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What has been the damage of the financial crisis to Belgian GDP ?

An assessment based on the FPB's
medium-term outlook

June 2011

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Federal Planning Bureau

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Abstract - Based on a comparison between different vintages of the Economic Outlook published by the Federal Planning Bureau, this Working Paper proposes a quantification of the impact of the financial and economic crisis on Belgian GDP. As such a crisis may affect medium-term output through different channels, we also examine, using a production function approach, the contribution of each factor to the loss in potential GDP.

Jel Classification - C5, E1, O47

Keywords - Potential output, Financial crisis, Forecast revisions

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1. Introduction and executive summary

A consensus quickly emerged among national and international organizations, based on past experiences, that the financial crisis that erupted in 2008 would have a long-lasting impact on the level of output.¹ As a financial crisis could affect medium-term output through different channels, those same institutions acknowledged that the expected magnitude of the adverse effects remained a major uncertainty.² Relying on a large sample of banking crises over the past four decades in a wide range of countries, a study released by the IMF (2009) shows that variation in outcomes across country experiences is substantial. Factors such as the magnitude of the short-term output losses, the existence of policy stimuli or the external environment all have an impact on the size of the medium-term output losses.

At the early stage of the crisis, these increased uncertainties were reflected by a widening of the confidence interval surrounding potential output and output gap estimates.³ This issue was addressed for Belgium in Lebrun (2009). An initial quantification of the potential output loss imputable to the crisis for Belgium was also presented. This Working Paper provides in Section 2 an update of this analysis and examines through the successive revisions of projections made by the Federal Planning Bureau (FPB) how the perception of the crisis has evolved over the last two years and what its implications are for the medium run. This analysis shows that conformably to the philosophy of the scenario retained in May 2009, the GDP shortfall is essentially determined by the size of losses recorded in 2009-2010 as growth is supposed to return gradually to pre-crisis rates afterwards. But contrary to what was initially expected, apparent labour productivity now appears to be the principal victim of the crisis as does, to a lesser extent, the average number of hours worked, while employment is assumed to regain most of the ground lost during the crisis. This result explains the spectacular downward revisions made to the projected evolution of the unemployment rate.

Section 3 presents the same kind of evaluation but based this time on the concept of potential output which constitutes an aggregate indicator of the supply-side capacity of an economy. This approach allows correction of the revision made to the business cycle prior to the crisis, which seems now to have been more favourable than initially believed. Taking this correction into account, the shortfall in potential output is estimated to be less than 3%, close to the area-wide loss estimated for the OECD-countries⁴. This method also shows that capital deepening is the main factor behind the deficit in structural productivity while total factor productivity should return to its pre-crisis path in the medium term.

¹ See for instance Haugh et. al. (2009) or CPB (2009).

² European Commission (2009).

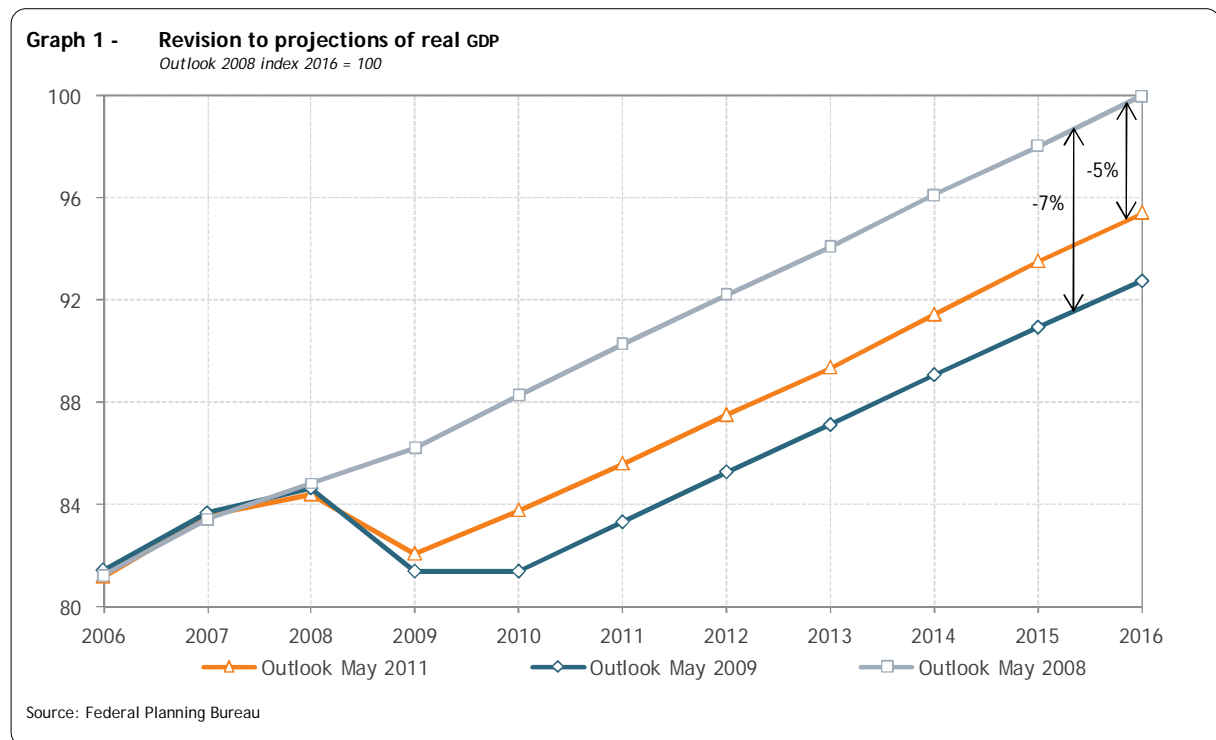
³ See ECB (2009) for a discussion on the euro area or OECD (2010b) for a comparison between estimates for the United States, the euro area and Japan.

⁴ See OECD (2010b).

2. The impact of the crisis on GDP, productivity and employment

In the literature, a methodology often used to assess the economic underperformance (“output loss”) resulting from a financial crisis is to compare the medium-term level of output to the level it would have reached if it had followed the pre-crisis trend.⁵ Without the necessary hindsight, a crude way to evaluate the medium-term impact of the latest financial crisis is to consider as pre-crisis trend the projected GDP level based on the FPB’s Economic Outlook before the outbreak of the crisis and compare it with the results of similar exercises produced after the crisis.⁶ Obviously, it remains a rough approximation because the impact of other changes has not been controlled for. For instance, public finances have deteriorated strongly since the onset of the crisis so that public debt is expected to be much higher in 2016 according to the May 2011 Economic Outlook compared to the level projected in May 2008. This calls for caution when comparing the level of GDP between the two releases as is done below. In addition, as past experiences show, substantial statistical revisions may still be possible and influence the results presented in this paper.

The upper line of Graph 1 presents the trajectory of real GDP (scaled to 100 in 2016) as projected in May 2008.⁷ The lower line represents the evolution of GDP as projected in May 2009 and constitutes a first attempt by the FPB to quantify the short- and medium-term impact of the crisis on Belgian economic activity.



⁵ See for instance CPB (2009), IMF (2009) or Cerra and Saxena (2007).

