

Chapter 1

EU employment in a global context: where will new jobs come from and what will they look like?⁽¹⁾

1. INTRODUCTION

New jobs in 2020 ...

This chapter explores future employment prospects in the European Union (EU). More specifically, it will investigate where new jobs will come from and what new jobs can be expected to look like by 2020.

The EU faces continuing and significant structural challenges at the same time as it works to recover from a severe economic downturn. Uncertainty about current and future job opportunities is a major concern with European policy makers focused on actions to address these challenges in pursuit of a competitive social market economy with full employment in the EU.

In the past, structural reforms such as the creation of the Single Market, EU enlargement to countries of Central and Eastern Europe, as well as monetary stability, bolstered the European economy's resilience to challenges posed by globalisation and technological progress. In the meantime, however, the pressures arising from technological progress and globalisation have strengthened, while the challenges resulting from an ageing population and the pressures on climate, natural resources and biodiversity have intensified.

These long-term trend developments will continue to have a profound impact on which, where and how goods and services

will be produced and consumed, and hence on the associated jobs and their quality. However, the current and persistent economic downturn has put increased pressure on Europe's labour markets, as well as other markets, to address these long-term trends. Indeed, as unemployment spells persist, the employability of unemployed people deteriorates with the risk of further labour market polarisation, all of which could have an adverse impact on our capacity to achieve our economic, social and employment goals.

... driven by trend developments, convergence and cyclical pick-up, ...

In this context, three sources of job growth are considered for the period from 2013 to 2020, namely: trend developments for the EU as a whole; convergence between Member States; and cyclical adjustments as the Union recovers from the current crisis ⁽²⁾.

In this context, we note that in the period to 2020:

- new jobs will be created while old jobs will be destroyed, transformed or maintained in order to address new challenges and opportunities arising from continued globalisation,

technological progress, demographic changes, and other factors such as the greening of the economy;

- Member States that are still catching up are likely to see their future employment prospects change more dramatically than others;
- the economic downturn has resulted in significant short-term variations in output and employment from underlying trends, some of which are likely to be at least partially corrected over the period.

In terms of the types of job changes, some will be created in growth areas such as environmental consultancy, some will be substitutes within similar types of activity, for example due to a shift from fossil fuel use to renewable energy use, others will be transformed by the acquisition of greener skills, while some may disappear altogether, as has largely happened in coal mining in most EU countries.

At the same time, changes in the organisation of work can be foreseen (for example, a continued growth of distance work) along with changes in the structure of production (for example, the expansion of global value chains) as well as changes in the gender, age and skill composition of the labour force.

However, this potential will only be fully realised to the extent that the framework conditions are right and the current economic and financial conditions are normalised. This chapter focuses in

⁽²⁾ It would be beyond the scope of this chapter to cover other drivers of future job creation and destruction such as overhang of consumer and government debt (see, for instance, Gordon (2012)), reforms to the European financial architecture (see, for instance, Liikanen Report (2012)), reforms of tax systems, etc.

⁽¹⁾ By Eric Meyermans and Jörg Peschner

particular on the labour market framework conditions and on the negative feedback within the labour market arising from the current economic downturn ⁽³⁾.

... provided the right framework conditions are put in place on time...

On the supply side of the labour market, developing the full job potential will require that workers receive adequate education, training and skills, have incentives to take up jobs, and can move in flexible, but secure, ways between jobs.

On the demand side of the labour market, this requires a strengthening of framework conditions for companies to respond to new structural challenges, targeting specific groups (notably the young), targeting regions or professions, and maintaining or strengthening the EU's comparative advantages in international markets.

... and the economic downturn ends without further delay

The current economic downturn will also affect the potential for labour to relocate in the short as well as the medium term, given: the adverse feedback from persistent unemployment (inducing hysteresis effects due to the erosion of skills and

employability); the polarisation in labour markets (hindering occupational mobility and social sustainability); the shortage of credit, especially for small and medium sized enterprises, which is limiting both human resource investment and innovation generally.

Structure of the chapter

This chapter aims to identify the most important trends and transmission mechanisms that will affect future job opportunities in the period to 2020. It does not attempt to produce precise quantitative projections and those that are used are only intended to be indicative, based essentially on existing forecasts rather than new calculations ⁽⁴⁾.

The chapter is structured as follows:

The analysis in **Section 2** begins with a description of past employment trends in those dimensions that are likely to condition future employment developments such as their sectoral composition and knowledge intensity, and taking account of developments in global value chains, and enterprise demographics.

This review underlines the continuing shift in employment share away from industry (and agriculture in the case of Member States joining the EU in

2004 or later) towards the service sector, as well as the shift of employment opportunities towards higher knowledge-intensive activities in expanding global value chains ⁽⁵⁾. It also highlights the importance of small and medium sized enterprises in the creation of new jobs.

Section 3 identifies the inter-related trend drivers of new job creation (as well as transformation and destruction), including technological progress, globalisation, demographic change, and the greening of the economy, and also reviews the transmission mechanisms that then determine the composition of employment and related working conditions.

These drivers are not new but they are expected to have an accelerated impact. Moreover, there remain major differences between Member States in terms of their adjustment to such drivers to date which provide differing needs and opportunities in terms of convergence in their relative performance in the future.

Section 4 discusses the challenges presented by the persistence of the economic downturn and inadequate structural reforms to date in terms of realising the EU's full employment potential by 2020. These factors include the risk of labour

⁽⁴⁾ The only exceptions are some regional projections. More generally it is important to recognise that, although several studies have made careful analyses of the employment effects of particular exogenous shocks or policies, no study known by the authors has studied the impact of all these exogenous shocks or policies simultaneously. In other words, no assessment of the mutually reinforcing or crowding out effects generated by the simultaneous implementation of these measures is available. Moreover, several studies use a partial equilibrium analysis that does not take account of general equilibrium feedback loops.

⁽³⁾ In the subsequent text, the structural framework conditions as outlined, for example, in the Europe 2020 Strategy, the Employment Package, the Social Investment Pact, the Single Market ACT II, etc. will be tackled to the extent that they have notable labour market effects.

⁽⁵⁾ Within a global value chain (GVC) different stages of the production process are carried out in different regions of the world.

market hysteresis effects resulting from persistent unemployment spells, labour market polarisation, skill mismatches, and slowness in ensuring the further deepening of the single market and the Economic and Monetary Union (EMU).

Section 5 describes what new jobs can be expected to look like by 2020. Important dimensions that are considered include changes in the personal characteristics of workers (e.g. skills, age), in working conditions (e.g. virtual workplaces), and in the nature of tasks (e.g. social jobs).

Section 6 pays particular attention to skills by investigating the potential impact of policy instruments aimed at improving the skills composition in the face of an ageing and shrinking workforce.

Section 7 draws general conclusions about the way that the forces of globalisation, technological progress, demographic change and the greening of the economy are expected to transform, not only the way goods and services are produced and consumed, but also where, bringing profound changes to the EU job panorama in 2020, creating continuing challenges to the policy aim of ensuring that the benefits of these changes are distributed in an equitable way.

2. LABOUR MARKET DYNAMICS

In looking to future employment prospects in the EU it is necessary to first review recent experiences and current trends. Five aspects are highlighted and addressed:

- first, the widely recognised fact that sector-level employment developments in the EU have involved declining shares for employment in industry and agriculture, and increasing shares in business services, and information and communication services;
- second, the evidence that international production has increasingly become fragmented with different parts subcontracted to specialised firms across the globe with consequent impacts on employment levels and job content;
- third, employment growth in technology and knowledge-intensive activities appears to provide a preliminary indication of job potential to strengthen a Member State's knowledge base;
- fourth, the evidence concerning the way changes in the patterns of birth

and death of enterprises have an impact on job creation;

- and finally, we consider the impact of cyclical downturns and the indications they may contain regarding possible lingering persistence and hysteresis effects on the labour market over the medium and longer term.

2.1. Sectoral employment dynamics

In the past, significant sectoral employment reallocation has taken place ...

Over time there has been a notable reallocation of labour across broad sectors of the economy in all EU Member States as indicated in Chart 1 showing the employment share for 9 sectors ⁽⁶⁾ in the EU Member States in 1995 and 2012 ⁽⁷⁾, adjusted for cyclical fluctuations with a view to narrow the focus on trend developments ⁽⁸⁾.

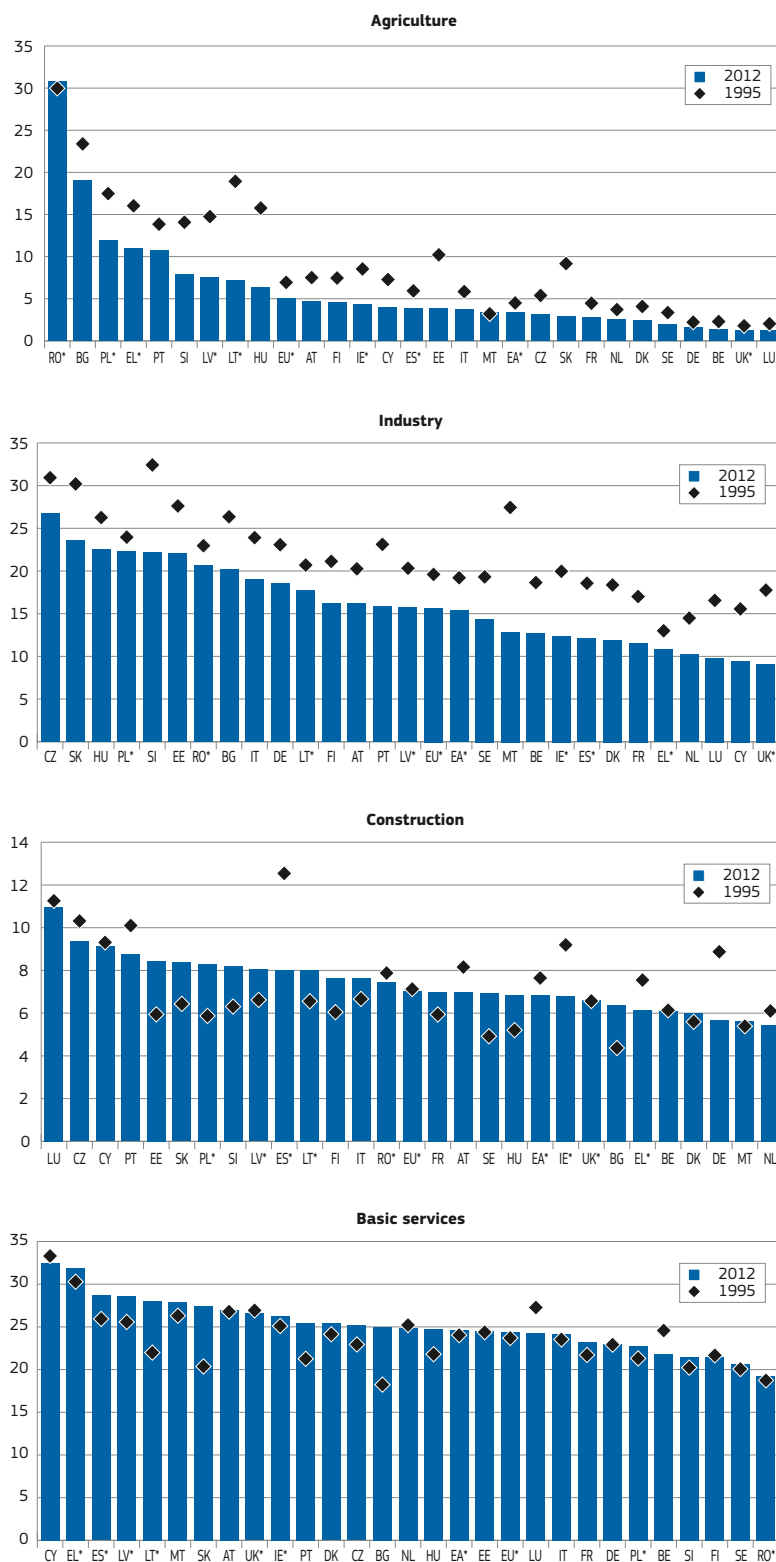
The employment share for industry was, in all Member States, lower in 2012 than in 1995 with Malta recording the sharpest decrease. Nevertheless, there are still important differences across Member States in the relative importance of industry, with the employment share ranging from over 26% in

⁽⁶⁾ Sectors: Agriculture, industry, construction, basic services, information and communication, financial services, business services, public services and other services. Basic services cover wholesale and retail trade; repair of motor vehicles and motorcycles, transportation and storage, accommodation and food service activities. Business services cover professional, scientific and technical activities and administrative and support service activities. Financial services cover financial and insurance activities and real estate activities. For a more in-depth description of past sectoral employment trends at a lower level of aggregation see, for instance, WiiW and Applica (2012).

⁽⁷⁾ The period starts in 1995 for the Member States for which the data are available. For the other Member States the first year may be different, i.e. IE 1998; EU and EA aggregates, as well as EL, ES, LV, LT 2000; PL 2004; RO 2008. Last observation for UK is 2011.

⁽⁸⁾ Values obtained fitting a stochastic trend using a Hodrick-Prescott filter.

Chart 1: Sectoral employment shares: 1995-2012 – net of cyclical component (scales vary)



Notes: Basic services cover wholesale and retail trade, transport, accommodation and food service activities. De-trended series using Hodrick-Prescott filter. Observations 1995 & 2012, except IE 1998; EU, EA, EL, ES, LV, LT 2000; PL 2004; RO 2008; UK 2012.

the Czech Republic to about 9% in the United Kingdom in 2012. The employment share for the agricultural sector has, likewise, been on a downward trend in all Member States (except Romania and Malta) and especially in Lithuania.

The employment share for the sector providing business services, as well as the sector providing information and communication services, was higher in all Member States (except Greece) in 2012 than in 1995, but notable differences across Member States remain, with the highest share in business services (at 18%) recorded in Belgium and the lowest (at 4%) in Romania.

The employment share in other sectors remains fairly stable, although notable differences between Member States remain. The most significant is that between the Scandinavian Member States, Belgium and France whose employment shares for public services are at approximately double the shares in Romania and Bulgaria.

... in response to interlocked structural changes

The above developments are the result of several factors: the stronger increases in labour productivity in industry and agriculture compared to other sectors⁽⁹⁾; the continuing liberalisation of international trade that has induced a shift from the tradable sectors (industry and agriculture) to the non-tradable sectors (construction and services)⁽¹⁰⁾; and the low income elasticity of demand for the goods and services provided by the agriculture sector⁽¹¹⁾.

⁽⁹⁾ See, for instance, Rowthorn and Ramaswamy (1997 and 1999) and Rowthorn and Coutts (2004). Nevertheless, to the extent that productivity gains are translated in price cuts and the demand for the goods and services is very responsive to price changes, total output may increase thereby offsetting or even overshooting the loss in employment. See, for instance, Edwards and Lawrence (2013).

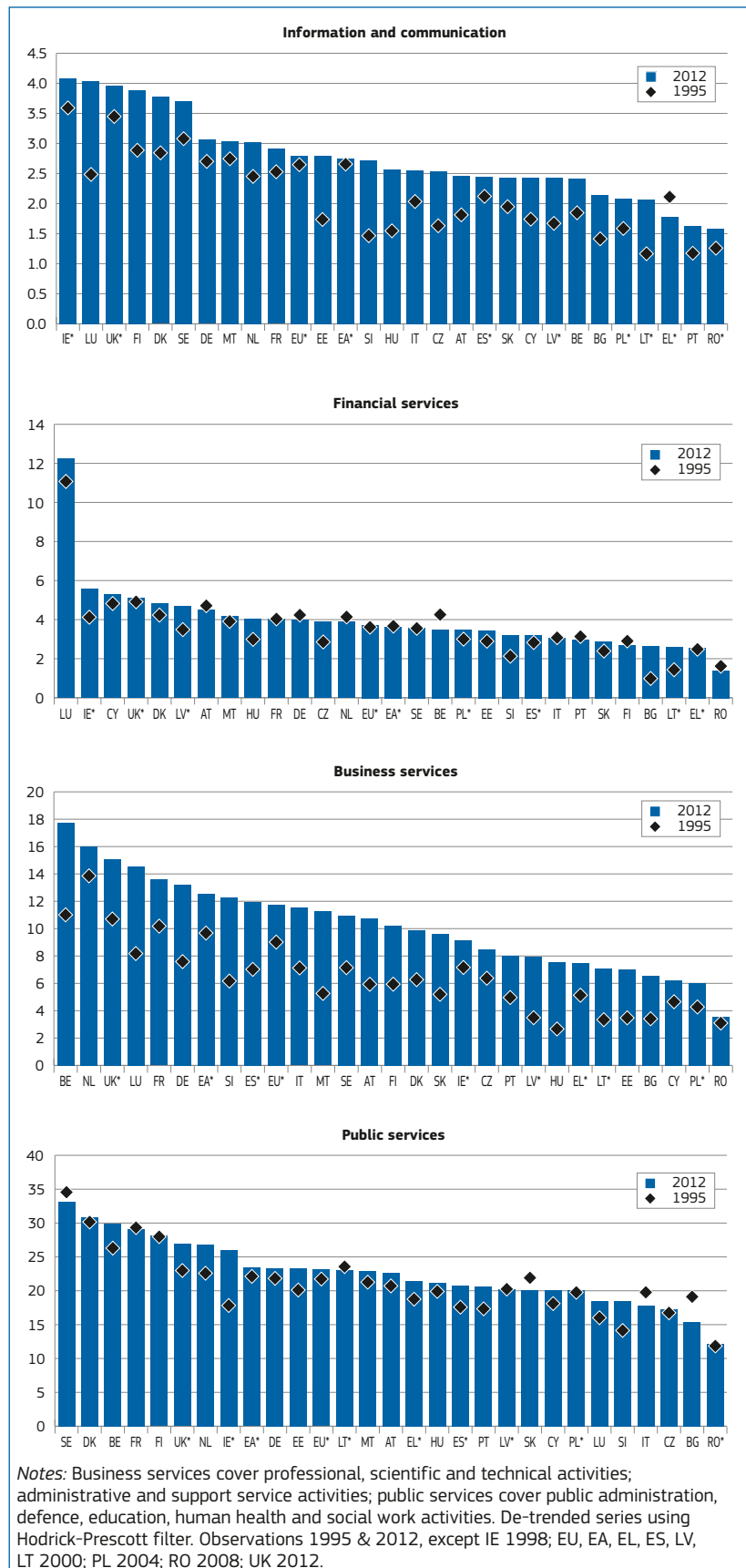
⁽¹⁰⁾ See, for instance, Sieber and Silva-Porto (2009).

⁽¹¹⁾ An increase in income will lead to a proportionally smaller increase in demand for agricultural goods and services. Nevertheless, in the future a shift in the observed income elasticity of goods and services provided by the agricultural sector is to be expected. For instance, in 1980, it was primarily foodstuff that was provided by the agricultural sector (for which there was low income elasticity), however as income increases there will be a shift to rural services, such as, for example, a clean environment, which increase at a higher proportion than income (i.e. high income elasticity).

Moreover, changing business models, whereby manufacturers outsource services such as logistics, marketing or legal advice to enterprises in the service sector, have caused a decline in the employment share for industry and a rise in the service sector for 'statistical reasons' ⁽¹²⁾.

Furthermore, in some Member States, fiscal consolidation since the onset of the crisis has reduced employment in public services, resulting in a decline in its employment share ⁽¹³⁾. Also, the cyclical fluctuations in the construction sector over the period 1995 to 2012 may have somewhat masked underlying trends ⁽¹⁴⁾. In addition, many of the Member States who joined the EU in 2004 or since then (the exceptions being Cyprus and Malta) also underwent a significant transition from being largely centrally planned economies to market economies, which may have accelerated the decline in employment shares for industry and agriculture.

Finally, while much of the growth of international trade in recent decades had been identified in terms of final products, and driven by falling global transport costs, a profound change is emerging in which the focus is on changes in the distribution of activities *within* enterprises under the impetus of ICT developments that make it technically possible to coordinate complexity from a distance – see, for instance, Baldwin and Evenett (2012).



⁽¹²⁾ See, for instance, Ciriaci and Palma (2012).

⁽¹³⁾ See, for instance, Efthyvoulou (2012).

⁽¹⁴⁾ The limited data time-span prevented a rigorous elimination of the cyclical component in the data series.

... and fragmentation of production processes ...

At the same time, the production of goods and services has been subject to more intense outsourcing and offshoring (15) as enterprises seek to both lower their production costs and access new, especially emerging, markets in order to establish global value chains (GVC). See, for instance, OECD (2007a).

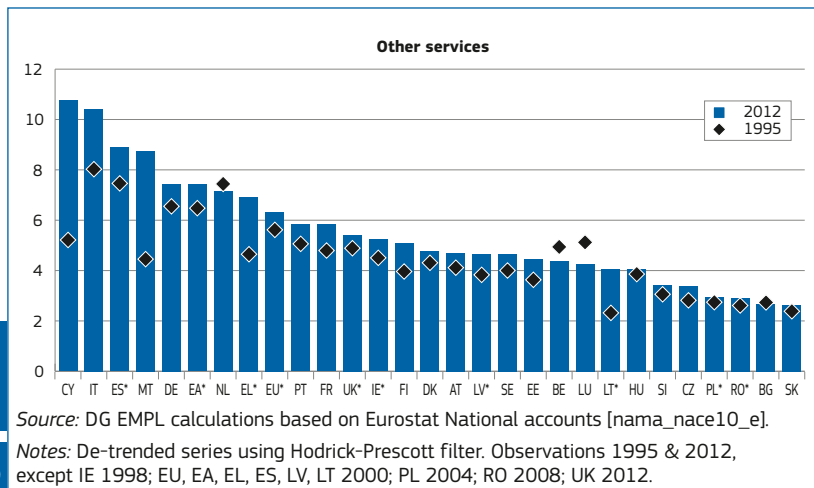
A notable expansion of the global value chain has been observed in the electronics industry, where lead firms conceive, coordinate, and market new products (e.g. iPods) while other firms (often located in other continents) provide electronics components and services. See, for instance, Dedrick *et al.* (2008).

... have affected European labour markets

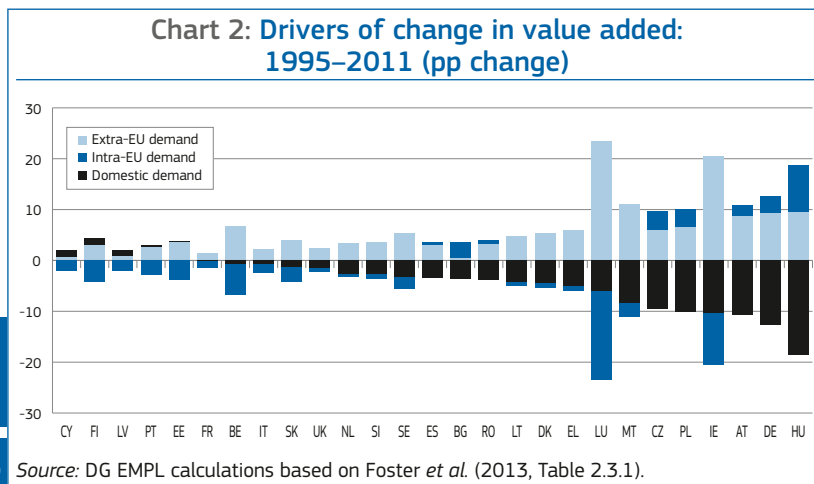
Assessing the labour market implications of global value chains in quantitative terms is not straightforward given the way production and employment data is recorded (16), with only the results of ad hoc surveys and studies of international sourcing available (17). Nevertheless some statistics are directly relevant.

For example, Chart 3 presents estimates of the number of workers directly and indirectly involved in the production of final manufacturing goods (i.e. manufacturing GVC workers) as the percentage of all workers employed in the whole economy in 1995 and 2008 – see Timmer *et al.* (2013) (18).

(15) Note that outsourcing (whereby an external contractor performs a services that could have been performed in-house) should be distinguished from offshoring (whereby jobs are moved abroad).
 (16) Traditional trade statistics may suffer from double counting, e.g. gross exports may also include value added created in countries supplying intermediary inputs. See, for example, Koopman and Wang (2012).
 (17) See for instance, Sturgeon (2013) and Eurostat 'International sourcing statistics' at http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/International_sourcing_statistics
 (18) Timmer *et al.* (2013) used the World Input-Output Database which is available at www.wiod.org. These tables provide a time-series of world input-output tables (WIOTs) from 1995 until 2008. It covers forty countries, including all EU- 27 countries and 13 other major advanced and emerging economies.



Source: DG EMPL calculations based on Eurostat National accounts [nama_nace10_e].
 Notes: De-trended series using Hodrick-Prescott filter. Observations 1995 & 2012, except IE 1998; EU, EA, EL, ES, LV, LT 2000; PL 2004; RO 2008; UK 2012.



Source: DG EMPL calculations based on Foster *et al.* (2013, Table 2.3.1).

2.2. Expanding global value chains

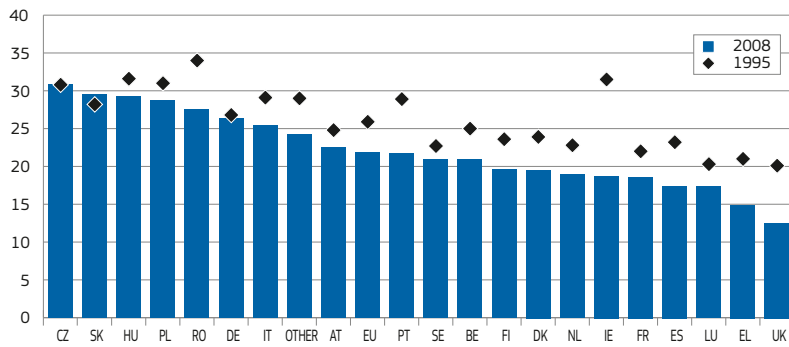
Increasing trade openness to the rest of the world ...

In terms of the employment effects of emerging global value chains, Chart 2 shows that most EU Member States experienced a strong shift away from production for domestic demand towards production for other countries, whether to fulfil intra-EU demand or extra-EU demand – see also Foster *et al.* (2013).

The strongest relative decrease (in excess of 10%) in the share for domestic demand is found in Hungary, Germany, Austria, Ireland and Poland, although a few Member States saw a modest rise in the domestic demand share, including Cyprus, Finland and Latvia.

In several Member States the shift towards meeting extra-EU demand has been much stronger than the shift towards meeting intra-EU demand. This was particularly the case for Luxembourg, Ireland, Malta and Belgium.

Chart 3: Manufacturing GVC workers as % of all workers



Source: Timmer *et al.* (2013).

This shows how the share decreased in all Member States (except Cyprus and Slovakia) over the period, and by 4% for the EU as a whole, while Ireland showed the strongest decrease, followed by the United Kingdom and Portugal. Overall, the number of manufacturing GVC workers in the EU fell by 1.8 million over this period.

This change was not evenly distributed across the sectors providing the intermediary inputs. While jobs in manufacturing decreased by 3 million and agriculture by 2.3 million, jobs in the service sector increased by 3.5 million. At the same time, there was also a shift from low-skilled towards highly-skilled workers, which was stronger among manufacturing GVC workers than in the EU economy as a whole. See Timmer *et al.* (2013) and Foster *et al.* (2013) for more details.

Such developments show how a resource-scarce, skill-rich, European Union has been actively exploiting its comparative advantages in the global value chain through a focus on activities performed by highly-skilled workers since the 1990s⁽¹⁹⁾. However it also shows the declining importance of global production of manufacturing for employment in Europe.

2.3. Knowledge-intensive employment growth

Apart from a shift in the sectoral composition of employment, there has also been a shift in the employment share for the types of knowledge and technology intensive activities⁽²⁰⁾ which are at the heart of Europe's potential for future innovation and productivity growth⁽²¹⁾ – the necessary conditions for the creation of high-quality jobs.

However, high-technology manufacturing represented only 6.9% of total employment in the manufacturing sector of the EU in 2011, compared to 28.6% for medium-high, 27.9% for medium-low and 36.6% for low knowledge-intensive jobs⁽²²⁾. Meanwhile the employment share for knowledge-intensive service sectors accounted for 56% of employment in the service sector as a whole.

The employment share for the high- and medium-high technology intensive manufacturing sector was very modest in 2011 on average ...

Chart 4 shows the employment shares for manufacturing industries

across Member States⁽²³⁾ in terms of the high-, medium-high, medium-low and low technology intensity dimension⁽²⁴⁾ in 2000 and 2011, and demonstrates the strong differences between the EU Member States in 2011. Here Ireland records the highest employment share in high knowledge-intensive industries at 26.2%, but with Member States such as Portugal, Cyprus, Romania, Bulgaria, Latvia, Greece, Poland and Spain recording shares of less than 5%.

When high and medium-high knowledge-intensive industries are combined, the highest shares in 2011 were found in Germany (48.8%) and Ireland (44.2%).

... while the employment share for the knowledge-intensive service sector was somewhat stronger on average ...

Chart 5 shows the employment share for services in the knowledge-intensive⁽²⁵⁾ and less knowledge-intensive dimension indicating the highest employment share in Luxembourg, at 67.2%, followed by the Netherlands, Denmark and Belgium. The lowest employment shares below 50% were found in Bulgaria, Cyprus and Spain.

... but several Member States underperformed

In the past, several Member States lagged in the creation of employment in knowledge-intensive industries, attributed to varying degrees to shortcomings in their R&D systems, lack of competition in certain sectors, tight credit conditions, slow bureaucracy, and a low level of internationalisation of enterprises. See, for instance, European Commission (2012y).

