchmark corresponds to the nominal budget balance increasing at the same pace as potential output, while the "bottom-up" benchmark is the development of the nominal budget balance in absence of new policy actions. ([5]) The latter benchmark could be affected by *trends* in expenditures or revenues (e.g. movements in asset/oil prices, trends in the composition of revenues, rising social protection spending due to demographic ageing), which lead to automatic changes in budget balance as a percentage of GDP, even in the absence of discretionary policy changes. Recent studies using the "bottom-up approach" include Barrios and Fargnoli (2010), Agnello and Cimadomo (2011), Princen et al. (2013).

The EU fiscal framework uses a standard "two-step methodology", which consists in computing the cyclical component of the budget first and then subtracting it from the actual budget balance. In algebraic terms $CAB = (B/Y) - CC$, where B/Y stands for the nominal budget balance to GDP ratio and CC for its cyclical component. ([6]) The determination of the cyclical component of balances in the EU methodology requires two inputs: i) a measure of the cyclical position of the economy (the output gap) and ii) a measure of the link between the economic cycle and the budget (cyclical-adjustment budgetary parameter).The product of the two measures gives the cyclical component of the budget, $CC = \varepsilon * OG$, which is then subtracted from the headline budget-to-GDP ratio to obtain the CAB. Most international organisations, including the OECD and the IMF, as well as national EU governments use this approach for budgetary surveillance. ([7]) This is the official methodology used for fiscal surveillance in the EU and the one presented in this paper. An advantage of the two-step approach is its relative simplicity and the fact that the cyclically-adjusted budget balance obtained thereby has a straightforward interpretation. ([8])

An alternative group of "top down" methods derives the CAB directly from regression based analysis. This direct approach, first developed by Blanchard (1990), benefited from the theoretical shift towards supply-side theories in the analysis of the business cycle, the progress made in the decomposition of time series between temporary and permanent components as well as advances in computing technology. More recent applications of this method include Dalsgaard and de Serres (1999) using structural VAR models and Camba-Méndez and Lamo (2002) using unobserved component models. This type of approaches is interesting as sensitivity analysis. However, it remains complex and difficult to

([5]) The benchmark in top-down approach is how the budget balance changes with respect to what it would have been if GDP was at potential. The benchmark in bottom-up approaches is how the budget balance behaves compared to what it would have been if no action was taken.

([6]) The budget balance is statistically defined as the *net lending of the general government*. If its sign is negative, this means a net borrowing of the general government, i.e. a budget deficit.

([7]) As an example, economists from the European System of Central Banks, Bouthevillain et al. (2001), presented a variant of the two step approach. Instead of employing the cyclical component of output, they corrected the different elements of the budget balances using cyclically-adjusted macroeconomic proxy of the relevant tax and expenditure bases, in order to better capture compositional effects. However, the cyclical correction relied on statistical filtering (à la Hodrick-Prescott) rather than an economic approach, such as the production function approach, used by the EU Commission to compute the potential output and the output gap. For IMF calculations, see Fedelino et al. (2009) and Escolano (2010).

([8]) The drawbacks of this two-step approach are well known (Larch and Turrini, 2009). It is subject to the uncertainty stemming from two sources: the measurement of the potential output and the output gap in real time and the estimation of the fiscal elasticities. The compounded error is difficult to measure, especially in real time. This approach may also disregard the importance of shocks that could affect the budget balance (i.e. asset-prices movements, prices movements).

communicate upon and to handle practically in the context of fiscal surveillance. It is also based on past statistical patterns, as the two-step approach, and is, thus, not immune from the Lucas critique.

The Commission has recently improved the CAB methodology used in the EU framework of fiscal surveillance and its amendments have been reviewed by the Output Gap Working Group (OGWG) and endorsed by the Economic Policy Committee (EPC) on 27 June 2012. The CAB methodology and the estimation of the CAB are based on work done by the OECD (Girouard and André, 2005) and are commonly agreed for use in budgetary surveillance by the OGWG and officially approved by Member States in its parent committee, the EPC. The Commission received a mandate by the OGWG in end 2011 to improve the way the CAB is computed. The revised methodology has fully been applied in the Commission Services Forecast since the Winter 2013 exercise.

The purpose of this paper is to present the recent improvements brought to the CAB methodology, namely the revision and update of the parameter measuring the reaction of the budget to the cycle. The first improvement consists in employing the semi-elasticity parameter instead of the usual budgetary sensitivity parameter, since semi-elasticity parameter correctly measures the reaction of the balance-to-GDP ratio to cyclical conditions. This is presented in Section 2. The second amendment is the update of the decade-old data underlying the computation of the CAB. It is presented in Section 3. Section 4 concludes. While the output gap OG is an essential driver of the CAB, its estimation remains outside the scope of this paper. The output gap estimates used in this paper are explained in detail in D'Auria et al. (2011). ([9]) In the appendix, the paper presents step by step how the CAB elasticity is derived from the individual elasticities and the weighting parameters and also indicates the data sources.

([9]) The assessment of the cyclical position of the economy is the other key input for the computation of the CAB. It is usually provided by the output gap, i.e. the distance between actual and potential real GDP in percentage points of potential output. Output gap estimates are surrounded by a degree of uncertainty and, therefore, often subject to significant revisions. Moreover, it may be particularly problematic to estimate potential output at cyclical turning points or in the presence of structural breaks. See D'Auria et al. (2011) for additional information.

2. MOVING FROM THE BUDGETARY SENSITIVITY TO THE BUDGETARY SEMI-ELASTICITY

Following the standard approach, the CAB is still computed as the difference between the actual balance-to-GDP ratio and an estimated cyclical component, defined as the product of the output gap and a cyclical adjustment parameter. In algebraic terms $CAB = B/Y - \varepsilon * OG$ where B stands for general government balance in nominal terms ([10]), Y for GDP and the cyclical component $\varepsilon * OG$ is the product of the cyclical sensitivity of the budget balance to the cycle, ε, times the output gap, OG.

The issue is which method should be used to best compute the cyclical adjustment parameter ε. Up until 2012, the later was defined as a "sensitivity". This section demonstrates that the concept of "semi-elasticity" leads to the correct computation of the cyclically-adjusted budget balance. This approach is used from now behind the CAB computation. The first subsection sets out the theoretical rationale, while the second one presents the empirical impact on the CAB results.

2.1. THEORETICAL RATIONALE

Using the sensitivity to capture the cyclical reaction of the budget fails to measure accurately the CAB, which is the cyclically-adjusted budget balance as a percentage of cyclically-adjusted output. The budgetary sensitivity parameter is defined as the marginal rate of change of the level balance with respect to a change in the level of GDP (i.e. mathematically the first derivative of the budget balance in monetary amounts):

$Sensitivity = \frac{dB}{dY}$ ([11]),

A straightforward way to see that sensitivity fails to measure accurately the CAB is to plug this formulation of the budgetary sensitivity parameter into CAB equation $CAB = \frac{B}{Y} - \varepsilon * OG$. The output gap measures the cyclical component of output and is computed as the deviation of GDP from its potential, expressed as a percentage of potential output: $OG = \frac{dY}{Y^p} = \frac{Y - Y^p}{Y^p}$. ([12])

([10]) The government balance is the net lending (surplus) / net borrowing (deficit) of general government according to the EDP definition ("excessive deficit procedure"). This EDP concept, which is consistent with the European system of accounts (ESA95) but *adjusted by Eurostat for the treatment of interest relating to swap arrangements and forward rate agreements*. The latter are considered as interest payment in EDP definition, while the national account ESA95 considers them as financial transactions ("below the line"), which have no impact on the deficit. In the methodology of CAB computation and for sake of consistency with the concepts used for fiscal surveillance, we use the EDP concept of expenditures, calculated by Eurostat and available in AMECO under "EDP definition". The revenue level is unchanged according to the EDP definition. This is a legal requirement arising from the Council Regulation (EC) No 479/2009 of 25 May 2009 on the application of the Protocol on the excessive deficit procedure annexed to the Treaty establishing the European Community.

([11]) Sensitivity is operationally computed as the weighted average of the revenue and expenditure elasticities, i.e. $Sensisivity = \left(\frac{\frac{dR}{R}}{\frac{dY}{Y}} \right) \frac{R}{Y} - \left(\frac{\frac{dG}{R}}{\frac{dY}{Y}} \right) \frac{G}{Y} = \frac{dR - dG}{dY} = \frac{dB}{dY}$

For further detail on the methodology used before the revision explained in this paper and on the computation of the sensitivities, see Chapter II.4 "Measurement and statistical issues" in the 2006 Commission Report "Public Finances in EMU" and in particular Box II.3 "Budgetary sensitivities: definition and construction". See also European Commission "New and updated budgetary sensitivities for the EU Budgetary Surveillance", September 2005. http://ec.europa.eu/economy_finance/economic_governance/sgp/pdf/budg_sensitivities_092005_v02_en.pdf.

([12]) As all the public finance variables, including revenue and expenditure, are expressed in current prices, the potential output Y^p used in this paper consistently corresponds to its value expressed in current prices (rather than in constant prices, which is the standard concept). This potential output in current price is derived from nominal GDP at current price, using the output gap. However, it could be noted that price developments – technically captured by changes in the GDP deflator – do not affect much the public finance variables at hand, since they are expressed as a percentage of (potential) output. Price effect is largely cancelling out between the numerator and denominator, under the reasonable assumption that price movements affect the revenue and expenditure items in broadly the same way as output variables.

$$CAB = \frac{B}{Y} - \varepsilon * OG = \frac{B}{Y} - \frac{dB}{dY} OG = \frac{B}{Y} - \frac{dB}{dY}\frac{dY}{Y^p} = \frac{B}{Y} - \frac{dB}{Y^p} \neq \frac{B - dB}{Y^p}$$

This is a hybrid definition of the CAB. In all logic, the correct definition of the CAB would be the budget balance prevailing when the economy is at its potential: the cyclically-adjusted budget balance as a percentage of cyclically-adjusted output, i.e. the potential output.

The use of sensitivity only adjusts the numerator of the CAB, i.e. the nominal budget balance, but does not correct the denominator, i.e. the actual output, which is also strongly affected by the business cycle. Indeed, subtracting the cyclical component of the budget balance from the actual budget-to-GDP ratio implicitly assumes that the CAB is measured as a percentage of *actual* output. This is in line with the concept of sensitivity, which only captures the cyclical reaction of the nominal budget balance (in monetary amount) to change in output (caused here by the business cycle).

Using semi-elasticity yields the accurate concept of the CAB, namely, the budget balance-to-GDP ratio that would prevail if the economy was at potential. By definition, the semi-elasticity captures the reaction of *the budget balance-to-GDP ratio* to cyclical change in GDP. This concept allows reflecting the impact both on the numerator (budget balance) but also on the denominator (output).

$$\textit{Semi-elasticity} \equiv \varepsilon = \frac{d(\frac{B}{Y})}{\frac{dY}{Y}} = \frac{\frac{dB}{dY}Y - \frac{dY}{dY}B}{\frac{Y^2}{Y}} = \frac{dB}{dY} - \frac{B}{Y} \qquad (2)$$

This new definition of ε yields the correct CAB concept:

$$CAB = \frac{B}{Y} - \varepsilon * OG = \frac{B}{Y} - \frac{d(\frac{B}{Y})}{\frac{dY}{Y}} OG = \frac{B}{Y} - \frac{\frac{dB}{dY}Y - \frac{dY}{dY}B}{\frac{Y^2}{Y}} OG = \frac{B}{Y} - \left(\frac{dB}{dY} - \frac{B}{Y}\right)\frac{dY}{Y^p} =$$

$$= \left(1 + \frac{dY}{Y^p}\right)\frac{B}{Y} - \frac{dB}{Y^p} = \left(1 + \frac{Y - Y^p}{Y^p}\right)\frac{B}{Y} - \frac{dB}{Y^p} = \frac{Y}{Y^p}\frac{B}{Y} - \frac{dB}{Y^p} = \frac{B - dB}{Y^p} = \frac{B^p}{Y^p} \qquad (3)$$

because dB measures the gap between the actual budget balance and the budget balance prevailing when the economic output is at its potential level, $dB = B - B^p$. Given the definition of the semi-elasticity ε, the term $-\varepsilon OG$ allows for both expressing the budget balance ratio (B/Y) in terms of potential output (B/Y^p) and subtracting the cyclical component of the budget balance (dB/Y^p) from it. Please note that this calculation, based on derivatives, deals with marginal variation of output (i.e. small output gap). The formula remains valid at the first order for large output gap, although the approximation becomes slightly larger with the size of the output gap. This first order approximation allows for expressing the CAB as a simple linear function of the output gap and of the cyclical budgetary semi-elasticity, in which the cyclical component is simply subtracted from the actual budget balance (as a percentage of GDP). The precise formula, dealing with exponentials, is more cumbersome and much less intuitive. ([13])

([13]) The mathematical identity, assuming a constant elasticity for the revenue (η_R) and expenditures (η_G) is (with the notation defined further below in the text):

$$CAB = CAR - CAE = \frac{R^p}{Y^p} - \frac{G^p}{Y^p} = \frac{R}{Y^p}\left(\frac{R^p}{R}\right) - \frac{G}{Y^p}\left(\frac{G^p}{G}\right) = \frac{R}{Y^p}\left(\frac{Y^p}{Y}\right)^{\eta_R} - \frac{G}{Y^p}\left(\frac{Y^p}{Y}\right)^{\eta_G}$$

$$= \frac{R(1+OG)}{Y}\left(\frac{1}{1+OG}\right)^{\eta_R} - \frac{G(1+OG)}{Y}\left(\frac{1}{1+OG}\right)^{\eta_G} = \frac{R}{Y}(1+OG)^{1-\eta_R} - \frac{G}{Y}(1+OG)^{1-\eta_G}$$

$$\cong \frac{R}{Y}(1+(1-\eta_R)OG) - \frac{G}{Y}(1+(1-\eta_G)OG) = \frac{R}{Y} - \frac{G}{Y} - \left(\frac{R}{Y}(\eta_R - 1) - \frac{G}{Y}(\eta_G - 1)\right)OG = B - (\varepsilon_R - \varepsilon_G)OG = B - \varepsilon OG$$

This proxy is mathematically derived from a limited development of order one.

