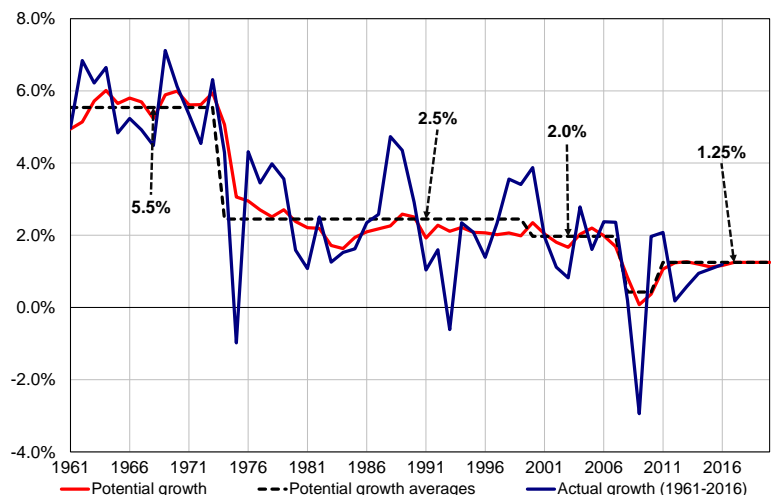


Potential growth in France

- Economic assessment often relies on the estimates of potential growth and the output gap, an indicator which describes the position of the economy in the cycle. As these notions allow for the breakdown the general government balance into its structural and cyclical components, they also have a strong bearing on the steering of public finances.
- The uncertainty surrounding estimates of these concepts makes it difficult to use them to guide economic policy. For instance, in 2007, most analysts considered the output gap to be slightly negative, whereas now, with hindsight, it is thought that it was highly positive at the time and, therefore, that the economic cycle was at a peak.
- Whilst prior to the 2008 crisis, the French economy's potential growth rate was around 2%, it is expected to be in the order of 1¼% between 2017 and 2020. The main reasons for this slowdown are the lower growth rate of total factor productivity (TFP) and a smaller contribution of capital. The slowdown in TFP is common to all advanced economies and may reflect both a general trend towards slower technological progress and the long-term fallout from the 2008 crisis.
- It is estimated that the output gap was approximately -1½% in 2016. This implies that the French economy could experience a temporary recovery during which actual growth may outstrip potential growth.
- Public policies may have a positive impact on potential growth by reducing structural unemployment and boosting productivity and investment. This is the case for labour market and training reforms, or support for innovation.
- This scenario is close to that of the international organisations, in particular the European Commission. It is similar to those of the IMF and OECD – even though these organisations consider that the output gap was wider in 2016.

Potential growth scenario



Source: INSEE, DG Trésor calculations.

1. Potential growth and the output gap are useful for economic analysis but their estimates are surrounded by uncertainty

1.1 Potential growth and the output gap are used for economic analysis and forecasting, and for steering public finances...

Potential GDP is usually defined as the level of output that an economy can sustainably produce using its full capacity, but without causing inflation to rise. Potential growth is the growth rate of potential GDP. The output gap measures the gap between actual GDP and its potential level, and therefore points to the position of the economy in the cycle.

Potential growth and the output gap are central to economic analysis and may be used for economic forecasting. For instance, if an economy's output gap is negative – as is currently the case for France (–1.3% of potential GDP in 2016 according to the European Commission) – this means that there is catch-up capacity and that, in the medium run, the economy should be able to temporarily record growth above its potential growth rate to narrow the output gap.

Estimates of the output gap and potential growth also allow fiscal policy to be steered across economic cycles by breaking down the general government balance into its structural and cyclical components. The structural balance is the theoretical balance if GDP achieved its potential; it therefore represents the general government balance adjusted for cyclical effects. As tax revenue is very largely dictated by business activity, should GDP be below its potential level, general government subsectors will collect less revenue. In this case, their cyclical balance will be negative, meaning that the structural balance is healthier than the headline balance.

1.2 ... but they are not directly observable, which makes their measuring uncertain

As potential growth and the output gap are not directly observable, it is difficult to measure and forecast them accurately.