⁽²⁰⁾ An activity is classified as knowledge-intensive if tertiary educated persons employed (according to ISCED97, levels 5+6) represent more than 33% of the total employment in that activity. See http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an8.pdf

⁽²¹⁾ See, for instance, OECD (2013.b).

⁽²²⁾ Based on NACE_R2. For the year 2000 NACE_R1 classification shows 6.3% for high, 30% for medium-high, 23.0% for medium low and 40.6% for low knowledge-intensive jobs.

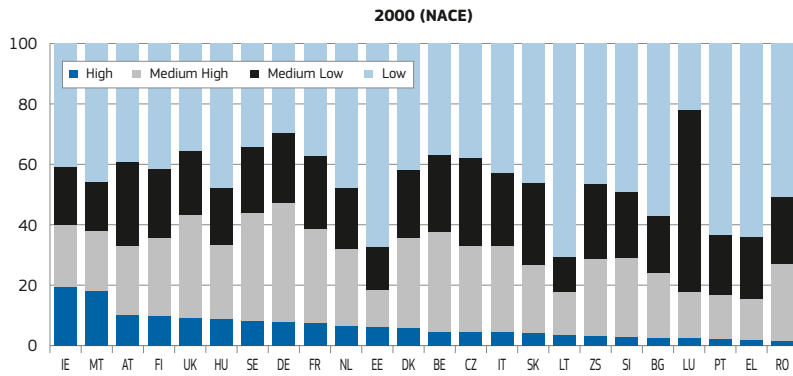
⁽²³⁾ For a detailed description of knowledge-intensive services and knowledge-intensive business services at the level of European regions. See, for instance, Schricke *et al.* (2012).

⁽²⁴⁾ See http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an3.pdf or Annex A for a definition of 'high-technology' and 'knowledge' based services' aggregations based on NACE Rev. 2.

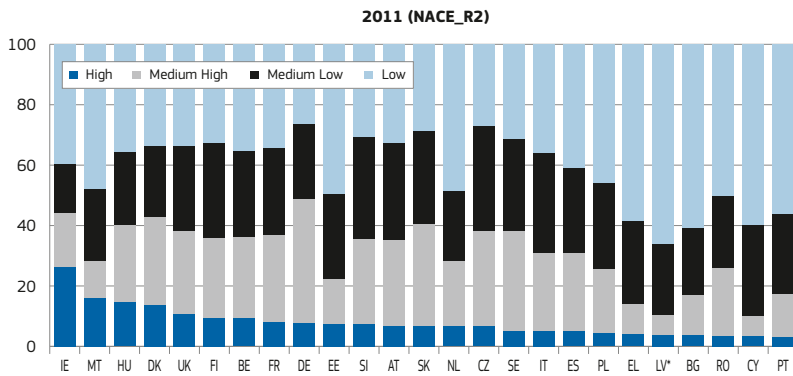
⁽²⁵⁾ See Annex A for grouping.

⁽¹⁹⁾ See also Galar (2012).

Chart 4: Employment shares for knowledge/technology-intensity of job – Manufacturing

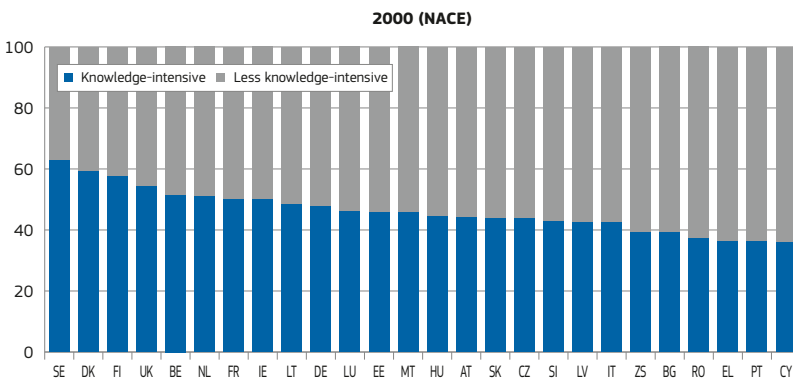


Source: DG EMPL calculations based on Eurostat (htec_emp_nat); see also Annex A.

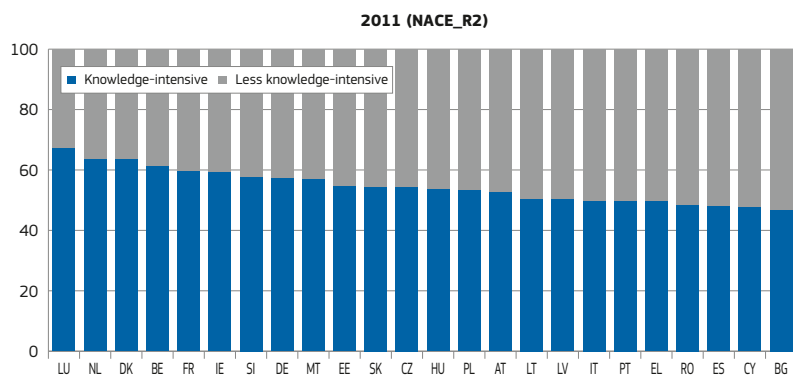


Source: DG EMPL calculations based on Eurostat, Science and technology (htec_emp_nat2); see also Annex A.

Chart 5: Employment shares for knowledge/technology-intensity of job – Services



Source: DG EMPL calculations based on Eurostat, Science and technology (htec_emp_nat); see also Annex A.



Source: DG EMPL calculations based on Eurostat, Science and technology (htec_emp_nat2); see also Annex A.

2.4. Enterprise dynamics

Enterprise demographics affect employment dynamics ...

Developments in employment are closely related to the dynamics of enterprises, with job losses when enterprises close or decline, and job creation when new ones are born or expand. In general, newly born enterprises with fewer than 5 employed persons (26) were, in most Member States, the biggest source of gross employment creation among all newly created enterprises. Enterprises with fewer than 5 employed persons (including declining 'old' enterprises) were also the most important source of gross job losses.

... with strong differences across Member States ...

Charts 6 and 7 show the creation and destruction of jobs due to the birth and death of enterprises in the European Union in 2005 and 2010 (27), in terms of the percentage of all those employed in all enterprises.

In 2005, most Member States recorded positive net job growth related to the birth and death of enterprises as the creation of jobs by new enterprises was greater than the destruction of jobs through enterprise closures. Notable exceptions were Hungary, France and Portugal who all recorded net job losses.

In 2010, the outlook was sufficiently gloomy that, in a large number of EU Member States, the job gains resulting from the creation of new enterprises were more than offset by the job losses from closures. Strong net job losses were found in Lithuania, Portugal, Hungary, and Latvia although, in these Member States, the net losses were accompanied by high gross in and out flows compared with other Member States. Malta was the only Member State that recorded significant job gains (+1.9%).

(26) Employed persons are either employees (working by agreement for another resident unit and receiving remuneration) or self-employed (owners of unincorporated enterprises).

(27) Note that data are not fully comparable as 2005 refers to NACE-R1 and 2010 to NACE-R2.

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... and sectors with a booming construction sector in 2006 ...

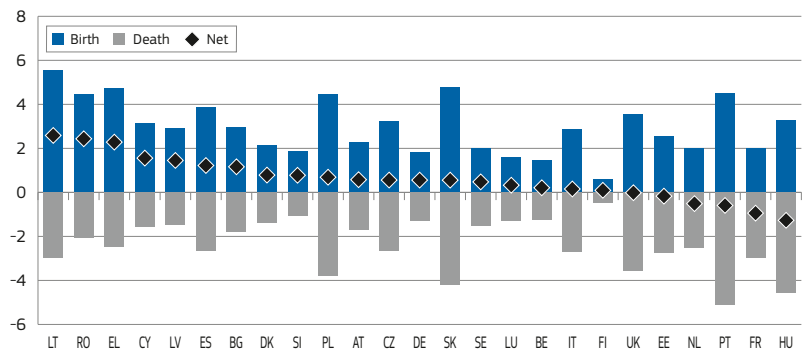
Charts 8 and 9 show the extent of job creation and destruction due to the birth and death of enterprises in the three main economic sectors, namely industry, construction, and services, in 2006 and 2010 ⁽²⁸⁾.

In 2006, the construction sector showed the strongest increase in employment as a result of the birth and death of enterprises. These increases were rather strong in Luxembourg, Spain, and Romania, while Malta, Portugal and the Czech Republic were the only Member States showing a decrease. Similar increases were seen in the services sector in a number of Member States including Romania, Spain and Luxembourg, while Bulgaria, Malta and the Czech Republic recorded notable decreases. The net contribution in the industry sector was modest, with the strongest net increase in Romania, and the strongest net decrease in Bulgaria.

... and a busting construction sector in 2010 ...

In 2010, the EU construction sector showed the strongest decrease in employment as a result of the birth and death of enterprises, with the largest falls in Hungary, Portugal, Lithuania and Spain, based on strong flows in and out. Only Latvia, the Czech Republic and Austria recorded a slight net increase. In industry the strongest losses in employment as a result of the birth and death of enterprises were found in Lithuania, Portugal, and Hungary, while notable increases were found in Romania and Latvia. In services, Lithuania and Portugal showed the strongest net decline, primarily reflecting a sharp loss in enterprises that was only partially compensated by an increase in the number of enterprises.

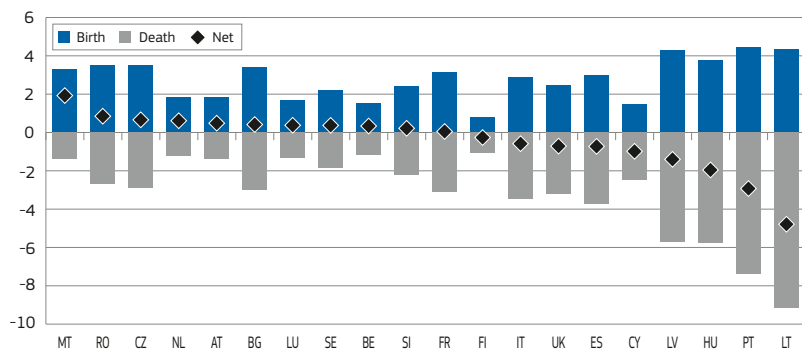
Chart 6: Gains in employment due to birth and death of enterprises – 2005



Source: DG EMPL calculations based on Eurostat, Structural business statistics [bd_9bd_sz_cl_r2].

Notes: Sectors covered are industry, construction and services except insurance activities of holding companies. Birth measures employment share for newly born enterprises; death measures employment share for enterprises that die; net is birth minus death. Share calculated vis-à-vis number of employed persons in the population of active enterprises.

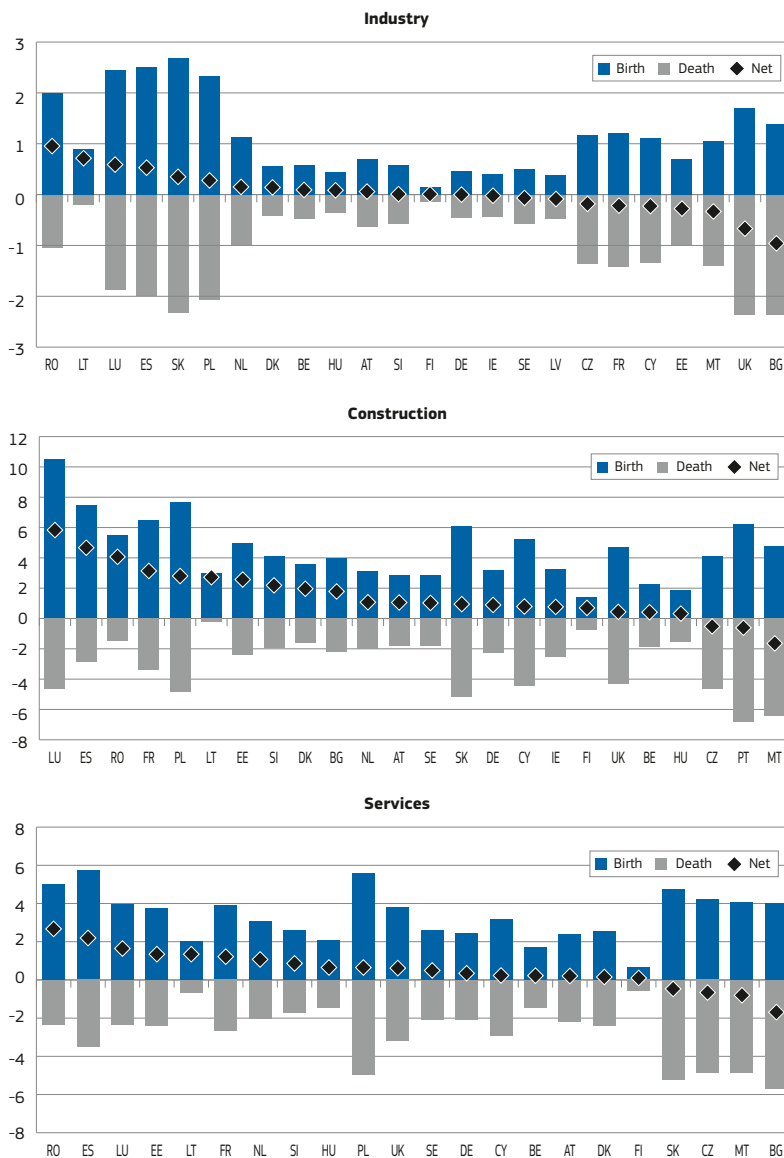
Chart 7: Gains in employment due to birth and death of enterprises – 2010



Source and notes: See previous chart.

⁽²⁸⁾ Note that data are not fully comparable as 2006 refers to NACE-R1 and 2010 to NACE-R2. Plots in charts measure % change vis-à-vis total sector employment.

Chart 8: Sectoral employment gains/losses due to birth and death of enterprises – 2006 (scales vary)



Source: DG EMPL calculations based on Eurostat, Structural business statistics [bd_9b_size_c for 2006 and bd_9bd_sz_cl_r2 for 2010].

Notes: Birth measures employment share for newly born enterprises; death measures employment share for enterprises that die; net is birth minus death. Share calculated vis-à-vis number of employed persons in the population of active enterprises. Per cent of number of employed persons in the population of active enterprises in the sector.

from 5–9 employed persons 9%; and the enterprises with 10 or more employed persons nearly 17%.

Newly born enterprises with only one employed persons contributed between 8% of new jobs in the United Kingdom and 79% in France in 2010, while enterprises with 2 to 4 employed persons contributed between 11% in France and about 54% in Finland. Newly born enterprises with between 5 and 9 employed persons contributed between 3% in France and 17% in Luxembourg. At the same time the contribution of enterprises with 10 or more employed persons ranged from 3% in Slovenia to 56% in Malta, with Malta and Romania being the only two Member States where the bulk of employment growth came from large new enterprises.

In terms of losses, on average ⁽³²⁾ in 2010, enterprises with only one employed person accounted for nearly 50% of the total number of jobs lost following the closure of enterprises, while enterprises with 1–4 employed persons were responsible for 26% of the jobs lost, followed by the enterprises with at least 10 employed persons at 21%, and nearly 8% for the enterprises with 5–9 employed persons.

The scale of job losses for enterprises with one employed persons ranged from about 8% in the United Kingdom to 82% in Latvia, and the enterprises with 1 to 4 employed persons from 8% in Latvia to 53% in Cyprus, for the enterprises with 5 to 9 employed persons from about 3% in Latvia to 16% in Luxembourg, and for the enterprises with at least 10 employed persons 45%.

... with small enterprises showing, on average, the strongest impact

Chart 10 shows the contribution to total employment ⁽²⁹⁾ creation from four size-groups ⁽³⁰⁾ of newly born enterprises in 2010. Within these four groups, those enterprises with up to 4 employed

persons created the strongest employment growth.

In terms of gains, on average ⁽³¹⁾, newly born enterprises with one person were responsible for the creation of nearly 43% of jobs created by all new-born enterprises; enterprises with 2–4 employed persons over 30%; enterprises

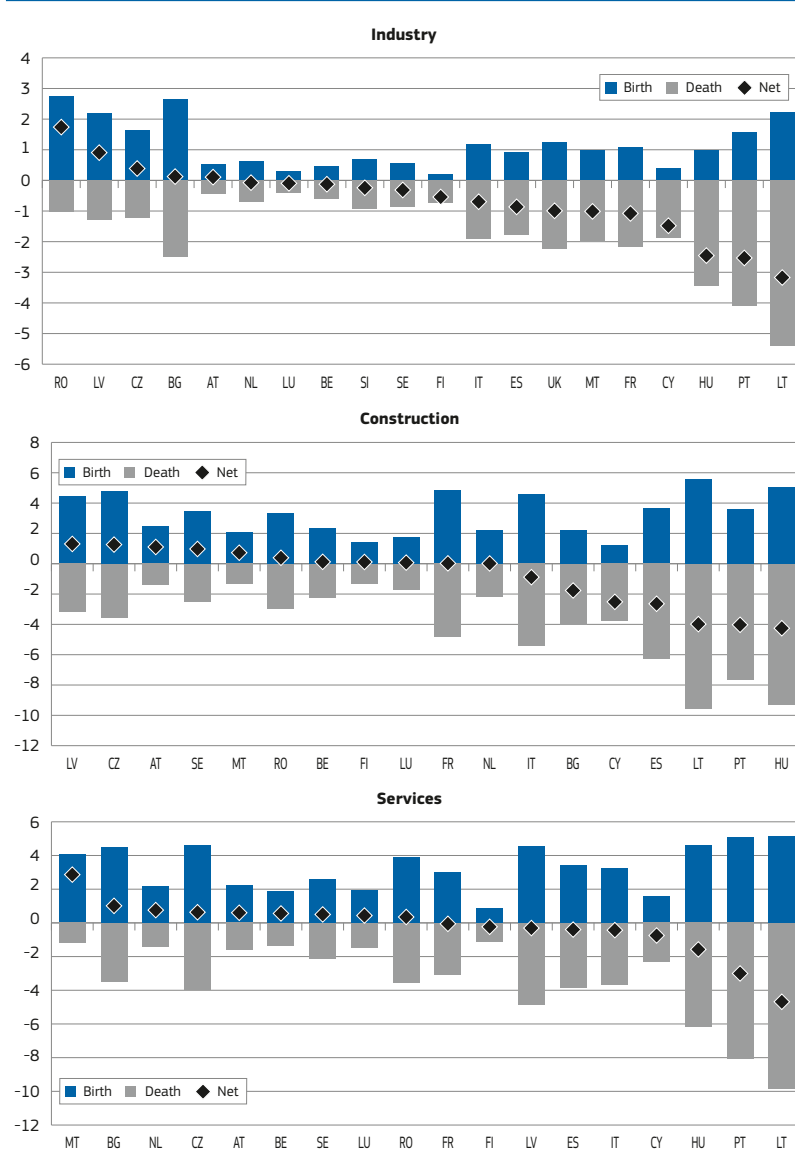
⁽²⁹⁾ Note that total employment is the number of employees plus number of self-employed.

⁽³⁰⁾ Namely enterprises with 1 employed person (i.e. self-employment), enterprises with 2 to 4 employed persons, enterprises with 5 to 9 employed persons, and enterprises with 10 or more employed persons.

⁽³¹⁾ An un-weighted average of the Member States for which the data are available.

⁽³²⁾ An un-weighted average of the Member States for which the data are available.

Chart 9: Sectoral employment gains/losses due to birth and death of enterprises – 2010 (scales vary)



Source and notes: See previous chart.

2.5. Cyclicity and persistence

In the past, cyclical downturns have often been followed by persistent sluggish labour market adjustment ...

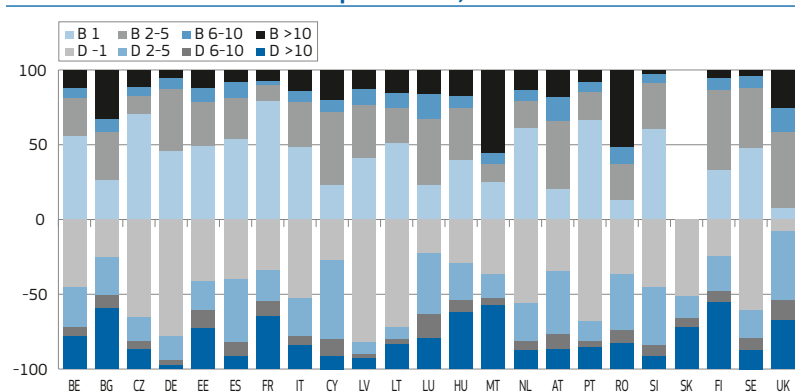
Output in the European economy is currently well below potential⁽³³⁾ with the expected negative impact on unemployment and employment⁽³⁴⁾. Given that labour market developments follow output developments with a time lag, cyclical unemployment could remain present for some time even after the output gap has closed.

Chart 11 shows that, over the 1995–2012 period, the cyclical component of the unemployment rate⁽³⁵⁾ behaved counter-cyclically in all Member States (i.e. it was negatively correlated with the cyclical component of output⁽³⁶⁾) while cyclical adjustments in the unemployment rate to cyclical changes in output were very sluggish in some Member States⁽³⁷⁾, notably Italy and Greece. A potential lack of responsiveness in labour markets⁽³⁸⁾ could be an obstacle to the realisation of the medium term job potential and is therefore taken into account in the subsequent analysis.

... due to, inter alia, inadequate labour market policies

In the past, such labour market persistence reflected, inter alia, the absence or inadequate use of active labour market policies such as job-search

Chart 10: Share in birth and death of employment – enterprise size, 2010



Source: DG EMPL calculations based on Eurostat, Structural business statistics [bd_9bd_sz_cl_r2].

Notes: Sectors covered are industry, construction and services except insurance activities of holding companies. + sign for birth, - sign for death. SK missing birth data.

⁽³³⁾ In 2012 the output gap stood at 2.2% for the EU as a whole with strong differences across Member States: at the upper end a positive output gap of 1.4% in Estonia and at the other end a negative gap of 12.2% in Greece.

⁽³⁴⁾ Pro-cyclical (countercyclical) behaviour if the deviations from trend are positively (negatively) correlated with the deviations from trend in output. See, for example, Stock and Watson (1999) for empirical regularities of business cycle fluctuations in macro-economic time series.

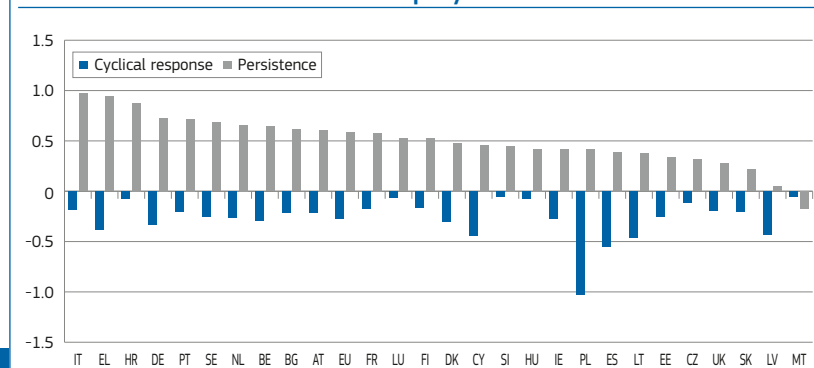
⁽³⁵⁾ Measured as contemporaneous unemployment rate minus the natural rate of unemployment, using ECFIN- AMECO database (variables ZNAWRU and ZUTN).

⁽³⁶⁾ Measured as contemporaneous GDP relative to potential GDP. The countercyclical nature of unemployment is a well-established macro-economic empirical regularity in the economic literature. See, for instance, Stock and Watson (1999).

⁽³⁷⁾ As reported elsewhere. See, for instance, OECD (2012b).

⁽³⁸⁾ Labour market hysteresis due to persistent unemployment spells (of young people) will be discussed in more detail in Section 4 below.

Chart 11: Cyclical responsiveness and persistence of unemployment



Source: DG EMPL calculations based on ECFIN-AMECO (AVGDGP, ZNAWRU, ZUTN).

Notes: Sample size 1995–2012. Coefficients of regression of cyclical unemployment on output gap (i.e. cyclical responsiveness) and lagged cyclical unemployment (i.e. persistence) (no constant term included); cyclical unemployment measures contemporaneous unemployment minus natural rate of unemployment.

assistance and training, targeted hiring subsidies, etc., so that more adequate labour market policies will be needed to realise full job potential by 2020 – see European Commission (2012a).

3. WHERE WILL THE NEW JOBS COME FROM?

Robust creators of new jobs ...

This section reviews the ways in which labour market outcomes by 2020 are likely to be affected by four key forces at work: globalisation, technological progress, demographic change, and the greening of the economy. Although the impact of these drivers will be discussed separately, the strong interactions between them need to be recognised.

This is particularly important when considering the interaction between technological progress and globalisation. On the one hand, technological progress reduces information and transaction costs which encourage, in combination with globalisation, international trade. On the other hand, increasingly open and fair international trade will strengthen the incentives for countries to specialise in activities in which they have a comparative advantage in international markets. For a resource-scarce, skill-rich, European Union economy, exploiting its comparative advantages implies the continued development of high knowledge and technology intensive activities, backed by enhanced innovation and expanding international trade, to create a virtuous circle of developing activity.

In this context, the direction of technological progress will also be

influenced by the need to address the challenges posed by the greening of the economy, such as the development of clean vehicles, and demographic concerns such as the ageing population, and the potential to promote active ageing through technological innovations linked to better working conditions.

... but conditioned by framework conditions

In addressing the labour market obstacles to the full realisation of the EU's potential by 2020, as addressed in the following sections, it must also be realised, however, that there are many other obstacles in play, including economic issues such as access to capital and credit⁽³⁹⁾, access to research and innovation clusters⁽⁴⁰⁾, the protection of intellectual property rights, and the fostering of entrepreneurship⁽⁴¹⁾.

⁽³⁹⁾ Access to credit and capital is especially difficult for small enterprises at the cutting-edge of innovation because of their high risk profile and the risk-averseness of banks (certainly in a severe economic and financial downturn) and because of underdeveloped venture capital markets at the European level. The future employment potential of these enterprises will then to a large be determined by the further development of integrated 'fat' venture capital markets at the European level (with access to world markets) (see, for instance, Veugelers (2012)) and seed capital (see, for instance, Bonaccorsi (2012)).

⁽⁴⁰⁾ Access to research and innovation clusters is especially difficult for small enterprises at the cutting-edge of innovation in regions still developing their capacities. As such this may have an important impact on the regional distribution of job opportunities.

⁽⁴¹⁾ See, for instance, European Commission (2012s and 2012tr) and Veugelers (2013). The employment effects of migration will be discussed in more detail in Section 6.

3.1. Globalisation

Globalisation⁽⁴²⁾ affects the employment prospects of the European Union in several ways. Over the medium-term its impact works primarily through trade in goods and services and foreign direct investments (FDI) but also, to a lesser extent, migration flows.

3.1.1. Trade in goods and services

Trade in goods and services will continue to create new job opportunities ...

International trade in goods and services is an important source of employment in Europe with the share for total employment due to extra-EU demand having increased from 9.3% in 1995 to 11.6% in 2009. See, for example, Foster *et al.* (2013).

In the medium to long term, ongoing globalisation is expected to primarily affect the composition of employment and the quality of jobs (including wages) as it provides EU Member States (as well as their international trading partners) with the opportunity to exploit their comparative advantages in world markets and increase their (as well as their international trading partners) overall productivity level. See, for instance, Krugman (1993).

In this respect the European Commission (2007c) suggests that a 1% increase in the openness of the economy generates an increase of 0.6% in labour productivity the following year, based on an analysis of EU trade flows between 1996 and 2005.

Furthermore, in times of a cyclical downturn, this access to new markets may also create further job opportunities via an overall increase in demand (provided that export markets are not facing a cyclical downturn).

Finally, apart from the employment effects within the Member States,

⁽⁴²⁾ No uniform definition of globalisation exists, but the following are examples: 'the removal of barriers to free trade and the closer integration of national economies', Stiglitz (2002). 'It refers to an extension beyond national borders of the same market forces that have operated for centuries at all levels of human economic activity—village markets, urban industries, or financial centers', IMF (s.a).

extra-EU exports of Member States create spillover effects in terms of job opportunities across Member States via the intra-EU value chains – which would be enhanced by any further deepening of the Single Market by 2020. For example, Sousa *et al.* (2012) report that the number of jobs generated indirectly in other EU Member States as a result of exports by other Member States amounted to almost 9 million jobs in 2007, up from 5.7 million jobs in 2002.

... but reallocation may be hindered and may have adverse effects on workers on the margins ...

In order to continue the growth in the EU's job potential into the future, labour will inevitably move between different areas and types of activity – a process that risks being hindered if existing institutional and physical infrastructure do not adequately support occupational and geographical mobility. See, for instance, Haltiwanger (2011).

Indeed, in case of an enterprise closure under pressure of international competition, it will depend, inter alia, on workers' geographical and occupational mobility whether they will get swiftly reemployed in new jobs. Labour reallocation can be hindered by several labour market conditions, including the lack of flexible working arrangements within firms, high severance pay for standard contracts, complicated individual or collective dismissal procedures, lack of flexibility in wage determination, etc.

Moreover, international trade can affect employment opportunities and wages of different groups of workers in the context of trade between developed and developing countries, such as, for example, between the EU and China – which may bring benefits overall but which may also worsen labour market polarisation, see Box 1.

... if not flanked by adequate labour market policies and other reforms

To offset the possible adverse effects of further globalisation ⁽⁴³⁾, appropriate

⁽⁴³⁾ As well as technological progress, greening and active ageing – as discussed in the following sections.

Box 1: International trade and employment composition

Adverse effects for low-skilled workers ...

