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Kieran McQuinn, Economic and Social Research Institute
Karl Whelan, University College Dublin

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Europe's Long-Term Growth Prospects: With and Without Structural Reforms

Kieran McQuinn*
Economic and Social Research Institute

Karl Whelan†
University College Dublin and CEPR

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Abstract

Even before the financial crisis of 2007/08, there were significant questions about Europe's long-term growth prospects. After a long period of catching up with US levels of labour productivity, euro area productivity growth had, from the mid-1990s onwards, fallen significantly behind. Using data for the period 1970 to 2006, McQuinn and Whelan (2008) identified declining rates of total factor productivity (TFP) growth and weaker capital accumulation as areas for concern in an European context. In updating this earlier analysis, we find that the growth prospects of the euro area have deteriorated further. With TFP growth continuing to fall, Europe's demographics are now also contributing to a decline in the workforce. Against this backdrop, we provide a long-term projection for euro area GDP based on unchanged policies and discuss the possible impacts of certain structural reforms including potential changes in the unemployment rate, pension reform and the successful implementation of a significant wider programme of regulatory reform that boosts TFP growth. We argue that, even with the successful adoption of these measures, the European economy is still likely to grow at a slower pace than it has in the past.

JEL classification: O40, O47, O16.
Keywords: Growth, Euro Area, Demographics, Structural Reforms

*E-mail: kieran.mcquinn@esri.ie.
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1 Introduction

There are many different aspects to the poor performance of the euro area economy in recent years. Perhaps the most commonly discussed aspect is the series of problems associated with high debt burdens. The euro area, as a whole, has a level of public debt to GDP that is high by modern historical standards but is not particularly high when compared with other economies such as the US, the UK or Japan. Still, many euro area countries, such as Italy, Portugal, Greece, Ireland and Spain do have high levels of public debt relative to GDP, while a number of these economies also have serious problems with the sustainability of various forms of private debt.

High public debt burdens have lead to substantial fiscal adjustment in many euro area countries, while private sectors in a number of countries are also going through a sharp deleveraging process. However, unlike the famous Swabian housewife whose prudent saving has no effect on her neighbours, the widespread belt-tightening across Europe appears to have had a substantial negative effect on euro area GDP.[1] The slump in real GDP (which was still 2.5 percent short of its pre-crisis peak as of 2014:Q2) and low inflation rates have combined to produce very low growth rates in nominal GDP and so limited progress has been made in improving debt ratios. These developments are consistent with Reinhart and Rogoff's (2009) evidence on the resolution of debt crises, which pointed towards nominal GDP growth as a key factor in resolving many debt crises rather than large outright reductions in debt.

Inflation in the euro area, as a whole, is likely to remain low given the ECB's approach to monetary policy and will probably be even lower in high-debt countries as they gradually recover competitiveness. Against this background, it appears that the debt situation of many European governments, businesses and households can only be rendered sustainable via a return to steady higher rates of real GDP growth. Much of the dialogue in European policy circles reflects this thinking with a steady focus from organisations such as the European Commission and the ECB on the need for growth-enhancing structural reforms. However, despite the ubiquity of the phrase "structural reforms", there is a very limited empirical literature explaining precisely what is meant by structural reforms and the magnitudes of the potential impacts that such reforms could have on the growth rates of individual euro area member states or the euro area as a whole.

This paper examines prospects for growth in the euro area, both with and without structural reforms. It follows up on an earlier paper of ours (McQuinn and Whelan, 2008) that focused on trends in European growth rates up to mid-2006. While the period of growth in Europe prior to the global crisis of 2008 is sometimes referred to as "the boom", our earlier paper had noted that long-run trends in both productivity and per capita hours worked were deteriorating to the

[1] Blanchard and Leigh's (2013) discussion of IMF forecast errors shows that fiscal multipliers appear to have been considerably larger than were assumed prior to the global financial crisis.

point where potential output growth in the euro area was at a historical low point and, apparently, on a negative trend. In particular, after a long period of catching up with US levels of labour productivity, euro area productivity growth had, from the mid-1990s onwards, fallen significantly behind.

In this paper, we update the calculations from our 2008 paper and provide projections for growth in the euro area out to 2060 based on a recovery scenario over the rest of this decade and long-term demographic trends. We then describe the potential impact of structural reforms relative to this baseline scenario. Because of data limitations, we restrict our analysis to the twelve countries that constituted the euro area prior to the accessions of recent years.[2] Given the complexities of modelling data for so many different countries, we also restrict our modelling approach to the use of a simple Cobb-Douglas production function for each country with a common elasticity of output with respect to capital and a common depreciation rate.

Overall, our findings are sobering for those expecting economic growth to deal with the euro area's debt problems in the coming decades. Among the results we report are the following:

- Total factor productivity (TFP) growth in the twelve country euro area group has declined in each decade since the 1970s. Over the years 2000-2013, a period that includes multiple slow-downs and expansions, TFP growth has averaged only 0.2 percent per year.

- The slump in investment due to the downturn is now having significant negative supply-side effects. We estimate that capital stock growth, which averaged 2.4 percent per year over the past two decades, is now falling below 1 percent per year. Using an elasticity of output with respect to capital of one-third, this factor alone is currently reducing the supply-side growth potential of the euro area economy by about 0.5 percentage points per year.

- While Europe's demographic ageing pattern is sometimes presented as a longer-term issue that will cause problems relating to pension systems in future decades, the ageing process is actually affecting Europe's growth potential right now. The work-age population of the euro area has peaked and Eurostat projections anticipate that the decline in this age group will accelerate in the coming decades. Even assuming a return to pre-crisis average unemployment rates and ruling out future declines in the average workweek of employees, we project that, if current patterns of labour market participation persist, total hours worked will grow at an average rate of only 0.4 percent per year until the end of this decade and this will be followed by significant declines in subsequent decades.

[2] These are Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain. We apologise in advance for using the short-hand "euro area" to describe our analysis, though these countries do account for the vast majority of euro area GDP.

- With a long-term projection of TFP growth of 0.2 percent, a gradual decline in the work-age population and a static average workweek, we project a "baseline" average real GDP growth rate in the euro area of 0.6 percent over the next decade even if the unemployment rate and investment share of GDP return to their pre-crisis levels by 2020.

The most obvious response to these gloomy projections is that Europe can implement various structural reforms to product and labour markets that can boost labour force participation and productivity. We discuss the potential impact of such reforms.

One approach to assessing the impact of reforms is to use detailed empirical studies that link the factors that affect GDP to specific policy instruments and then calculate the effect of changes to these instruments. However, many of the forces that affect key variables such as TFP or labour force participation rates are difficult to summarise accurately in cross-country regressions and policy recommendations can end up being based on regressions that may be poorly specified and focusing only on those variables that are available across a wide range of countries.

Instead, our approach is to focus on the potential *outcomes* that could be achieved by ambitious reform programmes if they were to be successful, with the details of precisely what these programmes would consist of likely varying widely across countries. In particular, we consider three different types of reform using data up to 2013, so that 2014 is the first year of the simulated reform programmes.

1. **Labour Market Reform**: Based on pre-crisis unemployment rates, we argue that seven of the euro area twelve countries could benefit from structural reforms to their labour market which would reduce their long-run average unemployment rates to 6 percent by 2025. We model the impact of these reforms purely through their effects on labour input via a reduction in unemployment and we do not assume a knock-on impact on TFP.

2. **Pension Reform**: We consider two different scenarios to examine how reforms to pension systems can increase the labour force participation rates of older workers.

    - In the first scenario, we use calculations from the European Commission's 2015 Ageing Report (based on a cohort simulation model) that describe the expected effects on the participation rates in each country of current legislated pension reforms.[3] Many of these reform packages include measures that are to be phased in gradually over time and which could be reversed by future governments. Thus, while legislated, these measures can still be partly considered "future reforms" that have yet to be undertaken.

[3] European Commission (2014a).

- In the second scenario, we calculate the effect on labour force participation of a gradual transition up to 2033 so that, by that date, the probability of all workers over 50 continuing to work at ages 55, 60, 65, 70 and 75 and over equal the corresponding current probabilities for Swiss workers. As in the OECD report of Johansson et al (2013), we consider Switzerland as a benchmark because of their high rates of labour force participation among older workers.

Again, we model the effect of these reforms purely through their impact on labour input and do not assume it has an impact on TFP.

3. **Broader Regulatory Reform**: Finally, we consider the potential impact of a broader package of regulatory reforms which have the impact of gradually raising TFP in all euro area countries to UK levels by 2043. This is inevitably the most speculative of our reform scenarios but the general idea here is that this is likely to represent the best possible outcome from a broad programme of systemic reforms in product and labour markets as well as reforms of government taxation and education policies. We choose the UK as a TFP "leader" due to calculations based on purchasing power parity adjusted TFP rates, which indicate the UK has particularly high levels of TFP.

We simulate these reforms using what is effectively a Solow growth model framework with TFP growth and the investment share of GDP treated as exogenous and output modelled with a Cobb-Douglas production function. We report baseline and reform scenarios for each of the twelve countries in our study as well as the euro area aggregate.

While our results show the various reforms considered would have positive effects on euro area GDP over a number of years, we estimate that even the ambitious labour market and pension reforms considered here would still have a relatively small effect on GDP growth over the coming decades. For example, we estimate that our simulated labour market reform would add 0.12 percentage points per year to growth in the euro area over the period 2014-2023 and only 0.05 percentage points per year in the following decade. The effects of pension reforms are larger. The effect of current legislated reforms on average annual growth rates over the period 2014-43 is estimated at 0.23 percentage points, while the effect of our "Swiss reform" is estimated at 0.20 percentage points. However, the size of the boost to growth from these reforms is modest enough relative to the decline in average growth rates from historical levels that we project in our baseline scenario.

The more ambitious reform scenario that allows each country to close its TFP gap relative to the UK by 2043 has a larger impact than either the labour or pension reforms, raising average GDP growth per year by 0.45 percentage points over the period 2014-2043. Combining the direct

impact on labour input of labour market and pension reforms with the effect on TFP in our "broader reform" case, we estimate that reforms can raise euro area GDP growth by about 0.9 percentage points. However, this positive impact generally does not offset the negative effects on future GDP growth of currently-envisaged demographic changes. Thus, even with a significant reform programme, the euro area is likely to grow at a slower average pace in the future.

One potential way to change Europe's demographic future is to encourage more immigration. Our final calculations provide some estimates of how inward migration may affect economic growth in the future.

2 Accounting for Growth in Europe

In this section, we review the historical sources of growth in the euro area as well as that of its constituent countries. We provide some comparisons between the euro area's performance and that of the US. In addition to reviewing historical performances, we explain why current trends suggest lower growth in the euro area in the future.

2.1 Growth Accounting

Throughout our analysis, we use a simple Cobb-Douglas production function

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

where Y_t is real GDP, K_t is capital input, L_t is labour input (defined in this paper as total hours worked), and A_t is total factor productivity. Output growth can then be written as

$$\frac{\dot{Y}_t}{Y_t} = \frac{\dot{A}_t}{A_t} + \alpha \frac{\dot{K}_t}{K_t} + (1-\alpha)\frac{\dot{L}_t}{L_t} \tag{2}$$

With data on output, capital, and labour growth to hand and a value for α, this equation can be used to calculate TFP growth.

In relation to capital inputs, European statistical agencies do not provide standardised measures of the productive capital stocks, so we construct this series ourselves by accumulating investment data. We assume that the initial stock of capital in 1970 equals the steady-state value implied by the Solow growth model in this year (this is discussed in further detail below) based on prevailing trends at that point for GDP growth, the investment share of GDP and the growth rate of labour input. We then derive the rest of the series from a perpetual inventory method according to the definition

$$K_t = (1-\delta)K_{t-1} + I_{t-1} \tag{3}$$

with a depreciation rate of six percent per year. While these are very specific assumptions, we do not find that our calculations about the recent performance of the euro area economy are significantly affected by reasonable changes to these assumptions.

Deciding on a methodology for the elasticity of output with respect to capital, α, is a tricky issue. Traditionally, a value of about one-third has often been used based on the observation that for countries with good income-side national accounts such as the United States, the labour share of income has traditionally been around two-thirds. However, this share has declined since the 1980s in Europe and has also been declining in recent years in the US. While there seems to be an absence of any single clear explanation for this pattern (see Elsby, Hobijn and Sahin, 2013, and Lawless and Whelan, 2011) the changes in this share seem to have little to do with structural changes in the substitutability of capital and labour. In the absence of clear guidance from income data, our approach here is to keep things simple and use the standard value of $\alpha = \frac{1}{3}$ for all cases. Our arguments about trends over time in TFP growth do not turn out to be affected by this specific choice.

The data in our paper are annual and mainly cover the period 1970 to 2013. Real GDP, real investment, employment, unemployment rates and total population are all sourced for each country from AMECO, the annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs (DG ECFIN).[4] Information on the average work week is taken from the Groningen Growth and Development Centre (GGDC).[5]

Table 1 presents results for the euro area and the US of the growth accounting exercise which allocates output growth according to the three components in equation (2) while Figure 1 charts the components of the decomposition for the euro area. A number of trends are evident from Figure 1.

- While there have been regular cyclical fluctuations, GDP growth in the euro area appears to have been on a downward trend since the 1970s. During the 1970s, GDP growth averaged 3.7 percent per year. During the 1980s this fell to 2.2 percent. In the 1990s, the average growth rate was 2.1 percent and the period from 2000 onwards has seen an average growth rate of only 1.1 percent.

- The growth rate of total hours worked in the euro area has shown little trend over the period since 1970. Over the period 2000-2013, total hours worked in the euro area has been effectively flat.

- We estimate capital stock growth in the euro area grows was over 4 percent per year in

[4] Available online at: http://ec.europa.eu/economyfinance/ameco/user/serie/SelectSerie.cfm
[5] Available online at www.ggdc.net

the early 1970s but then fluctuated between 2 and 3 percent between the late 1970s and 2008.[6] Recent years, however, have seen a significant decline in the investment share of GDP and we estimate that the euro area capital stock is now growing at an annual rate below 1 percent.

- The rate of TFP growth has also declined gradually over time. Table 1 provides estimates for each of the ten year intervals preceding 2007. TFP growth was running at 2.7 percent in the first half of the 1970s, fell to 1.6 percent over 1977-86, to 1.5 percent over 1987-1996 and to 0.7 percent over 1997-2006. The period from 2007-2013 has seen TFP decline at an average rate of 0.2 percent per year, mainly due to a 3 percent decline in 2009.

Table 1: Decomposition of Euro Area and US Output Growth Rates (%)

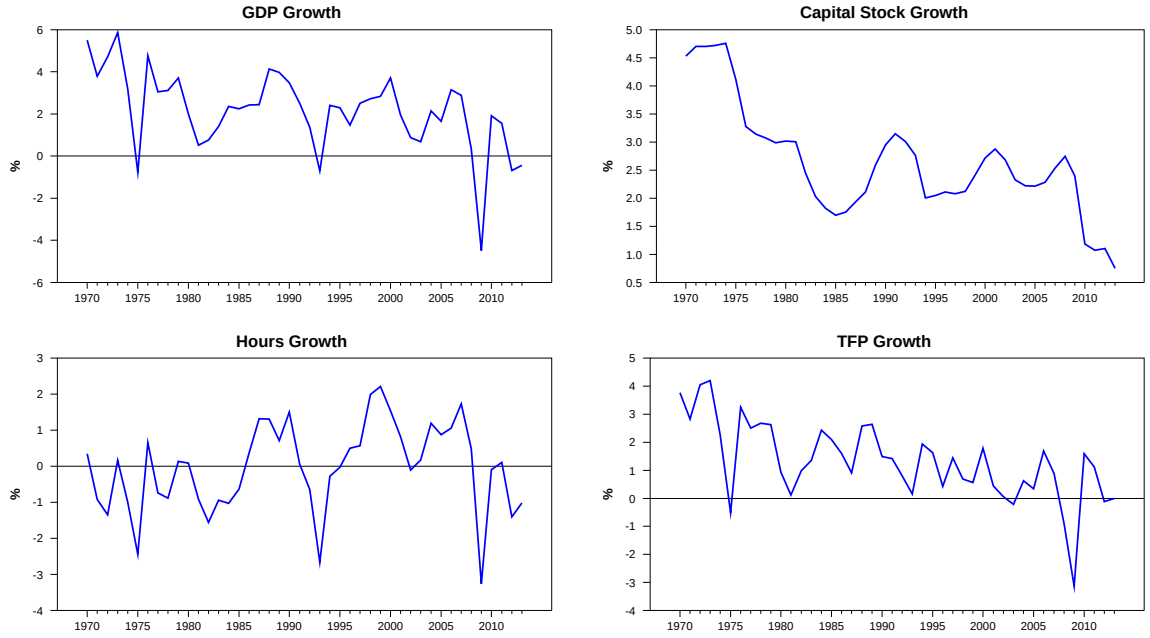
	Euro Area				United States			
Period	$\triangle y$	$\triangle a$	$\triangle k$	$\triangle l$	$\triangle y$	$\triangle a$	$\triangle k$	$\triangle l$
1970-1976	3.6	2.7	1.5	-0.5	3.1	0.9	1.2	1.0
1977-1986	2.1	1.6	0.8	-0.4	3.1	0.7	1.2	1.2
1987-1996	2.3	1.5	0.8	0.0	2.9	0.9	1.1	0.9
1997-2006	2.2	0.7	0.8	0.7	3.1	0.9	1.6	0.7
2007-2013	-0.3	-0.2	0.5	-0.6	1.0	0.5	0.7	-0.2
2000-2013	0.9	0.2	0.7	0.0	1.7	0.5	1.1	0.2
2010-2013	0.1	0.3	0.3	-0.5	2.1	0.7	0.5	0.9

Note: The table shows the contribution of growth in labour inputs, capital inputs and TFP to total output growth.

[6] The observations from 1980 onwards are perhaps more reliable given the initial stock for 1970 is an estimate.

Figure 1

Determinants of Euro Area Output Growth: 1970-2013



2.2 Trend TFP Growth in the Euro Area

Neoclassical growth models tell us that TFP growth is the key determinant of labour productivity growth over the longer run. What do these calculations suggest is going to be the likely trend rate of growth for TFP in the coming years? We believe that the average growth rate over the period 2000-2013 of 0.2 percent per year may well represent a reasonable value for the medium-term trend growth rate in the euro area. This period incorporated a number of years of expansion and falling unemployment as well as two periods of rising unemployment so the total cyclical effect on this average is probably quite low. An alternative way of extracting an underlying trend from these figures is to use a filter. Applying a Hodrick-Prescott (HP) filter (with a value of $\lambda = 6.25$. because of our use of annual data) we estimate an underlying annual trend growth rate for TFP of only 0.09 per percent.

Another reason to project a low rate of TFP growth in the coming years is the evidence for the US. Applying our methodology to the US data, we estimate that TFP growth has also slowed significantly. Indeed, we estimate an average TFP growth rate of only 0.5 percent over the period 2000-2013, which is very low by historical standards. Productivity performance in the US in the current expansion has been relatively poor, particularly, when considering that the early phases of expansions usually see strong productivity growth due to cyclical events. Robert Gordon (2012, 2014) has detailed a number of reasons why productivity growth is likely to be low in the coming years in the US. He points out that, from a very long-term perspective, US productivity growth has been falling since the 1950s and that the current round of innovations in areas such as healthcare and information technology are less transformative than previous waves of innovation.

Forecasting TFP growth is, of course, extremely difficult and our understanding of the forces underlying TFP improvements is limited. However, taken together, the various considerations above suggest that, in the absence of important changes to economic policies, there is little reason to expect a substantial improvement in TFP growth in the euro area in the coming years.

Table 2 presents an alternative accounting breakdown of the growth performance of the euro area and the US. Using the following identity:

$$\frac{\dot{Y}_t}{Y_t} - \frac{\dot{L}_t}{L_t} = \frac{\dot{A}_t}{A_t} + \alpha \left(\frac{\dot{K}_t}{K_t} - \frac{\dot{L}_t}{L_t} \right) \tag{4}$$

Labour productivity growth can be characterised as a function of TFP growth and "capital deepening" (growth in capital per unit of labour). Our calculations show that capital deepening has fallen by a smaller amount than TFP growth. For the period 2000 to 2013, our calculations ascribe 0.7 percent of the 0.9 percent average growth rate of productivity to the capital deepening effect.