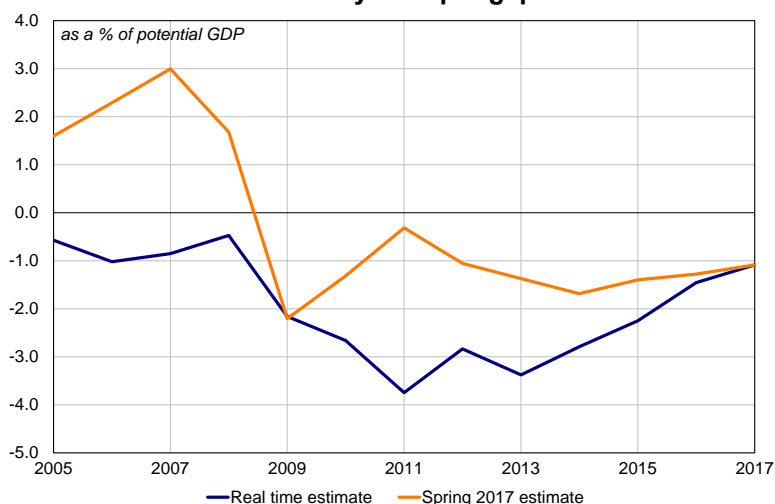
There is great uncertainty concerning the extent of the output gap for a given year, especially in the recent past and for the forecasting period. Estimates in this respect are therefore frequently adjusted *ex-post* (see Chart 2). In spring 2007, the European Commission estimated that the 2007 output gap was slightly negative (–0.9 percentage points) whereas, now, with hindsight and our knowledge of the 2008-2009 crisis, the Commission considers that the figure was in fact very positive (+3.0 percentage points).

Uncertainty also surrounds estimating potential growth, particularly in respect of forecasting. However, the range of potential estimates is restricted by the fact that potential growth cannot lastingly diverge from observed growth. For instance, a potential growth estimate that is constantly higher than actual growth would cause a steady widening of the output gap. This would show that the estimation method is unable to account for economic cycles.

Furthermore, a number of methods, that can generate different results, may be used to estimate potential growth: a structural approach based on a production function, a semi-structural approach including econometric equations, a direct approach using cyclical data, and the use of statistical filters.¹

¹ See, for instance, OBR Working Papers (Jamie Murray, “Output gap measurement: judgement and uncertainty”, *Working Paper* No. 5, OBR, 2014.) or INSEE (Lequien and Montaut, “*Croissance potentielle en France et en zone euro: un tour d’horizon des méthodes d’estimation*”, INSEE, *Working Paper* No. G2014/09, 2014).

Chart 2: Ex-post adjustments of the estimate of the French economy's output gap



How to read this chart: The orange curve shows the output gap estimate according to the European Commission's final Spring 2017 Economic Forecast, whilst the blue curve shows, for each year Y, the estimate made by the Commission in spring of year Y.

Source: European Commission.

Box 1: Potential growth estimate method

This potential growth estimate overview is based on production function methodology. With this modelling, GDP is connected to total factor productivity (TFP) and to labour (L) and capital (K) factors by a Cobb-Douglas function: $GDP = TFP \times L^\alpha \times K^{1-\alpha}$

The output gap (OG) amounts to the difference between GDP and potential GDP, measured in % of potential GDP:

$$OG = \frac{GDP - GDP^*}{GDP^*}$$

Potential GDP is calculated by estimating its three constituent elements: potential productivity, capital and labour. To estimate the potential level of the labour factor, it is broken down into the trend in hours worked per person, trend labour force and structural unemployment:

- The **trend in hours worked per person** is calculated by smoothing the entire series using a statistical filter. For forecasting purposes, the series used by the filter is fixed and this slightly extends the downtrend of potential hours.
- The **trend labour force** was derived from INSEE series and subsequently, as from 2016, from its forecasts published in May 2017.
- The **structural unemployment** used is the unemployment rate that avoids acceleration in unit labour costs, as projected by the European Commission in its Spring 2017 Forecast.

As regards the capital factor, it is assumed that the capital stock is always at its potential level ($K=K^*$). This means that fluctuations related to periods when capital is under-used will lead to lower actual TFP. For forecasting purposes, the capital stock is calculated by freezing the investment-capital stock ratio at its 2016 level (6.7%) and by holding the rate of capital depreciation at 5.5%.