Classical economic models of international trade, such as the Heckscher–Ohlin model, imply that, as less developed countries such as China and India become integrated into the global economy, unskilled workers in the EU will experience increased competition from imports of cheap goods produced by the abundant supply of low paid unskilled workers in these countries.

This will have a negative effect on employment opportunities of the unskilled in Europe, at the same time as the increased export of high quality goods to less developed countries should increase the demand for highly-skilled workers in the EU.

As this process proceeds, wage inequality in the EU would be expected to increase but to decrease in their trading partners insofar as the wages of the low skilled rise, relative to higher skilled workers, due to increased demand from employers.

... somewhat tempered by reallocation of labour ...

Nevertheless, low-skilled workers in Europe may still be able to maintain their wage levels insofar as they reallocate away from the production of traded goods and services towards labour-intensive non-tradable goods for which there is no direct competition with low-wage countries (except through immigration), such as child care, cleaning, hairdressing, gardening etc. See, for instance, Leamer (1995).

... productivity gains...

Moreover, with increasing returns to scale, higher demand should increase labour productivity as output increases at a faster pace than the labour input. See, for instance, Krugman (1979). As a consequence, these increases in productivity could increase wage increases without generating inflationary cost push pressures.

Furthermore, to the extent that the productivity gains decrease prices, and foreign demand for goods and services show strong responsiveness to price changes, total output may increase. See, for instance, Edwards and Lawrence (2013). At the same time, prices of imports may decrease raising the effective purchasing power of wage earners.

... and public policies.

Finally, as imports of goods and services as well as offshoring run the risk of displacing workers, public funds, including the European Globalisation Adjustment Fund ⁽¹⁾, can help to alleviate the adverse immediate employment impact of globalisation ⁽²⁾ by offering support in the form of job-search assistance, careers advice, tailor-made training and re-training, mentoring and promoting entrepreneurship, etc. to workers made redundant in this way.

⁽¹⁾ The European Globalisation Adjustment Fund helps workers find new jobs and develop new skills when they have lost their jobs due to displacement of a factory outside the EU or shut-down of a large company. For more details on the European Globalisation Adjustment Fund see <http://ec.europa.eu/social/main.jsp?catId=326&langId=en>

⁽²⁾ See also Rodrik (1999) on the relation between an economy's openness and level of public expenditure (on insurance).

labour market reforms can be foreseen in order to facilitate the reallocation of labour according to flexicurity principles, see European Commission (2008g).

In particular, such reforms would be seen as focusing on the further strengthening of active labour market policies (including

targeted wage subsidies, guidance, etc.); life-long learning (including appropriate training and transition between school and work); more flexible and secure contractual arrangements (from the point of view of both employer and worker); and social security (including covering the portability of social security rights).

Structural reforms beyond the labour markets may also be required to facilitate the reallocation of production factors, including, for example, the further development of trans-European networks for transport, energy, and ICT ⁽⁴⁴⁾.

Finally, it can be noted that the need to reallocate production may be offset, in part at least, by the ability of enterprises to innovate in the face of increased international competition. This will be conditioned, however, by the extent of further deepening of the single market and by the degree of success in implementing other structural measures that promote innovation. See, for instance, European Commission (2010a).

Foreign direct investment

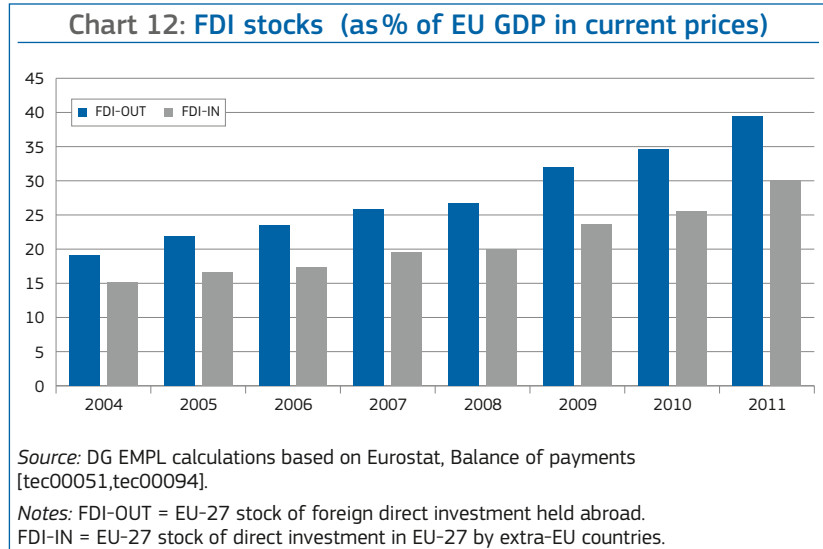
Globalisation affects not only the international flow of goods and services but also inward and outward flows of foreign direct investment (FDI) ⁽⁴⁵⁾. Chart 12 shows data on the stock of FDI (as percentage of EU GDP in current prices) ⁽⁴⁶⁾. The short time span for which data is available shows that FDI stocks constitute an important part of the European economy, with every expectation that this will increase in the coming decade. See, for instance, Subramanian and Kessler (2013).

Inward FDI has an important effect on total employment in the EU. In 2008, for example, the employment share for foreign affiliates in manufacturing in the European Union was 21%, 18% in information and communication, 15% in administrative and support service 13% in financial and insurance activities,

⁽⁴⁴⁾ Whereby the construction and operation of such infrastructure will also have the potential to create new jobs — as discussed, for instance, in Box 5 in Section 4 below.

⁽⁴⁵⁾ On the capital account, a distinction has to be made between FDI, i.e. the long-term capital investments, and portfolio investments, i.e. short-term investments (including shares and bonds). This chapter focuses on (long-term effects of) FDI. An analysis of the impact of short-term investments on labour markets is to be found in, for example, ILO (2013) — which provides empirical analysis of the impact of 'financial globalisation' (which puts pressure on firms to increase profits, especially in the short term) on labour markets.

⁽⁴⁶⁾ Interpreting these stock variables it should be taken into account that FDI stocks include the accumulation of investments over time but also exchange rates movements and other price changes resulting from holding gains or losses. Moreover, it should also be noted that in general FDI flows show a procyclical behaviour. For more details on FDI statistics for the EU see http://ec.europa.eu/statistics_explained/index.php/Foreign_direct_investment_statistics



but only 3% in construction and 4% in real estate activities. See, for instance, European Commission (2012y).

Various transmission mechanisms are seen as likely to influence future trends, as indicated below.

Inward FDI affects job opportunities primarily ...

For example, a foreign multinational enterprise seeking to exploit its competitive advantage in the EU has to hire local employees, thereby expanding domestic employment ⁽⁴⁷⁾. This employment impact may go further insofar as the foreign company uses intermediary goods and services produced locally. Such inputs from local firms may, in turn, increase the domestic firm's level of innovation and productivity. See, for instance, Gorodnichenko *et al.* (2010).

... via spillover of knowledge ...

Moreover, employees in foreign-owned companies are likely to receive training and acquire knowledge which could provide the opportunity to move to other companies or even set up their own business — also strengthening domestic productivity and employment. See, for instance, Martins (2011).

By contrast, if multi-national enterprises restructure their worldwide economic activities, job losses may occur in regions where the costs of departure are the lowest for them, without necessarily taking account of the wider socio-economic costs for the areas concerned ⁽⁴⁸⁾.

⁽⁴⁷⁾ Provided no crowding out of local producers.

⁽⁴⁸⁾ More about offshoring and outsourcing in Section 3.2.3 below.

... and to a lesser extent wages and working conditions, ...

As employees acquire new skills they may receive higher wages in order to retain them and avoid them transferring their acquired skills to other firms. Moreover, foreign firms may often occupy a market position yielding significant rents that employees may be able to partly share, thereby raising their remuneration.

Nevertheless, the evidence of the impact of FDI on wages does not point unambiguously in the direction of higher wages in the EU. See, for instance, OECD (2008). Moreover, while research findings suggest a limited impact on working conditions, a much stronger impact is seen in terms of management practices. See, for instance, Freeman *et al.* (2007) and Bloom *et al.* (2006).

... as does outward FDI ...

Outward FDI limits the resources available to create or maintain jobs at the same productivity level because workers have less capital to work with in the domestic labour market. However, if the aim of outward FDI is to gain market access in order to sell more products and services in international markets, the expanding export markets may trigger positive feedback for local employment.

Although the net impact on total employment may be positive, the evidence suggests that outward FDI lowers the employment share for the low skilled back home. See, for instance, Copenhagen Economics (2010). Moreover, if outward FDI is exclusively motivated by the need to exploit lower unit labour costs elsewhere, this will have a particularly

negative impact on the employment opportunities of the low-skilled.

... but labour markets also affect FDI ...

Several conditions underpin a multinational's FDI decisions, including proximity to new markets, transport costs, etc.⁽⁴⁹⁾, as well as access to a single market and single currency in the case of the EU. Of particular interest in this chapter are labour market conditions, including unit labour cost and labour market institutions⁽⁵⁰⁾.

... via unit labour costs ...

Studies on the impact of unit labour costs developments on FDI have concluded that inward FDI is significantly less in countries with high unit labour costs, even when taking into account other labour market conditions that affect FDI, such as the availability of a skilled workforce, as well as other FDI drivers such as the distance between home and host countries, the corporate tax burden, etc.⁽⁵¹⁾.

For instance, Bevan and Estrin (2004) report, using data covering FDI flows towards 11 Eastern European transition economies between 1994 and 2000, a significant impact of unit labour cost, alongside country size and proximity, on inward FDI.

Carstensen and Toubal (2004), using data from seven Central and Eastern European Member States over the 1993–99 period, report that a 1% decrease in the unit labour costs in the host countries relative to the country of origin increases the flow of FDI into the host country by roughly 25 million dollars in the first year, and 37 million dollars in the long term.

Driffield *et al.* (2005) reports, using data covering 13 countries and

⁽⁴⁹⁾ See, for example, Blonigen (2005).

⁽⁵⁰⁾ Section 3.2.2 below highlights the interaction between globalisation and technological progress.

⁽⁵¹⁾ Nevertheless, caution is warranted as Bellak and Liebrecht (2009) point out the difficulty of comparing estimates of the impact of labour costs on FDI that are reported in the literature – due to the use of different definitions of 'labour cost', including relative wage cost, relative nominal unit labour cost, relative real unit labour cost, relative wage cost in combination with relative productivity (i.e. with different parameter values), etc.

11 manufacturing sectors in the UK over the period 1987–1996, that technology differences were a much stronger driver of inward FDI into the UK than unit labour cost differences. Moreover the FDI flow was into sectors where the UK had a technological disadvantage, thereby increasing the demand for skilled labour and decreasing the demand for unskilled labour. By contrast, the UK's outward FDI was mainly to countries where unit labour costs were lower than the UK.

... and labour market institutional factors

Whether labour market institutional factors have an important influence in the context of globalisation is far from clear. For example, Olney (2012) provides evidence⁽⁵²⁾, using data covering outward FDI from the US into 26 countries, for the period 1985–2007, which suggests that reductions in employment protection legislation is associated with an increase in foreign direct investment.

By contrast, Leibrecht and Scharler (2009) found no evidence that employment protection legislation had been a determinant factor regarding bilateral FDI flows to seven Central and Eastern European countries (covering the 1995–2003 period).

Delbecq *et al.* (2007)⁽⁵³⁾ reported that the degree of centralisation of wage bargaining was the institutional labour market factor that most strongly affected the location decisions of French firms, while recognising that this effect was limited compared with other drivers of FDI such as market access.

3.1.2. Free trade agreements

The lifting of international trade barriers via multilateral platforms ...

Trade barriers have an adverse effect on international trade in goods, services, investments and public procurement by preventing countries from fully exploiting their comparative advantages.

⁽⁵²⁾ Using data on FDI by US multinationals and data on employment restrictions in twenty six foreign countries which collectively account for over three quarters of US outward FDI.

⁽⁵³⁾ Using French data covering the 1992–2001 period.

Although the World Trade Organisation provides a forum for multilateral trade negotiations (i.e. Doha Development Round), resolving trade disputes, and setting the legal ground rules, a current focus of the EU is on developing bilateral trade relations⁽⁵⁴⁾.

... and Free Trade Agreements have laid foundations for growth and jobs ...

So far, the EU has negotiated more than 200 Free Trade Agreements⁽⁵⁵⁾. Agreements of this kind, such as that concluded in 2010 in the EU–South Korea Free Trade Agreement⁽⁵⁶⁾, create trade opportunities for exporters and consumers by cutting customs duties, improving access for service suppliers and government procurement, tackling non-tariff barriers, ensuring the protection of intellectual property, the enforcement of competition rules and the commitment to sustainable development⁽⁵⁷⁾.

... and additional job opportunities will follow the implementation of FTA with the United States ...

It is to be expected that, by 2020, free trade agreements with the United States and China will have an important impact on the labour markets of the EU.

For example, ECORYS (2009a and 2009b)⁽⁵⁸⁾ assess the impact of further trade opening between the EU and US under alternative scenarios. Under its most ambitious FTA scenario⁽⁵⁹⁾, jobs in

⁽⁵⁴⁾ See, for instance, European Council Conclusions, 7/8 February 2012, EUCO 3/13, available at http://www.consilium.europa.eu/uedocs/cms_Data/docs/pressdata/en/ec/135324.pdf

⁽⁵⁵⁾ Bilateral free trade agreements remove trade barriers between countries so that trade between the involved parties is duty free but members set their own tariffs on imports from non-members. See http://trade.ec.europa.eu/doclib/docs/2011/august/tradoc_148181.pdf

⁽⁵⁶⁾ See, for instance, <http://eur-lex.europa.eu/JOHtmL.do?uri=OJ:L:2011:127:SOM:EN:HTML>

⁽⁵⁷⁾ For detailed assessments of FTA see, for instance, <http://ec.europa.eu/trade/policy/policy-making/analysis/sustainability-impact-assessments/assessments/#study-15>

⁽⁵⁸⁾ Using a general equilibrium model.

⁽⁵⁹⁾ The policy option with 100% duty elimination in tariffs, 25% reduction of barriers in non-tariff measures for goods and services and 50% reduction of barriers for public procurement (policy option C2 in ECORYS (2009a)). An updated assessment taking into account spill-over effects, economies of scale and imperfect competition by CEPR (2013) provides similar results.

the EU are created for both unskilled and skilled workers with the strongest gains for unskilled workers being in motor vehicles (up by 1.3%), insurance (0.6%) and other manufacturing (0.5%), with the sectors showing the strongest job gains for skilled workers also being motor vehicles (1.3%), insurance (0.6%) and other manufacturing (0.5). Job losses are foreseen, however, in electrical machinery, other transport equipment, metal and metal products, wood and paper products, business services, communication, as well as the personal services sectors.

Since the EU and US have a similar level and distribution of skills, any adverse wage developments that might affect the low-skilled in the case of trade opening with countries such as China are seen to be less pronounced. In fact, an ECORYS (2009a) study estimates that unskilled workers will earn higher wages and that EU wages will increase more than US wages, because of strong growth in sectors that focus on physical production activities such as the automobile sector (strong growth in the EU) or the other machinery sector (strong growth in the US). Overall ECORYS (2009a) foresees average wage increases of the order of 0.8% annually in the EU compared to 0.4% in the US. Under a scenario of only partial liberalisation, however, these estimates are halved.

... and China

The EU and China have recently committed themselves to the early start of negotiations on a trade agreement focused on investment, market access, public procurement and intellectual property rights. Copenhagen Economics (2012) ⁽⁶⁰⁾ projects that, in the medium to long term, such an agreement would only affect job opportunities in certain sectors, even under an ambitious, reciprocal and high spillover liberalisation scenario.

More particularly, increases in job opportunities in the EU are projected for the sectors covering electronic equipment (+0.5 to +0.7%), motor vehicles (+0.5 to +0.6%), transport equipment (+0.3 to +0.4%), metal products (+0.1 to +0.2%), with decreases projected for sectors covering ferrous metals (-0.2%), communication services (-0.2%) and other metals (-0.4%). At the same time, the employment share

for the higher skilled is projected to increase in the EU compared with the less skilled, but with wages only seen to be affected marginally, by about 0.1% for both groups.

However, all such projections of trade with emerging economies, and especially China, need to be treated with caution since they are conditioned by many factors, including underlying assumptions concerning local labour costs as well as other cost developments such as industrial real estate, together with the perception of European investors.

3.2. Technological progress and innovation

Future job opportunities will be driven by market exploitation of KETs and ICT ...

The successful application of technological progress will affect labour markets in a number of ways with economic activity continuing to be affected, even at an accelerating rate, by developments in information and communication technology (ICT) and key enabling technologies (KETs) ⁽⁶¹⁾. These will change what goods and services are produced (e.g. clean vehicles) and how this is done (e.g. 3D printing), creating an important potential for new jobs, see, for instance, European Commission (2012w and 2013d), and Brynjolfsson and McAfee (2012).

Importantly, such technological progress also requires the building, operation and maintenance of new infrastructures (e.g. cloud computing platforms) which will provide job opportunities for low and medium, as well as highly-skilled, workers. However, while technological progress, in combination with further globalisation and the deepening of the Single Market, can create important new job opportunities through outsourcing and offshoring, vertical disintegration, and local clustering, changes

in production processes can also have an adverse effect on groups of workers who are not equipped to benefit from such processes.

From a more positive perspective, though, technological progress can have a positive effect on work organisation at company level, with important feedback on job quality and work-life balance, which could lead to higher labour market participation of certain groups of workers, including older and female workers, as well as disabled workers.

... but cost and benefits may be distributed in a dissimilar manner

Finally, and most fundamentally, technological progress, along with other drivers, has the potential to raise the level and growth of productivity. For example, Bartelmans (2013) projects a potential for productivity growth of 2.5% a year over the next generation, assuming that the findings underlying Moore's law ⁽⁶²⁾ will continue to hold, and that appropriate framework conditions are in place.

Nevertheless, the impact of productivity growth on jobs, hours worked, output prices, wages as well as profits cannot be determined *a priori* given that labour markets are normally seen to be characterised by imperfect competition and imperfect information. The actual outcome will therefore depend to a large extent on such factors as prevailing preferences, technologies, bargaining power, labour (and product) market institutions, international trade opportunities, taxes, catch-up potential ⁽⁶³⁾, etc.

Furthermore, although technological progress will create new job opportunities, these opportunities are unlikely to be distributed equally among the different groups of workers as indicated above ⁽⁶⁴⁾. To the extent that the costs and benefits accrue in very unequal ways to the different groups of workers, support for technological progress is liable to be weakened.

⁽⁶¹⁾ Key enabling technologies (KETs) enable the development of new goods and services and the restructuring of industrial processes needed to modernise EU industry and make the transition to a knowledge-based and low carbon resource-efficient economy. They play an important role in the R&D, innovation and cluster strategies of many industries. More particularly, KETs cover micro-/nano-electronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing technologies. See European Commission (2012w) and HLGKET (2010).

⁽⁶²⁾ On Moore's Law. See, for instance, Wikipedia at http://en.wikipedia.org/wiki/Moore's_Law

⁽⁶³⁾ There is a consensus in the literature that during a period of catch-up in total factor productivity, hours worked will be temporarily high because the incentive to accumulate capital is higher. See, for instance, Alesina *et al.* (2005).

⁽⁶⁴⁾ If not accompanied by adequate labour market policies and reforms.

⁽⁶⁰⁾ Using a general equilibrium model.

3.2.1. Catalyst of new job creation

Exploiting the market opportunities of technological progress and innovation aimed at promoting smart, sustainable and inclusive growth is a key goal of the EU based on the development of adequate framework conditions. See European Commission (2012s and 2012t). The following sub-sections address some of the transmission mechanisms in more detail ⁽⁶⁵⁾. Nevertheless, it must also be recognised that it remains a challenge to project this future job potential accurately due to an insufficient evidence base and a lack of deep understanding of its dynamics ⁽⁶⁶⁾.

Unleashing the job potential of key enabling technologies will create new jobs ...

The development of the technologies that support the creation of new goods and services, and the associated jobs, does not occur in isolation, but in a context where many processes are already in place to address the challenges posed by environment pressures, population ageing and globalisation generally.

... by addressing, *inter alia*, environmental challenges ...

In that respect, an important part of the future job potential could result from implementing the commitments made at EU level to green the economy, involving developments such as cleaner vehicles, more sustainable industrial and construction production processes, as well as a more sustainable use of raw materials. See, for instance, European Commission (2012s) ⁽⁶⁷⁾.

... demographic change ...

Another important source of future job creation could be through the use of technologies that address issues arising from an ageing population, including allowing older people to live more independent and active lives through, for example, the development of various

⁽⁶⁵⁾ Employment effects stemming from technological innovations aimed at greening the economy will be discussed in more detail in section 3.4 of this chapter.

⁽⁶⁶⁾ 'The internet is one of the few things humans have built that they don't truly understand,' Schmidt and Cohen (2013).

⁽⁶⁷⁾ See Subsection 3.4 below for more details on the job potential related to the greening of the economy.

Box 2: The impact of broadband on jobs in Germany

The development of ICT infrastructure will have a significant impact on job creation. For example, Katz *et al.* (2009) projects that the construction of a network to ensure that 75 % of German households have broadband access of at least 50 Mbps by 2014 (the 'National Broadband Strategy') would create 304 000 jobs between 2010 and 2014. A further expansion of the network, aimed at providing 50% of German households' access to at least 100 Mbps and another 30% to 50 Mbps by 2020, is estimated to create well over 225 000 additional jobs between 2015 and 2020 (i.e. the 'ultra-broadband' strategy). In this projection, once the network is deployed, network externalities (such as enhanced innovation resulting in new services and additional business growth) could create more than an additional 425 000 jobs.

monitoring and detection systems, 'smart homes', electronic medical records. See, for instance, Center for Technology and Ageing (2009) ⁽⁶⁸⁾.

... as well as hyperglobalisation ...

At the same time, cross-cutting advanced manufacturing technologies (AMS) ⁽⁶⁹⁾ that integrate new technologies (such as ICT) and processes, and that are aimed at improving, *inter alia*, production speed, energy and materials consumption, waste and pollution management have the potential to create high-quality jobs (including in manufacturing sectors such as automotive, aerospace, engineering, electronics, etc.). See, for instance, European Commission (2012x) and HLGKET (2010).

As these activities become more and more part of an integrated global value chain ⁽⁷⁰⁾, however, sustaining comparative advantages in international markets for the EU is seen to require continuous product innovation along labour market and social policy practices in line with flexicurity principles, as in the case of many automotive ICT jobs. See, for example, Juliussen and Robinson (2010).

These new jobs would primarily provide opportunities for high skilled workers in small and medium sized enterprises, but they could, in turn, generate job opportunities among intermediary suppliers, who mainly employ lower skilled workers.

⁽⁶⁸⁾ See Subsection 3.3 below for more details on the job potential related to demographic change.

⁽⁶⁹⁾ AMS involve manufacturing operations that create high-tech products, use innovative techniques in manufacturing and invent new processes and technologies for future manufacturing, see HLGKET (2010).

⁽⁷⁰⁾ More on global value chains in section 3.2.3 below.

... so will further progress in information and information technologies ...

A further exploitation of the market opportunities of ICT can also create additional new jobs through the construction, operation and maintenance of appropriate infrastructure. Even more important, this new infrastructure will then establish a platform for further innovations that will create new job opportunities, for example, for entrepreneurs and micro-enterprises in the 'apps-economy', and it will also affect the organisation of workplaces ⁽⁷¹⁾ and value chains ⁽⁷²⁾, see, for instance, Box 2 ⁽⁷³⁾.

... provided they are accompanied by investments in the workforce ...

Nevertheless, the realisation of this job potential may be hindered by a shortage of skilled labour tailored to the multidisciplinary nature of key enabling technologies and by an insufficient supply of e-skilled workers.

As a consequence, the skills of the workforce will also have to be advanced by adequate policy measures. Such measures include improvement of the image and attractiveness of ICT careers, more aligned degrees and curricula at vocational and university level education that will respond to the needs of the students and the industry, improved recognition of qualifications across countries by stimulating take-up of a European certification scheme for digital skills of ICT professionals, stimulation of digital entrepreneurship, etc., – see the Grand Coalition for Digital Jobs (2013). At the

⁽⁷¹⁾ See Subsection 3.2.4 below.

⁽⁷²⁾ See Subsection 3.2.3 below.

⁽⁷³⁾ See also Sabadash (2013) for a comprehensive literature review.

same time, measures will have to be implemented to reinforce the science, technology, engineering and maths graduate base and strengthen the knowledge transfer between researchers and entrepreneurs. See, for instance, European Commission (2009d).

... with important multiplier effects ...

Furthermore, this job creation in core economic activities is also seen to have an important multiplier effect on employment in the rest of the economy because the internet provides a platform to develop new business opportunities, with the local retailer being substituted by the online supplier. For example, MGI (2011b) estimates (using survey data) that in France over the 1996–2011 period, the internet destroyed 500 000 jobs but created 1.2 million other jobs – in other words, 2.4 jobs were created for every job destroyed.

... and with an important impact on labour market dynamics...

Further ICT innovations that decrease search and start-up costs (such as cloud computing ⁽⁷⁴⁾) could also affect labour market dynamics. For example, better information about job vacancies and improved systems to bring together employers and potential employees has the potential to improve labour market matching and efficiency in general, thereby contributing to higher levels of employment.

As start-up costs decrease, it can make it easier for innovative self-employed people to access markets ⁽⁷⁵⁾ although it is recognised that the exploitation of this job potential can face serious bottlenecks ⁽⁷⁶⁾ including both business and labour market regulations, as well as the limited availability of skilled work-

ers, and the stigmatisation of business failure ⁽⁷⁷⁾.

... but labour market conditions will also affect the capacity to innovate

While technological progress and innovation are seen as important drivers of new jobs in the period to 2020, the efficiency of labour markets and the availability of appropriately skilled workers are likely to be factors having an important impact on the capacity to innovate and commercialise new products and services.

More particularly, persistent e-skills shortages, gaps and mismatches ⁽⁷⁸⁾ could affect negatively employment opportunities by 2020. Nevertheless, such outcomes can be avoided by adequate policy responses at EU as well as national level – as outlined in the European Commission (2007d and 2010e). This will then require, inter alia, that workers have an incentive and opportunity to acquire e-skills which can regularly be updated using e-learning. In order to optimise job potential, such e-skills should then be tailored to the needs of both the public and the private sector (especially small and medium sized enterprises (SME)) and should focus particularly on young people (especially girls), unemployed, elderly people, people with low education levels, and people with disabilities ⁽⁷⁹⁾.

In addition to these skills concerns, general labour market weaknesses, including the hysteresis effects following long periods of high unemployment, are also likely to have an unambiguous negative impact on the pace of technological

progress, innovation and reallocation of labour ⁽⁸⁰⁾.

The effects of institutional arrangements, including employment protection legislation and unemployment benefits are less clear. Indeed, it can be argued, for example, that employment protection legislation may strengthen the incentives for both employer and employee to invest in firm-specific human capital, which is seen as an important condition for continuous long-term innovation in business. However it may also have an adverse impact if it prevents the reallocation of labour across enterprises, regions, and sectors in times of change. This is particularly the case for firms close to the technology frontier for which experimentation is the driving force of innovation. See, for example, OECD (2013b).

3.2.2. Skill-biased technological progress

Technological progress will not always uniformly affect ...

There is a long-standing debate about the extent to which technological progress has had an impact on the skill composition of labour demand and related remuneration ⁽⁸¹⁾, and what this implies for future developments.

... employment opportunities ...

To start with an extreme example, it is rather obvious that the use of robots in the manufacturing process reduces the demand for unskilled workers at that stage of production. However the more general issue of whether it is technological progress in production processes or the increasing globalisation of markets that is behind the recent polarisation in labour markets is far less clear-cut.

For example, Autor (2010) ⁽⁸²⁾ and Goos *et al.* (2009) ⁽⁸³⁾ report that job polarisation is primarily generated by the automation of routine work, rather than the international integration of labour markets through trade and offshoring. Nevertheless, some non-routine

⁽⁷⁴⁾ Cloud computing will be discussed in more detail in section 5.2.1 below.

⁽⁷⁵⁾ All in all, it is estimated that at present about 30% of new start-ups are web start-ups and that it has strong potential to rise by 2020 – see European Commission (2013c). For a more in-depth assessment of web-entrepreneurship see the Entrepreneurship 2020 Action Plan which tables short and medium term specific actions to improve the situation of web entrepreneurs.

⁽⁷⁶⁾ Other barriers to web entrepreneurship include limited access to finance (because of the high-risk profile), protection of intellectual property rights, etc. See European Commission (2013c).

⁽⁷⁷⁾ Indeed, enterprises operating in the 'apps economy' – which is a sector subject to borderless competition – carry a strong risk of failure. Hence, in order not to stifle entrepreneurship and give a second chance, the period of liquidation until the bankrupt are free from debt should be kept as short as possible.

⁽⁷⁸⁾ Shortage refers to an insufficient number of skilled people in the labour market or in an occupational segment; gap refers to a competence shortfall between the current and needed competence levels of individual staff within organisations; mismatch refers to a mismatch between the competence of the trainee or graduating student/learner and the expected competence needs of the employers. Mismatch is assumed to arise from course/curricula misalignment. For more details, see, for instance http://ec.europa.eu/enterprise/sectors/ict/e-skills/extended/index_en.htm. The digital divide is discussed in the next sub-section.

⁽⁷⁹⁾ See http://ec.europa.eu/enterprise/sectors/ict/e-skills/index_en.htm

⁽⁸⁰⁾ As discussed in the following sections.

⁽⁸¹⁾ See, for instance, Acemoglu and Autor (2010).

⁽⁸²⁾ Using data covering the 1993–2006 period for the US and 16 European Union Member States.