This pattern, in which capital deepening displays a different pattern over time from TFP growth, can persist for some time. However, as we discuss below, with a stable investment share of GDP, a slow rate of TFP growth will ultimately also translate into a slow rate of capital deepening. In fact, the steady-state growth rate of a Solow model economy with the production function employed here is $\frac{g}{1-\alpha}$ where g is the growth rate of TFP. With a value of α of one-third, this equates to $1.5g$, meaning that along a steady growth path, only one-third of the growth in output per hour is due to capital deepening.

These calculations suggest that the euro area's rate of capital deepening has been unsustainably high in the period since 2000. With average TFP growth of 0.2 percent over this period, the long-run sustainable contribution from capital deepening should be only 0.1 percent, rather than the 0.7 percent that was observed. This trend points to a gradual slowing in productivity growth unless there is a turnaround in the growth rate of TFP.

Table 2: Decomposition of Euro Area and US Output per Hour Growth Rates ($\%$)

	Euro Area			United States		
Period	$(\triangle y - \triangle l)$	$\triangle a$	$(\triangle k - \triangle l)$	$(\triangle y - \triangle l)$	$\triangle a$	$(\triangle k - \triangle l)$
1970-1976	4.4	2.7	1.7	1.5	0.9	0.6
1977-1986	2.7	1.6	1.0	1.3	0.7	0.6
1987-1996	2.3	1.5	0.8	1.6	0.9	0.7
1997-2006	1.1	0.7	0.4	2.1	1.0	1.1
2007-2013	0.6	-0.2	0.8	1.2	0.5	0.8
2000-2013	0.9	0.2	0.7	1.5	0.5	1.0
2010-2013	0.9	0.3	0.6	0.8	0.7	0.1

Note: The table shows the contribution of capital deepening and TFP to the growth rate of labour productivity.

2.3 Country-Specific Calculations

Table 3 presents the different components of growth for the sub-periods 2007-2013 and 2000-2013 for each of the twelve euro area countries that we are considering as well as the UK to provide a non-euro-area comparison. Over the period 2007 to 2013, only Spain, Portugal and Austria within the euro area had a positive average rate of TFP growth. Over the longer perspective of 2000-2013, the average rate of TFP growth in the twelve euro area countries in our sample ranged from 0.8 percent in Austria to minus 0.6 percent for Italy. In general, however, there is a striking pattern of low rates of TFP growth. For example, every country apart from Austria had lower TFP growth over the period 2000-2013 than the euro area as a whole had for every decade prior to 2006.

Table 4 repeats the decomposition of growth in output per hour since 2000 into TFP growth and a capital deepening effect. Over the period 2000-2013, ten of the twelve euro area countries examined here had capital deepening effects contribute more to growth than TFP improvements and the other two (Austria and Germany) had contributions from capital deepening that were larger than would be sustainable along a steady growth path. Worryingly, many of the worst performers in relation to TFP growth since 2000 are those with large stocks of public debt.

Table 3: Decomposition of Output Growth Rates for European Countries (%)

	2007-2013				2000-2013			
Country	$\triangle y$	$\triangle a$	$\triangle k$	$\triangle l$	$\triangle y$	$\triangle a$	$\triangle k$	$\triangle l$
Belgium	0.4	-0.5	0.7	0.2	1.2	0.1	0.8	0.4
Germany	0.7	-0.1	0.4	0.3	1.1	0.6	0.5	0.0
France	0.1	-0.5	0.7	-0.1	1.0	0.1	0.8	0.1
Greece	-4.5	-2.6	0.6	-2.4	0.1	0.0	0.9	-0.8
Ireland	-1.3	-0.1	0.6	-1.8	2.0	0.4	1.4	0.2
Italy	-1.6	-1.0	0.4	-0.8	0.0	-0.6	0.6	0.0
Spain	-1.0	0.3	0.8	-2.1	1.3	-0.1	1.2	0.2
United Kingdom	-0.2	-1.1	0.7	0.2	1.5	0.2	0.9	0.2
Finland	-0.8	-1.0	0.7	-0.5	1.4	0.6	0.7	0.0
Lux	0.1	-2.4	1.4	1.1	2.2	-0.2	1.6	0.9
Portugal	-1.2	0.2	0.3	-1.7	0.1	0.0	0.7	-0.7
Austria	0.6	0.3	0.5	-0.2	1.5	0.8	0.6	0.1
Netherlands	-0.3	-0.8	0.6	-0.1	0.9	0.0	0.8	0.2

Table 4: Decomposition of Output Per Worker Growth for European Countries(%)

	2007-2013			2000-2013		
Period	$(\triangle y - \triangle l)$	$\triangle a$	$(\triangle k - \triangle l)$	$(\triangle y - \triangle l)$	$\triangle a$	$(\triangle k - \triangle l)$
Belgium	0.1	-0.5	0.6	0.6	0.1	0.6
Germany	0.2	-0.1	0.3	1.0	0.6	0.4
France	0.3	-0.5	0.7	0.9	0.1	0.8
Greece	-0.9	-2.6	1.8	1.4	0.0	1.4
Ireland	1.4	-0.1	1.5	1.7	0.4	1.3
Italy	-0.3	-1.0	0.7	0.0	-0.6	0.6
Spain	2.1	0.3	1.8	1.0	-0.1	1.1
United Kingdom	-0.6	-1.1	0.6	0.9	0.2	0.8
Finland	-0.1	-1.0	0.9	1.4	0.6	0.7
Luxembourg	-1.6	-2.4	0.9	1.0	-0.2	1.1
Portugal	0.9	0.3	0.6	1.1	0.0	1.1
Austria	0.9	0.3	0.6	1.3	0.8	0.5
Netherlands	-0.1	-0.8	0.7	0.7	0.0	0.7

2.4 Factors Determining Labour Input

Turning from productivity growth to the growth of labour input, we focus on the total amount of hours worked as our measure of labour input. We decompose past movements in hours worked based on five different factors: Population, the fraction of population of standard work age (i.e. aged between 15 and 64), the participation rate (by which we mean the labour force divided by the work-age population), the employment rate (employment as a fraction of the labour force) and the average workweek per employee. These factors determine hours worked as follows:

$$\begin{aligned} \text{Total Hours Worked} \;=\; & \text{Population} \\ & \times \left(\frac{\text{Work Age Population}}{\text{Population}} \right) \\ & \times \left(\frac{\text{Labour Force}}{\text{Work Age Population}} \right) \\ & \times \left(\frac{\text{Employment}}{\text{Labour Force}} \right) \\ & \times \text{Average Hours Worked Per Employee} \end{aligned} \tag{5}$$

This equation can be used to decompose the growth rate of total hours worked during any period into the contribution coming from each of these five factors.[7] Table 5 provides a decomposition of this type for the percentage change in total hours worked for the euro area and the United States. Table 6 presents this decomposition for the twelve euro area countries for the periods 2000-2013 and 2007-2013.

Figure 2 provides graphical evidence of how the five variables have evolved over time for the euro area twelve group of countries. The figure shows that in the period since 1970, population growth has fluctuated around a relatively low average value of about one half of one percent and has gradually fallen over the past decade. There have been significant changes over time in the link between population and labour input: The fraction of the population that was of work age in the euro area rose steadily from 63 percent in 1970 until it reached a peak of 67.6 percent in 1991. This fraction has declined since the early 1990s at a slow but accelerating pace and in 2013, it stood at 65.2 percent. Rising female labour force participation was a significant driver increasing the fraction of the population available for work in most of the years since 1970 but the overall participation rate has levelled off in recent years. Offsetting the longer-term rise in participation, the average workweek has declined steadily while rising average unemployment rates have also reduced the growth in hours worked.

[7] One small complication with this decomposition is that some people continue to work past 65, so our estimate of the "participation rate'; (the ratio of the labour force to population aged between 15 and 64) is boosted slightly by these people. We use this framework to illustrate historical developments because of the important role that the fraction of population aged between 15 and 64 will play in our projections.

Figure 2

Determinants of Euro Area Hours Growth: 1970-2013

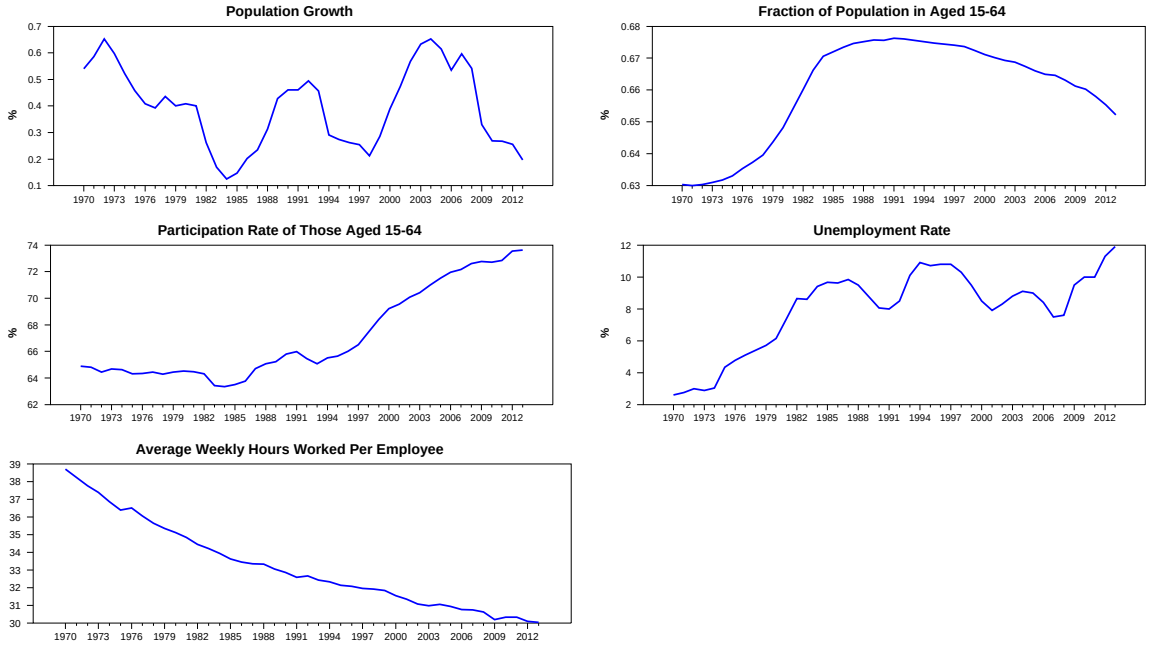


Table 5: Decomposition of Growth in Hours Worked (%)

	Euro Area					
Period	Total	Pop.	Frac 15-64	P. Rate	Emp. Rate	Workweek
1970-1976	-0.8	0.5	0.1	-0.1	-0.4	-1.0
1977-1986	-0.6	0.3	0.6	-0.1	-0.5	-0.8
1987-1996	0.1	0.4	0.0	0.2	-0.1	-0.4
1997-2006	1.1	0.5	-0.2	0.9	0.3	-0.4
2007-2013	-0.9	0.3	-0.3	0.3	-0.8	-0.4
2000-2013	0.0	0.5	-0.2	0.5	-0.3	-0.4
2010-2013	-0.8	-0.4	0.4	0.0	-0.7	-0.3
	United States					
Period	Total	Pop.	Frac 15-64	P. Rate	Emp. Rate	Workweek
1970-1976	1.5	1.0	0.7	0.8	-0.5	-0.5
1977-1986	1.8	1.0	0.3	0.6	0.0	-0.1
1987-1996	1.3	1.2	-0.2	0.3	0.1	0.0
1997-2006	1.0	1.0	0.3	-0.2	0.0	-0.2
2007-2013	-0.3	0.8	-0.2	-0.3	-0.5	0.0
2000-2013	0.2	0.9	0.1	-0.2	-0.3	-0.1
2010-2013	1.4	0.7	-0.2	-0.2	0.8	0.2

Note: $Pop.$ refers to population, Frac 15-64 is the fraction of the population aged between 15 and 64, $P.$ is the participation rate, $Emp.$ is employment and $Workweek$ is average hours worked by employees.

Table 6: Decomposition of Growth in Hours Worked (%)

	2007-2013					
Period	Total	Pop.	Frac 15-64	P. Rate	Emp. Rate	Workweek
Belgium	0.3	0.8	-0.2	0.1	-0.2	-0.2
Germany	0.5	0.0	-0.1	0.3	0.6	-0.4
France	-0.2	0.5	-0.4	0.3	-0.4	-0.1
Greece	-3.6	-0.1	-0.5	0.8	-3.9	0.0
Ireland	-2.7	0.7	-0.8	-0.5	-1.8	-0.6
Italy	-1.2	0.5	-0.3	0.3	-1.1	-0.6
Spain	-3.1	0.4	-0.6	0.6	-3.7	0.1
United Kingdom	0.3	0.8	-0.4	0.3	-0.4	0.0
Finland	-0.7	0.5	-0.6	0.1	-0.2	-0.4
Lux	1.6	2.1	0.3	0.3	0.0	-0.5
Portugal	-2.5	-0.2	-0.3	-0.3	-1.5	-0.3
Austria	-0.3	0.3	0.0	0.5	-0.1	-1.1
Netherlands	-0.1	0.4	-0.4	0.3	-0.5	0.1
	2000-2013					
Period	Total	Pop.	Frac 15-64	P. Rate	Emp. Rate	Workweek
Belgium	0.6	0.6	0.0	0.3	0.1	-0.2
Germany	0.1	0.0	-0.2	0.5	0.2	-0.4
France	0.2	0.6	-0.2	0.1	-0.1	-0.2
Greece	-1.2	0.1	-0.3	0.8	-1.5	-0.3
Ireland	0.3	1.5	-0.2	0.3	-0.8	-0.5
Italy	0.0	0.5	-0.3	0.4	-0.2	-0.5
Spain	0.3	-0.2	1.2	1.0	-1.4	-0.3
United Kingdom	0.6	0.7	0.0	0.3	-0.2	-0.1
Finland	0.0	0.4	-0.3	0.2	0.1	-0.1
Lux	1.3	1.7	0.2	0.2	-0.3	-0.5
Portugal	-1.1	0.2	-0.2	0.2	-1.0	-0.2
Austria	0.1	0.4	0.0	0.6	-0.1	-0.8
Netherlands	0.2	0.4	-0.2	0.6	-0.3	-0.2

Note: $Pop.$ refers to population, $P.$ is the participation rate, Frac 15-64 is the fraction of the population aged between 15 and 64, $Emp.$ is employment and $Workweek$ is average hours worked by employees.

Rather than discuss in detail the factors that have driven past fluctuations in labour input, we want to shift our focus to the outlook for the future. A number of patterns are now in place that point towards a potentially sharp contraction in total hours worked in the euro area economy over the next few decades. Figure 3 illustrates projections for the total population and population aged between 15 and 64 from Eurostat's EUROPOP2013 forecasts.[8] These projections are based on detailed projections for trends in life expectancy, fertility and migration (we will return to the issue of migration later).

- The population of the euro area 12 group of countries is expected to grow very slowly over the next few decades. Eurostat projections show 0.18 percent per year growth in population between 2013 and 2023 followed by a gradual reduction in population growth until population levels begin declining in 2046.

- More seriously, the fraction of the population that is of working age is set to drop rapidly in the coming years, falling from 65.2 percent in 2013 to 63.5 percent in 2020 and 57.2 percent in 2040. In fact, Eurostat estimate that the euro area's population in the normal working-age bracket of 15 to 64 years old peaked in 2010 and is set to decline steadily over the next few decades.

- Among those who are in the working-age bracket of 15 to 64 years old, increases in participation rates have gradually tailed off in recent years. This mainly stems from female labour force participation reaching a plateau in many countries but it also reflects population ageing. Participation rates fall off as people get closer to the "official" retirement age so the ageing of Europe's population may reduce the participation rate of those that are officially of working age. This is not an issue that is limited to Europe. Indeed, there is evidence that declining participation and population ageing are already having a significant restraining effect on employment growth in the US.[9]

Unlike the previously documented pattern of weak TFP growth being more of a factor with high-debt countries, population ageing is an issue that appears likely to affect most euro area countries equally. Figure 4 shows that Eurostat projections anticipate substantial declines in the fraction of the population aged between 15 and 64 in all twelve of the countries analysed here.

[8] These forecasts are available at http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data

[9] See Fallick, Fleischman and Pingle (2010) and Stock and Watson (2012) for a discussion of the effect of ageing and labour force participation on the US labour market.

Figure 3

Euro Area Demographic Changes

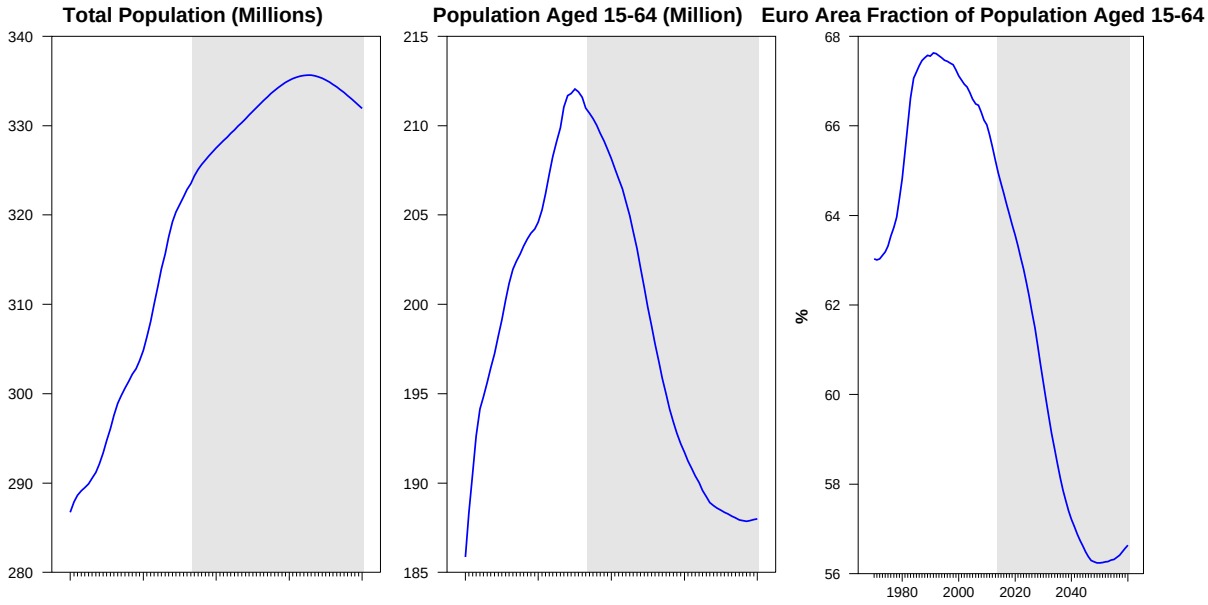
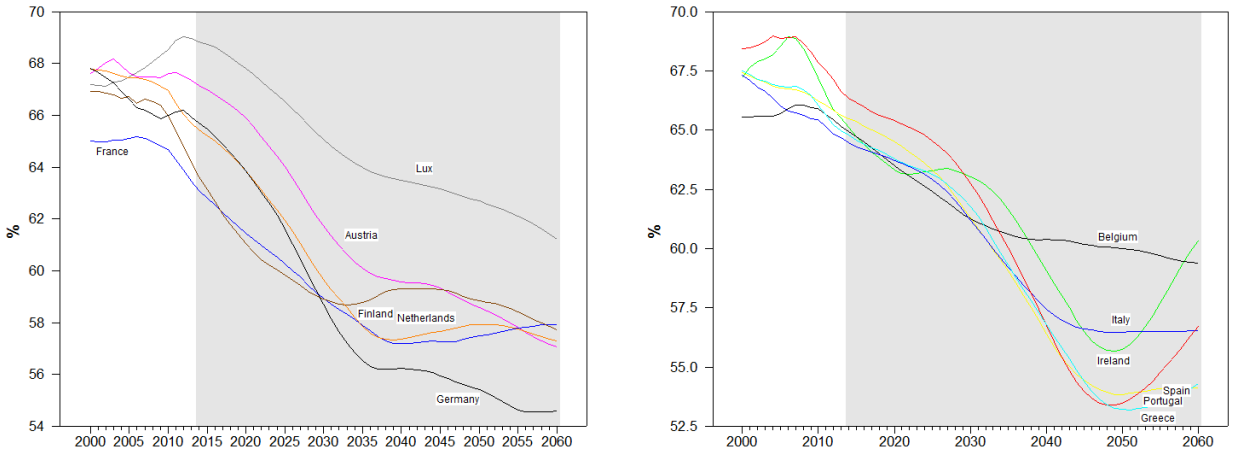


Figure 4

Proportion of Total Population in 15 to 64 Age Bracket



3 Longer-Run Outlook

We have outlined a number of trends that provide reasons to be downbeat about growth in the euro area in the coming years: Trend growth in TFP appears to be very low and ongoing demographic patterns are going to have a negative impact on the growth rate of employment in the euro area. Still, there are a number of aspects of the euro area economy that are very likely to improve from their current position. Even with a slow recovery constrained by fiscal adjustment, private sector balance sheet problems and tight bank credit, unemployment should fall from its current high level of over 11 percent. Similarly, the negative supply-side effects of the current low rate of investment are likely to be unwound over time as the economy moves more firmly out of its current slump.