TFP is the proportion of growth that cannot be explained by the growth in jobs and capital; it represents, in particular, the impact of technological advances. Being volatile by nature, actual TFP is measured as the proportion of growth that cannot be explained by labour and capital factors, in particular as jobs and the capital stock are unable to immediately adapt to shocks that have an impact on growth.

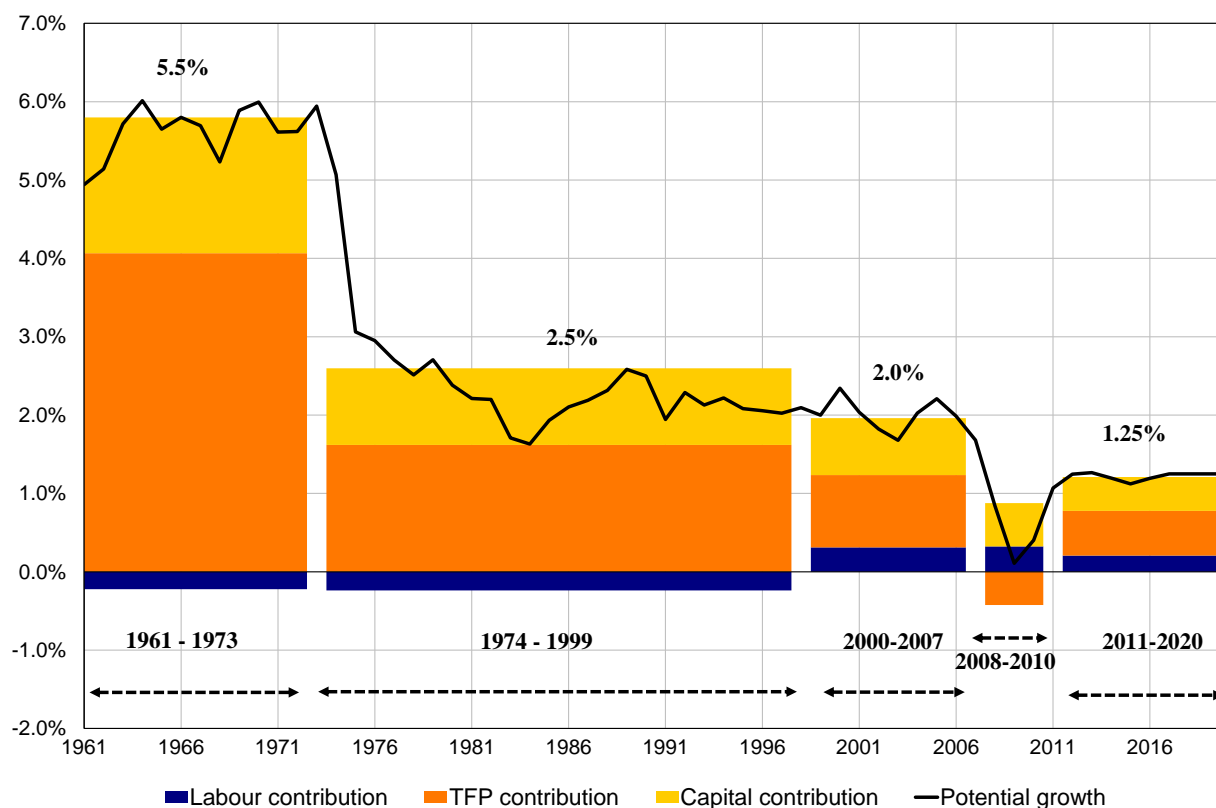
Conversely, the growth of potential TFP is more stable as it primarily reflects the principal trends in technological progress (post-war catch-up, dissemination of major innovations such as those of the second and third industrial revolutions). This scenario also assumes constant potential TFP growth over the periods. In practice, we first pinpoint breaks in the trend for actual TFP using an econometric test (Chow test). Then the potential TFP growth rate is kept constant² between these break dates (see Chart 4).

² Actually almost constant as the trend is calculated by applying a Hodrick-Prescott filter with a low correlation coefficient (0.5) to the piecewise averages.

2. The French economy's potential growth rate is expected to be around 1¼% between 2017 and 2020

2.1 From over 5% during the 1960s, potential growth has been falling after the end of the three post-war decades (Trente Glorieuses) to around 2% during the period prior to the crisis

Chart 3: Potential growth and average factor contribution since 1961



How to read this chart: Between 1974 and 1999, potential growth was at an average of 2.5%, the contribution of the labour factor was -0.2% (blue bar), that of capital was 1.0% (yellow bar) and that of TFP was 1.5% (orange bar).

