Future skill needs in Europe: critical labour force trends

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The **European Centre for the Development of Vocational Training** (Cedefop) is the European Union's reference centre for vocational education and training. We provide information on and analyses of vocational education and training systems, policies, research and practice. Cedefop was established in 1975 by Council Regulation (EEC) No 337/75.

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Foreword

Understanding future skill needs is essential for shaping education and training policies, particularly as labour markets undergo dynamic transformation driven by demographic change, digitisation, extensive value chains and increased complexity in work organisation. The net result is that ready-made human capital will no longer be available to employers.

Although making progress, labour markets in many EU Member States are still not fully recovered from the economic crisis that started in 2008. The European labour market is also challenged by changes in the demographic composition of the labour force as well as increased work complexities and processes. Cedefop skills supply and demand forecasts use sophisticated methodologies, combined with expert judgement, to provide sound evidence which can inform policy decisions in vocational education and training and in the complex context of lifelong learning, upskilling and reskilling.

One of the critical trends affecting the future of European labour markets is population ageing. Through employment and activation policies, EU Member States have been striving to increase labour force participation but the economic crisis will prevent the EU from reaching targets set in 2010. The policy focus is now on reducing unemployment while facing a migration crisis. The launching of the *Skills agenda* and the proposed skills guarantee aim at supporting Member States in addressing low-skilled adults and, consequently, unemployment. Cedefop's forecast, however, warns us that, as the EU moves into the next decade, the shrinking labour force in many Member States is likely to impede economic growth.

Using forecasting and modelling, this publication attempts to assess what might be the outcomes of activation, mobility and migration policies on mitigating the foreseen reduction in labour supply and preventing skills imbalances in EU Member State labour markets. Alongside suggesting the most likely future if the EU stays on the current path, is an alternative scenario of possible impacts of different policy mixes. Although the research presented in this report is explorative, it hopes to feed into debate on forward-looking policies aiming at increasing Europe's productivity and competitiveness.

Joachim James Calleja
Director

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Special thank goes to the team of individual country experts for their invaluable comments and reviews of methodological achievements, scenario assumptions and preliminary results (Annex 3).

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Executive summary

Although making progress, labour markets in many EU Member States are still not fully recovered from the economic crisis that started in 2008. Today's European labour market is also challenged by changes in the demographic composition of the labour force, as well as the increase in work complexities and processes. Skills forecasting is a useful tool serving informed decisions by policy-makers, experts and individuals in this complex environment.

This publication presents Cedefop's latest skills supply and demand forecasts. These are produced by robust modelling apparatus developed by Cedefop over the past decade: a key feature is the development of various alternative scenarios of the future, allowing efforts to answer key policy questions. After presenting the forecast using the baseline scenario, the publication offers an explorative analysis of the impact of an alternative skills supply scenario, driven by different labour market activation or migration policies, on future labour market imbalances.

Baseline assumption and baseline scenario key findings

The baseline scenario presents the 'most likely to happen' future for skills supply and demand in Europe up to 2025. Skills are measured by occupations and by formal level of qualifications. The projections present a consistent picture of likely trends across Europe, providing results for all Member States plus Norway, Switzerland and Iceland.

The current set of baseline projections has been updated in line with Europop 2013 ([1]), while short-term economic projections have also been updated to match the latest data available in the AMECO database ([2]). The long-run economic projections have also been updated to match the *Aging population*

([1]) Eurostat's population projections developed in 2013: http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data

([2]) AMECO is the annual macroeconomic database of the European Commission's Directorate General for Economic and Financial Affairs (DG ECFIN). http://ec.europa.eu/economy_finance/db_indicators/ameco/index_en.htm

report 2015 (European Commission, 2015) GDP growth assumptions, which are in line with the Europop 2013 projections.

Population and labour force

The European labour force is expected to continue to expand, although the rate of growth will slow towards 2020. Then it will stabilise, although a slight decline is expected beyond 2025. This path is explained by an increase in the size of the oldest cohorts and a decrease in the youngest age groups in the population. Despite demography, increase in labour supply may be achieved by gradually increasing rates of participation for many groups, particularly among older workers.

The future formal qualification level of the labour force is projected to continue to rise. Substantial increases in the numbers qualified at intermediate and high levels are projected over the medium term as individuals and governments attempt to meet uncertainty by investing in skills.

Employment

Projections of employment take the expected developments in labour supply into account, as well as the continuing slow recovery from recession. European employment levels are projected to rise, though this is dependent on economic and political developments. For EU countries, it is expected that employment will increase by an average 0.2% per annum over the forecast period but this growth is expected to become increasingly constricted by the available labour force across Member States.

Unemployment

Unemployment is expected to decline in many countries but the rates of change vary quite substantially, with southern Europe having the most persistently high unemployment rates. For Europe as a whole, unemployment rates are projected to have returned to their 2008 levels by 2030.

Macroeconomic uncertainties

The rate of recovery from the 2011 European sovereign debt crisis is still an important source of uncertainty for the current set of projections. There is considerable uncertainty in terms of development of countries which have high unemployment rates in the near future. Other outstanding questions are whether

austerity policies can eventually restore Eurozone stability and the longer-term impacts of international migratory movements ([3]).

Sectoral change

The current set of projections captures transition of the European economy towards a new model where the service sector will be the main economic driver. This trend was already evident in previous projections but a strong decline in the primary sector and manufacturing is expected. Significant further structural change is projected, especially for transition countries. These changing sectoral employment structures will reinforce (skill biased) technological change and trends towards increasing globalisation. The latter are expected to continue to have significant impacts on sectoral employment structures and, therefore, on the demands for different types of skills. The projections show a relentless shift away from primary and manufacturing activities towards knowledge-based and other consumer services.

Qualification needs

The analysis suggests that structural change at the sectoral level will be reinforced by changes within sectors which affect the way goods and services are produced and delivered. These will continue to produce a general increase in the demand for skills (as measured by both occupation and qualification) over the medium to longer term. But employment polarisation will continue, with significant growth in employment also in some less skilled areas, especially in the service sector. These jobs are often poorly paid with negative implications for job quality and social inclusion.

Changing patterns of demand are common across most countries and are driven by similar factors: demography, globalisation, international competition and technological change. Together, these drivers are leading to significant shifts in employment from primary and manufacturing towards services. Technological change and related factors are also driving changing occupational and qualification patterns in similar directions in most countries. There are, however, some notable variations between different parts of Europe, depending on the stage of economic development, and different industrial structures. Yet there is

([3]) This publication does not take into consideration uncertainties triggered by Brexit as the calculations were produced fare before the referendum took place. Moreover, the final arrangements of the process of the United Kingdom leaving the EU were not known at the time of publication.

continuing convergence, as newer Member States are expected to move towards output and productivity paths of older Member States.

Replacement needs

The importance of replacement demand is also emphasised. As older workers retire from the economically active workforce they will need to be replaced. Even in areas where employment levels are projected to decline quite rapidly, this results in substantial numbers of projected job openings. Recruitment into such areas (industries and occupations) will remain problematic and is especially concerning in areas of manufacturing and related activities which may be the engines of future growth.

Imbalances and mismatches

There are tensions between demand and supply trends. Despite increasing demand for skills, some well-qualified individuals may need to take up jobs that have typically not required such high formal qualifications in the past. There is likely to be a need for policy interventions stimulating growth in demand for high skill jobs, and to maximise the utilisation of individual skills. Historical patterns of employment by qualification reflect the growth in supply of people who have acquired formal qualifications. This will continue to be a feature.

Feasible activation and migration mix

The alternative scenario presented investigates the impact of the possible mix of activation and migration adjustment, achieving a satisfactory labour force structure across sectors and occupations. The primary aim is to assess resulting labour market imbalances, both at macro and micro level, by analysing to what extent changes in supply (activation) and EU-wide migration can help attenuate macroeconomic labour market imbalances and/or national skill mismatches.

The alternative scenario looked at the ‘highest possible’ labour market activity rates based on reviewing past and possible future baseline trends. These trends were reviewed for each Member State across genders and age groups. The analysis has shown that there is limited scope for participation to be increased. In many countries, low labour market participation rates are based more on systemic issues (overall economic environment, cultural heritage and role of the family) than simple low motivation to work.

The revised projections, for the EU-28 as a whole, would increase labour market participation for those aged 20 to 64 by only 1 pp (percentage points) for males and 1.8 pp for females (all 1.4 pp) by 2025. In several countries where

labour shortages exist, including Germany, the Netherlands, Finland and the United Kingdom, the potential for increased participation is limited. The greatest scope for increasing participation rates relates to countries with still relatively high unemployment (labour surplus) such as Ireland, Italy, Greece or Poland.

The role of migration in mitigating labour imbalances has also been explored. Immigration has been incorporated in the scenario by responding to job opportunities available, income differentials, and unemployment levels across Member States. Long-term migration patterns, as well as the ability to 'absorb' migrants from other EU Member States and from outside the EU, have also been considered.

The increase in participation and the inflow of additional workforce generally alleviates shortages. However, the impact of the increase in some countries, and particularly in those of higher economic growth, leads to higher labour demand. Further, a higher level of active population does not always translate into employment given increases in unemployment.

At occupation level, effects of the scenario cumulate in stronger increases in intermediate occupational groups: clerks, technicians and associate professionals, and, to a lesser degree crafts; and plant and machine operators and assemblers. This accompanies general reallocation towards higher education levels. Higher overall economic growth also translates into stronger demand among managerial and supervisory occupations: chief executives, senior officials and legislators; legal, social and cultural professionals; and the increase in crafts and production worker groups.

The ability of activation policies and migration to tackle future demand imbalances differs significantly across country and occupation groups. While the south European countries, the central and eastern Europe countries (CEEC), Benelux and France show stronger reactions, other countries remain fairly unaffected in respect of expected imbalances. South European countries seem to shift imbalances from lower- to higher-level occupations: lower level occupations seem to deteriorate in their outlook, while intermediate- and higher-level occupations seem to be able to solve some of their imbalances. Given the migration balance, the CEEC seem to deteriorate, while Germany and Austria benefit in terms of lower imbalances.

The impacts of the alternative labour supply scenario at the micro level are modest; they alleviate some labour market imbalances at the occupation level but without having a strong overall impact. Given the scale of changes to migration and participation that have been assessed as feasible alternative projections, this should have been expected. Some imbalances can be solved, especially if more directed qualification flows are feasible, as our thought experiment has shown.

Policy lessons

Translating outcomes from the alternative scenario into policy recommendations is not simple given that two combined effects have been analysed: increasing participation and the impact of (a combined) change to migration flow. While it is important to note that the impact of such possible future changes on labour supply seems limited, there are many reasons why an increase in participation rates is desirable from a policy perspective; it is an outcome to be expected in many countries over time. However, there are two main elements that diminish its impact in most countries:

(a) increases in participation in countries with low employment dynamics partly translate into higher unemployment;
(b) if there is no shortage in skills supply, an increase in participation is not productive if it does not also lead to employment growth;
(c) in the case of skills shortages, the increase in labour market participation, may help to increase productive employment and subsequently higher economic growth.

Similar reasoning applies for migration and EU-wide mobility. Both benefit most if they are 'directed', solving at least an imbalance in one of the two countries involved (sending or receiving). For mobility within the EU, better transparency of shortage qualifications, the recognition of qualifications, and a general culture of EU-wide hiring would help. Many steps have already been taken to improve these elements. It seems more natural to consider labour demand EU-wide, even for lower and intermediate occupations.

It is important, however, not to overestimate the impact of an integrated labour market. Even within countries, regional imbalances are not easily solved by worker mobility (for example in Italy in the imbalances between north and south, in Germany in east-west), although mobility across regions exists and has an impact on the labour market. EU-wide mobility necessarily involves more barriers, such as culture, language, and distance. Therefore, economic incentives through the discrepancies in opportunities for demand (hiring) and supply (job search) have to be strong for mobility to increase. Just as in national regions, we will also in the future see many labour market discrepancies across the EU-28 countries that are not fully resolved.

CHAPTER 1.

Introduction

Demographic change is a key challenge not only for sustainability of pension schemes across EU Member States but also for European labour markets. Eurostat's population projection shows that, in the coming decades, Europe will face a decline in working age population and increase in old age dependency ratio. Recent studies – such as European Commission (2013) or Cedefop country forecasts ([4]) – show that the decline of working age population will, in some countries, reduce the labour force to the extent that potential economic growth will be at risk.

The immediate and frequently discussed solutions to these problems are increase in mobility and increased labour market participation or employment rates. The increase in mobility seems to be an issue for the local communities and is not related solely to the current refugee crisis: EU internal mobility became an important theme of British referendum to leave the EU. At the same time, labour market activity and employment rates in many countries have already reached levels where additional activation is costly (Descy, 2014).

Cedefop has been working on skills supply and demand forecasting for about a decade, aiming to understand better possible future tensions in labour markets in the EU and individual Member States. During this decade a robust methodology allowing the creation of different scenarios has been developed. The latest methodological achievements, as well as assumptions and preliminary results of these scenarios, are regularly reviewed and discussed with an expert team ([5]) and individual country experts (ICEs) ([6]).

Understanding the demographic challenges for the labour market and the ability to evaluate policy responses by using highly sophisticated methodological apparatus motivated Cedefop to contribute to general discussion about the possibility to reverse the negative effect of ageing on economic performance. In

([4]) http://www.cedefop.europa.eu/en/publications-and-resources/country-reports/skills-forecasts

([5]) Cedefop outsources research to an international consortium of leading labour market research institutions through framework contracts.

([6]) The team of individual country experts (ICEs) is based on responses to a call for expressions of interest. Each Member State is represented typically by one expert or expert institution. See Annex 3 for the list of contributing country experts.

line with the latest updated forecasts, an alternative skills supply scenario reflecting possible alternative activation rates and migration patterns was developed.

The latest forecasting describes the 'most likely to happen' future (baseline). It is based on assumption of the persistence of current trends of economic recovery and renewed job growth. However, future labour markets will be affected by various drivers such as demographic change, technology progress and organisational changes inside jobs. European labour markets will also face several institutional challenges, such as Brexit or attempts at labour market protectionism.

The effects of these challenges and drivers are difficult to predict as inexhaustible combinations of factors leads to comparable numbers of scenarios. The Cedefop baseline scenario presents trends up to 2025, with an outlook to 2030. The forecasting results are described in general terms (aggregated employment growth) as well as disaggregated by economic sector, occupation and qualification level. Replacement needs, which form the major part of total job opportunities, are also described.

Skills supply (presented by population and labour force trends) will be directly impacted by demographic change. Complex jobs requiring higher skills will make young people stay longer in the education. Labour market demand for skills is changing much faster than education patterns, leading to skill mismatches and labour market imbalances. Continuing vocational education and training (VET) and adult learning are therefore important in tackling skill mismatches and obsolescence.

Alongside the baseline scenario, Cedefop looked at possible developments in skills supply. The alternative scenario presents a hypothetical effect of increased participation in the labour force and migration flows on potential labour market imbalances. Although hypothetical, we have tried to develop the scenario with a degree of plausibility: inputs from the individual country experts were used to set up assumptions which are feasible in their country.

Chapter 2 focuses on presentation of baseline scenarios, with details of future trends presented by economic sector, occupation, and qualification level. A description of potential future labour market imbalances offers an innovative overview of future labour market. Chapter 3 focuses on the description of the alternative labour supply scenario. It follows different stages of development, from discussing possible assumptions to the impact on the potential imbalances. The final chapter serves as a thought exercise which develops the narrative of the scenario.

CHAPTER 2.

Future skills demand and supply

This chapter presents the most likely scenario of future labour market trends up to 2025, with an outlook to 2030 (baseline scenario). The projections are produced by Cedefop's modelling framework developed over recent years (Cedefop, 2012b). The key assumptions are in line with the latest official projections of the European Commission, such as the short-term forecast of DG ECFIN ([7]) as published in autumn 2015, the latest 'ageing report' (European Commission, 2015) and the latest Eurostat population projection ([8]). The assumptions of the main methodological developments and plausibility of preliminary results ([9]) are subject to regular discussions within the group of individual country experts (ICEs) ([10]). Final results are available through the Cedefop web portal ([11]), various publications such as Cedefop (2016) and the Skills Panorama ([12]).

2.1. Aggregate employment

The post-crisis period (2008-10) has witnessed a general trend of a negative effect on employment in most countries. In concrete numbers, employment in the EU-28 Member States, Norway, Iceland and Switzerland – hereafter referred to as EU-28+ – will only reach pre-crisis level in 2019 and then will continue to grow. However, the growth is likely to be dampened by demographic trends and much slower growth in the labour force. Expected growth in 2020-30 will be

([7]) http://ec.europa.eu/economy_finance/db_indicators/ameco/index_en.htm

([8]) http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-projections-data

([9]) Cedefop forecasts are produced for EU-28 Member States plus Norway, Iceland and Switzerland. Results presented in this publication referring to 'European' trends and values generally refer to this group of countries if not stated differently. The 'EU-28+' is also used when referring to these 31 countries.

([10]) The list of country experts contributing to the exercise is in Annex 3.