How are these positive and negative factors likely to shape economic growth in the coming decades? In this section, we report results from a simulation of a simple supply-side model that projects growth using recent trends for TFP, uses the demographic projections just described and also assumes an unwinding of the cyclical problems of low investment and high unemployment. The model is implemented on a country-by-country basis and then aggregated to give results for the euro area 12 group of countries. Everything up to 2013 is taken from historical data, so 2014 is the first year of the simulation.

3.1 The Model and Underlying Assumptions

The model is described as follows:

$$
\begin{aligned}
Y_{it} &= A_{it} K_{it}^{\alpha} L_{it}^{1-\alpha} && (6)\\
K_{it} &= (1-\delta) K_{t-1} + I_{t-1} && (7)\\
L_{it} &= (1-U_{it})(PART_{it} \times WorkPop_{it}) \times H_{it} && (8)\\
I_{it} &= s_{it} Y_{it} && (9)\\
\Delta \log A_{it} &= g && (10)
\end{aligned}
$$

The evolution of each country's capital stock depends on last period's rate of investment which we project as a time-varying ratio of total real GDP. Labour input is modelled as a product of the country's employment rate $(1 - U_{it})$, the participation rate for those in the work-age age population $(PART_{it})$ the working age population $(WorkPop_{it})$ and the average length of the workweek (H_{it}).

The assumptions underlying the simulation are as follows:

- TFP in each country is assumed to continue to grow at the euro area average for 2000-2013 of 0.2 percent.

- The ratio of investment to GDP in each country is projected to recover to its 1998-2007 average by 2020 and remain constant thereafter
- Unemployment rates in each country are projected to fall gradually to their 1998-2007 averages by 2020 and be constant thereafter. Two exceptions to this procedure are Germany and Finland, where the current rates are below these averages. We project the unemployment rates in these countries to stay constant from 2013 onwards.
- The work-age population is taken from Eurostat's EUROPOP2013 projections as illustrated in Figure 3.
- We model the labour force participation rate using age cohort projections from Eurostat's EUROPOP2013 projections. Specifically, we assume that participation rates in each five year age cohort (starting from age 15-19 and moving up to age 70-75 with a final category of aged over 75) remain at their 2013 levels.
- We project that the average workweek of employees remains flat from 2014 onwards.

Overall, with these assumptions, our goal is to summarise the idea of a gradual recovery in the economy that reflects underlying trends in the labour market and in TFP. Unsurprisingly, the TFP growth assumptions are perhaps the trickiest to settle on. At a euro area aggregate level, the assumption of 0.2 percent growth per year is certainly very low by longer-term historical standards but we believe this low growth rate has prevailed for a sufficiently long enough period of time to be considered the current underlying trend. In relation to specific economies, one could argue for projecting a continuation of country-specific trends. However, decade-by-decade growth rates of country-specific TFP tend to be volatile and we don't want to spuriously extrapolate from recent trends into the far future. In general, we view the 0.2 percentage point TFP growth assumption for each country as representing a sluggish future performance consistent with the disappointing trends that have been seen for almost all euro area countries.

Figures 5 and 6 provide graphic illustrations of how our assumptions translate into euro area aggregate labour market outcomes. Figure 5 illustrates the four variables that determine total hours worked. Population growth is projected to be weak over the next few decades before turning negative near the middle of the century. The labour force participation rate of those aged between 15 and 64 is projected to decline by a couple of percentage points over the next few decades as the fraction of workers in the older cohorts with lower participation rates increases.

The assumption about the unemployment rate adopted here is based on the idea that over the longer run, unemployment rates tend to be determined by underlying labour market institutions, a position that can be justified on the basis of empirical work such as Nickell, Nunziata and Ochel

(2005). However, to the extent that labour market hysteresis effects may still determine the behaviour of unemployment out to 2020, this projection may be too optimistic. While we project each country to have a constant unemployment rate after 2020, Figure 5 shows a very small upward trend in the euro area unemployment rate after 2020 due to composition effects: Some of the large countries that are projected to have higher unemployment rates (such as France and Italy) are also projected to have labour forces that become larger over time relative to Germany, which is projected to have a low unemployment rate.

Our projection of the average workweek as remaining flat at 2013 levels could be considered optimistic on the grounds that there is no evidence, as of yet, that the trend decline in the average workweek has ended. However, it is likely that much of the trend decline in the average workweek is due to increased female labour force participation in part-time employment. When this source of increased participation flattens out, the trend decline in the average workweek may also cease. In addition, we consider it unlikely that the rest of the decade would see the introduction of many legal new restrictions on the amount of hours that people can work. But there is a possibility that this assumption is too positive.

Figure 6 shows how our assumptions translate into projections for total employment and hours worked. The reduction in the unemployment rate leads to a temporary increase in total employment up to 2020 (with an average annual growth rate of employment of 0.32 percent) before demographic patterns reassert themselves and produce a gradual decline in employment from there onwards. Our assumption about a constant workweek for employees means the projection for hours worked roughly parallels that for employment with an average annual growth rate of 0.38 percent per year up to 2020 followed by declines in subsequent decades.[10]

Figure 7 illustrates the assumptions for TFP growth and the investment share of GDP. While each country moves towards its average investment rate of the period 1998-2007 by 2020, the projected growth rates of each country differ so there is a small increase in the aggregate euro area investment share of GDP after 2020.

[10] The growth rate for hours worked differs slightly from the growth rate for employment despite the assumption of constant workweeks because of mix shifts. Employment growth in countries with high average workweeks is stronger than in countries with low average workweeks.

Figure 5

Baseline: Labour Market Assumptions

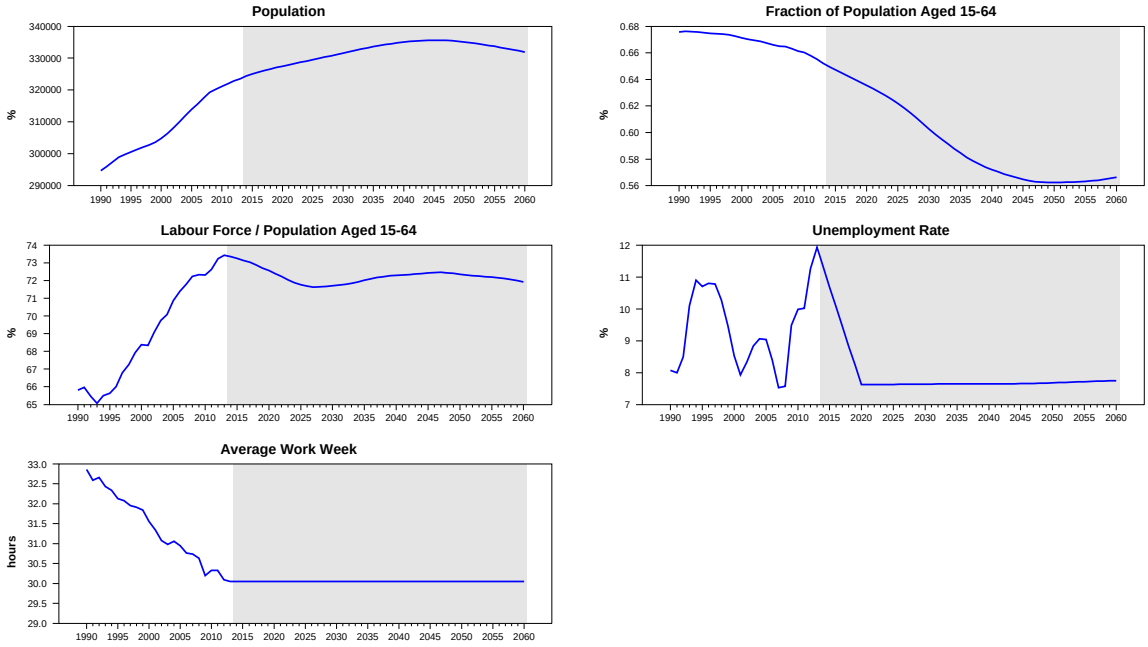


Figure 6

Baseline: Labour Supply (Millions)

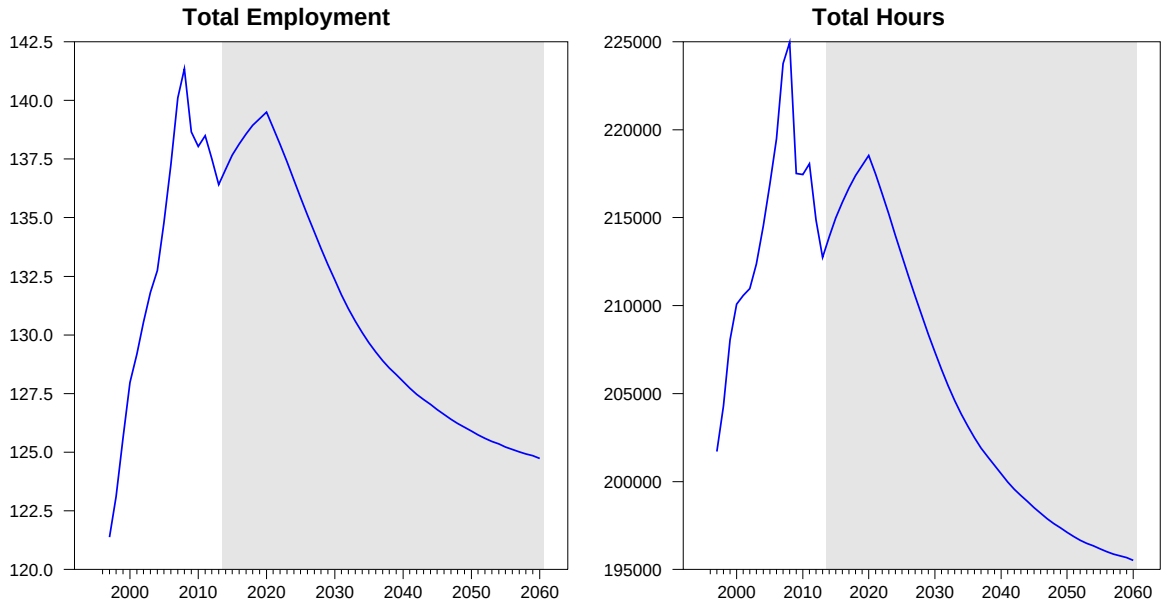
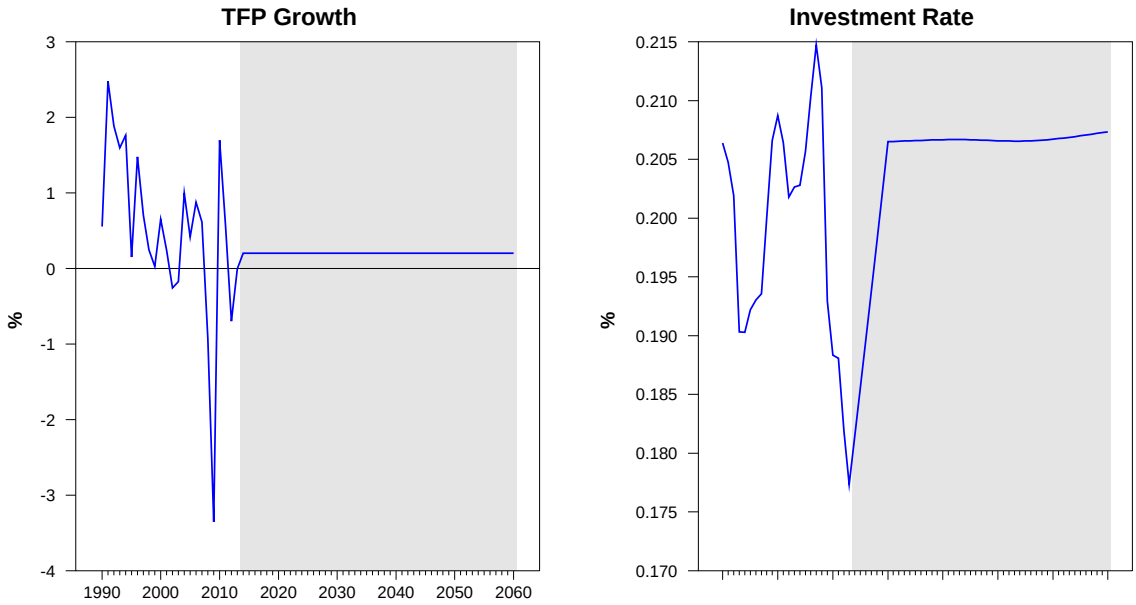


Figure 7

Baseline Investment and TFP Assumptions



3.2 Euro Area Aggregate Results

Before describing the results of this simulation, it worthwhile discussing the analytics underlying the model's long-run behaviour. This simulation is essentially a practical application of the Solow model of economic growth. One useful way of thinking about the model's long-run behaviour comes from an alternative decomposition for output per hour from the one used above. Defining the capital-output ratio as

$$X_t = \frac{K_t}{Y_t} \tag{11}$$

Output per hour can now be expressed as

$$\frac{Y_t}{L_t} = A_t^{\frac{1}{1-\alpha}} X_t^{\frac{\alpha}{1-\alpha}} \tag{12}$$

This decomposition has been used in a number of previous studies, most notably by Hall and Jones (1997). DeLong (2003) shows that the capital-output ratio in this model follows a so-called "error-correction" equation of the form

$$\Delta X_t = \lambda \left(X^* - X_t \right) \tag{13}$$

such that it adjusts towards a long-run or "steady-state" level determined by

$$X^* = \frac{s}{\frac{g}{1-\alpha} + n + \delta}. \tag{14}$$

where the adjustment speed is

$$\lambda = (1-\alpha)(\frac{g}{1-\alpha} + n + \delta). \tag{15}$$

McQuinn and Whelan (2007) use data from the Penn World Tables to show that convergence speeds for the capital-output ratio tend to conform closely to the Solow model's predictions.

Relative to the more familiar decomposition of output per hour into TFP and capital-per-hour terms, this decomposition has an important advantage. The long-run capital-output ratio is independent of the level of A_t, something which is not true of capital-per-hour. Hence, this formulation completely captures the effects of A_t on long-run output, while the more traditional decomposition features a capital deepening term that depends indirectly on the level of technology.

These calculations show that, over the long-run with constant values for g and n, the capital-output ratio converges to its steady-state. Thus, equation (12) tells us that all growth in output per hour ends up being due to $A_t^{\frac{1}{1-\alpha}}$. This term grows at rate $\frac{g}{1-\alpha}$. Thus, in our example with TFP growth of $g = 0.002$ per year and a value of $\alpha = \frac{1}{3}$, we end up with a long-run steady-state

growth rate of output per hour $\frac{g}{1-\alpha} = 0.003$ or only 0.3 percent per year.

We estimate, however, that the current value of the euro area's capital-output ratio is about 2.7 while its long-run steady-state estimate, based on a projection of 0.2 percent per year TFP growth and a slightly negative growth rate of labour input, is about 3.3. This means that the model will generate growth in output per hour that is greater than 0.3 percent along a transition path. The pace of convergence, λ, is also slow when the pace of economic growth is as weak as we project. With our depreciation rate of six percent per year, the pace of this convergence is about four percent per year so the convergence dynamics of the capital-output ratio are projected to last for a long time, meaning a very gradual transition to the steady-state growth rate of output per hour of 0.3 percent per year. These dynamics are illustrated in Figure 8. Rising investment leads to a gradual increase in the growth rate of the capital stock from 0.79 percent in 2013 to a peak of 1.48 percent in 2021 before gradually declining again.

Figure 9 shows the growth rates in output and output per hour generated by this model. Positive cyclical factors play some role in boosting growth in the years up to 2020. However, despite rising investment, falling unemployment and a stabilisation in the average workweek, the average growth rate of GDP is only 0.71 percent in the years up to 2020 and only 0.60 percent per year over the period 2014-2023. The average growth rate of hours worked over the full decade 2014-23 is only 0.11 percent as declines after 2020 because of demographic factors erode the gains due to falling unemployment during the projected recovery. Capital stock growth falls to only 0.58 percent in 2014 but then picks up due to rising investment to average 1.1 percent per year over. This combination of weak growth in labour input, capital input and TFP produces anaemic growth over the decade despite a recovery in investment and unemployment.

We project that output per hour will grow at an average rate of 0.49 percent over the period 2014-2023. After this decade, output per hour is projected to grow in the subsequent decades at average rates of 0.71 percent in 2024-2033 (declining employment leads to a temporary boost via a capital deepening effect), 0.52 percent in 2034-2043, 0.4 percent in 2044-53 as this rate gradually eases towards its steady-state value of 0.3 percent. With falling hours worked, euro area GDP grows at 0.21 percent per year in 2023-2033. The decline in hours growth tails off in subsequent decades, thus allowing total GDP growth to settle down at about 0.28 percent per year despite declining productivity growth.

It is worth emphasising that these projections do not represent a forecast of year-by-year growth in the euro area. They are based on a set of assumptions in which key parameters are either constant (TFP growth) or converge at a constant pace towards previous averages over a fixed time period (investment ratio, unemployment rate). Our projection shows GDP growth only averaging 0.7 percent during the recovery period up to 2020. It is of, course, likely that during

some of these years growth will be higher than this value, for example because unemployment falls faster than we have projected or because TFP grows faster than 0.2 percent. However, faster declines in unemployment will likely just change the timing of the recovery rather the average amount of growth experienced. Similarly, yearly movements in TFP growth are highly volatile and so some years may see strong growth coming from this source. Still, the historical evidence points to a steady reduction in the trend growth rate of TFP. While we cannot be confident in our 0.2 percent trend growth rate for TFP as a forecast, the evidence certainly points towards a lower trend value than during previous decades.