The "previous" CAB measure, based on sensitivity, differs from the "correct" CAB measures, based on semi-elasticity, by an amount equal to the product of the actual budgetary balance and the output gap. Therefore, the difference in the two CAB measures is small in all cases where the government balance-to-GDP ratio or the output gap is small.

$$CAB - CAB_{based\ on\ sensitivity} = \frac{B}{Y^p} - \frac{B}{Y} = \frac{B}{Y^p} - \frac{B}{Y^p(1+OG)} = \frac{B+OG.B-B}{Y^p(1+OG)} = OG\left(\frac{B}{Y}\right) \qquad (4)$$

In most cases, the last term of this equation will be of second order magnitude. During the recent economic and financial crisis, however, an output gap close to 4% and a deficit close to 6% were observed in a couple of countries. In such a case, the discrepancy between the two CAB concepts is approximately ¼ point of GDP, a fairly large gap. In some extreme cases, the deviation could be close to ½ point of GDP.

Likewise, the (correct) semi-elasticity differs from the sensitivity by an amount equal to the actual balance-to-GDP ratio. Specifically, rewriting the actual surplus/deficit in terms of its components (revenues and expenditures), the semi-elasticity can be broken down into the weighted average of the cyclical elasticities of revenue (expressed in nominal terms, that is, in monetary amount) minus one and the cyclical elasticities of expenditure (in monetary amount) minus one. Putting it another way, the budgetary semi-elasticity is equal to the difference of the elasticity of the revenue-to-GDP ratio (weighted by the revenue ratio) and the elasticity of the expenditure-to-GDP ratio (weighted by the expenditure ratio). The term "minus one" indeed corresponds to the elasticity of the denominator (GDP) of the revenue-to-GDP ratio and the expenditure-to-GDP ratio to itself. This impact on the denominator was precisely omitted in the 2005 computation method of the CAB.

$$\textit{Semi-elasticity} \equiv \varepsilon = \frac{d(\frac{R}{Y})}{\frac{dY}{Y}} - \frac{d(\frac{G}{Y})}{\frac{dY}{Y}} = \frac{\frac{dR}{dY}Y - \frac{dY}{dY}R}{\frac{Y^2}{Y}} - \frac{\frac{dG}{dY}Y - \frac{dY}{dY}G}{\frac{Y^2}{Y}} = \left(\frac{dR}{dY} - \frac{R}{Y}\right) - \left(\frac{dG}{dY} - \frac{G}{Y}\right)$$

$$= \left(\frac{\frac{dR}{\frac{R}{dY}}}{\frac{Y}{Y}} - 1\right)\frac{R}{Y} - \left(\frac{\frac{dG}{\frac{G}{dY}}}{\frac{Y}{Y}} - 1\right)\frac{G}{Y} = (\eta_R - 1)\frac{R}{Y} - (\eta_G - 1)\frac{G}{Y}, \qquad (4)$$

where $\eta_R = \frac{\frac{dR}{\frac{R}{dY}}}{\frac{Y}{Y}}$ and $\eta_G = \frac{\frac{dG}{\frac{G}{dY}}}{\frac{Y}{Y}}$ denotes the elasticity of revenues and expenditure with respect to GDP and $\frac{R}{Y}$ and $\frac{G}{Y}$ represent (fixed) revenue- and expenditure-to-GDP ratios. $(\eta_R - 1)$ and $(\eta_G - 1)$ are equal to the elasticity of the revenue-to-GDP ratio and the expenditure-to-GDP with respect to GDP. ([14])

The use of semi-elasticity instead of sensitivity will affect more substantially the cyclically-adjusted components of the budget than the overall CAB. The CAB is the difference between cyclically adjusted revenues (CAR) and the cyclically adjusted expenditures, i.e. *CAB=CAR-CAE*. The equations below can be derived easily from equation (4).

$$CAR - CAR_{based\ on\ sensitivity} = OG\left(\frac{R}{Y}\right) \text{ and } CAE - CAE_{based\ on\ sensitivity} = OG\left(\frac{G}{Y}\right) \qquad (5)$$

([14]) This relation is valid at the first order, as shown in the formula at the previous footnote.

Table 2.1: **CAB using sensitivities versus CAB using semi-elasticities (% GDP, selected years, 1995-2004 weights)**

	Cyclically-adjusted balance (CAB)								Difference				p.m. Ouput Gap			
	using sensitivities				using semi-elasticities											
	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012
	(a)	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*	*(h)*	*(e-a)*	*(f-b)*	*(g-c)*	*(h-d)*				
BE	-1.4	-3.3	-3.6	-2.3	-1.4	-3.3	-3.6	-2.3	0.0	0.0	0.0	0.0	2.4	-0.9	-0.2	-1.3
BG	-0.2	-1.7	-1.3	-0.7	-0.2	-1.7	-1.3	-0.7	0.0	0.0	0.0	0.0	3.8	-3.8	-2.2	-2.1
CZ	-3.2	-4.7	-3.3	-2.7	-4.0	-4.7	-3.4	-2.4	-0.8	0.0	0.0	0.3	6.8	-0.3	0.2	-2.2
DK	2.5	0.1	0.5	-1.8	2.5	0.1	0.5	-1.8	0.0	0.0	0.0	0.0	3.6	-4.0	-3.6	-3.3
DE	-0.8	-3.6	-0.9	0.0	-0.9	-3.5	-0.9	0.0	-0.1	0.0	0.0	0.0	2.1	-1.1	0.3	-0.3
EE	-1.3	2.0	0.9	-1.4	-1.0	1.8	1.0	-1.4	0.3	-0.1	0.0	0.0	11.9	-5.9	0.7	1.0
IE	-1.4	-29.1	-12.3	-7.8	-1.4	-29.1	-12.3	-7.8	0.0	0.0	0.0	0.0	3.6	-4.4	-2.8	-1.5
EL	-7.9	-8.4	-5.1	-1.2	-8.1	-8.0	-4.6	-0.5	-0.2	0.3	0.6	0.7	3.4	-5.4	-10.0	-13.0
ES	1.0	-7.6	-7.7	-6.0	1.0	-7.6	-7.7	-6.0	0.0	0.0	0.0	0.0	2.1	-4.8	-4.2	-4.6
FR	-4.2	-6.0	-4.4	-3.4	-4.3	-5.9	-4.3	-3.3	-0.1	0.1	0.1	0.1	2.9	-2.2	-1.6	-2.3
IT	-3.2	-3.5	-3.0	-1.3	-3.3	-3.4	-3.0	-1.2	-0.1	0.1	0.1	0.1	3.1	-2.0	-1.8	-3.2
CY	2.7	-5.3	-6.1	-4.4	2.5	-5.3	-6.1	-4.3	-0.1	0.0	0.0	0.1	2.1	-0.1	-0.4	-2.0
LV	-4.2	-5.2	-2.0	-1.2	-4.4	-5.1	-1.9	-1.2	-0.2	0.1	0.1	0.0	13.7	-10.6	-5.1	-1.8
LT	-4.1	-5.1	-4.9	-2.6	-4.2	-5.0	-4.9	-2.6	-0.1	0.1	0.0	0.0	11.5	-8.0	-2.1	-2.0
LU	1.3	0.1	0.3	-1.0	1.3	0.1	0.3	-1.0	0.0	0.0	0.0	0.0	4.8	-1.8	-1.3	-1.8
HU	-6.5	-2.8	5.3	-1.1	-6.6	-2.5	5.4	-0.8	-0.2	0.2	0.1	0.2	2.9	-3.6	-2.0	-3.2
MT	-2.2	-3.5	-2.8	-2.5	-2.2	-3.5	-2.8	-2.5	0.0	0.0	0.0	0.0	-0.4	-0.3	0.3	-0.1
NL	-1.1	-4.0	-3.5	-2.2	-1.1	-4.0	-3.4	-2.1	-0.1	0.1	0.1	0.1	2.3	-1.9	-1.8	-2.7
AT	-1.9	-3.7	-2.5	-2.9	-2.0	-3.7	-2.5	-2.9	0.0	0.0	0.0	0.0	2.3	-1.6	-0.1	-0.5
PL	-3.0	-8.0	-5.0	-2.8	-3.2	-8.0	-5.0	-2.8	-0.1	0.0	0.0	0.1	2.9	0.4	0.0	-1.4
PT	-3.6	-9.1	-3.2	-3.1	-3.6	-9.1	-3.1	-3.0	0.0	0.0	0.1	0.1	0.9	-1.6	-2.6	-4.3
RO	-5.3	-6.1	-5.0	-1.9	-5.4	-6.0	-4.9	-1.9	-0.1	0.0	0.0	0.0	7.9	-2.5	-1.9	-3.1
SI	-3.1	-4.5	-5.7	-2.9	-3.3	-4.4	-5.6	-2.8	-0.2	0.1	0.0	0.1	6.4	-2.6	-1.5	-3.2
SK	-3.5	-7.6	-4.9	-4.9	-3.7	-7.5	-4.9	-4.9	-0.2	0.0	0.0	0.0	5.7	-0.4	0.0	-0.1
FI	2.8	-0.8	0.2	-0.8	2.9	-0.8	0.1	-0.8	0.1	-0.1	0.0	0.0	5.1	-3.4	-1.5	-2.0
SE	1.6	1.3	0.3	0.6	1.7	1.3	0.3	0.6	0.0	0.0	0.0	0.0	3.4	-1.8	0.0	-1.0
UK	-4.4	-9.0	-6.8	-4.7	-4.5	-8.9	-6.7	-4.6	-0.1	0.1	0.1	0.1	3.7	-2.7	-2.4	-3.4
EA-17	-2.0	-5.2	-3.4	-2.2	-2.0	-5.1	-3.4	-2.2	-0.1	0.1	0.0	0.1	2.6	-2.2	-1.5	-2.3
EU-27	-2.3	-5.5	-3.7	-2.5	-2.4	-5.4	-3.7	-2.4	-0.1	0.1	0.0	0.1	3.0	-2.3	-1.6	-2.5

Note: Net lending (+) / net borrowing (-) of cyclically-adjusted government balance (CAB).
Source: Commission services.

The change in the CAR (CAE) following the use of semi-elasticity is given by the by the product of the output gap and the revenue-to-GDP ratio (expenditure-to-GDP ratio). By contrast, the change in the CAB is measured by the product of the output gap with balance-to-GDP ratio. As the balance-to-GDP ratio is of a much smaller magnitude than either the revenue- or expenditure-to-GDP ratio ([15]), the semi-elasticity method affects the CAR and CAE by a much larger amount than the CAB.

With the new methodology, the impact of the cyclical adjustment is much stronger on the expenditure side than on the revenue side. The reason for this result is easily understood from equation (5). The revenue component of the budgetary semi-elasticity is the product of the revenue elasticity $\eta_R - 1$ times the revenue ratio. Given that revenue elasticities take values around 1 ([16]), the revenue component of the cyclical adjustment will be around 0 if semi-elasticities are used. In other words, given that revenues, on average, follow the cyclical movements of output/GDP, any percentage change in output will be matched by the same percentage change in revenues, leaving the revenue *ratio* unchanged. By contrast, since the expenditure component of the budgetary semi-elasticity is the product of the expenditure elasticity $\eta_G - 1$ times the expenditure ratio and expenditure revenue elasticities take values around 0, the expenditure component of the cyclical adjustment will be approximated by G/Y, which is around 50% in the euro area on average. The expenditure elasticity is due to the fact that most expenditures are little cyclical, except the unemployment benefits, which represents a very small faction of total expenditures.

([15]) The order of magnitude of the two ratios for euro-area countries over the last ten years was around 5% for the deficit against around 50% for revenue and expenditure ratios.

([16]) See Girouard and André (2005) for OECD Member States, Commission Report on Public finances in EMU (2006) for non-OECD Member States. The aggregated elasticity of revenues for the euro area and the EU is 1.04 and 1.01 respectively, while the elasticity of expenditures is much weaker, i.e. -0.15 and -0.12 for the euro area and the EU respectively.

