

# Potential output estimates and their role in the EU fiscal policy surveillance

*The surveillance of fiscal policies of EU Member States makes extensive use of estimates of the potential output and related concepts, including output gap and structural budget balance. This note provides an overview of these concepts, of their use and of some related issues.*

## 1. The concepts of “potential output” and “output gap”

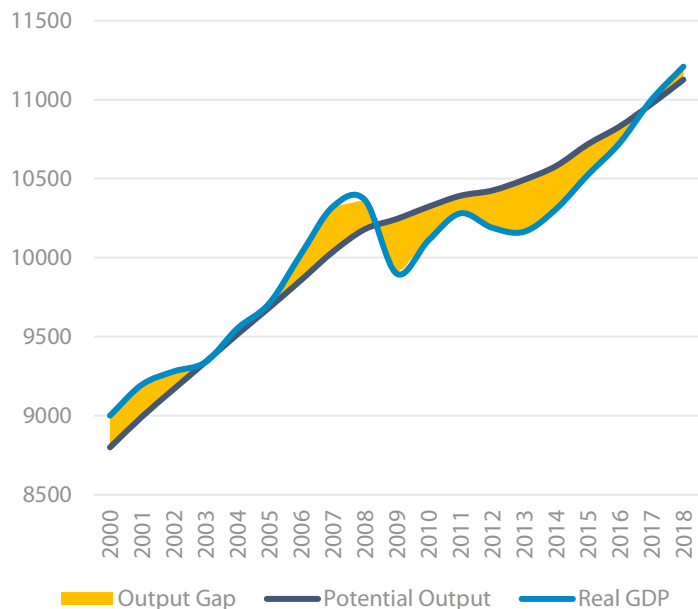
**Potential output** is a concept used in economic analysis to measure the highest level of production (Gross Domestic Product - GDP) that an economy can reach without generating inflationary pressures. The **output gap** is the difference between real and potential output (see Box 1).

A **positive output gap**, i.e. when real output is above potential output, depicts an economy producing more than its equilibrium capacity: as a result, unemployment should decrease and inflation increase. A **negative output gap**, i.e. when real output is below potential output, describes a system producing less than its equilibrium capacity, with high unemployment and low inflation.

The main role of output gap estimates is to identify the actual economic situation within the cycle, so that governments can put in place counter-cyclical fiscal policies, aimed at influencing the length and the effects of the cycle itself. Counter-cyclical policies consist in restrictive fiscal stances during booms (reduce expenditures or increase taxes, to avoid further inflationary pressures) and expansionary fiscal stances during contractionary periods (increase public expenditures and/or decrease taxes, to increase domestic demand).

Graph 1 shows the potential output (in bn €) of the Euro Area as a whole, from 2000 to 2018: the **output gap was negative from 2009 to 2016**, and is slightly positive since 2017.

**Graph 1: Euro Area output gap (2000 - 2018), billion €**



Source: EGOV based on AMECO data ([Potential GDP](#) and [Real GDP](#)), extracted in November 2019.



**Box 1: Definitions of potential output**

**European Commission:** "Potential output constitutes the best composite indicator of the aggregate supply side capacity of an economy and of its scope for sustainable, non-inflationary, growth... Potential growth constitutes a summary indicator of the economy's capacity to generate sustainable, non-inflationary, growth".

**OECD:** "Potential gross domestic product is defined in the OECD's Economic Outlook publication as the level of output that an economy can produce at a constant inflation rate. Although an economy can temporarily produce more than its potential level of output, that comes at the cost of rising inflation. Potential output depends on the capital stock, the potential labour force (which depends on demographic factors and on participation rates), the non-accelerating inflation rate of unemployment (NAIRU), and the level of labour efficiency."

**ECB (2018):** "Potential output is a key economic concept as its evolution determines how fast an economy can grow in a sustainable way. It is typically thought of as the highest level of economic activity that can be sustained by means of the available technology and factors of production, in particular labour and capital, without creating inflationary pressure."

**ECB (2011):** "Potential output is generally understood to provide an indication of the medium-to-long-term level of sustainable real output in the economy and its rate of growth. It is also referred to as the level of output which can be achieved using available production factors without creating inflationary pressures."

**IMF (2013):** "Potential output is the maximum amount of goods and services an economy can turn out when it is most efficient—that is, at full capacity. Often, potential output is referred to as the production capacity of the economy."

Table 1 below presents recent estimates and forecasts of the output gaps for the Euro Area as a whole, published by the European Commission, the International Monetary Fund (IMF) and the Organisation for Economic Cooperation and Development (OECD). It shows that the three institutions estimate very different output gaps: while the COM is estimating a positive output gap since 2017 (until 2021), the IMF identifies a (much smaller) positive output gap only from 2018, and the OECD estimates only negative output gaps.