Figure 8

Baseline: Capital-Output Ratio Convergence

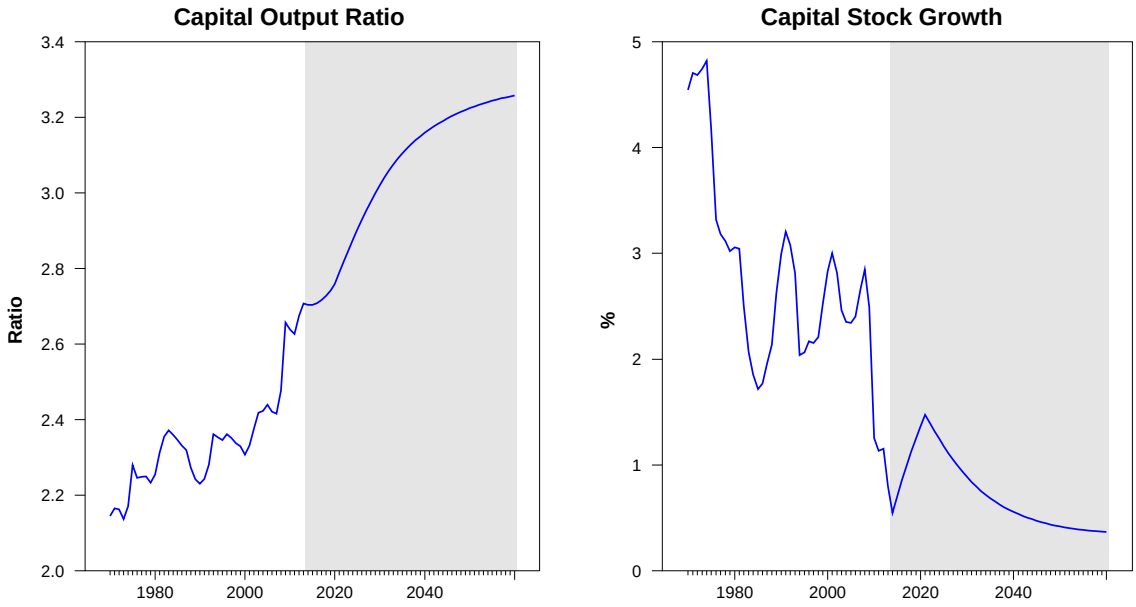
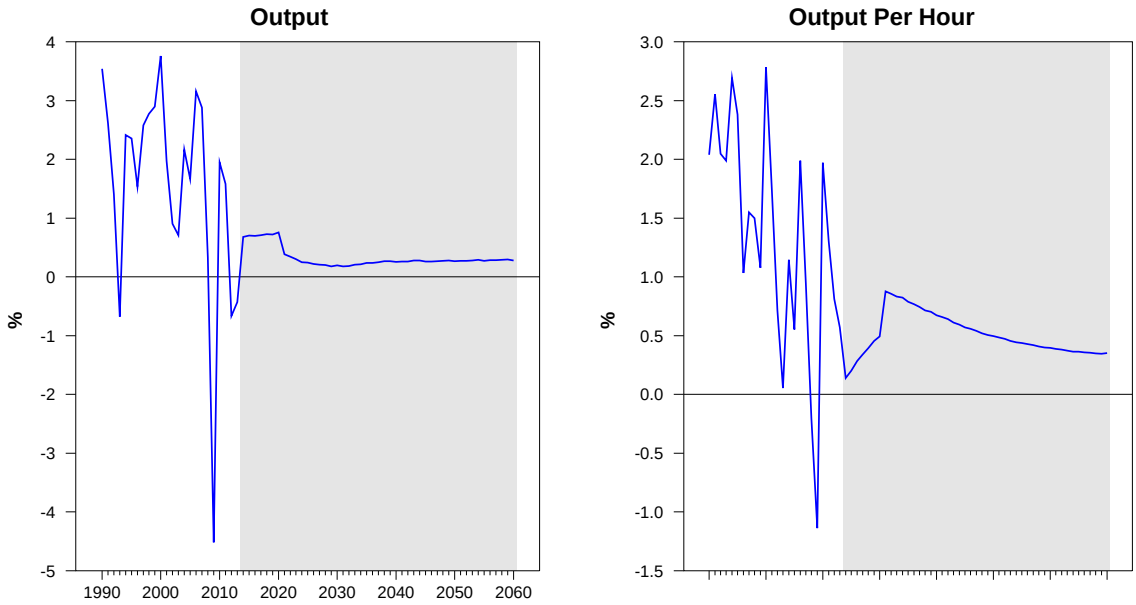


Figure 9

Baseline: Output Growth Rates



3.3 Country-Level Results

Table 7 summarises the results for both the euro area and the individual member countries out to 2044. The differences in growth rates reported here stem from three main factors.

First, for the period 2014-23, there are significant differences related to the recovery scenarios assumed in our baseline. For example, Greece and Spain both record stronger growth rates due to large reductions in unemployment. Some of the larger differences in growth rates of output per hour over 2014-23 reflect differences in the intensity of the recoveries in the capital and labour inputs during this recovery. Greece, for example, projects to have a decline in labour productivity over the period 2014-23 because of the effect of diminishing returns to labour but also because the recovery in investment only translates into an increase in the capital stock after 2017 so the capital-output ratio declines until 2021.

Second, much of the difference in headline GDP growth rates across countries reflects differences in demographic projections. In particular, there are a number of striking differences between headline GDP growth rates and growth rates in output per hour due to demographic patterns. For example, German GDP growth is projected to average -0.25 percent over 2024-2033 despite output per hour growth of 0.72 percent while Luxembourg is projected to growth at an average rate of 2.09 percent over the same period despite output per hour growth of only 0.46 percent. In fact, rolling the model forward, Germany is projected to fall behind France in terms of total GDP in the late 2050s.

Third, the longer-run differences in output per hour growth all reflect differing initial conditions and demographic patterns so that countries differ considerably in their transition paths to the equilibrium capital-output ratio. If run on forever, all of the countries in this simulation would tend towards a growth rate of output per hour of 0.3 percent per year. As with the aggregate euro area economy, the slowdown in the long-run growth rate is consistent with long-run capital-output ratios that are higher than those currently prevailing in these countries. For this reason, all of these economies are projected to continue with output per hour growth above 0.3 percent per year over our projection period due to capital-deepening effects.

Table 7: Baseline Growth Forecasts (%)

	Output			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.60	0.21	0.25	0.35
Belgium	0.88	0.96	1.00	0.95
Germany	0.16	-0.25	-0.11	-0.07
France	0.63	0.48	0.56	0.56
Greece	1.00	-0.31	-0.51	0.06
Ireland	1.19	0.91	0.70	0.93
Italy	0.55	0.26	0.29	0.37
Spain	1.33	0.11	-0.01	0.47
Finland	0.53	0.66	0.66	0.62
Lux	2.46	2.09	1.78	2.11
Portugal	0.81	0.08	-0.32	0.19
Austria	0.67	0.52	0.53	0.57
Netherlands	0.67	0.30	0.31	0.42
	Output Per Hour			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.49	0.71	0.52	0.57
Belgium	0.52	0.41	0.35	0.43
Germany	0.75	0.72	0.46	0.64
France	0.58	0.52	0.38	0.49
Greece	-0.10	0.93	0.69	0.51
Ireland	0.75	1.06	0.71	0.84
Italy	0.27	0.54	0.41	0.41
Spain	0.44	1.03	0.68	0.72
Finland	0.62	0.46	0.38	0.49
Lux	0.41	0.46	0.48	0.45
Portugal	0.34	0.94	0.75	0.68
Austria	0.70	0.61	0.46	0.59
Netherlands	0.59	0.72	0.50	0.60

Note: Average annual growth rate for the period in question.

4 The Potential Impact of Structural Reforms

The outlook we have just painted may be considered a fairly grim one. However, it is based on our best estimate of the current medium-term trend for TFP growth in the euro area as well as projections of labour market trends that are reasonable extrapolations of where Europe is heading without significant policy changes. Indeed, it could be argued that our assumptions about a gradual return to normal cyclical conditions in the coming years are, perhaps, a bit optimistic. High unemployment rates may persist for longer than we have projected because of hysteresis effects while the investment rate may not recover as far as we have projected because of diminished opportunities for investment in a slow growing economy. In addition, our assumption about the absence of further declines in average workweeks may also prove to be too optimistic.

It is reasonable to ask, however, whether Europe's governments will permit an outcome as poor as the one we project to occur. From reviewing policy-related literature as well as annual country reports from the IMF, European Commission and OECD, it is clear there are many potential changes to economic policy that could help to boost labour productivity as well as the number of hours worked in the economy. Perhaps the implementation of some of these measures will boost growth rates in the coming decades.

One approach to assessing the impact of potential policy changes to boost growth is to come up with a detailed list of "structural reforms" for each country and then use empirical studies to link these policy changes to their effect on growth. An important difficulty with such an approach is that many of the forces that affect key variables such as TFP or labour force participation rates are difficult to summarise accurately in comparable cross-country data. This approach can mean that policy recommendations end up being based on regressions that may be poorly specified and focus too much on those variables that are available across a wide range of countries.

In addition, the details of which reforms are likely to be effective may differ widely across countries, particularly as many countries within the euro area have their own distinctive models of the mixed economy. A number of countries in Europe have maintained low unemployment rates using very different mixes of tax and social welfare policies, so it would be simplistic and misleading to believe there is a "one size fits all" of policies that should be applied to each country's labour market.

Given these problems, rather than concentrate on specific policy reforms, we choose to focus mainly on the potential boost that such reforms could achieve if they were to be successful. We focus on four different types of reforms: A labour market reform scenario, two pension reform scenarios, a broader regulatory reform scenario and a scenario in which net migration is substantially increased.

4.1 Labour Market Reform

The fact that unemployment is high across a wide range of euro area economies at present is not, on its own, sufficient evidence to suggest that labour market imperfections are a key cause of high unemployment in these countries. A number of countries that currently have high unemployment rates had relatively low levels of unemployment prior to the crisis. Indeed, in our recovery scenario above, there are five countries that we project to have unemployment rates below 6 percent even in the absence of labour market reforms. Germany, where we project the unemployment rate to remain at its current low levels, is one of these countries. However, based on our assumptions that unemployment rates will eventually return to their 1998-2007 averages, Austria, Ireland, Netherlands and Luxembourg are also projected to return to unemployment rates below 6 percent. This still leaves a number of other countries projected to have relatively high unemployment rates even after a recovery. Italy's average unemployment rate returns to 8.7 percent, France's to 9.0 percent, Greece's to 10.2 percent and Spain's to 11.1 percent.

It is likely that this latter group of countries could benefit from substantial reforms of their labour markets. Here, we consider the impact of the implementation of an unspecified set of labour market reforms that would act, in addition to the baseline recovery scenario, to reduce the unemployment rates in each of these countries to 6 percent in 2025. The additional reductions in the unemployment rate due to these reforms are assumed to occur in equal amounts in each year from 2014 onwards. The phase in period of 12 years combines an assumption that reforms may take time to pass and that they may also take time to have their desired impact. For example, Bouis, Causa, Demmou and Duval (2012) estimate that a reduction in initial unemployment benefit replacement rates of around 8 percentage points translates into a 0.5 percentage point increase in employment after three years and into an almost 1 percentage point increase after five years.

While we are not detailing specific labour market reforms that could bring about this outcome, there are a large number of areas that could be examined in each of these countries to produce concrete reform packages. For example, France and Italy both score well above average for the OECD's four principal measures of employment protection.[11] Spain and Italy, despite some recent reforms, have well known problems with two-tier labour markets that have highly protected permanent workers as well as large numbers of workers on temporary contracts with much weaker rights.

How substantial would the packages of reforms have to be to achieve these outcomes for countries like France and Spain? An OECD study by Johansson et al (2013) considers a case in which the replacement rate of unemployment benefits is reduced by 10 percentage points,

[11] These are (i) Protection of permanent workers against individual and collective dismissals (ii)Protection of permanent workers against (individual) dismissal (iii) Specific requirements for collective dismissal (iv) Regulation on temporary forms of employment.

the tax wedge is cut by 4 percentage points and the OECD's measure of the volume of active labour market policies is increased by one standard deviation. They estimate that these measures would, over a period of about ten years, reduce the unemployment rates in Spain and France by almost 3 percentage points. Our reform scenario envisages a similar-sized reduction in French unemployment rates and a larger reduction for Spain.

To place a 10 percentage point reduction in replacement rates in context, the OECD reports that in 2012, the replacement rate for a one-earner couple with two children during the initial phase of unemployment was 68 percent in France, 70 percent in Italy and 72 percent in Spain. For comparison, the figure in the UK was 48 percent and in the US was 43 percent.[12] To put a 4 percentage point cut in the tax wedge in context, the OECD reports that in 2013, the tax wedge for a one-earner couple with two children was 42 percent in France, 38 percent in Italy and 35 percent in Spain. For comparison, the figure in the UK was 27 percent and in the US was 20 percent. These comparisons suggests that the outcomes envisaged here would not be achieved by small, piecemeal reforms but they would still be consistent with relatively high tax rates of labour as well as unemployment benefits that were relatively generous by international standards.[13]

Figures 10 and 11 describe the outcome for unemployment rates in this reform scenario for both the euro area and certain select individual countries respectively. As certain countries (most notably Germany) are projected to have unemployment rates below 6 per cent even without reforms, the overall euro area rate eventually declines to 5.6 per cent as opposed to the 7.7 per cent in the baseline.

The impact on output growth for the euro area, as a whole, can be observed from Figure 12. GDP growth improves out to 2024 and, thereafter, converges back to the baseline case. However, despite relatively large declines in unemployment rates in certain countries, the overall impact on euro area growth rates of a two percentage point reduction in the unemployment rate phased in over ten years is very modest. Over the period 2014-2023, the labour market reforms boost growth in the euro area by 0.13 percentage points per year. This falls to 0.05 percentage points over 2024-2033 and 0.01 percentage points over 2034-2043 (the later effects being due to additional capital accumulation effects). Table 8 presents the country-by-country results for both output and output per hour growth. Despite the modest aggregate effects, the boost to the growth rates of some individual countries, such as Spain (where GDP growth would be raised by 0.35 percentage points over the next decade) are a good deal larger than for the euro area average.

As shown in Figure 12, we estimate that the labour market reforms reduce the growth rate of labour productivity due to the diminishing marginal returns effect of increased employment as

[12] These figures were taken from http://www.oecd.org/els/benefitsandwagesstatistics.htm

[13] These figures were taken from http://www.oecd.org/ctp/tax-policy/taxing-wages-tax-burden-trends-latest-year.htm

modelled with our Cobb-Douglas production function.[14] An alternative channel through which labour market reforms could depress productivity growth—the additional workers perhaps having lower productivity than the average worker—is not modelled here but could point towards to these calculations of the impact on growth of labour market reforms as being upper estimates of the possible effects.

On the other hand, these estimates assume that labour market reforms have no impact on total factor productivity. However, it may be that restrictive labour market policies such as high levels of employment protection for a large fraction of workers acts to reduce flexibility in the economy and to limit the efficiency with which these workers are employed. Below, we consider a scenario in which a wider programme of reforms boosts TFP in euro area countries. While we do not specifically outline what these reforms could consist of, it is likely that for countries like Spain and Italy, reform of dual labour market systems could be an important element in these reform programmes.

[14] The boost to productivity growth shown in the later years of this figure stems from the positive effect of capital deepening that still occurs during these years after the increase in employment has ceased.

Figure 10

Labour Market Reform: Unemployment rates

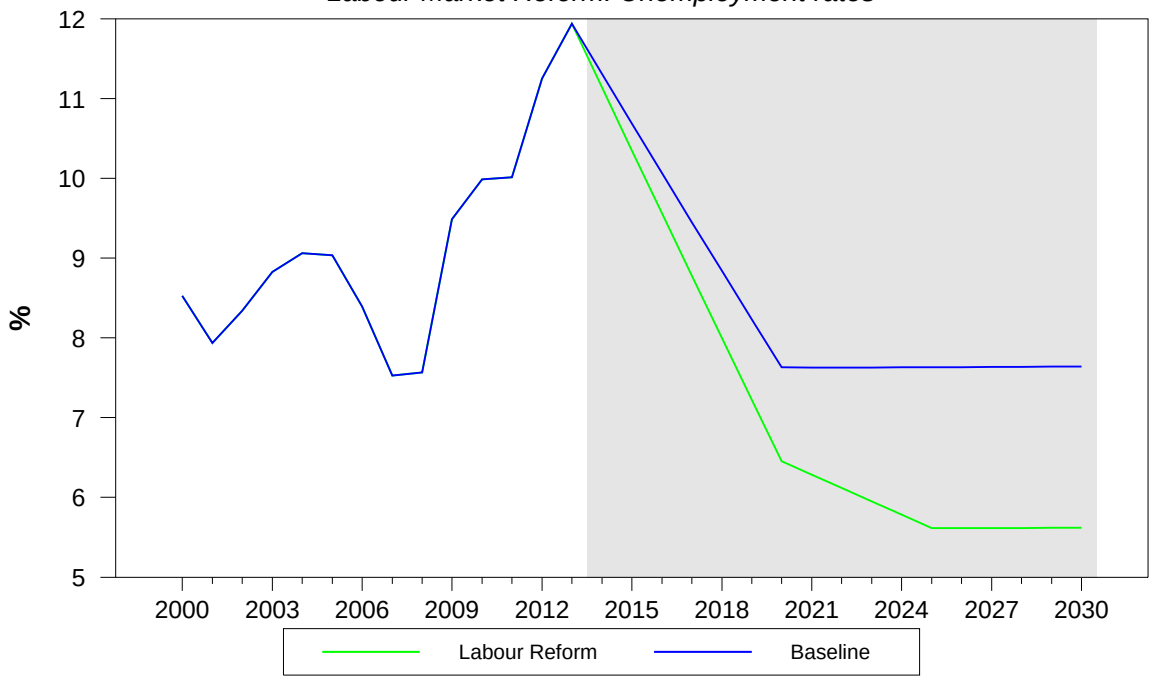


Figure 11

Labour Market Reform: Unemployment rates

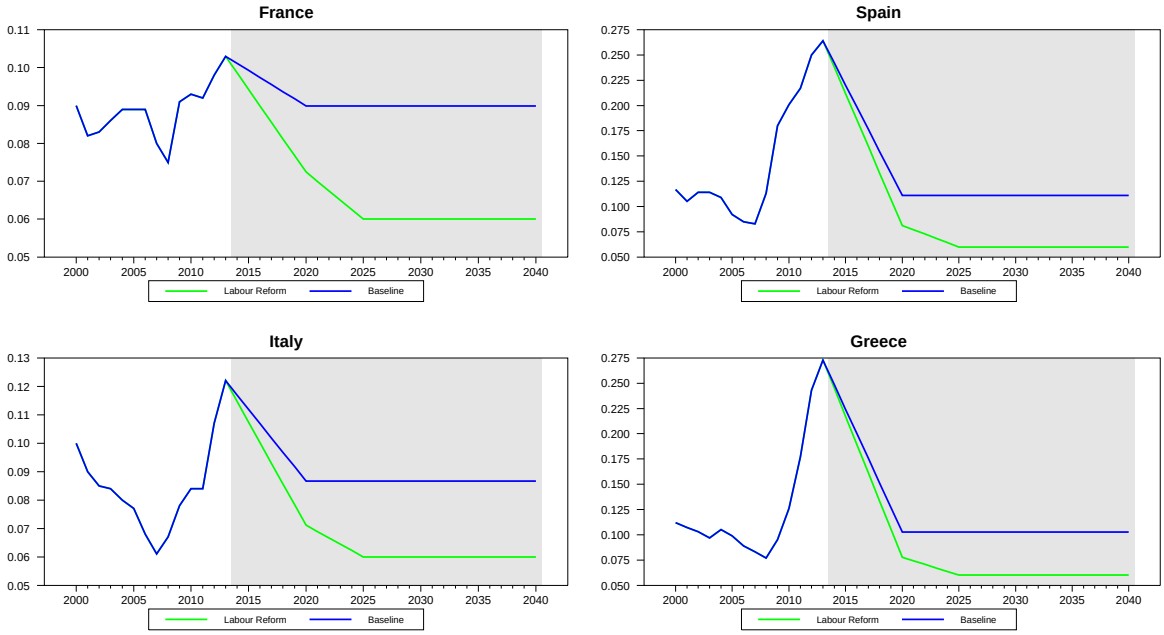


Figure 12

Impact of Labour Market Reform

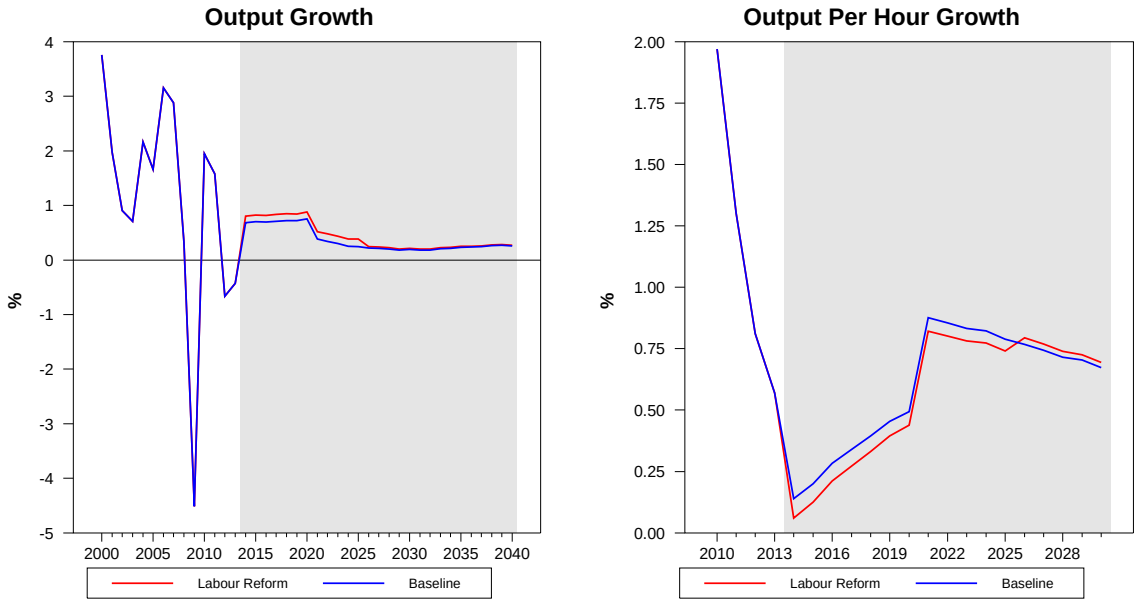


Table 8: Change in Annual Growth Rates due to Labour Reform (%)

	Output			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.13	0.05	0.01	0.06
Belgium	0.13	0.05	0.01	0.06
Germany	0.00	0.00	0.00	0.00
France	0.20	0.07	0.02	0.10
Greece	0.28	0.10	0.03	0.14
Ireland	0.00	0.00	0.00	0.00
Italy	0.17	0.06	0.02	0.08
Spain	0.35	0.12	0.03	0.17
Finland	0.14	0.05	0.02	0.07
Lux	0.00	0.00	0.00	0.00
Portugal	0.04	0.01	0.00	0.01
Austria	0.00	0.00	0.00	0.00
Netherlands	0.00	0.00	0.00	0.00

	Output Per Hour			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	-0.01	0.01	0.01	-0.01
Belgium	-0.01	0.01	0.01	-0.01
Germany	0.00	0.00	0.00	0.00
France	-0.01	0.02	0.02	-0.01
Greece	-0.02	0.02	0.03	-0.02
Ireland	0.00	0.00	0.00	0.00
Italy	-0.01	0.01	0.02	-0.01
Spain	-0.02	0.03	0.03	-0.02
Finland	-0.01	0.01	0.02	-0.01
Lux	0.00	0.00	0.00	0.00
Portugal	-0.01	0.00	0.00	-0.01
Austria	0.00	0.00	0.00	0.00
Netherlands	0.00	0.00	0.00	0.00

Note: Average annual growth rate for the period in question *in addition* to the Baseline.