The use of the semi-elasticity, therefore, allows for the correct measure and interpretation of the decomposition of the fiscal adjustment. With the sensitivity-based method, the revenue-to-GDP ratio was, inaccurately, supposed to be very cyclical, because the impact of the business cycle on the denominator was neglected. In reality, the revenue-to-GDP ratio remains very stable along the business cycle, because revenues move alongside output and the use of semi-elasticity correctly captures this pattern. Technically, the co-movement between revenues and output offset each other when revenues as taken as a share of GDP. By contrast, the expenditure-to-GDP ratio is sensitive to the cycle, since GDP follows a cyclical pattern, while only a marginal part of government expenditures is cyclical. The sensitivity-based method neglects the denominator effect of the expenditure-to-GDP ratio, assuming inaccurately that the expenditure-to-GDP ratio is fairly stable throughout the cycle.

2.2. EFFECT ON THE EMPIRICAL RESULTS

A comparison of the results of the two methods confirms the theoretical results above. ([17]) The effect of switching from sensitivities to semi-elasticities tends to be relatively negligible as regards the cyclically-adjusted budget balance overall. Table 2.1 shows the impact of the new method on the CAB measure in selected years, before and after the crises. At the EU and euro-area level, the absolute impact of the proposed change on the CAB is 0.1 pp of GDP at most for all the concerned years. Across Member States, the impact is in the narrow range of +/- 0.2 pp of GDP, except for CZ, EL and EE for some years. In contrast to the overall CAB, the effect of changing the method can be quite important for the components - i.e. cyclically-adjusted revenues and cyclically-adjusted expenditure – depending also on cyclical conditions, as shown in Table 2.3.

Table 2.2: **Cyclical component of revenue and expenditure using sensitivities and semi-elasticities (% GDP, selected years, 1995-2004 weights)**

	Cyclical component of revenue using								Difference				Cyclical component of expenditure using								Difference			
	sensitivities				semi-elasticities								sensitivities				semi-elasticities							
	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012
	(a)	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*	*(h)*	*(e-a)*	*(f-b)*	*(g-c)*	*(h-d)*	*(a')*	*(b')*	*(c')*	*(d')*	*(e')*	*(f')*	*(g')*	*(h')*	*(e'-a')*	*(f'-b')*	*(g'-c')*	*(h'-d')*
BE	1.1	-0.4	-0.1	-0.6	-0.1	0.0	0.0	0.1	-1.3	0.5	0.1	0.7	-0.2	0.1	0.0	0.1	-1.4	0.5	0.1	0.7	-1.3	0.5	0.1	0.7
BG	1.3	-1.3	-0.8	-0.7	-0.2	0.2	0.1	0.1	-1.5	1.6	0.9	0.8	0.0	0.0	0.0	0.0	-1.6	1.6	0.9	0.9	-1.5	1.6	0.9	0.8
CZ	2.4	-0.1	0.1	-0.8	-0.4	0.0	0.0	0.1	-2.8	0.1	-0.1	0.9	-0.1	0.0	0.0	0.0	-3.7	0.2	-0.1	1.2	-3.6	0.2	-0.1	1.2
DK	1.8	-2.0	-1.8	-1.7	-0.2	0.2	0.2	0.2	-2.0	2.2	2.0	1.9	-0.5	0.6	0.5	0.5	-2.5	2.8	2.5	2.3	-2.0	2.2	2.0	1.8
DE	0.8	-0.4	0.1	-0.1	-0.1	0.1	0.0	0.0	-0.9	0.5	-0.1	0.1	-0.2	0.1	0.0	0.0	-1.3	0.7	-0.2	0.2	-1.0	0.5	-0.1	0.2
EE	3.4	-1.7	0.2	0.3	-1.3	0.6	-0.1	-0.1	-4.7	2.3	-0.3	-0.4	-0.2	0.1	0.0	0.0	-4.7	2.3	-0.3	-0.4	-4.5	2.2	-0.2	-0.4
IE	1.3	-1.6	-1.0	-0.6	0.1	-0.1	0.0	0.0	-1.2	1.5	0.9	0.5	-0.2	0.2	0.1	0.1	-1.4	1.7	1.1	0.6	-1.2	1.5	0.9	0.5
EL	1.4	-2.3	-4.2	-5.4	-0.1	0.1	0.2	0.3	-1.5	2.4	4.4	5.7	0.0	0.1	0.1	0.2	-1.7	2.8	5.1	6.7	-1.7	2.7	5.0	6.5
ES	0.8	-1.8	-1.6	-1.7	0.0	0.0	0.0	0.0	-0.8	1.8	1.6	1.8	-0.1	0.2	0.2	0.2	-0.9	2.1	1.8	2.0	-0.8	1.8	1.6	1.8
FR	1.3	-1.0	-0.7	-1.0	-0.2	0.1	0.1	0.1	-1.5	1.1	0.8	1.2	-0.2	0.1	0.1	0.1	-1.7	1.3	1.0	1.4	-1.6	1.2	0.9	1.3
IT	1.5	-1.0	-0.9	-1.5	0.1	0.0	0.0	-0.1	-1.4	0.9	0.8	1.5	-0.1	0.0	0.0	0.1	-1.6	1.0	0.9	1.6	-1.5	1.0	0.9	1.6
CY	0.8	0.0	-0.1	-0.8	0.0	0.0	0.0	0.0	-0.8	0.0	0.1	0.8	0.0	0.0	0.0	0.0	-1.0	0.0	0.2	0.9	-1.0	0.0	0.2	0.9
LV	3.6	-2.8	-1.3	-0.5	-1.1	0.8	0.4	0.1	-4.6	3.6	1.7	0.6	-0.2	0.2	0.1	0.0	-5.0	3.9	1.9	0.7	-4.8	3.7	1.8	0.6
LT	3.0	-2.1	-0.5	-0.5	-0.7	0.5	0.1	0.1	-3.7	2.6	0.7	0.7	-0.1	0.1	0.0	0.0	-4.0	2.8	0.7	0.7	-3.9	2.7	0.7	0.7
LU	2.3	-0.9	-0.6	-0.9	0.1	-0.1	0.0	-0.1	-2.1	0.8	0.6	0.8	-0.1	0.0	0.0	0.0	-2.2	0.9	0.6	0.9	-2.1	0.8	0.6	0.8
HU	1.3	-1.6	-0.9	-1.4	0.0	0.0	0.0	0.0	-1.3	1.6	0.9	1.4	0.0	0.0	0.0	0.0	-1.5	1.8	1.0	1.6	-1.4	1.8	1.0	1.6
MT	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.2	-0.1	0.1	0.2	0.2	-0.1	0.1
NL	0.9	-0.8	-0.7	-1.0	-0.1	0.1	0.1	0.2	-1.0	0.9	0.8	1.2	-0.4	0.3	0.3	0.4	-1.5	1.2	1.2	1.7	-1.1	0.9	0.9	1.3
AT	1.0	-0.7	0.0	-0.2	-0.2	0.1	0.0	0.0	-1.1	0.8	0.0	0.2	-0.1	0.1	0.0	0.0	-1.3	0.9	0.1	0.3	-1.2	0.8	0.0	0.2
PL	1.0	0.1	0.0	-0.5	-0.2	0.0	0.0	0.1	-1.2	-0.2	0.0	0.6	-0.2	0.0	0.0	0.1	-1.5	-0.2	0.0	0.7	-1.3	-0.2	0.0	0.6
PT	0.4	-0.7	-1.1	-1.8	0.0	0.0	0.1	0.1	-0.4	0.7	1.1	1.8	0.0	0.1	0.1	0.2	-0.4	0.8	1.3	2.1	-0.4	0.7	1.2	2.0
RO	2.2	-0.7	-0.5	-0.9	-0.3	0.1	0.1	0.1	-2.5	0.8	0.6	1.0	-0.1	0.0	0.0	0.1	-2.8	0.9	0.7	1.1	-2.7	0.8	0.6	1.0
SI	2.7	-1.1	-0.6	-1.3	-0.3	0.1	0.1	0.1	-2.9	1.2	0.7	1.4	-0.4	0.2	0.1	0.2	-3.5	1.4	0.8	1.7	-3.1	1.3	0.7	1.5
SK	1.6	-0.1	0.0	0.0	-0.5	0.0	0.0	0.0	-2.1	0.1	0.0	0.0	-0.1	0.0	0.0	0.0	-2.4	0.1	0.0	0.0	-2.3	0.1	0.0	0.0
FI	2.1	-1.4	-0.6	-0.8	-0.6	0.4	0.2	0.2	-2.7	1.8	0.8	1.1	-0.5	0.3	0.1	0.2	-3.1	2.1	0.9	1.2	-2.6	1.8	0.8	1.0
SE	1.6	-0.9	0.0	-0.5	-0.4	0.2	0.0	0.1	-2.0	1.0	0.0	0.6	-0.3	0.2	0.0	0.1	-2.3	1.2	0.0	0.7	-2.0	1.0	0.0	0.6
UK	1.5	-1.1	-1.0	-1.4	0.0	0.0	0.0	0.0	-1.5	1.1	1.0	1.4	-0.1	0.1	0.0	0.1	-1.7	1.2	1.1	1.6	-1.6	1.2	1.0	1.5
EA-17	1.1	-0.9	-0.6	-1.0	-0.1	0.1	0.0	0.1	-1.2	1.0	0.7	1.0	-0.2	0.1	0.1	0.1	-1.5	1.2	0.8	1.2	-1.3	1.0	0.7	1.1
EU-27	1.2	-0.9	-0.7	-1.0	-0.1	0.1	0.0	0.0	-1.3	1.0	0.7	1.1	-0.2	0.1	0.1	0.1	-1.6	1.2	0.8	1.2	-1.4	1.0	0.7	1.1

Source: Commission services.

([17]) The details of the calculation are found in section 2.1. The parameters necessary to make the calculation of the CAB are the sensitivities, the semi-elasticities, expenditure and revenue ratios and the output gap. They are computed on the basis of data from AMECO, Eurostat and OECD, available in mid-January 2013. AMECO data, used in particular to retrieve the expenditure and revenue ratios and the output gap, correspond to the vintage of Commission 2012 Autumn Forecast.

Table 2.3: **Cyclically-adjusted revenue and expenditure using sensitivities and semi-elasticities (% GDP, selected years, 1995-2004 weights)**