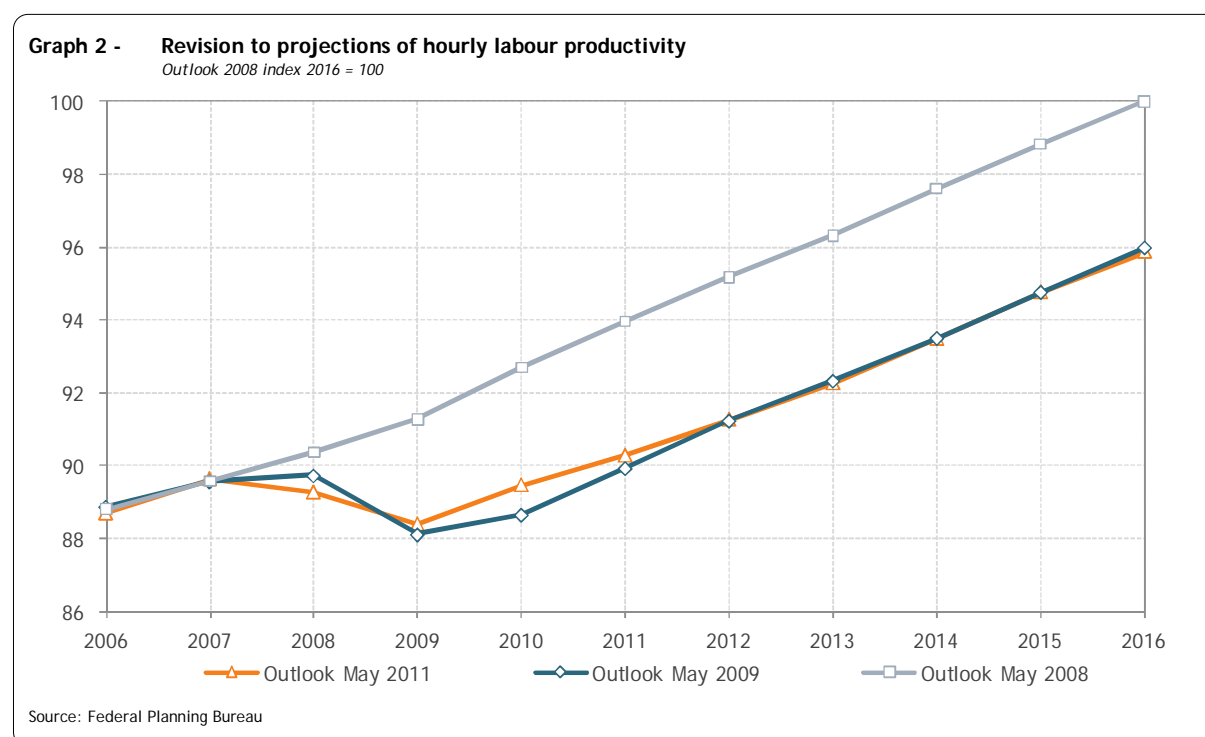
⁶ This approach has already been used in Lebrun (2009).

⁷ The published version of the Economic Outlook of May 2008 covers the period 2008-2013, however a technical extension is available till 2016. The same remark is valid for the Economic Outlook of May 2009.

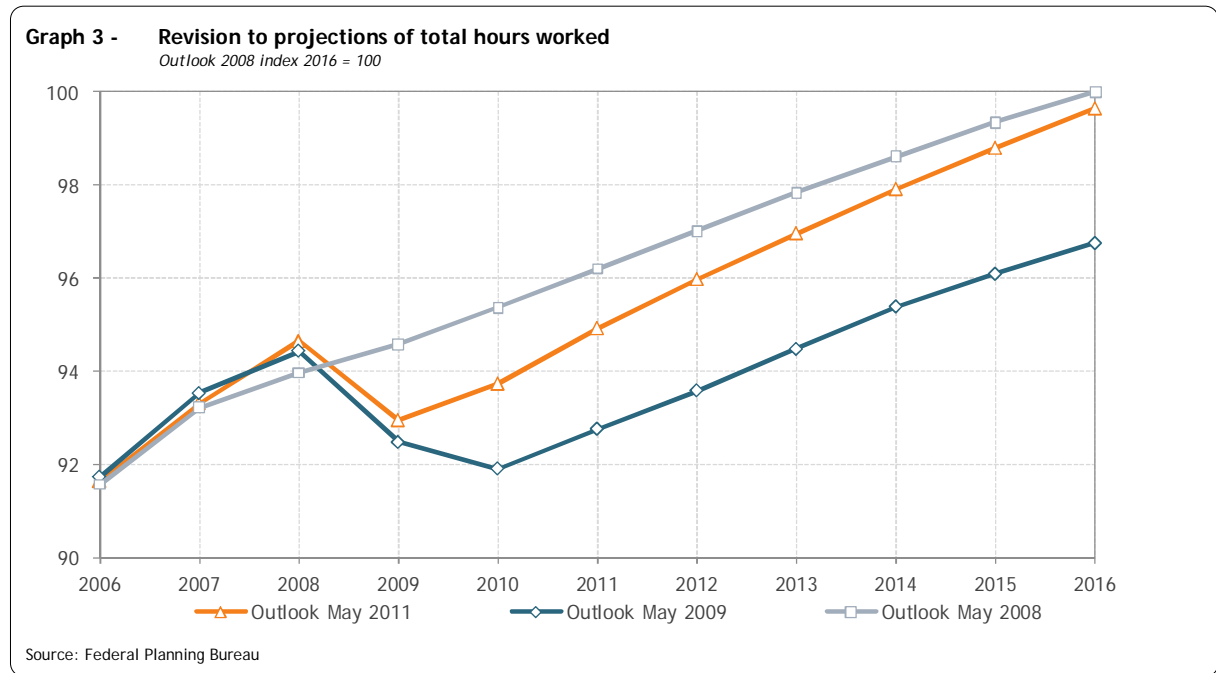
The latest national accounts data reveal that the recession in Belgium was less steep than initially feared and that the recovery in 2010 was faster and stronger than expected. It is fair to say that the unprecedented monetary and fiscal policy response at the global level as well as the remarkable resilience of emerging and developing countries played an important role in cushioning the shock caused by the turmoil on the financial markets. The performance of Belgian economic growth in 2010 was also boosted by the unexpectedly strong rebound in German exports. All these factors explain why the initial estimate of a 7% output loss attributable to the financial crisis (Lebrun, 2009) is now projected to be less than 5%. This downward revision is in line with some of the findings of a comprehensive study produced by the IMF (2009) based on sample of 88 past banking crises. According to this study, the first-year loss is a good predictor of the medium-term impact and macroeconomic stimulus in the short run and a favourable external environment are generally associated with smaller medium-term output losses. This new estimate is also very close to that computed by the CPB (2010) for the Netherlands using a comparable methodology.

Next to the estimation of total output loss, it is also interesting to examine the dynamics of the revisions of the two main components of GDP, namely employment (expressed in total hours worked) and hourly labour productivity. Note that these comparisons are slightly more complicated than for GDP due to successive statistical upward revisions in total hours worked compensated by downward revisions in the level of productivity.

Neglecting these differences in starting point, the evolution of hourly productivity was only marginally affected by the GDP growth revisions between May 2009 and May 2011. In 2016, the level attained by hourly productivity is almost identical in both projections.