4.2 Pension Reform

Another area in which there is room to boost growth is reform of pension systems. Many European countries have generous pension systems that provide strong incentives for people to retire early and, as a result, labour force participation rates among the over-50s are very low in some of these countries. With the process of demographic ageing now accelerating, many European governments are aware of the potential problems with the sustainability of their pension systems and have passed various laws aimed at reducing the generosity of these systems in the future.

In this section, we consider the potential effect of two different but related sets of pension reforms on labour supply. One set of reforms have already been legislated for and are summarised in European Commission (2014a). We also consider an alternative scenario in which the rates of transition of older workers to retirement in euro area countries gradually changes to match the values observed in Switzerland, a country picked out by OECD publications such as Johansson et al. (2013) as having particularly high rates of labour force participation by older workers.

4.2.1 The Impact of Legislated Reform

We first consider the effect of reforms to pension systems which have already been legislated. The European Commission's 2015 Ageing Report describes these reforms. Appendix A provides a summary for each of our 12 country sample. Most countries have, for example, increased the legal retirement over the past number of years with countries such as Ireland, Spain and the Netherlands increasing the statutory age to 67 over a period of time. Other reforms involve reducing the benefits of early retirement.

The Commission's Ageing Report has estimated the effects that these reforms will have on participation rates in the future. They describe this work as follows (page 51): "the distribution of labour market exit probabilities (between ages 55 and 74), calculated separately for both genders, is shifted according to the expected effects of pension reforms. The estimation of the shift takes into account country-specific information about the relationship between retirement behaviour and the parameters of the pension system, together with cross-country econometric evidence of the impact of changes in the implicit tax rate on continuing work and retirement decisions."

Here, we have simulated a scenario in which labour force participation rates are in line with the Ageing Report's projections rather than the constant within-cohort participation rate assumptions that were used to construct our baseline scenario.[15]

Figure 13 illustrates the impact of the current legislated reforms on labour force participation

[15] Specifically, we use the report's projections for the participation rates in each country of the 15-74 age group, which it reports for 2013, 2015 and at further five year intervals until 2060. These are provided in the country tables at the back of the report. We linearly interpolate between the five year periods to get an annual series. The total labour force is calculated by assuming that, within each country, the participation rates of those aged over 75 is not affected by pension reform.

by comparing the labour supply that is projected by the Ageing Report with our baseline scenario in which within-cohort participation rates remain at their 2013 levels. The left-hand panel shows the ratio of the labour force to the population aged between 15 and 64. The growth in this series has been tailing off in recent years and our baseline projection shows it declining from 73 percent in 2013 for about a decade before flattening out at about 72 percent. Factoring in the impact of legislated pension reforms, however, this ratio keeps rising, reaching a peak of almost 79 percent in 2038 before easing off by about a percentage point in later years. (These figures should not be interpreted as a "labour force participation rate" because the legislated reforms will boost the participation rate of those aged over 64.)

To put these figures in context, the ratio of the labour force to the population aged between 15 and 64 in the US peaked at 79.6 percent in 1997 and stood at 76.9 percent in 2013. So these projections imply a higher rate of labour force participation in Europe than has been observed historically in the US.

This comparison shows that the legislated reforms represent a significant change relative to current participation trends. However, the right-hand side of the panel illustrates the strength of the demographic forces acting to reduce the future supply of labour. In the baseline scenario, the fraction of the total population in the labour force sinks rapidly from its current value of 48 percent to under 41 percent in the 2040s. The pension reforms enacted only act to keep this rate flat until the late 2020s, after which it sinks at a fast pace before settling at 44 percent in the 2050s.

The left-hand panel of table 9 provides estimates of the effects on output growth and output per hour growth of the Ageing Report's labour force scenario relative to our baseline. While the impact on employment in the euro area of these reforms could be considered significant—by 2060, there area 11 million additional workers relative to the baseline—this impact phases in very gradually over time so that its impact on annual average growth rates are modest. The overall impact on the average growth rate of the euro area over 2014-43 is 0.23 percent. However, the impact of higher rates of participation are more substantial for some of the countries examined: For example, the impact on growth in Spain over the coming three decades would be 0.51 percent, while the impact in Greece would be 0.59 percent.

As with the labour market reform, we model the impact of pension reform purely through its impact on labour input and do not assume it has an impact on TFP. For this reason, the pension reforms slightly depress the growth rate of output per hour through a diminishing marginal productivity effect. However, these estimates may somewhat over-state the impact of pension reform on output growth because they neglect two additional channels. First, if the older workers that remain in the labour force have lower productivity, then this will reduce TFP as calculated

using our methodology. Second, it is unlikely that these additional workers will have the same workweek as the average employee, so there is likely to be some reduction in the average workweek associated with an increase in older workers in part-time jobs.

4.2.2 A Pension Reform Modelled on Switzerland

One complication from using the Ageing Report scenario is that the legislated reforms differ widely across countries and it is difficult to assess the extent to which they bring countries in line with "best practice" pension systems.

For this reason, in a second pension scenario, we consider the effect of a *potential* reform to pension systems that would produce an increase in labour force participation rates in the euro area. One approach to modelling a reform of this type is taken by Johansson et al (2013). They consider a case in which the average duration of what they term "individual active life" slowly converges in all countries towards the standard observed in Switzerland, which has one of the highest rates of labour force activity among OECD members.

We adopt a different approach here because there are a number of reasons why countries differ in terms of how many years the average person spends in the labour force and a number of these reasons have little to do with pensions systems. For example, Switzerland has a considerably higher labour force participation rate among people in their late 40s and early 50s than the average figures for the euro area. These differences likely reflect a wide range of factors that are not related to pension systems, including cultural differences and differences in the extent to which taxation and welfare systems support female labour force participation.

As an alternative, then, we consider a scenario in which reforms to pension systems increase only the labour force participation rates of older workers. Specifically, we consider the case in which there is a gradual transition up to 2033 so that, by that date, the probability of all workers over 50 continuing to work at ages 55, 60, 65, 70 and 75 and over equal the corresponding current probabilities for Swiss workers. This very gradual adjustment roughly matches the gradual impact of current legislated reforms illustrated in the right-hand side of Figure 13.

Figure 14 illustrates the difference between Swiss and euro area participation rates for the 50+ age cohorts. The sizeable difference between the participation rates for the older cohorts is clearly apparent. In some instances (for the 60 to 64 age group for example), the difference is up to 30 percentage points. While there is some evidence of convergence over time for the 50 to 54 and 55 to 59 euro area age cohorts towards Swiss levels, no such trend is apparent for the 60+ group.

The right-hand-side of Table 9 presents the implications of this "Swiss-style" pension reform for average growth rates for output and output per hour for the euro area and the twelve member countries, while Figures 15, 16 and 17 illustrate the scale of the increases in participation rates

implied by this reform for France, Italy and Germany. For the euro area as a whole, the size of the boost to real GDP growth of the Swiss reform at 0.20 percentage points per year, is very similar to the estimate based on the Ageing Reports assessment of current legislative reforms. This suggests that, on average, the changes in pension system laws that have already been passed represent a substantial move towards potential "best practice" in this areas.

A comparison between the left and right hand panels in Table 9 is useful, however, in telling us which countries have implemented more significant pension reforms and which have not. For example, Belgium's legislated pension reforms add only 0.13 percentage points to growth over 2014-43 while a Swiss-style reform in Belgium would add 0.26 percentage points. In contrast, legislated pension reforms in Greece and Spain add 0.59 and 0.51 percentage points respectively to growth over this period, compared with 0.29 and 0.27 from a Swiss-style reform.

These last calculations illustrate the pitfalls in assuming that just because reforms have been legislated, they will definitely happen. For example, as described in the appendix, the legislated Greek pension reform is very substantial, featuring a higher retirement age and regular further adjustments after 2020 in line with changes in life expectancy. As a result of these laws, the Ageing Report estimates that the labour force participation rate of those aged 15-64 in Greece will rise from 67.7 percent in 2013 to 71.9 percent in 2020 to 75.5 percent in 2040. By contrast, for the euro area as a whole, the Ageing Report estimates that the labour force participation rate of those aged 15-64 will rise from 72.2 percent in 2013 to 73.6 percent in 2020 to 74.7 percent in 2040. It is possible that Greece's reforms will see it go from having a participation rate that is substantially lower than the rest of the euro area to one that is somewhat higher by 2040. However, it is also possible that political pressures will see the current legislated reforms watered down.

In this sense, we think it is best to see the legislated pension reform effects discussed here as something that will require continuous support and implementation by governments if they are to have the effects described here.

Figure 13

Impact of Legislated Pension Reforms

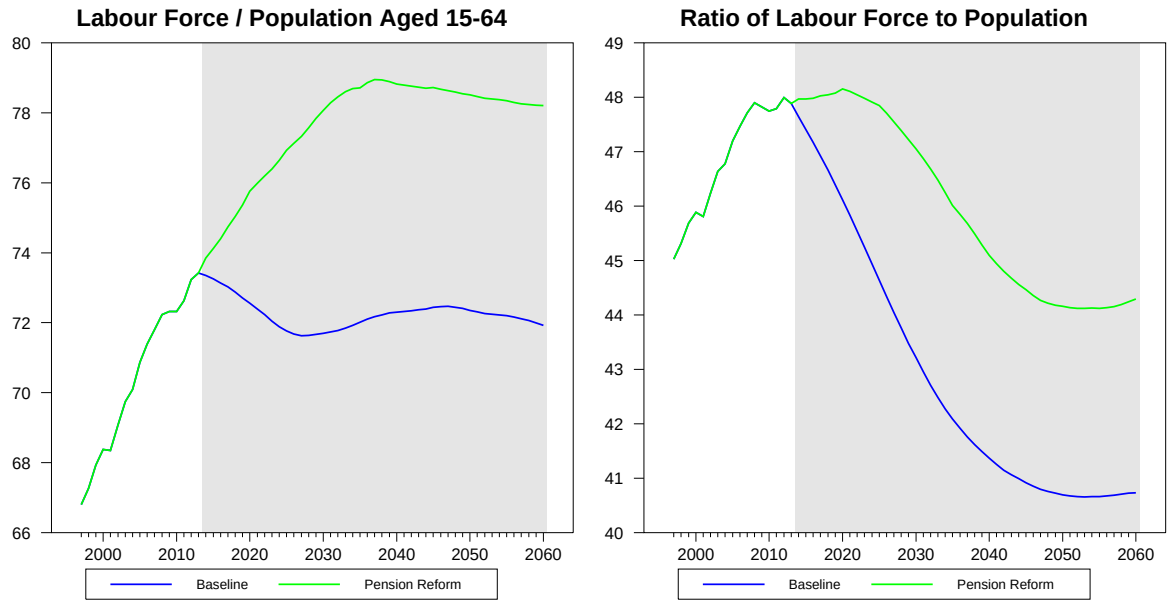


Figure 14

Comparing Euro Area (Black) and Swiss (Blue) Labour Force Participation Rates

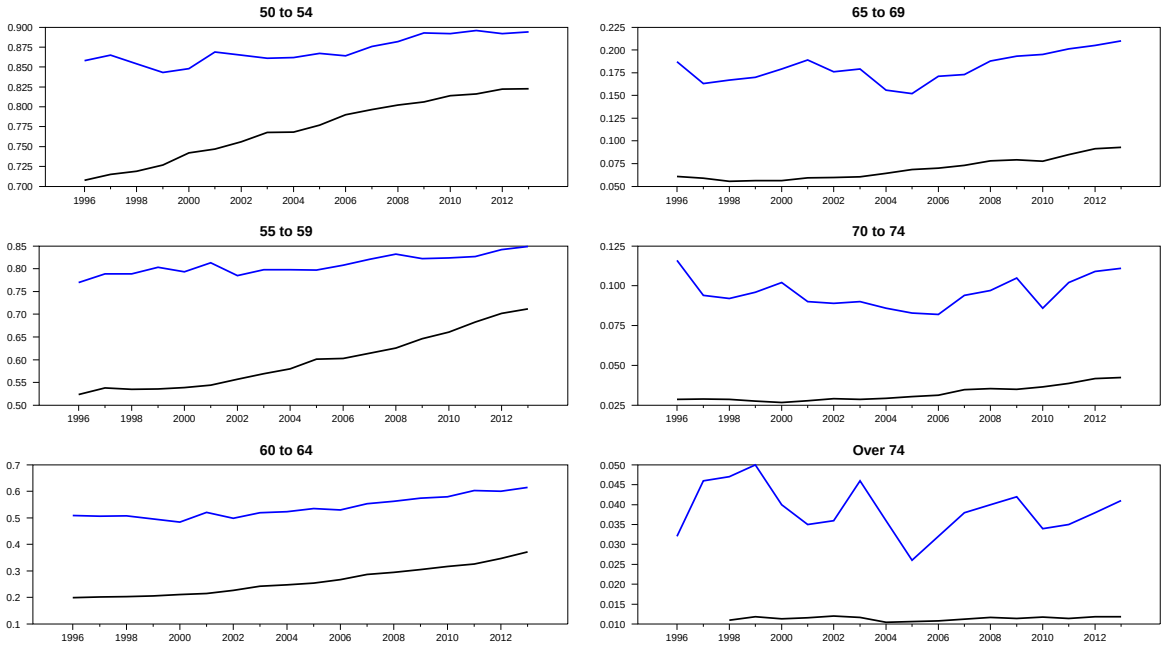


Figure 15

Swiss Pension Reform in France: Baseline (Blue) and Reform Scenario (Green) Participation Rates

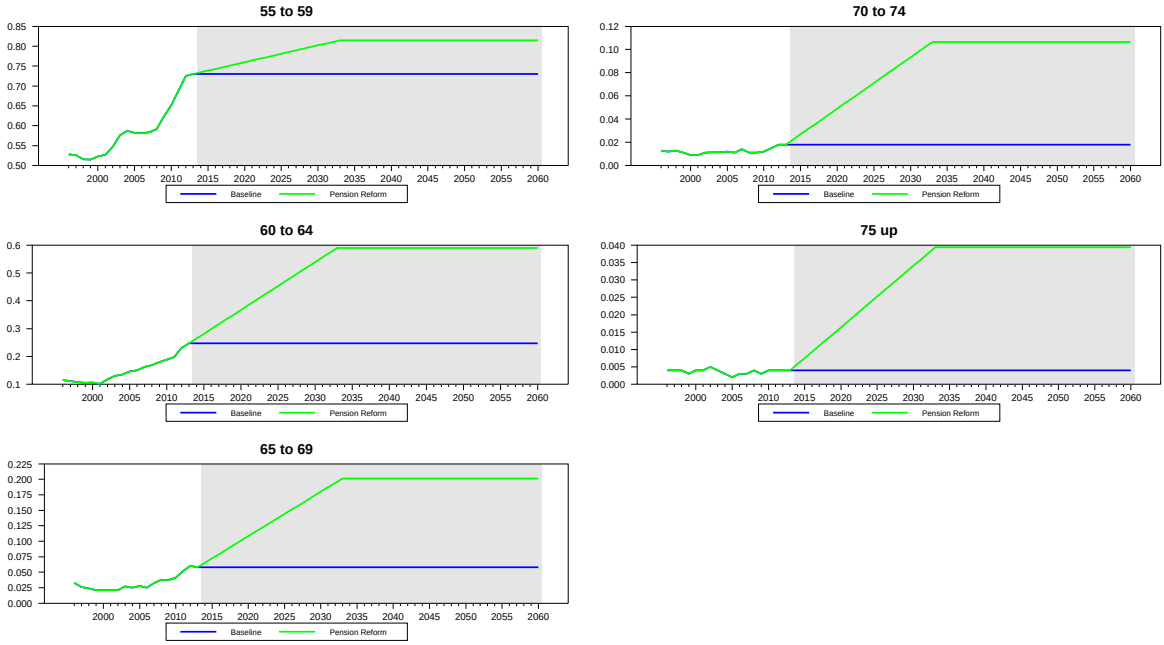


Figure 16

Swiss Pension Reform in Italy: Baseline (Blue) and Reform Scenario (Green) Participation Rates

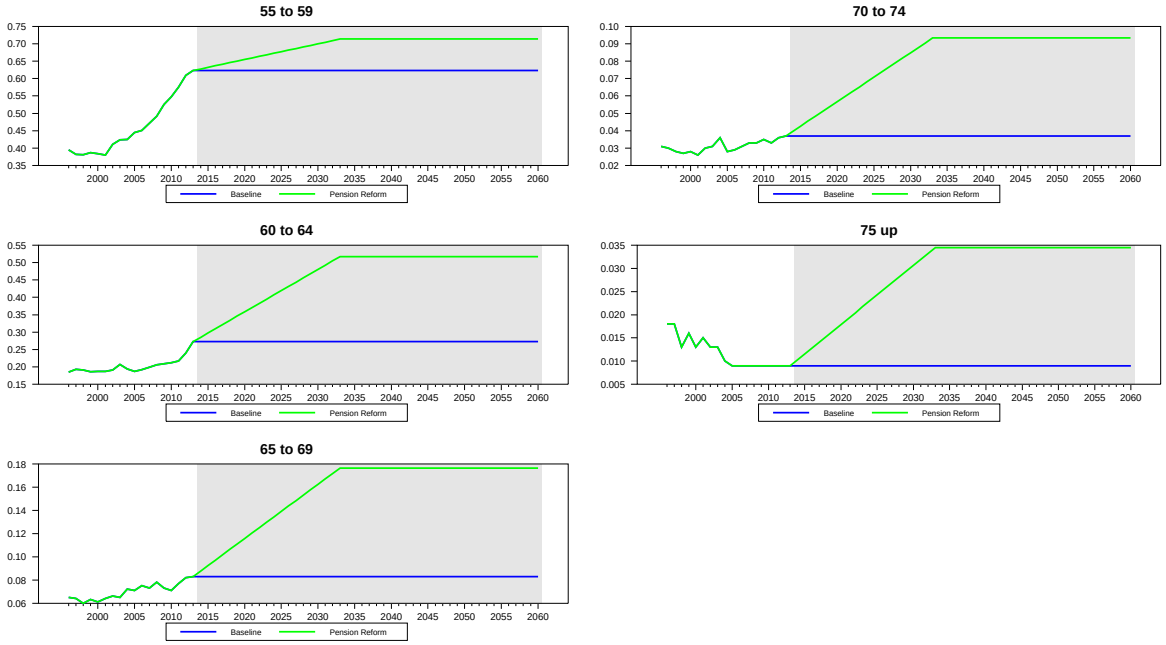


Figure 17

Swiss Pension Reform in Germany: Baseline (Blue) and Reform Scenario (Green) Participation Rates