	Cylically-adjusted revenues								Difference				Cylically-adjusted expenditures								Difference			
	sensitivities				semi-elasticities								sensitivities				semi-elasticities							
	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012
	(a)	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*	*(h)*	*(e-a)*	*(f-b)*	*(g-c)*	*(h-d)*	*(a')*	*(b')*	*(c')*	*(d')*	*(e')*	*(f')*	*(g')*	*(h')*	*(e'-a')*	*(f'-b')*	*(g'-c')*	*(h'-d')*
BE	47.0	49.1	49.5	51.8	48.3	48.6	49.4	51.1	1.3	-0.5	-0.1	-0.7	48.4	52.3	53.1	54.0	49.6	51.9	53.0	53.4	1.3	-0.5	-0.1	-0.7
BG	39.0	35.7	34.4	35.7	40.6	34.1	33.5	34.8	1.5	-1.6	-0.9	-0.8	39.2	37.4	35.6	36.4	40.8	35.8	34.8	35.6	1.5	-1.6	-0.9	-0.8
CZ	37.9	39.1	39.7	40.9	40.7	39.0	39.8	39.9	2.8	-0.1	0.1	-0.9	41.1	43.8	43.1	43.6	44.7	43.6	43.2	42.4	3.6	-0.2	0.1	-1.2
DK	53.8	57.1	57.9	57.3	55.8	54.9	55.9	55.4	2.0	-2.2	-2.0	-1.9	51.3	57.0	57.3	59.1	53.3	54.8	55.3	57.2	2.0	-2.2	-2.0	-1.8
DE	42.9	44.0	44.4	45.1	43.9	43.5	44.6	45.0	0.9	-0.5	0.1	-0.1	43.7	47.6	45.4	45.1	44.8	47.0	45.5	45.0	1.0	-0.5	0.1	-0.2
EE	32.9	42.5	39.3	39.8	37.6	40.2	39.5	40.2	4.7	-2.3	0.3	0.4	34.2	40.6	38.3	41.2	38.6	38.4	38.6	41.6	4.5	-2.2	0.2	0.4
IE	35.6	36.8	35.8	34.8	36.9	35.3	34.9	34.3	1.2	-1.5	-0.9	-0.5	37.0	65.9	48.1	42.6	38.2	64.4	47.2	42.0	1.2	-1.5	-0.9	-0.5
EL	39.3	42.9	46.5	49.4	40.8	40.5	42.1	43.6	1.5	-2.4	-4.4	-5.7	47.2	51.2	51.6	50.6	48.9	48.5	46.6	44.1	1.7	-2.7	-5.0	-6.5
ES	40.3	38.4	37.3	38.0	41.1	36.6	35.7	36.3	0.8	-1.8	-1.6	-1.8	39.3	46.0	44.9	44.1	40.1	44.2	43.3	42.3	0.8	-1.8	-1.6	-1.8
FR	48.6	50.4	51.5	52.8	50.0	49.3	50.7	51.7	1.5	-1.1	-0.8	-1.2	52.8	56.4	55.9	56.2	54.3	55.2	55.0	54.9	1.6	-1.2	-0.9	-1.3
IT	44.6	47.0	47.0	49.6	46.0	46.1	46.2	48.2	1.4	-0.9	-0.8	-1.5	47.7	50.4	50.0	50.9	49.2	49.5	49.1	49.4	1.5	-1.0	-0.9	-1.6
CY	44.0	40.9	40.0	42.4	44.8	40.9	39.8	41.6	0.8	0.0	-0.1	-0.8	41.3	46.2	46.1	46.9	42.3	46.1	45.9	45.9	1.0	0.0	-0.2	-0.9
LV	32.0	38.4	36.3	35.5	36.6	34.8	34.6	34.9	4.6	-3.6	-1.7	-0.6	36.2	43.5	38.3	36.8	41.0	39.8	36.5	36.1	4.8	-3.7	-1.8	-0.6
LT	30.6	35.7	32.4	34.2	34.4	33.1	31.7	33.5	3.7	-2.6	-0.7	-0.7	34.7	40.7	37.4	36.8	38.6	38.0	36.7	36.1	3.9	-2.7	-0.7	-0.7
LU	37.7	42.9	42.3	43.3	39.8	42.1	41.7	42.5	2.1	-0.8	-0.6	-0.8	36.3	42.8	42.0	44.3	38.5	42.0	41.4	43.5	2.1	-0.8	-0.6	-0.8
HU	44.3	46.9	54.8	47.8	45.6	45.4	53.9	46.4	1.3	-1.6	-0.9	-1.4	50.7	49.7	49.5	48.9	52.2	47.9	48.5	47.3	1.4	-1.8	-1.0	-1.6
MT	40.4	39.0	39.5	40.1	40.2	38.9	39.6	40.0	-0.1	-0.1	0.1	-0.1	42.6	42.5	42.3	42.6	42.4	42.3	42.5	42.5	-0.2	-0.2	0.1	-0.1
NL	44.6	46.9	46.1	47.3	45.6	46.0	45.3	46.1	1.0	-0.9	-0.8	-1.2	45.6	50.9	49.6	49.5	46.7	50.0	48.7	48.2	1.1	-0.9	-0.9	-1.3
AT	46.6	48.8	48.1	48.7	47.8	48.0	48.0	48.4	1.1	-0.8	0.0	-0.2	48.6	52.5	50.6	51.6	49.7	51.7	50.5	51.4	1.2	-0.8	0.0	-0.2
PL	39.3	37.4	38.5	39.9	40.5	37.6	38.5	39.3	1.2	0.2	0.0	-0.6	42.4	45.4	43.6	42.7	43.7	45.6	43.6	42.1	1.3	0.2	0.0	-0.6
PT	40.8	42.1	46.1	43.5	41.2	41.4	44.9	41.6	0.4	-0.7	-1.1	-1.8	44.3	51.2	49.3	46.6	44.7	50.4	48.1	44.6	0.4	-0.7	-1.2	-2.0
RO	33.1	34.0	32.9	34.2	35.6	33.2	32.3	33.2	2.5	-0.8	-0.6	-1.0	38.4	40.1	37.8	36.1	41.0	39.2	37.2	35.1	2.7	-0.8	-0.6	-1.0
SI	39.7	45.6	45.0	45.7	42.7	44.4	44.3	44.3	2.9	-1.2	-0.7	-1.4	42.9	50.1	50.6	48.6	46.0	48.8	49.9	47.1	3.1	-1.3	-0.7	-1.5
SK	30.8	32.4	33.2	32.7	32.9	32.3	33.2	32.7	2.1	-0.1	0.0	0.0	34.3	40.0	38.2	37.6	36.6	39.8	38.2	37.6	2.3	-0.1	0.0	0.0
FI	50.6	54.4	54.5	54.4	53.4	52.5	53.7	53.3	2.7	-1.8	-0.8	-1.1	47.9	55.1	54.3	55.1	50.5	53.4	53.6	54.1	2.6	-1.8	-0.8	-1.0
SE	52.9	53.2	51.3	51.9	54.9	52.1	51.3	51.3	2.0	-1.0	0.0	-0.6	51.3	51.9	51.0	51.3	53.2	50.8	51.0	50.7	2.0	-1.0	0.0	-0.6
UK	39.4	41.3	41.6	43.6	40.9	40.2	40.7	42.2	1.5	-1.1	-1.0	-1.4	43.8	50.3	48.4	48.3	45.4	49.1	47.4	46.8	1.6	-1.2	-1.0	-1.5
EA-17	44.2	45.7	46.0	47.2	45.4	44.7	45.3	46.2	1.2	-1.0	-0.7	-1.0	46.2	50.8	49.4	49.4	47.4	49.8	48.7	48.3	1.3	-1.0	-0.7	-1.1
EU-27	43.7	45.2	45.5	46.8	45.0	44.2	44.8	45.7	1.3	-1.0	-0.7	-1.1	46.0	50.7	49.2	49.2	47.4	49.6	48.5	48.1	1.4	-1.0	-0.7	-1.1

Source: Commission services.

The cyclical component of the revenue ratio becomes significantly less important with the new method (semi-elasticities), while the cyclical component of the expenditure ratio becomes significantly larger. Table 2.3 shows the impact on the cyclical components of the revenue and expenditure ratios computed for selected periods. With the new method, the cyclical component of the revenue to-GDP ratio is much less important, reflecting the underlying unit elasticity of revenues with respect to GDP. Therefore, the cyclically-adjusted revenue ratio according to the new method is thus typically larger in booms, while it is smaller in troughs. The opposite pattern holds for the expenditure ratio: the cyclical component of the ratio is becoming more important, so that the cyclically-adjusted expenditure ratio is becoming smaller in periods of a positive output gap compared to the old method, and becoming larger in periods of a negative output gap (as in 2011).

The difference between the budgetary semi-elasticities and sensitivities underlying the CAB computation is limited, although not negligible at the second decimal for some countries. Table 2.4 below shows that the biggest change occurs for CZ and MT, where the budgetary semi-elasticity would be 0.13 and 0.10 higher respectively than the current sensitivity parameter, followed by HU (0.07 higher), as well as EL and CY where the parameter goes up by 0.06. Thirteen countries only record a very modest change (of +/-0.02 and below), while a variation of between +/-0.03 and +/-0.05 occurs for nine countries.

In contrast, the semi-elasticity of revenues and expenditures is very different from the sensitivities of revenues and expenditures. As mentioned in the previous section, this difference is much higher and is of the same order of magnitude (around -0.5 for the EU and the euro area), although of opposite sign. Therefore, these differences are offsetting each other, when the semi-elasticity of revenues and expenditures are compound to compute the CAB semi-elasticity.

Table 2.4: **Impact of change in method on the parameters linking the budget balance and its components to the cycle (1995-2004 weights)**

	Revenues			Expenditures			Overall balance		
	Sensitivity	**Semi-elasticity**	**Difference**	**Sensitivity**	**Semi-elasticity**	**Difference**	**Sensitivity**	**Semi-elasticity**	**Difference**
	(a)	*(b)*	*(b-a)*	*(c)*	*(d)*	*(d-c)*	*(e)*	*(f)*	*(f-e)*
BE	0.47	-0.05	-0.52	-0.07	-0.59	-0.52	0.54	0.54	0.00
BG	0.35	-0.05	-0.40	-0.01	-0.41	-0.40	0.36	0.36	0.00
CZ	0.36	-0.05	-0.41	-0.01	-0.54	-0.54	0.37	0.49	0.13
DK	0.50	-0.06	-0.56	-0.15	-0.70	-0.55	0.65	0.64	-0.01
DE	0.40	-0.05	-0.45	-0.11	-0.60	-0.49	0.51	0.55	0.04
EE	0.29	-0.11	-0.40	-0.02	-0.39	-0.37	0.31	0.29	-0.02
IE	0.36	0.02	-0.34	-0.05	-0.39	-0.34	0.40	0.40	0.00
EL	0.42	-0.02	-0.44	-0.01	-0.51	-0.50	0.43	0.49	0.06
ES	0.38	0.00	-0.39	-0.05	-0.43	-0.39	0.43	0.43	0.00
FR	0.44	-0.06	-0.50	-0.06	-0.59	-0.54	0.49	0.53	0.04
IT	0.49	0.02	-0.46	-0.02	-0.51	-0.49	0.50	0.53	0.03
CY	0.39	0.00	-0.39	-0.01	-0.46	-0.45	0.40	0.46	0.06
LV	0.26	-0.08	-0.34	-0.02	-0.37	-0.35	0.28	0.29	0.01
LT	0.26	-0.06	-0.32	-0.01	-0.34	-0.33	0.27	0.28	0.01
LU	0.48	0.03	-0.45	-0.01	-0.46	-0.45	0.49	0.49	0.00
HU	0.45	0.01	-0.44	-0.01	-0.52	-0.50	0.46	0.52	0.07
MT	0.35	-0.05	-0.40	-0.01	-0.52	-0.50	0.36	0.46	0.10
NL	0.39	-0.06	-0.45	-0.17	-0.64	-0.48	0.55	0.58	0.03
AT	0.43	-0.07	-0.50	-0.04	-0.55	-0.51	0.47	0.48	0.01
PL	0.33	-0.07	-0.41	-0.06	-0.52	-0.46	0.40	0.45	0.05
PT	0.41	-0.02	-0.43	-0.04	-0.50	-0.46	0.45	0.48	0.03
RO	0.28	-0.04	-0.32	-0.02	-0.35	-0.34	0.30	0.31	0.02
SI	0.41	-0.05	-0.46	-0.06	-0.55	-0.49	0.48	0.50	0.03
SK	0.27	-0.08	-0.36	-0.02	-0.42	-0.40	0.29	0.33	0.04
FI	0.41	-0.12	-0.53	-0.09	-0.60	-0.51	0.50	0.48	-0.02
SE	0.48	-0.10	-0.59	-0.10	-0.68	-0.58	0.58	0.58	0.00
UK	0.40	0.00	-0.40	-0.02	-0.46	-0.44	0.42	0.46	0.03
EA-17	0.42	-0.04	-0.46	-0.07	-0.56	-0.49	0.49	0.52	0.03
EU-27	0.42	-0.03	-0.45	-0.06	-0.55	-0.48	0.48	0.51	0.03

Source: Commission services.

3. UPDATING THE WEIGHTING PARAMETERS

This section assesses the impact on the CAB figures resulting from the update of the weighting parameters. The overall impact on the CAB figures – vis-à-vis previous estimates of the CAB - is the result of two effects: a change in the method and an update of the weights underpinning the method used. The previous section has discussed the impact on the CAB figures following the shift from budgetary sensitivity to budgetary semi-elasticity in the computation of the cyclical component of the budget, while keeping unchanged the weighting parameters used in the aggregation of different revenue and expenditure elasticities. This section focuses on the impact induced by the proposed update of the weighting parameters, while applying the semi-elasticity approach in the computation of the CAB. This allows a precise assessment of the relative importance of the two proposed changes.

3.1. THE COMPONENTS OF SEMI-ELASTICITY: NEED FOR UPDATES AND CONSISTENT CALCULATION PERIODS

The OGWG methodology breaks down the CAB semi-elasticities into the weighted sum of elementary elasticities by type of revenues and expenditures. The budgetary semi-elasticity with respect to the output gap can be rewritten as:

$$\varepsilon = \varepsilon_R - \varepsilon_G = (\eta_R - 1)\frac{R}{Y} - (\eta_G - 1)\frac{G}{Y} = (\sum_{i=1}^{5} \eta_{R,i} \frac{Ri}{R} - 1)\frac{R}{Y} - (\eta_{G_U} \frac{G_U}{G} - 1)\frac{G}{Y}$$

This requires first estimating the elasticities to the output gap of five individual revenue categories $\eta_{R,i}$ (personal income taxes, corporate income taxes, indirect taxes, social security contributions, non-tax revenue) and of one-cyclically sensitive spending category η_{GU} (unemployment-related expenditure) ([18]). Individual revenue elasticities are then aggregated to an overall revenue elasticity η_R using the share of each item in the total revenue as weights $\frac{R_i}{R}$. The cyclical elasticity of non-tax revenue is assumed to be zero for all Member States, since non-tax revenue comprises very disparate items and is generally considered as not influenced by the business cycle. ([19]) Bouthevillain et al. (2001) and Girouard and André (2005) also assume zero elasticity for non-tax revenue. The size of non-tax revenue in some countries explains why the aggregate revenue elasticity could be significantly lower than the aggregate tax elasticity, often taken as an (inaccurate) proxy of revenue elasticity in the past. A similar calculation

([18]) Most of the nominal public expenditures, at the exception of unemployment-related, are supposed to be discretionary and independent from GDP movement. Other non-discretionary expenditures, such as interest rate payment, are often assumed to be independent of GDP. Discretionary measures could be indirectly (not systematically) influenced by the business cycle, since policymakers may, at some point in time, wish to change the fiscal stance to stabilise the economic activity beyond the automatic stabilisers. However, Princen et al. (2013) showed that (tax) discretionary measures do not show a clear and regular relationship with the business cycle over time, as the pro- or counter-cyclical nature of discretionary measures varies according policy regimes and depends on the fiscal space.