Source: INSEE, DG Trésor estimates.

From 1961 to 1973, it is estimated that potential growth was around 5.5% on average. Against a backdrop of technological catch-up and upgrading of the economy, potential growth would have been mainly buttressed by total factor productivity (average contribution of 4.1% over the period) whilst it is thought that the strong investment momentum (average of +7.4% per year) supported the capital contribution (average of +1.7% per year). Lastly, despite a thriving labour force, the contribution of the labour factor was probably slightly negative (-0.2%) owing to the downtrend in hours worked per capita.

The recession in 1973-1974 in the wake of the oil crisis signalled a marked change in productivity trends (1.5% per annum between 1974 and 1999 compared to a previous figure of 4.1%). It is thought that this downturn also dragged potential growth down to around 2.5% for the period. The contribution of capital also fell (+1.0% after an average of +1.7% per year) whilst the labour factor is estimated to have had a slight adverse impact on potential growth, again due to the downtrend in hours worked per capita, but also owing to the rise of structural unemployment as from the mid-1970s.

In the late 1990s, it is thought that the French economy experienced a further fall in the TFP uptrend (around 1.0% between 2000 and 2007 compared to a previous figure of 1.5%). Less investment momentum, which had already been noted since the early 1990s, is estimated to have had a negative effect on the contribution of capital (an average of +0.7% between 2000 and 2007), but this was probably offset by a higher contribution from the labour factor (an average of +0.3% per year after -0.2%), owing to a lesser downtrend in hours worked per capita and the levelling off of structural unemployment. Overall, it is estimated that potential growth was around 2.0% per year for the period after 2.5%.

2.2 Since the end of the 2008-2009 crisis, potential growth is thought to have been around 1.25% due to a slowdown in productivity compared to the pre-crisis period

Table: Assumptions for potential growth and contributions

	2017-2020 average
Potential growth	1.25 %
TFP*	0.6/0.7 %
K*	0.4/0.5 %
L*	0.1/0.2 %

Potential growth is expected to be in the order of 1.25% between 2017 and 2020. The factors of production and productivity each contribute equally to this scenario.

On the basis of the assumptions set out in Box 1, hours worked per capita should contribute an average of $-0.1/0.0\%$ to potential growth per year out to 2020. The contribution of the labour force is expected to be $0.1/0.2\%$. The fall in structural unemployment should therefore contribute an annual average of $0.0/0.1\%$ between now and 2020, and therefore, overall, the labour factor is expected to contribute an annual average of $0.1/0.2\%$ for the period. Due to an investment-capital ratio which is less sustained than in the 2000s, it is thought that the accumulation of capital will contribute an average of $0.4/0.5\%$ to potential growth for the period 2017 to 2020, down around 0.3% compared to the period 2000-2007.

With this scenario, between 2017 and 2020, trend productivity growth is expected to be less than its pre-crisis rate ($0.6/0.7\%$ per year compared to 1.0% previously), without offsetting the shock on potential output level observed during the crisis.

In spite of a major downturn during the crisis (an aggregate of -3.0% during 2008-2009), TFP has only very marginally recovered (an annual average of $0.5/0.6\%$ between 2010 and 2016). Furthermore, whilst the capacity utilisation rate in industry is close to its pre-crisis level, offsetting the 2008-2009 shock on potential output level seems very unlikely. Under our scenario, potential TFP is estimated to have fallen between 2008 and 2010, putting a drag on potential growth for the period which is thought to have been around 0.5% on average during the crisis.

The slowdown in post-crisis TFP trends is due to factors that are common to all advanced economies. These include the global downtrend since 1970 owing to the impact of technological advances (see Gordon, 2012), along with other explanations. For instance, the IMF³ has demonstrated that severe recessions have been traditionally associated with downturns in productivity as they go hand-in-hand with poor capital allocation between companies, lower business investment (in particular in R&D and in the most-innovative projects, which can reduce the standard of capital and therefore of TFP), or greater uncertainty. The fall in productivity may also have been compounded by the slowdown in trade integration and the knock-on effect of the opening-up of China.