**Table 1: Estimates and forecasts of Euro Area output gaps, 2015-2021 by different institutions**

Institution	2015	2016	2017	2018	2019	2020	2021
<a href="#">COM - Autumn Economic Forecast 2019</a>	-1.8	-1.0	0.2	0.7	0.5	0.4	0.3
<a href="#">IMF - World Economic Outlook, October 2019</a>	-2.0	-1.3	-0.3	0.3	0.1	0.0	-
<a href="#">OECD - Economic Outlook, November 2019<sup>1</sup></a>	-2.9	-2.4	-1.0	-0.4	-0.4	-0.6	-0.5

<sup>1</sup> EA-17, without Latvia and Lithuania.

The **potential output is not observable**, and is estimated on the basis of models and assumptions. This means that different models and assumptions produce different estimates; economists evaluate the performance of the applied methodologies by looking at revisions of the estimated values over time.

The size of output gap revisions applied to past years, in particular after the recent economic crises, has generated discussions (presented in Section 3) related to its reliability for economic policy making on the weakness of output gap models and the fragility of the fiscal measures based on them (detailed in Section 2). Annex 1 presents the output gaps for the Euro Area Member States from 2015 to 2021; Annex 2 provides a synthetic methodological overview; and Annex 3 gives a list of selected bibliographic references.

## 2. Potential output and related concepts in the evolution of the EU fiscal surveillance

The strictly related concepts of potential output, output gaps and structural budget balance (see Box 2), are at the core of the fiscal surveillance framework of the EU as defined in the Stability and Growth Pact (SGP)<sup>1</sup> and in the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (TSGC - also known as [Fiscal Compact](#), see Box 3).

### Box 2: Some definitions of budget balance

The **general government budget balance** is the difference between government revenues and expenditures (including interests on debt); it is the well-known “headline deficit”, with the threshold of 3% of GDP referred to in the Protocol 12 to TFEU, as agreed in the Maastricht Treaty of 1992.

The **cyclically-adjusted budget balance** (CAB) is the budget balance corrected for cyclical effects (downs and ups of the economy); such cyclical effects are generally due to the ‘automatic stabilisers’, which include higher expenditures due to unemployment benefits and reduced tax revenues (in case of the negative situation of the economy), or vice versa. (See three papers on the automatic stabiliser published by EGOV in May 2019: [M. Dolls et al](#); [P. Van Den Noord](#); and [A. Fatas](#)).

The **structural budget balance** (SBB) is the CAB corrected for one-off and temporary measures, such as acquisitions, privatisation, expenditures for natural catastrophes.

A specific body of the Economic Policy Committee, the [Output Gaps Working Group](#) (OGWG), discusses and agrees the common methodologies to be applied by the Commission and the EU Member States when computing structural budgets and output gaps; it is composed of experts and representatives from Member States, as well as from the IMF and the OECD.

Table 2 presents the values of the structural budget balances of the Euro Area as a whole for the years 2015-2021 estimated and forecast by the COM, the IMF and the OECD in autumn 2019: it can be noted that they vary quite significantly.

**Table 2: Euro area structural budget balances for 2015-2021, relative to potential GDP (%)**

Institution	2015	2016	2017	2018	2019	2020	2021
<a href="#">COM - Autumn Economic Forecast 2019</a>	-0.8	-1.0	-1.0	-0.8	-0.9	-1.1	-1.2
<a href="#">IMF - World Economic Outlook October 2019</a>	-0.8	-0.7	-0.7	-0.6	-0.7	-0.9	-
<a href="#">OECD - Economic Outlook, November 2019<sup>3</sup></a>	-0,3	-0,1	-0,3	-0,2	-0,4	-0,7	-0,7

<sup>3</sup> EA-17, without Latvia and Lithuania.

### 2.1 Structural budget balances and the Medium Term Objectives

In 1997, the Maastricht Treaty expressed the main reference value for the fiscal framework in terms of the **nominal budget balance**: the threshold of 3% of GDP was set as the maximum deficit<sup>2</sup>.

When the SGP was first revised in **2005**, the focus was set on an indicator that would be less rigid, and could take into account the cyclical position of an economy over the cycle: such indicator was the **structural budget balance**<sup>3</sup>, and the fiscal objective to be reached in the medium-term (the MTO) was

<sup>1</sup> Regulations [1466/97](#) and [1467/97](#), complemented by guidelines (including the [Code of Conduct of the Stability and Growth Pact](#), the [Vade Mecum on the SGP](#) and the [Council Guidelines and Specifications](#)).

<sup>2</sup> According to the [ECB](#), it “appears to have acted as a guidepost for fiscal policies since the SGP took effect in 1998” for a number of Member States.