([19]) Whilst the role of non-tax revenue may not be negligible in some Member States in some years, its amount is generally limited and, in most cases, unrelated to the business cycle. Potential large non-tax revenue is linked to taking over pension obligations from the private sector (under the category of capital transfer but which comes with the obligation of future pension payments). The sale of market output is limited in size and dependent on demand or existing procedures for these services and thus cannot often be regarded as cyclical. Property income includes dividends from state-owned companies (such as the utilities or public networks) and renting out real estates, which can be large in some cases and are at the discretion of the government (e.g. policy regarding the perception of dividends as opposed to reinvestment in the company, renting out new estates). Other non-tax revenues could be the structural fund transfers received by Member States. Other non-tax revenues could be the transfers from the EU to Member States' general government. Their relation with the output gap is not clear cut. Moreover, many non-tax "revenue" is not considered statistically as revenue in the sense of the SGP. For instance, the 'overdraft' of dividends, i.e. exceeding the profits of the corporation, would not be regarded as revenue in ESA95 terms, but rather as a financial transaction (withdrawal of equity). Privatisation receipts (and more generally selling non-financial assets) are considered as public disinvestment, that is, negative spending rather than additional revenue. Moreover, selling financial assets is considered to be 'below the line', not affecting the ESA95 deficit but reducing the level of public debt (as part of the 'stock-flow' adjustment).

applies for the expenditure elasticity η_G, where the elasticity of unemployment-related expenditures is transformed into the overall expenditure elasticity using the share of unemployment-related expenditure in total expenditure as weight $\frac{G_U}{G}$. Subtracting one from the elasticity of revenue level and expenditure level yields the appropriate elasticity of revenue-to-GDP ratio and expenditure-to-GDP ratio to the output gap. Minus one represents the "denominator" effect of the ratios. The two ratio elasticities are then multiplied by the revenue-to-GDP ratio $\frac{R}{Y}$ and expenditure-to-GDP $\frac{G}{Y}$ to derive the semi-elasticity for revenue and expenditure, since budgetary variables are generally expressed as a percentage of GDP.

In a nutshell, the following components need to be estimated to derive the semi-elasticity of the budget:

- The five individual elasticities
  - the *individual elasticities* of five distinguished revenue categories with respect to the output gap $\eta_{R,i}$,
  - the *elasticity of unemployment expenditure* with respect to the output gap η_{G_U},
- Revenue and expenditure structure (i.e. share of 5 specific revenue/expenditure items in total revenue/expenditure)
  - the *weights of the five individual revenue categories* in total general government revenue R_i/R,
  - the *weight of the unemployment-related expenditures* in total general government expenditures G_U/G,
- The two aggregate revenue and expenditure ratios (i.e. the size of total revenue and total expenditure in terms of GDP).
  - the *total general government revenue* in % of GDP R/Y and
  - the *total general government expenditure* in % of GDP G/Y.

For sake of conciseness, the parameters 2 and 3) are also called "weighting parameters" or "weights" in the remainder of the paper, as opposed to the individual elasticities.

Data used as inputs for the calculation of semi-elasticities were almost 10-years old until the recent revision presented in this paper. They needed to be updated due both to inevitable data revisions and the necessity of taking into account recent developments. The revenue and expenditure weights computed in 2005 – parameters 2) and 3) described above – were still in use until 2012. The semi-elasticities (or sensitivities) in use until recently did not reflect the substantial changes in the structure of revenues that occurred thereafter. In many EU countries, there has been a trend toward shifting from direct taxes to indirect taxes. Since direct taxes, in particular on corporate income but also on personal income are more cyclical than indirect taxes, this implying a smaller cyclicality of overall revenues. Moreover, national account data have been subject to data revisions also for the benchmark period (1995-2004). The same applies to estimates of the elasticity of individual revenue and expenditure items, given the changes in the tax structure and in the cyclical relation of the tax bases with GDP.

Some inconsistencies in the calculation period of the weights needed also to be corrected. The calculation periods were very different across the weighting parameters in the previous CAB methodology. The weight of individual revenue categories (with respect to total revenue) are computed using OECD Economic Outlook data for most EU countries and the AMECO database for non-OECD Member States, with the two sources being consistent with ESA95 concepts (see Appendix). The weights

are calculated as averages over a relatively long-time span to smooth-out cyclical variations in the revenue composition of the tax burden. The period over which the average weights were computed in the previous CAB methodology was 1995-2004 for most EU Member States (or 1995-2003 depending on data availability). By contrast, concerning expenditures (i.e. the ratio of unemployment-related spending to total public expenditure), the previous computation method took 2003 as the reference year (or 2002 depending on country-data availability) rather than the 10-years average used in the case of revenues due to the lack of comparable time series of country-data. Moreover, the revenue-to-GDP and expenditure-to-GDP ratios corresponded to their 2003 value.

Therefore, the tax structure, on the one hand, and the aggregate revenue and spending ratios, on the other hand, was updated consistently using a 10-year average over 2002 – 2011. The choice of a more recent period, however, faces the difficulty to get hard data rather than forecast. Therefore, the window stops in 2011, where hard data are available for most series and most Member States. The only exception is the unemployment-related expenditure, available up to 2011 only in DK, DE, FR and AT and up to 2010 for the other countries. The data for unemployment-related expenditure is coming from Eurostat's detailed database on 'General government expenditure by function' (COFOG99), with the exception of BE, SK and RO where they are not available and other sources are used (see note iii of Table A.2 in the Appendix). The pros and cons of the appropriate choice of the time-interval are discussed in the next section.

The elasticities of individual tax and expenditure categories with respect to the output gap are left unchanged for now, but their revision is planned for the first half of 2014. The update of the individual elasticities is particularly tricky on the technical side and intensive in resources. They will be revised by the OECD, most probably before the Spring 2014 forecast. Individual elasticities currently used in the CAB framework are considered as time-invariant. They were computed in 2005 on the basis of the methodology developed by the OECD and agreed by the EPC's OGWG. Revising them means computing both the i) elasticity of individual tax revenues /expenditures with respect to their base and ii) the reaction of (a macroeconomic proxy of) the different tax/expenditure bases to the change in output gap. Computing the former would require complex simulations using detailed tax codes and micro-income data for personal income tax and social security contribution. ([20]) The OECD will undertake this task, under Commission and OGWG guidance. As the author of the current method, OECD is particularly qualified to update the individual elasticities and ensure the consistency of the method applied.

3.2. IMPACT OF UPDATING WEIGHTS

The updating of the benchmark period may have a non-negligible impact on the semi-elasticities, mainly due to the expenditure data. As seen in Table 3.1, the impact of updating the benchmark period is relatively small for revenue semi-elasticities, i.e. at most 0.02, except for HU. By contrast, the change in expenditure semi-elasticities reaches 0.12 for IE, 0.10 for CZ), 0.06 for MT and around +/- 0.05 in DK, ES, LV, SI and FI. However, the changes seem to be slightly lower than those induced by the use of semi-elasticity, described in section 2. Indeed, the change for the EU induced by data revisions is around zero, as compared with 0.03 caused by the use of semi-elasticity.

([20]) The elasticities of personal income taxes and social security contributions with respect to their base (the wage bill) are derived from individual tax codes and detailed revenue data. Corporate and indirect taxes are assumed to be proportional to their tax bases (profits and consumption, respectively). On the expenditure side, unemployment-related expenditure is also assumed to be proportional to unemployment. The elasticity of tax bases as well as unemployment with respect to the output gap are estimated econometrically using about three decades of time-series data ending in 2003. DG ECFIN produced estimates for non-OECD member states following the OECD procedure.

Table 3.1: **Impact of updates on the semi-elasticities of the budget balance and its components**

	Revenues			Expenditures			Overall balance		
	Semi-elasticity using		Difference	Semi-elasticity using		Difference	Semi-elasticity using		Difference
	1995-2004 weights	2002-2011 weights		1995-2004 weights	2002-2011 weights		1995-2004 weights	2002-2011 weights	
	(a)	*(b)*	*(b-a)*	*(c)*	*(d)*	*(d-c)*	*(e)*	*(f)*	*(f-e)*
BE	-0.05	-0.03	0.02	-0.59	-0.58	0.01	0.54	0.55	0.02
BG	-0.05	-0.07	-0.02	-0.41	-0.39	0.02	0.36	0.32	-0.04
CZ	-0.05	-0.06	0.00	-0.54	-0.45	0.10	0.49	0.39	-0.10
DK	-0.06	-0.06	0.00	-0.70	-0.66	0.04	0.64	0.61	-0.03
DE	-0.05	-0.05	0.01	-0.60	-0.61	0.00	0.55	0.56	0.01
EE	-0.11	-0.10	0.01	-0.39	-0.39	0.00	0.29	0.30	0.01
IE	0.02	0.00	-0.02	-0.39	-0.51	-0.12	0.40	0.50	0.10
EL	-0.02	-0.03	-0.01	-0.51	-0.51	0.00	0.49	0.47	-0.02
ES	0.00	0.00	0.00	-0.43	-0.48	-0.04	0.43	0.48	0.05
FR	-0.06	-0.06	0.01	-0.59	-0.60	-0.01	0.53	0.55	0.01
IT	0.02	0.04	0.02	-0.51	-0.51	0.00	0.53	0.55	0.01
CY	0.00	-0.02	-0.01	-0.46	-0.45	0.01	0.46	0.43	-0.02
LV	-0.08	-0.09	-0.02	-0.37	-0.40	-0.04	0.29	0.31	0.02
LT	-0.06	-0.07	-0.01	-0.34	-0.38	-0.03	0.28	0.30	0.02
LU	0.03	0.03	0.00	-0.46	-0.44	0.02	0.49	0.47	-0.02
HU	0.01	-0.05	-0.06	-0.52	-0.52	-0.01	0.52	0.47	-0.05
MT	-0.05	-0.05	0.00	-0.52	-0.46	0.06	0.46	0.40	-0.06
NL	-0.06	-0.05	0.01	-0.64	-0.62	0.02	0.58	0.57	-0.02
AT	-0.07	-0.06	0.01	-0.55	-0.55	0.00	0.48	0.49	0.01
PL	-0.07	-0.09	-0.01	-0.52	-0.49	0.03	0.45	0.40	-0.04
PT	-0.02	-0.03	-0.01	-0.50	-0.50	0.00	0.48	0.46	-0.01
RO	-0.04	-0.05	-0.01	-0.35	-0.38	-0.03	0.31	0.33	0.02
SI	-0.05	-0.04	0.01	-0.55	-0.50	0.05	0.50	0.46	-0.04
SK	-0.08	-0.08	0.01	-0.42	-0.41	0.01	0.33	0.33	0.00
FI	-0.12	-0.13	-0.01	-0.60	-0.66	-0.05	0.48	0.53	0.04
SE	-0.10	-0.08	0.02	-0.68	-0.67	0.01	0.58	0.59	0.01
UK	0.00	0.01	0.01	-0.46	-0.47	-0.02	0.46	0.48	0.02
EA-17	-0.04	-0.03	0.01	-0.56	-0.56	-0.01	0.52	0.54	0.02
EU-27	-0.03	-0.03	0.01	-0.55	-0.55	-0.01	0.51	0.53	0.01

Source: Commission services.

However, the updating of the benchmark period has a very moderate impact on the CAB for several countries, even in periods of fairly large output gaps. The update of key CAB parameters was necessary in order to better trace structural changes in the composition of the tax burden and expenditures over time. While strongly preferable from a conceptual point of view, computing weighting parameters over 2002-2011 has a very modest effect on the outcomes of the cyclical-adjustment calculation.

Table 3.2: **Impact of change in weights on the cyclically-adjusted budget and its components for 2011 (in % of GDP)**

	Revenues			Expenditures			Overall balance		
	Cyclically-adjusted revenues using semi-elasticity		Difference	Cyclically-adjusted expenditures using semi-elasticity		Difference	Cyclically-adjusted balance using semi-elasticity		Difference
	1994-2004 weights	2002-2011 weights		1994-2004 weights	2002-2011 weights		1994-2004 weights	2002-2011 weights	
	(a)	*(b)*	*(b-a)*	*(c)*	*(d)*	*(d-c)*	*(e)*	*(f)*	*(f-e)*
BE	49.4	49.4	0.0	53.0	53.0	0.0	-3.6	-3.6	0.0
BG	33.5	33.5	0.0	34.8	34.8	0.1	-1.3	-1.3	-0.1
CZ	39.8	39.8	0.0	43.2	43.2	0.0	-3.4	-3.4	0.0
DK	55.9	55.9	0.0	55.3	55.5	0.1	0.5	0.4	-0.1
DE	44.6	44.6	0.0	45.5	45.5	0.0	-0.9	-0.9	0.0
EE	39.5	39.5	0.0	38.6	38.6	0.0	1.0	0.9	0.0
IE	34.9	34.9	0.0	47.2	46.8	-0.3	-12.3	-12.0	0.3
EL	42.1	42.0	-0.1	46.6	46.7	0.0	-4.6	-4.7	-0.2
ES	35.7	35.7	0.0	43.3	43.2	-0.2	-7.7	-7.5	0.2
FR	50.7	50.7	0.0	55.0	55.0	0.0	-4.3	-4.3	0.0
IT	46.2	46.2	0.0	49.1	49.1	0.0	-3.0	-2.9	0.0
CY	39.8	39.8	0.0	45.9	45.9	0.0	-6.1	-6.1	0.0
LV	34.6	34.5	-0.1	36.5	36.4	-0.2	-1.9	-1.8	0.1
LT	31.7	31.7	0.0	36.7	36.6	-0.1	-4.9	-4.9	0.1
LU	41.7	41.7	0.0	41.4	41.4	0.0	0.3	0.3	0.0
HU	53.9	53.8	-0.1	48.5	48.5	0.0	5.4	5.3	-0.1
MT	39.6	39.6	0.0	42.5	42.4	0.0	-2.8	-2.8	0.0
NL	45.3	45.3	0.0	48.7	48.8	0.0	-3.4	-3.4	0.0
AT	48.0	48.0	0.0	50.5	50.5	0.0	-2.5	-2.5	0.0
PL	38.5	38.5	0.0	43.6	43.6	0.0	-5.0	-5.0	0.0
PT	44.9	44.9	0.0	48.1	48.1	0.0	-3.1	-3.2	0.0
RO	32.3	32.3	0.0	37.2	37.2	-0.1	-4.9	-4.9	0.0
SI	44.3	44.3	0.0	49.9	50.0	0.1	-5.6	-5.7	-0.1
SK	33.2	33.2	0.0	38.2	38.2	0.0	-4.9	-4.9	0.0
FI	53.7	53.7	0.0	53.6	53.5	-0.1	0.1	0.2	0.1
SE	51.3	51.3	0.0	51.0	51.0	0.0	0.3	0.3	0.0
UK	40.7	40.7	0.0	47.4	47.3	0.0	-6.7	-6.7	0.1
EU-17	45.3	45.3	0.0	48.7	48.7	0.0	-3.4	-3.4	0.0
EA-27	44.8	44.8	0.0	48.5	48.5	0.0	-3.7	-3.6	0.0

Source: Commission services.