In light of the foregoing, we have chosen a TFP growth scenario of less than its pre-crisis average but slightly above the average since 2010 (see Chart 4). The structural reforms rolled out at the end of the previous five-year Presidential term (in particular, reforms to promote competition and streamlining, reforms of the labour market and labour-management dialogue⁴) foster productivity. However, these reforms have not yet taken full effect. TFP is also buttressed by the potential of French businesses to catch up as regards digital technologies and the rise of private R&D expenditure with the ramping up of the Research Tax Credit (*Crédit Impôt Recherche*).

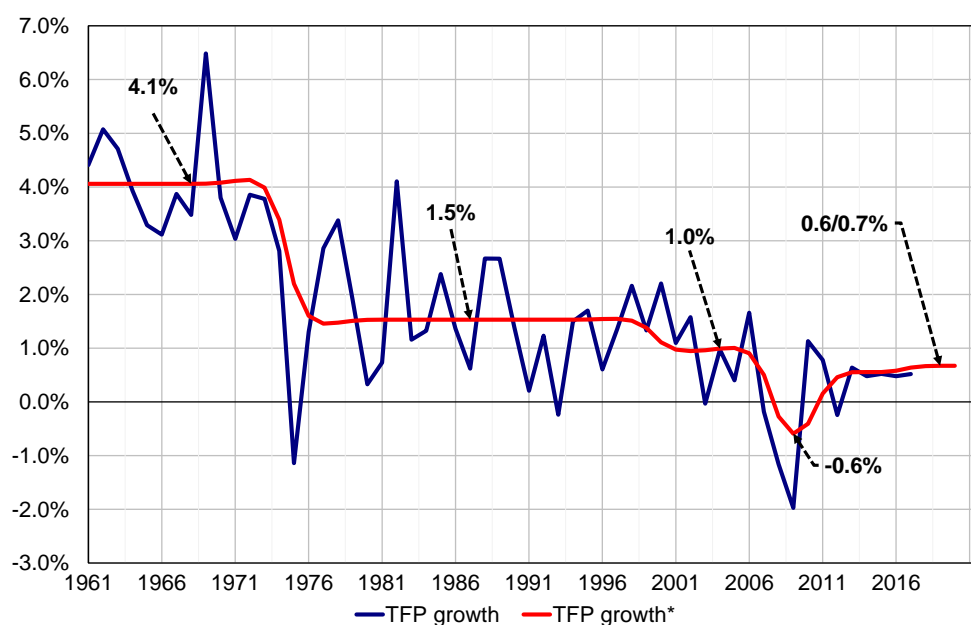
Nevertheless, this final point is still being discussed by economists, some of whom (“techno-pessimists”, see Gordon, 2012) consider that the impact of digital technologies on productivity has already been widely felt and that, therefore, the current slowdown is set to continue. Others (“techno-optimists”, see Brynjolfsson et McAfee, 2014) believe that major repercussions are ongoing and still to come and posit, in particular, that the national accounts poorly measure the productivity gains generated by the digital economy and that the timelines

³ *Gone with the Headwinds: Global Productivity*, IMF Staff discussion note No. 17/04, 2017.

⁴ These measures foster productivity as they enable better matching of supply and demand on the labour market and qualifications to be bolstered.

for disseminating and taking up the most ground-breaking technologies throughout the economy may be very long (see David, 1990 concerning electricity).

Chart 4: Scenario for trend TFP



Source: INSEE, DG Trésor estimates.

2.3 Public policies may affect potential growth

The trend for productivity is dictated, inter alia, by the standard of the education and vocational training systems,⁵ incentives and support for innovation⁶ and the level of competition. The structural unemployment rate reflects the functioning of the labour market; this may be improved by changes to labour law and labour-management dialogue or by a reduction in the tax wedge between labour costs and net wages, whereas the labour force is largely dependent on the rules governing the pension system. Lastly, productive investment may be fostered through tax breaks or partly assumed by the public authorities as regards infrastructure by backing the most profitable projects from a socio-economic standpoint.