<sup>3</sup> The Commission calculates it with a two-step methodology: the cyclical component of the budget is calculated as the product of the output gap and a so-called ‘semi-elasticity parameter’, which captures the reaction of the budget to cyclical changes in GDP; this component is then subtracted from the actual budget. The potential output used in this calculation is estimated on the basis of a “production function” (see Annex 2).

expressed in terms of this indicator. The MTOs for Euro Area Member States (and Member States belonging to the Exchange Rate Mechanism – ERM II) should lie within a range between -1 % and a balance or surplus. MTOs are updated every three years, or in case of major structural reforms. More specifically:

- Countries under the *preventive arm* of the SGP, not having achieved their MTOs, should define and maintain an adjustment path of their SBB towards it, with an annual improvement of 0.5 % of GDP per year, as a benchmark;
- Countries under the *corrective arm* of the SGP (those in excessive deficit situations) should improve their SBB of at least 0.5% of GDP per year.

### Box 3: The structural budget balance in the Fiscal Compact

The objective of a structural budget balance was also included as the main element of the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (TSGC, also known as the "[Fiscal compact](#)" signed in 2012): *"The budgetary position of the general government of a Contracting Party shall be **balanced** or in **surplus** if the **annual structural balance** (SBB) of the general government is at its country-specific medium-term objective (MTO), as defined in the revised Stability and Growth Pact, with a lower limit of a structural deficit of 0.5% of the gross domestic product at market prices. The Contracting Parties shall ensure rapid convergence towards their respective medium-term objective. The time-frame for such convergence will be proposed by the European Commission taking into consideration country-specific sustainability risks. Progress towards, and respect of, the medium-term objective shall be evaluated on the basis of an overall assessment with the **structural balance as a reference**, including an analysis of expenditure net of discretionary revenue measures, in line with the revised Stability and Growth Pact"* (Art. 3).

Under the terms of the TSGC, all signatories\* committed to approve national binding law rules - at constitutional level - that reflect the provisions of the preventive arm of the SGP (intended to limit their structural deficits) and including a correction mechanism that would be triggered automatically. In accordance to the TSGC, Member States with a debt ratio well below 60%, and/or facing low risks to the sustainability of public finances, are committed to set a MTO of at least **-1.0 % of GDP**, while signatories from the euro area with a debt ratio above 60%, or facing risks to the sustainability of their public finances, are committed to set a MTO of at least **-0.5 % of GDP**.

The Fiscal Compact (Title III of the TSGC) binds 22 Member States of the EU: the 19 Member States of the Eurozone plus Bulgaria, Denmark and Romania who have decided to opt in. See [here](#).

## 2.2 The expenditure benchmark

In 2011, an **expenditure benchmark rule** was introduced in the preventive arm of the SGP, to complement the existing rules. This rule compares the growth rate of "net expenditures"<sup>4</sup> to the growth rate of potential output. Member States that have not achieved their MTO cannot spend more than what they are expected to grow, unless they raise additional revenues. The rule is defined in terms of "moving average of potential output growth estimates", over the ten years, centred on the current year; this implies the use of estimates for the past five years and forecasts for the future four years. Such averaging should reduce the impact of the revisions<sup>5</sup>.

At its meeting of December 2016, the [ECOFIN Council](#) endorsed an [agreement](#) reached in the Economic and Financial Committee and aimed at improving the predictability and transparency of the SGP. *"The agreement, on how to simplify the assessment of compliance with the pact's rules, covers both in the preventive and corrective arms of the pact. No change to legislation underlying the pact is envisaged. Stronger focus on an*

<sup>4</sup> Net expenditure is defined as the general government expenditure minus interests on debt, expenditures on EU programmes fully matched by EU funds revenues, as well as cyclical elements such as unemployment benefits (see Box 1.11 in [SGP Vade Mecum - 2019](#)).

<sup>5</sup> In its "[Assessment of EU fiscal rules](#)" of August 2019, the European Fiscal Board proposed the "net expenditure growth, to be compared to potential growth" as the single instrument for the EU fiscal framework, together with one single target and one single "escape rule".

expenditure-based indicator is envisaged for setting and assessing fiscal policies, reducing complexity in the fiscal surveillance framework. The indicator involves setting an upper limit for the growth rate of government expenditure. It is considered an operational and easy-to-measure target that can guide member states in the preparation and monitoring of their budgets. The structural balance indicator will remain an essential part of the fiscal surveillance framework."

### 2.3 The output gap in the flexibility clauses

In its communication of January 2015 "[Making the best use of flexibility within the existing rules of the SGP](#)", the Commission introduced the output gap in one of the **flexibility clauses** used to assess the adherence of a Member State to the preventive arm of the SGP. This clause allows account to be taken of "good" and "bad" economic times: to this scope, the Commission defined five "output gap intervals" in order to assess the annual fiscal adjustments towards the MTOs. Table 3 shows the fiscal adjustments that Member States are expected to make in order to keep or reach their MTOs, taking into account their respective cyclical position.