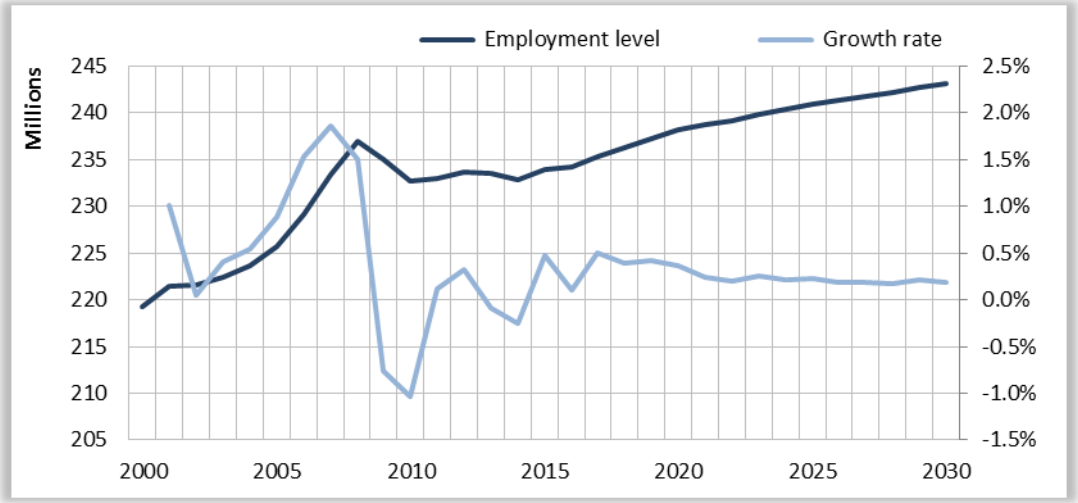
([11]) http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations

([12]) http://skillspanorama.cedefop.europa.eu/en

weaker than in the pre-crisis period. Previous reports ([13]) suggest that employment in many countries may even to decline over 2020-30, due to ageing ([14]).

The extensive loss of jobs in countries such as Ireland, Greece, Spain, Latvia and Lithuania is reversed by the average rate of growth over 2010-15. Falling employment until 2025 is projected for Germany, Estonia and Romania. Employment growth is expected to be slightly lower in 2025-30 than in 2015-25. The current set of projections suggests that the strongest growth in employment towards the end of the period is expected to occur in Belgium, Cyprus, Iceland and Ireland, while employment in Germany, Estonia, Latvia, Poland and Romania is expected to decline slightly.

Figure 1. **Past and likely future employment in EU-28+ (million, % growth rates on secondary axis)**



Source: Cedefop skills forecasts (2016).

2.2. Sectoral employment

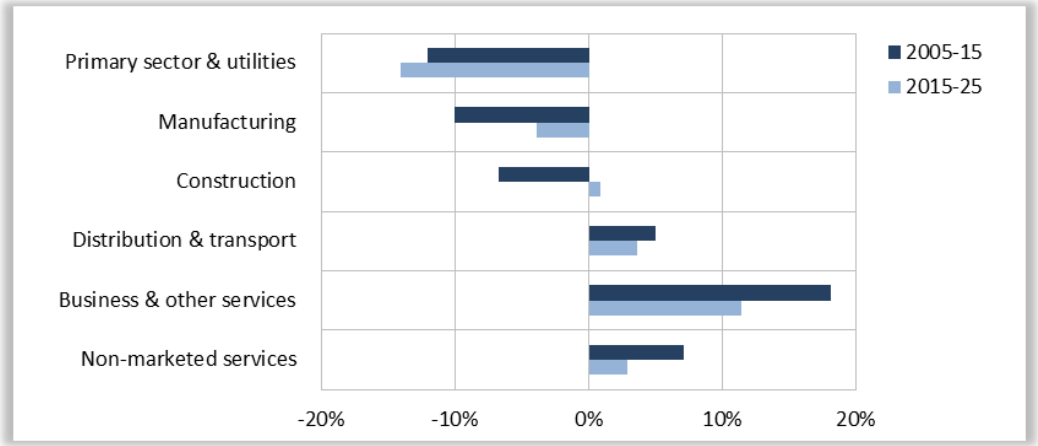
Several key drivers, such as demographic structure, technological advancements, and climate change will significantly impact future employment, occupational structure and employees' skills and qualifications across sectors and across Europe (Cedefop, 2016). The intensity of each driver's impact varies,

([13]) For example, country skills forecasts http://www.cedefop.europa.eu/en/publications-and-resources/country-reports/skills-forecasts

([14]) Selected forecasting results are available in Annexes 1 and 2.

depending on sector activities (production or services) or vulnerability to exogenous elements, such as global competition. This is reflected in the persistence of long-term trends, such as the decline of employment in primary industries and basic manufacturing, while employment in tertiary sectors such as business services or distribution and retail are expected to rise.

Figure 2. **Employment trends by sector in EU-28+**



Source: Cedefop skills forecasts (2016).

Although the manufacturing sector as a whole will experience slight decline in the future, the motor vehicles subsector, is expected to grow by about 4% between now and 2025 (Annex 2). Future employment in subsectors other transport equipment or electronics and optical equipment will be stable, experiencing change (growth or decline) by less than 0.5% in the next 10 years. Austerity measures implemented by many European governments are expected to result in slower, but overall positive, employment growth in non-marketed services 2015-25, with the growth attributed to employment in health services and education, compensating for employment losses in the public administration.

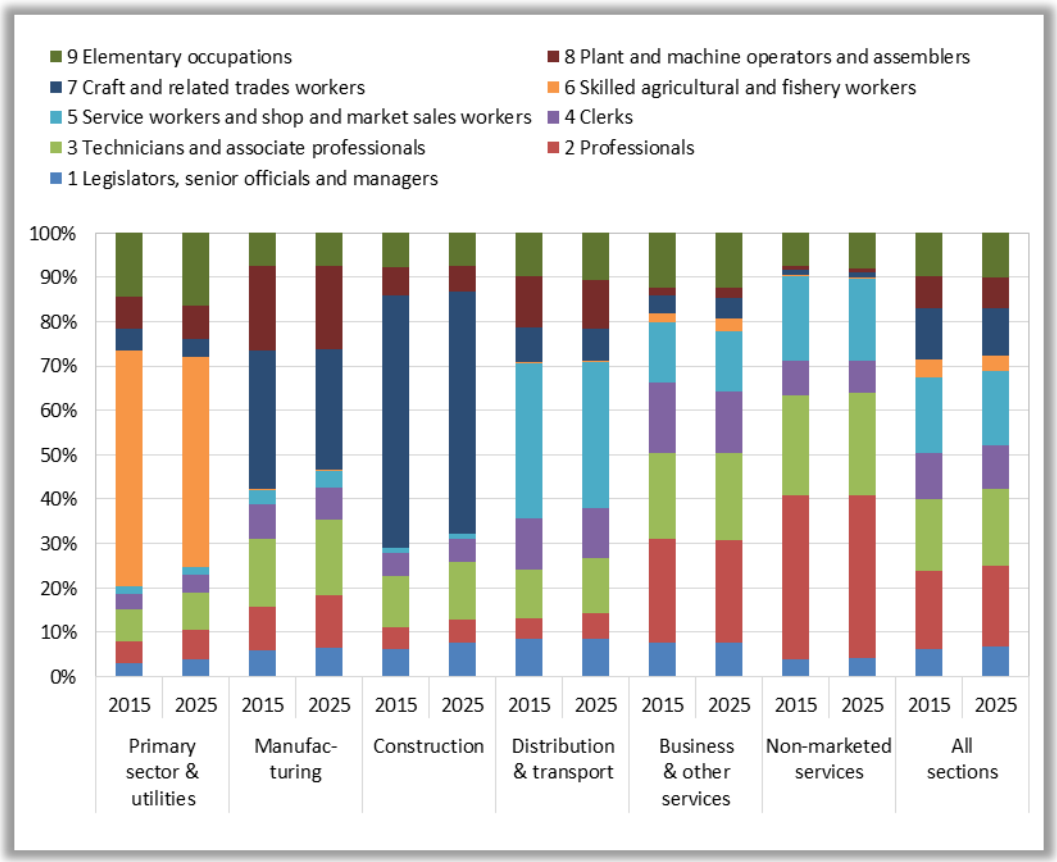
Employment growth usually contributes to marginal numbers of jobs available on the labour market. Around 14 of every 15 jobs will become available due to the need to replace workers leaving the labour market. The large share of people new at their jobs in 2025, due to high replacement demand and changes in job content and type of job tasks performed in some occupations or sectors, will naturally create a need for high quality education and training in touch with changing skill needs in the labour market.

2.3. Employment by occupations

Future employment trends by occupation will be based on employment in sectors as well as changes inside the sectors. Technological developments, and particularly the fourth industrial revolution and automation, are seen to have strong impact on employment and demand for higher-level occupations. Automated processes, robots and artificial intelligence can replace routine and data processing jobs and tasks, impacting both blue- and white-collar jobs. The introduction of robots/advanced machines can eventually replace some jobs but simultaneously may create new ones with pertinent specialised skills and higher qualification demands.

Changing work content and increased task complexity will result in growth of the occupational group of legislators, senior officials and managers, professionals and technicians and associate professionals (ISCO 1, 2 and 3). Occupational groups of skilled agriculture workers, plant and machine operators or craft and related trades workers will experience job losses while being still an important group in some sectors (Figure 3).

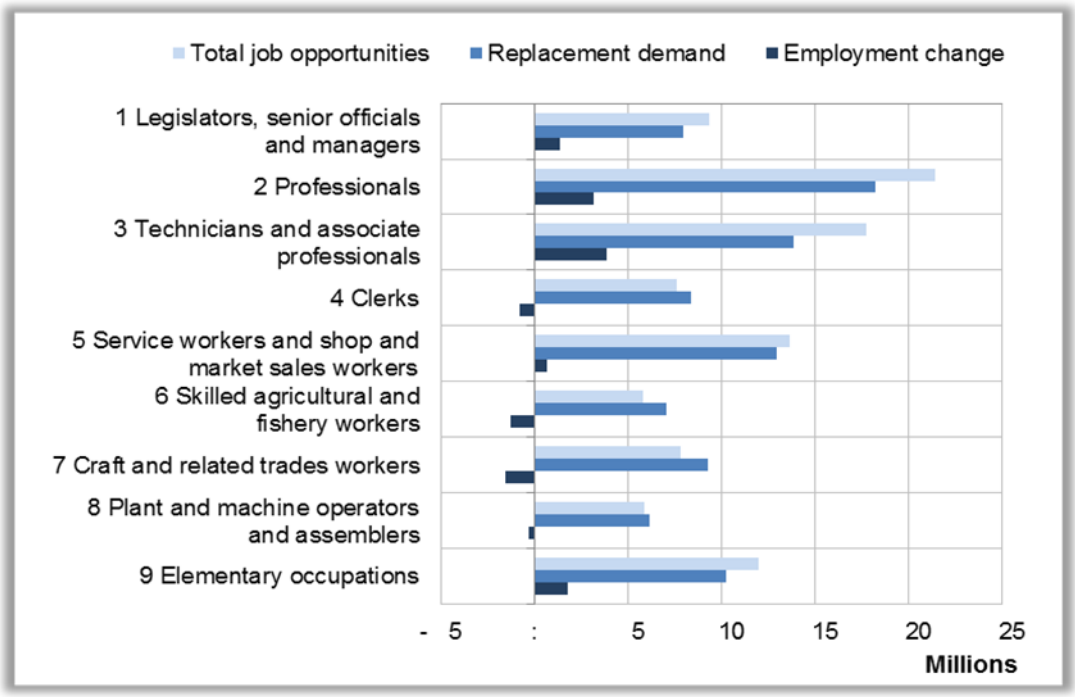
Figure 3. **Occupational structure by sector in EU-28+ (2015 and 2025)**



Source: Cedefop skills forecasts (2016).

About 85% of all jobs openings will arise from the need to replace workers leaving the occupation, with retirement or other reasons for moving into inactivity the most visible likely cause. While, in practice, not all these positions will eventually be filled, the general assumption is that employers are trying to do this; non-replacement of the position is counted as the job loss and negative employment change. The need to replace workers leaving occupations will be found in all occupational groups, even though some groups are affected by negative employment growth.

Figure 4. **Total job opportunities by occupations in EU-28+ (2015 to 2025)**

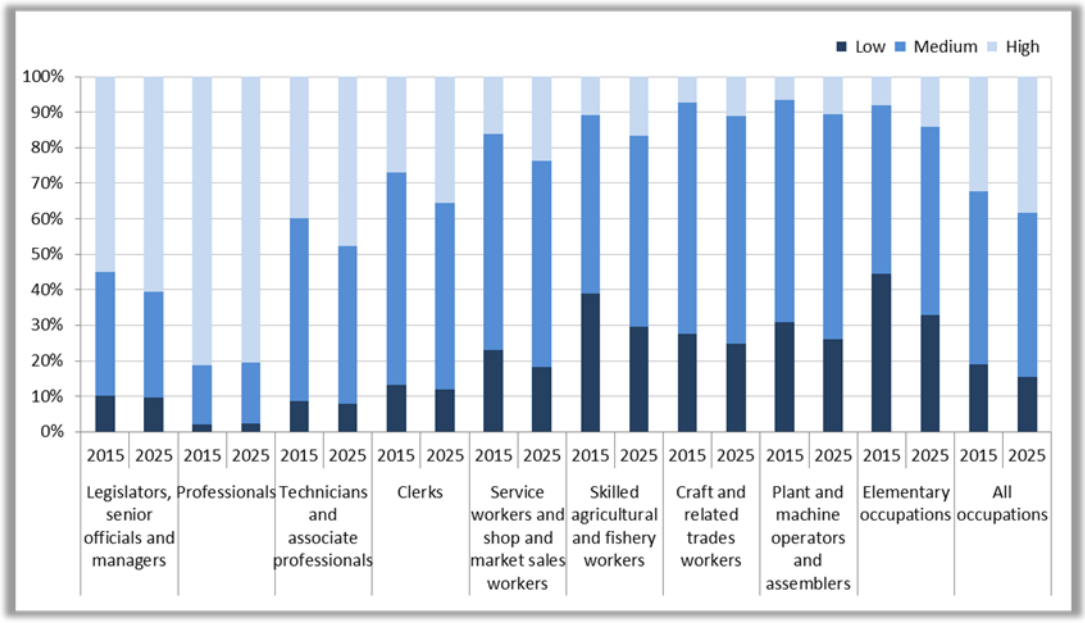


Source: Cedefop skills forecasts (2016).

2.4. Qualification requirements

Processes complexity and the tendency to replace workers leaving the occupation with better qualified ones will lead to an overall decline in demand for those with low qualifications. Between now and 2025, even the share of those working in elementary occupations with low qualifications will reduce from 44% to 33% while the share of those with high qualifications working in occupation demanding typically lower levels of skills will grow from 8% to 14%. Employment of those highly qualified across Europe in all occupations in the next 10 years will increase from 32% to 38%.

Figure 5. **Qualification shares across occupations in EU-28+**



Source: Cedefop skills forecasts (2016).

2.5. Population and labour force

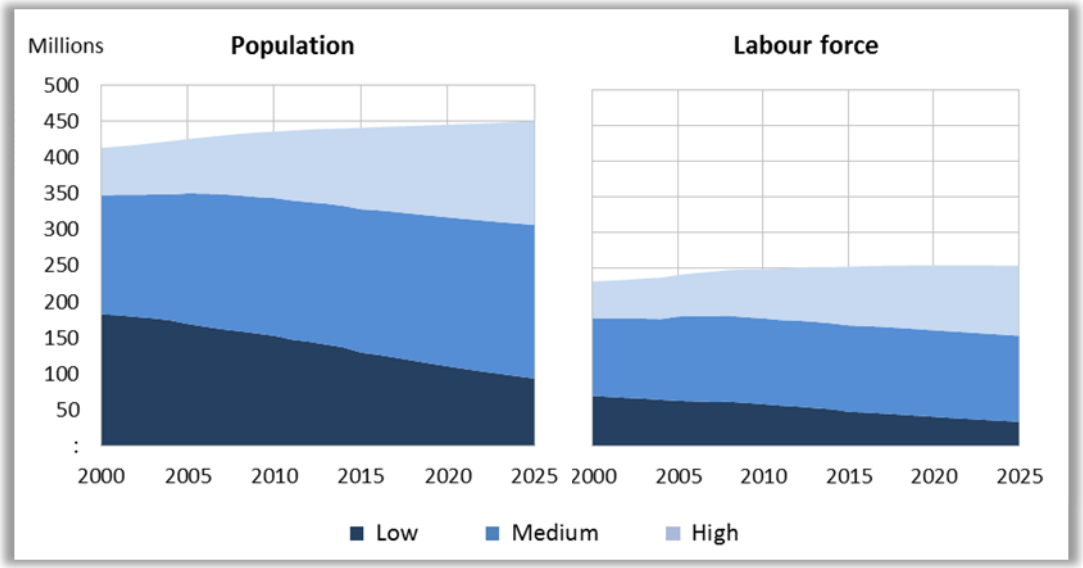
Developments in the supply of skills (as measured by qualifications) are driven by the overall demographic and labour market trends set out above, in combination with the outcomes of many individual decisions about how much to invest in education and training. Analysis of stocks and flows using data from the Eurostat labour force survey (LFS) ([15]) suggests a significant increase in the numbers of people participating in further and higher education beyond compulsory minimum school leaving age and acquiring formal qualifications at medium and higher level.

The European population will grow in the next decade by about 9.5 million, reaching nearly 450 million people (Figure 5). However, due to the increasing share of elderly ([16]) the available labour force will be lower than in the past. The only age group in the EU-28+ as a whole experiencing growth will be that over 55 years old (Figure 6).