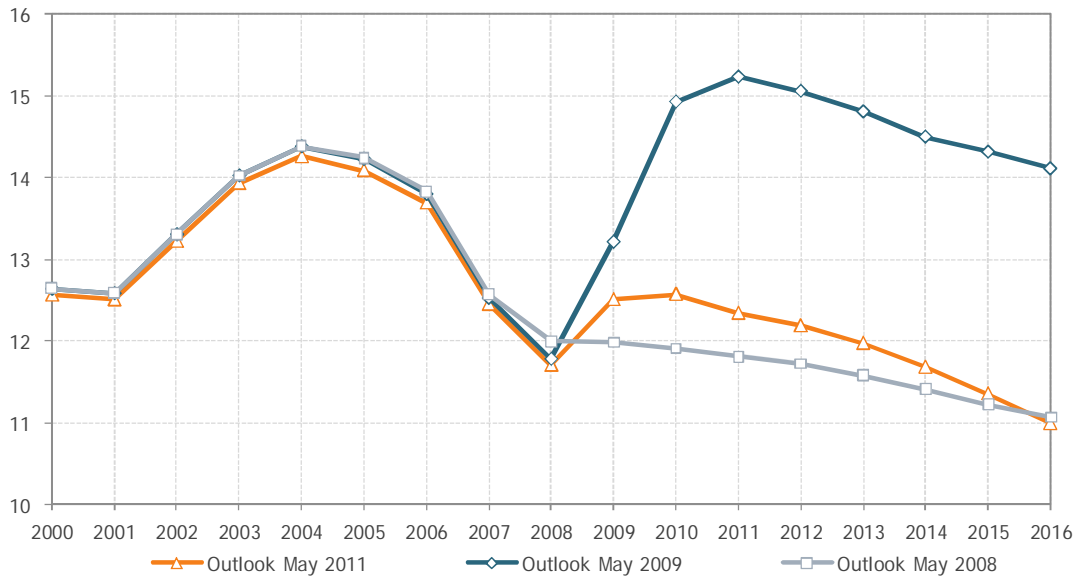
This conclusion also entails that the revision in GDP projections between May 2009 and 2011 is almost entirely to be found on the side of total hours worked, the level of the latter having been revised upwards by 2% for the year 2010. At the end of the projection period, the “loss” in hours worked is now evaluated at less than 0.5%. If one takes into account the difference in starting point, the underperformance is closer to 1%. One has to admit that this surprising outcome - if confirmed - will need further investigation, but no doubt that the underestimation in the May 2008 projection of the number of “service-voucher” jobs is one of the explaining factors. This element has no direct link with the financial crisis and may blur somewhat our findings.



These results, combined with a permanently lower level of average hours worked, explains why despite the financial crisis, the unemployment rate in 2016 is identical in the May 2008 and May 2011 Outlook. Needless to say, this represents an enormous change vis-à-vis the initial estimate of the impact of the crisis on the unemployment rate.

The approach used above has some shortcomings. In particular, estimating the trajectory of GDP had there been no crisis may be tricky as a financial crisis is usually preceded by a boom which may give a misleading picture of the underlying growth trend. To try to overcome this problem, the IMF (2009) computes the pre-crisis trend based on past growth rates recorded excluding the three years preceding the onset of the crisis. Transposed to our application - using a projection made before the outbreak of the crisis to define the pre-crisis trend - the question whether the starting point is correct, could be raised. To tackle this issue, we will present in the next section an assessment based on the concept of potential GDP.

Graph 4 - Revision to projections of the unemployment rate
in % of the labour force - definition FPB



Source: Federal Planning Bureau

3. An assessment based on potential GDP

The concept of potential output can be defined as the level of output consistent with stable inflation. As such it constitutes an aggregate indicator of the supply-side capacity of an economy. Since potential output is not directly observable, it may be computed through a variety of methods.⁸ Most international organisations rely on a method based upon a macroeconomic production function that allows potential output to be broken down into contributions from input factors and total factor productivity.⁹ In order to identify the underlying trends, this methodology uses statistical filters to smooth some of the input series. Due to the well-known end-point bias (difficulty of disentangling the cycle from the trend at the end of the sample) a widespread approach consists of applying a filter to a historical series that is supplemented by projected values. Following this approach, the Federal Planning Bureau uses its medium-term scenario for the Belgian economy to compute potential GDP. The methodology is described in detail in the Annex.

Analogous to the analysis made in the previous section for GDP, potential output estimates based upon the Economic Outlook of May 2008 and 2011 can be compared. This approach is subject to the limitations mentioned in the previous chapter as other factors than the financial crisis may have had an effect on potential growth between the two projections. Nonetheless, their impact should remain limited in comparison with the shock triggered by the financial crisis.

The graph below reveals large downward revisions as potential growth was reduced by almost 0.7 percentage point for the year 2009 and is expected to converge only very slowly to its previously estimated rates. It is notable that potential growth estimates for the years prior to the crisis were also re-

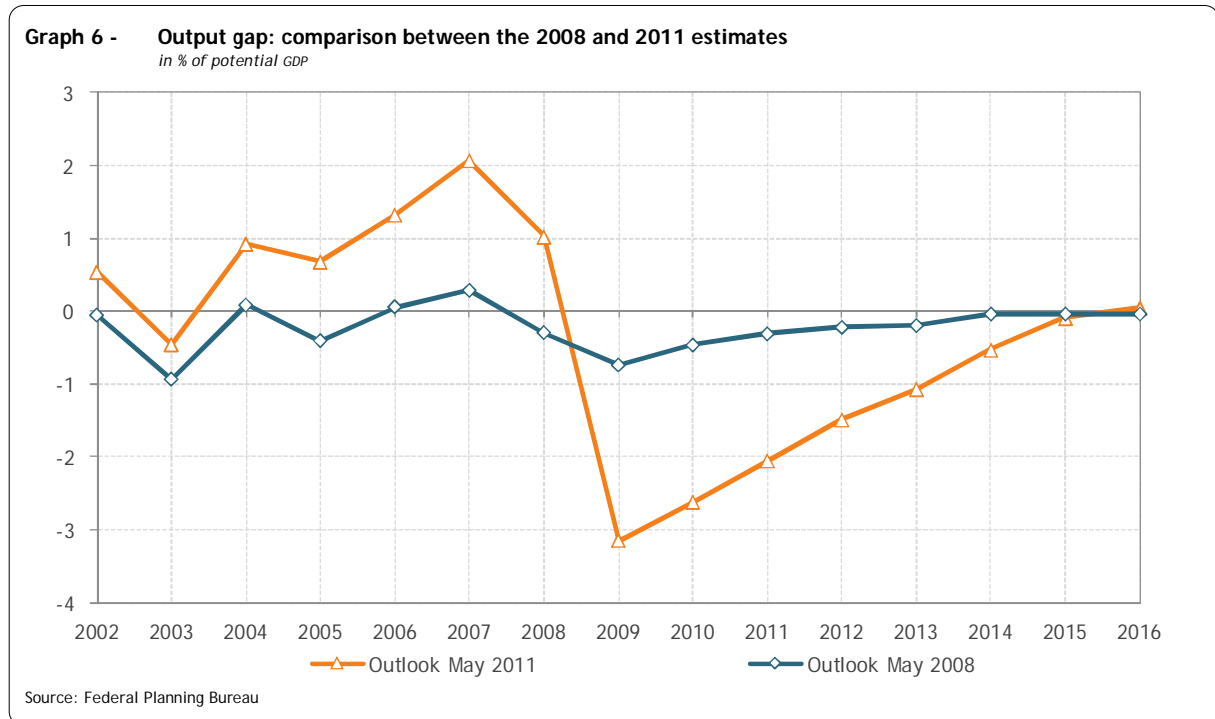


⁸ See ECB (2000) for an overview of the methods available.

⁹ See Beffy et. al. (2006) and OECD (2009) for a presentation of the methodology used by the OECD and D'Auria et. al. (2010) for an update of the method developed by the European Commission.