⁽⁸³⁾ Using EU Labour Force Survey data for 16 EU Member States covering the 1993–2006 period.

tasks done by manual workers (such as cleaning, child care, hairdressing) may be largely unaffected by technological progress ⁽⁸⁴⁾.

Furthermore, Vivarelli (2007) argues that the impact of technological progress depends largely on the form of innovation and the level of unit considered (firms, sectors, or the whole economy). Indeed, some product innovations that lead to an increase in total consumption, such as the development of mobile phones, may stimulate total employment and, on balance, reduce wage inequality.

Moreover, it is important to recognise that the transmission mechanisms described above capture only partial equilibrium adjustments and that, to the extent that globalisation and technological progress raise total incomes due to increased productivity, it will depend on the relative income elasticity of demand for goods and services as to the extent that this induces shifts in job composition, see for instance, Goos *et al.* (2010).

... and earnings ...

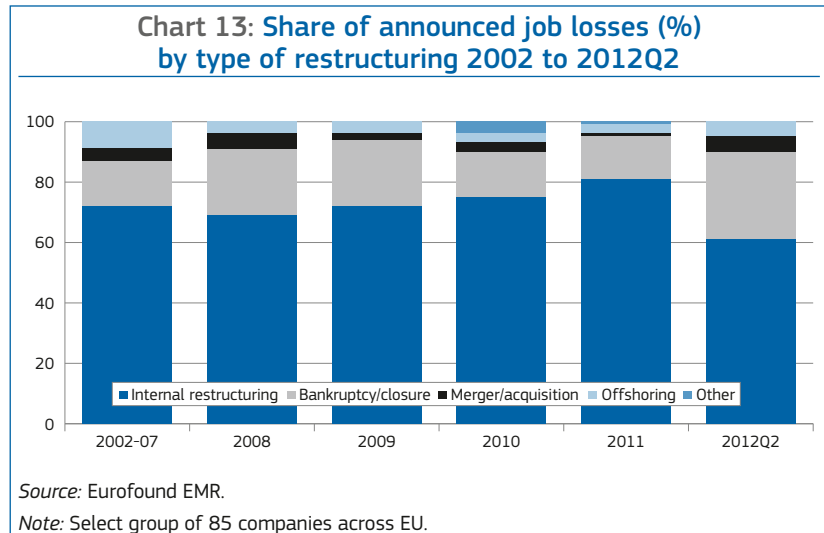
Technological progress will lead to higher productivity for workers who have the skills to operate the new technologies, who are liable to see their wages increase as new technologies are introduced.

However, the productivity of those who lack the skills to operate the new technologies is liable to remain the same, to the extent that they are not actually replaced by the new technology, which will have a negative impact on their relative wages. This is considered to be particularly the case with regard to routine non-manual work done by medium-skilled workers. See, for instance, Autor and Don (2013).

... while the resulting polarisation may affect technological progress

Finally, note needs also to be taken of the mutual interaction between the drivers of changes and labour market developments. Indeed, while skill-biased

⁽⁸⁴⁾ In these studies it is also claimed that labour market institutions (including labour union penetration and real minimum wage) are of minor importance. Note that these studies cover mainly periods prior to the severe economic downturn that started in 2008. This issue will be investigated in more detail in Section 4.1.2 below.



technological progress may induce labour market polarisation ⁽⁸⁵⁾, such polarisation may, in turn, impede further technological progress if it hinders the upward mobility of low-skilled workers.

3.2.3. Offshoring

Technological progress not only affects the nature of the goods and services that will be produced by 2020, but also where they will be produced.

Expanding global value chains...

In the past, enterprises often faced underdeveloped or uncertain supply networks leading them to develop complex production processes with the full integration of the supply chain under a single ownership (vertical integration).

However, by 2020, globalisation, technological progress, and the building of international network infrastructures that facilitate communication and transactions, are expected to have strengthened the ability of large firms to relinquish much of the direct control of non-core activities to suppliers who specialise in narrow niches of the value chain ⁽⁸⁶⁾, thereby enhancing innovation and productivity and reducing costs through competition. See, for instance, OECD (2007b) and OECD (2013a). On the other hand, the development of global value chains may be tempered, with some sub-contract work brought back 'in

⁽⁸⁵⁾ See Section 4.1.2 below for more details.

⁽⁸⁶⁾ Technological progress can also be a driver of outsourcing because it may become too costly for firms to keep up with the latest developments in some niche of the production process. Outsourcing it to a firm specialising in it may then save costs, see for example, Bartel *et al.* (2008).

house' in order to avoid being subject to unpredictable failures in the supply chain, whether due to unpredictable natural disasters (e.g. the March 2011 Tohoku earthquake and subsequent tsunami in Japan) or labour unrest (e.g. striking air pilots). See, for instance, SCRLC (2011).

... will affect job opportunities ...

Vertical disintegration will have an impact on job opportunities although, as Chart 13 shows, the share of job losses due to offshoring over the 2002–12 period (in a study of 85 companies across Europe) ranks third among the reasons for restructuring, with internal restructuring being by far the strongest reason for job losses, followed by bankruptcy and offshoring. Moreover, during the years of economic downturn from 2008 to 2012, the share for offshoring was actually lower than during the pre-crisis period 2002–07, see Eurofound (2012c) for more details.

Nevertheless, it should also be noted that globalisation, along with technological progress, may indirectly lead to job losses through internal restructuring and bankruptcy. Furthermore, the net employment effect of international outsourcing may be lower than expected insofar as the outsourcing of non-core tasks provides inputs at lower cost and enables the company to focus more on core tasks where it has a comparative advantage, and thereby create new jobs.

... but differently according to contract type ...

An analysis of historical data suggests that the effects of international

outsourcing will tend to generate different outcomes for different subgroups in the labour market. For example, a study by Möhlmann and Groot (2013) ⁽⁸⁷⁾ reports that job losses in the Netherlands following domestic and international outsourcing were often higher among employees on temporary contracts, often involving female employees, younger employees, and employees born in low income countries. Moreover, former employees of firms that had outsourced internationally were somewhat less likely (by about 9%) to find a new job in the Netherlands ⁽⁸⁸⁾.

... age and skill type, ...

Bachmann and Braun (2011) ⁽⁸⁹⁾ report that, while the effects of international outsourcing had no overall negative impact on labour market performance in Germany, the distribution was not uniform with a negative effect on medium-skilled workers in the manufacturing sector, and a positive one for highly-skilled workers in the service sector. International outsourcing had a generally unfavourable impact on older workers, which may be due to the fact that they were less likely to fulfil the new skill requirements.

... and sectors...

Timmer *et al.* (2013) ⁽⁹⁰⁾ report that the deepening of global value chains had primarily led to reductions in jobs in manufacturing in the EU, but that this was off-set by increases in the number of jobs in the services sector. See also Foster *et al.* (2013).

Blinder (2009) identifies jobs with the strongest 'offshorability potential' in the US to include ⁽⁹¹⁾ computer programmers, data entry keyers, electrical and electronics drafters, actuaries, math-

ematicians, statisticians, etc. Jobs with average 'offshorability potential' ⁽⁹²⁾ include materials scientists, electrical and electronic equipment assemblers, engine and other machine assemblers. Jobs with the least 'offshorability potential' include postal service mail sorters, processors, and processing machine operators, advertising sales agents, photographers, music directors, health and safety engineers, etc.

... at an accelerating pace by 2020

Finally, it is to be expected that past and current trends will be reinforced by 2020 due to further developments in communication and transaction technologies. See, for instance, Subramanian and Kessler (2013). Nevertheless, to the extent that bargaining power of domestic employers and employees vis-à-vis foreign GVC partners are not balanced, a fair distribution of gains (including remuneration) may be absent thereby hindering societal support for further expansion of GVCs. See, for instance, UNCTAD (2013).

3.2.4. Workplace innovation

Workplaces will adjust ...

Technological progress and innovation are also expected to have an impact on what happens at the workplace, although not all the channels through which innovation due to technological progress will impact future workplaces can be identified given the shortage of quantitative evidence about different types of workplace practices. Nevertheless, several channels are recognised, including teleworking, flexi-time, employee empowerment and autonomy, task rotation and multi-skilling, team work and team autonomy. See, for instance, Beblavý *et al.* (2012) ⁽⁹³⁾.

... creating new job opportunities...

Workplace innovations, inasmuch as they improve the quality of work, may affect the choices of different groups, notably older workers and female workers, concerning retirement

decisions, and labour market participation more generally. See, for instance, European Commission (2011a).

Moreover, there are expectations, based on business practices of some forward thinking companies in hi-tech and communications areas, that a high job quality business environment can produce a virtuous circle of innovation ⁽⁹⁴⁾, productivity growth, and rising incomes.

Finally, the combination of globalisation, technological progress and further deepening of the Single Market will also create employment opportunities in globally networked companies, although this type of work may also have an adverse effect on the work-life balance of employees required to be almost permanently on call.

... provided the change is well-embedded in social dialogue

While workplace innovation is seen to have the potential to create a broad range of employment opportunities, it is also seen to require systems of effective employee participation and dialogue in order to ensure that the benefits of improved organisational performance are appropriately shared between employees and employers, as well as among different categories of employees ⁽⁹⁵⁾.

3.2.5. Catching-up potential of some Member States

Technological progress in labour markets has not been evenly spread across Member States.

ICT user skills

In most Member States the share of persons employed with ICT user skills in total employment increased between 2001 and 2010 with the notable exceptions of Italy and the Netherlands, where the proportion actually decreased, as seen in Chart 14. However, significant differences remain between Member States, with the highest percentage found in Luxembourg (31 %) and the lowest in Romania (9%).

⁽⁸⁷⁾ Using Dutch micro-data covering the 2001–06 period.

⁽⁸⁸⁾ Nevertheless, they report also that employees were 32 per cent less likely to lose their job if they worked in a firm that outsourced internationally, and 52 per cent more likely to lose their job if they worked in a firm that outsourced domestically.

⁽⁸⁹⁾ Using German administrative micro-data covering the 1991–2000 period.

⁽⁹⁰⁾ Using the World Input-Output Database which is available at www.wiod.org. These tables provide a time-series of world input-output tables (WIOTs) from 1995 until 2008. It covers forty countries, including all EU-27 countries and 13 other major advanced and emerging economies.

⁽⁹¹⁾ See Appendix of Blinder (2009) which ranks 291 occupations by off-shorability.

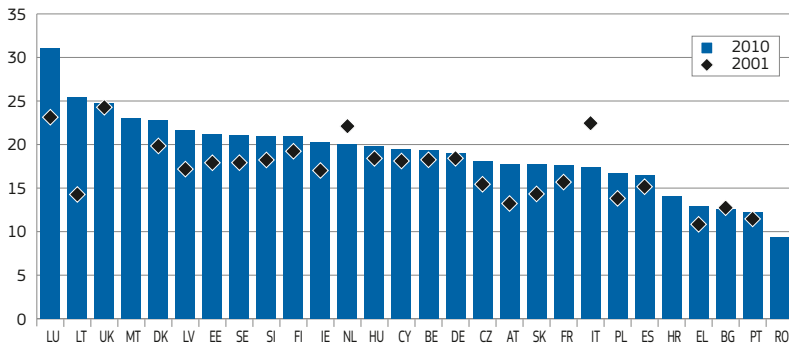
⁽⁹²⁾ I.e. ranked at about the 150th position in Annex of Blinder (2009).

⁽⁹³⁾ Using data from the European Working Conditions Surveys available at <http://www.eurofound.europa.eu/surveys/ewcs/index.htm>

⁽⁹⁴⁾ Although this hypothesis clearly requires some rigorous testing.

⁽⁹⁵⁾ See, for instance, <http://ec.europa.eu/enterprise/policies/innovation/policy/workplace-innovation> and Pot (2010).

Chart 14: Percentage of employed persons with ICT user skills in total employment

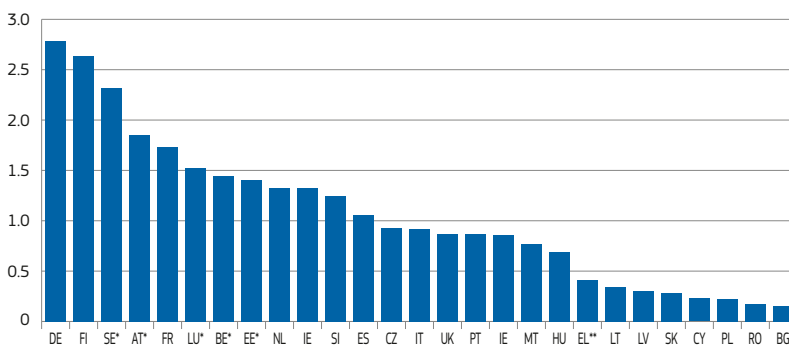


Source: Eurostat, Information society statistics [isoc_ic_biski].

Research, development and innovation

Technological progress is driven to a large extent by the quantity and quality of resources devoted to education, research, and innovation. Chart 15 shows R&D personnel as percentage of employment in the business sector in 2010. Strong differences between Member States are evident, with more than 2.5% of total employment in the business sector in Germany devoted to R&D against negligible proportions in most of the Member States that joined the EU in 2004 or later.

Chart 15: Share of total R&D personnel and researchers



Source: DG EMPL calculation based on Eurostat, Statistics on research and development [rd_p_bempoccr2 and nama_nace10_e].

Note: R&D personnel as a percentage of employment in business sector (i.e. sum of NACE_R2 sectors B+C+ ... M+N). 2010 observations, except Member States with * 2009 and with ** 2007.

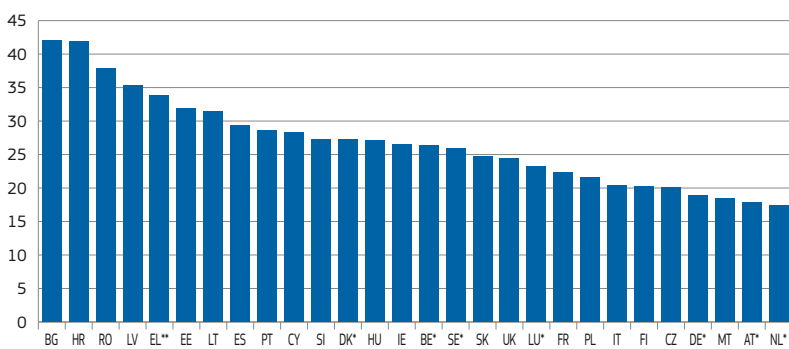
Chart 16 shows the share of female R&D personnel in total R&D personnel. In no Member State is the share of female workers in R&D larger than the share of male workers. However, the Member States with the lowest share of total R&D personnel and researchers, namely Romania and Bulgaria, have the highest share for female R&D personnel in total R&D personnel.

3.3. Demographic change

3.3.1. Changes in labour supply

More people will become available for employment ...

Chart 16: Share of female R&D personnel in total R&D personnel



Source: DG EMPL calculation based on Eurostat, Statistics on research and development [rd_p_bempoccr2 and nama_nace10_e].

Note: R&D personnel as a percentage of employment in business sector (i.e. sum of NACE_R2 sectors B+C+ ... M+N). 2010 observations, except Member States with * 2009 and with ** 2007.

An ageing population, increasing female labour market participation, changes in both family structures and the labour market for young people, together with evolving patterns of migration, will give rise to both challenges and new job opportunities by 2020.

On the supply side, demographic changes will be associated with an increasing need for job profiles that match the individual and household characteristics of older, female and young workers while, on the demand side, these same demographic changes will call for the creation of new jobs in areas of social services, including services for elderly people and child care.

... due to active ageing ...

By 2020 the share of older workers in the total labour force is foreseen to rise as the population ages and older people are encouraged to work longer and retire later. See, for instance, European Commission (2011a). At the same time, the share of the low-skilled in the total labour force is seen to decrease as current generations of older workers are replaced by older workers with higher skill and education levels.

... stronger female labour market participation, ...

By this time the gender composition of employment is also expected to become more balanced for several reasons. These include better education (which is correlated with higher labour market participation and later retirement), a rising number of single-person households (which is correlated with stronger labour market participation), the further implementation of technological innovations (including virtual workplaces which will provide workers the opportunity for a better work-family balance), more equal sharing of caring for children and the elderly, availability of quality and affordable childcare facilities, tax-benefit systems providing the right incentives, efforts to close the gender pay gap, more women in MINT jobs⁽⁹⁶⁾, as well as combating horizontal and vertical segregation. See, for instance, Dahl *et al.* (2002), European Commission (2011a) and EGGE (2009).

However, it should also be noted that prime aged women belong to the so-called 'sandwich generation' often caring for both children and frail parents and that, by 2020, the dependency of the 'baby-boom' generation is expected to have increased, which could then become a negative factor in terms of the labour market participation by women.

... and stronger youth employment

It is commonly assumed that an ageing population requires older workers to stay employed longer and to retire later if European economies are to achieve sustainable growth and a high level of social cohesion. See, for

example, European Commission (2011a). Nevertheless, the economic benefits of keeping older workers in their jobs will only be ensured if their wages are not higher than their productivity. Moreover the adequacy of older workers to their hitherto jobs cannot be taken for granted. For example, in some professions like air and sea pilots or train and truck drivers the speed in capturing information (eyesight, hearing and concentration), analysing and reacting to it may make replacement necessary before the mandatory retirement age. The ideal solution would be adapting wages to productivity including, if needed and possible, by a redeployment of older workers to jobs where their salaries and productivity would be aligned. But this is not always possible within a given firm or sector.

In the current economic downturn, with very high levels of youth unemployment in many Member States, the focus of the debate has shifted somewhat towards securing employment opportunities for young people rather than the older people. In general, success in ensuring adequate job opportunities for the young in 2020 is likely to depend on the adoption of a comprehensive set of measures along the lines described in the 'Youth on the Move' strategy⁽⁹⁷⁾, which covers measures ranging from a better match between young people's skills and labour market requirements to more effective actions to remove institutional obstacles to hiring young people.

3.3.2. Changes in labour demand

At the same time new needs will have to be met, inter alia,...

An ageing population and increasing female labour participation will affect the nature of demand for goods and services – as the following examples illustrate.

... of older people who want to stay active for longer in the labour market ...

In order to retain older workers in employment, more intensive personalised services – such as guidance, counselling or outplacement – are likely to be needed. See, for instance,

European Commission (2011a). The health status of older workers is particularly important in this respect since it can significantly affect decisions regarding labour market participation.

Poor health affects both employability and earnings potential because it leads to lower productivity, greater absenteeism and fewer opportunities to update skills and knowledge – all of which may change workers' preferences and provide an incentive to retire early. Moreover, in a family context, the poor health of a partner may induce people to allocate more time for care – which is especially relevant for older workers. See, for instance, European Commission (2011) and Eurofound (2012d).

One consequence of this is that, by 2020, job opportunities for providers of health service for older workers and elderly care are expected to increase.

... as well as of older people who want to continue to live an independent life...

As the share of those aged 65 or more in the total population is projected to grow from less than 17.5% in 2010 to over 20% in 2020, the demand for the treatment of multiple chronic conditions will likewise increase. As a consequence, future job opportunities are expected to emerge from the need to provide long-term care in an ageing society, including prevention, rehabilitation, and better ways of delivering care – all of which would be expected to lead to increased demand for nursing, psychiatric, and home health aides. See, for instance, European Innovation Partnership on Active and Healthy Ageing⁽⁹⁸⁾.

... and women

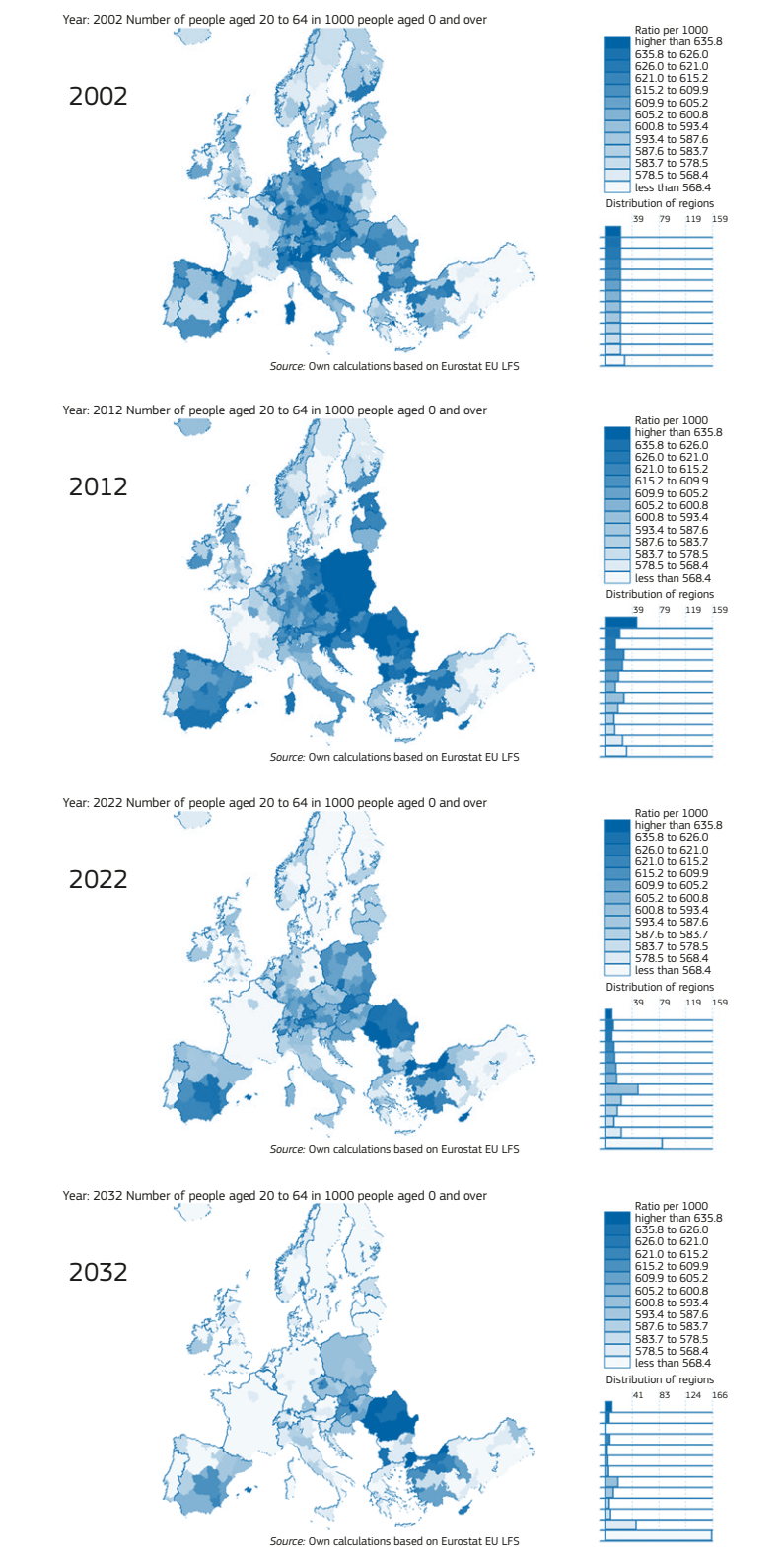
Rising labour market participation by women, and rising numbers of single-parent families, will likewise increase the demand for household services such as child care, cleaning services, gardening, etc. Such jobs are often seen as relatively low skilled. However, they often require 'people' skills which may depend on personal characteristics as much as formal training and this may provide stable long-term employment for the right people.

⁽⁹⁶⁾ MINT abbreviation for Mathematics, Informatics, Natural sciences and Technology.

⁽⁹⁷⁾ See also European Commission (2012e).

⁽⁹⁸⁾ Available at http://ec.europa.eu/research/innovation-union/index_en.cfm?section=active-healthy-ageing

Chart 17: Share of working age population (aged 20-64) in total population 2002-32 under positive future employment scenarios



gif excel file

Source: EU-LFS provided by Eurostat and DG EMPL calculations based on DG EMPL's regional socio-demographic projection tool.

of the real price with public authorities paying the difference – see European Commission (2012c) ⁽⁹⁹⁾.

3.3.3. Regional differences

The Commission's Eighth Progress Report on Economic Social and Territorial Cohesion reviews the severe impact that the current economic crisis has had on the EU's regions, viewed at the level of the 270 NUTS-2 regions ⁽¹⁰⁰⁾. It focuses on rising unemployment and the negative impact on GDP growth in the vast majority of EU regions between 2008 and 2012, bringing to a halt the tendency towards declining regional disparities that had previously been observed (European Commission (2013e), pp. 10–11).

This section looks forward, however, and considers how projected demographic developments are likely to impact on Europe's regions over the next two decades. It examines the extent to which different NUTS-2 regions are affected by ageing populations and a shrinking workforce, based on a 20-year projection using the DG EMPL's socio-demographic projection tool and the EU Labour Force Survey data. It is important to go beyond the EU 2020 time horizon as the EU workforce is projected to decrease more quickly from next decade on.

Demographic dependency will multiply in many regions ...

Chart 17 shows the total dependency ratio, defined as the share of the working-age population (WAP) in total population in each of the NUTS-2 regions in the EU, with the darker coloured regions having the highest share.

During the last 10 years, around half of the EU's NUTS-2 regions had declining demographic dependency, with WAP still growing, baby-boom cohorts still part of the workforce, with the decline in fertility that had been reducing the WAP in other parts of the EU being delayed in Eastern Europe.

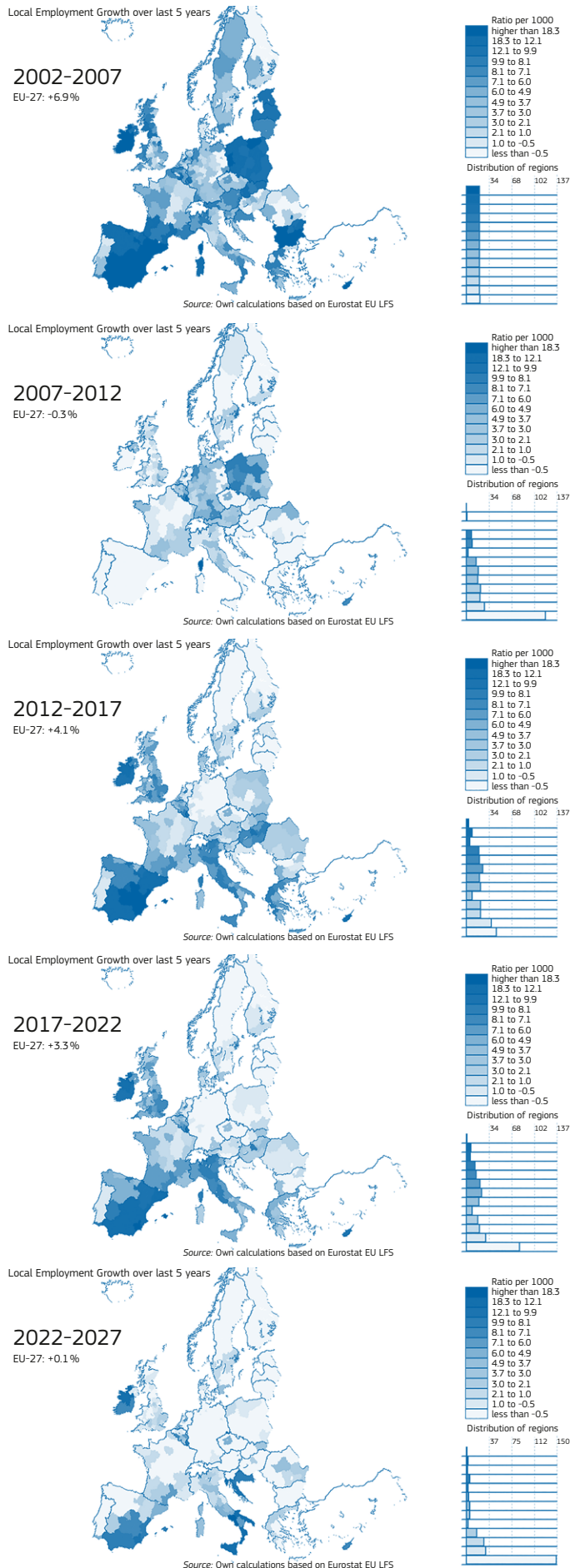
⁽⁹⁹⁾ Such a system exists, for example, in Belgium for activities done at home (cleaning, laundry and ironing, cooking and sewing) and outside the house (shopping, ironing in an ironing station, and providing assistance with the transportation of persons under specific conditions). European Commission (2012c) extrapolates the Belgian system to the EU (by taking into account the respective size of both populations, simple multiplication by 50) yielding 4 million of new jobs in housework services — at a net cost of 1.2 billion euros.

⁽¹⁰⁰⁾ For an explanation of the NUTS (Nomenclature of territorial units for statistics) see http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction

Nevertheless, even such low-paid jobs may still be too high in their costs. Therefore, the job potential of such activities could be enhanced by a direct

intervention in the price paid by the user, for example, by providing services vouchers that are targeted at specific tasks, but where the consumer pays only part

Chart 18: Potential employment growth (aged 20–64) in EU regions assuming optimistic employment rate scenarios



As those cohorts reach working age, however, the situation is reversing quickly. The next 10 years will see a projected increase of total demographic dependency in almost all EU regions, with the situation becoming aggravated in the second decade of the century. Moreover, this trend is expected to continue up to 2032 (the regional model's maximum projection horizon).