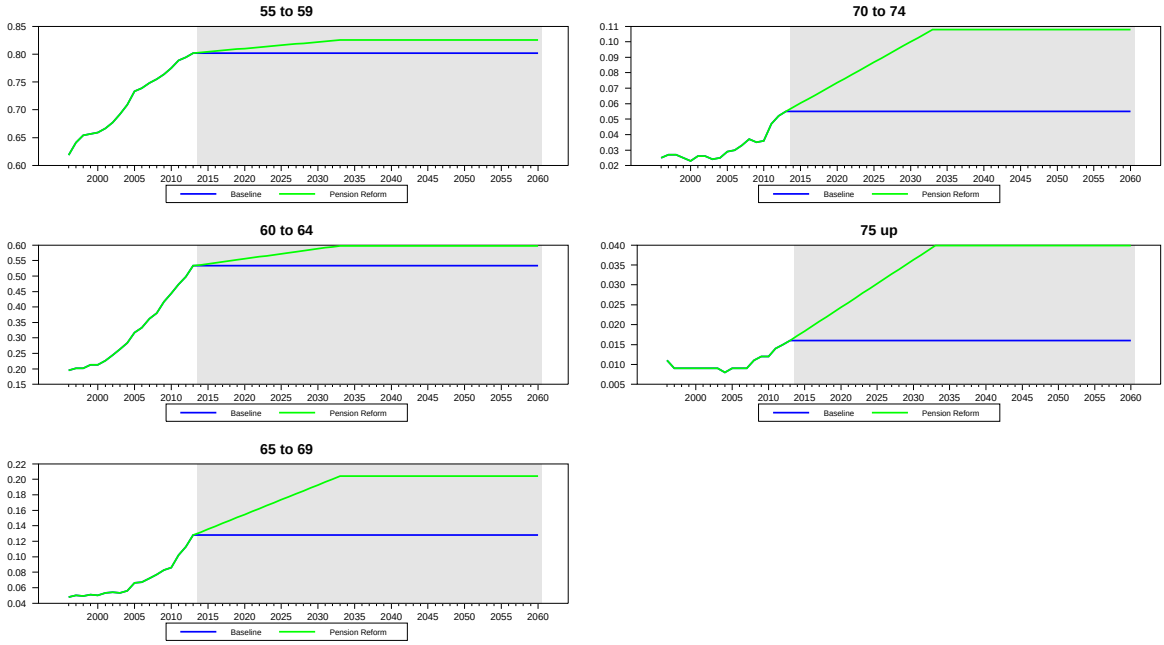


Table 9: Change in Annual Growth Rates due to Pension Reforms: 2014-2043 (%)

	Legislated Reforms		Swiss Reform	
	Output	Output Per Hour	Output	Output Per Hour
Euro Area	0.23	-0.06	0.20	-0.04
Belgium	0.13	-0.01	0.26	-0.04
Germany	0.18	-0.02	0.11	-0.02
France	0.15	-0.02	0.27	-0.04
Greece	0.59	-0.10	0.29	-0.05
Ireland	0.10	-0.01	0.05	-0.01
Italy	0.30	-0.04	0.26	-0.04
Spain	0.51	-0.07	0.27	-0.05
Finland	0.03	0.00	0.12	-0.02
Lux	0.13	-0.01	0.26	-0.03
Portugal	0.20	-0.10	0.02	-0.01
Austria	0.15	-0.07	0.20	-0.10
Netherlands	0.15	-0.08	0.07	-0.04

Note: Average annual growth rate for the period in question *in addition* to the Baseline.

4.3 Combining Pension and Labour Reforms

Figure 18 shows how the combination of the labour reform scenario and legislated pension reform would affect GDP growth as well as output per hour for the euro area. Table 10 reports the impact of this combined set of reforms on growth by decade for the euro area as well as for each of the twelve countries in our sample.

Overall, when both sets of employment-boosting reforms are implemented, the increase in GDP growth for the euro area averages 0.54 percent in 2014-23, 0.32 percent in 2024-33 and 0.03 percent in 2034-43. This implies average growth rates of 1.14 percent, 0.53 percent and 0.28 percent for the periods 2014-2023, 2024-2033 and 2034-2043 respectively. Given the scale of reforms assumed in these scenarios, the overall effects on growth seems pretty underwhelming.

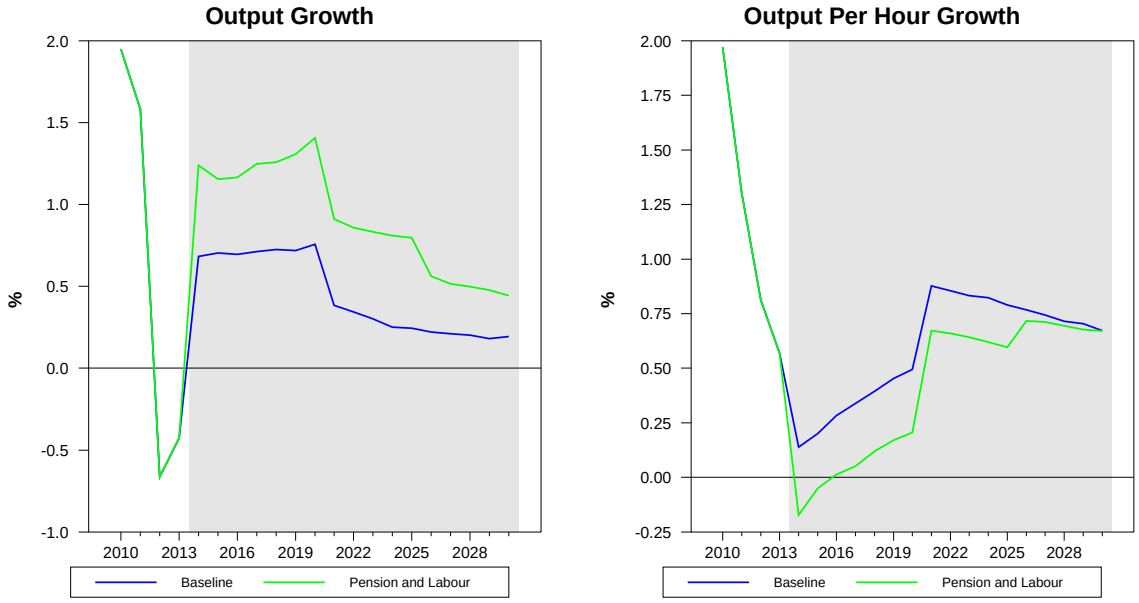
Table 10: Change in Annual Growth Rates due to Labour Reforms and Legislated Pension Reforms (%)

	Output			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.54	0.32	0.03	0.29
Belgium	0.46	0.10	0.01	0.19
Germany	0.35	0.20	-0.01	0.18
France	0.47	0.25	0.02	0.25
Greece	1.09	0.72	0.38	0.73
Ireland	0.19	0.16	-0.03	0.11
Italy	0.72	0.44	0.01	0.39
Spain	1.10	0.74	0.19	0.67
Finland	0.26	0.04	0.00	0.10
Lux	0.26	0.10	0.04	0.13
Portugal	0.32	0.24	0.07	0.21
Austria	0.33	0.13	-0.02	0.15
Netherlands	0.29	0.16	0.00	0.15
	Output Per Hour			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	-0.26	-0.04	0.08	-0.07
Belgium	-0.16	0.05	0.05	-0.02
Germany	-0.13	-0.01	0.07	-0.02
France	-0.17	0.00	0.08	-0.03
Greece	-0.39	-0.05	0.08	-0.12
Ireland	-0.06	-0.01	0.06	-0.01
Italy	-0.27	-0.01	0.14	-0.05
Spain	-0.39	-0.03	0.16	-0.09
Finland	-0.09	0.03	0.03	-0.01
Lux	-0.08	0.02	0.02	-0.01
Portugal	-0.16	-0.12	-0.03	-0.11
Austria	-0.16	-0.07	0.01	-0.07
Netherlands	-0.15	-0.08	0.00	-0.08

Note: Average annual growth rate for the period in question *in addition* to the Baseline.

Figure 18

Impact of Combined Labour and Legislated Pension Reform



4.4 Broader Regulatory Reform

The previous calculations suggest that if the euro area is to experience a reform-generated transformation in growth, it won't occur through getting more people at work via reduced unemployment and higher labour force participation. This probably is not too surprising to those familiar with neoclassical growth models. Increases in labour input are a "level effect" so they can only provide a temporary boost to growth. And we believe our assumptions about relatively long phase-in periods for these reforms (12 years for the labour market reforms, 20 years for the Swiss-style pension reform) are realistic, so these policies provide a steady but small boost to growth rates.

For these reasons, if reforms are to give a substantial boost to growth, they must act to increase TFP. It is possible that labour market reforms, which we modelled earlier as reducing unemployment, will improve productivity efficiency but it is likely that substantial increases in TFP will require a wider range of reforms. Here, we consider a scenario in which a broad package of regulatory reforms have the impact of gradually raising TFP in all euro area countries to UK levels by 2043. This is inevitably the most speculative of our reform scenarios but the general idea here is that this is likely to represent the best possible outcome from a broad programme of systemic reforms in product and labour markets as well as reforms of government taxation and education policies.

4.4.1 Regulatory Reform Scenarios

Our motivation for choosing the UK as a "TFP leader" emanates from a number of different sources. In the most recent version of the Penn world tables (Feenstra, Inklaar and Timmer, 2013), figures on purchasing power parity (PPP) adjusted TFP levels are presented. This enables both a temporal and a cross-country comparison of TFP levels. We use Penn estimates of TFP to calibrate our convergence scenario. In practical terms, the scenario involves each country growing from its TFP level in 2013 to that of the UK in 2043. Countries are converging to a moving target as we project UK TFP to grows over this period by 0.2 percent per year. This future rate of growth for the UK is based on the observed rate of TFP growth in the UK between 2000 and 2013 presented in Table 3. Only Ireland is measured as having a higher rate of TFP than the UK, so Irish TFP is modelled as also growing at 0.2 percent per year.

OECD (2012) computes a cross-sectional estimate for 2011 of multifactor productivity (MFP) for some 40 countries.[16] While some discrepancies arise in comparisons of the two different sets of productivity estimates, overall, the estimates confirm the UK as a European TFP leader.

In relation to which types of policies may be changed as part of a broader regulatory package, we note that our "leader" country, the UK, is traditionally been regarded as having more liberal and

[16] Note the OECD estimate of MFP excludes the contribution of "human capital", whereas the estimate of TFP om the Penn World Tables implicitly includes this element.

flexible labour and product markets than other European economies. Table 11 reports two well-known measures of the regulatory framework that allow comparisons across countries: The World Bank's 2015 Doing Business ranking and the OECD Product Market Regulation score.[17] The UK ranks 8th in the Doing Business indicators. This is above all of the twelve euro area member states in our study; the average rank across these twelve countries is 33. The Netherlands is the only country that scores better than the UK on the OECD's 2013 Product Market Regulation score.

The OECD and World Bank indicators are constructed from a wide range of sub-indices measuring different aspects of a country's regulatory environment, so it is possible to design country-specific reform packages that can improve the underlying regulatory environment. For example, Italy's relatively low ranking of 56th partially reflects very poor rankings under the headings of paying taxes (141st) and enforcing contracts (147th) which suggests these are areas that could be reformed. France performs better, ranking 31st, but still score poorly under the headings such as construction permits (86th) and paying taxes (95th). The long phase-in period assumed here reflects the probability that passing reforms to improve the regulatory environment is likely to take a long time and that it may take longer again for the full effects of such reforms to impact upon TFP.

We should admit that we are not claiming to have strong evidence linking the passing of regulatory reform packages of this type to TFP growth. There is some evidence of linkages between productivity performance and the headline indicies discussed here. For example, Gillanders and Whelan (2014) find a causal effect running from the Doing Business index to levels of output per capital while Bouis, Duval and Murtin (2011) find a significant link between TFP growth and the OECD's measure of Product Market Regulation. However, the statistical fits underlying these regressions tend to be poor and they certainly don't provide a basis for assessing detailed reform programmes. As such, we see this scenario as outlining the "best case" outcome that we could expect a regulatory reform programme to achieve.

4.4.2 Results

We present the individual impact of this reform scenario on average growth rates by decade in Table 12. The impact over the thirty year period 2014-2043 is larger than for the combined labour market and pension reform scenario. Over this period as a whole, the increases in TFP add 0.55 percentage percentage points per year to GDP growth. The initial impact in the early years is to raise both output growth and TFP growth by 0.45 percentage points. However, as the higher rate of TFP induces additional capital accumulation, the effect on growth increases to average 0.49 percentage points over 2014-23, 0.56 percentage points over 2024-33 and 0.59 percentage points

[17] See World Bank (2014) and www.oecd.org/economy/pmr for these indicators

over 2034-44. After the TFP convergence is completed in 2043, the additional induced capital accumulation boosts growth by 0.15 percentage point in 2044 and then gradually fades away in subsequent years.

Table 13 describes the impact of combining three reform scenarios together (the labour market reform, the legislated pension reforms and the regulatory reform that affects TFP) while Figure 19 illustrates the impact on GDP growth in the euro area. The full package of reforms boosts growth in the euro area as a whole by 1.03 percentage points in 2014-2023, by 0.89 percentage points in 2024-2033 and by 0.63 percentage points in 2033-43. This implies GDP growth rates of 1.63 percent over 2014-23 with growth peaking at 1.92 percent in 2020. Average growth rates then fall off to 1.09 and 0.88 per cent per annum respectively in the subsequent two decades.

Some individual countries have their growth rates boosted substantially by the simulated reform scenario. For example, average growth in Portugal is boosted by 1.58 percentage points per year over 2014-43 (mainly due to TFP improvements) while average growth in Greece is boosted by 1.85 percentage points over the same period.

Table 14 describes the growth rates that could be achieved if all of these structural reform impacts were to occur. The figures show that some countries, most notably Greece and Spain, can have a long period of high growth rates if structural reform packages were to achieve the goals described here. However, it is also somewhat sobering to see the aggregate euro area growth rates produced by a fairly radical set of reforms still being relatively low by historical standards and falling away over time. The fact that the ultimate effect of the reforms would still see euro area growth quite below the two per cent rate is of note given that the well known Sapir report (Sapir et al., (2004)), was commissioned to improve the medium-term prospects at a time when the European economy was already averaging two per cent growth. This shows that it may not be possible for structural reforms to offset the twin negative forces of weak demographics and slow TFP growth in "frontier" countries.

Table 11: Select Cross-Country Comparison of World Bank *Doing Business* and OECD *Product Market Reform* Indicators

	Doing Business Rank	Product Market Reform Score
UK	8	1.08
Finland	9	1.29
Ireland	13	1.45
Germany	14	1.29
Austria	21	1.19
Portugal	25	1.29
Netherlands	27	0.92
France	31	1.47
Spain	33	1.44
Belgium	42	1.39
Italy	56	1.26
Luxembourg	59	1.46
Greece	61	1.74

Note: In the case of the OECD product market reform scale, the indicator presented represents the stringency of regulatory policy in specific areas on a scale of 0 to 6 with a higher number indicating a policy stance that is deemed less conducive to competition.

Figure 19

Effect of All Reforms on Output Growth

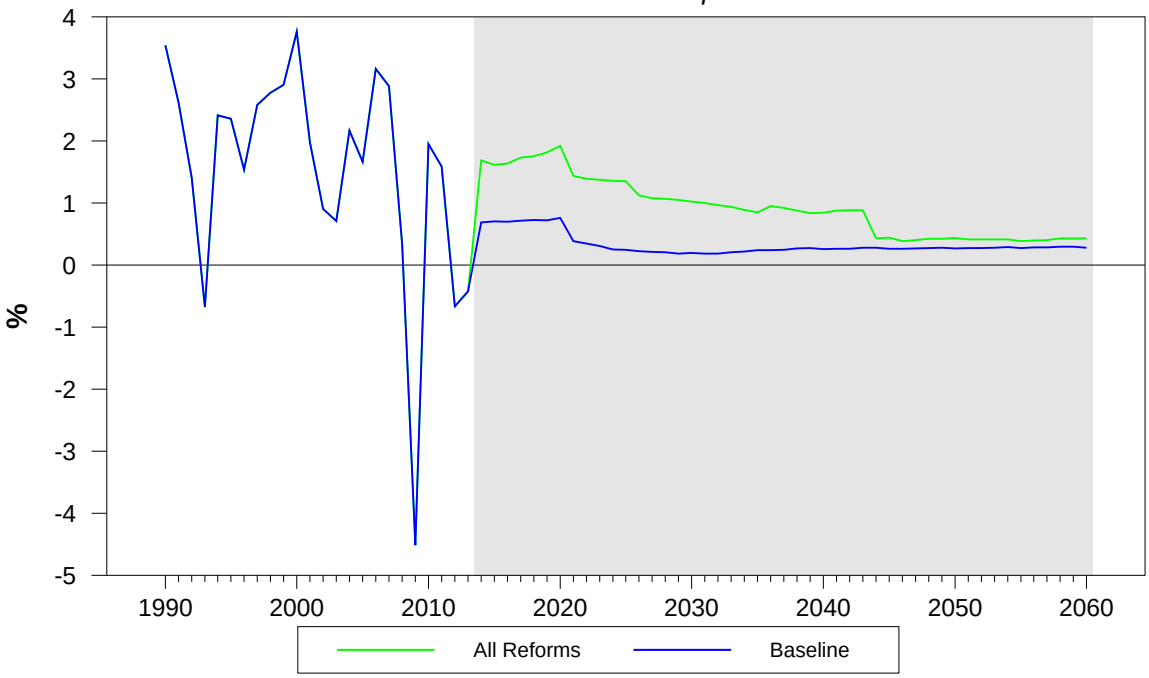


Table 12: Change in Annual Growth Rates due to Regulatory Reform (%)

	Output			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.49	0.56	0.59	0.55
Belgium	0.44	0.50	0.54	0.50
Germany	0.47	0.53	0.56	0.52
France	0.40	0.45	0.49	0.45
Greece	0.99	1.13	1.20	1.11
Ireland	0.00	0.00	0.00	0.00
Italy	0.51	0.58	0.62	0.57
Spain	0.75	0.86	0.91	0.84
Finland	0.49	0.56	0.60	0.55
Lux	0.03	0.03	0.03	0.03
Portugal	1.26	1.44	1.53	1.41
Austria	0.30	0.34	0.36	0.33
Netherlands	0.31	0.35	0.37	0.34

Note: Average annual growth rate for the period in question *in addition* to the Baseline.

Table 13: Change in Annual Growth Rates due to All Reforms (%)

	Output			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	1.03	0.89	0.63	0.85
Belgium	0.90	0.61	0.55	0.69
Germany	0.81	0.73	0.56	0.70
France	0.87	0.71	0.51	0.69
Greece	2.09	1.86	1.59	1.85
Ireland	0.19	0.16	0.00	0.10
Italy	1.23	1.03	0.63	0.96
Spain	1.85	1.61	1.10	1.52
Finland	0.75	0.60	0.60	0.65
Lux	0.29	0.13	0.07	0.16
Portugal	1.58	1.64	1.52	1.58
Austria	0.62	0.46	0.32	0.47
Netherlands	0.60	0.50	0.35	0.48
	Output Per Hour			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.24	0.52	0.68	0.48
Belgium	0.28	0.56	0.59	0.48
Germany	0.34	0.52	0.63	0.50
France	0.22	0.46	0.57	0.42
Greece	0.60	1.10	1.29	1.00
Ireland	-0.06	-0.01	0.06	-0.01
Italy	0.24	0.58	0.77	0.53
Spain	0.37	0.84	1.07	0.76
Finland	0.40	0.59	0.62	0.54
Lux	-0.06	0.05	0.06	0.02
Portugal	1.09	1.28	1.41	1.26
Austria	0.13	0.26	0.35	0.25
Netherlands	0.16	0.26	0.36	0.26

Note: Average annual growth rate for the period in question *in addition* to the Baseline.