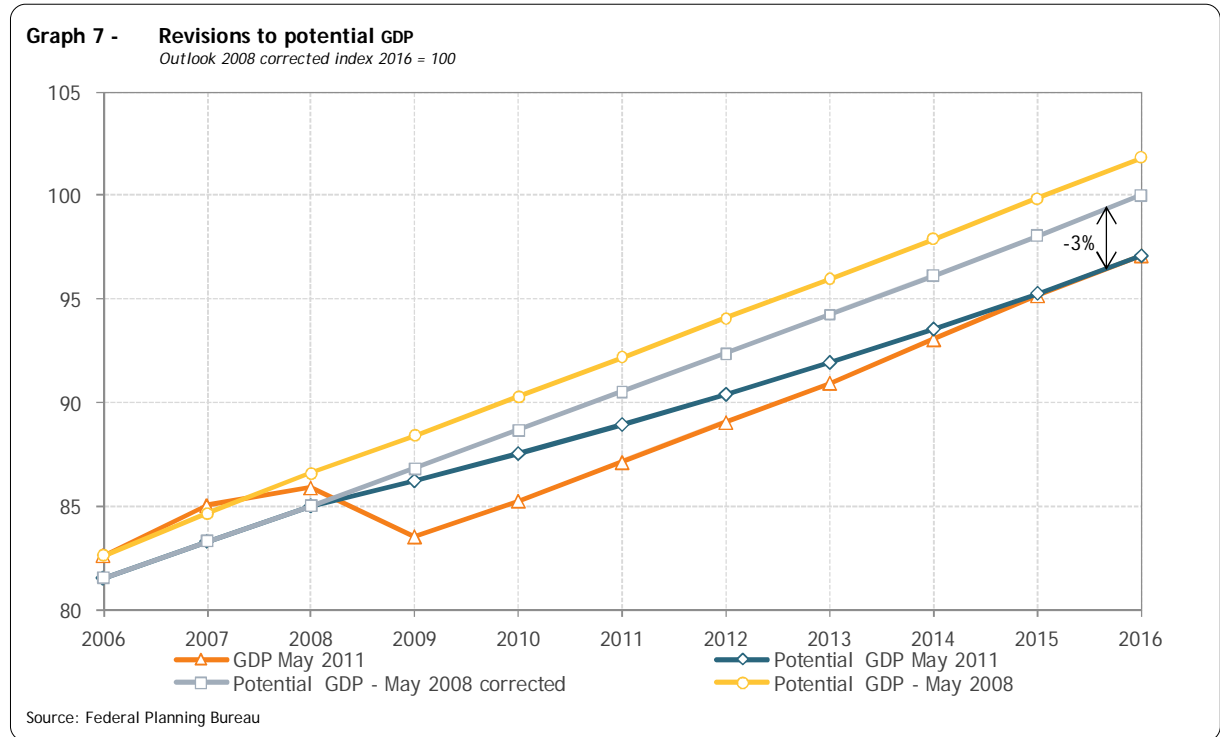
duced significantly. These revisions reflect the view that economic growth recorded during the years preceding the burst of the financial bubble turned out *ex post* to be unsustainable.

As shown in Graph 6, the downward revisions of potential GDP result in a much more positive output gap¹⁰ for the period between 2004 and 2008 than previously estimated. Business cycle conditions now appear to have been very favourable during this period, while in May 2008 they were still considered to be relatively neutral with an output gap estimated close to zero.

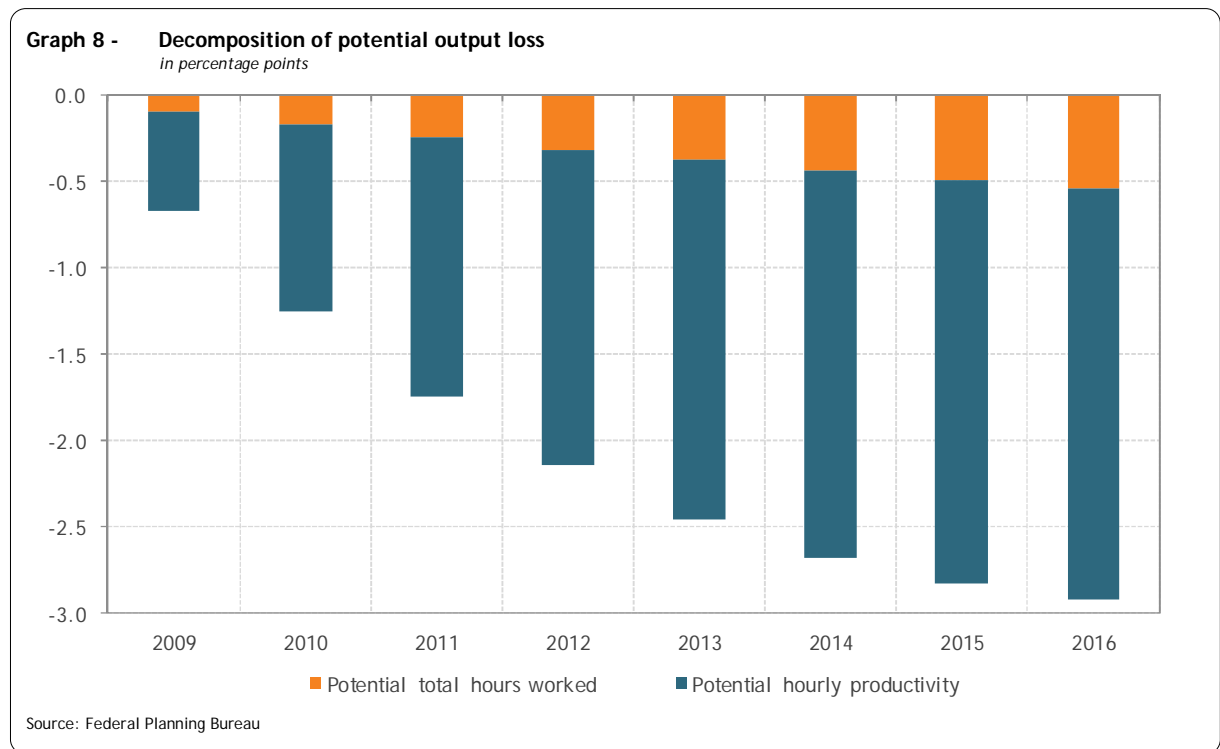


Using the same approach as the one proposed in the previous section and because in 2016 the output gap is closed, the potential output loss equals the estimated actual GDP shortfall (5%). However, this computation does not take into account the fact that the level of potential output in 2008 appears at present to have been overestimated. If we correct the starting point, we obtain a potential output level which is nearly 2% lower in 2016 than the level estimated according to the May 2008 Outlook. In this case, the estimated loss in potential output is limited to less than 3%.

¹⁰ The output gap is defined as the percentage deviation of the actual level of GDP from its potential level.