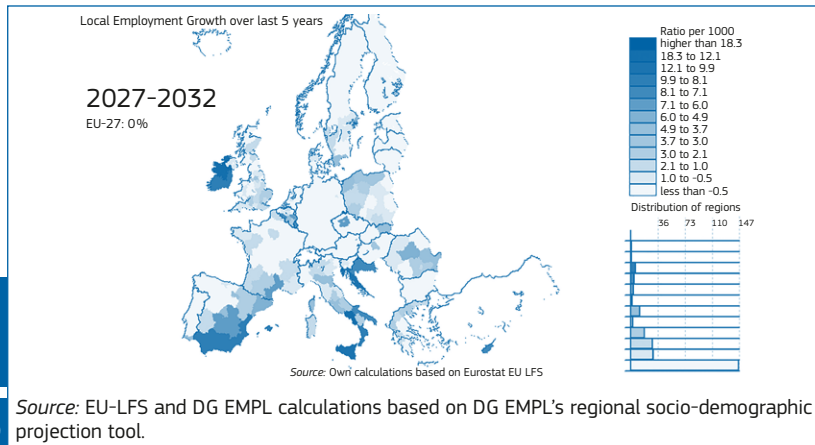
While the trend in Eastern Europe may be delayed, the fertility decline is much more pronounced than in other countries, and the shift towards higher demographic dependency in Eastern Europe is expected to be much stronger after 2030. For example, by 2032, Romania's dependency would still be the lowest as can be seen in the sub-chart although, according to Eurostat's Europop2010 projection, by 2060 it will be one of the highest in the EU (i.e., the share of working-age in total population in Romania being one of the lowest by 2060).

Chart 18 shows that growing total demographic dependency is projected to hit many regions hard over the next two decades. In 2012, 40% of all EU NUTS-2 regions are projected to show a share of WAP in total population of below 60% but by 2032 around 86% of NUTS-2 regions in the EU would be in this situation. Many regions in Germany (particularly Eastern Germany), Austria or Italy face strongly increasing dependency as low fertility cohorts enter working age and/or those regions showing negative mobility balances.

... while regional employment will be strongly driven by demographics and local mobility trends

Looking over the next two decades, the working age population is projected to decline in two thirds of the EU's regions which will have a direct impact on potential regional employment. DG EMPL's regional socio-demographic projection tool allows for a projection of regional employment, taking on board the national EU2020 employment rate targets for the year 2020, broken down to the regional level ⁽¹⁰¹⁾.

⁽¹⁰¹⁾ For technical reasons, those are applied to the year 2022 and then broken down to NUTS-2 level in a way as low-employment regions contribute more to achieving the national target than those showing high employment rates today (update of Peschner (2012), pp. 220–224).



The chart shows the observed and projected annual average regional employment growth of the age group 20–64 across Europe over different 5-year periods. The darker the colour, the higher the employment growth is. As can be seen, the second sub-chart shows how employment growth virtually collapsed in many regions in the course of the current crisis, becoming negative in almost half of all NUTS-2 regions.

For the current decade the model assumes full compliance with the goals of EU2020⁽¹⁰²⁾ in that regions increase their employment rates to meet the national employment-related targets for 2020 set out in their April 2011 National Reform Programmes⁽¹⁰³⁾. Such a scenario implies that a particularly strong effort will have to be made by a number of Mediterranean countries' regions, although little further action is needed in Germany or the Nordic countries where local employment rates are already above average. Doing so would thus lead to the envisaged 75 % average employment rate for EU-27 by 2022 (up from 69 % today). Under these assumptions, total employment growth over the ten years between 2012 and 2022 would need to amount to 7%, with almost half of all EU NUTS-2 regions seeing employment grow by this rate or more, despite a decline in their workforce.

⁽¹⁰²⁾ For the EU as a whole the EU2020 strategy adopted in 2010 foresees a 75 % employment rate for people aged between 20–64 years by the year 2020 (starting from below 69% in 2010, with little progress seen so far). For technical reasons we draw on 2022 instead of 2020.

⁽¹⁰³⁾ See http://ec.europa.eu/europe2020/pdf/targets_en.pdf on the employment-related national targets for the year 2020 (second column). For countries with a target range the upper threshold will be assumed. For the UK, in the absence of a national target, it is assumed that the target be 81 % – a necessary assumption in order to arrive at 75 % average for EU-27.

For the years after 2022, it is assumed that those regions still lagging behind an employment rate of 75 %, will manage to reach that level by 2032. This particular assumption implies a major leap for most regions of Southern Italy or Spain, leading to an EU-27-average employment rate of slightly above 77 % by 2032. However, even under these assumptions, the EU's average employment growth in the years around 2030 (see last sub-chart) will be around zero, with almost 60 % of the EU's NUTS-2 regions showing negative employment growth.

As a result, the decline of working age population will pose huge challenges for a number of EU regions. At national level, with employment growth stagnating or even negative, productivity growth would become the main source of economic growth in almost all Member States even under the most generous assumptions concerning employment growth, see Peschner (2012) and Peschner/Fotakis (2013).

In regions facing massive outward mobility, the problems would become even more urgent. The Commission assessment finds that 'outmigration will reinforce the natural aging process' with mobility across regions and national borders being one of the core rights of EU citizens and an indispensable source of employment growth. However, regions facing a continuous outflow of potential workers and increasing demographic dependency are likely to rely on national and EU transfers to alleviate the imminent economic and social implications. Under such circumstances, the supply of the most important public goods, such as care, housing or infrastructure will become increasingly difficult to ensure (European Commission (2008d), p. 11).

Over the next 20 years, a large number of regions in Eastern Germany or Eastern

Europe are projected to see two-digit declines in their working-age population, with a number of locations facing declines of 20%, or even 30%. It will be very difficult to compensate such severe losses through productivity gains within the local industries. Moreover, much will depend on the effectiveness of national and EU Cohesion Policy in encouraging and assisting local investment in human capital in order to improve and protect the competitive positions of these areas. In that respect, the Commission's 2010 Cohesion Report (European Commission (2010i), p. 231) concludes that 'creating ... a social infrastructure and social services is an important part of Cohesion Policy to ensure that young qualified people have the incentive to stay. Cohesion Policy should make sure 'not only that there are sufficient employment opportunities for people of working age but also adequate social and cultural facilities'.

3.4. Greening

The overall impact on the volume of employment in the EU of the ongoing transition to a more low-carbon, resource-efficient and climate-resilient economy is expected to be rather modest by 2020⁽¹⁰⁴⁾, with the most important effects being seen in terms of the changing composition of employment and the associated job profiles. See, for example, Cambridge Econometrics (2011).

The nature of these future employment outcomes are expected to be particularly influenced by the impact of policies intended to mitigate further climate change and strengthen resource efficiency, as well as by the need to adapt to already ongoing changes in the environment. In these respects, the employment effects will depend to a large extent on the type of instruments used to attain the policy targets (notably whether they depend on tax changes or legal regulations), and on the nature of the technological innovations involved (notably whether or not they are capital intensive, and the extent to which they generate demand for high or low skilled workers). See, for instance, European Commission (2012j).

⁽¹⁰⁴⁾ This assumes no change in the overall level of aggregate demand in the economy. In the circumstances of a recession, however, policy action to green the economy could form part of a policy stimulus with a positive impact on total employment.

The current assessment is that, by 2020, the effects of actions taken to mitigate the effects of climate change will have had a stronger impact on employment than a more general adaptation ⁽¹⁰⁵⁾ to environmental change although this is likely to vary considerably from locality to locality. See, for example, European Commission (2009a).

Moreover, a general greening of the economy, accompanied by the associated technological progress, is expected to significantly affect working conditions and skill requirements, although the way this develops in practice will very much depend on the interaction between governments – who are the main initiators of green growth – and the market and technological responses of both private and public sector enterprises. As a consequence, the realisation of the growth potential of economic greening in terms of employment outcomes is neither automatic or easily predictable.

Finally, as greening of the economy will have a strong impact on skills needs and training needs ⁽¹⁰⁶⁾, social partners are developing initiatives, at different levels (European, national, sectoral, regional and company) to ensure a smooth transition towards a green economy. While the crisis has reduced public funding for green employment initiatives overall, the European Social Fund (ESF) provides support for new initiatives. See, for example, European Commission (2012aa) and European Commission (2010b).

3.4.1. Adaptation

Adaptation to changes in the environment, including climate change, will clearly affect employment opportunities across many sectors and regions – see European Commission (2013f). However, the sectors seen as most likely to undergo significant changes in employment in the long run include agriculture and fisheries, beach and skiing tourism, infrastructure building, energy supply, construction and finance and insurance. Likewise, the regions seen as most likely to undergo significant changes include coastal zones, densely populated floodplains, and mountainous

⁽¹⁰⁵⁾ Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise – see http://ec.europa.eu/clima/policies/adaptation/index_en.htm; <http://climate-adapt.eea.europa.eu/> as well as GHK (2010).

⁽¹⁰⁶⁾ Whereas dimensions such as career and employment security, working time and health and safety would be less affected.

areas. See, for instance, ETUC (2007), OECD (2008) and Muller *et al.* (2013).

In terms of new job opportunities, adaptation to climate change is also seen to have a positive effect in, for example, the provision of services related to health, sanitation, access to clean water, etc. See, for instance, ETUC (2007). Nevertheless, by 2020, job opportunities in response to adaptation are expected to be driven primarily by efforts to build new infrastructures to deal with the issues that are likely to become more pressing after 2020, such as the strengthening of inland flood defences or of sea dikes ⁽¹⁰⁷⁾.

3.4.2. Mitigation

Mitigation will affect jobs via ...

Further reductions in greenhouse gas emissions and the strengthening of resource efficiency are seen to have a strong impact on the job potential in the EU by 2020 ⁽¹⁰⁸⁾, being driven by the building and operation of new infrastructures as well as by taxes and regulations that are needed to ‘push’ and provision of information about energy and environmental performance that are needed to ‘pull’ producers, consumers and governments to act in a more sustainable way ⁽¹⁰⁹⁾.

... infrastructure building...

Job opportunities would result from the operation and maintenance of the infrastructure (especially, renewable energy infrastructure) built to reach the Europe 2020 green targets, but, given the long lead times required, they could also arise from the building of new infrastructure with a view to reaching targets related to the 2050 resource efficiency targets (see European Commission (2011c)).

⁽¹⁰⁷⁾ See, for instance, the Deltaplan in the Netherlands at <http://www.deltawerken.com/The-Deltaplan-192.html>

⁽¹⁰⁸⁾ Based on Cambridge Econometrics *et al.* (2011).

⁽¹⁰⁹⁾ The net impact on jobs will be affected via direct channels that stem from changes in expenditure (such as for example the shift in investment from the fossil fuel energy sector to the renewable energy sector), indirect channels linked to the supply chain (with for example a different impact for suppliers to fossil fuel energy sector and the renewable energy sector) and induced jobs caused by changes in relative prices and incomes across the economy. Estimates of these distinct effects can be found in for example Cambridge Econometrics (2011) and ECORYS (2012).

While the construction of new infrastructure would be expected to provide job opportunities mainly for skilled workers in the initial phase, job opportunities for the less skilled should follow, provided they are able to adapt (with or without appropriate support) to the types of work that emerges.

... and shifts towards greener economic activities, including renewable energy, ...

Greening the economy will also affect how goods and services are produced and consumed, with important impacts on the allocation of job opportunities as the following examples illustrate.

An important source of strong job creation by 2020 is seen to be the development of renewable energy, which is projected to increase its employment share in energy production from 19% in 2010 to 32% by 2020 (i.e. about 3 million people by 2020) with the generation from wind power expected to increase substantially, while the share of hydro power (currently the highest) already close to capacity. See, for instance, Cambridge Econometrics *et al.* (2011).

The counterpart of this increased supply of renewable energy will be a decrease in ‘traditional’ fossil-based energy providers but, since the labour intensity of the renewable energy sector is higher than that of the fossil energy sector, a net increase in employment is to be expected from this transition. Furthermore, to the extent that Europe can gain a leading position in the exploitation of renewable energy, it can increase its export markets, yielding additional job opportunities.

... energy efficiency, ...

Future job opportunities will likewise be affected by ongoing efforts to improve energy efficiency ⁽¹¹⁰⁾. For example, the

⁽¹¹⁰⁾ As outlined in Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, available at http://ec.europa.eu/energy/efficiency/eed/eed_en.htm. ‘Push’ and ‘pull’ drivers of improved energy efficiency include the removal of barriers in the energy market and overcome market failures that impede efficiency in the supply and use of energy, covering inter alia insufficient awareness and capacity of market actors and institutions, national technical or administrative barriers to the proper functioning of the internal energy market or underdeveloped labour markets to match the low-carbon economy challenge.

European Commission (2008b), estimates that retrofitting houses could generate around 280 000–450 000 new jobs (gross measure) for energy auditors, certifiers, inspectors of heating systems, renewable technology installers and industries producing energy-efficient materials for buildings – with particularly strong potential in Central and Eastern Europe where the least energy-efficient buildings are located. Furthermore, Cambridge Econometrics *et al.* (2011) estimate, using an econometric model, that implementation of the Energy Efficiency Directive would increase employment by 0.18% (compared to the baseline) in 2020.

Additional job gains may also arise insofar as savings caused by the decrease in energy consumption provide purchasing power that can be spent on the consumption of other goods and services⁽¹¹¹⁾, thereby creating jobs. For example, Ecofys (2012) estimates reinvesting the savings (accruing from that a full implementation of the Ecodesign Directive) in other sectors of the economy could result in the creation of 1 million jobs.

... waste management, recycling and biofuels, ...

Furthermore, a more advanced maintenance, repair, upgrade, and reuse over the lifecycle of product of 70% of key materials could create about 560 000 new jobs by 2025, while improved waste management could create over 400 000 jobs by 2020 – see OECD (2012a).

In the same way, the bio-economy (which includes agriculture, forestry, fisheries, food production, as well as parts of chemical, biotechnological and energy industries) has a strong potential to create jobs in rural and coastal areas, although the impact of biofuels is not always clear-cut, as their job potential is closely related to the potential to use land and adverse impact on food prices. Equally, new jobs should arise also from the uptake of products covered by eco-design and labelling measures (e.g. electric motors and drivers, refrigerators and freezers).

⁽¹¹¹⁾ As well as energy in response to improvements in efficiency, i.e. the rebound effect. See, for instance, Global View (2011).

Box 3: Illustrative employment effects of CO₂ reductions in 2020 – revenue recycling

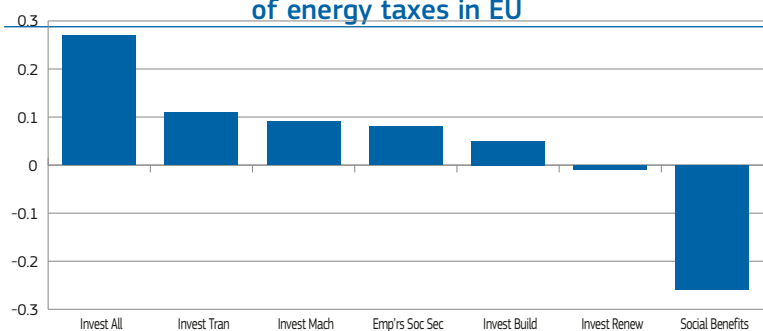
The taxation of the emission of greenhouse gases (including CO₂) provides tax revenues.

Cambridge Econometrics *et al.* (2011) report that recycling green tax revenues achieves the strongest net employment outcomes when used to subsidise low-carbon technologies (not employment), i.e. up to three times the outcome of other recycling strategies (including the lowering of social security contributions). Chart 19 shows the employment results of recycling revenue according to 5 different scenarios.

This stronger employment impact of investing in infrastructure that contributes to energy and resource efficiency stems from the fact that additional jobs are created as these technologies give EU companies a leading edge in manufacture/distribution, and drive further innovation.

The net impacts under the alternative scenarios are modest at the NACE 2-digit sector level. Nevertheless, even a 0.1% growth of total employment still covers some 235 000 people by 2020.

Chart 19: Illustrative scenario of revenue recycling of energy taxes in EU



Source: Cambridge Econometric *et al.* (Table 3.11).

Note: Invest All: All revenues used for investment in transport, machinery, buildings and renewables (25% each). Invest Tran: 25% invested in transport, 75% in income tax reductions. Invest Mach: 25% invested in machinery, 75% in income tax reductions. Emp'r's Soc Sec: All revenues offset through employers' social security reductions. Invest Build: 25% invested in buildings, 75% in income tax reductions. Invest Renew: 25% invested in renewables, 75% in income tax reductions. Social Benefits: All revenues paid out through higher benefits rates.

... as well as shifts out of unsustainable activities ...

There will also be sectors where employment opportunities will decline (including enterprises extracting and combusting coal and enterprises manufacturing refined petroleum products) as a direct result of taxes and regulations that are implemented with a view to reducing the emission of greenhouse gasses.

Other sectors producing goods that depend on energy-intensive inputs, such as aluminium and lime⁽¹¹²⁾, will also be affected by rising prices of CO₂ emissions. For these sectors the final impact may be difficult to predict. For exam-

⁽¹¹²⁾ For production of lime around 70% of the sector's carbon emissions come from the chemical reaction required for producing lime, e.g. Cambridge Econometrics (2011).

ple, while employment in the aluminium sector would be expected to suffer as a result of the higher costs of renewable energy in this energy-intensive sector, this could be partly or wholly off-set by stronger demand for the products of the sector in order to meet more stringent building and maintenance standards with respect to building insulation (double/triple glazing, etc.). See, for instance, Cambridge Econometrics (2011).

Net employment outcomes will also be affected by any relocation of production to non-European countries with lower levels of CO₂ taxes or weaker regulations.

... to a large extent conditioned by government policies ...

Finally, government policies will have also an impact on the job potential by

2020 through the application of environmentally friendly public procurement procedures and the strengthening public investment in research and innovation in the field of greening, as well as by strengthening the interaction with other policy fields. See, for example, European Commission (2012s).

However, the most important channel through which governments will affect the future job potential is likely to be through the way they recycle the revenues obtained from green taxes – as illustrated in Box 3 which suggests that recycling green tax revenues achieves the strongest net employment outcomes when they are used to subsidise low-carbon technologies.

... thereby also affecting job quality ⁽¹¹³⁾...

Mitigating climate change will have positive effects on the quality of life and should improve working conditions including health and safety at work. These developments should provide encouragement for increased labour market participation as people, especially older people, find it more attractive to work. Moreover, many new jobs in energy services and construction will be created at the local level as the existing building stock is re-furbished to higher energy-efficiency standards.

Nevertheless, some adverse pressures on job quality may arise from greening if they are not addressed by adequate policy responses.

First, (based on historical observation) women and young people are more likely to be employed in non-green occupations which suggests that they might be disadvantaged by any shift in employment towards green occupations. See, for instance, Cambridge Econometrics *et al.* (2011). For young people this under-representation in green jobs may be offset as their careers progress, although the current crisis risks creating permanent adverse hysteresis effects that erode skills and employability – as discussed in Section 4.1.1 in this chapter. For women this under-representation may reflect a deeper structural labour market imbalance due to occupational

segmentation, which requires appropriate responses – see also Chapter 3 of this report.

Second, insofar as the greening of the economy stimulates the demand for higher skilled jobs, there is likely to be a positive impact on overall job quality ⁽¹¹⁴⁾, but some lower skilled occupations (e.g. office clerks) that are currently seen as relatively high quality may become redundant through technology driven innovations. Moreover, some jobs in activities such as waste management, recycling and agriculture, are often associated with less favourable working conditions for the low-skilled, including low pay and hazardous health and safety conditions.

Third, in regions that are predominantly characterised by energy-intensive industries and poor economic diversification, the job opportunities for all categories of local people may be severely hit during a transition process that can, on past experience, be very long.

Fourth, the costs of reducing emissions may fall disproportionately on low-wage earners insofar as they spend a larger share of income on heating fuels. See, for instance, Cambridge Econometrics *et al.* (2011).

... and skills profiles

Finally, greening the economy will involve also changes in skill profiles in technical as well as managerial occupations. As a consequence, training systems will have to cope with the demand for new skills – as discussed in the 'New Skills for New Jobs' initiative under the Europe 2020 Strategy, see European Commission (2010e).

Nevertheless, several studies, including for example CEDEFOP (2010), report a systemic deficit in management skills and job-specific technical skills (related to science, technology, engineering and mathematics) across the EU. Persistent skills bottlenecks may then hinder the full realisation of the job potential as they will not only have an immediate negative impact on the job potential but it will also intensify competition for workers with skills which are insufficiently supplied. This will then raise (relative)

wages which will further reduce overall labour demand, and increase prices – with adverse effects on price competitiveness. For example, Cambridge Econometrics *et al.* (2011) estimates that under a skills bottleneck scenario that increases wages by 0.5 %, employment will decrease by 0.1 % in 2020 for the EU as a whole – but outcomes may differ across Member States to the extent that differences in labour market flexibility to address these mismatches exist.

4. BARRIERS TO FUTURE LABOUR MARKET DYNAMICS

The previous section showed how globalisation, technological progress, demographic change and the greening of the economy will create new employment opportunities, but will also transform and destroy old jobs by 2020.

Addressing these opportunities and challenges requires the reallocation and full use of labour, as well as the other production factors, within sectors and regions as well as across sectors and regions. However, this process may be hindered by the persistence of the current economic downturn as well as poor or inappropriate responses in pursuit of labour market flexibility.

This section examines the effects of these impediments, beginning with an analysis of the effects of hysteresis and polarisation in the labour market. It then provides an assessment of the impact of a number of structural reforms that have a direct impact on future job potential, including labour market reforms, the further deepening of the single market, and the strengthening of the skill formation processes.

4.1. Effect of the economic downturn on future job potential

4.1.1. Labour market hysteresis effects

The current economic downturn is characterised by persistently high unemployment rates (especially for the young) in several Member States of the euro area – see Chapter 5 in this report. Apart from its broad social impact and direct socio-economic cost in terms of social expenditures and lost tax revenue, persistent unemployment risks causing

⁽¹¹³⁾ A deeper analysis of job quality and greening of the economy is to be found in Cambridge Econometrics *et al.* (2011).

⁽¹¹⁴⁾ In general, the higher the level of skill (or qualification) associated with an occupation, the higher the job quality.

Box 4: Labour market hysteresis

'Spells of persistent unemployment can have a 'scarring' effect on the unemployed, affecting future job opportunities and earnings ⁽¹⁾.

Persistent economic downturns affect future employment opportunities ...

The future employment opportunities of young people are particularly adversely affected by persistent unemployment spells, as the following studies illustrate.

Edin and Gustavsson (2008) – using Swedish data from two waves (1994 and 1998) – find strong evidence of a negative relationship between work interruptions and skill levels. They report, for instance, that a full year of non-employment was associated with a decline in their relative skill position within their age group ⁽²⁾.

Cockx and Picchio (2013) – using Belgian panel data covering the labour market history of young people over the 1998–2002 period – report that, if job market entry is delayed by one year, the probability of finding a job in the following two years falls from 60% to 16% for men and from 47% to 13% for women. However, they also found that the duration of the unemployment spell hardly affects the quality of subsequent employment. These outcomes are seen to be primarily driven by stigmatisation – i.e. the fact that they are labelled as unemployed – rather than any depreciation in their human capital i.e. in their capacity to do the jobs available to them.

Kahn (2010) – using the National Longitudinal Survey of Youth (US) – reports that workers who graduate from college in difficult economic conditions are unable to move fully into better jobs, at least over the first 15 years of their careers. Andersen (2010) shows how the long-term effects of a recession affect different age groups differently. For older workers even a temporary spell of unemployment may induce early retirement because of a loss of skills and a lack of training opportunities to compensate. For young workers the impact is less clear, mainly due to the fact that younger age groups are more likely to benefit from active labour market policies that help compensate.

Ball (2009) provides empirical evidence from 20 developed countries that indicates how recessions have an overall negative impact on the long-term labour market potential. In particular he shows that the so-called natural rate of unemployment (which some theorists consider to be independent of the state of the business cycle) is in fact affected by developments in aggregate demand, and that this can lead to the degeneration of skills, a reduction in motivation to search a job, as well as to the stigmatisation of those affected in the eyes of potential employers.

Bell and Blanchflower (2011) present evidence indicating that periods of unemployment also have a negative impact on the wellbeing, health status and job satisfaction of young people, although this effect is less serious for older young people, i.e. those aged 23 or more.

Finally, hysteresis effects for particular countries or regions may also be generated by 'brain drain' to the extent that a temporarily depressed economy provides strong incentives to look for a job elsewhere with a possible permanent effect if an outflow of workers is not compensated by an inflow of workers when the effects of the recession have subsided. On the other hand, the long run effect of workers returning to their country of origin can be positive if they return with a higher level of human capital because they have acquired more skills and experience.

... as well as future earnings and job quality.

The earnings potential, as well as the employment opportunities, also deteriorate for people who are unemployed for a long period, as the following studies illustrate.

Oreopoulos *et al.* (2008) – using a large sample of Canadian college graduates – find that young graduates entering the labour market in a recession suffer a significant initial loss of earnings that, on average, takes 8 to 10 years before they recover, but with higher skilled graduates switching to better firms more quickly than lower skilled graduates.

Gregg and Tominey (2005) report – analysing data on workers in the UK – that unemployment early in life leads to a loss in earnings ranging from 13 to 21% by the age of 42. However, they also report that, if individuals avoid having repeated exposure to unemployment over their life, this loss of earnings falls to around 10%.

Similar results – using UK data for the 1991–97 period – are reported by Arulampalam (2001) who finds that unemployment carries a wage penalty of about 6% on re-entry in Britain and that, after three years, they are earning 14% less than they would have received if they had not been unemployed.

Skans (2004) – using data on Swedish youths graduating from vocational high school programmes in 1991–94 – reports a 3 percentage-points increase in their probability of being unemployed, and a 17% reduction in their annual earnings after 5 years if they experienced unemployment after graduation.

Mroz and Savage (2006) – using a sample from the National Longitudinal Survey of Youth (US) – found that a six month spell of unemployment at age 22 would result in an 8 per cent lower wage at age 23 and that, even at ages 30/31, wages are 2–3 per cent lower than they would otherwise have been.

Brunner and Kuhn (2009), – using 1972-2005 data from the Austrian Social Security Database – report a 15% loss in the present value of lifetime earnings for a cohort entering the labour force when unemployment is high compared with a cohort entering in normal economic conditions. However, the initial labour market conditions are seen to have smaller and less persistent effects on the earnings of blue-collar workers than on those of white-collar workers.

⁽¹⁾ See also DeLong and Summers (2013) for the impact of hysteresis effects on economic stabilisation. In a seminal paper, Blanchard and Summers (1986) define 'hysteresis' in labour markets as the cases where actual unemployment affects equilibrium unemployment for a long time. A more strict definition would have been the case where there is path dependence of steady state equilibrium unemployment.

⁽²⁾ Reported as a 5 percentile move down the skill distribution.

long-run damage by undermining the employability and earnings potential of those affected, especially the young unemployed – see Box 4.

Furthermore, a prolonged economic downturn may also encourage older workers to retire earlier than they would otherwise have done⁽¹¹⁵⁾. See, for instance, OECD (2010). This temporary loss of employability of the young and the early exit of the older workers may adversely affect the ability of labour markets to respond to new challenges and opportunities with permanent adverse effects, generally described as labour market hysteresis – see Box 4. Nevertheless, when the job of the ‘main breadwinner’ becomes precarious, other members of the family may become economically active, i.e. the so-called ‘added worker effect’. See, for instance, European Commission (2013g).

4.1.2. Labour market polarisation

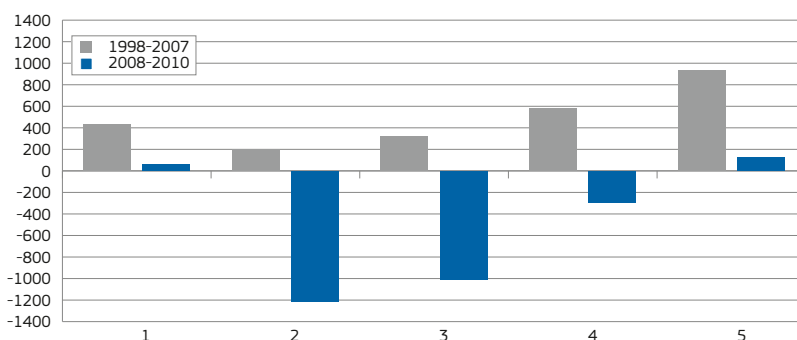
In recent decades one of the key developments in the European labour market has been an increasing number of workers at the extremes of the wage and skills distribution and fewer in the middle. See, for instance, Eurofound (2013). Such labour market polarisation may have adverse impacts that are relevant for the analysis in this chapter.

First, to the extent that polarisation in labour markets occurs in parallel with a reduced upward mobility of workers at the bottom end of the labour market, it will lead to a deterioration of equality of chances in society as a whole, thereby adversely affecting the EU’s job potential by 2020.

Second, polarisation may undermine macro-economic stability and the pursuit of sustainable growth and full employment. In this respect Stiglitz (2009) argues that ‘growing inequality in most countries of the world has meant that money has gone from those who would spend it to those who are so well off that, try as they might, they can’t spend it all’ which ‘contributed to the reckless leverage and risk-taking that underlay this crisis.’

⁽¹¹⁵⁾ This will depend on the extent they can avoid the crisis having an adverse effect on their wealth. If not, the postponement of retirement may become unavoidable.

Chart 20: Annual average change in absolute employment by wage quintile, EU, 1998–2010 (1000)



Source: Eurofound (2013) available at <http://www.eurofound.europa.eu/emcc/ejm/summary.htm>

Note: No data for BG, MT, PL or RO.

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The following charts illustrate the extent and nature of the increasing polarisation that has taken place in the European Union, see also Eurofound (2013).

Growing polarisation at the European level...

Chart 20 shows the annual average changes in the distribution of wage earners in the EU as a whole over the period 1998–2010⁽¹¹⁶⁾. In the period prior to the crisis (1998–2007) it was primarily jobs in the highest and upper quintiles that showed an increase in earnings while the middle quintiles remained largely stable.