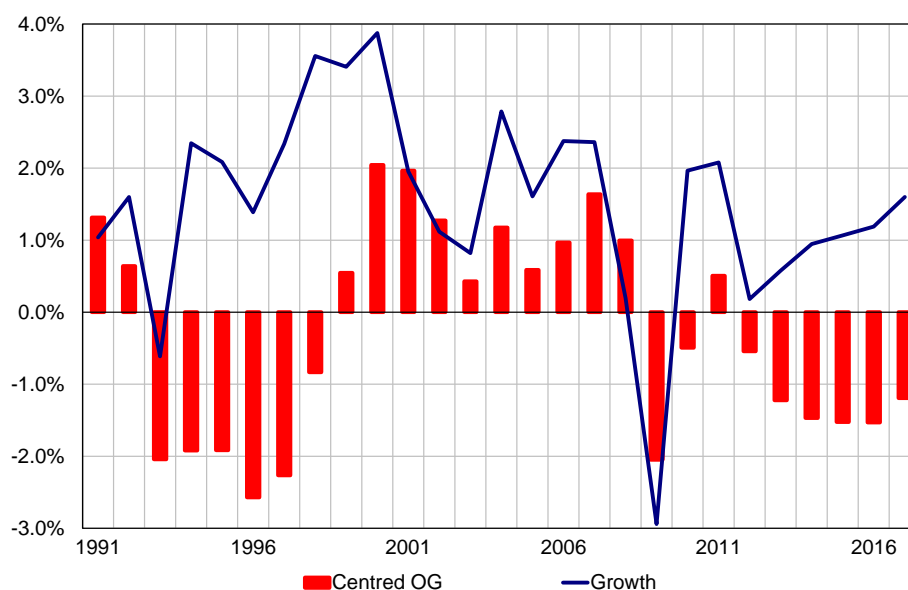
3. The estimated output gap for 2016 is approximately $-1\frac{1}{2}\%$

Potential growth points to the variation in the output gap but not to the level of potential GDP and therefore the extent of the output gap. Potential GDP is calculated using the assumption of an average output gap of zero over a period encompassing an entire number of economic cycles (1991 to 2011 for our purposes) between the economic peak in 1990 prior to the European Monetary System crisis in 1992-1993 and that of 2011 prior to the euro area debt crisis. This centring assumption is crucial for steering public finances as the cyclical balance will also be zero on average.

⁵ See, for instance, Anne-Braun J., Lemoine K., Saillard E., Taillepiéd P. (2016), “Initial and continuing education: the implications for a knowledge-based economy”, *Trésor-Economics* no. 165.

⁶ See, for instance Rabier L. (2017), “Patents and Technical Standardisation: how to balance Competition and Innovation?”, *Trésor-Economics* no. 193.

Chart 5: Output gap scenario



Source: INSEE, DG Trésor estimates.

It is therefore estimated that the output gap was approximately $-1\frac{1}{2}\%$ in 2016. After being above $+1\%$ in 1991, the output gap was negative until the end of the 1990s owing to the recession in 1993 and the 1997 downturn. On the back of an improved global economy, it recovered to $+2.0\%$ in 2000 and 2001 and remained positive until 2008. During the “Great Recession”, the output gap widened considerably to -2.0% in 2009. The economic recovery as from 2010 and the assumption of a fall in potential growth caused the output gap to be fleetingly positive in 2011 before the slowdown caused by the euro area debt crisis. Since 2014, growth has increased at an annual rate of around 1% , i.e. less than potential growth, and the output gap widened slightly over the period to reach $-1\frac{1}{2}\%$ in 2016.

4. A scenario close to that of the international organisations

The potential growth scenario presented is close to that of the European Commission⁷ for France, i.e. around 1.2% for 2017-2020. The 2016 output gap ($-1\frac{1}{2}\%$) is also similar to the Commission’s projection (-1.3%). The potential growth scenario decided on for 2017-2018 is almost the same as that of the OECD⁸ (average of $1\frac{1}{4}\%$ vs 1.2% for the OECD). In relation to the IMF’s scenario,⁹ the selected potential growth rate is similar in 2017-2018 ($1\frac{1}{4}\%$ as against 1.2% for the IMF) but lower for 2019-2020 ($1\frac{1}{4}\%$ compared to 1.4%). However, the output gap was wider in 2016 at -2.2% in both the OECD and IMF scenarios.

Box 2: Comparison with the European Commission’s scenario

Broadly speaking, the European Commission’s potential growth and output gap estimates, which are used as part of fiscal surveillance of the euro area, are consistent with the scenario presented here despite different assumptions concerning the constituent elements of potential growth.