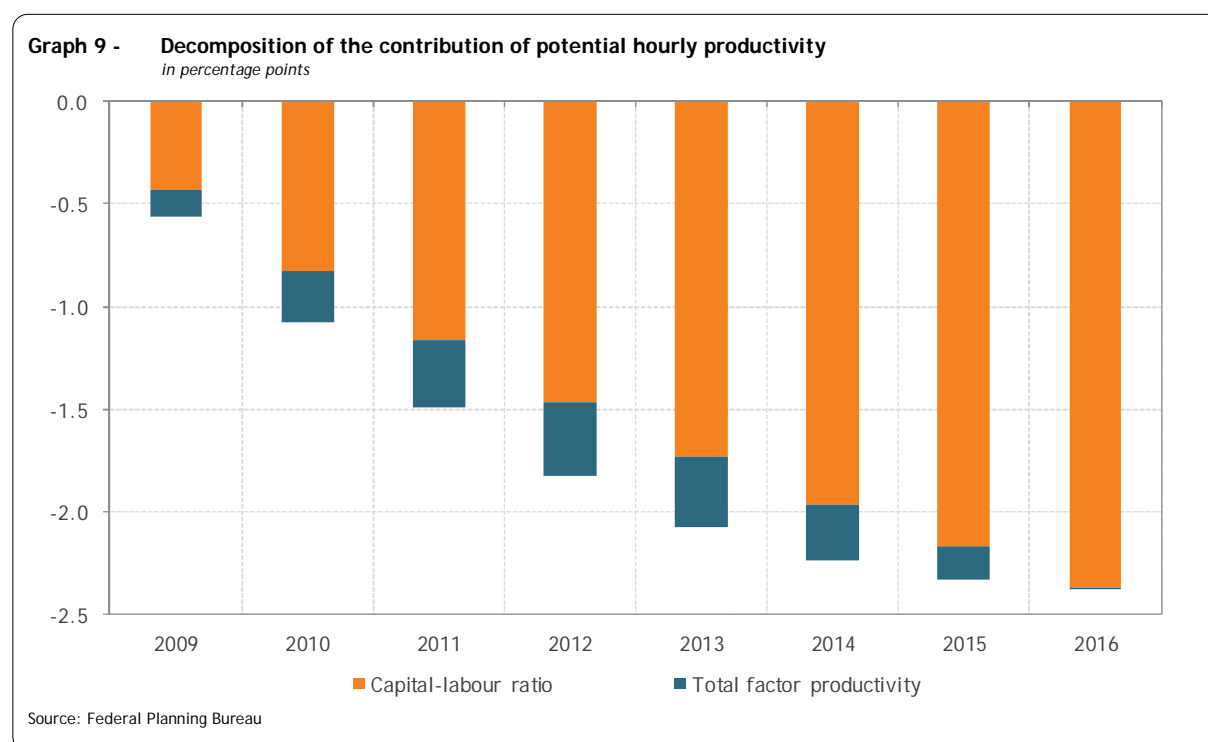
Based on this methodology, the potential output loss can be broken down into its labour and productivity component. As shown in the graph below, almost 2 ½ percentage points of the fall in the level of potential output is explained by the decline in structural hourly productivity, while potential labour (expressed in hours worked) contributes somewhat more than half a percentage point.



The contribution of potential hourly productivity can be further split into its capital-labour ratio and total factor-productivity components. According to the latest scenario, the capital-labour ratio should

be permanently reduced. This is consistent with past findings that a financial crisis depresses investment and slows capital accumulation over a protracted period as firms face tougher financing conditions in the form of tighter lending standards and higher effective costs of borrowing (IMF, 2009). According to the OECD (2010a), the latest financial crisis is expected to have caused an increase in the cost of capital equivalent to a rise in interest rates of 150 basis points.

Total factor productivity should on the contrary be only temporary affected by the crisis and consequently retrieve its level projected before the crisis by 2016. The fact that total factor productivity should fully recover in the medium run is not in contradiction with theoretical considerations that state that the global impact of a financial crisis on total factor productivity is ambiguous. On the one hand, total factor productivity could be permanently affected by a reduction in innovative activity due to lower R&D expenditure. On the other hand, this result could be counterbalanced by a “cleaning-up” effect, as the least productive firms are forced out of the market during downturns and by a shift of resources to more productive uses.

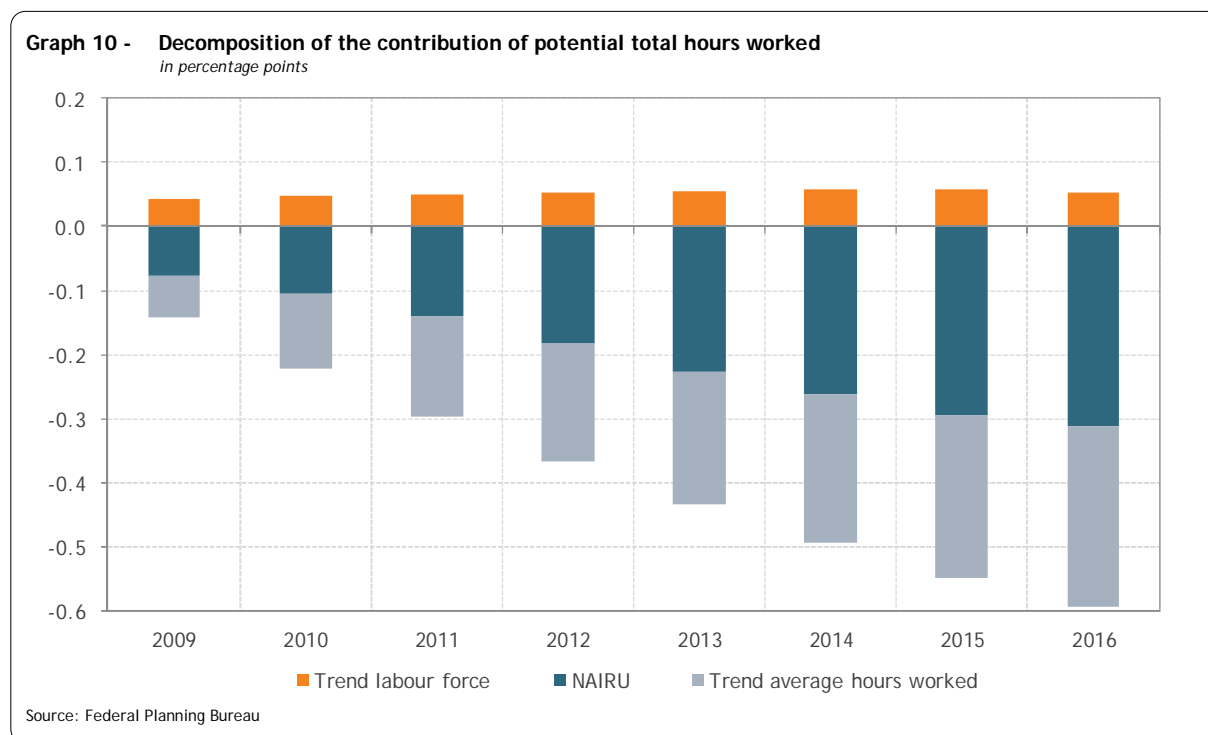


The contribution of potential total hours worked can also be broken down. Previous historical experience suggests that sharp increases in unemployment following recessions are long-lasting and may lead to a rise in the structural unemployment rate as the long-term unemployed become less attractive to employers and as they reduce their job search intensity.¹¹ This kind of a severe increase in unemployment was also expected for Belgium, but has not materialized up to now. This explains why the structural unemployment rate¹² contributes merely 0.3 percentage point to the total potential output loss in 2016. Trend average hours worked have also been slightly reduced compared to the pre-crisis projected level and add 0.3 percentage point to the revision. The slight upward revision in trend labour

¹¹ See for instance Guichard and Rusticelli (2010).

¹² Also commonly called the non-accelerating inflation rate of unemployment (NAIRU)

force is the consequence of revisions in population projections with no direct link to the crisis. Again this calls for caution when interpreting the results in terms of the sole effect of the crisis.



How do the above-mentioned estimates compare with similar studies? Using an equivalent approach, the CPB (2010) evaluates the loss in potential output for the Dutch economy at roughly 2%, attributable for 1 ½ percentage point to a reduction in the level of structural productivity and for the ½ percentage point remaining to an increase in the structural unemployment rate. According to the OECD (2010b), the level of area-wide potential output is expected to have fallen by about 3%. About 2 percentage points is assumed to come from a permanently higher cost of capital which reduces the capital-labour ratio and hence productivity, while 1 percentage point is supposed to be caused by a rise in structural unemployment as a result of hysteresis-type effects.