In contrast, during the period 2008–10, there were major losses for those in the middle quintiles against some modest increases in both the lower and upper quintile.

... as well as at the level of sectors ...

Chart 21 shows developments at sector level for the EU as a whole over the period 1995–2010. Here, in the run-up to the crisis, it was primarily employment at the bottom end of the low knowledge-intensive service sector, and at the upper end of the knowledge-intensive service sector that experienced the strongest increases.

Since the onset of the crisis, the sectors hardest hit showed the strongest decrease in the middle quintiles – this being particularly the case for construction, and, to a lesser extent, the low- and high-tech industries and the low knowledge-intensive industries. In

contrast, education and especially the health sector experienced increases at the upper end of the wage distribution.

This pattern may be viewed simply as a typical cyclical outcome – pro-cyclical in construction and industry, and counter-cyclical in education and health, and likely to be temporary and reversible. On the other hand, hysteresis effects may perpetuate these outcomes for some time.

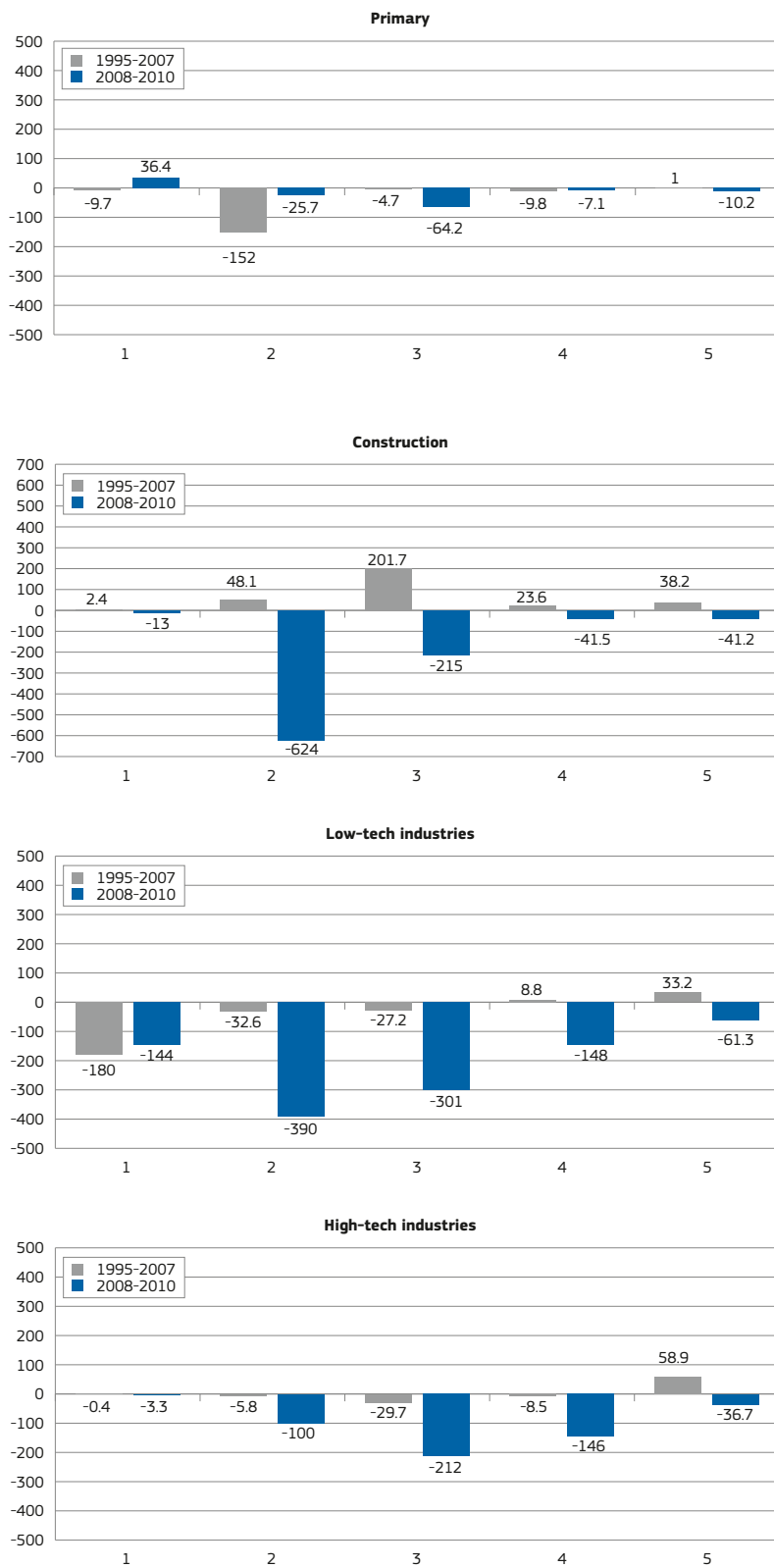
... driven by technological progress, globalisation, ...

Between the early 1980s and the onset of the crisis, there was an increasing polarisation in EU labour markets, which was seen to be driven primarily by skill-biased technological progress leading to the replacement of workers carrying out routine tasks by machines and processes and, hence, a reduction in the employment share of routine middle-skilled workers. At the same time, however, job opportunities for non-routine manual workers such as housekeeping, hair dressing, gardening etc. remained strong, as discussed in Section 3.2.

The associated process of globalisation led initially to a displacement of the less knowledge-intensive industries from the EU towards those regions of the world where low-skilled workers were plentiful and where wages were low relative to productivity, with a negative impact on the employment share of the low skilled in sectors producing goods and services traded on international markets, such as textiles – as discussed in Section 3.1.

The combination of globalisation and technological progress over this period also affected parts of the production

Chart 21: Average annual change in absolute employment by wage quintile and sector, EU, 1998–2010 (thousands)



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process *within* enterprises through the outsourcing of various activities, often primarily affecting those employed under temporary contracts – see Section 3.2.3.

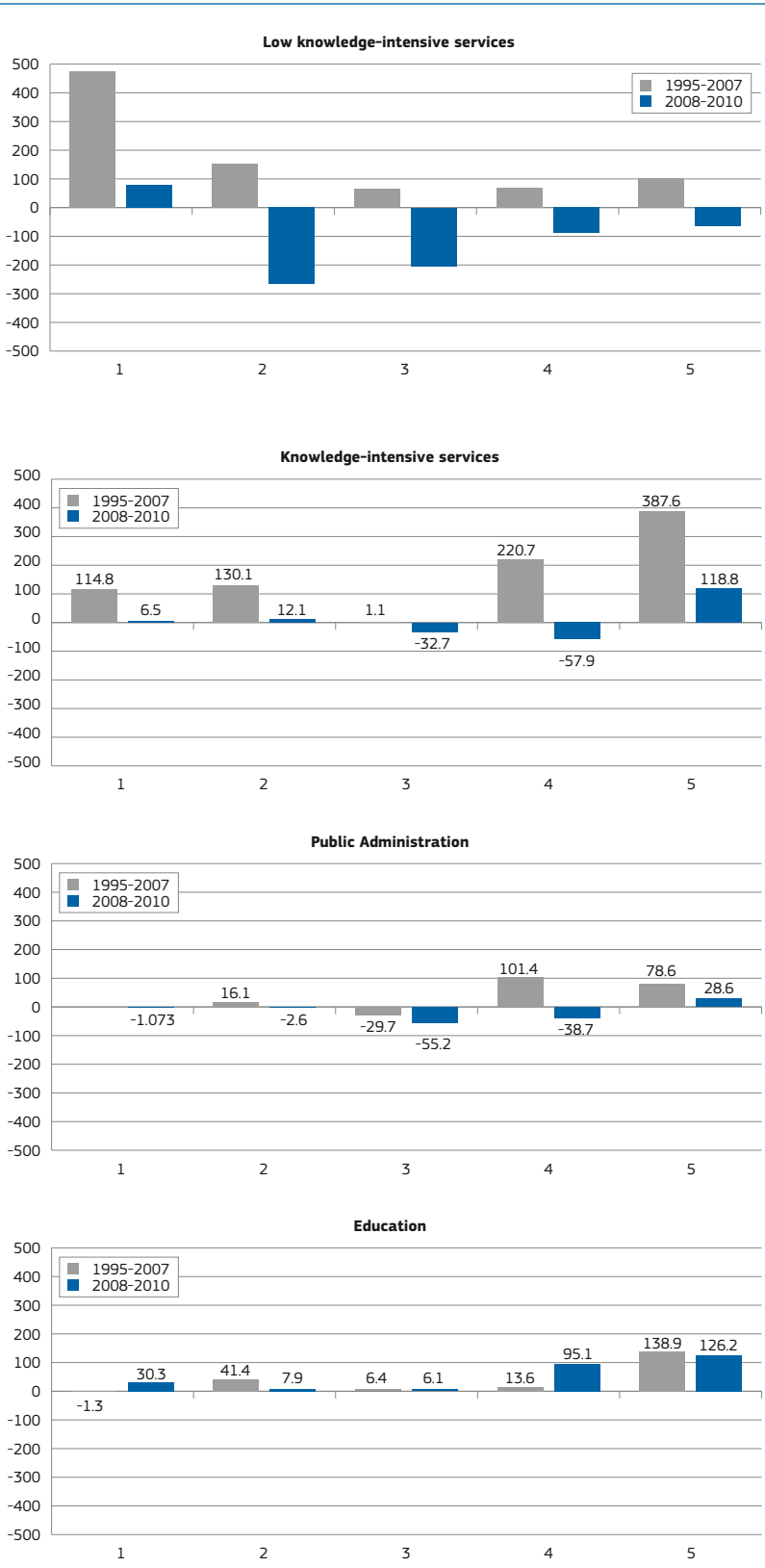
... and labour market institutions ...

Since the onset of the crisis, however, there appears to have been an acceleration in this labour market polarisation which may also be partly attributable to the effects of negative changes in those institutional arrangements that had served to protect or support lower income workers such as minimum wages, collective wage bargaining, unemployment benefit levels at the same time as low wage employment opportunities are being promoted. See Eurofound (2013).

For instance, minimum wages prevent bidding on wages below subsistence level, especially when bargaining positions are unequal. Nevertheless, very high minimum wages may price out the young and low-skilled groups from legal employment.

Centralised wage-setting institutions and higher trade union density tend to compress wages, to the advantage of those at the bottom. See, for instance, Pontusson, Rueda, and Way (2002), Wallerstein (1999) and European Commission (2008e).

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The unemployment benefit is an important part of the social safety net, supporting the most vulnerable groups in hard economic times. It may improve labour market matching insofar as it provides unemployed people with the time to find appropriate work rather than take the first job available. It may also strengthen the bargaining position of lower-paid workers. However, unemployment benefit systems should be designed in a way that the unemployed have an incentive to return to employment.

... as well as other factors

While globalisation, technological progress and changes in labour market institutional arrangements may be the most important drivers of growing labour market polarisation⁽¹¹⁷⁾, they are not the only factors at work.

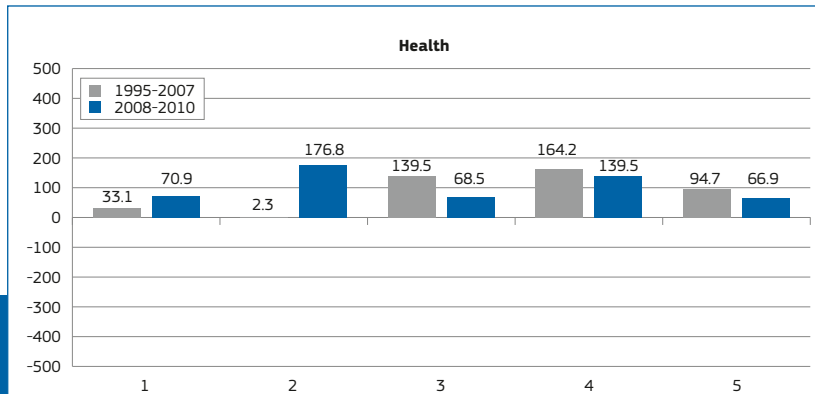
In situations where relative rather than absolute performance determines the earnings (as is the case, for example, for top athletes, musicians, and CEOs in financial services), the link between absolute productivity and wages is very unclear, giving rise to levels of wage dispersion that far exceed productivity differentials. See, for example, Dew-Becker and Gordon (2006).

Likewise, in enterprises with strong price-setting power in their product markets, this may enable employees to share in the rents⁽¹¹⁸⁾ of the firm, as presented in, for example, Oi and Idson (1999) and Stiglitz (2013).

Furthermore, studies show that older workers enjoy a wage premium compared to those who are younger, as do men compared to women. See, for instance, RWI (2011). To the extent that this reflects persistent discrimination, it can discourage labour market participation among these groups. See, for instance, Koske *et al.* (2011).

⁽¹¹⁷⁾ See, for example, Nelson (2013).

⁽¹¹⁸⁾ I.e. compensation of a production factor in excess of its opportunity cost.



Source: Eurofound (2013) available at <http://www.eurofound.europa.eu/emcc/ejm/summary.htm>

Note: No data for BG, MT, PL or RO.

At the same time, it has to be recognised that demand for personal services and low paid tasks such as housekeeping, cleaners or waiters are increasing as the number of high income earners increase, as is also apparent with demand for basic services for older and for disabled people under the impact of demographic changes. See, for example, Mazzolari and Ragusa (2013).

In addition, as labour market participation of women increases, there is also rising market demand for undertaking household services that were previously carried out unpaid within the household. See, for example, Mason and Salverda (2010).

4.2. Absence of structural reforms

The previous sections considered the drivers of future job potential as well as obstacles raised by the current economic downturn. However the realisation of the EU's full job potential also depends on the implementation of

structural reforms of the kind outlined in the Europe 2020 Strategy for smart, sustainable and inclusive growth, and this section discusses some of the structural reforms expected to have an important impact in this respect ⁽¹¹⁹⁾.

4.2.1. A dynamic and inclusive European labour market

An important contributor to the full realisation of the job potential by 2020 is the development of flexible labour markets across the EU in which workers are not only helped to change jobs or to get back into work, but also encouraged and enabled to invest in their skills and made aware of the benefit to be gained from the free movement opportunities offered by the EU internal market – see the European Commission (2012a).

Realising future job potential by ...

Part of the process of realising future job potential involves the effective and

efficient movement of workers out of declining enterprises and sectors and into expanding ones. Social dialogue can play an important role in this respect. In 2010, the European social partners at cross-industry level concluded a framework agreement to promote inclusive labour markets ⁽¹²⁰⁾.

However there are serious obstacles in the way at both national and sectoral level with job vacancy levels varying enormously across both sectors and Member States.

- On average, the job vacancy rates in business services are highest, with very high rates in Germany (7.6%) in 2012, followed by Belgium (3.8%) and the Czech Republic (3.5%), while the lowest job vacancy rates are to be found in Bulgaria (0.2%), Latvia (0.3%), Slovakia (0.4%) and Romania (0.4%).
- At the same time, the job vacancy rate in the information and technology sector is strongest in Belgium (4.2%), followed by the Netherlands (3.0%) and Germany (2.6%). At the lower end are Bulgaria (0.3%), Slovakia (0.4%), Slovenia (0.4%), Romania (0.4%) and Cyprus (0.4%).
- On average, the job vacancy rate in industry is lowest, i.e. ranging from UK (1.5%) and Belgium (1.4%) to Latvia (0.2%) and Portugal (0.3%).

These imbalances in terms of job opportunities are seen to reflect a variety of structural shortcomings in European labour markets, as presented by the European Commission ⁽¹²¹⁾.

⁽¹¹⁹⁾ Note: this chapter does not address the potential benefits of wider economic reforms such as banking union, fiscal union, etc.

⁽¹²⁰⁾ See http://ec.europa.eu/employment_social/dsw/public/actRetrieveText.do?id=8850

⁽¹²¹⁾ Including a lack of occupational and geographical mobility, as well as unemployment benefits that discourage workers to take up a job. See, for instance, Hobijn and Şahin (2012).

... strengthening geographical ...

In this context, the limited and weak geographical mobility of workers has been identified as a significant contributor to this mismatch. See, for instance, MKW and Empirica (2009). In this context a number of factors have been identified that could improve mobility, including addressing the portability of pensions, the tax treatment of cross border workers, as well as maximising access to EU-wide vacancies (as is envisaged in the further development of EURES, see European Commission (2012d))⁽¹²²⁾.

Geographical mobility has to take place in compliance with EU legislation concerning the national legal framework to be applied, in particular Regulation 593/2008/EC (Rome I) on the law applicable to contractual obligations and the Posting of workers directive 96/71/EC. The exercise of the basic freedoms of movement of people and services should take place within the channels of EU and national legislation to avoid the working conditions of the most vulnerable workers being negatively affected. All too often competition not only takes place between workers and markets of emitting and receiving Member States (MS) (home and host countries) but between legal systems, including by the use of those of third Member States with “convenience” legislations. This can give rise to situations where EU law is infringed.

... as well as occupational mobility ...

Given the scale of the challenge, occupational mobility in 2020 is still expected to be held back, to a large extent, by weaknesses in processes and support for skill formation. Even without this, however, occupational mobility could still be improved by 2020 through a further reduction in barriers such as those that prevent or discourage female workers from pursuing further education, training or job opportunities in the areas of science and technology, or those that confront young people with disabilities, people with learning difficulties, and immigrants.

Furthermore, as the European population ages, it will become increasingly important to assist and encourage

occupational mobility among older workers so that they can move to jobs adjusted to their capabilities, and limit early labour market exits for health or other reasons.

... as well as better balancing supply and demand in the labour market ...

Several reforms outlined in the Employment Package⁽¹²³⁾ have yet to be implemented to create the framework conditions to exploit the job potential to the full, including the following: targeting subsidies to new hiring; reducing the tax on labour while ensuring fiscal sustainability; promoting and supporting self-employment, social enterprises and business start-ups; transforming informal or undeclared work into regular employment; boosting ‘take home’ pay, as well as modernising wage-setting systems so that wages are better related to productivity developments.

Such reforms will have an important impact on the distribution of job opportunities. For example, not only could the expansion of employment in social enterprises⁽¹²⁴⁾ have a direct impact on job potential, but also an indirect effect insofar as it leads to more effective labour market reintegration and rehabilitation of long-term unemployed people and others on the margins of the labour market – see Box 5.

... in a sustainable way

A more inclusive labour market is seen as a necessary precondition for exploiting future job potential in a sustainable way. The Employment Package, for example, argues that this objective can be realised more effectively and rapidly by labour market reforms that encourage internal flexibility within companies; encourage decent and sustainable wages; make job transitions pay; reduce the labour market segmentation between those in precarious

employment and those on more stable employment; anticipate economic restructuring; develop lifelong learning and active labour market policies; deliver youth opportunities and the youth employment package; reinforce social dialogue; and reinforce public employment services.

In this light, it will also be seen as necessary to invest in social services, that cover, inter alia, investments in health and equal access to healthcare for all, the provision of individualised reintegration services for jobless people (especially the long-term unemployed, and vulnerable groups), as well as better access to quality early-childhood education and care – as described in the Social Investment Pact. In all these respects, appropriate dialogue with civil society and the social partners is seen to be necessary in order to ensure success.

4.2.2. Product market reform

Further deepening of the single market ...

The further integration, or deepening, of the European single market is an important part of the structural reform needed in order to fully realise the Union’s job potential. In this respect, the continued fragmentation of many markets in the EU, due to legal, technical and physical barriers, is seen as a serious impediment.

Several key action areas have been identified, including the development of fully integrated European networks for energy and transport, fostering of the mobility of citizens and businesses across borders, support for the digital economy across Europe, and the strengthening of social entrepreneurship, cohesion, consumer confidence and non-discrimination – see European Commission (2012y).

... will create job opportunities

Market deepening will affect the employment potential in various ways, including new jobs being created by the investments needed to build new infrastructures and operate and maintain existing infrastructure. However, while the former effects are expected to generate the strongest employment effects, it is also necessary to recognise that they will diminish once the infrastructure becomes fully operational.

⁽¹²²⁾ For more details on EURES, see <https://ec.europa.eu/eures/home.jsp>

⁽¹²³⁾ See European Commission (2012a).

⁽¹²⁴⁾ ‘A social enterprise is one whose main objective is to achieve a social objective rather than make a profit for their owners or shareholders. It operates by providing goods and services for the market in an entrepreneurial and innovative fashion and uses its profits primarily to achieve social objectives. It is managed in an open and responsible manner and, in particular, involves employees, consumers and stakeholders affected by its commercial activities.’ See, COM/2011/0682 final at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52011DC0682:EN:NOT>

Box 5: Jobs in social enterprises

Social enterprises ...

Social enterprises are present in almost every sector of the economy, including banking, insurance, agriculture, craft, various commercial services, and health and social services, etc., see Defourny and Nyssens (eds., 2008). In 2012, social enterprises covered more than 11 million jobs in over 2 million enterprises ⁽¹⁾, with membership of social economy enterprises estimated as high as 160 million.

... promote current job opportunities ...

Social enterprises are particularly important in terms of providing job opportunities for people who have difficulty finding work in private, profit-maximising enterprises; for example, a second-hand clothes shop employing disabled people to collect, sort, clean and resell its goods.

A specific characteristic of social enterprises is that they can create sustainable jobs for women, young, elderly, disabled people, those with mental health problems, ex-offenders, etc. Moreover, an important feature of social enterprises is that they pay special attention to the development of skills and human capital.

... as well as future ones ...

Social enterprises are also distinguishable from private, profit-maximising enterprises insofar as they supply services and goods such as the provision of early childhood education and care for families from a disadvantaged socio-economic background, such as migrants, Roma, low-skilled parents, thereby improving access to education and reducing the risk of leaving school early – an important condition for promoting future employability.

... in a resilient way

Jobs in social enterprises have also showed themselves to be more resilient to the economic crisis as a result of their long-term focus, with shareholder control being in the hands of worker members, and with strong internal flexibility in terms of hours worked or pay in order to maintain jobs.

Nevertheless, success in exploiting the potential by the non-profit private sector requires financial support and regulations that set conditions and standards for the provision of social services. See, for instance, Sirovátka *et al.* (2011).

⁽¹⁾ With 70% employed in non-profit associations, 26% in cooperatives and 3% in mutual.
See <http://ec.europa.eu/enterprise/policies/sme/promoting-entrepreneurship/social-economy/>

At that point, employment gains can be expected from the effects of lower entry barriers to markets which will strengthen competition and innovation, reduce price mark-ups ⁽¹²⁵⁾ and ensure the efficient allocation of labour, as well as the other production factors, although success here may reduce the incentive for outsiders to enter the market, hence reducing the pressure on incumbents to innovate. See, for instance, Roeger *et al.* (2008).

The further liberalisation of the cross-border provision of services and the free establishment within the EU (especially in the case of services) will reduce administrative burdens ⁽¹²⁶⁾, encourage foreign direct investment, facilitate access to finance (especially for SMEs), and simplify public procurement. Such progress is seen to especially benefit employment in small and medium sized enterprises, which will experience

a strong disproportional reduction in business burden.

Estimating these employment effects is not straightforward – partly because its full transposition is not yet completed. See, for instance, Monteagudo *et al.* (2012) – but some indications of the strong job potential of such structural reform can be seen in the available research. See, for instance, Box 6.

⁽¹²⁵⁾ Rents measure the difference between price and marginal cost.

⁽¹²⁶⁾ Inter alia by setting up of eGovernment portals for businesses ('Points of Single Contact') and dismantling unnecessary red tape. See, for instance, Monteagudo *et al.* (2012).

Box 6: Illustrative scenarios of product market reform

Further deepening the Single Market could have a significant potential to increase the EU's job potential by 2020, as the following projections illustrate ⁽¹⁾.

Opening markets for network industries

Regulatory reforms aimed at further opening of markets for network industries (e.g. electricity, gas) are expected to generate important employment effects. See, for instance, European Commission (2007b).

Indeed, increased competition (via the entrance of new enterprises in open markets), would put downward pressure on the (relative) price of the output of the network industries – provided output is not subject to increasing returns to scale which may be the case for network industries.

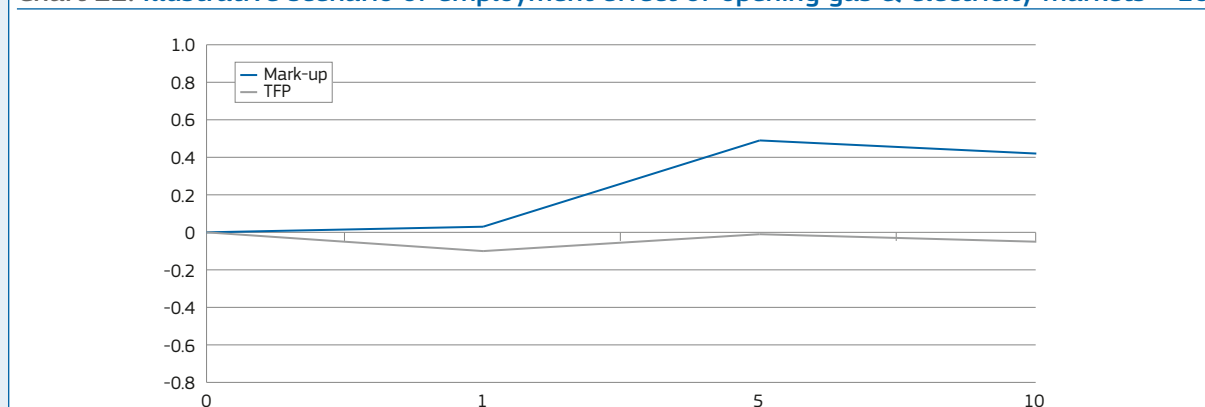
In response to such price decreases the network industries would be driven to reduce either their profit margins or production costs.

A reduction in profit margins would not have a direct impact on employment in the network industries in the short run, but it would make investment in these industries less attractive in the medium term. A reduction in production costs could be established by either increasing productivity or reducing the cost of the production factors, with increased productivity inducing a decrease in the sector's demand for labour in the medium term.

At the macro-level, lower prices would reduce the production cost for industries that use the network industries' output (such as electricity), as a consequence of which, they may gain in international cost-competitiveness, which would have a positive impact on employment. Domestic demand might receive a stimulus as lower prices for goods and services of the network industries increase real disposable household income. However, increases in productivity might also lead to a decrease in employment, thereby depressing domestic demand.

Chart 22 provides an illustrative scenario, using a general equilibrium model, that captures the above outcomes and the complex adjustment processes. The lower boundary describes the case that all adjustment occurs through changes in productivity, while the upper boundary shows what happens when the whole adjustment is achieved through changes in profit margins. On this basis, the chart indicates how the realisation of a truly European network for transporting energy could create around 775 000 extra jobs in the period between 2011 and 2020.

Chart 22: Illustrative scenario of employment effect of opening gas & electricity markets – EU



Source: DG EMPL calculations based on European Commission (2007).

Cuts in cost of public procurement

While the use of public procurement processes have grown rapidly in recent years in order to benefit from competition and combat concerns of corruption, the cost of the procurement process to bidders can amount to a high percentage of the total value of a contract. For example, the European Commission (2011b) reports that the costs of tendering range from between 18 and 29% of the contract value for a tender of €125 000, and between 6 and 9% of tenders of a median value contract (i.e. €390 000).

Reforms aimed at increasing competition in public procurement (such as the use of standardised electronic invoicing) may produce a cut in suppliers' mark-up charges. Such cost savings can then be recycled in several ways, affecting employment as well as output.

For example, Vogel (2009) estimates ⁽²⁾ that, if these cost savings are used for the reduction of labour income taxes, it would have the potential to increase employment between 0.14% and 0.65% after 10 years (depending on the range of public procurement on which cost savings can be realised) ⁽³⁾. However, an inelastic labour supply (for example as a result of inadequate skill formation) might reduce this employment gain very substantially (to just 0.06%).

⁽¹⁾ Estimates of the impact of the service directive are to be found in for example Copenhagen Economics (2005), Aussilloux *et al.* (2011), Weber and Juergen (2008), and Monteagudo *et al.* (2012) which estimate the job gains of the full implementation of the Services Directive at roughly 600 000 jobs.

⁽²⁾ Based on Europe Economics (2006) which reports (based on survey data) that there is scope for decreases in contract values in public procurement within a range between 6 and 24% – varying across sectors and industries.

⁽³⁾ Recycling the procurement cost savings by cutting capital taxes or public investment would increase employment respectively by 0.01 and 0.02%.

5. WHAT WILL NEW JOBS LOOK LIKE?

The previous sections indicated where new jobs are likely to come from, and those insights have been used to build scenarios and investigate what their employment effects will be.

Box 7 briefly summarises the findings from sectoral and occupational projections made elsewhere by researchers, while this section explores the extent to which the job panorama is likely to be characterised, not only by a different age, gender, occupation and skills profile compared to the present, but also

by changes in work content and work organisation ⁽¹²⁷⁾.

⁽¹²⁷⁾ The following sub-sections are based on the previous analysis as well as, inter alia, MGI (2011a), MGI (2012b), the Economist Intelligence Unit (2010), Carey (2008), Karoly *et al.* (2007), Schaffers *et al.* (2006), Talwar and Hancock (2010), Eurofound (2012d).

Box 7: Changes in job composition – projections

This box summarises changes in employment composition between 2010 and 2020. These projections are obtained using econometric and statistical models – see Cedefop (2013a).