([15]) http://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey

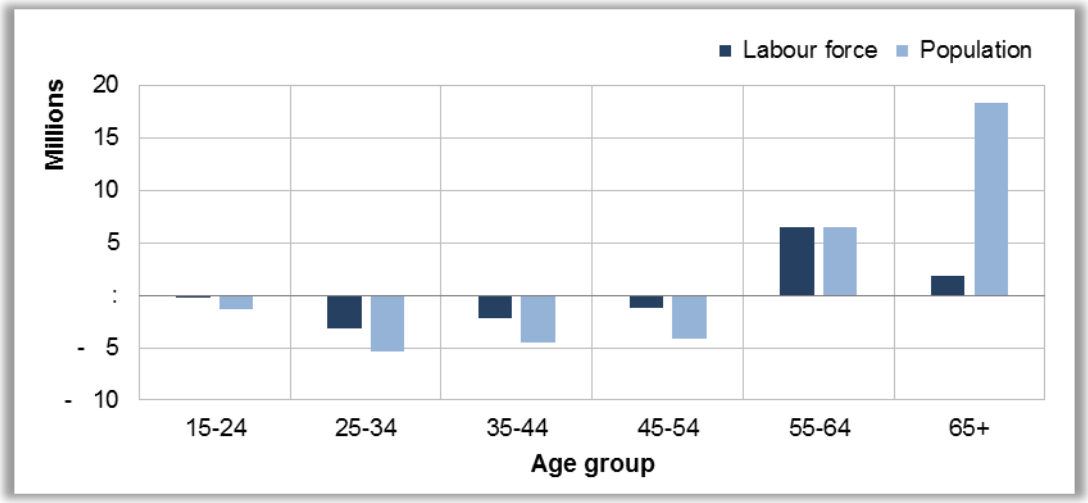
([16]) The share of population 65+ in EU-28+ will grow from 22% in 2015 to 26% in 2025.

Figure 6. **Population (left) and labour force (right) by qualification in EU-28+**



Source: Cedefop skills forecasts (2016).

Figure 7. **Growth of population and labour force by age group in EU-28+ (2015 to 2025)**



Source: Cedefop skills forecasts (2016).

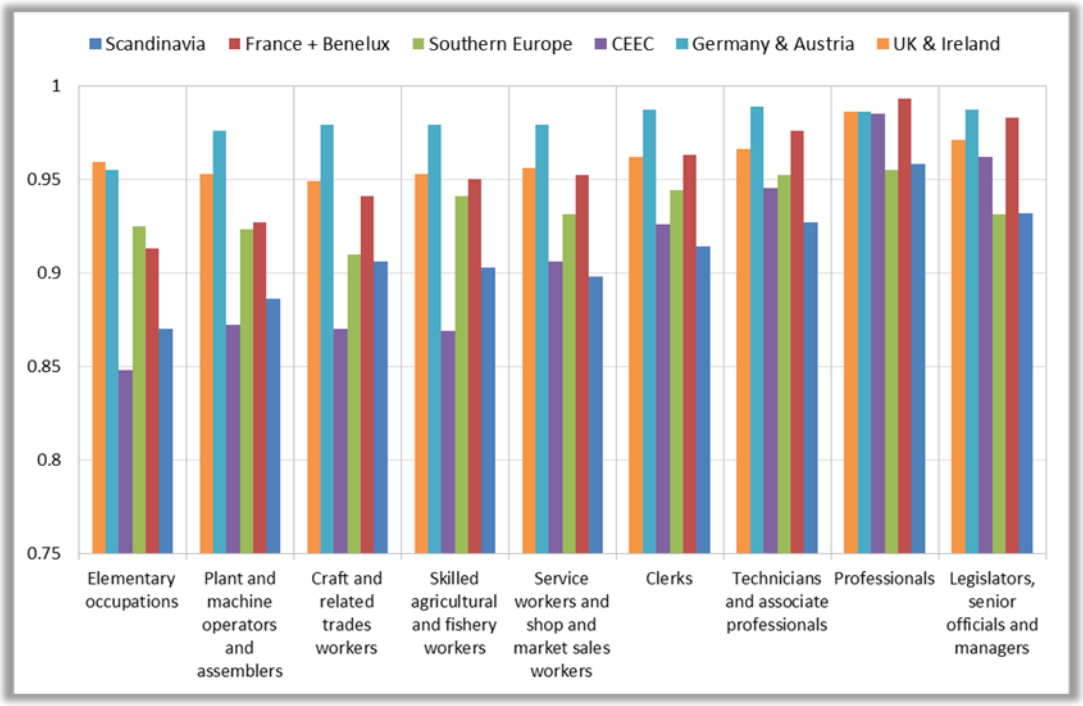
Although relatively older, the future labour force will be formally well qualified. The labour force with high-level qualifications (ISCED 5 and more) is projected to increase by more than 15 million between now and 2025. Of these, more than 56% will be females: about 43% of females will have high qualifications by 2025 while the share of highly qualified males will be only 34%. The labour force with low qualifications will decline (in the same time period) by

nearly 14 million and the share of those low qualified will drop to 13% (10% females, 15% males).

2.6. Potential labour market imbalances

Matching skills supply and demand is more complex than simply comparing qualification levels on both sides of the equation. Job seekers are not aware of all available vacancies meeting their expectations nor are employers able to address all possible candidates. Such imperfect information makes the labour markets distorted. Subsequent adjustments made by various labour market actors are leading to different types of imbalance and skill mismatch.

Figure 8. **Indicator of future imbalances of demand (2015 to 2025)**



Source: Cedefop skills forecasts (2016).

The indicator of future imbalances of demand (IFIOD) assesses sufficiency of skills supply of adequate qualification for particular occupation. Based on the importance of specific qualifications in an occupation, the indicator shows to what degree hiring difficulties are expected as (some of the) skills are in short supply relative to overall demand in an economy. Values of 1 indicate no shortage, lower values indicate some shortage and zero absolute inability to find appropriate skills. A simplified interpretation of the number would be the extent to which the

occupations can easily satisfy their demand (a value of 1 = 100%). More information on the methodology is available in various publications (Cedefop, 2012a, 2012b; Kriechel, 2015).

The indicator of future imbalances of demand presents lower values in Scandinavia (for example, 0.9 for service workers and shop/market sales workers). However, the low indicators for almost all intermediate- and lower-skilled occupations for Scandinavia, the CEEC, and also for France and Benelux, indicate a potential shortage of lower and intermediate workers, which might lead to imbalances on the labour market. The forecast indicates significant change in the qualification composition of occupations. This could be driven by structural changes, increased job complexity or work organisation as well as changes in supply by qualification. However, the indicator does not only reflect potential shortages of adequate qualification in countries but also continuing structural changes in qualification supply and skill mix within occupations.

CHAPTER 3.

Alternative skills supply

In previous Cedefop work designed to inform the OECD-EU dialogue on mobility and international migration (Descy, 2014), Cedefop undertook analysis of the impact of (hypothetically) reaching the EU 2020 employment rate headline target for the European labour market. This analysis, following work by the European Commission (European Commission, 2013), confirmed that meeting the employment target is dependent on considerable activation efforts by several EU Member States, which will have to counteract existing practices and policies. The magnitude of the population that needs to be activated in the European economy is significant.

While activation policies and better education and training are key ingredients for attaining this goal, the high fiscal cost imposed on debt-laden economies implies that other solutions, such as migration, will have to be explored. This is particularly the case considering that a share of non-active domestic population cannot be brought into the job market due to severe health incapacities or other personal constraints.

Following this initial reflection, and to explore further how the future supply of labour might impact on EU labour markets, Cedefop has developed a scenario to represent an alternative projection for skills supply. This alternative scenario takes into account different elements of supply: labour market participation rates and migration. The analysis has been designed to respond to the following research questions:

(a) what could be a feasible mix of activation and migration adjustments to achieve a more satisfactory labour force structure in different countries, sectors, occupations?
(b) what effect will this mix have on any future labour market imbalances?

This work extends the baseline scenario (described earlier) using the same modelling apparatus in assessing the feasibility of some of the suggested solutions and the implications for both kinds of imbalance.

The following analysis will distinguish two types of imbalance:

(a) macro supply/demand imbalance: a general imbalance of labour supply and demand. Is there a general workforce shortage in meeting the needs of the economy or an oversupply of workers relative to demand (reflected in high unemployment rates and/or low labour market participation rates)?

(b) micro/skills imbalance: is there an imbalance in the required skills of the workforce versus those available (as measured by occupation and/or qualification)?

The answer to the question 'how might changes in supply (activation) and EU-wide migration help attenuate both macroeconomic labour market imbalances and/or national skill mismatches' is not straightforward. While it is clear that there are some macro stylised facts we can refer to and draw on in this area, it is difficult to model this quantitatively in a robust fashion.

In the United Kingdom, for example, we know there have been big flows of inward migration, much of which is into areas that United Kingdom residents are unwilling or unable to work in. We also know that many other countries are experiencing outward flows because domestic labour markets are unable to compete with the appeal of other countries. More recently, the flow of migrants and refugees across the Mediterranean and Aegean has increased the net inflow into several European countries. However, measuring these phenomena and building them into quantified scenarios is difficult, if not impossible

3.1. Study approach

The approach chosen has involved structured and detailed analysis of Cedefop's baseline projections of aggregate labour supply and demand, as well as the detailed constraints and imbalances by skill (as measured by occupation and qualification). It has attempted to assess how changes in supply (activation and EU-wide migration) can help attenuate both macroeconomic labour market imbalances and/or national skill mismatches.

This is an ambitious project. To develop an alternative labour supply scenario it has been necessary to make simplified assumptions about the future profiles of outcomes (such as labour market participation rates and migration) that are determined by many interrelated and complex factors. The assumptions and methodological choices made have been informed by analysis of relevant data and evidence. However, there are substantial gaps in available data. We have made best use of the available evidence and have engaged and consulted with OECD, Eurostat and DG Employment researchers in the field (particularly the analysis of migration) to exchange ideas and data.

Figure 9 illustrates the three main steps of developing the alternative scenarios, as described hereafter:

(a) step 1: detailed analysis of skills supply. Using the multisectoral macroeconomic model as the foundation, we analysed labour market

imbalances at macro level (by country) in the existing baseline scenario, to determine the scope for changes in population and the economically active workforce. We make an underlying assumption that macro imbalances can be (partially) solved by migration, as well as by changes in participation (activation policies). An alternative set of projections of participation rates (to represent reasonable adjustment to activation) was prepared. Country experts were invited to comment on the feasibility of the alternative projections;

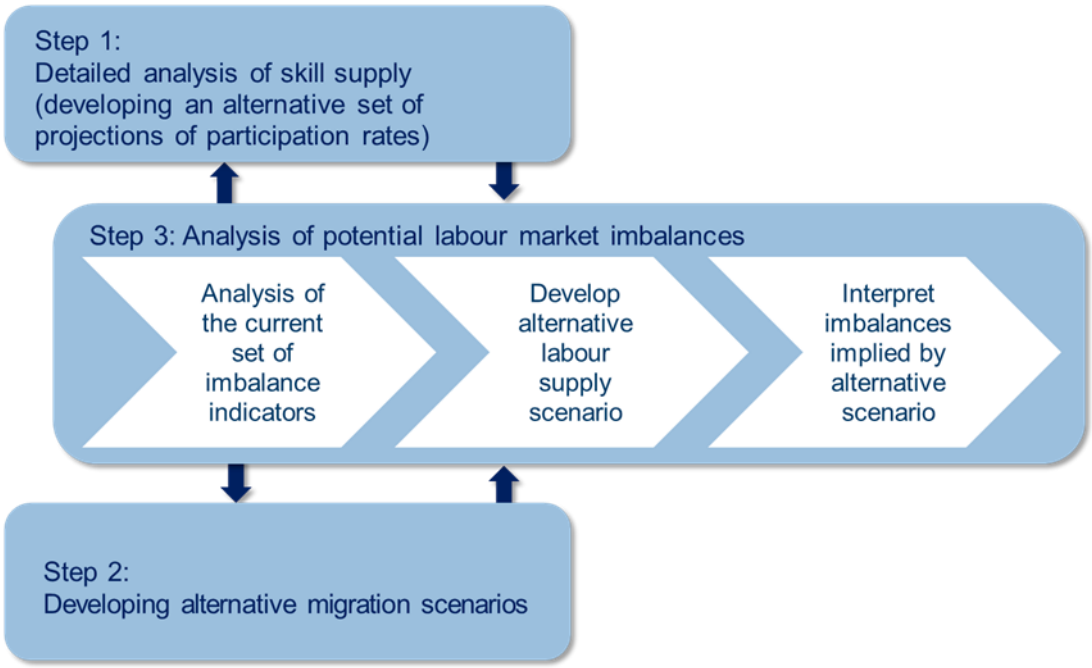
(b) step 2: developing alternative migration scenarios. This involved further analysis of the baseline scenario ordered countries from high labour market participation/low unemployment countries to low participation/high unemployment countries, to identify the potential receiving and sending countries for EU-wide mobility. An alternative set of projections of population was prepared (to represent a reasonable reflection of alternative patterns of migration). Country experts were invited to comment on the feasibility of these alternative projections;

(c) step 3: analysis of potential labour market imbalances. These alternative views for migration and participation were input to E3ME – the global macroeconometric model designed by Cambridge econometrics ([17]) – and further interventions were made to develop a plausible alternative labour supply scenario. The new scenario was analysed to explore both macro and micro imbalances compared with the baseline scenario and to interpret the implications for supply/demand imbalances.

We distinguish between macroeconomic imbalances (gaps between overall labour demand and labour supply), and micro (skills) imbalances. The modelling framework used for the further analysis ignores (or takes as given) most cross-country macro imbalances and concentrates primarily on skills imbalances (mismatch between qualification demanded and available).

([17]) http://www.camecon.com/EnergyEnvironment/EnergyEnvironmentEurope/ModellingCapability/E3ME.aspx

Figure 9. **Steps for the development of alternative skills supply scenario**



Source: Cedefop.

To investigate macroeconomic imbalances, we focus on how far potential labour supply (is likely) to fulfil national labour demand. One simple (but limited) indicator is unemployment. Low levels of unemployment may indicate an overall shortage of workers. Another useful indicator is the level of labour market inactivity. In principle, both indicators could also distinguish education/ qualification level but currently this is problematic because of data limitations.

The aim of the exercise has been to identify countries which can be characterised as regions of labour shortage and those of labour surplus (many MS have currently high levels of unemployment). The analysis then considered how these different types of countries are likely to react:

(a) activation policy might be used to increase labour market participation; how much is possible/feasible is the relevant question here;

(b) migration is the second consideration; again the question is how much is feasible, recognising that not all migration is for economic reasons, and that solving imbalances in one country can create imbalances in another country.

3.2. Trends in labour market participation

Raising labour market participation is considered as one of the main ways to address labour force shortages: the various drivers and barriers to labour market

participation as discussed below. Review of past and forecast trends in participation rates across EU Member States helps to asses to what extent activation policy might stimulate participation. This analysis creates a basis for an alternative projection of future participation rates and offers a plausible outcome of possible activation policies aimed at attenuating macro-level supply constraints and skills imbalances.

3.2.1. Drivers of labour market participation

Factors driving labour market participation are many and varied, as summarised in Table 1.

Supply-side drivers that can encourage participation include rising life expectancy, changes in statutory retirement age, availability of public and affordable childcare facilities, and policies such as tax incentives for second earners. However, participation rates can be affected negatively by increases in the average age of the population, and the availability of generous public packages of social benefits and disability insurances. The existence of high unemployment and a self-defeating attitude caused by a non-functioning labour market can also discourage workers and harm participation. Even the structure of the nuclear family unit can affect participation: having a first earner in the unit could discourage some other members from seeking a job, for example, mothers with young children and young potential jobseekers. The presence of old and young dependents within the family unit may also prevent females from participating in the labour market in the absence of policies to reconcile work and family life; low-paid females may be more sensitive to these circumstances and abandon the labour market when income is not high enough to afford childcare facilities. A virtuous circle can be identified in terms of education attainment, with highly-educated workers more likely to participate and achieve the expected return on their investment in education.

On the demand-side, existing evidence suggests that participation (particularly of women) is often linked to expanding employment in the public sector and the service sector. Participation can also be increased by exposure of households to financial obligations (such as mortgages and debt). Another factor that has an important impact on participation is the macroeconomic context: strong economic growth can encourage participation as firms recruit additional workers and/or offer higher wages. In contrast, high unemployment will depress employer expectations of demand and recruitment, and discourage workers from actively searching for jobs, affecting participation rates negatively.

A further set of explanatory factors can have negative or positive impact on participation. For instance, part-time employment opportunities can be an

attractive way of reconciling work and family life but employers may adopt such contracts in a manner that harms the quality of employment and remuneration, and the attractiveness of work. Culture and attitudes may also play positive or negative roles, with the perception of 'work as a value' acting as an incentive for individuals to seek employment. Employment protection will also play a role in participation: high levels of employment protection could dissuade employers from hiring additional workers in response to a temporary/short-term peak in demand. It could also negatively affect opportunities for young jobseekers to gain initial employment.

Table 1. **Main drivers of labour market participation**

Supply-side elements	Impact	Demand-side elements	Impact
Population ageing	-	Growth of public employment	+
Retirement/early retirement	-/+	Expansion of service sector	+
Generous disability insurances	-	Part-time jobs (in both public and private sector)	+ (short-run) / - (long run)
Generous social benefits	-	Overall strictness of employment protection	-
Life expectancy	+	Macroeconomic conditions	+
Educational attainment	+/-	Active labour market policies	+
Self-defeating attitude	-	Unemployment rates (employers' expectations)	-
Family responsibilities	-/+	Financial obligations (mortgages, credits, etc.)	+
Financial incentives to work	+	Working attitude	+/-
Mobility of young adults	-/+ (origin country and destination country)		
Unemployment rates (discouraged workers)	-		
Availability of public childcare facilities	+		

Source: Cedefop.