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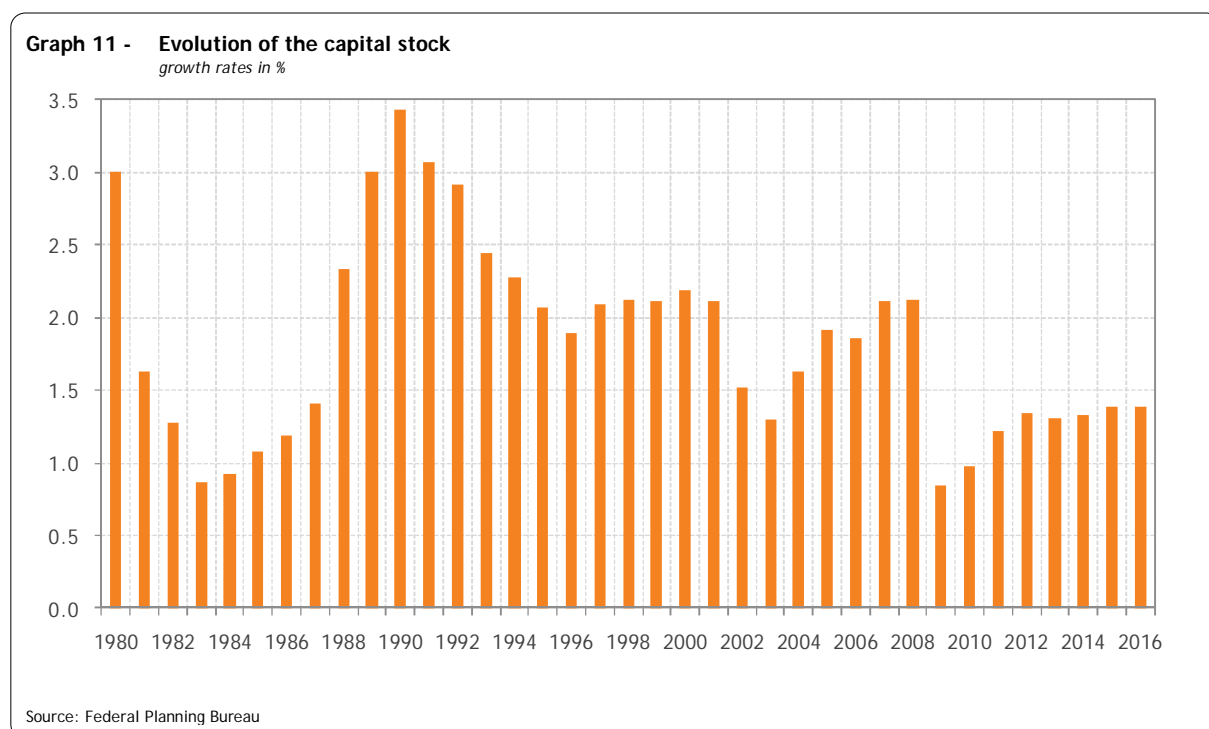
5. Annex: Computing potential GDP using the production function approach and the medium-term scenario

To compute potential GDP for Belgium, the Federal Planning Bureau uses the methodology developed by the European Commission¹³ but applies it on its own historical database extended using its medium-term projections. This approach ensures full compatibility between the potential GDP estimates and the medium-term macro-economic scenario produced by the HERMES model. In this annex we detail the different steps needed to compute potential GDP and describe briefly the latest developments as well as the projected values.

The EC method relies on a Cobb-Douglas production function with constant returns to scale:

$$YPOT = (LP * HT)^\alpha K^{1-\alpha} TFPT \quad (1)$$

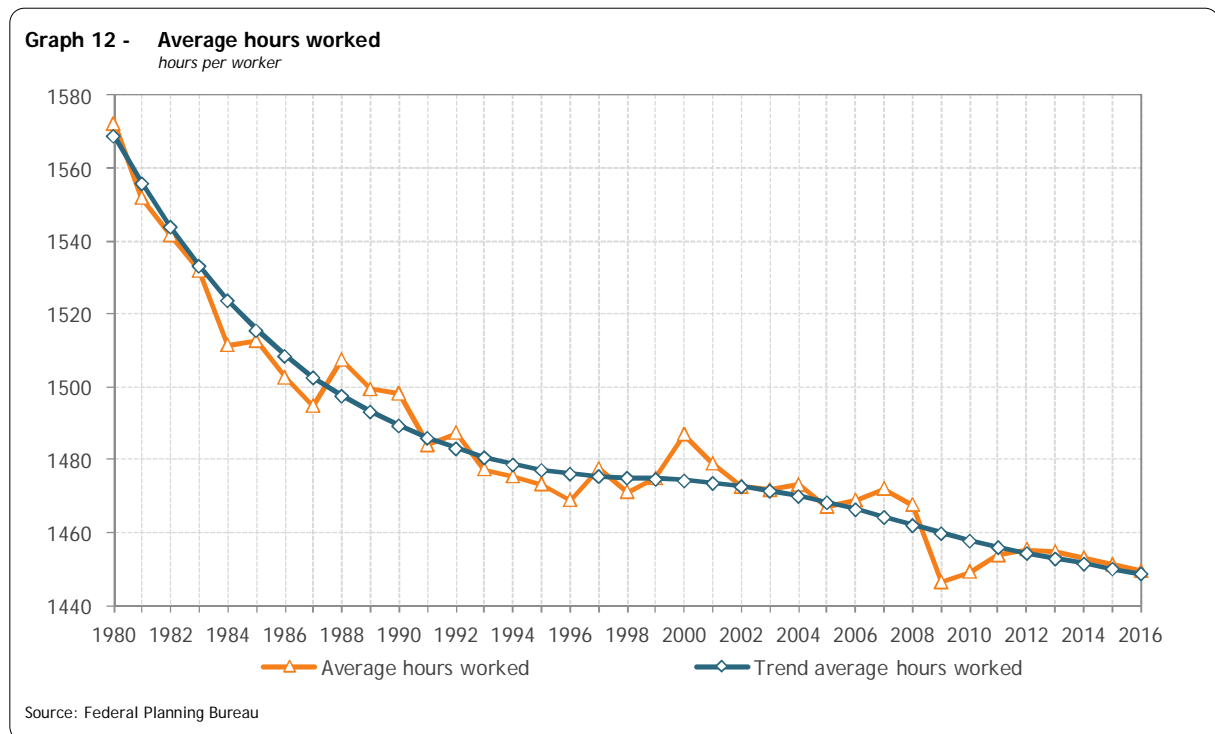
where $YPOT$ represents potential GDP, LP potential employment, HT trend average hours worked, K capital stock, $TFPT$ trend total factor productivity and α the average wage share. This approach defines potential GDP as the output produced with a “normal” degree of utilisation of the production factors. For capital, the full utilisation of the existing stock represents the maximum contribution to potential output and therefore no smoothing is required. Future values of the capital stock are produced by the HERMES model within the medium-term scenario. As can be seen from the graph below, the growth rate of the capital stock, and consequently its contribution to potential growth, is expected to recover only very slowly from the 2009 recession.



¹³ See D'Auria et. al. (2010).

For labour, the normal degree of utilisation is not as straightforward. Computing labour input defined in total hours worked implies different steps.

Firstly, trend average number of hours worked are obtained by applying the Hodrick-Prescott filter to the observed and projected values of the series. The cyclical movements, as the spectacular drop in hours worked in 2009, are filtered out by the smoothing procedure but the trend remains downwards oriented over the projection period. Accordingly, average hours worked are expected to continue to contribute negatively to potential growth in the coming years.