**Table 3: Annual fiscal adjustments towards the MTOs under the preventive arm of the SGP**

Required fiscal adjustment (pp of GDP)						
Economic Cycle	Output gap and real growth levels	Debt < 60 % and no sustainability risk		Debt > 60 % or sustainability risk		
		Growth < Potential	Growth > Potential	Growth < Potential	Growth > Potential	
Exceptionally bad	Output gap < -4% or real growth < 0	No adjustment needed				
Very bad	-4% ≤ output gap < -3%	0		0.25		
Bad	-3% ≤ output gap < -1.5%	0	0.25	0.25	0.5	
Normal	-1.5% ≤ output gap < +1.5%	0.5		> 0.5		
Good	Output gap ≥ +1.5%	> 0.5	≥ 0.75	≥ 0.75	≥ 1	

Source: COM Communication '[Making the best use of flexibility within the existing rules of the SGP](#)'.

### 2.4 "The use of a "plausibility tool"

In November 2016, the Commission [published](#) some information on an agreement reached within the Output Gaps Working Group regarding:

- the **revision of the methodology** for the estimation of the potential output and
- the implementation of the "Agreement to examine **the plausibility of output gap estimates**".

The output gap used in the Commission [Autumn forecast](#) of November 2016 was estimated by applying the revised methodology, with specific reference to an indicator used in the calculation of potential output (namely the so-called "non-accelerating wage rate of unemployment" (NAWRU) that measures the non-cyclical component of unemployment, see Annex 2).

Furthermore, the Commission introduced a new "plausibility tool" for the output gap, that could be used to signal cases where the results of the agreed methodology seem economically counter-intuitive. The plausibility tool provides an alternative country-specific estimate of the output gap for the current year, based on a statistical assessment methodology discussed in the OGWG: "*When the difference between the alternative estimate and the estimate on the basis of the common method exceeds a certain threshold, this indicates that the output gap based on the common method may be "counterintuitive"*". In this case, the range between the two estimates constitutes a plausibility range, within which a plausible level of the output gap can be identified by the Commission and used as an additional qualitative factor to be considered (only) in the context of the Commission's fiscal assessments.



In April 2017, the Commission published an [Assessment of the plausibility tool](#), giving emphasis on the correct interpretation of the findings from the tool and explaining the observed differences between the “Production function” methodology<sup>6</sup> and the plausibility tool. Such procedure, introduced in the [Autumn 2016 forecasts](#), improved the understanding of the uncertainty surrounding the estimates of the output gap. The note described the “Plausibility tool” as an empirically-based statistical model, which uses a comprehensive list of cyclical indicators and can be used to provide a measure of confidence about any estimate of the output gap.

In **February 2020**, the Commission published a [review](#) of the economic governance legislation, which included a [communication](#) (see Box 4), a detailed [report](#) and the opening of a public [consultation](#) on possible ways to enhance its effectiveness.

**Box 4: Extract from the [Commission communication](#) on the current framework**

*“The fiscal framework (which includes the secondary legislation and other documents that provide more details and transparency on how surveillance is carried out in practice) has grown excessively complex. This complexity results from the framework pursuing multiple objectives and the need to cater for a wide variety of evolving circumstances, including by the use of flexibility, in a context of divergences of views among Member States. It is reflected in a very detailed codification, encompassing several operational indicators of which a number are non-observable and frequently revised, as well as a variety of escape clauses. As a result, the fiscal rules have become less transparent, hampering predictability, communication and political buy-in.”*

### 3. Criticisms on the use of potential output and related estimates

The concepts of structural budget balance, output gap and potential output, and the methodology used to estimate them, have been subject to some criticisms since 2014, focussed on their reliability and complexity.

#### 3.1 Early criticisms (2014 – 2016)

An early wave of criticism started from a paper of the [Deutsche Bundesbank](#) of April 2014. This study focussed on G7 countries and warned about the high degree of uncertainty of output gaps estimates, expressing doubts about their use in economic policy. The uncertainty regarded the scale of revisions of output gaps estimates, the relatively frequent changes of output gaps signs and the considerable overestimation of major economies` potential output in the years preceding the great financial crisis started in 2007.

In July 2014, the [CPB Netherlands Bureau for Economic Policy Analysis](#) pointed out that using the structural budget balance as the indicator of a government fiscal effort and as a policy target presents the following drawbacks: (1) it is highly dependent on the volatile and often-biased output gap estimates; (2) it can give wrong signals, showing substantial adjustments when there is none, or significant policy changes offset by output gap revisions; and (3) it is subject to diverging estimates by different institutions, leading to confusion and diverging assessments of the national fiscal policies.

In October 2015, the [Commission](#) assessed the relative quality of its estimates of output gaps. It recognised errors in the estimation of output gaps for the years preceding the crisis, but showed that errors were much smaller than those of the IMF and the OECD. It also stressed the importance of continuing to improve the EU’s commonly agreed methodology (discussed in the [Output Gaps Working Group](#)).