Although the structural unemployment used is that of the European Commission, labour force assumptions differ as the Commission uses the Europop medium-term population projections. Overall, the labour and capital factor contributions are slightly higher in the Commission’s scenario.

But, for recent and coming years, the Commission has chosen TFP with less momentum. Basically, this can be explained by the way in which the crisis is addressed. The Commission contends that the crisis did not cause a downward shock on the level of TFP but merely an adjustment of its growth (in spite of the factoring in of the cyclical part of the slowdown in productivity due to the under-use of production capacities). The crisis therefore had a major and lasting impact on the TFP growth rate. Indeed, smoothing out a quantity that experienced a sharp downturn leads to lower post-shock dynamics by absorbing the shock over a long period of time (illustration with a theoretical scenario in Chart 6, with an HP filter).

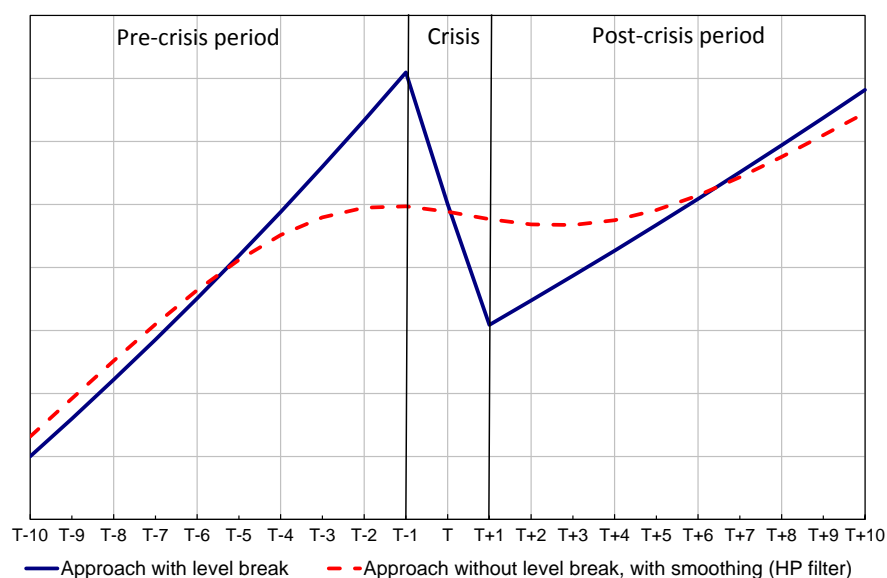
⁷ Spring 2017 Economic Forecast.

⁸ Economic Survey of France (September 2017).

⁹ 2017 Article IV Consultation with France (September 2017).

Here, a different choice was made, by deciding on a level shock on productivity during the period 2008-2010 and a slowdown of the post-crisis trend (see Chart 4). As a result, the downturn in productivity is less pronounced in our estimates (annual growth of 0.6/0.7% between 2017 and 2020 compared to 0.4/0.5% for the Commission). A number of studies point to the existence of a level shock.¹⁰ The fall in domestic R&D expenditure in the majority of developed countries (not including France) in 2009-2010 had a lasting adverse effect on the world technology frontier. Moreover, this level shock may also be partly construed as a post-financial crisis return to normal following a period of overheating buoyed up by debt and fairly accommodative monetary policies, especially in the US with the widespread rollout of subprime loans and the build-up of imbalances in the euro area between 2000 and 2007.

Chart 6: Schematic illustration of two approaches to TFP during a crisis



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This study was prepared under the authority of the Directorate General of the Treasury (DG Trésor) and does not necessarily reflect the position of the Ministry of Economy and Finance.

¹⁰ See, in particular, studies from the European Commission (“Impact of the current economic and financial crisis on potential output”, *Occasional Papers* No. 49, 2009), the IMF (“Gone with the Headwinds: Global Productivity”, *IMF Staff discussion note* No. 17/04, 2017), the Banque de France (https://www.banque-france.fr/sites/default/files/media/2016/12/05/articlelemoine-effet-de-la_-croissance_en.pdf) and the Mourougane estimate for the 2008 crisis (*Crisis, potential output and hysteresis*, 2016).