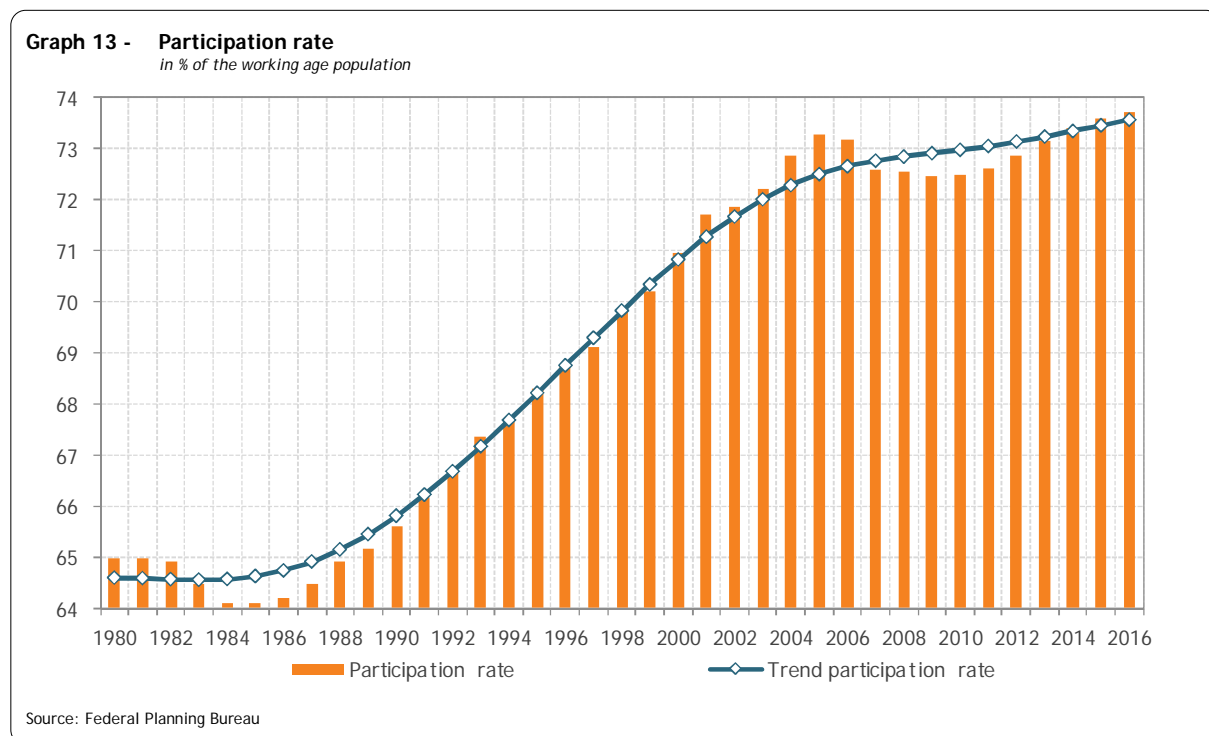


Secondly, potential employment is computed as:

$$LP = (PARTS * POPW) * (1 - NAIRU) \quad (2)$$

where *PARTS* stands for trend participation rate, *POPW* for population of working age and *NAIRU* for structural unemployment rate.

The trend participation rate is identified using the Hodrick-Prescott filter. The participation rate reached a peak in 2005 and receded somewhat in recent years. It started to rise again in 2010 and is expected to continue to do so in the coming years, but at a slower pace than in the nineties. The trend ignores these cyclical fluctuations and has a positive slope all the way, although the pace of progression is significantly reduced. Multiplied with the actual and projected population of working age it provides the trend labour force.

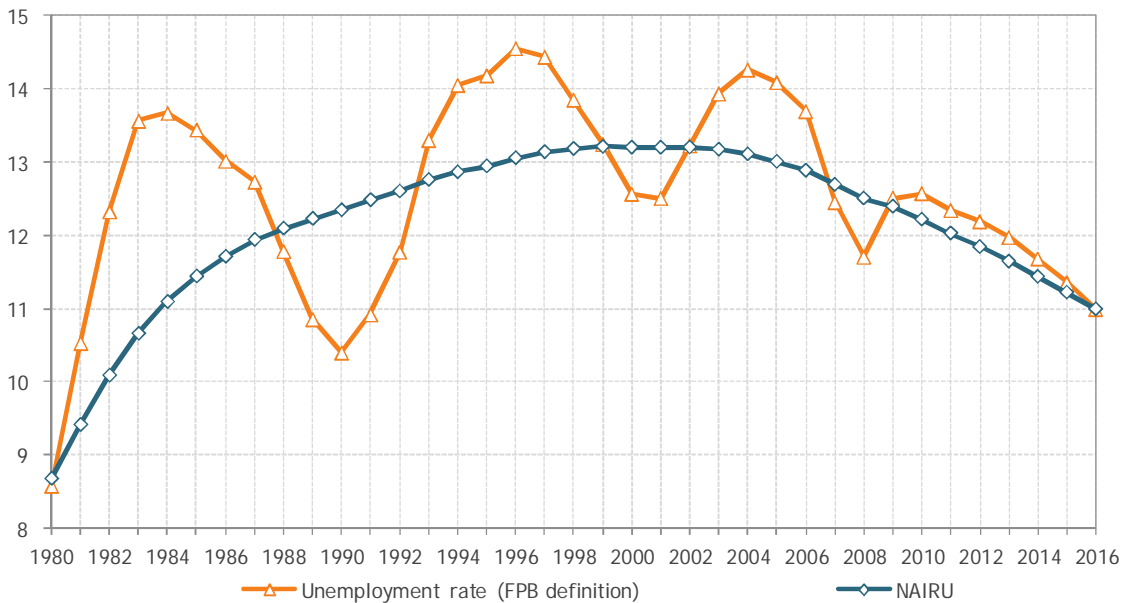


The structural unemployment rate is defined as the rate consistent with stable, non-accelerating (wage) inflation, commonly called the NAIRU. In our methodology it is computed by removing the cyclical component (the “unemployment gap”) from the actual unemployment rate. The system is identified by adding a reduced-form Philips curve linking the change in wage inflation to the unemployment gap and other explanatory variables. In the case of Belgium the second difference in productivity and in the terms of trade as well as the lagged unemployment gap have been selected as additional variables. By imposing a functional form to the equations representing the trend and cyclical components, the whole system can be estimated using the Kalman filter technique.¹⁴

Compared to the previous two cycles and despite the severity of the recession in 2009, the cyclical component of the unemployment rate appears rather subdued. According to the medium-term scenario, the decrease in the unemployment rate from 2011 onwards combined with no major acceleration in wage inflation implies a further decrease in the NAIRU which should return in 2016 to the level recorded in the mid-eighties.

¹⁴ See D’Auria et. al., op. cit.

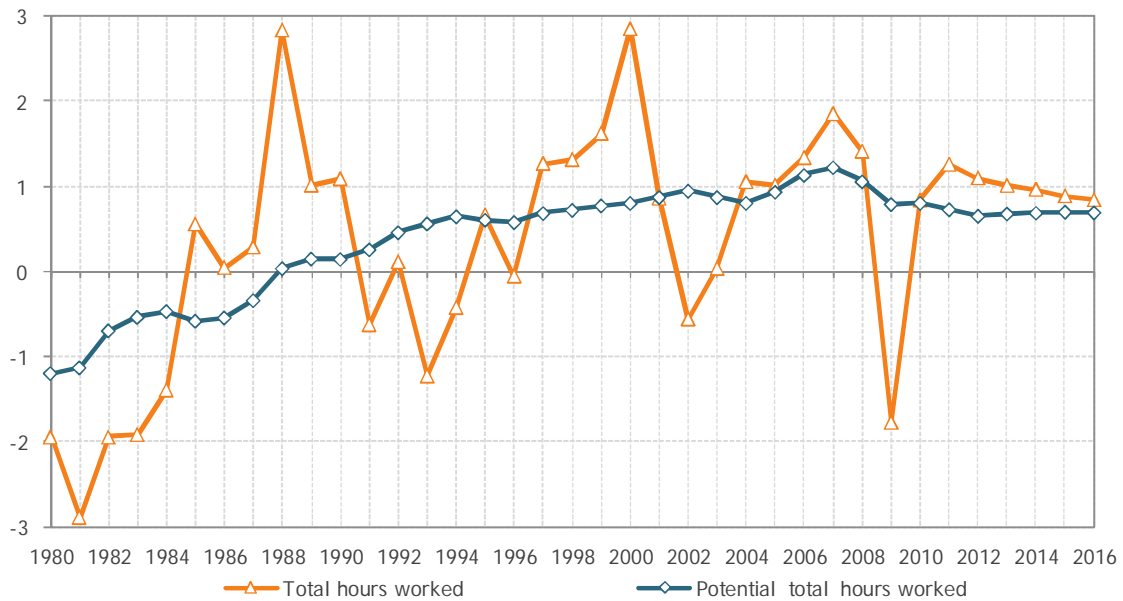
Graph 14 - Unemployment rate and NAIRU
in % of the labour force



Source: Federal Planning Bureau

Potential total hours worked are obtained by multiplying trend average hours worked with potential employment. The series is obviously much smoother than the one measuring actual total hours worked but it nonetheless captures movements linked to socio-demographic and labour market developments. While it recorded negative growth rates in the eighties, potential total hours worked increased by 1.2% in 2007 and are expected to continue growing at a rate slightly below 0.7% in the coming years.