In March 2016, the Ministers of finance of eight Member States (Italy, Spain, Latvia, Lithuania, Luxembourg, Portugal, Slovenia and Slovakia) sent a [letter](#) to the Commission expressing their concerns regarding the estimation of potential output. They asked the Commission to extend the length of its forecast horizon from two to four years, while noting “*More substantial doubts have been raised about the commonly agreed*

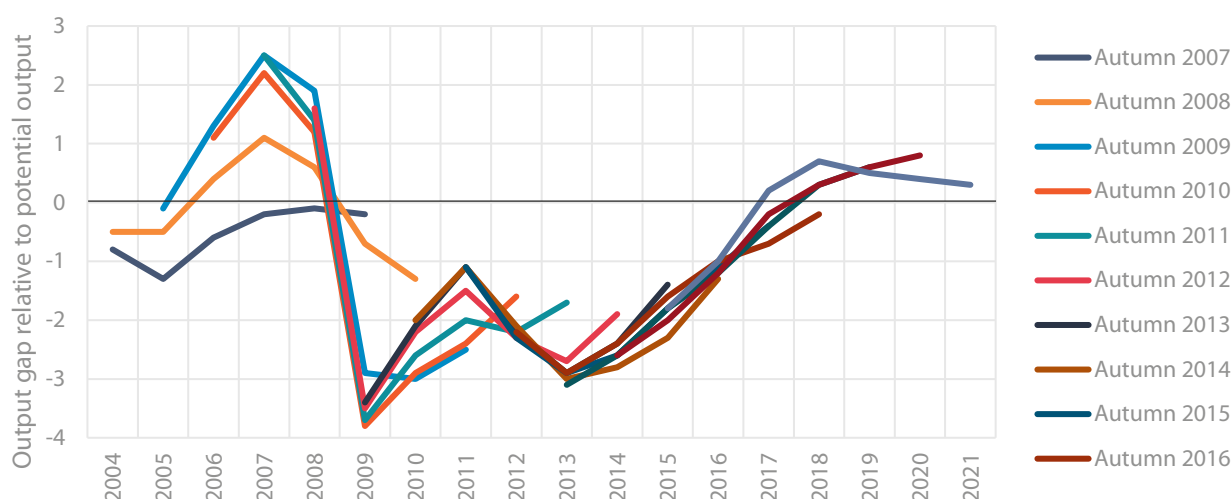
<sup>6</sup> Please see Annex 2 for an overview and Annex 3 for bibliographic references.

methodology and it has also been suggested to complement the output gap with other indicators. While these concerns are not the topic of this letter, we support an intensification of the technical work on the matter”.

In its [Special Report](#) of April 2016, the European Court of Auditor examined the Commission’s implementation of the Excessive Deficit Procedure between 2008 and 2015, focusing on six member States, and recommended the Commission to improve its transparency<sup>7</sup>.

Graph 2 presents the estimates and the forecasts of the output gap produced by the Commission from 2007 to 2019, for years from 2004 to 2021: it shows how estimates and forecasts vary over time. For year 2007, the current forecast projected a slightly negative output gap; in 2008, the estimate for 2007 was revised upwards, as it happened again in 2009 and in 2010: therefore, policies for that year revealed inadequate (with hindsight). For the years from 2011 to 2014, the Commission expected reduction of the (negative) output gap that did not materialize.

**Graph 2: Commission's Estimates of Output gaps, euro area, years 2004 - 2021**



Source: EGOV based on Statistical Annexes Commission’s Autumn [Forecasts](#), 2007-2019.

### 3.2 Recent criticism

In spring 2019, [Brooks and Basile](#) and [A.Tooze](#) raised doubts on the reliability of the output gap as an accurate measurement of the state of the economy in the business cycle, starting a second wave of criticisms, also known as “campaign against non-sense output gaps” (CANOO, see a summary in this [Bruegel blog](#)). Attention focused mainly on Italy and Spain, for which the Commission estimated an output gap close to 0, with the output gap for Germany at 0.2. This seems very implausible to the CANOO authors, also in view of the level of unemployment in these countries (9.7% in Italy, 14.0% in Spain and 3.0% in Germany, in May 2019, [Eurostat](#)). They argued that potential output estimates are the outcome of models that incorporate past economic performance<sup>8</sup> and therefore are heavily affected by the magnitude of recessions; as a consequence, potential output for Spain or Italy (that were hit hard by the crisis) decreased not because of fundamentals, but because of statistical effects. The higher recessions, the lower the potential output, the lower the output gaps.

The Commission applies a production function methodology for estimating the potential output (see Annex 2), which uses three main components: labour (employment), capital (investments) and Total Factor Productivity (TFP, that measures the efficiency of the economy).