Sectoral composition

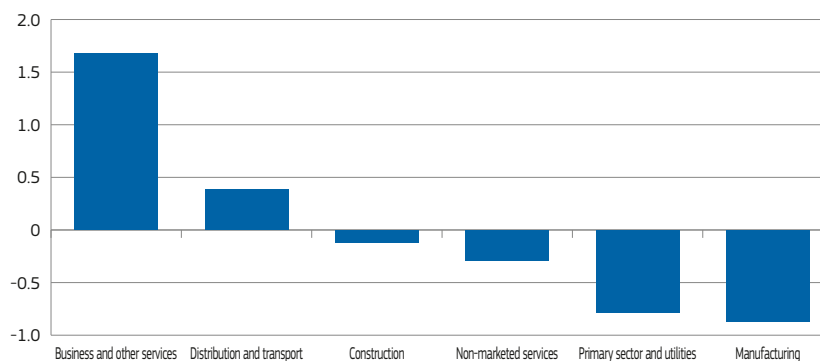
Chart 23 shows a relatively strong increase in employment in the business service sector, alongside notable decreases in both manufacturing and the primary sector between 2010 and 2020.

These projections are in line with the qualitative assessment of the trend developments discussed in the previous sections. Indeed, on the supply side, technological progress and further globalisation is foreseen to reduce the demand for labour in manufacturing and agriculture, while it will increase the demand for business services.

Occupational composition

Chart 24 shows a relatively strong increase in the share of technicians and associated professionals (covering highly-skilled occupations such as associate professionals in physical and engineering science, life science and health, teaching, finance and business sectors, as well as public administration) between 2010 and 2020.

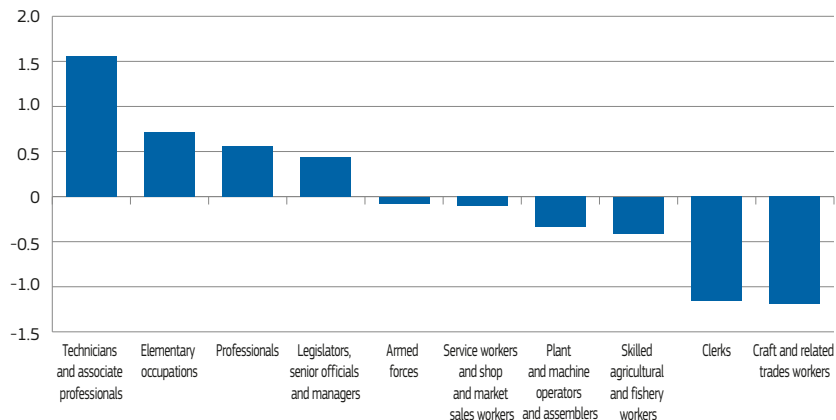
Chart 23: Percentage point changes in sectoral shares in EU: 2010–20



Source: DG EMPL calculations based on CEDEFOP (2013a).

Notes: Percentage point change (pp) in the shares for 9 occupation aggregates. Baseline projection.

Chart 24: Percentage point changes in shares for occupations in EU: 2010–20



Source: DG EMPL calculations based on CEDEFOP (2013a).

Note: Percentage point change (pp) in the shares for 9 occupation aggregates. Baseline projection.

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5.1. Job profiles in 2020

On the basis of the evidence that has been reviewed, a number of developments can be foreseen with regard to the characteristics of EU jobs in 2020:

- The **average age of the labour force** is expected to have increased – provided effective active ageing policies are implemented, thereby creating the incentives for older workers **to participate more** in the labour market and **retire later** – see Section 3.3 of this chapter.
- The **gender profile** of the EU labour force is expected to have become **more balanced**, as more women are expected to participate in the labour market – see Section 3.3.
- The **employment rate of the young is likely to have increased**, provided institutional obstacles to hiring young people are removed and young people's skills become more in line with labour market requirements – see Section 3.3.
- Labour market participation of people with **disabilities** is expected to be higher due to the availability of technologies that allow workplaces and work organisation to be better adapted to their capabilities.
- The employment share for the **knowledge-intensive sectors** is expected to have increased in line with the full realisation of the EU's **comparative advantages in world markets**.
- A **shift to labour intensive sectors** such as health care and personal care is expected to have been established in order to meet the new demands stemming from demographic change and from the need to strengthen social cohesion – see Sections 3.3 and 6.2. Such a shift will also occur as the renewable energy sector gains market share – see Section 3.4.
- A shift of employment opportunities for the **low-skilled towards the non-tradable sectors** under the pressure of globalisation (in combination with technological progress and a further deepening of the Single Market) is likely to be seen.

- **Non-routine tasks** that require **highly-skilled workers** (such as provision of specialised health services) as well as non-routine tasks that require **low-skilled manual workers** (such as cleaning, child care, hairdressing) are expected to become ever more important by 2020 – see Section 3.2.
- The share of **self-employed** is expected to increase as start-up costs decrease, especially for web entrepreneurs.
- The share of **voluntary temporary contracts** (e.g. freelancing) is expected to increase to meet the flexibility of the emerging apps-economy.
- **International experience, cultural awareness** and communication skills, are likely to be highly valued as global value chains expand.
- Some Member States are expected to exploit their potential to **catch up** with the Member States at the cutting edge in the field of technological progress.
- More **job rotation within as well as between enterprises for the average worker** which may, however, adversely affect their loyalty to their enterprise as well as the incentive to acquire firm-specific skills.
- **Working conditions** to be better adapted to the needs of older and female workers, including more flexible working time, better child care and elderly care facilities, etc., possibly leading to a more widespread use of part-time, and work-from-home employment.
- A greater use of **'drop-in' workplaces** with fixed desks for only a small percentage of staff.
- Possible **increases in work pressures/stresses** due to demand for enhanced availability at any time from any geographical place, although this may also provide opportunities for a better **balance between professional and private life**.
- Greater job and career uncertainty over the longer term due to stronger **outsourcing** within as well as beyond European borders.

All in all, job profiles are expected to undergo profound changes as new needs have to be met and new technologies become available by 2020. Box 8 provides an illustrative scenario of the effects of such developments on job potential in the health sector.

5.2. Work organisation in 2020

A review of available research⁽¹²⁸⁾, suggests that the organisation of work is expected to be affected along the following lines.

- A continuing call for more **training and skill formation** in technical as well as managerial occupations.
- **Stronger synergies** between occupational profiles such as, for example, between construction and renewable energy sectors.

⁽¹²⁸⁾ Generally based on findings from the periodic Eurofound surveys of working conditions at <http://www.eurofound.europa.eu/ewco/surveys/>, as well as MGI (2011a), MGI (2012b), the Economist Intelligence Unit (2010), Carey (2008), Karoly *et al.* (2007), Schaffers *et al.* (2006), Talwar and Hancock (2010).

- A partial shift to **virtual work sites** driven, inter alia, by social media and cloud computing, with the potential for less bureaucratic work environments.
- More **autonomous** work groups with **more responsibility**, especially in high knowledge and technology intensive activities.
- Changes in the **distribution of costs of home and mobile working** that will need to be addressed in contractual relationships between employers and employees, including costs for mobile phone charges, teleconferencing costs, remote connection, home furnishing, etc.
- **Shorter job vacancy spells** because of more efficient job search tools.
- Increased job uncertainty but **increased employment certainty** over the life cycle provided that labour market reforms along flexicurity lines are implemented.

Box 8: Jobs in the health sector by 2020

The EU health sector has the highest employment level and the steepest growth – see Annex 2 – but with future job opportunities subject to developments on both the supply and demand side.

Technological innovations on the supply side ...

New jobs will be created and old ones will disappear or be transformed under pressure of technological innovations (including pharmaceuticals, equipment and techniques), and of changes in care delivery systems (including shifts from care in hospitals to primary care closer to home). See, for instance, Dussault *et al.* (2010) and European Commission (2012v).

More particularly, by 2020, jobs in the health sector are expected to be particularly affected by developments in e-health, i.e. the provision of healthcare services supported by ICT processes ⁽¹⁾ although this outcome will be largely driven by the need to increase cost effectiveness in the health sector ⁽²⁾.

Furthermore, to the extent that technological progress allows less technical tasks to be carried out by highly-skilled service providers, there will be some scope for the creation of jobs for middle-skilled workers. See, for instance, MGI (2011a).

...and structural changes on the demand side ...

Rising demand for health services (in combination with more individualised services) is driven by both rising average income and an ageing population.

In terms of the income effect, health care is a service for which demand increases more than proportionally as income rises and, once the European economy re-establishes a pattern of sustainable and inclusive growth, demand for health services is expected to increase, generating employment growth ⁽³⁾.

In terms of an ageing population, this will also affect the demand for health care with, for instance, a stronger emphasis on chronic diseases, social care and end-of-life needs. See, for instance, Dussault *et al.* (2010). Moreover, in combination with ongoing changes in family structures (notably single parent families), households may be less able to respond to the care needs of older people, thereby strengthening the shift towards care provision by professional service providers.

... but constrained by working conditions, ...

Nevertheless, the realisation of this job potential may be constrained, not least by the fact that employment in the health sector is characterised by demanding working conditions in combination with moderate pay (in some health occupations).

Employed persons in the health sector are exposed to a broad range of risks (especially biological, musculoskeletal, psychosocial and chemical risks), as well as harassment and violence at work from patients and their relatives. See, for instance, European Commission (2010g). In addition, working conditions in the health sector are demanding, as they rely, for instance, on intense use of night and shift work ⁽⁴⁾. Exposure to these additional risks makes employed persons prone to a high accident rate (compared with similar jobs in other sectors) – see Annex 2.

Moreover, based on current trends, the health sector labour force is expected to continue to age, and this will require changes in working conditions in order to fully realise the job potential of the sector.

Furthermore, within the health and social work sector, there are significant differences in earnings – see Annex 2. In 2010, for the EU as a whole, women as well as men with a basic education earned just above half the average earnings in the sector, while the highest earnings were received by men with tertiary level education who received 50% more than women with the same education level.

... lack of financial resources...

Health services involve significant costs that have to be financed either through public funding from taxation, private funding from incomes or insurance, or a combination of the two.

However, from a macro-economic perspective, it is important to recognise that these 'costs' are also the income of service providers and that a good health service (along with good education) is a necessary (if not sufficient) condition to have a productive workforce and active older population (because of fewer absences due to illness, less need for treatment, less disability, etc.). Moreover, health services is one of the most innovative sectors providing additional stimuli to overall productivity growth.

However, to the extent that health care costs are paid through taxation, these taxes may have a negative impact on people's decision to participate in the labour force with adverse effects on aggregate employment and economic efficiency. By contrast,

⁽¹⁾ It should be noted that projecting the future employment potential of eHealth is hindered by the limited availability of specific cases. See, for example, Dobrev *et al.* (2009). Nevertheless, in qualitative terms it can be conjectured that this emerging field of activity will not only create jobs (with higher labour productivity) needed for operation and maintenance (in a cost-effective way), but also jobs in the field of research and innovation –potentially creating a leadership role in world markets.

⁽²⁾ Joint Report on Health Systems, the European Commission and the Economic Policy Committee (AWG), 2010, http://ec.europa.eu/economy_finance/publications/occasional_paper/2010/op74_en.htm

⁽³⁾ To the extent that productivity improvements do not offset job creation.

⁽⁴⁾ Symptomatic for these severe working conditions is for example that a significant number of women do not return to work in the sector following childbirth because of difficulties expressed in reconciling work and family life – see, for instance, Eurofound (2011) and European Commission (2010g).

if the financing is exclusively carried by private health insurance these high premium payments may have a negative impact on people's ability to participate in the labour market – especially in the case of people at the margin with poor health – with adverse effects on aggregate employment, economic efficiency and social cohesion.

... *and skills and competences.*

By 2020, the development of newer, more integrated, care delivery models (e.g. care provision closer to home for elder patients) and new technologies, new medical appliances and diagnostic techniques will require new skills and competences, while the expansion of e-health (e.g. distant diagnostics services) can trigger new ways of working in the health sector. See, for instance, European Commission (2012i) and Matrix insight (2012).

As a consequence, realising the job potential of the health sector to its fullest extent will then require better synergies between education/training providers and employment. At the same time, skill matching in individual Member States or regions may also be affected by the migration of health professionals to areas that offer better wages and working conditions. See, for instance, Rechel *et al.* (2006).

- More people will take up **stronger responsibilities** early on in their career.
- There will be more intensive use of **video-communication**.
- **Globalised supply chains** will put stronger emphasis on **unit labour costs** in the location of economic activity.
- **Effective workers' participation** and **social dialogue** may need to develop, and even intensify, in new ways in order that employers and employees address common challenges together.

With respect to the above, cloud computing⁽¹²⁹⁾ (in combination with social networks and collaborative software programmes⁽¹³⁰⁾) is expected to be particularly important in terms of future developments in work organisation and job opportunities. See, for instance, Box 9.

5.3. Job quality in 2020

All the prospective developments described above are also expected to impact on job and employment quality.

Labour productivity is expected to increase insofar as globalisation and technological progress allows Member States to better exploit their comparative advantages in world markets, which will provide the opportunity to increase the real wages of workers. Moreover, technological progress has the potential to facilitate a better balance between private and professional life and improve the scope for adapting working conditions to the specific needs of different groups of workers.

Nevertheless, in the absence of labour market reforms according to flexicurity principles, the reallocations of labour

could create pressures that have an adverse impact on job quality. For example, Eurofound (2012c) reports that life satisfaction is strongly and negatively associated with job displacement. However, those who are displaced and find a new job are significantly better off than those who remain jobless, which underscores the importance of activation policy for employees. Furthermore, while globalisation and technological progress bring potential benefits, they also carry the risk for workers being pressured to be continuously available which can be detrimental in terms of work-life balance.

In addition, there is no guarantee that, in the absence of policy action, the overall gains from future developments will be distributed in an equitable way in line with the objective of the social cohesion target of the Europe 2020 Strategy, underlining the continuing need for effective social dialogue.

⁽¹²⁹⁾ According to the official US National Institute for Standards and Technology definition, "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." See <http://www.nist.gov/itl/csd/cloud-102511.cfm>

⁽¹³⁰⁾ See, for instance, Bayrak *et al.* (2011) and Beblavy *et al.* (2012).

Box 9: Virtual workplaces

Cloud computing is expected to affect job opportunities via several channels, including the creation and maintenance of its infrastructure ⁽¹⁾ as well as through its impact on the working of product and labour markets.

Competitive pressures in product markets will strengthen ...

With cloud computing individual enterprises will no longer need heavy investments in ICT infrastructure at the start of their activities as they can spend on ICT in line with their production needs. As a consequence, cloud computing should lower entry barriers for enterprises (and self-employed people). See, for instance, Etro (2009) and Liebenau *et al.* (2012).

Lowering entry barriers will increase competition (in sectors where fixed ICT spending is crucial), which will, in turn, reduce price mark-ups and increase production thereby creating additional job opportunities. See, for instance, Etro (2009).

Nevertheless, although technological progress will affect future employment via its initial impact on competition, the causality may also run in the opposite direction in the sense that increased competition creates the incentives to enhance cloud computing. Such interactions may then give rise to a virtuous circle between innovation, competition and job creation.

Cloud computing is also expected to affect cost structures of enterprises by providing cushions for handling short term peaks in seasonal demand, and reducing the time to market for goods and services, etc. See, for instance, CEBR (2010a and 2010b). Such cost-savings may then lead to stronger international cost competitiveness of enterprises, with a potentially positive impact on the job potential of these enterprises.

... as well as enhance labour market flexibility ...

As cloud computing reduces search cost for both employee and employer, it also has the potential to improve job matching thereby increasing both the quantity and quality of future jobs. Moreover, for self-employed people, the start-up costs for ICT infrastructure will be reduced, which will have a positive impact on future job creation.

... while cloud computing will also affect the organisation of work ...

Cloud computing is expected to lead to a more fragmented organisation of tasks with an impact on the 'coherence' of the total workforce although the impact of this on productivity is less clear.

On the one hand, to the extent that 'team-spirit', enhanced by physical interaction, affects positively productivity growth, the creation of virtual teams connected by cloud computing may carry a downside risk for productivity growth.

However, cloud computing creates opportunities for shifting less efficient firm-based data handling tasks to more efficient data centres, which will have a positive impact on productivity. Furthermore, to the extent that efforts of workers at a distance cannot be observed in a direct way, a change in payment schemes may arise. Finally, outsourcing obviously carries the risk that tasks can be outsourced to areas with lower unit labour costs.

... provided that barriers to take-up of cloud computing get removed.

Realising the job potential of cloud computing to its fullest extent requires the removal of several barriers that may limit its use, including the limited level of harmonisation in the digital content and electronic communications, the complexities of multiple jurisdictions, the lack of standardised contracts, differing requirements regarding safety, security and reliability, together with incomplete information, for example on the location of data centres. See European Parliament (2012) for a comprehensive overview.

⁽¹⁾ However, as the location of cloud computing infrastructure will be determined to a large extent by energy costs, there may be pressure for localisation of infrastructure in places with low energy costs, see Liebenau *et al.* (2012), resulting in an uneven territorial distribution of job opportunities. Furthermore, in order to reach the full job potential it is also necessary that workers have adequate ICT skills to operate cloud computing platforms.

6. SKILL FORMATION AND DEMOGRAPHY

Future labour market outcomes will be influenced, to a large extent, by structural changes driven by globalisation, technological progress, the greening of the economy, and demographic change. These developments will create new job opportunities, including in the green, social and ICT sectors, and will give rise to new forms of work organisation (including

decentralised decision taking, just-in-time operation, job rotation, teamwork and multitasking). See, for instance, European Commission (2008b).

Nevertheless, it is to be expected that the supply of skills will not automatically match the profiles of these new jobs, not least due to imperfect information and structural rigidities in European labour markets. However, mismatches can be tackled and limited by promoting a better

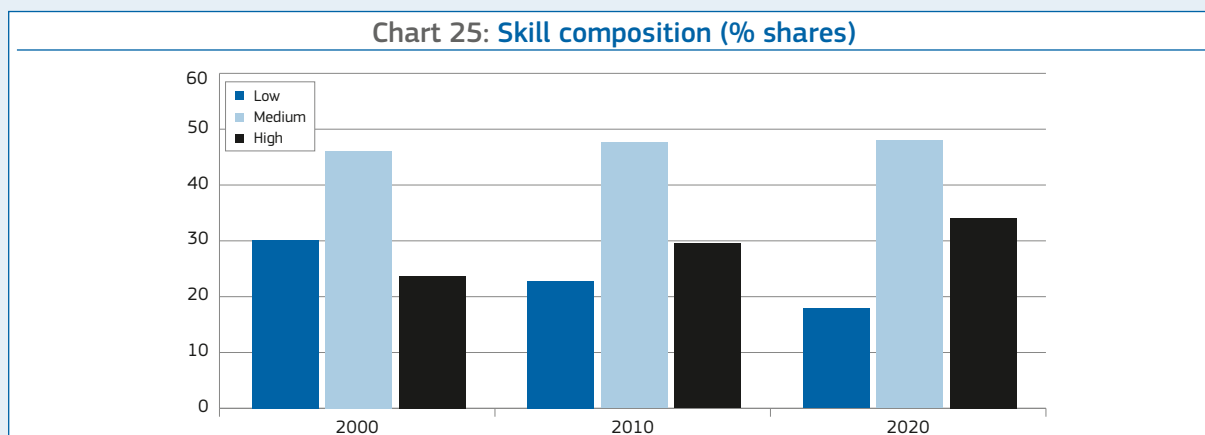
anticipation of future skills needs, developing a better matching between skills and labour market needs, and bridging the gap between the worlds of education and work skill levels and its composition – as discussed in the ‘The New Skills for New Jobs’ initiative under the Europe 2020 Strategy.

Box 10 provides projections of developments in skill composition – based on Cedefop (2013a and 2013b).

Box 10: Skill composition by 2020

Important changes in skill composition at the EU level as a whole ...

Chart 25 summarises a projection of the skill composition in the EU by 2020 (as well as skill composition in 2000 and 2010), see Cedefop (2013) ⁽¹⁾. It indicates how the share for the low skilled is expected to decrease while the share of the highly skilled is expected to increase ⁽²⁾. In line with this development, Cedefop projects that the share of highly-skilled jobs will increase: from 41.9% of EU-27 employment in 2010 to 44.1% in 2025 (Cedefop 2013b, p. 2). That is, future skills needs move in the direction of higher educated and better skilled workers.



Source: DG EMPL calculations based on CEDEFOP (2013a).

Note: Baseline scenario.

... but differences across Member States will persist

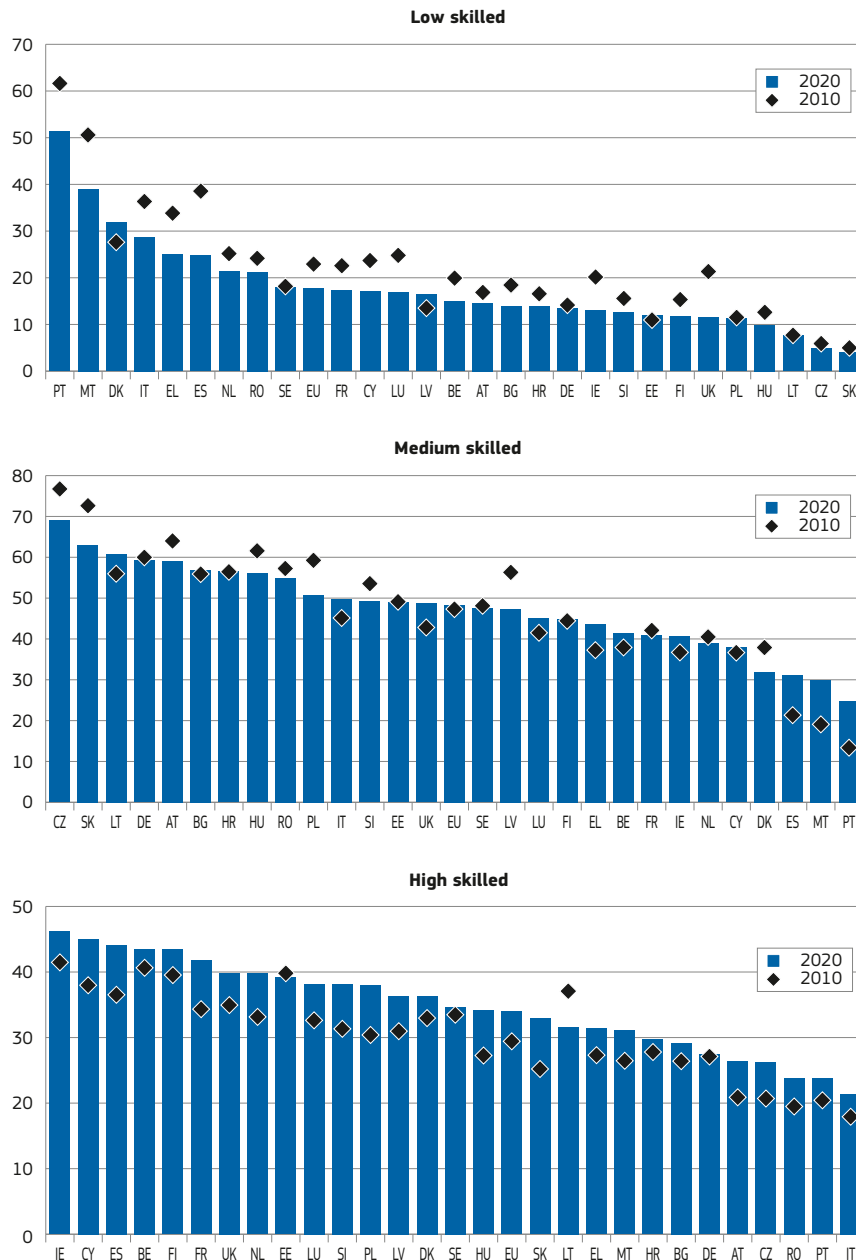
However, Chart 26 also shows that important differences in skill composition across Member States will continue to exist.

More particularly, the difference between the highest share of low-skilled workers (Portugal at 51%) and the lowest share (Slovakia at 4%) is projected to be lower (by 47 pp) in 2020 compared to 2010 (at 57 pp) with the difference between the highest share of medium-skilled workers (69% in the Czech Republic) and the lowest share (25% in Portugal) projected to rise to 44 pp in 2020, while the difference between the highest share of highly-skilled workers (46% in Ireland) and the lowest share (21% in Italy) is projected to be 25 pp in 2020.

⁽¹⁾ It would be beyond the scope of this chapter to analyse this to its fullest extent. See Cedefop (2013) for a detailed projection of future skill needs in the EU.

⁽²⁾ Qualification refers to the highest level of education/qualification held by an individual. Three broad levels of qualifications are presented – low, medium and high. These are connected to different ISCED groups 0-2 for low, 3-4 for medium and 5-6 for high. See CEDEFOP (2013a).

Chart 26: Change in skill composition – 2010 & 2020



Source: DG EMPL calculations based on CEDEFOP (2013).

Without attempting a full quantitative assessment of future skill needs, Sections 6.1 and 6.2 investigate the potential impact of policy instruments aimed at improving the skills composition of an ageing population and a shrinking workforce based on a model simulation.

Box 11 considers the long-term effect of demographic changes using DG EMPL's Labour Market Model (LMM), a general equilibrium model with a particular focus on the labour market ⁽¹³¹⁾. It clearly indicates that 'doing nothing' in policy terms is not an option since a shrinking

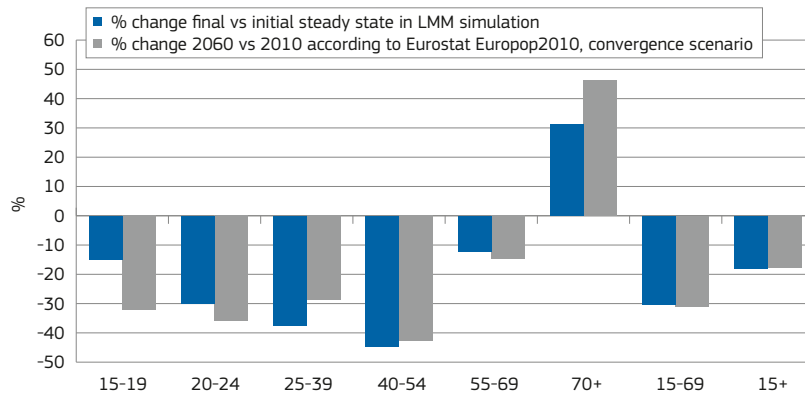
workforce would drag down investment, productivity, wages, and employment in the long run if no action is taken to limit the employment decline and to strengthen productivity growth.

⁽¹³¹⁾ An outline of the model can be found in European Commission's *Employment in Europe 2010* (pp. 113-116). For a full technical model description by the LMM developers see Berger *et al.* (2009). Other LMM-related exercises are shown in *Employment and Social Developments in Europe 2011* (pp. 221-229) and 2012 (pp. 275-279).

Box 11: Demographics and the cost of doing nothing

The model used assumes a general equilibrium in both the initial and final state. While it assumes a static population both in size and age composition, it is possible (with some limitations) to map the impact of a shrinking and ageing workforce in such a way as to depict the effects of a change in the age composition and a decline in the size of the working-age population ⁽¹⁾. The LMM has eight age groups, starting at the age of 15 years. While the model covers 14 countries, Germany is taken as a platform for the simulation. The exogenous changes in terms of both the age structure and the working age population are done in a way as to resemble the long-term changes projected by Eurostat in their Europop2010 convergence scenario. The age-structural changes are somewhat less pronounced however ⁽²⁾.

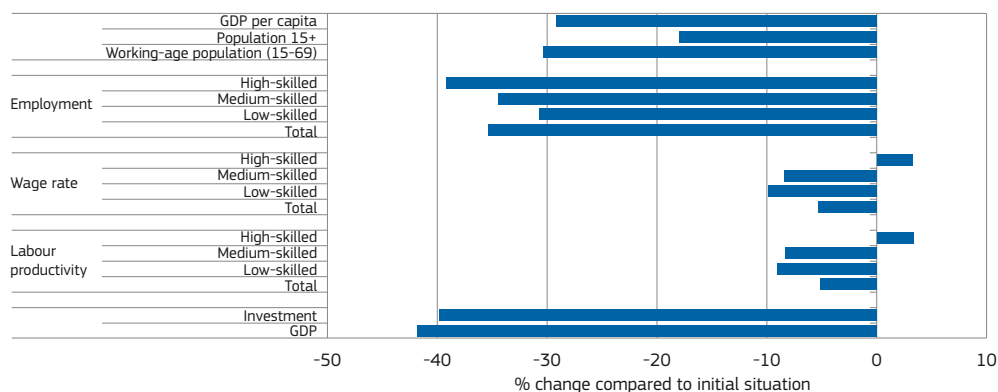
Chart 27: Exogenous long-term demographic change assumed in LMM simulation vs. Eurostat Europop2010 convergence scenario for Germany (2060 vs. 2010)



Source: Own calculation, Eurostat Europop2010 demographic projection.

Chart 27 plots the relative change between 2060 and 2010 of the population in different age groups following Europop2010 against the LMM simulation scenario. LMM would produce similar results as regards both the change of total population (15 years and older) and the change of the working-age population (age 15 to 69). The relative change of the older population (70 years and older) would be less pronounced as would be the relative decrease of the young cohorts, whereas the changes of the prime age groups (from 25 to 54 years) would be stronger in the LMM simulated scenario.

Chart 28: Exogenous shock: shrinking working-age population and population ageing, long-term impact for Germany on the labour market and the economy



Source: Own calculation based on DG EMPL's Labour Market Model.

With respect to the declining working-age population it is assumed that the exogenous shock is neutral in terms of skills in that the decline is the same for each skills group.