Table 14: Growth Rates Including Impact of All Reforms

	Output			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	1.63	1.09	0.88	1.20
Belgium	1.79	1.57	1.55	1.63
Germany	0.97	0.48	0.44	0.63
France	1.50	1.19	1.07	1.25
Greece	3.09	1.56	1.08	1.91
Ireland	1.38	1.07	0.67	1.04
Italy	1.78	1.29	0.92	1.33
Spain	3.18	1.71	1.09	1.99
Finland	1.28	1.26	1.25	1.26
Lux	2.75	2.22	1.85	2.27
Portugal	2.40	1.76	1.28	1.81
Austria	1.29	0.99	0.87	1.05
Netherlands	1.27	0.81	0.68	0.92

	Output Per Hour			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.73	1.24	1.20	1.06
Belgium	0.80	0.97	0.94	0.90
Germany	1.09	1.24	1.09	1.14
France	0.81	0.98	0.94	0.91
Greece	0.50	2.03	1.98	1.51
Ireland	0.69	1.05	0.77	0.84
Italy	0.51	1.12	1.17	0.93
Spain	0.80	1.87	1.76	1.48
Finland	1.02	1.05	1.01	1.03
Lux	0.36	0.50	0.54	0.47
Portugal	1.44	2.27	2.25	1.99
Austria	0.83	0.88	0.83	0.85
Netherlands	0.75	0.99	0.87	0.87

Note: Average annual growth rate for the period in question *inclusive* of the Baseline.

4.5 The Effect of Reforms on Individual Countries

Figures 20 through 23 summarise the cumulative effects of the joint "three reform" scenario for the euro area's four largest economies: Italy, France, Spain and Germany. Figure 24 illustrates the contribution of each of the reforms to the average growth rate between 2014 and 2043.

Italy: As shown in Figure 20, the demographic outlook in Italy is one of the more positive among our twelve countries. Population is projected to continue to grow until the 2050s. However, the baseline scenario involves a very sharp decline in the ratio of employment to population from 2020 onwards, as this ratio sinks from what is already a very low level. Italy, thus, benefits from the labour reform and legislated pension reforms (which have larger effects only in Spain and Greece) which sees the employment to population ratio rising above its previous peak. Italy is in the middle of the euro area pack in terms of gains from our TFP scenario. The result of all reforms together is a significant boost to growth of 1.23 percentage points over 2014-23 and average boost of 0.96 percentage points over 2014-43.

France: As shown in Figure 21, France has significantly more positive demographics than other euro area countries, with its population set to rise throughout our projection out to 2060. However, population ageing is set to see the employment to population ratio decline from its current level of 41 percent to 37 percent by the 2040s. The labour and pension reforms allow France to maintain a relatively stable employment to population ratio. With France's TFP level currently above the euro area average, the gain from the regulatory reform scenario is smaller. Our projection shows that with all reforms introduced, the French economy can grow at about 1.5 percent up to 2025 (the end of the impact of the labour reform) and then at about 1.1 percent up to 2043.

Spain: Figure 22 demonstrates that of the large economies, Spain has the potential to benefit most from reforms. Initially, its baseline growth rate is quite strong as it, particularly, benefits from the assumed decline in unemployment. However, it can also benefit considerably from labour market reforms to reduce the long-run unemployment rate, from the increased participation stemming from legislated pension system reforms and from the boost to TFP of the convergence-to-UK scenario (only Greece and Portugal benefit more from this scenario). Instead of peaking in 2020 at 1.9 percent as it does in our baseline scenario, Spanish GDP growth reaches 3.8 percent. Over the longer-run, Spain's demographic position is relatively weak so population declines somewhat from current levels but labour and pension reforms can, like Italy, allow it to reach higher ratios of employment to population in the future than have been recorded in the past.

Germany: Given the good publicity from recent years as an example of positive labour market reform and as "the engine of Europe's economy", it might be surprising that Germany has the weakest growth outlook of any of the countries in our sample. As described in Figure 23, the German outlook is the most negatively impacted by future demographic trends. Its baseline growth rate of -0.07 percent per year over 2014-43 means that it is the only one of the euro area 12 economies projected to contract over this period. Germany also stands to benefit less from structural reforms. German unemployment rates are already amongst the lowest in Europe, so not much scope for increased growth remains through this channel. The benefit from legislated pension reforms is also limited: This reform is projected to stabilise the employment to population ratio until the early 2020s after which it declines rapidly. Even with all reforms implemented, we estimate growth in Germany over the next 30 years would average only 0.63 percent per year, just over half the rate that would be achieved by the euro area as a whole.

Figure 24 provides a simple summary of the sources of growth in the four largest economies and the euro area, incorporating the baseline scenario and the effect of the three types of reforms.

Figure 20

Italy: Effect of All Reforms

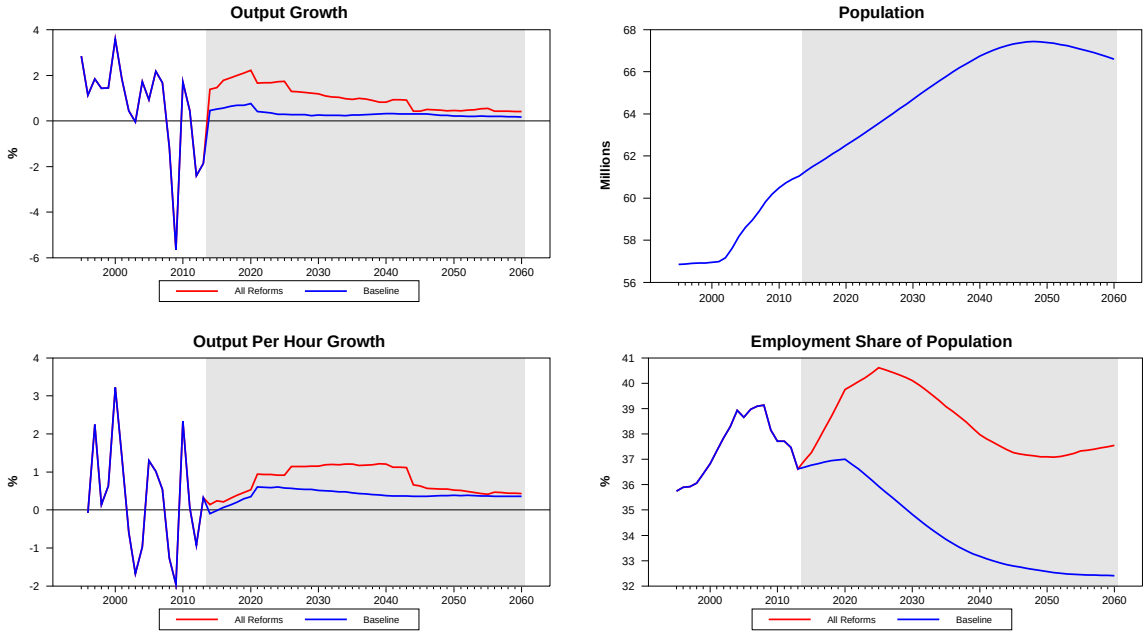


Figure 21

France: Effect of All Reforms

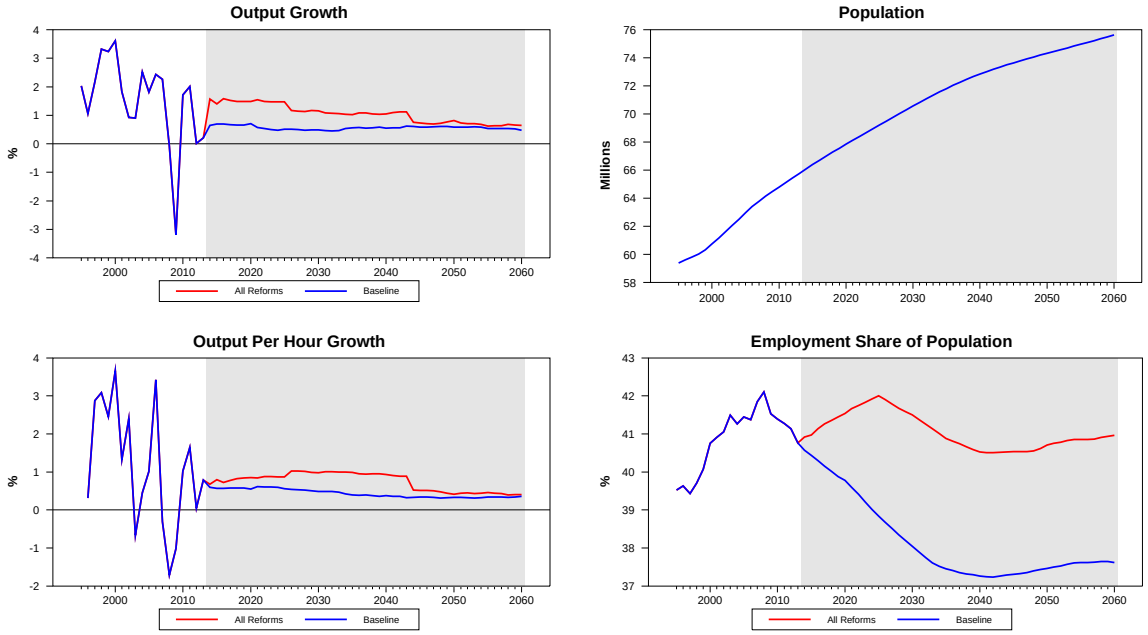


Figure 22

Spain: Effect of All Reforms

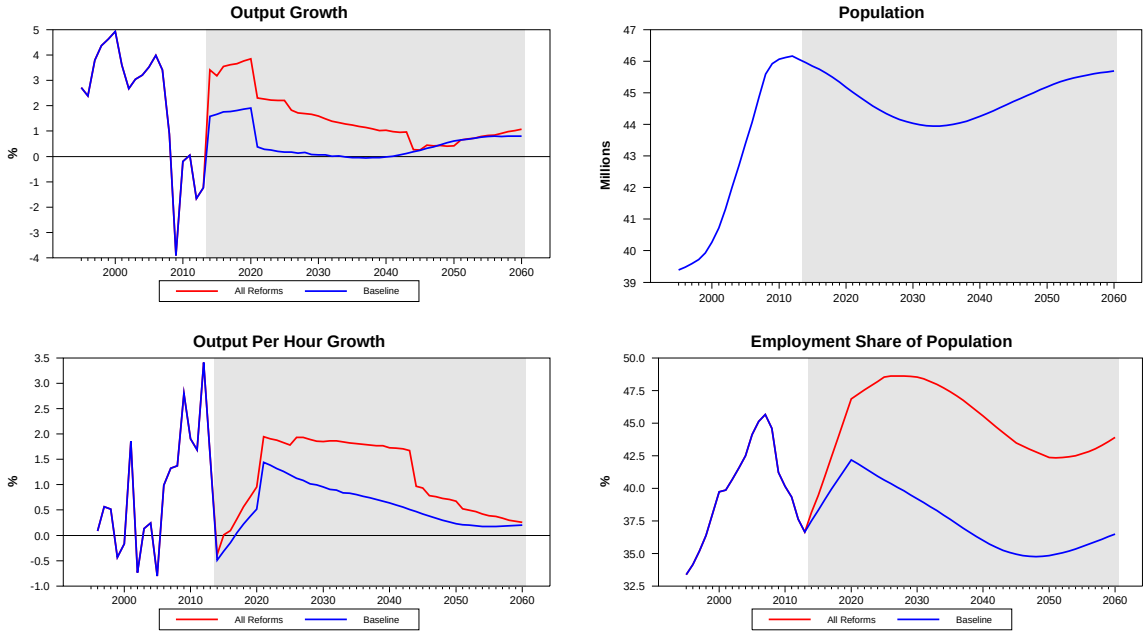
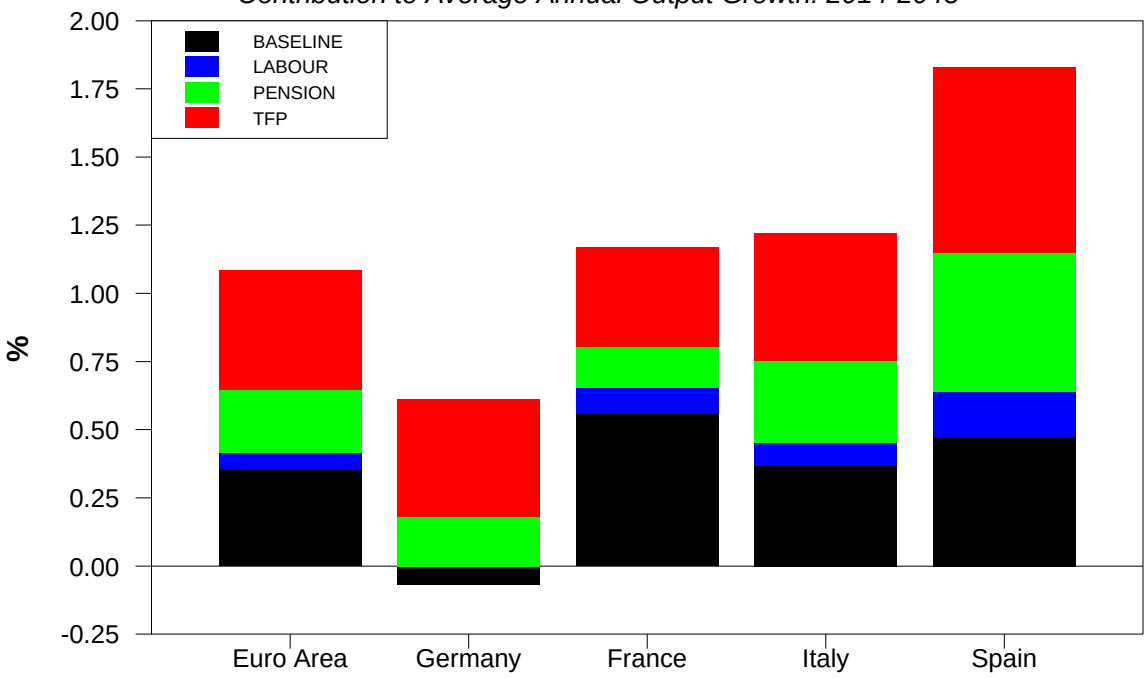


Figure 23

Germany: Effect of All Reforms

Figure 24

Contribution to Average Annual Output Growth: 2014-2043



5 Demographics and Migration

Population trends have played an integral part of our forecast of weak growth in Europe in the coming decades. A key issue in that context is the potential role immigration may play in offsetting this drag on future growth. Here, we consider a scenario involving higher migration.

The population projection that we use here is that published by EuroStat as its "main scenario". This EUROPOP2013 scenario assumes a certain degree of net migration. As described in European Commission (2014a) it is assumed that cumulated net migration to the EU up to 2060 will be 55 million (about 10 percent of the EU population in 2060) with the bulk of this migration being concentrated in the euro area (40 million).

We consider a scenario which doubles the rate of net immigration to the euro area 12 group of countries relative to that assumed by Eurostat in its baseline scenario. (Eurostat forecast net outward migration from Ireland and Greece in their projection, so our "high migration" scenario for these countries sets their net migration to zero). The additional migration assumed here affects the euro area's population but also its age structure. We calculate these effects by comparing the difference between Eurostat's projections for various age cohorts in their baseline scenario with figures from a "no migration" scenario also published by Eurostat. This allows us to estimate the effect that additional migration will have on labour force participation and employment.

To put this level of net migration in context, Figure 25 illustrates the future population of the euro area 12 group of countries under the baseline, under the no migration scenario and under the double migration scenario while Figure 26 shows both the historical rate of net migration (as a proportion of population) along with the future rate under the higher migration scenario.

On a historical basis, net migration into the euro area reached a peak in 2007 at approximately 0.5 per cent of the population. Eurostat's baseline scenario sees inward migration rates staying well below this level while our double migration scenario sees this rate gradually moving back towards this pre-crisis peak up until the 2030s after which point it declines again. These differences in immigration rates may seem relatively modest on an annual basis but they have a big cumulative impact: The difference between the no migration and double migration scenarios is the difference between a euro area population of about 280 million in 2060 versus a population of about 390 million.

In Figure 27 we plot the resulting impact of the increased migration level on future labour supply, participation rates as well as output and output per hour growth. Higher migration has obvious effects on future labour supply in terms of the direct demographic impact. However, there is also an increase in participation rates owing to the different composition of the population under the increased migration scenario. Therefore, rather than declining sharply at the end of the projected cyclical recovery, labour supply stays roughly flat until the 2030s in the higher migration

scenario and then starts to gradually increase. By 2060, the euro area has 27 million more workers due to the additional migration.

Initially, over the period 2014-2023, the difference in output growth is not substantial with an average growth rates under the migration scenario of 0.78 per cent compared with 0.60 per cent under the baseline. Thereafter, however, the difference grows somewhat due to the increased population differential and for the later years of our model's projection, 2044-2060, growth is 0.68 per cent per annum under increased migration compared with 0.28 percent under the baseline. This suggests a significant increase in the rate of migration seems more likely to provide a modest boost to growth that tends to increase over time, rather than something that transforms the underlying pattern of waning growth.

Finally, in Figure 28 we combine the results for both output and output per hour growth for the baseline, all reforms (under the baseline population), the increased migration scenario and a final case where all the reforms occur with increased migration. For the initial forecast period, 2014-2023, the optimal outcome for output growth, under the "double migration plus all reforms" scenario, results in an annual growth rate of 1.8 per cent, which is a significant increase on the baseline outcome. However, like the effect of previous scenarios, this is still somewhat below the 2 per cent target growth rate discussed in the previous section. Table 15 provides detailed country-by-country figures for growth rates under this scenario up to 2043. After the TFP reform has fully phased in by 2043, the "double migration plus all reforms" economy grows at under 1 percent per year out to the end of our projection period in 2060.

As with our labour and pension reform scenarios, an important caveat to these calculations is the implicit assumptions that the additional workers in the high migration scenario are of the same average productivity as existing workers. While this may be a reasonable long-run assumption, it is likely to be overly optimistic in the short- to medium term.