Table 3.3 shows the impact of data revisions on the CAB and its components for the year 2011. The update of the benchmark period from 1995-2004 to 2002-2011 leads to a revision of the cyclically adjusted balance in eleven out of 27 EU countries. The largest revisions are still limited and can be seen in IE (0.3 pp of GDP), EL and ES (+/-0.2 pp). In the remaining sixteen Member States, the revision of the benchmark period has no effect on the CAB (at the first digit level). CAB revisions stem from changes in cyclically adjusted expenditures, while cyclically adjusted revenues are broadly unchanged.

3.3. SENSITIVITY ANALYSIS: ALTERNATIVE CALCULATION PERIODS

The appropriate length of the time interval over which the averages of the weighting parameters are calculated is an arbitrary choice. It dwells on the evaluation of two opposite factors: elimination of cyclical developments versus relevance of structural changes. The retained interval needs to balance these two conflicting factors, although the exact number of years is ultimately arbitrary.

The choice of a relatively long interval, e.g. 10 years, allows removing the short-term effect of cyclical developments on the expenditure and revenue ratios over GDP and on the relative weight of individual revenue categories, since such a time length is likely to cover an entire business cycle. The quite pronounced cyclical development observed in the last ten years speaks in favour of a long benchmark period. It will also smooth out the impact of any structural change in revenues (e.g. due to substantial reforms, avoiding breaks in parameters, which may blur the interpretation of the CAB). ([21])

On the other hand, a long interval would imply a risk of excessive delays in adjusting the figures to reforms of taxation and/or expenditure or trends in the tax and expenditure structure. A relevant

Table 3.3: **Budgetary semi-elasticity: effect of choosing a calculation period of 5 vs. 10 years and of refreshing those annually**

	5-year windows				10-year windows			
	2004-2008 weights	2005-2009 weights	2006-2010 weights	2007-2011 weights	1999-2008 weights	2000-2009 weights	2001-2010 weights	2002-2011 weights
BE	0.54	0.55	0.55	0.56	0.54	0.55	0.55	0.55
BG	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.32
CZ	0.38	0.38	0.38	0.38	0.39	0.39	0.39	0.39
DK	0.58	0.58	0.59	0.60	0.61	0.61	0.61	0.61
DE	0.56	0.57	0.56	0.55	0.56	0.56	0.56	0.56
EE	0.28	0.30	0.32	0.33	0.28	0.29	0.29	0.30
IE	0.44	0.48	0.57	0.61	0.43	0.45	0.49	0.50
EL	0.46	0.47	0.49	0.50	0.45	0.46	0.47	0.47
ES	0.45	0.48	0.50	0.52	0.44	0.45	0.47	0.48
FR	0.54	0.54	0.54	0.55	0.54	0.54	0.54	0.55
IT	0.54	0.55	0.56	0.56	0.53	0.54	0.54	0.55
CY	0.42	0.43	0.44	0.45	0.41	0.42	0.43	0.43
LV	0.29	0.31	0.33	0.33	0.30	0.30	0.31	0.31
LT	0.29	0.31	0.33	0.33	0.29	0.30	0.30	0.30
LU	0.45	0.46	0.46	0.47	0.45	0.46	0.47	0.47
HU	0.48	0.49	0.48	0.45	0.48	0.48	0.48	0.47
MT	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
NL	0.54	0.55	0.56	0.57	0.55	0.55	0.56	0.57
AT	0.48	0.48	0.48	0.49	0.49	0.49	0.49	0.49
PL	0.40	0.40	0.41	0.41	0.40	0.40	0.40	0.40
PT	0.46	0.47	0.48	0.48	0.44	0.45	0.46	0.46
RO	0.32	0.34	0.35	0.35	0.33	0.33	0.33	0.33
SI	0.44	0.45	0.46	0.47	0.46	0.46	0.46	0.46
SK	0.31	0.32	0.33	0.33	0.36	0.35	0.34	0.33
FI	0.50	0.51	0.51	0.52	0.52	0.52	0.52	0.53
SE	0.58	0.57	0.56	0.55	0.57	0.58	0.59	0.59
UK	0.47	0.49	0.50	0.51	0.45	0.46	0.47	0.48

Source: Commission services.

([21]) At present time, a ten year computation period has also the merit to neutralise the effect of asset-related revenue windfall (before the crisis) and of asset-related revenue shortfall (in the wake of the crises), since they are, at least partly, cancelling out.

example is the gradual shift from direct to indirect taxes which took place in a number of Member States during recent years. In this case the cyclical adjustment would be carried out based on largely outdated figures, which would not reflect the current tax structure at the end of the period.

The weighting parameter should be based on hard data. Using forecast data in the parameter updates is unwise, given the normal level of uncertainty surrounding the forecast and the high probability of revision.

The choice of the span of the benchmark period does not have a visible impact on the estimated CAB, which suggests that budgetary semi-elasticities are fairly stable, especially for longer intervals. Table 3.3 compares the budgetary semi-elasticity, by showing the effect of choosing a benchmark period of 5 vs. 10 years. It also displays the effect of updating the window annually. As expected, the budgetary semi-elasticities for the 10-year window (going from 1999-2008 to 2002-2011) are more stable than the 5-year window (going from 2004-2007 to 2007-2011).

Overall differences in semi-elasticities appear to be minor (at the level of second decimal). By comparing the two intervals (i.e. 2007-2011 vs. 2002-2011), the largest differences in semi-elasticities (higher than 0.03) are observed in EE, IE, ES, LT, SE and UK.

3.4. THE UPDATING FREQUENCY OF THE WEIGHTING PARAMETERS

A general consensus emerges at the OGWG about the fact that a one-year frequency will be not be necessary to revise the weighting parameters, while an update every decade will be definitely insufficient. Table 3.3 confirms that the elasticities did not change much from a year to another, based on past data. The choice of the frequency with which calculations should be updated aims at conciliating two opposite factors: a high frequency in refreshing data would allow to better capture the effects of trends and reforms, while leading to greater instability of results. Up until recently, there were no provisions on the frequency of data updates. Therefore, some OGWG delegates suggested updating the parameter every 6 years, at the same time as the Medium Term Objectives (updated every 3 years), which was agreed by the OGWG.

Data updates will therefore take place every 6 years, i.e. every second update of Medium Term Objectives. This will allow for both regular updates and stability in the elasticities.

4. OVERALL IMPACT OF THE REVISIONS AND CONCLUDING REMARKS

By and large, the updated semi-elasticities of the budget balance to the output gap are fairly close to the sensitivities previously used to compute the CAB (and based on old data). On average and as seen in the last column of Table 4.1, the difference is only 0.04 for both euro area and EU27 as a whole and +/- 0.04 or less for the majority of EU countries. The difference is slightly higher for ES (+0.05), DE, FR UK (+0.6) and IE (+1.0). In contrast, the updated semi-elasticities of both total revenue and total expenditure to the output gap are significantly different from the old sensitivity. ([22])

The budgetary semi-elasticity ranges from 0.3 to 0.6, suggesting significant differences in the cyclicality of the budget balance across Member States. It averages out to 0.54 for the euro area and 0.53 for the EU, as shown in Table 4.1.

Table 4.1: **Impact of change in method and updates on the cyclical-adjustment parameters of the budget balance and its components**

	Revenue sensitivity	Revenue semi-elasticity	Difference	Expenditure sensitivity	Expenditure semi-elasticity	Difference	Overall balance sensitivity	Overall balance semi-elasticity	Difference
	1995-2004 weights	2002-2011 weights		1995-2004 weights	2002-2011 weights		1995-2004 weights	2002-2011 weights	
	(a)	*(b)*	*(b-a)*	*(c)*	*(d)*	*(d-c)*	*(e)*	*(f)*	*(f-e)*
BE	0.47	-0.03	-0.50	-0.07	-0.58	-0.51	0.54	0.55	0.01
BG	0.35	-0.07	-0.42	-0.01	-0.39	-0.38	0.36	0.32	-0.04
CZ	0.36	-0.06	-0.41	-0.01	-0.45	-0.44	0.37	0.39	0.03
DK	0.50	-0.06	-0.56	-0.15	-0.66	-0.51	0.65	0.61	-0.04
DE	0.40	-0.05	-0.44	-0.11	-0.61	-0.50	0.51	0.56	0.05
EE	0.29	-0.10	-0.39	-0.02	-0.39	-0.37	0.31	0.30	-0.01
IE	0.36	0.00	-0.36	-0.05	-0.51	-0.46	0.40	0.50	0.10
EL	0.42	-0.03	-0.45	-0.01	-0.51	-0.49	0.43	0.47	0.04
ES	0.38	0.00	-0.38	-0.05	-0.48	-0.43	0.43	0.48	0.05
FR	0.44	-0.06	-0.49	-0.06	-0.60	-0.55	0.49	0.55	0.06
IT	0.49	0.04	-0.45	-0.02	-0.51	-0.49	0.50	0.55	0.04
CY	0.39	-0.02	-0.40	-0.01	-0.45	-0.44	0.40	0.43	0.04
LV	0.26	-0.09	-0.35	-0.02	-0.40	-0.39	0.28	0.31	0.03
LT	0.26	-0.07	-0.33	-0.01	-0.38	-0.37	0.27	0.30	0.04
LU	0.48	0.03	-0.45	-0.01	-0.44	-0.43	0.49	0.47	-0.02
HU	0.45	-0.05	-0.50	-0.01	-0.52	-0.51	0.46	0.47	0.01
MT	0.35	-0.05	-0.40	-0.01	-0.46	-0.45	0.36	0.40	0.04
NL	0.39	-0.05	-0.44	-0.17	-0.62	-0.45	0.55	0.57	0.01
AT	0.43	-0.06	-0.49	-0.04	-0.55	-0.51	0.47	0.49	0.02
PL	0.33	-0.09	-0.42	-0.06	-0.49	-0.43	0.40	0.40	0.01
PT	0.41	-0.03	-0.44	-0.04	-0.50	-0.46	0.45	0.46	0.02
RO	0.28	-0.05	-0.33	-0.02	-0.38	-0.37	0.30	0.33	0.03
SI	0.41	-0.04	-0.45	-0.06	-0.50	-0.44	0.48	0.46	-0.02
SK	0.27	-0.08	-0.35	-0.02	-0.41	-0.39	0.29	0.33	0.04
FI	0.41	-0.13	-0.54	-0.09	-0.66	-0.57	0.50	0.53	0.02
SE	0.48	-0.08	-0.56	-0.10	-0.67	-0.57	0.58	0.59	0.01
UK	0.40	0.01	-0.40	-0.02	-0.47	-0.45	0.42	0.48	0.06
EA-17	0.42	-0.03	-0.45	-0.07	-0.56	-0.50	0.49	0.54	0.04
EU-27	0.42	-0.03	-0.45	-0.06	-0.55	-0.49	0.48	0.53	0.04

Source: Commission services.