The impacts of these drivers depend upon situations in Member States: macroeconomic conditions, the composition of the population, and cultural background and institutional factors (Table 2). Such characteristics may also vary

across different regions or areas within a country, as in Italy, where important differences in overall context are found in comparing urban industrialised northern areas with rural communities in the south. This heterogeneity complicates analysis, since general assumptions adopted for a country may not be representative of all parts of the economy. While the focus here is on variation across Member States, many regions within some of the larger ones are much greater in economic and labour market terms than some individual countries.

Table 2. **Country characteristics that influence economic activity rates**

Characteristic	Description/examples
Population composition	Population ageing; life expectancy; migration; education; family responsibilities
Institutional set-up	Generosity of disability insurance and other social benefits; financial incentives dismissal costs
Macroeconomic conditions	Self-defeating attitude; recession/recovery/growth; expansion of the service sector; growth in public sector employment
Cultural background	Urban vs rural communities; traditional vs unconventional attitudes towards work and women in work place; attitudes towards family formation; religious/social/cultural differences across countries

Source: Cedefop.

3.2.2. Patterns of labour market participation

Past and projected future trends in participation rates have been reviewed to make an assessment about the extent to which activation policy might further stimulate participation ([18]). This enables us to characterise the trends and contexts of different Member States. Given the complexity of the interrelated drivers of participation and Member State-specific contexts, an assessment is made about what might represent a 'feasible' outcome of activation policies. However, it was difficult to evaluate individual activation policy interventions in different Member States in detail. The contexts of each Member State have been accounted for by seeking the opinions of the network of individual country experts (ICEs) to review and refine our revised assumptions for future trends in participation.

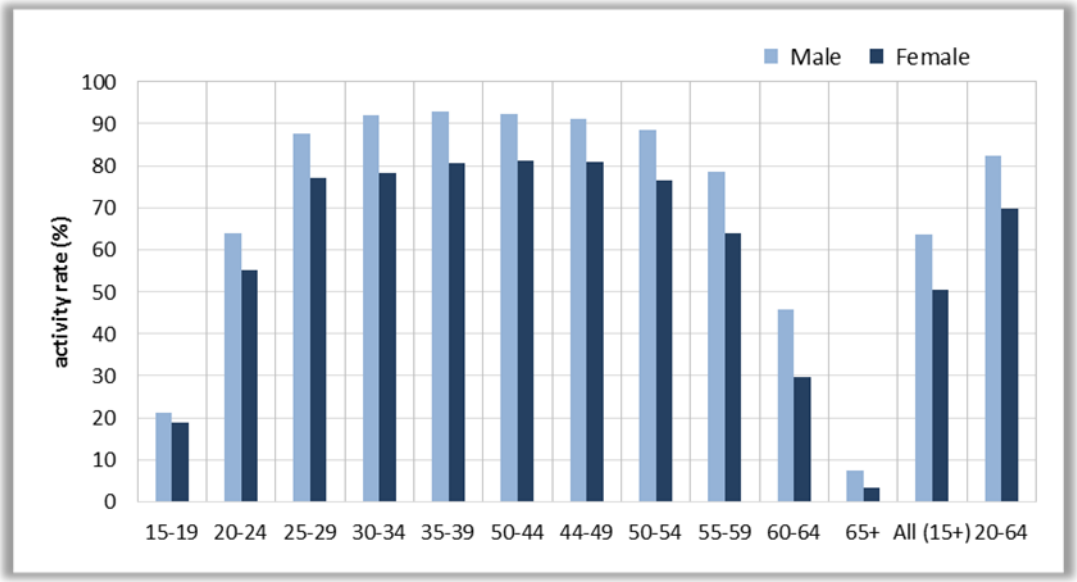
It is among the older age groups and females in the EU-28 that there appears greatest scope to raise participation, though there are significant differences across countries. Participation rates for prime age males are typically

([18]) Activity rates are considered as the ratio between labour force and population by the defined age/gender group. The analysis is based on the activity as estimated in the baseline scenario described above.

close to 100% for most countries. For younger age groups, education participation is the norm rather than labour market participation.

For population groups of working age, female activity rates are typically 10-12% lower on average for the EU-28 than for males (Figure 10). Activity rates for the EU-28 also become lower for groups older than 50, and tail off markedly after age 60. This general pattern is common across most Member States, but with some variation in average Members State activity rates and in the differences within each Member State between older/core and male/female activity rates. Tables 3 and 4 summarise past trends (since 1990) in activity rates by age group and gender in the different Member States.

Figure 10. **Activity rates by age and gender (EU-28), 2015**



Source: Cedefop skills forecasts (2016).

For these reasons, policies to promote participation in the coming years typically focus on females and older age groups. Table 3 compares past trends in male activity rates with those for females for workers of prime age. In most Member States, female participation rates have been on an upward trend since the 1990s. However, there has been little improvement in terms of closing the gender gap in several countries, including Bulgaria, the Czech Republic, Hungary, Latvia, Romania and Slovakia and Finland.

Table 3. **Activation rates among population aged 25 to 54, by gender, across EU Member States**

		Female aged 25 to 54, activation rate		
		Upward	**Stable**	**Downward**
Male aged 25 to 54, activation rate	**Upward**	Bulgaria**, Hungary**, Poland***		
	Stable	Germany, Spain*, Greece*, Malta*, Netherlands	Czech Republic**, Denmark, Estonia**, Latvia**, Lithuania, Romania**, Slovenia, Slovakia**, Finland**, Sweden**	
	Downward	Belgium, Ireland*, France, Croatia, Italy*, Cyprus, Luxembourg, Austria, Portugal, United Kingdom		

(*) Member States where there is potential for the participation of the population aged 25 to 54 to increase (e.g. cultural factors cause lower female participation).

(**) Countries where gender differences have either intensified or kept constant through time.

Source: Cedefop.

Table 4 explores the age dimension and compares the trends (from the 1990s to 2014) followed by the youngest and the oldest population groups. Participation has increased for the oldest groups, with the exception of Greece and Romania. For many years in many developed countries the trend for participation for older workers had been downwards as individuals chose to take the fruits of economic growth in the form of shorter working lives; this trend continued in many countries during the 1990s (as in Denmark, France and Austria). More recently, this trend has been reversed in many countries: governments have raised statutory retirement ages in response to aging populations, while the global crisis of 2008 exacerbated concerns about the financial viability of pension schemes. Participation rates for the youngest cohorts have been declining since the 1990s in most countries, indicating in some countries a higher rate of participation in education and training. In contrast, participation in the labour market for young workers has followed an upward trend in the Netherlands, Finland and Sweden.

Table 4. **Activation rate by age groups across the EU Member States**

		Population aged 15 to 24		
		Upward	**Stable**	**Downward**
Population aged 55 to 64	**Upward**	Netherlands, Sweden, Finland	Bulgaria, Estonia, France, Cyprus, Latvia, Austria	Belgium*, Czech Republic*, Denmark*, Germany, Ireland*, Spain, Croatia*, Italy*, Luxembourg, Lithuania, Hungary*, Malta*, Poland*, Portugal*, Slovenia*, Slovakia*, United Kingdom*
	Stable			Greece*
	Downward			Romania*

(*) Countries in which a decline in participation of the youngest group of population is caused by an increase in participation in education.

Source: Cedefop.

To analyse future trends, we have characterised Member States by focusing on some of the drivers of participation discussed earlier in this chapter. The analysis links the evolution of participation rates to the following set of indicators.

Table 5. **Categorisation by key driver/indicator**

Driver/indicator	Categories
GDP growth (2014-30)	'High economic growth' are countries where the rate of growth of GDP is projected to be faster than the EU-28 average 'Low economic growth' are projected to see slower than EU-28 average growth
Unemployment rate	'High unemployment' countries currently have an unemployment rate above the EU-28 average 'Low unemployment' countries have lower than average unemployment
Change in working age population (2014-30)	'Growing working age population' 'Declining working age population'
Change in participation rate (2014-30)	'Growing labour force participation rate' countries in which the participation rate is projected to increase 'Declining labour force participation rate'

Source: Cedefop.

Table 6 shows that participation rates and working age population are expected to decline in most countries, regardless of economic conditions. This can be explained partly by the aging population of many countries: more people will enter into groups with lower participation rates as the population ages. The proportion of the total population in younger age groups is expected to fall substantially, while the proportion of the population in the older age groups will rise. Participation rates among the older age groups are, however, expected to

increase (albeit from a low base) as retirement ages rise and there is greater pressure to continue working to top up pensions.

Table 6. **Country categories by demand- and supply-side indicators**

		High unemployment		Low unemployment	
		High economic growth	**Low economic growth**	**High economic growth**	**Low economic growth**
Declining working age population	**Declining labour force participation rate**	Ireland, Spain, Cyprus, Latvia, Poland, Slovakia	Greece, Lithuania Portugal,	Czech Republic, Estonia, Romania, Malta, Slovenia	Germany, Netherland, Finland
	Growing labour force participation rate	Bulgaria, France, Hungary	Croatia		
Growing working age population	**Declining labour force participation rate**	Sweden	Italy	Belgium, Luxembourg, Austria	United Kingdom
	Growing labour force participation rate			Denmark	

Source: Cedefop.

Analysis of past trends in participation rates shows that:

(a) the gender gap has been narrowing in all but one Member State since the 1990s. The exception is Romania, where female participation has been declining, while male participation has increased;

(b) countries such as Lithuania, Portugal and the United Kingdom have experienced strong convergence in terms of participation by gender. This has been characterised by an upward trend in female participation accompanied by a downward trend in male participation;

(c) there is limited scope to increase female participation in several countries where participation is already quite high (as in Denmark, the Netherlands, Finland and Sweden);

(d) it seems feasible that male participation rates could be increased in several countries with the exception of Denmark, Germany, Latvia, Lithuania, Austria, Sweden and the United Kingdom;

(e) participation rates for the younger population groups are relatively low in many countries, so there appears scope for increase. However, for the youngest group, the policy priority is likely to be continued participation in education and training;
(f) there is scope to increase participation of older age groups in several countries.

The aim of this analysis has been to identify countries which can be characterised as regions of labour shortage and those of labour surplus (in terms of macro imbalances). Some groups of countries appear more clearly defined as having labour shortages: those forecast to have low unemployment, relatively high participation and declining working age population (such as Germany and Finland). Labour surplus countries have high unemployment and relatively low participation (as in Ireland and Greece). Many countries are less clearly defined (Table 7).

Table 7. **Typology of countries based on baseline economic prospects and demographic trends**

		Decline working age population	Growing working age population
Macro-economic prospects	**Positive**	Czech Republic, Estonia, Malta, Romania, Slovenia	Belgium, Denmark, Luxembourg, Austria,
	Mix results	Bulgaria, Germany, Ireland, Spain, France, Cyprus, Latvia, Hungary, Netherlands, Poland, Slovakia, Finland,	Sweden, United Kingdom
	Negative	Greece, Lithuania, Croatia, Portugal	Italy

Source: Cedefop.

3.2.3. Alternative projection of future participation rates

An alternative projection of future participation rates was prepared for each for each Member State, informed by the above analysis. These projections were reviewed by individual country experts, for them to check the assessment of what might represent a 'feasible' outcome of activation policies. The projections were then refined to take account of the individual country experts' insights and opinions.

Table 8 summarises for each country the adjustments (compared to baseline) that have been made for the alternative projections of participation rates. The assessment is that there is limited scope for participation to be increased. For the EU-28 as a whole, the revised projections would increase participation (age 20 to 64) in 2025 compared to the baseline by only 1 pp for

males and 1.8 pp for females (all 1.4 pp). In several of the countries with labour shortages, such as Germany, the Netherlands, Finland and the United Kingdom, the potential for greater participation is considered limited. The greatest scope for further increasing participation is assessed to be in countries including Ireland (+4.6 pp by 2025), Italy (+4.4 pp), Greece (+3.5 pp) and Poland (+3 pp), yet these are countries with relatively high unemployment (labour surplus). Adjustments have been made to increase participation of the following gender/age groups (towards the EU-15 average by 2025): females, younger, and/or older age groups.

3.3. Trends in labour mobility and migration

There is a huge amount of literature discussing different drivers and decision processes in migration. Here we focus on the main economic drivers for migration and mobility decisions, as these are the most important for setting up the alternative scenario. Although we recognise the high importance of factors such as institutions, language barriers, cultural background (or religion) or physical distance, for the purpose of this scenario they are of secondary importance.

3.3.1. Drivers of labour mobility and migration

In *The theory of wages*, Hicks argues that the main causes of migration are differences in wages (Hicks, 1932). To this day, all economic studies of migration decisions employ Hicks' considerations as the general foundation upon which more sophisticated arguments are built about the influence of various other factors. These economic factors are considered relevant for internal (within country) mobility just as much as for between countries. In this context, migration is seen as an investment in human capital, yielding potentially higher income in the receiving country/region than in the sending country/region (Sjaastad, 1962). Borjas (2014) has formulated this into an inter-temporal choice to the general evaluation of income differences. The migration decision is based on income differences between home (sending) and foreign (receiving) country, individual preferences for specific countries (which can be specified by a separate factor, or attributed in relation to the cost of moving) and the cost of moving.

Table 8. **Adjustments to baseline projections of participation rates**

Country	Adjustments made (compared to Cedefop baseline)
Belgium	Further increase participation of younger and older age groups (male and female).
Bulgaria	Further increase participation of younger age groups (male and female).
Czech Republic	Further increase participation of females and younger males.
Denmark	No adjustments. Limited potential for greater participation.
Germany	Limited potential for greater participation. Some uplift made to female participation.
Estonia	No adjustments. Limited potential for greater participation.
Ireland	Further increase participation across many age groups (male and female).
Greece	Further increase participation of younger and older age groups (male and female) and other female age groups.
Spain	Further increase participation of younger and older age groups (male and female).
France	Further increase participation of older age groups (male and female).
Croatia	Further increase participation of younger and older age groups (male and female).
Italy	Further increase participation across many age groups (male and female).
Cyprus	Further increase participation of younger (male and female) and older age groups (female).
Latvia	No adjustments. Limited potential for greater participation.
Lithuania	No adjustments. Limited potential for greater participation.
Luxembourg	Further increase participation of younger and older age groups (male and female).
Hungary	Further increase participation of younger and older age groups (male and female).
Malta	Further increase participation of females (most age groups) and older males.
Netherlands	No adjustments. Limited potential for greater participation.
Austria	Limited potential for greater participation. Push up older (55 to59; 60 to 64) female participation.
Poland	Further increase participation across many age groups (male and female).
Portugal	Further increase participation of older females and younger (male and female) age groups.
Romania	Further increase participation of younger and older age groups (male and female).
Slovenia	Further increase participation of younger and older age groups (male and female).
Slovakia	Further increase participation of younger and older age groups (male and female).
Finland	Further increase participation of younger and older age groups (particularly male).
Sweden	No adjustments. Limited potential for greater participation.
United Kingdom	No adjustments. Limited potential for greater participation.

Source: Cedefop.

The new economics of labour migration emphasises the importance of families or households in the decision to migrate. Rather than taking an isolated, individual decision, it is argued that the unit of interest is often the household. We consider this by taking earnings relative to household rather than individuals in our simulation tool.

Employing wage or income differentials as an explanation of mobility behaviour seems at odds with low mobility in the European Union, which greatly reduced legal and institutional obstacles to the free movement of workers. Wages in the past have had only a weak influence on migration flows. Braunerhjelm and colleagues (2000) find that mobility levels were not increasing despite a widening gap in income differentials and unemployment levels. In contrast, Bentivoli and Pagano (1999) note that the US labour market shows much stronger reaction to income differentials than the EU. In the US, language and other cultural barriers to moving across State borders are much lower than in Europe. More recent evidence, however, shows that mobility plays a stronger role in solving imbalances. Probably through the abolishment of inhibitions to mobility within the European Union, market forces such as wage differences allow regional mobility to solve shocks to labour markets more easily. For example, the European commission's study on labour mobility and labour market adjustment (European Commission, 2014) shows that regional labour market mobility can adjust for about 25% within a year of the shock that affects a specific region, so regional mobility within a country (which explicitly includes mobility across national borders) plays an important role in resolving labour market imbalances. Beyer and Smets (2015) corroborate those findings by showing that regional labour market mobility can also adjust for about 25% of the shock that affects a specific region within a year.

Measurement of the success of mobile workers is difficult, as most data sets cannot overcome the problem of selectivity of results through re-migration. Edin and colleagues (2000) show that 30% to 40% of the immigrants to Sweden had left the country within five years. These re-migrants were usually less assimilated than the group of migrants staying longer. Similar patterns can also be found in other countries (such as in Germany, as reported by Constant and Massey (2003) and Bellemare (2007)). The literature shows clear differences in the success of migrants (as measured by earnings assimilation, unemployment, or cultural integration) in mobility from within the EU and migration from outside of the EU (mostly developing countries). Overall, those migrants that remain in the country exhibit closer earnings assimilation to the natives (Aaslund and Rooth, 2007).