As noted by the [ECB](#), the deterioration of these components determines a permanent loss of potential output after a crisis:

- Recessions are often followed by increases in structural **unemployment**, as shown by [Blanchard and Summers](#): this phenomenon is known as *hysteresis effect*, characterized also by downward rigidity of

<sup>7</sup> The European Court of Auditors published reports on the EU fiscal governance also in [2018](#) and in [2019](#).

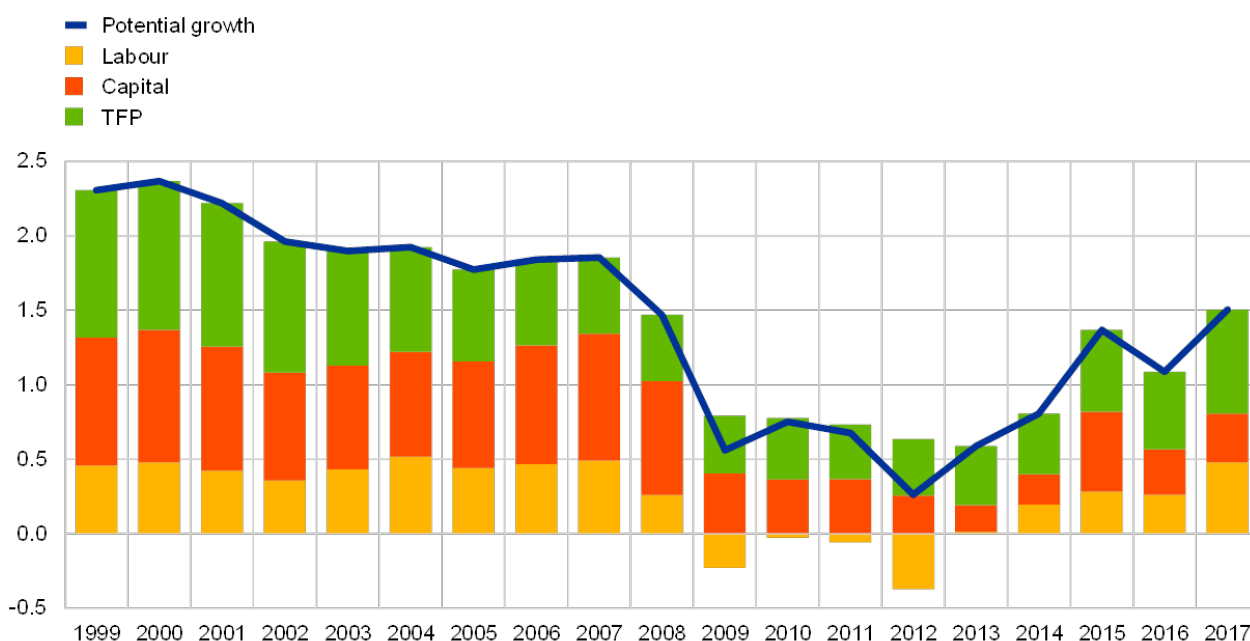
<sup>8</sup> This is explicitly recognised by the [European Commission](#) (p. 68)

prices and wages. Furthermore, high emigration reduces the supply of domestic labour, fundamental for the growth of potential output. Also demographic changes (e.g. ageing population) have a significant negative impact on potential output ([Deutsche Bundesbank](#)).

- The other important driver of loss of potential output is the reduction in productive **investments**, which decreases the level of capital in the production function. The [ECB](#) points out that the capital was the main driver of the decline of potential output growth in the latest years, when the contribution of investments to growth was lower than in the pre-crisis period, as it is clear from Graph 3. Indeed, in the post-crisis period, public investments were low because of budgetary constraints. In general, public investments are positively correlated to private investment (see [ECB](#)), and the very low share of public investments over GDP was recorded together with low private investments.
- Finally, the global financial crisis exacerbated the decline in **TFP growth** and some Euro Area countries, such as Italy, experienced prolonged periods of low productivity growth. [Buti et al.](#) highlighted that this has a lasting impact on potential output growth, since productivity has a determinant role in long-term economic growth.

Graph 3 shows the decomposition of potential output growth in these three components: labour, capital and TFP. It can be noted that the “capital component” was high from 1999 to 2008, and shrank thereafter; the employment component dropped in 2009 and started recovering in 2014.

**Graph 3: Decomposition of potential output growth of EA19, 1999-2017**



Source: [ECB Economic Bulletin](#), 2018.

Nevertheless, the CANOO authors claim that assuming elevated levels of structural unemployment is “extreme”: this leads to underestimations of potential output, with consequent underestimation of output gaps and recommendations for economic policies that do not act countercyclically. Their analysis would be consistent with Phillips curves that relate inflation and unemployment<sup>9</sup>.

<sup>9</sup> In September 2019, the ECB hosted a conference on “[Inflation in a changing environment](#)”, aimed at enhancing the understanding of why price inflation has been so difficult to stimulate, as of yet, in the aftermath of the global financial crisis. by showcasing frontier research into the topic from academia and policy institutions.