In the absence of any counter-balancing policy measure, this leads to the following results:

On the basis of the significant decline in the working-age population, employment would be expected to decline by some 35% in the long run, compared to the initial position. This employment decline would be more pronounced than the decline in the

⁽¹⁾ These changes do not perfectly reproduce current long-term population projections such as Eurostat's Europop2010 demographic projection since this is not possible with LMM given its limited demographic control parameters.

⁽²⁾ For large exogenous shocks there are technical limitations as regards fine-tuned changes in the demographic parameters. The simulation of large-scale demographic shocks is not what LMM was developed to address.

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working age population insofar as lower wages would reduce labour market participation, adding to the negative supply-side effect resulting from the demographic changes.

However, a massive decline in employment would reduce potential GDP. With demand following supply in the long run, real GDP would plummet by more than 40%, as would physical investment with a negative impact on productivity, despite lower employment, resulting in a decline in total labour productivity of 5%.

The strong productivity decline is also a result of a change in the skill mix of the employed workforce as employment declines. In effect, the complementarity between skills and capital formation means that lower rates of investment result in a relatively stronger decline in employment of those with higher skill levels, even if the initial demographic shock introduced into the model was neutral with respect to skills for a given age ⁽³⁾.

Lower productivity leads to lower wages despite the reduction of labour supply, contrary to theoretical expectations. With production falling fast and employment and wages declining, the base for taxes and social contributions will be eroded. Since it is assumed that any impact on public budgets will be neutralised by a corresponding lump-sum tax (or transfer) imposed to all households, the lower tax base necessitates an additional lump-sum tax equivalent to 15% of GDP.

⁽³⁾ The effect on the skills mix may be somewhat too strong however. As the reduction of young age groups below 24 years is less pronounced than in the official EuroPop2010 projection, they may be overrepresented in the new steady state. As young people are mostly low-skilled, this structural effect may skew the skills distribution to the lower end to some extent.

In fact, the evidence suggests that, even under optimistic employment scenarios, the strong decline in the working-age population will inevitably result in slower, maybe even negative, employment growth over the next decades (Peschner (2012), Peschner/Fotakis (2013) unless effective policies can be put in place to cushion the employment decline to the largest possible extent and to multiply productivity gains.

In recent decades productivity gains in Europe have been moderate compared to other regions in the world (van Ark *et al.* (2013)). To address this, policy interest has focused on the development of education and skills ⁽¹³²⁾ because, unlike pure capital deepening (which substitutes capital for labour), human capital development is both socially beneficial and a sustainable source of higher productivity growth.

Section 6.1 therefore considers the potential impact of activities to develop skills (higher education) on productivity, employment and economic growth in the long run, while Section 6.2 looks at migration as a potential source of employment growth, with a focus on the skills-mix.

6.1. Skills, productivity, and employment

In the LMM, educational attainment ⁽¹³³⁾ is normally treated as endogenous, implying that, right at the beginning of their careers (age 15), young people decide, once and for all, on the educational attainment level they aim to achieve, and that this is exactly how things turn out. Given that investment in education promises a return in the form of higher life-time income but also imposes a cost, young people are assumed to weigh up

the relative advantages when making their decision.

For the purposes of this simulation, however, the endogenous educational decision is replaced by the exogenous assumption that, through their education policies, governments manage to reduce the share of young people who remain low-skilled and to shift a number of them into medium and high level education. This approach is similar to that taken by Peschner/Fotakis (2013) in work on France.

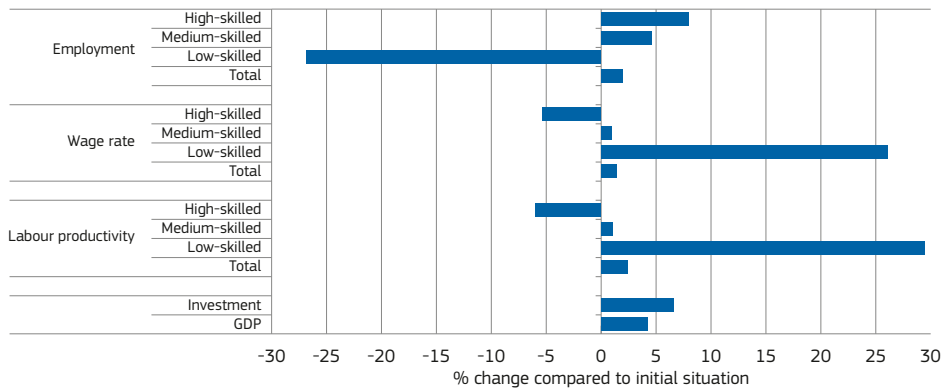
In the current case, it is specifically assumed that 5% of all people in the age group 15–19 will move from low education into medium (+2.5%) and high (+2.5%) education ⁽¹³⁴⁾. As a result, the share of people holding low qualifications will be reduced by around 33% in the very long run, while the number of medium and highly skilled will rise by 4% and 9% respectively.

⁽¹³²⁾ As van Ark *et al.* (2013) point out in their conclusion: 'Especially if European businesses and governments succeed to strengthen investment in their capabilities, including technology, innovation and skills, the chances of climbing the value chain and benefiting from each individual economy's competitive advantages in part of the global supply chain will significantly increase.' (p. 22).

⁽¹³³⁾ Though LMM makes a distinction between vocational skills (through training) and educational attainment, 'skills' are being approximated by 'educational attainment' level in this section. Earlier analysis based on LMM has already shown the relevance of vocational training for higher productivity and higher growth. See, for example, European Commission (2011a), p. 225.

⁽¹³⁴⁾ In contrast, Peschner/Fotakis (2013, p. 36, 37) change the share of low/medium/high education according to a separate projection, resulting in those shares being different from the ones assumed here (for example, they reduce the share of medium-educated in total labour supply).

Chart 29: Simulation with DG EMPL's Labour Market Model: Lowering the number of low-educated, increasing medium- and high-educated people



Source: Own calculations based on DG EMPL's Labour Market Model.

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The LMM also takes on board the fact that investments in skills and capital are complementary and that, following the change in the skills mix, investment is almost 7% higher than in the initial state, raising GDP by more than 4%.

The more favourable skills mix allows total productivity to shift by 2.4%, hence overall wages by 1.4% and total employment by 2%. The more pronounced impact on low-skilled employment is due to the significant reduction in supply, resulting in much higher wages and a higher average productivity for low-skilled workers.

Looking at employment and wages, the purely structural effect of a reduced supply of low-skilled workforce would be to allow employment, wages and production to increase, following higher productivity and higher capital formation.

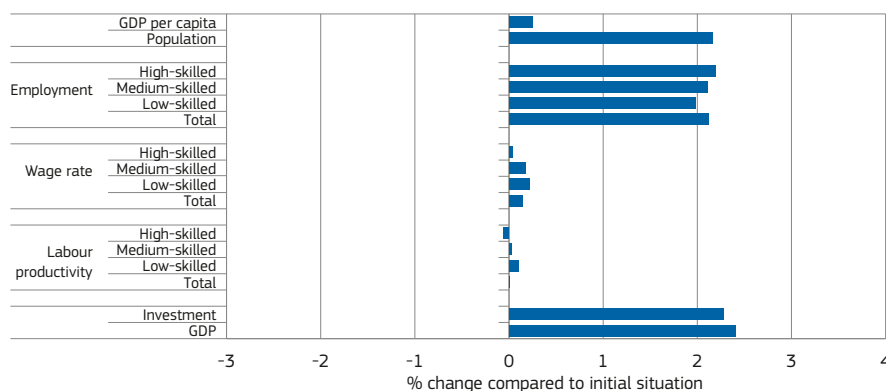
6.2. Skills and migration

There is considerable literature concerning the impact of migration on local economies and labour markets and most of this research concludes that the effects on wages and output depend on the skills mix of the migrants and whether this is complementary to the needs of the local economy. In the

long-term, higher net migration is seen to have no significant impact on local wage levels as the economy adapts to the new labour force composition and characteristics (European Commission (2008c), p. 54).

Using the LMM, this section assesses the likely long-term impact of higher net migration of prime age (25–49) workers, assuming alternative skill characteristics. For each skills⁽¹³⁵⁾ group (low, medium, high), net migration increases the total population in that group in each year by 0.1%. Chart 30 shows the long-term steady state results of such developments.

Chart 30: Simulation with DG EMPL's Labour Market Model: Migration shifts each year by 0.1% of the population aged between 25 and 49 (skills-neutral migration)



Source: Own calculations based on DG EMPL's Labour Market Model.

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⁽¹³⁵⁾ Based on educational attainment.

These results confirm the view that higher, skills-neutral net migration will not change the skills composition of labour supply, and will not influence wages and productivity in the long run. In particular, there is no detrimental impact on wages. This is because the new workforce, in particular the medium and high skilled, will trigger investment. Higher investment will then trigger GDP and employment growth, so that total employment increases by 2.1% in line with the increase in total population. GDP will then be almost 2 ½% higher than in the initial steady state, indicating that

GDP per capita increases by 0.25% in the process.

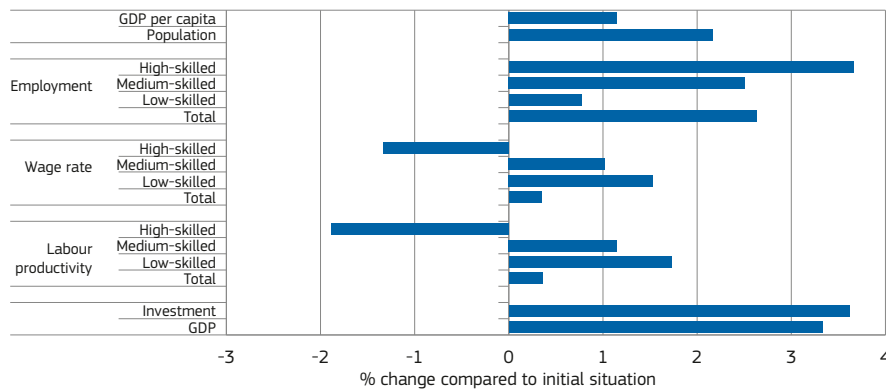
To demonstrate the impact of migrants' skills mix on the employment outcome and the economy, a second simulation assumed the same number of migrants, but with all of them of high skill. Chart 31 shows the long-term steady-state outcomes.

Given that the overall composition of the employed workforce shifts in the direction of higher skills, total productivity increases by 0.3% with a corresponding positive impact on wage levels. As

a technical effect, however, due to the concentration of employment gains among high skilled people, their average productivity decreases simply because of the much higher headcount.

Investment and GDP nevertheless increases by +3.6% and +3.2% respectively, so that the productivity of other skills groups can increase considerably, also fuelling employment gains and higher wages. GDP per capita thus increases by 1.2% following the higher net migration of highly skilled people of prime working age.

Chart 31: Simulation with DG EMPL's Labour Market Model: Migration shifts each year by 0.1% of the population aged between 25 and 49 (highly- skilled migration)



Source: Own calculations based on DG EMPL's Labour Market Model.

As a result, both skills-neutral and highly- skilled net migration produce higher employment and higher GDP per head of population, but the effects are much greater in the case of highly skilled migration. On top of that, the skills-capital

complementarity brings structural benefits for low and medium skilled workers given that the investment impact of more highly skilled employment reinforces the productivity and wages of low and medium-skilled workers.

In short, skills-neutral migration would not have a detrimental impact on the economy or on the labour market in the long term but the effect is the more positive when there is a good skills mix of migrants.

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7. CONCLUSIONS

This chapter investigated where new jobs will come from and what they will look like in the EU in the period to 2020 and beyond. It does not attempt to make quantitative forecasts but to provide a broad overview of the likely outcomes for employment and jobs in a variety of ways in the light of current and foreseeable trends and developments.

Globalisation, technological progress, demographic change and the greening of the economy, and the interactions between them, have had a significant impact on labour market dynamics in the EU in the past, including the emergence of global value chains as well as the recognition of the need for employees and employers to adapt their skills and competences to changing labour markets.

New job opportunities ...

It is to be expected that in the future these trend developments will strengthen providing the Member States and regions of the EU the opportunity to exploit their comparative advantages in world markets by specialising in activities with high technology and knowledge-intensive profiles.

More specifically, it is to be expected that, by 2020, new jobs (such as, for example, jobs in the renewable energy sector) will be created, while old jobs will be transformed (such as, for example, jobs in the construction sector with a view to increasing the energy efficiency of buildings) or destroyed (such as, for example, jobs in coal mining).

Moreover, technological progress (such as, for example, the creation of virtual workplaces) and the greening of the economy (such as, for example, more intensive use of teleworking to limit travelling) will continue to transform the ways in which goods and services are produced, while technological progress in combination with further globalisation will induce continuing changes in areas of the world where specific stages of the production process take place (such as, for example, the production of intermediary inputs of electronic devices).

... but also challenges,...

However, the analysis in this chapter also showed that, in order to realise this job potential to its fullest extent, the right framework conditions have to be implemented and the current economic and financial conditions have to be normalised.

Indeed, most of the opportunities and challenges facing the EU are driven, to a large extent, by market forces. The challenge and test for policy makers and social partners will be to ensure that these changes are shaped according to the path of smart, sustainable and inclusive growth.

In this respect it is important to recognise that, while structural changes inevitably create some insecurity, the EU can actively promote employment security by strengthening the operation of its labour markets along flexicurity lines, in close cooperation with social partners as well as other stakeholders.

Moreover, there are no guarantees that the benefits and costs of these changes will be distributed in an equitable manner, although globalisation, together with technological progress, should strengthen the opportunities to specialise in the production of those goods and services in which the EU has a comparative advantage in international markets, thereby increasing its overall productivity and living standards.

... including labour market polarisation ...

These developments are expected to create a stronger demand for highly-skilled workers, with a positive effect on their earnings prospects. To the extent that the upward mobility of workers with lower skills is hindered, there is a continuing risk for further labour market polarisation.

Past experience has seen labour market polarisation being especially apparent in manufacturing activities where routine work performed by low and medium-skilled workers has been adversely affected by technological progress (in combination with globalisation) with only limited labour market institutional support for re-skilling.

... job quality ...

One of the most positive aspects of the combination of technological innovation with globalised production is the possibility to organise production processes in more flexible ways, from both the employer perspective (via for example

outsourcing and offshoring) as well as that of employees (via, for example, more household-friendly flexible working hours). Where this succeeds, the resulting flexibility can increase both productivity and earnings.

Such flexibility offers the possibility to adapt jobs and working conditions to specific individual and household needs, including those of specific groups such as disabled or older workers, recognising that job quality is an important determinant of the labour market participation decisions of people with more specific employment needs.

On the other hand, insofar as a more flexible workplace environment leads to less secure employment, work-life balances may be negatively affected which can have not only a negative impact on job quality and life satisfaction, but also lead to lower rates of labour market participation.

... skill formation and a modern approach towards migration in a changing demographic context...

Knowledge-intensive forms of technological innovation and human capital investment will be at the heart of developments and action that can realise the full job potential of the resource-scarce, skills-rich European Union in the coming years. Indeed, they are a necessary condition for ensuring the enhanced productivity growth and stronger economic growth required to off-set the effects of a shrinking workforce and an ageing population. A massive investment in skills formation and education is imperative for future productivity gains, in line with rising rates of physical investment, and rising incomes.

At the same time, the issues surrounding the foreseeable declining working age population in the EU must be addressed.

In fact, the decline affects the EU at all levels – from the national as well as regional perspective. While improved productivity can off-set part of the effect of the workforce decline, much more effective use needs to be made of all sources of domestic and migrant labour.

In the case of the domestic labour force potential, much more can be done to raise the employment rates of all age and skill groups. In the case of migrants, evidence shows that, positively managed from a social perspective, migration can have an overall positive impact for all workers.

The strengthening of skills formation, in combination with policies aimed at strengthening flexicurity, job quality and working conditions, and job creation according to the ‘New Skills for New Jobs’ flagship initiative ⁽¹³⁶⁾ is fundamental to ensuring that the European Union fully exploits its comparative advantages in international markets.

⁽¹³⁶⁾ For more details see <http://ec.europa.eu/social/main.jsp?langId=en&catId=958>

ANNEX A: MANUFACTURING INDUSTRIES AND KNOWLEDGE BASED SERVICES

Table A.1: Manufacturing industries (NACE Rev. 2 codes – 2-digit level)

High-technology	21 Manufacture of basic pharmaceutical products and pharmaceutical preparations 26 Manufacture of computer, electronic and optical products
Medium-high-technology	20 Manufacture of chemicals and chemical products 27 to 30 Manufacture of electrical equipment, Manufacture of machinery and equipment n.e.c., Manufacture of motor vehicles, trailers and semi-trailers, Manufacture of other transport equipment
Medium-low-technology	19 Manufacture of coke and refined petroleum products 22 to 25 Manufacture of rubber and plastic products, Manufacture of other non-metallic mineral products, Manufacture of basic metals, Manufacture of fabricated metal products, except machinery and equipment 33 Repair and installation of machinery and equipment
Low-technology	10 to 18 Manufacture of food products, beverages, tobacco products, textiles, wearing apparel, leather and related products, wood and of products of wood, paper and paper products, printing and reproduction of recorded media 31 to 32 Manufacture of furniture, Other manufacturing

Source: http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an3.pdf

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Table A.2: Knowledge based services (NACE Rev. 2 codes – 2-digit level)

Knowledge-intensive services (KIS)	50 to 51 Water transport, Air transport 58 to 63 Publishing activities, Motion picture, video and television programme production, sound recording and music publishing activities, Programming and broadcasting activities, Telecommunications, Computer programming, consultancy and related activities, Information service activities (section J) 64 to 66 Financial and insurance activities (section K) 69 to 75 Legal and accounting activities, Activities of head offices; management consultancy activities, Architectural and engineering activities; technical testing and analysis, Scientific research and development, Advertising and market research, Other professional, scientific and technical activities, Veterinary activities (section M) 78 Employment activities 80 Security and investigation activities 84 to 93 Public administration and defence, compulsory social security (section O), Education (section P), Human health and social work activities (section Q), Arts, entertainment and recreation (section R)
Knowledge-intensive market services (excluding high-tech and financial services)	50 to 51 Water transport, Air transport 69 to 71 Legal and accounting activities, Activities of head offices; management consultancy activities, Architectural and engineering activities; technical testing and analysis 73 to 74 Advertising and market research, Other professional, scientific and technical activities 78 Employment activities 80 Security and investigation activities
High-tech knowledge-intensive services	59 to 63 Motion picture, video and television programme production, sound recording and music publishing activities, Programming and broadcasting activities, Telecommunications, Computer programming, consultancy and related activities, Information service activities 72 Scientific research and development
Knowledge-intensive financial services	64 to 66 Financial and insurance activities (section K)
Other knowledge-intensive services	58 Publishing activities 75 Veterinary activities 84 to 93 Public administration and defence, compulsory social security (section O), Education (section P), Human health and social work activities (section Q), Arts, entertainment and recreation (section R)
Less knowledge-intensive services (LKIS)	45 to 47 Wholesale and retail trade; repair of motor vehicles and motorcycles (section G) 49 Land transport and transport via pipelines 52 to 53 Warehousing and support activities for transportation, Postal and courier activities 55 to 56 Accommodation and food service activities (section I) 68 Real estate activities (section L) 77 Rental and leasing activities 79 Travel agency, tour operator reservation service and related activities 81 Services to buildings and landscape activities 82 Office administrative, office support and other business support activities 94 to 96 Activities of membership organisations, Repair of computers and personal and household goods, Other personal service activities (section S) 97 to 99 Activities of households as employers of domestic personnel; Undifferentiated goods- and services-producing activities of private households for own use (section T), Activities of extraterritorial organisations and bodies (section U)
Less knowledge-intensive market services	45 to 47 Wholesale and retail trade; repair of motor vehicles and motorcycles (section G) 49 Land transport and transport via pipelines 52 Warehousing and support activities for transportation 55 to 56 Accommodation and food service activities (Section I) 68 Real estate activities 77 Rental and leasing activities 79 Travel agency, tour operator reservation service and related activities 81 Services to buildings and landscape activities 82 Office administrative, office support and other business support activities 95 Repair of computers and personal and household goods
Other less knowledge-intensive services	53 Postal and courier activities 94 Activities of membership organisations 96 Other personal service activities 97 to 99 Activities of households as employers of domestic personnel; Undifferentiated goods- and services-producing activities of private households for own use (section T), Activities of extraterritorial organisations and bodies (section U)

Source: http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/htec_esms_an3.pdf

ANNEX B: HEALTH SECTOR: MEMBER STATE DETAIL

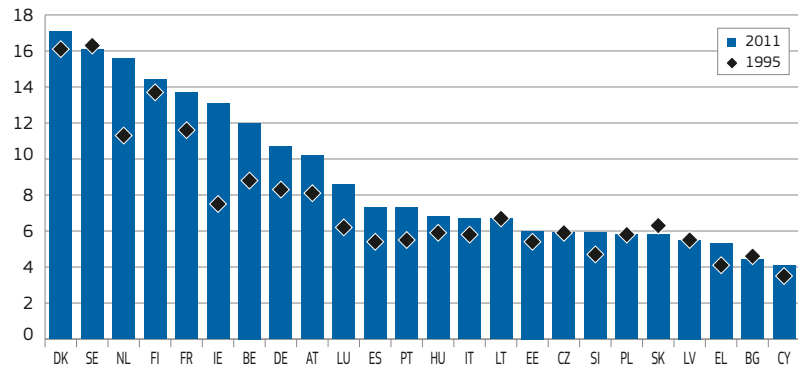
The health sector in the EU is one of the sectors with the highest employment level and sharpest growth.

Nevertheless, its labour force has its own specific characteristics (including its high labour intensity, gender imbalance, and ageing workforce) that will affect its future growth potential. See also European Commission (2012i) and (2012o).

In all EU Member States (except Bulgaria, Slovakia and Sweden), the employment share for human health and social work activities was greater in 2011 than in 1995. Nevertheless, there are still some significant differences across Member States, with the Nordic Member States recording employment shares more than double the employment shares of the Eastern and Southern Member States. See Chart B1.

In all Member States there is a strong unbalanced gender composition of the health sector and the total economy. On average, in the EU as a whole 78% of the people employed in this sector are female workers, compared with about 49% in the total economy. The highest shares are to be found in the Baltic States and Finland, while the lowest share is recorded for Malta. See Chart B2.

Chart B1: Employment share for human health and social work activities



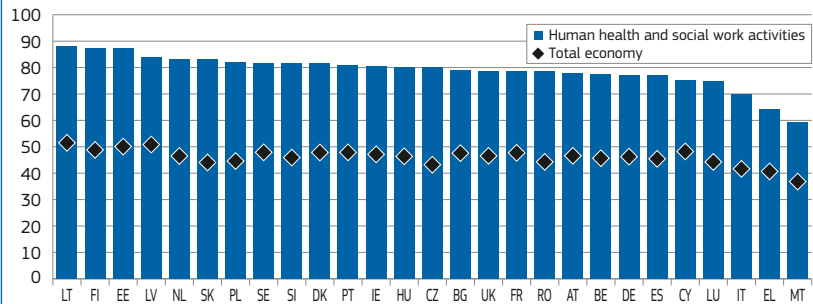
Source: DG EMPL calculations based on Eurostat, National accounts [nama_nace21_e].

Notes: BG, EL, ES, LV, LT the year 2000 (instead of 2005), IE 1998, PL 2004, for PT 2010 instead of 2011. Break in series of EL and LV.

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Chart B2: Gender distribution in human health and social work activities sector 2012 (aged 15-64)



Source: DG EMPL calculations based on Eurostat, Labour force survey [lfsa_egan2].

Note: Total – All NACE activities.

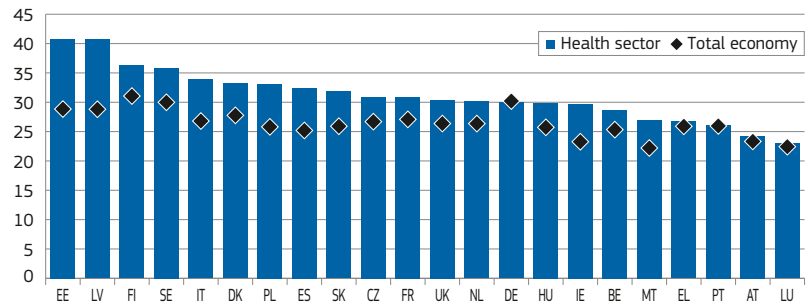
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In several Member States there are very notable differences between the age structure of the health sector and the total economy. This is especially the case in Bulgaria, Cyprus and the Baltic States where the share for older workers (aged 50 to 64) is more than 10 pp higher than the share for the same age group in the total economy. By contrast, in Germany and Portugal these differences in the employment share for older workers is very modest. See Chart B3.

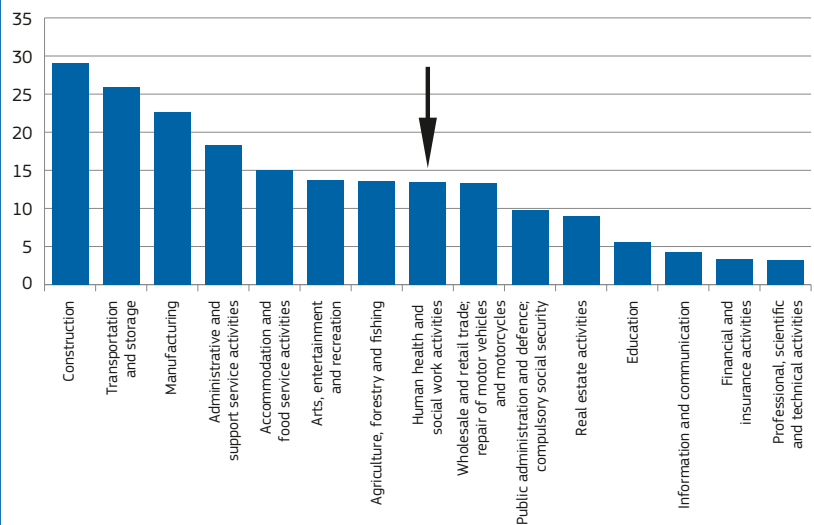
In 2010, on average for the EU as a whole, earnings of women in the health and social work sector are higher than the earnings of women in industry, construction and services ⁽¹³⁷⁾ for all education levels – see Chart B4.

Chart B3: Share of people aged 50-65 in total employment



Source: DG EMPL calculations based on Eurostat, Labour force survey [lfsa_egan2].

Chart B4: Accidents at work per employed persons (x 1000) – EU in 2010

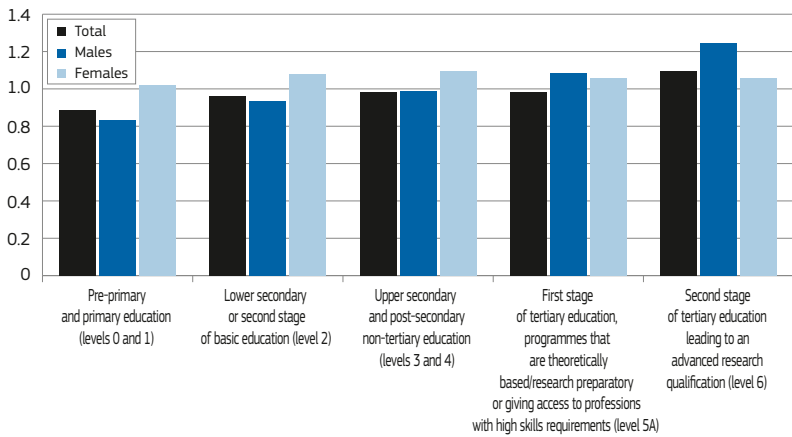


Source: DG EMPL calculations based on Eurostat, population and social conditions [hsw_n2_07 and nama_nace21_e].

Note: Total number of accidents at work with more than 3 days of absence and fatal accidents at work divided by the number of employed persons.

⁽¹³⁷⁾ Except public administration, defence, compulsory social security.

Chart B5: Earnings of health and social work sector compared with rest of economy in EU in 2020

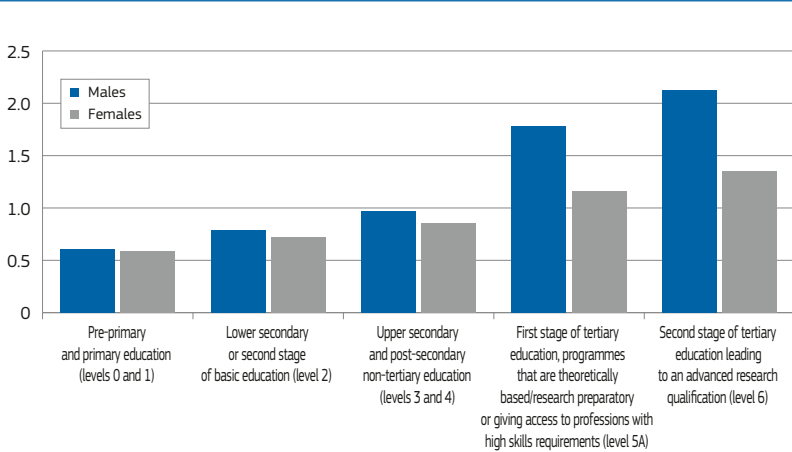


Source: DG EMPL calculations based on Eurostat, Structure of earnings survey [earn_ses10_30].

Notes: Enterprises with 10 employees or more. Business sector comprising industry, construction and services (except public administration, defence, compulsory social security). Earnings of the health and social work sector divided by earnings of industry, construction and services (except public administration, defence, compulsory social security) with the same education and gender.

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Chart B6: Earnings structure within health and social work sector in EU in 2010



Source: DG EMPL calculations based on Eurostat, Structure of earnings survey [earn_ses10_30].

Notes: Enterprises with 10 employees or more. Business sector comprising industry, construction and services (except public administration, defence, compulsory social security).

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