Table 9. **Main push/pull factors affecting migration volume**

Hypotheses		Push factors (at the migrant's place of origin)	Pull factors (at the migrant's destination)
Economic determinants	**Probability of finding a job**	High unemployment	Low unemployment
		Low number of vacancies	High number of vacancies
		Low labour market participation rate	High labour market participation rate
	Income prospects	Low income prospects/wage rates	High income prospects/wage rates/wage differentials compared to the migrant's place of origin
	Amenities	Poor supply of amenities (health and social security system, consumer goods,…)	Good supply of amenities (health and social security system, consumer goods,…)
Demographic determinants	**Age structure**	Younger population -> higher probability to migrate	/
	Skills	Higher-skilled persons are more likely to migrate	/
	Female participation rate	Higher labour force participation of women makes migration decisions harder to coordinate since relocating a two-earner household may be more difficult than relocating a single-earner household.	/
Geographic determinants	**Geographic distance**	Short geographic distance (low costs of migration)	
	Countries sharing a border	Higher migration volume between countries sharing a border (due to low costs of migration)	
Administrative determinants	**Migration policy**	Liberal emigration policy (low costs of migrations)	Liberal immigration policy (low costs of migration)
Social/cultural determinants	**Return migration**	/	Return migration to the country of origin
	Social networks	/	High number of persons from the same cultural group/nationality with personal connections to potential migrants at the migrant's destination reduce migration costs (presence of a national community at the destination)
	Linguistic distance	/	Short linguistic distance or same official language
	Religious distance	/	Short religious distance (Belot and Ederveen, 2012)
	Cultural distance	/	Short cultural distance (indicator of cultural distance)

Source: Sprenger, 2013.

While economic factors by themselves seem to offer little explanatory value for the variation in mobility across EU countries, taking into account non-economic factors yields expected outcomes. Correcting for cultural differences such as the Belot and Ederveen, (2012) language and cultural distance between countries, as in Sprenger (2013), economic factors play an important role in explaining migration flows. Over time, economic differences across regions seem to have increased in their explanatory power.

The main push/pull factors from the literature are given in Table 9. Economic determinants, relating to income, employment and benefits, play an important role. Demographic aspects are important in determining the supply side, and the pull effect of 'missing' supply. The other determinants are, for our purposes, not important.

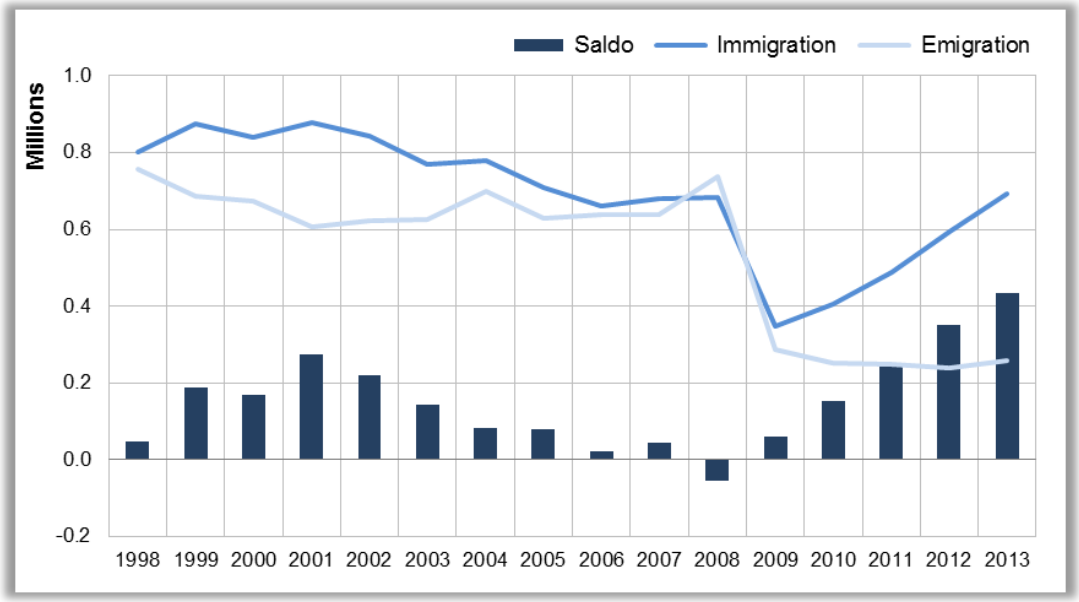
3.3.2. From EU mobility to refugees

The recent refugee crisis focuses the attention on migration towards a group that are much harder to predict, in terms of number, their impact, including future role on the labour market of the host country, and the duration of their stay. One of the main pillars of the European Union, the free movement of people ([19]), is likely to continue to be governed by economic rationale, at least as a strong aspect of the motivation.

Most EU countries follow one of the three patterns depicted in Figures 11 to 13. In the case of Germany (Figure 11), some minor net inflow of migrants (relative to population size) is consistently entering the country every year. German immigration in increased tremendously following the recent recession, as many other European labour markets were more strongly hit than in Germany. Because of its strength, and the increasingly important gaps arising from an ageing population, the need for immigration into Germany created favourable pull factors to increase the inflow to current levels, going well beyond the peak year value for 2013 as shown in Figure 11. Countries such as Belgium, Denmark, France, the Netherlands, Austria, Finland, Sweden and the United Kingdom are following a pattern similar, consistently benefitting from migrants inflow.

([19]) Although the restrictions for free movement of EU citizens in connection to Brexit are widely discussed, the scenario does not reflect this issue due to high uncertainty of final decisions and subsequent impacts.

Figure 11. **Migration trends in Germany**

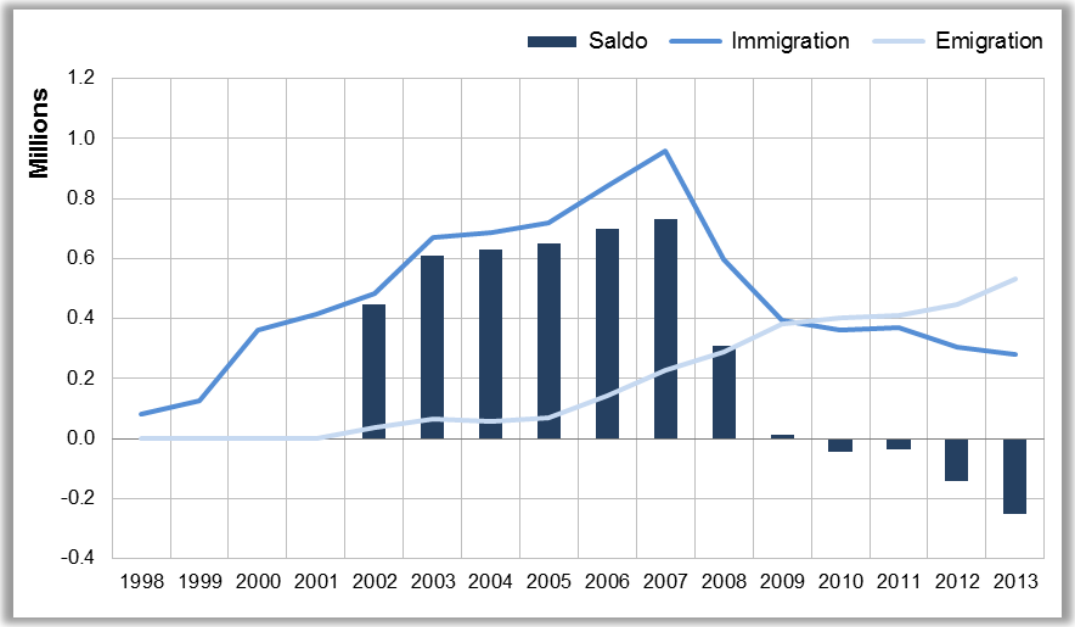


NB: Saldo = net migration.
Source: Eurostat.

In contrast to Germany, Spain experienced a high inflow of foreign migrants in the early 2000s until the crisis in 2008 (Figure 12). The positive migration balance was mainly driven by inflow from non-EU countries, especially from Africa and Latin America. However, following the crisis and the reduced job opportunities on the Spanish labour market, immigration fell significantly, while many (especially young) people decided to leave the country. As a result, the migration balance switched to negative. Similar results can be observed for Ireland and Portugal ([20]).

([20]) Migration data from Eurostat are not complete for all Member States, nor do all countries provide time series going back as far as the ones shown in the figure. Shorter time series make it much harder to provide good estimates of trends from which some idea of future changes and the likely push/pull factors can be gleaned.

Figure 12. **Migration trends in Spain**



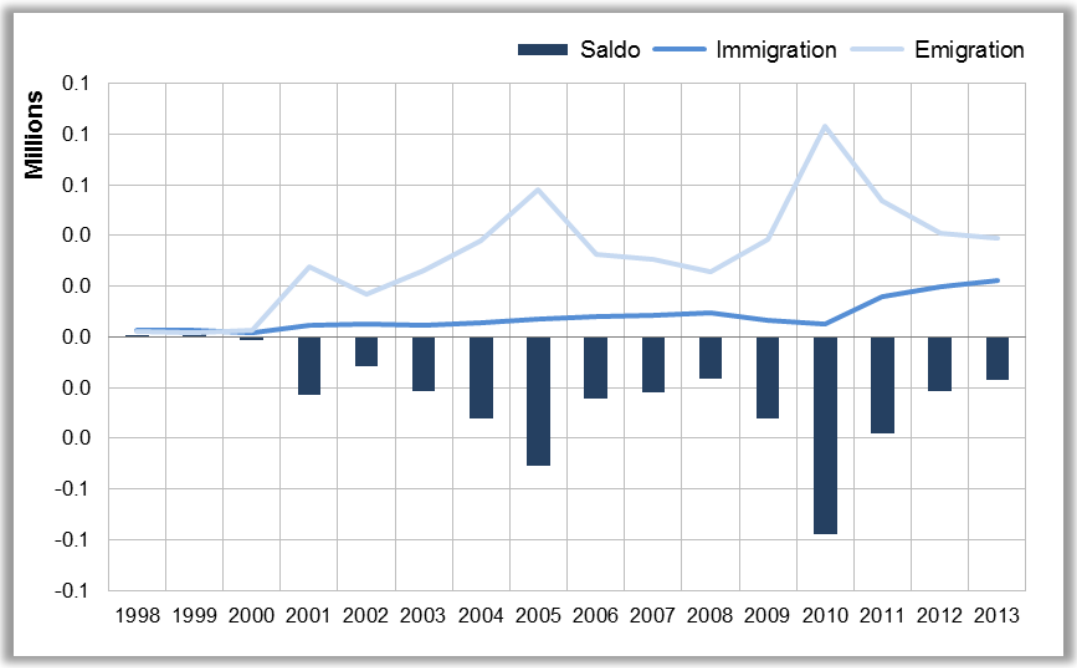
NB: Saldo = net migration.
Source: Eurostat.

Figure 13 depicts the migration flows that are typical for some 'new' Member States. There is a consistent outflow of citizens to other countries. This outflow tends to fluctuate mainly through the (dominating) element of emigration, which seems to progress in waves, to some degree reflecting economic circumstances and opportunities (abroad), or the lack thereof at home. Similar countries include the other Baltic States, Bulgaria, Poland and Romania.

All these trends offer a basis to build general scenarios, in which the countries change their migration role from receiving to sending country unpredictably. However, while most demographic statistics already partly include internal EU mobility, they can also include inflows (and some outflows) from non-EU countries. This external migration is even more difficult to incorporate into the models due to the different status of those involved (refugee, asylum seeker, economic migrant). Further, migrants from outside the EU quite often face issues of legal status and ability to participate on the labour market or recognition of their qualifications.

Table 10 summarises current trends in terms of receiving and sending countries within the EU. It can be used as a first ordering of countries into groups of receiving and sending countries, and possible future developments.

Figure 13. **Migration trends in Lithuania**



NB: Saldo = net migration.
Source: Eurostat.

Table 10. **Countries and migration balance**

	Migration balance: trend	
	Negative	**Positive**
Negative migration balance (2013)	Greece	Bulgaria
	Spain	Estonia
	Croatia	Ireland
	Cyprus	Lithuania
	Latvia	Poland
	Portugal	Romania
Positive migration balance (2013)	Belgium	Austria
	Italy	Czech Republic
	Hungary	Germany
	Slovenia	Denmark
	Slovakia	France
		Luxemburg
		Malta
		Netherlands
		Finland
		Sweden
		United Kingdom

Source: Eurostat.

3.3.3. Alternative assumptions for migration

For the alternative scenario, we use the following general assumptions on the size and direction of the flow of mobile workers within the EU labour market:

(a) following job opportunities: workers follow economic incentives, generally trying to move from low– to high–opportunity environments. This can be linked to general employment opportunities (job opening) and related demographic developments (ageing domestic populations), but also specific to a given qualification. In this last context, skill imbalances reflecting opportunities for particular skills would be the best indicator to use. Indicators that suggest relatively better (future) employment opportunities would suggest movement into that country (and conversely);

(b) income matters: relative income levels, ideally for a given qualification level, are also important. Here we expect an effect (migrant flow) from low to higher income level locations. One way of determining numbers here is to look for imbalances (‘opportunities’) first, then determine the existing income differences between countries. If there are high employment opportunities in one country with low income for a specific occupation, it is less likely to draw in a significant number of citizens from other EU countries;

(c) unemployment: unemployment matters in determining the overall macro context and its attractiveness. More detailed unemployment levels can also be used, in principle, to determine push/pull factors by level of qualification. Given that most migrants are (relatively) young, it may make sense to focus especially on youth or school-leaver unemployment differentials.

3.4. Implications for supply/demand imbalances

Past trends, recent evidence and individual country expert group opinion have been reviewed to prepare alternative assumptions to represent what might be feasible outcomes for migration flows and activation policy. These assumptions were incorporated into the Cedefop forecasting framework along with other adjustments, to produce an alternative labour supply scenario, to assess the potential impacts on macro and micro labour market imbalances. This section summarises the results, exploring both macro and micro imbalances compared with the baseline scenario and interpreting the implications for supply/demand imbalances.

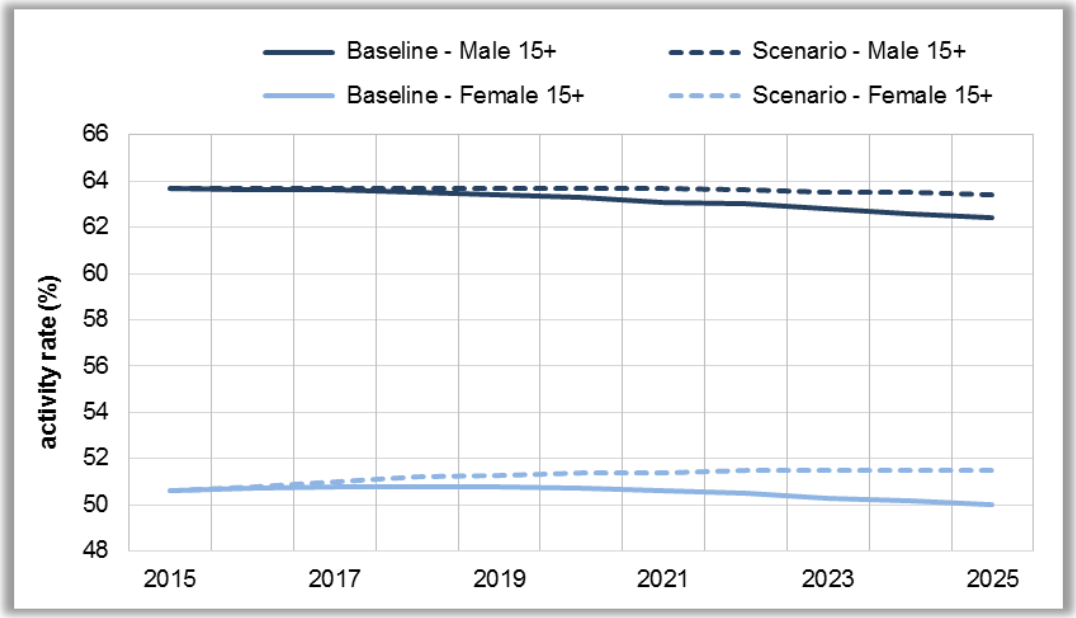
3.4.1. Macro imbalances

In the alternative labour supply scenario, the labour force of the EU-28 is boosted by 1.5% (3.6 million) by 2020 and by 2.7% (6.7 million) by 2025 (compared to the

baseline). These changes to labour supply result directly from the revised assumptions for migration flows and participation rates, and also from the consequent knock-on effects on the macroeconomy and the labour market.

To build the scenario, adjustments are made in the E3ME model to increase participation (by age and gender) in line with an assumed alternative projection. However, the participation rates change further in the model in response to the knock-on effects of the scenario. These knock-on effects have tended to offset the adjustments made so that, in the scenario, the increases in participation rates are fairly modest: EU-28 participation (aged 15+) in 2025 compared to the baseline (Figure 14) is increased by only 1.0 pp for males and 1.5 pp for females (and by 1.3 pp for males plus females). In several countries, falling participation rates were projected (2015-30) in the baseline forecast, while participation is now expected to increase: Belgium, Greece, Italy, Luxembourg, Malta, Poland, Romania and Finland.

Figure 14. **Activity rates by gender in EU-28, scenario compared with baseline**



Source: Cedefop.