The semi-elasticity for expenditure accounts for most of the disparity in the budgetary semi-elasticity across Member States. The semi-elasticity for revenue is close to zero (-0.03) for the EU and ranges from -0.13 to 0.04, which is explained by the fact that revenue is almost as cyclical as GDP (except for non-tax revenue). Therefore, the revenue-to-GDP ratio is almost invariant with the business cycle, especially in countries where non-tax revenue is relatively low (see column *K* of Table A.2 in the appendix). In contrast, the semi-elasticity for expenditure is 0.55 for the EU, which broadly corresponds to the share of total expenditure in GDP. This reflects the fact that the elasticity of the expenditure-to-GDP ratio to the output gap is close to, but slightly lower than, minus one (see column *d* of Table A.3 in

([22]) On the revenue side, the semi-elasticity represents the change in the revenue-to-GDP ratio brought about by the business cycle, while the sensitivity captures the effect of the business cycle on the level of revenues, thus neglecting the impact on the denominator (i.e. GDP). Therefore, the cyclical correction of the revenue ratio using the semi-elasticities is considerably reduced compared with the sensitivity-based correction: revenue (except non-tax revenue) moves along with GDP during the cycle rather proportionally, thus keeping the revenue-to-GDP ratio constant. A similar argument, in the opposite direction, holds for expenditure. Since cyclically-related unemployment expenditure is a relatively small share of total expenditure, the cyclical correction of the expenditure ratio using semi-elasticities is amplified (rather than reduced as in the case of revenue) compared to the sensitivity-based correction.

the appendix). Indeed, the cyclical effect of the denominator (GDP) largely dominates the low cyclicality of expenditure in level, given the small share of unemployment-related expenditure in total expenditure. The semi-elasticity for expenditure is ranging from -0.38 to -0.67, which explains most of the disparity in budgetary semi-elasticity across Member States. ([23])

The impact on the cyclically-adjusted budget balance of the use of updated semi-elasticity – instead of the outdated sensitivity – remains limited even when the output gap becomes very large. By definition, the magnitude of the CAB revision depends on both the size of the revision in the cyclical sensitivity parameters and the value of the output gap. A one-percent output gap leads to a revision in the CAB of 0.1 pp at most. The overall impact on cyclically-adjusted values can be larger (smaller) in years when the output gap is above (below) one in absolute value. However, even in the case of an output gap of 4%, the CAB will vary by at most 1 pp and on average by less than 0.5 pp in the euro area and 0.4 pp in the EU as a whole. These fairly limited changes will not challenge fiscal surveillance in the medium term. In particular, they are very small compared to current consolidation needs in most EU countries. ([24]) Table 4.2 shows the overall impact of the changes explained in this note on cyclically-adjusted budget for selected years. For 2011, the largest CAB revisions are observed for EL (+ 0.4 pp), IE (+0.3 pp), DK, ES and LV (+/-0.2 pp). A similar picture holds for 2012, where the revision for 23 Member States was of +/- 0.1 pp only or closer to zero.

Table 4.2: **Impact of change in method and weights on the cyclically-adjusted balance in selected years**

	Cyclically-adjusted balance using sensitivity and 1995-2004 weights				Cyclically-adjusted balance using semi-elasticity and 2002-2011 weights				Difference			
	2007	2010	2011	2012	2007	2010	2011	2012	2007	2010	2011	2012
	(a)	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*	*(g)*	*(h)*	*(e-a)*	*(f-b)*	*(g-c)*	*(h-d)*
BE	-1.4	-3.3	-3.6	-2.3	-1.4	-3.2	-3.6	-2.3	0.0	0.0	0.0	0.0
BG	-0.2	-1.7	-1.3	-0.7	-0.1	-1.9	-1.3	-0.8	0.2	-0.2	-0.1	-0.1
CZ	-3.2	-4.7	-3.3	-2.7	-3.4	-4.7	-3.4	-2.7	-0.2	0.0	0.0	0.1
DK	2.5	0.1	0.5	-1.8	2.6	-0.1	0.4	-1.9	0.2	-0.2	-0.2	-0.1
DE	-0.8	-3.6	-0.9	0.0	-0.9	-3.5	-0.9	0.0	-0.1	0.1	0.0	0.0
EE	-1.3	2.0	0.9	-1.4	-1.1	1.9	0.9	-1.4	0.1	-0.1	0.0	0.0
IE	-1.4	-29.1	-12.3	-7.8	-1.7	-28.7	-12.0	-7.6	-0.4	0.5	0.3	0.2
EL	-7.9	-8.4	-5.1	-1.2	-8.1	-8.1	-4.7	-0.7	-0.1	0.2	0.4	0.5
ES	1.0	-7.6	-7.7	-6.0	0.9	-7.4	-7.5	-5.8	-0.1	0.2	0.2	0.2
FR	-4.2	-6.0	-4.4	-3.4	-4.3	-5.9	-4.3	-3.2	-0.2	0.1	0.1	0.1
IT	-3.2	-3.5	-3.0	-1.3	-3.3	-3.4	-2.9	-1.2	-0.1	0.1	0.1	0.1
CY	2.7	-5.3	-6.1	-4.4	2.6	-5.3	-6.1	-4.4	-0.1	0.0	0.0	0.1
LV	-4.2	-5.2	-2.0	-1.2	-4.6	-4.9	-1.8	-1.2	-0.4	0.3	0.2	0.1
LT	-4.1	-5.1	-4.9	-2.6	-4.5	-4.8	-4.9	-2.5	-0.4	0.3	0.1	0.1
LU	1.3	0.1	0.3	-1.0	1.4	0.0	0.3	-1.0	0.1	0.0	0.0	0.0
HU	-6.5	-2.8	5.3	-1.1	-6.5	-2.7	5.3	-1.0	0.0	0.0	0.0	0.0
MT	-2.2	-3.5	-2.8	-2.5	-2.2	-3.5	-2.8	-2.5	0.0	0.0	0.0	0.0
NL	-1.1	-4.0	-3.5	-2.2	-1.1	-4.0	-3.4	-2.2	0.0	0.0	0.0	0.0
AT	-1.9	-3.7	-2.5	-2.9	-2.0	-3.7	-2.5	-2.9	0.0	0.0	0.0	0.0
PL	-3.0	-8.0	-5.0	-2.8	-3.1	-8.0	-5.0	-2.8	0.0	0.0	0.0	0.0
PT	-3.6	-9.1	-3.2	-3.1	-3.6	-9.1	-3.2	-3.0	0.0	0.0	0.0	0.1
RO	-5.3	-6.1	-5.0	-1.9	-5.5	-6.0	-4.9	-1.8	-0.2	0.1	0.1	0.1
SI	-3.1	-4.5	-5.7	-2.9	-3.0	-4.5	-5.7	-2.9	0.1	0.0	0.0	-0.1
SK	-3.5	-7.6	-4.9	-4.9	-3.7	-7.5	-4.9	-4.9	-0.2	0.0	0.0	0.0
FI	2.8	-0.8	0.2	-0.8	2.6	-0.7	0.2	-0.7	-0.1	0.1	0.0	0.0
SE	1.6	1.3	0.3	0.6	1.6	1.3	0.3	0.6	0.0	0.0	0.0	0.0
UK	-4.4	-9.0	-6.8	-4.7	-4.6	-8.9	-6.7	-4.5	-0.2	0.2	0.1	0.2
EA-17	-2.0	-5.1	-3.4	-2.2	-2.1	-5.0	-3.4	-2.1	-0.1	0.1	0.1	0.1
EU-27	-2.3	-5.4	-3.7	-2.4	-2.5	-5.3	-3.6	-2.3	-0.1	0.1	0.1	0.1

Source: Commission services.

In contrast, the use of updated semi-elasticity leads to large revisions in cyclically-adjusted revenue and expenditure. Table 4.3 displays the overall impact of the changes on the components of the CAB, namely the cyclically-adjusted revenues and cyclically-adjusted expenditures, in the year 2011. The effect averages out to -0.7 pp in both the euro area and the EU. It is quite large for six countries, where the revision exceeds 1 pp.

([23]) The (un-weighted) standard deviation of the semi-elasticity across Member States confirms the results obtained from the min-max range. The former is 0.04 for revenue, compared with 0.09 for expenditure and the budget balance.

([24]) According to the Stability and Growth Pact, countries which have not yet achieved their medium-term objectives should consolidate by 0.5 pp per annum as a benchmark.

Table 4.3: **Impact of change in method and weights on the cyclically-adjusted balance and its components for 2011**

	Cyclically-adjusted revenue using		Difference	Cyclically-adjusted expenditure using		Difference	Cyclically-adjusted balance using		Difference
	Sensitivity and 1995-2004 weights	Semi-elasticities and 2002-2011 weights		Sensitivity and 1995-2004 weights	Semi-elasticities and 2002-2011 weights		Sensitivity and 1995-2004 weights	Semi-elasticities and 2002-2011 weights	
	(a)	*(b)*	*(b-a)*	*(c)*	*(d)*	*(d-c)*	*(e)*	*(f)*	*(f-e)*
BE	49.5	49.4	-0.1	53.1	53.0	-0.1	-3.6	-3.6	0.0
BG	34.4	33.5	-0.9	35.6	34.8	-0.8	-1.3	-1.3	-0.1
CZ	39.7	39.8	0.1	43.1	43.2	0.1	-3.3	-3.4	0.0
DK	57.9	55.9	-2.0	57.3	55.5	-1.9	0.5	0.4	-0.2
DE	44.4	44.6	0.1	45.4	45.5	0.1	-0.9	-0.9	0.0
EE	39.3	39.5	0.3	38.3	38.6	0.2	0.9	0.9	0.0
IE	35.8	34.9	-1.0	48.1	46.8	-1.3	-12.3	-12.0	0.3
EL	46.5	42.0	-4.5	51.6	46.7	-4.9	-5.1	-4.7	0.4
ES	37.3	35.7	-1.6	44.9	43.2	-1.8	-7.7	-7.5	0.2
FR	51.5	50.7	-0.8	55.9	55.0	-0.9	-4.4	-4.3	0.1
IT	47.0	46.2	-0.8	50.0	49.1	-0.9	-3.0	-2.9	0.1
CY	40.0	39.8	-0.2	46.1	45.9	-0.2	-6.1	-6.1	0.0
LV	36.3	34.5	-1.8	38.3	36.4	-2.0	-2.0	-1.8	0.2
LT	32.4	31.7	-0.7	37.4	36.6	-0.8	-4.9	-4.9	0.1
LU	42.3	41.7	-0.6	42.0	41.4	-0.6	0.3	0.3	0.0
HU	54.8	53.8	-1.0	49.5	48.5	-1.0	5.3	5.3	0.0
MT	39.5	39.6	0.1	42.3	42.4	0.1	-2.8	-2.8	0.0
NL	46.1	45.3	-0.8	49.6	48.8	-0.8	-3.5	-3.4	0.0
AT	48.1	48.0	0.0	50.6	50.5	0.0	-2.5	-2.5	0.0
PL	38.5	38.5	0.0	43.6	43.6	0.0	-5.0	-5.0	0.0
PT	46.1	44.9	-1.2	49.3	48.1	-1.2	-3.2	-3.2	0.0
RO	32.9	32.3	-0.6	37.8	37.2	-0.7	-5.0	-4.9	0.1
SI	45.0	44.3	-0.7	50.6	50.0	-0.7	-5.7	-5.7	0.0
SK	33.2	33.2	0.0	38.2	38.2	0.0	-4.9	-4.9	0.0
FI	54.5	53.7	-0.8	54.3	53.5	-0.9	0.2	0.2	0.0
SE	51.3	51.3	0.0	51.0	51.0	0.0	0.3	0.3	0.0
UK	41.6	40.7	-1.0	48.4	47.3	-1.1	-6.8	-6.7	0.1
EA-17	46.0	45.3	-0.7	49.4	48.7	-0.7	-3.4	-3.4	0.1
EU-27	45.5	44.8	-0.7	49.2	48.5	-0.7	-3.7	-3.6	0.1

Source: Commission services.

While the change in the method and the data update bring about a major improvement in the calculation of the CAB, other relevant issues not covered by the CAB methodology need to be borne in mind. First, updating the elasticity of individual tax and expenditure categories with respect to the output gap appears inevitable despite its complexity and will be carried out under the supervision of the OGWG over the next two years, most likely by the OECD. ([25]) Individual revenue and expenditure elasticities, computed by the OECD (and DG ECFIN for non-OECD countries) in 2005, may have been affected by recent changes in the tax codes. This update is a complex task as detailed information on the degree of progressivity (or regressivity) is required to account for the impact that changes in the underlying tax bases have on effective tax rates. Second, the business cycle as measured by the output gap does not take fully into account asset and commodity-price cycles, which may have strong impacts on tax revenue although not being necessarily correlated with the business cycle. ([26]) Third, the use of the output gap as a summary measure of the state of the economy over the business cycle does not take into account the changes in the composition of output. For example, a recovery driven by domestic consumption may have different fiscal implications compared with an export-led recovery, because domestic consumption is typically more heavily taxed than exports (via VAT and excise duties). The composition of demand could then influence the semi-elasticity in the short term. ([27])

([25]) Since the re-estimation of individual elasticities was likely to take more than one year at least, it was decided by the OGWG to carry out a two-tier revision of the CAB methodology: a prompt revision by the Commission (using semi-elasticities and updated weights and tax and expenditure ratios) in time for the Commission Winter 2013 forecast and, at a later stage, a revision of individual elasticities.

([26]) A comprehensive account of asset price adjustments is available in Eschenbach and Schuknecht (2002).

([27]) A stylized approach to adjust for output composition effects is to focus on domestic absorption (defined as output minus net exports). See European Commissions (2010), Report on Public Finances (Chapter 6), for a detailed account. For selected European economies, Bouthevillain et al. (2001) find that controlling for the changes in the composition of output changes the characterization of fiscal policy in certain episodes.