See also: [ECB \(2017\)](#), which provides a discussion about possible nonlinearities in the Phillips curve, One of the theories that imply a rationale for such behaviour of inflation during recessions is the “capacity constraint model”, which argues that if aggregate demand increases during recessions—as a result possibly of successful expansionary monetary or fiscal policy—firms would be able to satisfy the additional demand by producing more and hence see little incentive to raise prices.

[Kimball \(2017\)](#): this blog presents an explanation and provides some interesting referencs. It notes that a range of different macroeconomic theories have the property that a zero output gap is consistent with any constant inflation rate, e.g. models that



In September 2019, [Buti et al.](#) replied to these criticism. They noted first that the introduction of the concepts of potential output, structural balance and output gap in the EU fiscal framework represented an improvement, when compared to the strict nominal “Maastricht rules”, which do not take into account the business cycle and the need of countercyclical policies. Second, they reminded that the estimates of output gaps obtained applying the Commonly Agreed Methodology (set in the Output Gaps Working Group) performed better than other relevant indicators (inflation, unemployment or external imbalances), as shown by [Roeger et al. \(2019\)](#). Third, they note that the “plausibility tool” introduced in 2016 allow for an element of judgement in the application of the fiscal surveillance framework: indeed, if potential output estimates are significantly different from plausible estimates based on cyclical indicators (see [Hristov et al. 2017](#)), the principle of “constrained judgement” is used in setting the pace of adjustment to the MTO. Overall, the fiscal surveillance implementation does not follow a rigid and mechanical approach based on output gaps, while trying to keep the fiscal assessment predictable.

In 2019, the [IMF](#) investigated the revisions of its output gaps estimates for EA19 countries from 1994 to 2017, published in the World Economic Output (WEO). It found that real-time estimates of output gaps are systematically biased and they are largely revised in later vintages. This is essentially due to the over-estimation of potential output. In countries where potential growth (and consequently output gap) is overestimated to a larger extent, primary fiscal balances tend to be lower and public debt ratios are higher and increase faster than projected. To the extent that estimates play a role in calibrating fiscal policy, over-optimism about long-term growth could contribute to excessive deficits and debt build-up.

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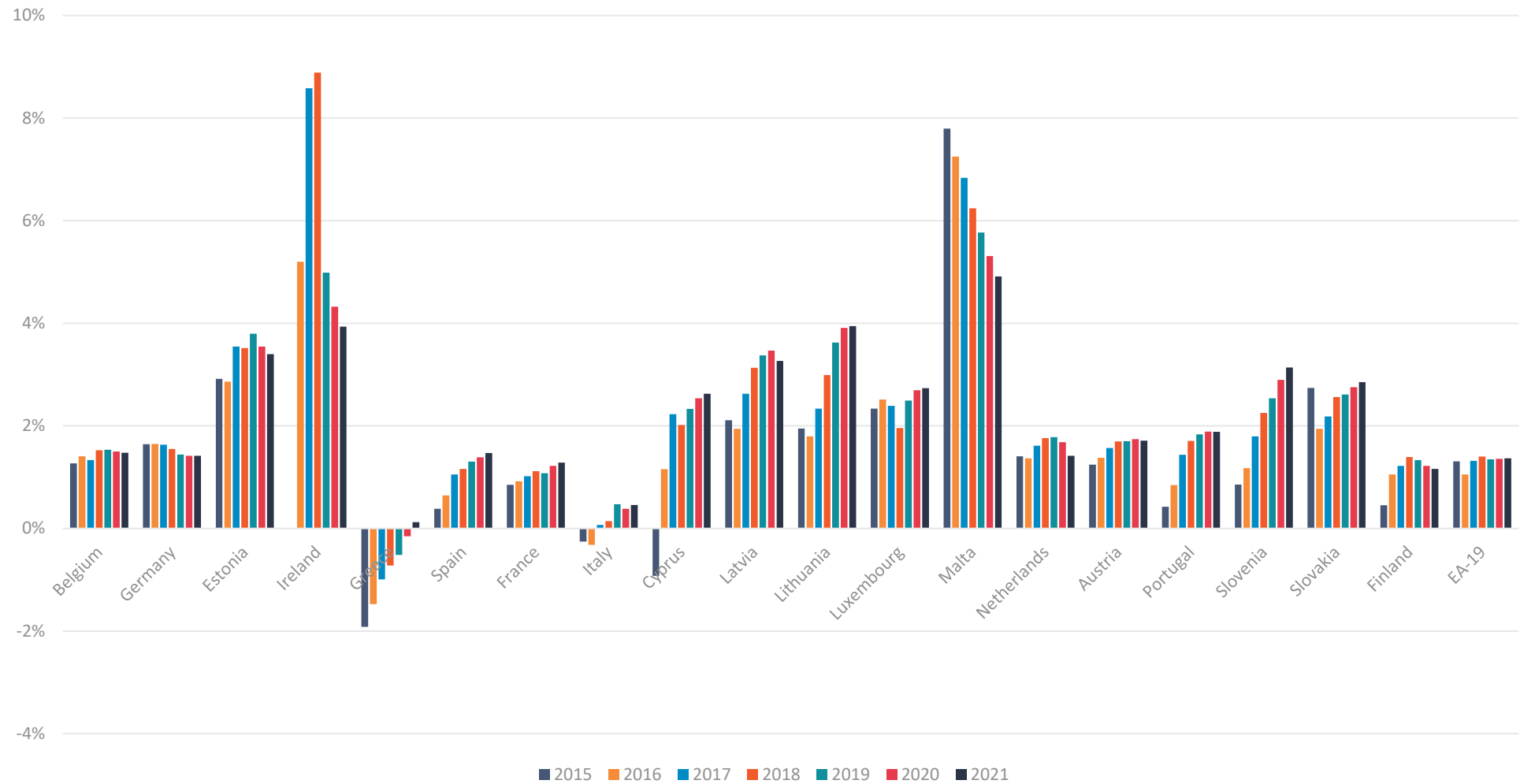
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have a simple Calvo pricing mechanism, which predicts that that an increase in expected future output gaps will make inflation jump up, while a current positive output gap is associated with inflation gradually falling, with the direction reversed for negative output gaps.