Figure 25

Future Population Levels

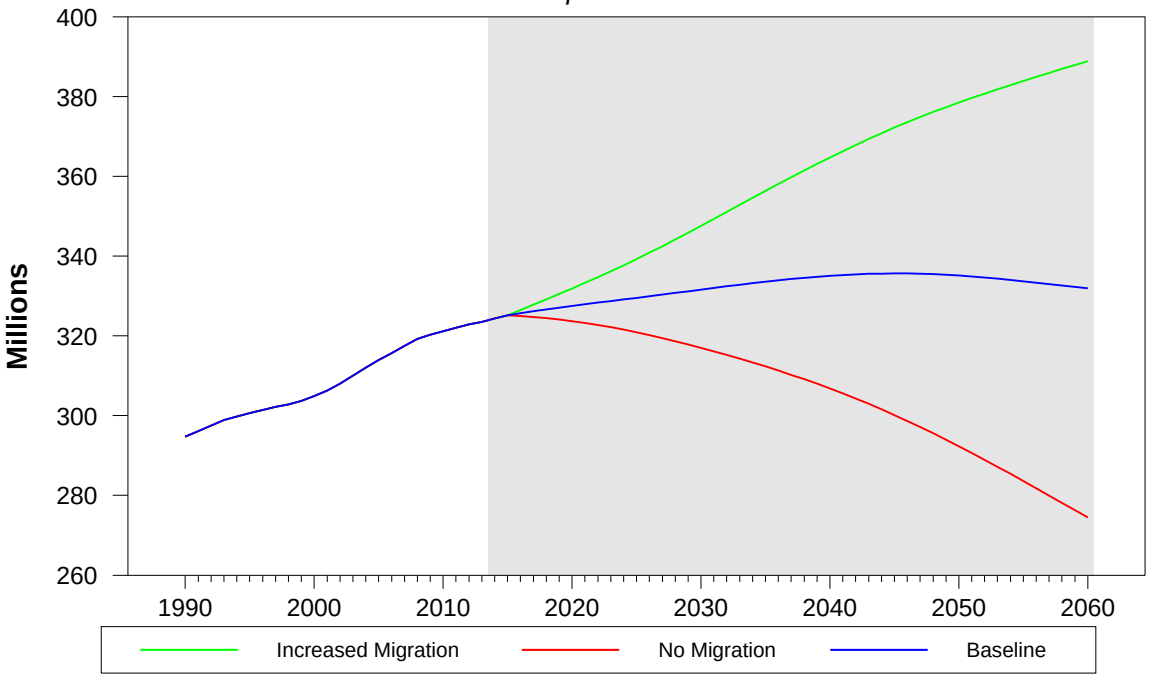


Figure 26

Historical and Future Net Immigration Rates

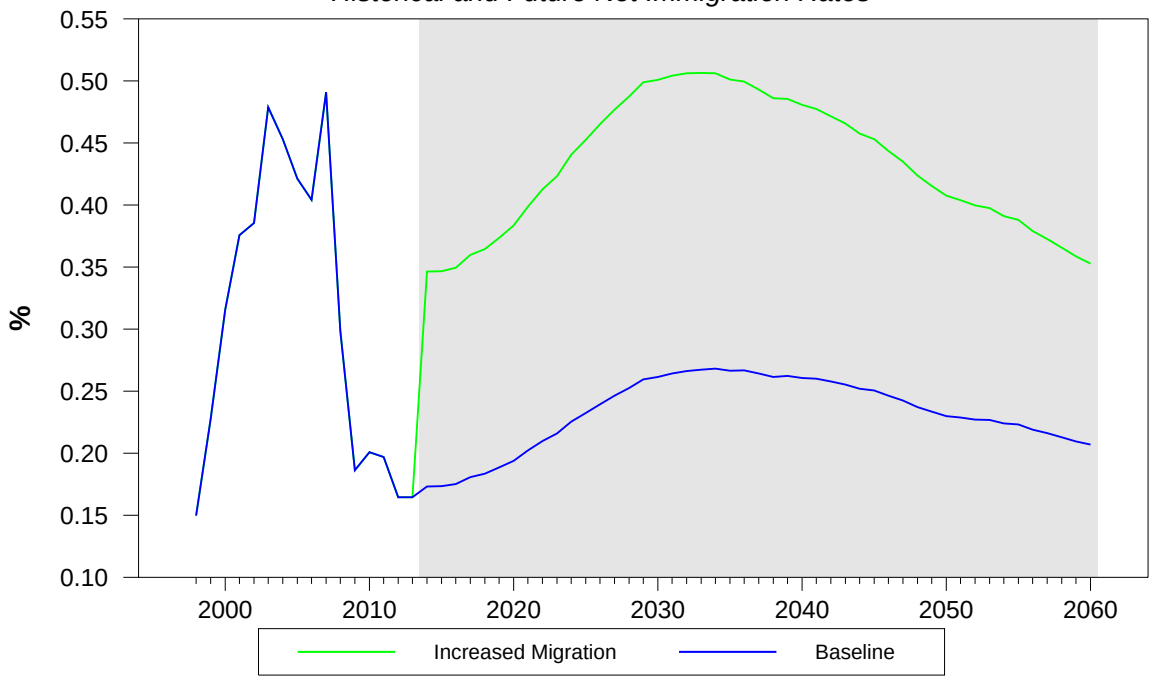


Figure 27

Impact of Alternative Euro Area Population Projections

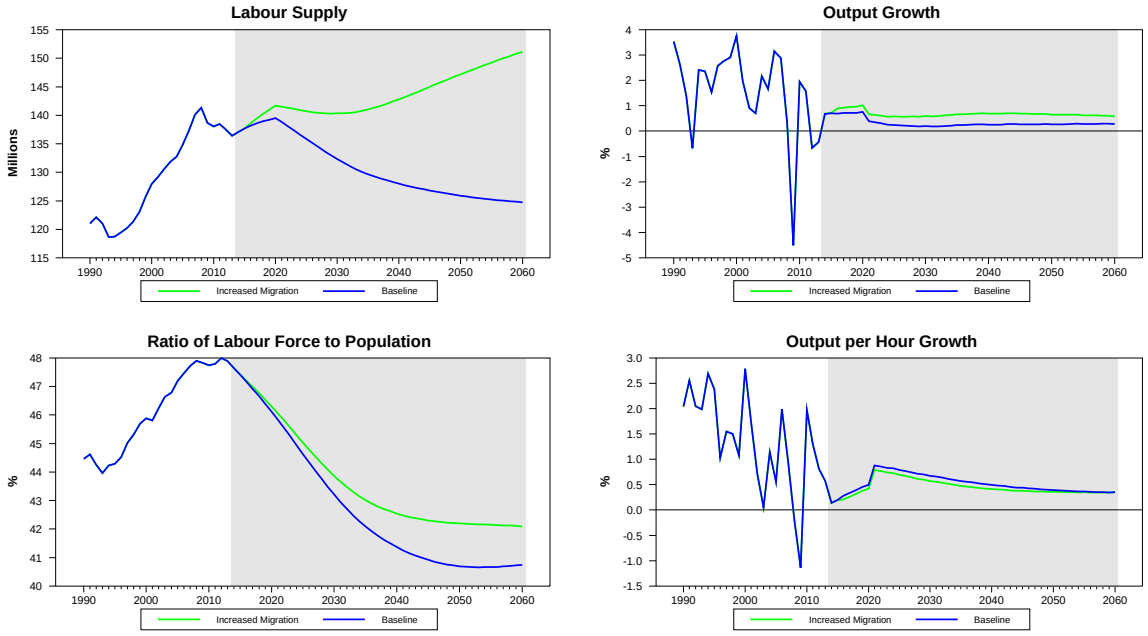


Figure 28

Effect of All Reforms and Migration Scenario

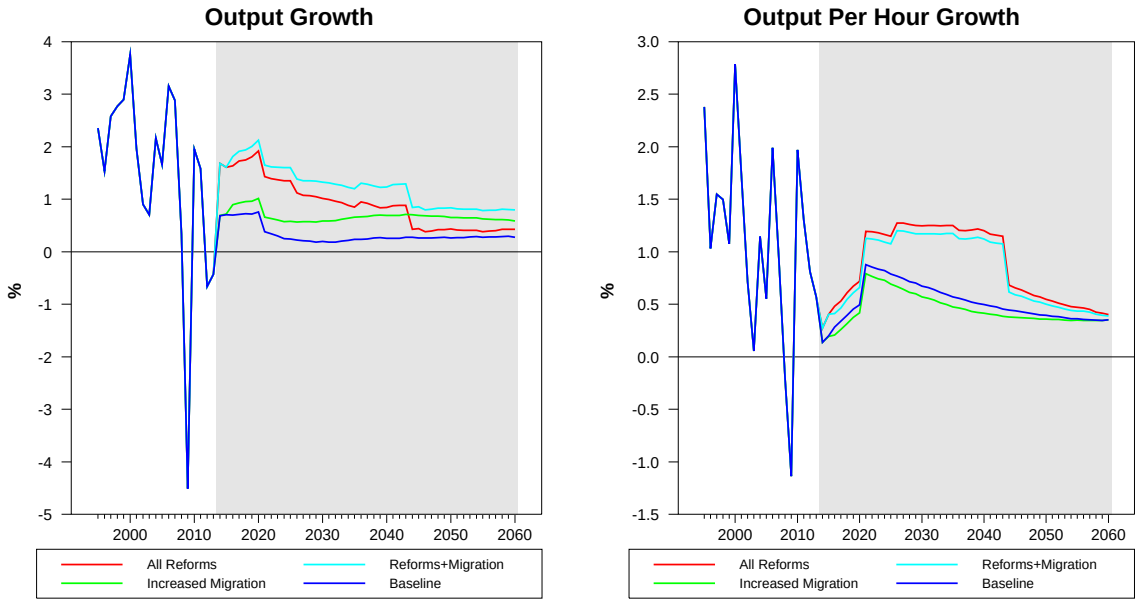


Table 15: Growth Rates With All Reforms and Double Migration

	Output			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	1.80	1.39	1.26	1.48
Belgium	2.19	2.15	2.17	2.17
Germany	1.15	0.78	0.80	0.91
France	1.59	1.34	1.26	1.39
Greece	3.24	1.69	1.11	2.01
Ireland	1.83	1.42	0.77	1.34
Italy	2.13	1.83	1.55	1.84
Spain	3.07	1.80	1.52	2.13
Finland	1.52	1.64	1.67	1.61
Lux	3.73	3.29	2.77	3.26
Portugal	2.36	1.82	1.42	1.86
Austria	1.64	1.54	1.49	1.56
Netherlands	1.35	0.97	0.87	1.06

	Output Per Hour			
	2014-2023	2024-2033	2034-2043	2014-2043
Euro Area	0.69	1.16	1.12	0.99
Belgium	0.64	0.85	0.87	0.79
Germany	1.02	1.16	1.03	1.07
France	0.78	0.94	0.91	0.88
Greece	0.56	2.05	1.95	1.52
Ireland	0.86	1.09	0.70	0.88
Italy	0.37	0.99	1.08	0.82
Spain	0.84	1.80	1.61	1.42
Finland	0.92	0.96	0.96	0.95
Lux	0.00	0.35	0.52	0.29
Portugal	1.45	2.24	2.22	1.97
Austria	0.71	0.79	0.78	0.76
Netherlands	0.72	0.96	0.85	0.84

Note: Average annual growth rate for the period in question *inclusive* of the Baseline.

6 Caveats and Areas for Future Research

We have presented a wide range of figures describing how structural reforms can increase growth rates in the euro area. In general, however, we believe these calculations are perhaps overly optimistic about how much additional growth Europe can achieve via structural reforms.

One reason is political. The joint probability of all of the reforms we have discussed being successfully implemented across all euro area member countries in the time frame envisaged is probably low. There would inevitably be significant opposition from vested interests against the proposed reforms and their implementation is, at best, likely to be partial in nature.

There are also a number of areas where our analysis may have overstated the impact of the reforms. To list a few of the important caveats:

- Our labour and pension reform scenarios assume that the additional workers brought into the labour market by these reforms are equal in productivity to existing workers but this is probably unlikely.

- Our pension reform scenario assumes that the marginally attached workers induced into the labour force will have the same average workweek as other workers. It is arguably more likely that many of those joining the labour force in such a case will do so on a reduced workweek.

- We have assumed it is possible for countries to adopt product and labour market reforms that will see each country's TFP rise to UK levels. Given our limited understanding of the factors determining TFP, this is an optimistic assumption.

- The levels of migration assumed in our "higher migration" scenario may not be politically feasible and the assumption about migrant workers being of equal productivity to existing workers is probably overly optimistic.

There may also be areas where our analysis has been too pessimistic about the potential impact of reforms (perhaps some of the transitions are slower than could be achieved, for instance) but we don't believe the balance of risks lies in this direction.

The analysis also raises many questions and suggests a large research agenda. For example, in relation to the labour market, which specific measures such as tax wedges, minimum wages, employment protection and activation policies are most effective in reducing the structural unemployment rate? In attracting older workers back into the labour force, which aspects of pension systems are most influential in affecting retirement decisions? The impact of pension reform on actual hours worked is also an important consideration as increased participation rates amongst older workers may well entail further declines in the average workweek.

A number of issues relating to productivity also arise from the analysis. For example, what are the effects of changing demographic composition on productivity rates? Feyrer (2007) finds a link between productivity performance and demographics, reporting that an a 5 percent increase in the size of the cohort of people aged between 40 and 49 is associated with a higher productivity growth of 1 percent to 2 percent per year. An examination of the channels of this relationship and its potential impact on future growth in Europe would be useful.

More generally, there are a number of important unanswered questions on the implications for productivity of labour market reforms: Would such reforms work largely through increasing employment, or, is there evidence that they would induce wider increases in efficiency? Further work could also achieve greater clarity on the relationship between productivity and various kinds of product market reforms as well as the impact of taxation and education policies.

Finally, we have not discussed the possibility of further increases in female labour force participation rates or the potential increased costs that may be involved in boosting labour input through this channel. European Commission (2014b), for example, notes the significant difference in childcare costs across Europe.[18] This suggests that increasing participation rates across Europe is going to be more expensive in some countries than others.

7 Conclusions

Despite the post-financial crisis need for faster rates of economic growth in the euro area to deal with severe balance sheet problems affecting many of its members, the current set of supply-side trends are not at all encouraging for the growth prospects over the medium- and long-term. TFP growth has been very poor, investment is low and demographic problems are set to exert significant downward pressure on labour input in the coming years. Combined with a series of demand-side problems, such as tight fiscal policy and restrictions on bank credit, the prospects for growth in the euro area economy over the next few decades are unpromising.

Indeed, even allowing for a return of investment and unemployment to pre-crisis levels, we project growth in the euro area that is below one percent per year over the next decade and weaker in later decades. In this sense, despite the intense focus on debt levels, the euro area is facing a growth crisis as much as it is facing a debt crisis, with the latter perhaps more a symptom of the former.

The official response to the problem of low growth and high debt from politicians and international organisations has been to highlight the need for structural reforms as a way to boost real GDP growth and lower debt ratios. Our calculations confirm that, for a number of European

[18] European Commission (2014b) shows that fees for early childhood education and care are highest in Ireland, Luxembourg, the United Kingdom and Switzerland.

countries (most notably Greece and Spain) structural reforms can probably have a substantial effect on growth rates over the next thirty years. However, for the euro area as a whole, we estimate that even ambitious and successful structural reform programmes (focused on improving labour market performance and reducing inefficiencies relative to the most productivity economies) will not manage to get the growth rate of real GDP in the euro area above 2 percent per year. While there are many positive structural reforms worth undertaking, the idea that these reforms can have a transformative effect on euro area growth rates in either the short- or longer-run appears to be largely wishful thinking.

We conclude by emphasising two very different areas of policy, one short-term and one long-term. In the short-term, the focus of policy-makers on supply-side reforms should not distract from the fact that, at an unemployment rate of over 11 percent, the euro area's current level of GDP is well short of its current supply potential. Morever, as we document here, the current slump in investment is having a substantial negative effect on the growth in supply-side capacity. This partially reflects an endogenous response of the economy to a slower TFP trend but it also reflects a significant cyclical weakness in investment.

The euro area's current ratio of public debt to GDP is high by modern historical standards at about 92 percent as of 2014:Q3 but many of its member states are able to borrow at very low rates and the pricing of ESM-issued securities shows that there are few concerns about the solvency of the euro area as a whole. There is, thus, a strong economic case for a large investment program aimed at reducing unemployment and raising the supply capacity of the economy, funded by the euro area as a whole. Given that public capital funding has been significantly reduced in recent years, it is likely that many of the projects funded by such an initiative would involve spending that would need to be undertaken at some time in the future anyway so a program of this sort may have limited long-run effects on debt levels while generating a positive impact on economic growth over the next decade. Unfortunately, Europe's political constraints are likely to rule out such a programme for the foreseeable future with the current "Juncker plan" with its very limited use of European public funds apparently representing the limit of what is politically achievable at present.[19]

Over the longer-term, Europe is undergoing a pattern of population ageing that is set to have enormous effects. One encouraging aspect of our calculations is that the legislated pension system reforms that have already been passed in euro area countries are set to mitigate some of the more negative effects that ageing could have on labour supply. However, these reforms may prove hard to stick to and will not be sufficient to prevent a sharp decline in future decades in the fraction of the population that is employed. A return to higher rates of inward migration, as described in our

[19]Details on this plan are available at http://ec.europa.eu/priorities/jobs-growth-investment/plan/index$_en.htm$

scenario in the previous section, could be politically difficult but may be necessary if governments wish to keep the supply of labour growing and economic growth rates from collapsing.

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A Legislated Pension Reforms in Euro Area 12 Countries

Here, we summarise the reforms that have been made to pension systems in the twelve euro area countries. For more detailed information, see pages 36 to 50 of European Commission (2014a) for more information.

A.1 Belgium

Pension reforms in 2011 introduced reform to the minimum early retirement age and the minimum number of career years required for eligibility. As of 2013, the early retirement age was to be raised each year by six months in order to reach 62 years in 2016 and the minimum number of years required increased from 35 to 40 years. These more stringent eligibility conditions are aimed at reducing the number of pensioners and raising employment. Further reforms in 2014 seek both to reduce the generosity and tighten the eligibility for the public pension scheme and increase the labour force participation rate of older workers.

A.2 Austria

New pension measures came into effect in January 2014. The aim of these modifications is to harmonise the effective retirement age with an increase in the legal retirement age, enhancing participation rates of older people and, ultimately, curbing early retirement and invalidity pensions. As well as a gradual increase in the retirement age, deductions for early retirement were raised from 4.2 per cent per annum to 5.1 per cent per annum. In December 2010, the government approved measures to foster rehabilitation and keep people in the workforce, thereby seeking to decrease expenditure on individual pensions. With these modifications, the government aims to increase the effective retirement age by 1.7 years between 2012 and 2018 which is above expected gains in life expectancy.

A.3 Germany

Following reforms introduced in 2007 the statutory retirement age was increased in steps of either one or two months from 65 years of age depending on the year of birth. Early retirement for persons with a minimum contributory period of 35 years remained at 63 years of age while the maximum penalties for early retirement at age 63 rose from 7.2 per cent to 14.4 per cent.

A.4 Greece

In July 2010, the Greek parliament adopted a comprehensive pension reform of the main pension schemes. The reform simplified the highly fragmented pension system, enhanced transparency and fairness, postponed the retirement age, and decreased the generosity of benefits. Along with other changes, the reform increased the statutory retirement age from 60 to 65 while the minimum age for retirement was set to 60 years. The full contributory career increased to 40 years and penalties now apply for persons with less than the full contributory career. Following this, in November 2012, the parliament further increased the statutory retirement age from 65 to 67. From 2020 onwards, the statutory retirement age is scheduled to be automatically adjusted (every 3 years) to reflect changes in life expectancy.

A.5 Ireland

From the 1st of January 2014, the State Pension Transition (which allowed people with sufficient social insurance contributions to collect a state pension) was abolished, while the age of qualification will rise to 67 in 2021 and then to 68 in 2028.

A.6 Spain

The 2002 pension reform abolished mandatory retirement at 65 in the private sector. Workers remaining active after 65 will increase their pension benefit by 2 per cent per year. Early retirement is possible from

61 years, with at least 30 years of paid contributions and registered as unemployed for at least 6 month, but with a high penalty associated, from 6 per cent to 8 per cent per year. The 2011 pension reform contains measures for the statutory retirement age to gradually increase from 65 in 2013 to 67 in 2027. Also, early retirement at 61 will still be possible during the economic crisis for workers with contributory careers longer than 33 years while the period used to calculate pensionable earnings will be gradually increased from 15 years to 25 years by 2022. Beginning in 2027, the fundamental parameters of the pension system will be revised every five years to take into account changes in life expectancy.

A.7 Finland

Since 2005, flexible old-age retirement increased (63 to 68 years) with an increase of the accrual rate to 4.5 per cent for those continuing to work beyond the age of 63. A new early retirement scheme was introduced with a minimum age of 62 and an actuarial reduction of 0.6 per cent per month prior to 63 for those born before 1952.

A.8 France

Between 2004 and 2008, public sector pensions were gradually aligned with private sector pensions by increasing the number of contribution years for entitlement to a full pension, from 37.5 to 40 years. Between 2006 and 2015, the yearly penalty for early-retirement (before 40 years of contribution) will gradually decrease from 10 per cent to 5 per cent of pension benefits for private sector workers, while increasing from 0.5 per cent to 5 per cent for civil servants. The 2010 pension reform introduced a progressive rise in age limits. The standard pension age will be gradually increased for all pension schemes, from 60 to 62 years of age. Simultaneously, the full rate pensionable age will rise from 65 to 67. There will also be a convergence of pension rules between the public and private sectors. In the 2014 pension reform, the number of required contribution years for a full benefit will rise gradually from 41.5 to 43 years over the 20202035 period.

A.9 Italy

Laws introduced in 2007 included measures regarding the minimum requirement for early retirement. From 2013 onwards the age requirement, for those with a contributory career of 35 years, is 62 for employees and 63 for self-employed. Further reforms in 2011 introduced several changes to the public pension scheme. These include exit-window mechanism; indexation of retirement age; statutory retirement age of women in the public sector; early pension with 40 years of contributions; and early retirement regardless of age.

A.10 Luxembourg

A major pension reform was introduced in 2012 in order to align the pension benefit to the evolution in life expectancy over a 40-year period. Formally constant pension parameters have been replaced by annually varying parameters.

A.11 The Netherlands

In January 2006 a law was introduced to replace a previous scheme facilitating actuarially unfair early retirement. The old scheme had an important impact on the participation rate. Since January 2009, older workers receive an age-related tax credit on their wage income in order to increase participation. The effect of the envisaged gradual increase in the statutory retirement age to 67 in 2023 is expected to have a decreasing impact on the number of pensioners and an increasing effect on employment. Also, the link of the retirement age to gains in life expectancy as of 2023 will also contribute to reduce the number of pensioners and increase employment.

A.12 Portugal

Portugal introduced a sustainability factor in 2007 linking initial benefits to average life expectancy at retirement. A national strategy for the promotion of active aging was introduced aiming to encourage older workers to remain longer in the labour force through better access to vocational training; improvement of older workers employment conditions; a higher penalty for early retirement; and benefits granted in case of longer contribution career. In 2014 and 2015 the statutory retirement age of old-age pensions will shift to 66 years. As from 2015, the legal age for entitlement to old-age pensions will vary according to the evolution of life expectancy at 65 years of age.

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