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APPENDIX

Parameters to derive the semi-elasticities of the budget balance to the output gap and data sources

Table A.1: **Elasticities of individual revenue categories and elasticity of unemployment-related expenditure**

	Revenue					Expenditure
	Personal income tax	Corporate income tax	Social security contributions	Indirect taxes	Non-tax revenue	Unemployment-related expenditure
	(A)	*(B)*	*(C)*	*(D)*	*(E)*	*(F)*
BE	1.09	1.57	0.80	1.0	0.0	-3.3
BG	1.40	1.40	0.88	1.0	0.0	-3.3
CZ	1.19	1.39	0.80	1.0	0.0	-3.3
DK	0.96	1.65	0.72	1.0	0.0	-7.9
DE	1.61	1.53	0.57	1.0	0.0	-5.0
EE	0.80	1.40	0.70	1.0	0.0	-3.3
IE	1.44	1.30	0.88	1.0	0.0	-5.3
EL	1.80	1.08	0.85	1.0	0.0	-3.3
ES	1.92	1.15	0.68	1.0	0.0	-3.3
FR	1.18	1.59	0.79	1.0	0.0	-3.3
IT	1.75	1.12	0.86	1.0	0.0	-3.3
CY	1.97	1.50	0.83	1.0	0.0	-3.3
LV	0.90	1.30	0.70	1.0	0.0	-3.3
LT	0.90	1.40	0.70	1.0	0.0	-3.3
LU	1.50	1.75	0.76	1.0	0.0	-3.3
HU	1.70	1.44	0.63	1.0	0.0	-3.3
MT	1.67	1.40	0.61	1.0	0.0	-3.3
NL	1.69	1.52	0.56	1.0	0.0	-7.9
AT	1.31	1.69	0.58	1.0	0.0	-3.3
PL	1.00	1.39	0.69	1.0	0.0	-5.8
PT	1.53	1.17	0.92	1.0	0.0	-3.3
RO	1.21	1.60	0.75	1.0	0.0	-3.3
SI	1.37	1.50	0.86	1.0	0.0	-5.8
SK	0.70	1.32	0.70	1.0	0.0	-5.8
FI	0.91	1.64	0.62	1.0	0.0	-5.8
SE	0.92	1.78	0.72	1.0	0.0	-7.9
UK	1.18	1.66	0.91	1.0	0.0	-5.3

Note and data explanation: Data has been unchanged since 2005. See Girouard and André (2005) and European Commission (2006).
i) The non-tax revenue is assumed to be zero, as implicitly assumed in Girouard and André (2005). While the role of non-tax revenue may not be negligible in some Member States in some years, its amount is generally limited and, in most cases, unrelated to the business cycle. Potential large non-tax revenue is linked to taking over pension obligations from the private sector (under the category of capital transfer but which comes with the obligation of future pension payments). The sale of market output is limited in size and dependent on demand or existing procedures for these services and thus cannot often be regarded as cyclical. Property income includes dividends from state-owned companies and renting out real estates, which can be large in some cases and are at the discretion of the government (e.g. medium-term policy regarding the perception of dividends as opposed to reinvestment in the company, renting out new estates). Other non-tax revenues could be the transfers from the EU to Member States' general government. The impact of the output gap on these revenue items is not straightforward and can only be very indirect, if any.
ii) The elasticities with respect to the output gap are estimated out of two components, the elasticity of revenues/expenditure with respect to their base and the elasticity of the base with respect to the output gap. The elasticities of personal income tax (PIT) and social security (SSC) revenues with respect to their base (i.e. the wage bill) are based on individual tax codes and detailed revenue data. For the currently used estimates, tax law information refers to 2003 and the income distribution relates to the years 1999 to 2001, depending on data availability. For the other tax components, corporate income tax (CIT) revenues and indirect taxes are assumed to be proportional to their tax base (profits and consumer expenditure respectively). Unemployment-related government expenditure is assumed to be proportional to unemployment.
iii) The elasticities of the different tax bases and unemployment with respect to the output gap are estimated econometrically. Regressions are in principle based on 1980-2003 OECD Economic Outlook data (but with different samples for several countries). For PIT and SSC base, the wage bill is regressed on the output gap. For CIT base, the profit share is derived from the wage bill and is regressed on the output gap. For indirect taxes, the elasticity of private consumption with respect to output gap is set to one for all countries (due to estimation problems). For unemployment-related expenditure: the cyclical component of unemployment is regressed on the output gap.
Source: OECD and Commission services for non-OECD countries.

Table A.2: **Shares of revenue categories (% of total revenues) and share of unemployment-related expenditure (% of total expenditure), average 2002-2011**

	Revenue					Expenditure
	Personal income tax	Corporate income tax	Social security contributions	Indirect taxes	Non-tax revenue	Unemployment-related expenditure
	(G)	*(H)*	*(I)*	*(J)*	*(K)*	*(L)*
BE	27.43	6.68	33.92	26.61	5.36	4.46
BG	6.11	5.29	24.81	44.23	19.56	0.70
CZ	10.68	10.25	39.05	27.44	12.58	0.74
DK	47.85	6.11	3.57	31.14	11.33	2.82
DE	20.25	5.74	40.06	24.99	8.96	6.22
EE	16.31	3.55	30.50	35.00	14.64	1.89
IE	24.30	9.77	18.45	35.76	11.72	4.32
EL	12.83	7.99	33.69	31.20	14.29	1.66
ES	19.55	8.38	34.57	28.91	8.59	4.89
FR	17.62	4.96	37.14	30.70	9.59	3.46
IT	25.70	6.17	29.40	31.77	6.95	1.18
CY	9.38	13.12	31.28	31.28	14.94	1.28
LV	15.86	4.97	30.81	30.81	17.56	1.70
LT	16.26	4.86	32.97	32.97	12.94	1.48
LU	15.50	17.91	27.83	30.57	8.20	2.46
HU	16.41	4.28	29.15	35.84	14.32	1.15
MT	13.75	6.84	33.44	33.40	12.58	1.35
NL	18.65	7.08	33.13	27.50	13.63	3.87
AT	22.55	4.86	33.50	29.96	9.13	2.56
PL	12.52	6.28	31.00	35.07	15.13	2.08
PT	14.02	7.91	29.09	34.21	14.77	2.18
RO	9.57	7.82	34.23	34.23	14.14	1.14
SI	14.54	4.88	33.80	34.39	12.40	1.36
SK	9.60	8.43	37.88	32.83	11.26	1.06
FI	26.13	6.71	23.41	25.81	17.93	4.98
SE	32.11	5.69	18.33	31.95	11.92	3.32
UK	31.79	8.24	20.71	31.81	7.45	0.78

Note and data explanation:
i) The share for non-tax revenue is derived from AMECO database (Autumn 2012 vintage). It is computed as the relative difference between total taxes (including imputed social security contribution) and total revenue of general government.
ii) The data for the main tax components (personal income tax, corporate income tax, social security contribution and indirect taxes) are originating from the OECD Economic Outlook database (codes used: TYH, TYB, TIND, SSRG), which employs consistent concepts with the ESA95 national account (but does not includes the tax transfer from the EU) and with the data used in Girouard and André (2005). The OECD Economic Outlook database corresponds to the Economic Outlook No. 92, released in Mid-December 2012. This source should be distinguished from the OECD Revenue statistics, which are using a different classification from ESA95. For BG, CY, LV, LT, MT and RO, where the OECD data are not available, AMECO database is used (codes used: UTYH, UTYC, UTVT, UTAG). For MT, the data is computed as the arithmetic average of EU-9 (i.e. Member States that joined the EU in 2004). For EL and LU, sources are combined (AMECO for personal income tax, corporate income tax and OECD economic outlook for indirect tax and social security) and data are rescaled to ensure that all revenue components add up to 100%, as for the other Member States. Data for all tax categories are only available for the period 2006-2009 in LU.
iii) The data for unemployment-related expenditure are coming from Eurostat's detailed database on 'General government expenditure by function' (COFOG99), with the exception of BE, SK and RO where they are not available. Most COFOG data stopped in 2010, except for DK, DE, FR and AT, covering also 2011. Data for LV starts in 2007. Because of the broader concept of unemployment-related expenditure used by DK and the need to ensure an equal treatment with other EU Member States, the figure was adjusted for DK to match the OECD data ('Public expenditure and participant stocks on LMP') used in the estimate of individual elasticities. In the absence of such correction, Danish semi-elasticities would have been implausibly high and would have stood as a clear outlier. The definition of unemployment-related expenditure in COFOG is the following: Provision of social protection in the form of cash benefits and benefits in kind to persons who are capable of work, available for work but are unable to find suitable employment; administration, operation or support of such social protection schemes; cash benefits, such as full and partial unemployment benefits, early retirement benefits paid to older workers who retire before reaching the standard retirement age due to unemployment or job reduction caused by economic measures, allowances to targeted groups in the labour force who take part in training schemes intended to develop their potential for employment, redundancy compensation, other periodic or lump-sum payments to the unemployed, particularly the long-term unemployed; benefits in kind, such as mobility and resettlement payments, vocational training provided to persons without a job or retraining provided to persons at risk of losing their job, accommodation, food or clothes provided to unemployed persons and their families. Are excluded from COFOG data: general programs or schemes directed towards increasing labour mobility, reducing the rate of unemployment or promoting the employment of disadvantaged or other groups characterized by high unemployment (04.12); cash benefits and benefits in kind paid to unemployed persons on reaching the standard retirement age. For BE and SK, the OECD database on 'Public expenditure and participant stocks on LMP' was used (category 10 "Passive expenditures", which encompasses full unemployment benefits, partial unemployment benefits, the redundancy compensation, the bankruptcy compensation and early retirement). The data for RO are based on the Eurostat's data on Social protection (spr) up to 2010, where the concept of total social benefit for the unemployment function was employed.
Source: OECD, AMECO and Commission services.

Table A.3: **Decomposition of the semi-elasticity of budget balance to output gap**

	Elasticity of:				Weights (% of GDP) of:		Semi-elasticity for:		
	Revenue level	Expenditure level	Revenue-to-GDP ratio	Expenditure-to-GDP ratio	Total revenue	Total expenditure	Revenue	Expenditure	Budget balance
	(a)	*(b)*	*c = a-1*	*d = b-1*	*(e)*	*(f)*	*g = c*e*	*h = d*f*	*i = g-h*
BE	0.94	-0.15	-0.06	-1.15	49.05	50.70	-0.029	-0.582	0.553
BG	0.82	-0.02	-0.18	-1.02	37.75	38.10	-0.068	-0.390	0.322
CZ	0.86	-0.02	-0.14	-1.02	39.91	43.77	-0.057	-0.448	0.391
DK	0.90	-0.22	-0.10	-1.22	55.75	54.34	-0.057	-0.665	0.607
DE	0.89	-0.31	-0.11	-1.31	44.00	46.45	-0.047	-0.609	0.562
EE	0.74	-0.06	-0.26	-1.06	37.63	36.99	-0.096	-0.393	0.297
IE	1.00	-0.23	0.00	-1.23	35.20	41.14	-0.001	-0.506	0.505
EL	0.92	-0.05	-0.08	-1.05	39.93	48.06	-0.034	-0.507	0.473
ES	1.00	-0.16	0.00	-1.16	38.14	41.13	-0.002	-0.478	0.476
FR	0.89	-0.11	-0.11	-1.11	49.90	54.11	-0.056	-0.603	0.546
IT	1.09	-0.04	0.09	-1.04	45.14	48.77	0.040	-0.507	0.547
CY	0.95	-0.04	-0.05	-1.04	40.27	43.47	-0.019	-0.453	0.434
LV	0.73	-0.06	-0.27	-1.06	35.08	38.26	-0.094	-0.404	0.310
LT	0.77	-0.05	-0.23	-1.05	32.92	36.13	-0.074	-0.379	0.305
LU	1.06	-0.08	0.06	-1.08	41.87	41.09	0.026	-0.444	0.471
HU	0.88	-0.04	-0.12	-1.04	44.97	50.33	-0.053	-0.522	0.470
MT	0.86	-0.04	-0.14	-1.04	39.48	43.74	-0.054	-0.457	0.403
NL	0.88	-0.31	-0.12	-1.31	45.25	47.37	-0.053	-0.618	0.566
AT	0.87	-0.08	-0.13	-1.08	48.49	50.77	-0.062	-0.551	0.488
PL	0.78	-0.12	-0.22	-1.12	38.78	43.79	-0.086	-0.491	0.404
PT	0.92	-0.07	-0.08	-1.07	41.08	46.42	-0.034	-0.498	0.463
RO	0.84	-0.04	-0.16	-1.04	32.97	36.78	-0.053	-0.382	0.329
SI	0.91	-0.08	-0.09	-1.08	43.46	46.49	-0.040	-0.502	0.461
SK	0.77	-0.06	-0.23	-1.06	34.23	38.62	-0.078	-0.410	0.332
FI	0.75	-0.29	-0.25	-1.29	53.13	51.08	-0.132	-0.658	0.526
SE	0.85	-0.26	-0.15	-1.26	53.99	53.13	-0.082	-0.671	0.589
UK	1.02	-0.04	0.02	-1.04	40.36	45.60	0.007	-0.475	0.482

Note: The parameters (a) and (b) are derived from Tables A1 and A2; a = (A * G + B * H + C * I + D * J + E * K) / 100; b = F * L / 100.
The total revenue and expenditure as a percentage of GDP (columns *e* and *f*) correspond to the "Excessive Imbalance Procedure" definition, as explained in more detail in the footnote at the very start of section 2.
Source: Commission services.