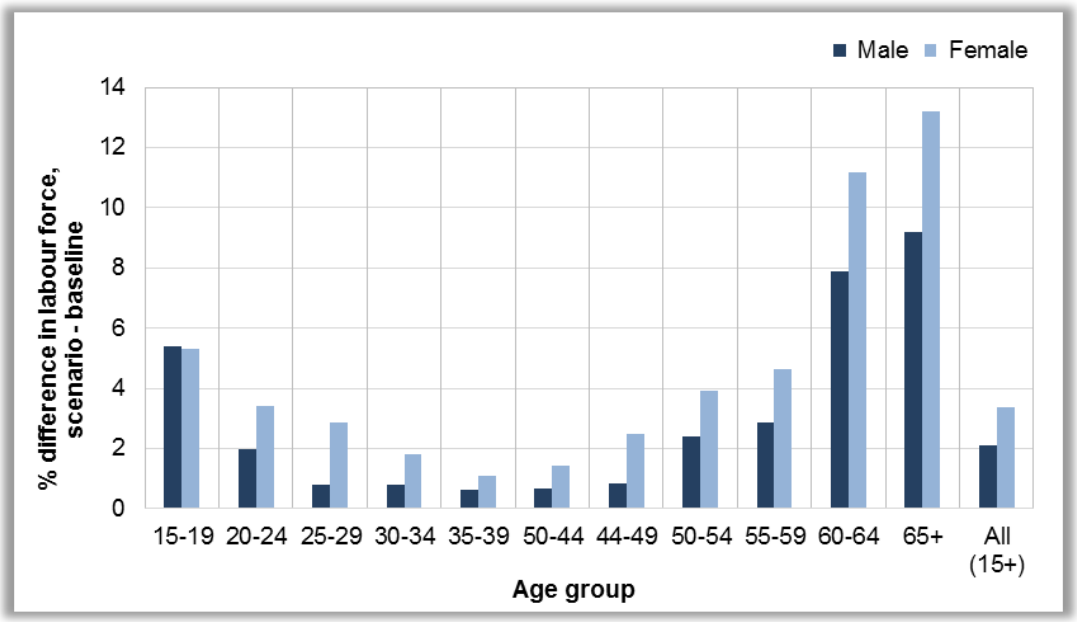
Adjustments were made to increase participation of three key categories:

(a) females;
(b) younger;
(c) older workers.

This is reflected in the scenario results for the labour force (Figure 15): the boost (compared to baseline) to labour supply is focused on older workers (aged

55+) for males, while for females the greatest increase to the labour force is also among older workers, but there is some increase in the core age groups (25 to 54).

Figure 15. **Labour force by gender and age in EU-28; scenario compared with baseline, 2025**



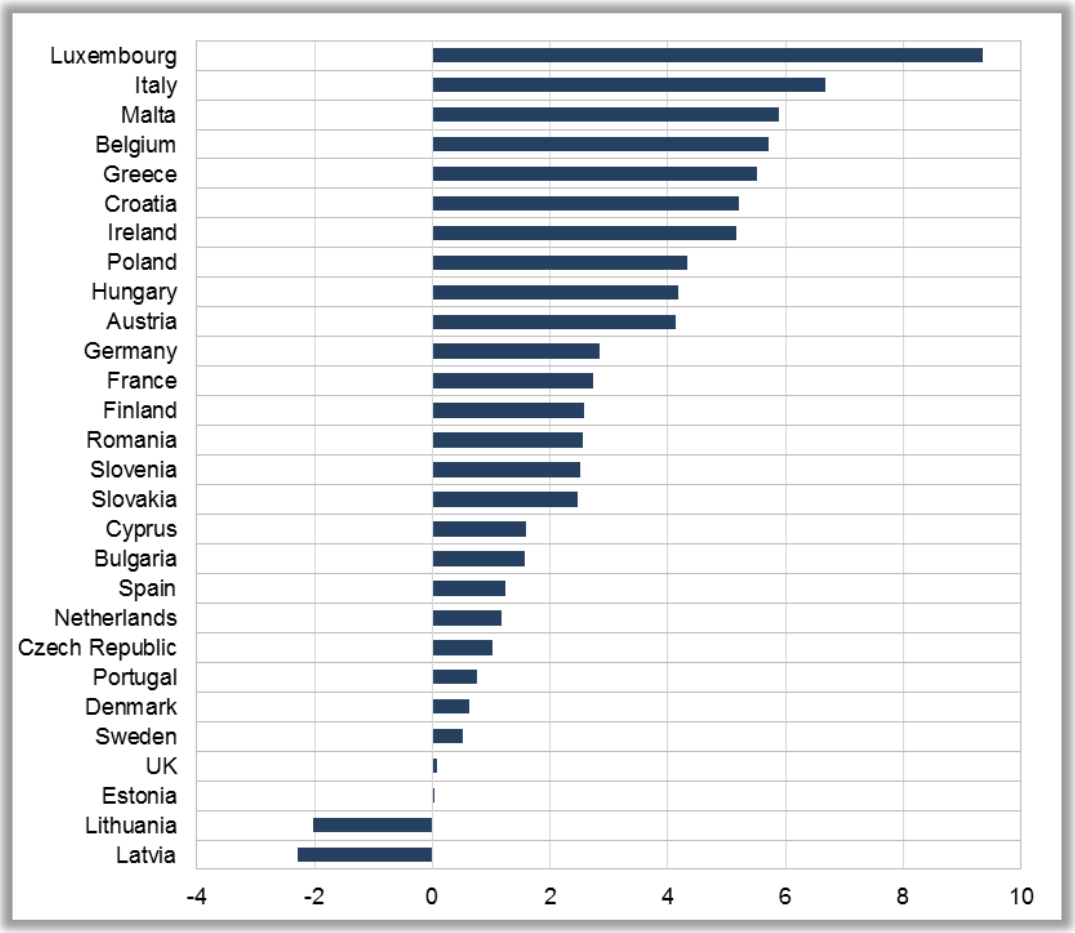
Source: Cedefop.

The impacts on the labour force vary across the Member States (Figure 16), with the largest proportional boosts to labour supply in countries where both higher participation rates and net inward migration have been assumed, such as Belgium, Croatia and Luxembourg. Labour supply is also projected to be higher than in the baseline in Malta and Austria (due to assumptions for larger flows of net inward migration) and in Ireland, Greece and Italy (because of assumptions of higher participation rates).

It has been assumed that higher labour supply leads to greater economic capacity; in those countries with a larger labour force, there is an sustainable increase in the potential output (production of goods and services). There is variation in the overall impact of higher capacity on the output or GDP of each country because there are a number of effects at play. Higher capacity can boost domestic production by curbing prices and wages, and so improving competitiveness, and reducing import substitution. Member States are dependent on intra-EU trade and so a shift from imports to domestic production in, for example, Belgium, will reduce Belgium's demand for the exports from its EU

trading partners. Because wages are lower, there is some substitution of capital for labour and so investment is reduced. There is a small boost to household expenditure in the short term but this decays over time because of weaker wage inflation.

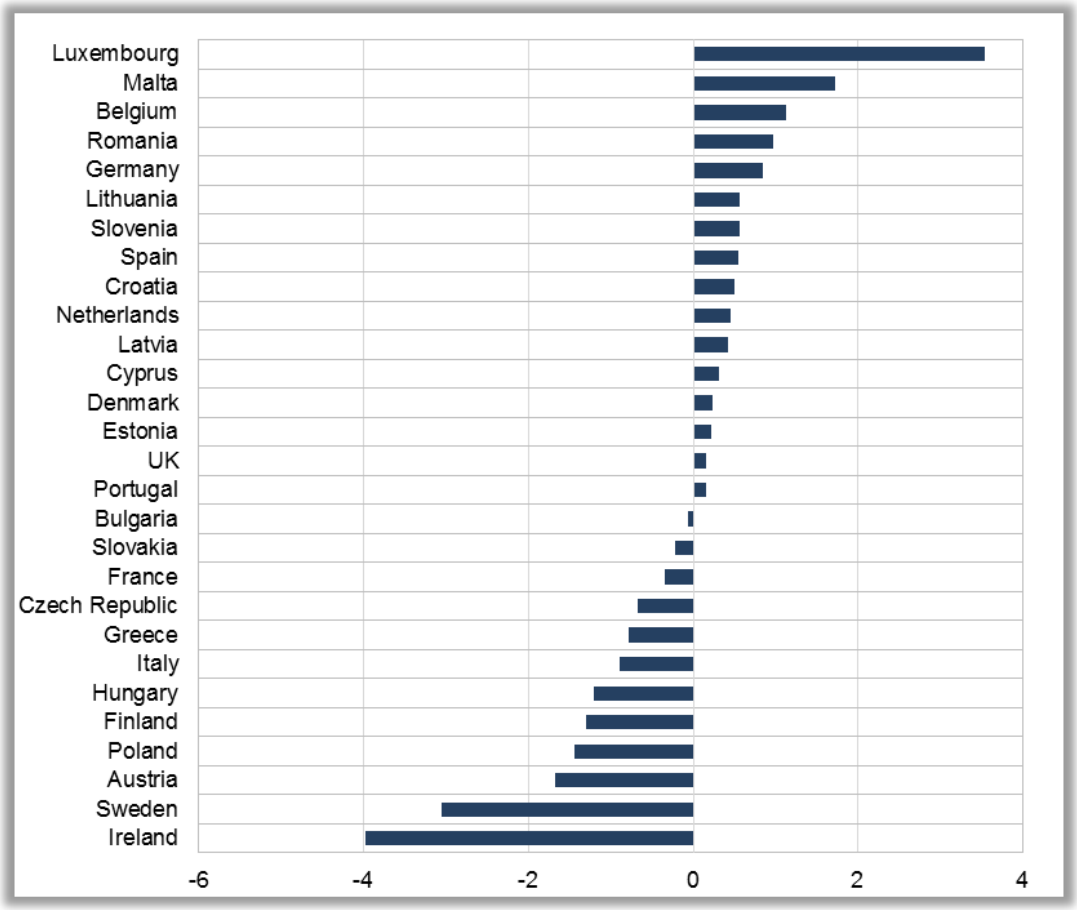
Figure 16. **Labour force by EU Member State; scenario compared with baseline, 2025 (% difference of alternative scenario from baseline)**



Source: Cedefop.

The net effect is a marginal reduction on EU-28 GDP of 0.1 pp by 2025. Those countries that increase GDP compared with baseline (Figure 17) include some of those considered constrained by labour shortages (in terms of macro imbalances), such as Germany and the United Kingdom. Countries that see a fall in GDP compared to the baseline include some of those thought to have labour surpluses, such as Ireland and Greece.

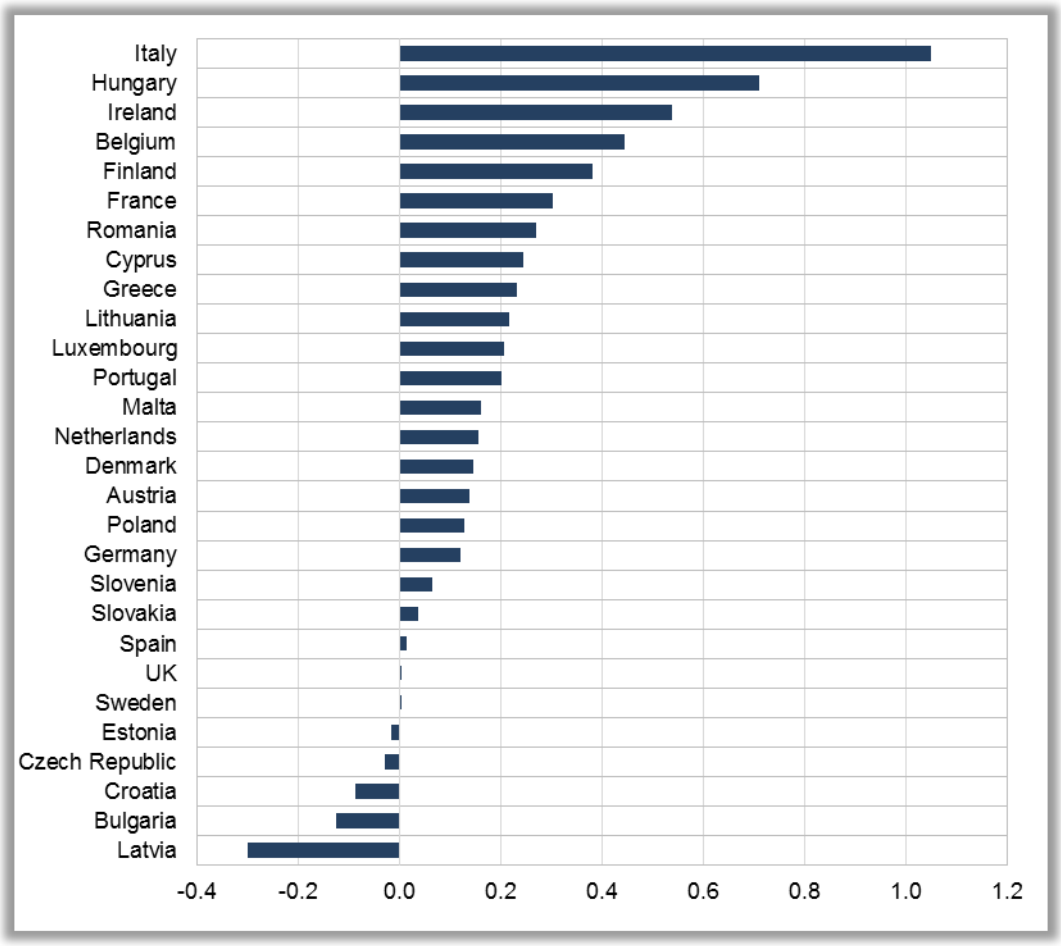
Figure 17. **GDP by EU Member State; scenario compared with baseline, 2025 (% difference of alternative scenario from baseline)**



Source: Cedefop.

There is a small boost to EU-28 employment: + 0.1 pp by 2020 (or 0.2 million jobs); and + 0.2 pp by 2025 (or 0.6 million jobs). This is because there is some substitution of capital for labour (because of lower wages) and output of some countries is boosted. Those countries that see the largest gains in employment are Italy, Hungary and Ireland. There are modest falls in employment compared to the baseline in a few countries including Bulgaria, Croatia and Latvia. Not all of the additional labour supply is reflected in increased employment, so that in the EU-28 as a whole, and in most Member States, there is an increase in the numbers of unemployed. Overall therefore, there is no improvement in macro imbalances.

Figure 18. **Employment by EU Member State; scenario compared with baseline, 2025 (% difference of alternative scenario from baseline)**



Source: Cedefop.

The impacts of the alternative labour supply scenario are not large at the macro level. This is not surprising given the scale of changes to migration and participation that have been assumed. Table 11 characterises the countries based on economic prospects and demographic trends from the scenario; highlighted in red and underlined are those countries that have changed position compared with the baseline. In the alternative labour supply scenario, Irish GDP growth is now forecast to be slower than EU average (was faster), the United Kingdom GDP growth is forecast to be faster than EU average (was slower) and in Finland the working age population is now projected to grow (was expected to fall). These changes in position are fairly modest, given what have been assumed as feasible projections for participation and migration. The main message from the scenario is that it shows a continuation, and some further

exaggeration, of the divergence in economic performance between Europe's leading performers and laggards.

Table 11. **Typology of countries based on scenario economic prospects and demographic trends**

		Decline working age population	Growing working age population
Macro-economic prospects	**Positive**	Czech Republic, Estonia, Malta, Romania, Slovenia	Belgium, Denmark, Luxembourg, Austria, United Kingdom
	Mix results	Bulgaria, Germany, Spain, France, Cyprus, Latvia, Hungary, Netherlands, Poland, Slovakia	Sweden, Finland
	Negative	Ireland, Greece, Croatia, Lithuania, Portugal	Italy

Source: Cedefop.

3.4.2. Micro imbalances

Looking at the occupational qualification skill mix, the scenario results in a varied increase in supply for most countries as well as the result of the increased participation and the changes to migration inflows. The combined effect of participation rate increases and migration has a supply effect through the change of the available labour force, but also a macroeconomic effect on overall demand; the impact of the scenario is an increase in labour supply given both effects together. The migration effect can be positive or negative depending on the country's net migration position.

Looking at labour demand, it is in the services sectors where boosts to employment are greatest, particularly in hospitality, personal services and financial and business services. The impact is strongest among clerks, which increase by +1.2% relative to the baseline, followed by technicians and associate professionals, with +1.0%, and professionals with +0.9%. The smallest impact is on the armed forces category and the skilled agriculture and fishery workers group, both increasing by +0.5% relative to the baseline. The increase in employment is mainly among those in the intermediate and higher education level categories. The increased supply, driven by increased participation or, potentially, an inflow of migrants, may contribute to decreased future labour market imbalances in selected occupations.

Figure 19. **Average percentage change in employment by occupation**

EU28	Average education	% employment increase in scenario Education level		
Occupation	low … high	low	med	high
Armed forces		-0.1	0.3	1.0
Legislators, senior officials and managers		-0.3	0.6	0.8
Professionals		-0.1	0.6	1.0
Technicians and associate professionals		0.0	1.0	1.3
Clerks		0.2	1.3	1.4
Service workers and shop and market sales workers		-0.1	0.8	1.3
Skilled agricultural and fishery workers		-0.4	0.6	1.8
Craft and related trades workers		-0.1	1.0	1.9
Plant and machine operators and assemblers		-0.1	0.9	1.8
Elementary occupations		0.2	1.0	1.6

NB: Based on model calculations: Cambridge Econometrics (CE), Institute for employment research (IER) and Economix research and consultancy (ERC); Qualification level (1) low: ISCED 1-2, (2) medium: ISCED 3-4, (3) high: ISCED 5-6. First result column shows the average level of education in the scenario outcome for 2025. The dotted line depicts a medium (2) education level. Result columns 2 to 4 give the %-point increase in employment of the 2025 scenario results relative the baseline results.