Graph 15 - Evolution of total hours worked
growth rates in %



Source: Federal Planning Bureau

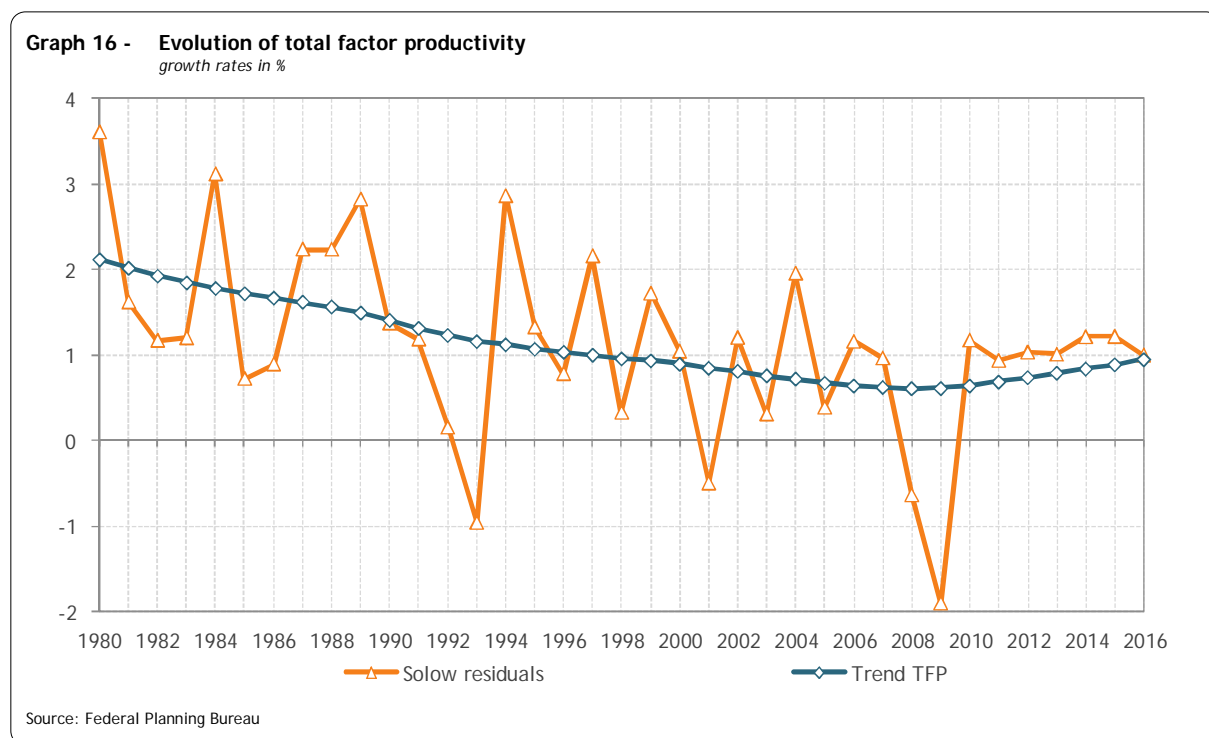
Total factor productivity can be computed using the Cobb-Douglas production function specification:

$$TFP = Y / (L * H)^\alpha K^{1-\alpha} \tag{3}$$

The so-called Solow residuals capture, in addition to the measurement errors, the efficiency of both production factors (E_L and E_K) as well as their degree of utilisation (CU_L and CU_K):

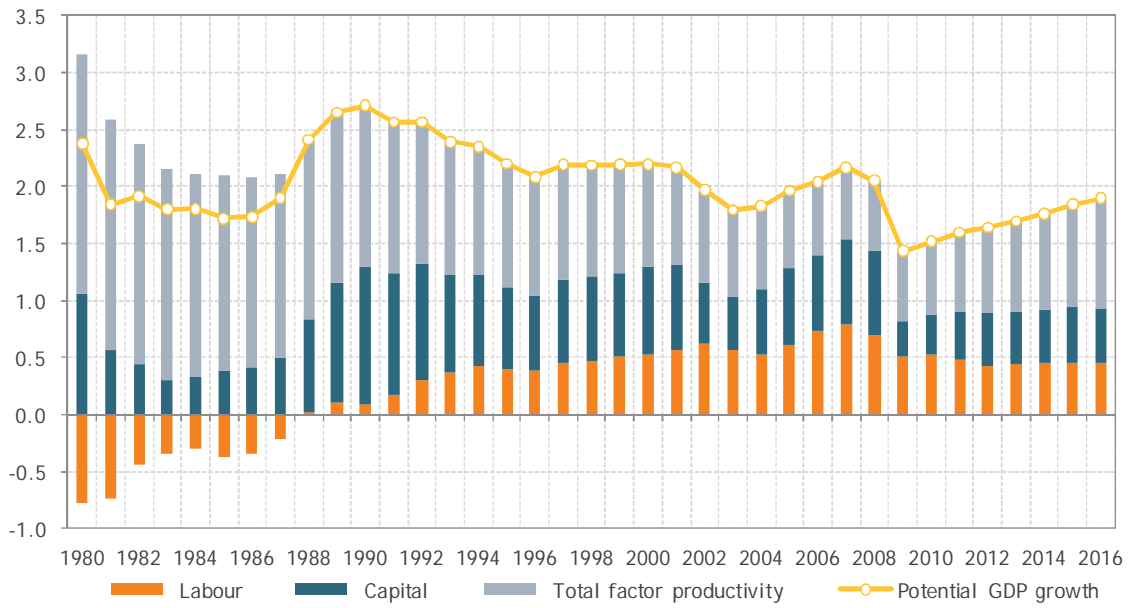
$$TFP = (E_L^\alpha E_K^{1-\alpha}) * (CU_L^\alpha CU_K^{1-\alpha}) \tag{4}$$

To obtain trend total factor productivity the second component has to be filtered out. Planas et. al. (2010) propose a method using a bivariate Kalman filter exploiting the link between the cyclical component of the Solow residuals and an indicator of capacity utilisation. The trend identified with this methodology is presented in the graph below. Trend total factor productivity growth exhibits a downwards oriented slope between 1980 and 2008. It is expected to rebound moderately during the projection period.



Potential GDP and the contributions from each production factor can now be computed using equation (1). Although much smoother than the evolution of GDP, potential growth still shows some pro-cyclicality largely determined by the pace of capital accumulation. However, potential growth remained, between 1980 and 2008, in a range between 1.7 and 2.6%. Only with the recent financial crisis is it expected to have dropped below the threshold of 1.5%. Following experiences from past financial crisis, it is assumed to return progressively to its pre-crisis rate.

Graph 17 - Contributions to potential growth
in percentage points



Source: Federal Planning Bureau