In February 2018, the Policy Department of the EP published a collection of papers on “[An economic recovery with little signs of inflation acceleration: transitory phenomenon or evidence of a structural change?](#)”, in view of the Monetary Dialogue with the President of the ECB.

### Annex 1: Estimates and forecast of potential growth in EU Member States, EU and EA, 2015-2021



Source: [COM - Autumn Economic Forecast 2019](#). The estimate for Ireland in 2015 is not included in the figure.

## Annex 2: Potential output and structural budget balance methodologies

Estimates of potential output are essentially based on two classes of models:

- **Time series observations:** the cyclical component is identified and subtracted from the real GDP time series to obtain the trend component by means of extrapolation.
- **Production function:** the output of the economy is considered as the outcome (function) of its human capital, investments and productivity. The potential output is obtained on the basis of estimates of these components and their developments.

Quite often, the two classes of models are combined.

The [Commission](#), the [IMF](#) and the [OECD](#) estimate potential output via a production function approach, as function of trend capital, labour and total factor productivity:

- **Capital** depends on past capital stock, investments, and depreciation rate, ranging from 1 % for computer hardware and equipment to 30% for housing. Owing to its smoothness and stability, capital is identified with trend capital. It is assumed that there are no cycles for capital stock: any increase in investment enters directly in the production function and increases potential output.
- **Labour** is defined in terms of hours worked, and is calculated as a product of population projections, participation rates, hours worked and the non-accelerating wage or inflation rate of unemployment. Trend labour is the product of its trend components.
- **Total factor productivity (TFP)** measures productivity growth independent from capital and labour, such as technology improvements, as a difference between output and input components. The trend is obtained by [filtering](#) its time-series. As the TFP is a doubly-indirect indicator, expressed as a residual of unobservable quantities, it is very difficult to estimate.

The main differences between the three methodologies are the following:

- The OECD labour component is calculated on the basis of the non-accelerating inflation rate of unemployment (NAIRU), which is the level of unemployment below which prices rise;
- The Commission labour component is calculated on the basis of the non-accelerating wage rate of unemployment (NAWRU), which is the level of unemployment below which wages rise;
- The IMF methodology differs from country to country, but a production function approach predominates for advanced economies.

All three international institutions compute the cyclically adjusted balance (CAB) as the product of the output gap and a budget coefficient known as a sensitivity or semi-elasticity parameter. As a result, the cyclical budget balance varies in accordance with the output gap, with the structural budget balance reproducing the behaviour of the real balance when the economy is at its full potential.

### The ECB structural budget balance methodology

The [ECB](#) disaggregated methodology estimates the CAB directly from its main components, such as revenues (taxes) and expenditures. In this respect, it differs from the Commission, IMF and OECD methodologies, as it does not make use of the concept of output gap. The ECB methodology defines the cyclical components of each item as the difference between the real and the potential component, as well as separate corresponding elasticity factors. The total cyclical component of the budget balance is obtained in two ways: by summing the cyclical components of each budget item and by computing it on the aggregated GDP time-series; the difference between the two definitions is known as composition effect. The ECB methodology allows for an interpretation in terms of tax and expenditure.

## ANNEX 3 - Selected bibliographic references

The literature about potential output, output gap and their computation methodologies is extremely wide. Here some of recent or relevant source references on the subject, in chronological order.

- A.M. Okun, *Potential GNP: Its Measurement and Significance*, Proceedings of the Business and Economic Statistics Section, American Statistical Association, pp 98–104, 1962.
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