Source: Cedefop.

Table 12. **Average percentage change in employment by detailed occupation**

Occupation	% increase in scenario relative to baseline outcome (2015-25) Education level		
	Low	Medium	High
11. Chief executives, senior officials and legislators	0.94	1.87	1.31
12. Administrative and commercial managers	-0.4	0.47	0.83
13. Production and specialised services managers	-0.38	0.23	0.7
14. Hospitality, retail and other services managers	-0.33	0.51	0.69
21. Science and engineering professionals	0.18	0.74	0.92
22. Health professionals	-0.26	0.49	1.05
23. Teaching professionals	-0.21	0.07	0.77
24. Business and administration professionals	-0.21	0.76	1.01
25. Information and communications technology professionals	-0.39	0.57	0.97
26. Legal, social and cultural professionals	0.28	1.15	1.49
31. Science and engineering associate professionals	-0.22	0.75	1.5
32. Health associate professionals	0.58	1.47	1.61
33. Business and administration associate professionals	-0.17	0.91	1.13
34. Legal, social, cultural and related associate professionals	0.16	1.1	1.06
35. Information and communications technicians	-0.3	0.55	1.13

Occupation	% increase in scenario relative to baseline outcome (2015-25)		
	Education level		
	Low	Medium	High
41. General and keyboard clerks	0.8	1.49	1.51
42. Customer services clerks	-0.39	0.79	1.17
43. Numerical and material recording clerks	0.49	1.58	1.43
44. Other clerical support workers	-0.37	0.88	1.25
51. Personal service workers	1.03	1.45	1.95
52. Sales workers	-0.58	0.46	1.06
53. Personal care workers	-0.52	0.81	1.38
54. Protective services workers	-0.43	0.46	0.64
61. Market-oriented skilled agricultural workers	-0.46	0.58	1.83
62. Market-oriented skilled forestry, fishery and hunting workers	-0.43	0.75	1.45
63. Subsistence farmers, fishers, hunters and gatherers	-0.03	0.19	2.09
71. Building and related trades workers, excluding electricians	-0.01	0.75	2.08
72. Metal, machinery and related trades workers	-0.13	1.05	1.68
73. Handicraft and printing workers	0.05	1.33	1.85
74. Electrical and electronic trades workers	0.04	1.05	1.46
75. Food processing, wood working, garment and other craft and related trades	-0.09	1.17	2.2
81. Stationary plant and machine operators	0.07	1.07	2.06
82. Assemblers	-0.29	1.12	2.11
83. Drivers and mobile plant operators	-0.12	0.83	1.69
91. Cleaners and helpers	0.37	1	1.79
92. Agricultural, forestry and fishery labourers	-0.34	1.07	1.83
93. Labourers in mining, construction, manufacturing and transport	0.08	0.85	1.48
94. Food preparation assistants	0.91	1.16	1.51
95. Street and related sales and service workers	-0.55	0.88	0.72
96. Refuse workers and other elementary workers	0.14	0.99	1.5

NB: Based on model calculations (CE, IER, ERC); qualification level (1) low: ISCED 1-2, (2) intermediate: ISCED 3-4, (3) high: ISCED 5-6.

Source: Cedefop.

At occupation level, these direct and indirect effects cumulate into stronger increases in intermediate occupation groups (clerks, technicians and associate professionals, and, to a lesser degree, crafts and plant and machine operators and assemblers) which goes with general reallocation towards higher education levels. Note that the increases are very small (around or below 1 pp. change relative to the baseline scenario in a 10-year forecast). Higher economic growth

translates also into stronger demand among managerial and supervisory occupations (chief executives, senior officials and legislators; legal, social and cultural professionals), along with the increase in crafts and production worker groups.

Employment changes by countries, here grouped into six major groups – Scandinavia, France and Benelux, southern Europe, the CEEC, Germany and Austria, the United Kingdom and Ireland – show divergent developments.

The highest changes in employment are Germany and Austria with +2.6%, followed by France and Benelux at +1.0% relative to the baseline scenario. Southern Europe and the CEEC also improve their overall employment, while the United Kingdom and Ireland remain at the same level (due to Ireland's reduction) and Scandinavia decreases slightly. This is the direct result of the impact in changes in participation rate by the group of countries with high increases. There is much more scope for an increase in the participation rate than in Scandinavia.

Looking at qualification mix shows the strongest increases at the highest level, usually followed by intermediate level qualifications. Germany and Austria follow this pattern, as do southern Europe and the CEEC, both of which have reductions in low-qualified employment. The same is true of the United Kingdom and Ireland, which have employment reduction at intermediate- and higher-level qualifications. France and Benelux have a U-shaped development: the highest increase for high qualified, followed by almost similar increases in low qualified employment, with intermediate level employment showing the lowest increases (Table 13).

Table 13. **Average percentage change in employment by country group**

Country group	Education level		
	Low	Medium	High
Scandinavia	-1.99	-0.08	0.38
France and Benelux	1.04	0.84	1.12
Southern Europe	-0.43	0.41	1.52
CEEC	-1.05	0.22	0.92
Germany and Austria	1.84	2.63	2.74
United Kingdom and Ireland	-0.34	-0.08	0.27

NB: Based on model calculations (CE, IER, ERC); Qualification level (1) low: ISCED 1-2, (2) intermediate: ISCED 3-4, (3) high: ISCED 5-6.

Source: Cedefop.

The higher migration and participation rates have some impact on the imbalances observed in these countries relative to the baseline scenario. Since the greater number in the labour force also leads to higher growth rates in the

economy of that country, some effect of the additional labour force will not be observed within the imbalances. Additional growth will lead to higher demand that additional supply cannot potentially fulfil.

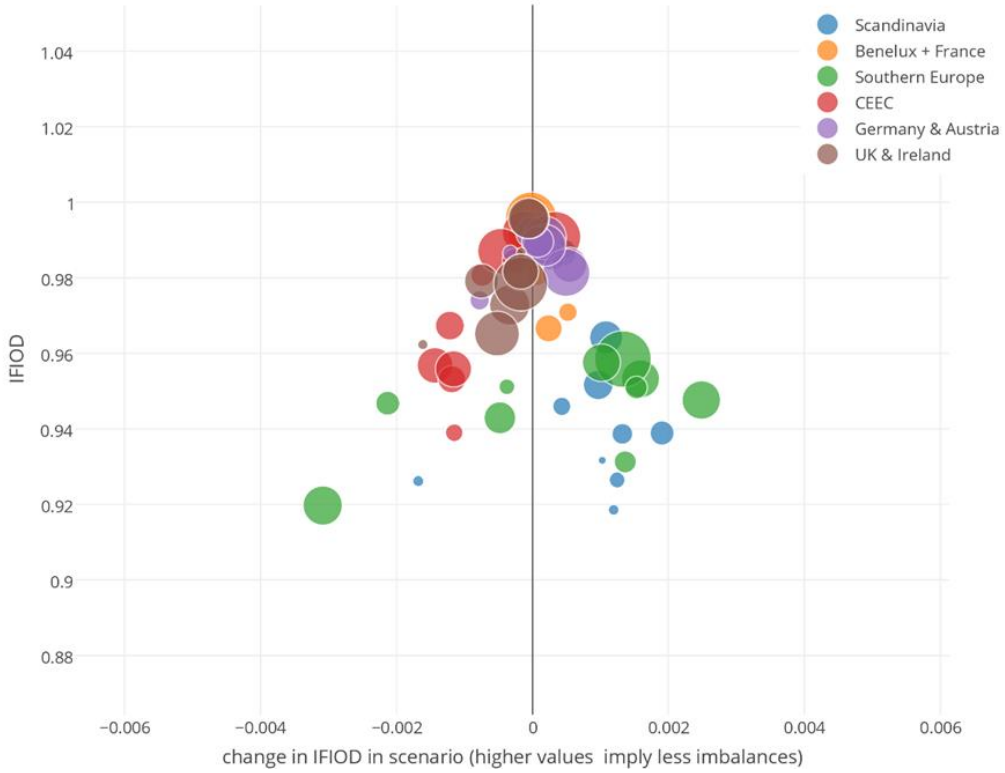
In Figures 20 to 22 the imbalance indicators (described earlier) are used to evaluate how far the imbalances were influenced by our assumption of higher participation rate and the changed assumptions of migration.

Figure 20 plots the indicator of future imbalances of demand (IFIOD) of the baseline against the changes implied by the scenario. The IFIOD measures hiring difficulties based on the importance of the qualifications used in an occupation (the qualification mix). A value of 1 implies no hiring difficulties, while lower values imply some hiring difficulties. The figure plots the IFIOD by the main occupation groups for each of the six country groups. The x-axis measures the changes of the indicator of the scenario relative to the baseline outcome; a positive number increases the IFIOD in the scenario, so positive numbers imply fewer imbalances in the scenario. To give an impression of the importance of the occupation groups we sized the bubble according to employment in the base year 2015.

The highest impact of the scenario according to the IFIOD measure of imbalances is in the Benelux and France and the CEEC. In southern Europe some of the imbalances seem to be reduced, but with limited impact. Scandinavia, the United Kingdom and Ireland remain almost at the same level, while in Germany and Austria the higher economic growth seems to increase imbalances slightly, despite the increase in the labour force.

In most country groups the increase in imbalances is in lower-level occupations: elementary occupations, plant and machine operators and assemblers, and craft and related trades workers are reducing imbalances in south European countries, the CEEC, and in Benelux and France. In the other three country groups, we observe less change in the indicator values. Intermediate- to higher-level occupations are improving their position, not increasing their imbalances as much. For Germany and Austria these are professionals and technicians and associate professionals, in Scandinavia it is also legislators, senior officials and managers. In the United Kingdom and Ireland all three of the occupations show the least increases in imbalances.

Figure 20. **Changes to the indicator of future imbalance of demand, 2025**

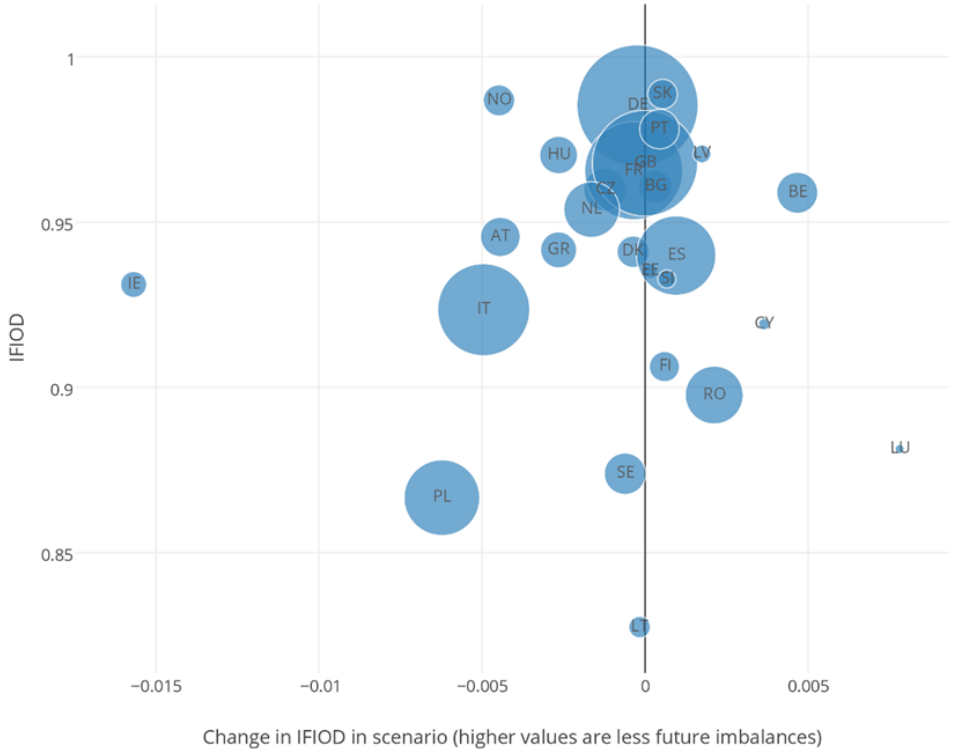


NB: Based on model calculations (CE, IER, ERC); IFIOD calculated at two-digit occupation level and aggregated using employment weights towards nine occupation groups: armed forces legislators, senior officials and managers, professionals, technicians and associate professionals, clerks, service workers and shop and market sales workers, skilled agricultural and fishery workers, craft and related trades workers, plant and machine operators and assemblers, elementary occupations.

Source: Cedefop.

Figure 21 plots the indicator of future imbalances of demand of the baseline against the changes implied by the scenario, this time aggregated towards the country level. A value of 1 implies no hiring difficulties, while lower values imply some hiring difficulties. The bubble size is determined according to the employment in the country in the base year 2015. We can see reductions in the imbalances for Luxemburg, while Ireland is on the opposite side implying greater increases in imbalances. In the latter case this is largely determined by the assumed net outward migration. Lithuania has low IFIOD values, which do not change significantly from the baseline to the scenario, hence the location in the middle of the x-axis. Among the larger countries, Poland and Italy increase imbalances in the scenario relative to the baseline, while Spain and Romania slightly improve. Germany, France and the United Kingdom remain at about the same level.

Figure 21. **Imbalances changes by country**

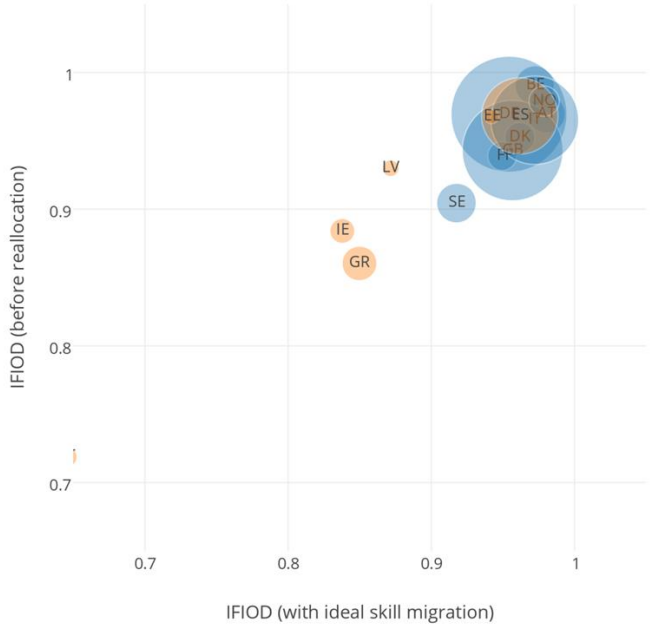


NB: Based on model calculations (CE, IER, ERC); IFIOD calculated at two-digit occupation level and aggregated using employment weights towards national level. The decreasing imbalances of France and Belgium determine this effect for their country group.

Source: Cedefop.

Figure 22 allows us also to understand in how far individual countries contribute to the results in the country groups of Figure 21. The stronger effects of the CEEC seem to be dominated by Romania and Poland. The southern countries' reduction in imbalances is largely driven by Italy, while the bigger countries such as Germany and the United Kingdom determine their respective group. Austria does not deviate too much from the German result, while Ireland differs from the United Kingdom in the changes to the imbalance indicators.

Figure 22. **Potential of migration to solve imbalances**



NB: Based on model calculations (CE, IER, ERC); IFIOD calculated at two-digit occupation level and aggregated using employment weights towards national level.

Source: Cedefop.

3.5. Can migration solve imbalances?

In a thought experiment, we want to extend the analysis of solving shortages through migration flows towards a more extreme case. This focuses mainly on mobility within the EU, though migration from third countries has comparable effects. We assume that for a group of countries that have high outward migration, this alleviates the key receiving countries' shortages in its skill mix. Both groups of countries were determined by having high migration outflows as a percentage of the labour force, and the receiving countries to have a high percentage inflow relative to labour force in the base year and, on average, higher wages. The sending countries comprise the Baltic countries, Ireland, Greece and Spain, which have assumed net migration outflows that are more than 3% of the base year labour force. In total they allow for some two million people to move towards another EU country. The receiving countries are Belgium, Denmark, Germany, Italy, Luxemburg, Austria, Sweden and the United Kingdom.

This ‘supply’ of movements within the EU fixes the types of workers for the receiving countries, for which we allow reallocation of qualifications according to shortages in the receiving country. For example, the United Kingdom has a specific shortage at intermediate qualification level and Germany at lower level. The sending countries’ movement of two million will be distributed according to size of the net inflow in the receiving countries.

This deviates from the predicted outcome in the scenario (presented in the tables and figures above). Migration will generally be influenced by occupation shortages in the receiving countries, as those provide the job openings or opportunities that will lead to the assumed migration flows.

However, the thought experiment exaggerates the degree to which these problems can be solved, as not all the migration is the result of such demand-pull factors, or people following direct job openings in the shortage occupations. Part of migration is less directed, following family members or simply wage differentials that can also exist in non-shortage occupations. Further, many qualification levels are downgraded by cross country movements; migrants tend to have a higher degree of overqualification than natives.

For this we collect the total sum of shortages by qualification level in the receiving countries and subtract them from the sending country (assuming fixed shares). Figure 22 shows how this would change the currently observed imbalance indicator: the countries towards the right (and below) the 45-degree line show improvements, while the countries to the left or above show worsening imbalances on the labour market. We show only those countries that were labelled ‘sending’ (orange) or ‘receiving’ (blue), as we only adjusted the skills mix towards those countries. Overall, we can see that the countries profiting from the inward mobility are mostly improving their imbalance indicator, so there are fewer shortages on the labour market. However, some sending countries can improve their situation if the other countries demand workers at skill levels which are in abundance.

The countries with outward migration have more imbalances: Lithuania experiences roughly a 7.3% increase in imbalances, Latvia a 5.8% increase, and Ireland a 4.6% increase. Bigger gains are found in the receiving countries: Luxemburg can improve its situation by 9.3% (reduction in expected future imbalances), the United Kingdom can decrease by 1.4% and Sweden by 1.3%. However, most improvements in the receiving country barely move those countries from the 45-degree line, given that most of them are large relative to the inflow.

A strong caveat is needed at this point. These calculations are unrealistic in the sense that EU mobility served only one goal: to mitigate imbalances. An

additional element is that these qualification-directed migration flows would lead to higher economic growth in sectors and countries profiting from better allocation. These growth effects in turn might lead to additional demand.

CHAPTER 4.

Conclusions

The European labour market faces several challenges. Changes in the economic structures of Member States are likely to affect the distribution of employment across sectors of economic activity. At the same time, the changes in the content of jobs and in work organisation, as well as the increased automation and robotisation, are likely to affect occupational and qualifications structures. Demographic changes and the ease in accessing education will also affect the composition of population and labour force.

Although these challenges, as well as many others (including labour economic migration), make the future rather uncertain, this publication brings evidence for future policy-makers by presenting two possible scenarios. The baseline scenario presents the most likely-to-happen future. The alternative skills supply scenario presents the effects of increased labour market participation and migration flows across Member States. The main focus is how these are able to boost economic growth and tackle labour market imbalances.

The baseline scenario confirms the persistence of long-term trends. Future employment growth across the EU will be mainly concentrated in the service sectors and high-level occupations. However, due to high replacement needs there will be job opportunities across all sectors and occupations. This publication brings more detailed results on the future composition of employment. Looking at the concentration of occupations and qualification levels across economic sectors confirms the importance of VET in providing the future labour force with adequate skills.

Indicators of future imbalances in demand show important changes of qualification structure in some occupations and countries. The CEEC and Scandinavian results show signals of future difficulties in hiring for occupations requiring medium– and low–qualification. This could be an outcome of structural changes within occupations or different qualification structure of younger cohorts replacing workers which did not have access to formal education. At the same time, better access to higher education may create some difficulties finding appropriate employees for occupation where more job-specific skills and VET profiles are required.

The alternative labour supply scenario confirms that demographic trends are an essential driver which is difficult to divert by activation or migration policies. Countries where labour force shortages will negatively affect the economic

performance have the participation rates at levels where the space for additional activation is limited. In contrast, in countries where there is a scope for additional activation the overall economic conditions are not favourable and any additional labour force will mostly trigger unemployment.

The limited ability of countries (and regions) efficiently to ‘absorb’ migrants, both from EU Member States and from outside the EU, without creation of additional social tensions, leads to low alternative migration flows. The alternative scenario has little effect on both types of policy for the labour force (about 1 pp change over a next 10 years). Therefore, the effects will be more visible on micro level (tackling imbalances in particular occupational groups) than on overall macroeconomic performance of the country.

List of abbreviations

CE	Cambridge Econometrics
CEEC	central and eastern Europe countries
ERC	Economix research and consultancy
ICE	individual country experts
IER	Institute for Employment Research, University of Warwick
IFIOD	indicator of future imbalances of demand
ISCED	international standard classification of education
VET	vocational education and training

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Annex 1.
Skills supply: detailed baseline scenario results

Table A1. 1. **Population (15+) by age, gender and qualification, EU-28+, 2005-25**

	Alll qualification					Low qualification					Medium qualification					High qualification				
	Levels (000s)			Change (000s)		Levels (000s)			Change (000s)		Levels (000s)			Change (000s)		Levels (000s)			Change (000s)	
	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25
Males and females																				
15-24	31 671	28 497	27 839	- 3 174	- 657	15 257	12 071	11 207	- 3 187	- 864	13 942	13 062	12 503	- 881	- 558	2 471	3 364	4 129	893	765
25-34	35 408	33 532	30 391	- 1 876	- 3 141	7 172	4 483	2 627	- 2 688	- 1 856	17 303	14 107	10 903	- 3 196	- 3 204	10 933	14 941	16 861	4 008	1 919
35-44	38 394	36 364	34 116	- 2 030	- 2 249	10 415	6 276	3 342	- 4 139	- 2 933	18 942	16 232	14 384	- 2 711	- 1 848	9 037	13 857	16 390	4 820	2 533
45-54	35 318	38 271	36 164	2 954	- 2 107	12 648	9 309	5 015	- 3 339	- 4 294	15 915	18 647	19 174	2 731	528	6 754	10 316	11 974	3 562	1 659
55-64	29 607	34 289	37 216	4 681	2 928	15 198	11 608	6 906	- 3 590	- 4 703	10 469	15 405	19 128	4 937	3 723	3 941	7 275	11 183	3 334	3 908
65+	49 525	56 244	65 492	6 719	9 247	33 047	26 001	18 096	- 7 046	- 7 905	12 744	21 187	30 758	8 443	9 571	3 734	9 056	16 637	5 322	7 582
Males																				
15-24	32 857	29 884	29 209	- 2 974	- 674	17 341	13 785	12 858	- 3 556	- 927	13 747	13 599	13 318	- 148	- 281	1 769	2 500	3 033	730	533
25-34	36 112	34 141	31 918	- 1 971	- 2 223	8 208	5 861	4 208	- 2 346	- 1 653	18 685	16 549	14 290	- 2 135	- 2 260	9 220	11 731	13 420	2 511	1 690
35-44	38 817	36 789	34 562	- 2 028	- 2 227	10 085	7 302	4 955	- 2 783	- 2 347	19 544	17 622	15 951	- 1 921	- 1 671	9 189	11 865	13 656	2 676	1 791
45-54	34 709	38 115	36 032	3 406	- 2 083	10 097	9 070	6 671	- 1 027	- 2 399	17 116	18 960	19 097	1 845	137	7 496	10 085	10 264	2 589	179
55-64	27 943	32 388	35 898	4 445	3 509	10 517	8 739	6 529	- 1 778	- 2 211	11 758	15 626	18 800	3 868	3 174	5 668	8 023	10 569	2 355	2 546
65+	34 497	42 049	51 174	7 552	9 125	18 567	14 301	10 486	- 4 266	- 3 815	10 985	17 873	24 740	6 888	6 867	4 945	9 875	15 949	4 931	6 073
Females																				
15-24	31 671	28 497	27 839	- 3 174	- 657	15 257	12 071	11 207	- 3 187	- 864	13 942	13 062	12 503	- 881	- 558	2 471	3 364	4 129	893	765
25-34	35 408	33 532	30 391	- 1 876	- 3 141	7 172	4 483	2 627	- 2 688	- 1 856	17 303	14 107	10 903	- 3 196	- 3 204	10 933	14 941	16 861	4 008	1 919
35-44	38 394	36 364	34 116	- 2 030	- 2 249	10 415	6 276	3 342	- 4 139	- 2 933	18 942	16 232	14 384	- 2 711	- 1 848	9 037	13 857	16 390	4 820	2 533
45-54	35 318	38 271	36 164	2 954	- 2 107	12 648	9 309	5 015	- 3 339	- 4 294	15 915	18 647	19 174	2 731	528	6 754	10 316	11 974	3 562	1 659
55-64	29 607	34 289	37 216	4 681	2 928	15 198	11 608	6 906	- 3 590	- 4 703	10 469	15 405	19 128	4 937	3 723	3 941	7 275	11 183	3 334	3 908
65+	49 525	56 244	65 492	6 719	9 247	33 047	26 001	18 096	- 7 046	- 7 905	12 744	21 187	30 758	8 443	9 571	3 734	9 056	16 637	5 322	7 582

Source: Cedefop skills forecasts (2016).

Table A1. 2. **Labour force (15+) by age, gender and qualification, EU-28+, 2005-25**

	Alll qualification					Low qualification					Medium qualification					High qualification				
	Levels (000s)			Change (000s)		Levels (000s)			Change (000s)		Levels (000s)			Change (000s)		Levels (000s)			Change (000s)	
	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25
Males and females																				
15-24	12 758	11 029	10 813	- 1 729	- 216	3 797	2 541	2 237	- 1 256	- 305	7 245	6 340	6 008	- 905	- 332	1 716	2 148	2 568	432	420
25-34	26 556	26 124	24 693	- 432	- 1 431	4 128	2 554	1 558	- 1 574	- 996	12 943	10 760	8 513	- 2 182	- 2 247	9 485	12 809	14 621	3 324	1 812
35-44	29 858	29 455	28 909	- 403	- 546	6 487	3 960	2 180	- 2 526	- 1 781	15 338	13 223	12 004	- 2 115	- 1 219	8 033	12 272	14 726	4 238	2 454
45-54	25 800	30 166	29 942	4 365	- 224	7 355	5 761	3 201	- 1 594	- 2 560	12 361	15 145	15 886	2 784	741	6 085	9 260	10 855	3 175	1 595
55-64	10 782	16 441	19 133	5 660	2 691	4 121	4 068	2 518	- 53	- 1 550	4 290	7 668	9 629	3 378	1 961	2 370	4 705	6 985	2 335	2 280
65+	1 376	2 001	2 516	624	515	855	775	588	- 80	- 187	330	713	1 029	383	316	191	512	898	321	386
Males																				
15-24	15 384	13 180	13 140	- 2 204	- 41	6 039	3 952	3 579	- 2 087	- 373	8 171	7 621	7 583	- 550	- 38	1 174	1 606	1 978	433	371
25-34	32 571	30 725	28 945	- 1 846	- 1 780	7 183	4 944	3 572	- 2 238	- 1 372	16 861	14 993	13 000	- 1 869	- 1 993	8 527	10 788	12 373	2 261	1 585
35-44	36 136	34 056	32 406	- 2 080	- 1 649	8 936	6 235	4 266	- 2 702	- 1 968	18 329	16 449	15 008	- 1 880	- 1 441	8 870	11 372	13 132	2 502	1 760
45-54	30 669	34 316	33 372	3 647	- 944	8 416	7 598	5 725	- 818	- 1 873	15 142	17 104	17 689	1 962	585	7 111	9 614	9 957	2 503	344
55-64	15 559	20 569	24 324	5 010	3 755	4 919	4 621	3 736	- 298	- 885	6 589	9 864	12 470	3 275	2 607	4 051	6 085	8 117	2 034	2 033
65+	2 285	3 264	4 588	979	1 324	1 001	866	738	- 135	- 127	705	1 227	1 843	522	616	579	1 171	2 007	592	836
Females																				
15-24	12 758	11 029	10 813	- 1 729	- 216	3 797	2 541	2 237	- 1 256	- 305	7 245	6 340	6 008	- 905	- 332	1 716	2 148	2 568	432	420
25-34	26 556	26 124	24 693	- 432	- 1 431	4 128	2 554	1 558	- 1 574	- 996	12 943	10 760	8 513	- 2 182	- 2 247	9 485	12 809	14 621	3 324	1 812
35-44	29 858	29 455	28 909	- 403	- 546	6 487	3 960	2 180	- 2 526	- 1 781	15 338	13 223	12 004	- 2 115	- 1 219	8 033	12 272	14 726	4 238	2 454
45-54	25 800	30 166	29 942	4 365	- 224	7 355	5 761	3 201	- 1 594	- 2 560	12 361	15 145	15 886	2 784	741	6 085	9 260	10 855	3 175	1 595
55-64	10 782	16 441	19 133	5 660	2 691	4 121	4 068	2 518	- 53	- 1 550	4 290	7 668	9 629	3 378	1 961	2 370	4 705	6 985	2 335	2 280
65+	1 376	2 001	2 516	624	515	855	775	588	- 80	- 187	330	713	1 029	383	316	191	512	898	321	386

Source: Cedefop skills forecasts (2016).

Table A1. 3. **Labour market participation (activity) rates (in %) by age, gender and qualification, EU-28+, 2005-25**

	Alll qualification			Low qualification			Medium qualification			High qualification		
	Levels (000s)			Levels (000s)			Levels (000s)			Levels (000s)		
	2005	2015	2025	2005	2015	2025	2005	2015	2025	2005	2015	2025
Males and females												
15-24	40.3%	38.7%	38.8%	24.9%	21.1%	20.0%	52.0%	48.5%	48.1%	69.4%	63.8%	62.2%
25-34	75.0%	77.9%	81.2%	57.6%	57.0%	59.3%	74.8%	76.3%	78.1%	86.8%	85.7%	86.7%
35-44	77.8%	81.0%	84.7%	62.3%	63.1%	65.2%	81.0%	81.5%	83.5%	88.9%	88.6%	89.8%
45-54	73.1%	78.8%	82.8%	58.1%	61.9%	63.8%	77.7%	81.2%	82.9%	90.1%	89.8%	90.7%
55-64	36.4%	47.9%	51.4%	27.1%	35.0%	36.5%	41.0%	49.8%	50.3%	60.1%	64.7%	62.5%
65+	2.8%	3.6%	3.8%	2.6%	3.0%	3.3%	2.6%	3.4%	3.3%	5.1%	5.7%	5.4%
Males												
15-24	46.8%	44.1%	45.0%	34.8%	28.7%	27.8%	59.4%	56.0%	56.9%	66.3%	64.3%	65.2%
25-34	90.2%	90.0%	90.7%	87.5%	84.4%	84.9%	90.2%	90.6%	91.0%	92.5%	92.0%	92.2%
35-44	93.1%	92.6%	93.8%	88.6%	85.4%	86.1%	93.8%	93.3%	94.1%	96.5%	95.8%	96.2%
45-54	88.4%	90.0%	92.6%	83.4%	83.8%	85.8%	88.5%	90.2%	92.6%	94.9%	95.3%	97.0%
55-64	55.7%	63.5%	67.8%	46.8%	52.9%	57.2%	56.0%	63.1%	66.3%	71.5%	75.8%	76.8%
65+	6.6%	7.8%	9.0%	5.4%	6.1%	7.0%	6.4%	6.9%	7.4%	11.7%	11.9%	12.6%
Females												
15-24	40.3%	38.7%	38.8%	24.9%	21.1%	20.0%	52.0%	48.5%	48.1%	69.4%	63.8%	62.2%
25-34	75.0%	77.9%	81.2%	57.6%	57.0%	59.3%	74.8%	76.3%	78.1%	86.8%	85.7%	86.7%
35-44	77.8%	81.0%	84.7%	62.3%	63.1%	65.2%	81.0%	81.5%	83.5%	88.9%	88.6%	89.8%
45-54	73.1%	78.8%	82.8%	58.1%	61.9%	63.8%	77.7%	81.2%	82.9%	90.1%	89.8%	90.7%
55-64	36.4%	47.9%	51.4%	27.1%	35.0%	36.5%	41.0%	49.8%	50.3%	60.1%	64.7%	62.5%
65+	2.8%	3.6%	3.8%	2.6%	3.0%	3.3%	2.6%	3.4%	3.3%	5.1%	5.7%	5.4%

Source: Cedefop skills forecasts (2016).

Table A1. 4. **Labour force by country and qualification, EU-28+, 2005-25**

	AlII qualification					Low qualification					Medium qualification					High qualification				
	Levels (000s)			Change (000s)		Levels (000s)			Change (000s)		Levels (000s)			Change (000s)		Levels (000s)			Change (000s)	
	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25	2005	2015	2025	2005-10	2015-25
Austria	4 032	4 456	4 591	424	136	717	616	446	- 102	- 170	2 583	2 383	2 175	- 200	- 208	731	1 457	1 971	726	514
Belgium	4 626	4 994	5 340	369	346	1 190	916	648	- 273	- 268	1 804	1 963	2 171	159	208	1 632	2 115	2 521	483	406
Bulgaria	3 316	3 371	3 256	55	- 115	662	408	244	- 254	- 164	1 856	1 944	1 989	88	45	798	1 019	1 023	221	4
Croatia	1 800	1 844	1 850	44	6	372	199	114	- 173	- 85	1 110	1 160	1 198	50	38	317	485	538	168	53
Cyprus	363	440	448	76	9	106	75	46	- 31	- 29	144	169	175	24	6	113	196	227	83	32
Czech Rep.	5 174	5 307	5 240	133	- 67	371	228	132	- 143	- 96	4 095	3 859	3 725	- 236	- 134	709	1 220	1 384	512	163
Denmark	2 892	2 956	3 240	64	285	600	591	657	- 9	66	1 370	1 315	1 286	- 56	- 29	922	1 050	1 298	128	248
Estonia	669	676	625	7	- 51	65	49	36	- 16	- 13	374	349	314	- 25	- 35	230	277	275	47	- 3
Finland	2 620	2 691	2 784	71	93	506	295	192	- 211	- 103	1 239	1 249	1 216	10	- 33	876	1 147	1 376	271	229
France	27 384	28 773	30 418	1 388	1 645	7 677	4 965	3 524	- 2 713	- 1 441	12 063	12 861	13 550	798	689	7 644	10 947	13 343	3 303	2 396
Germany	40 932	42 084	40 481	1 151	- 1 602	7 242	5 294	4 262	- 1 948	- 1 032	23 640	24 915	23 640	1 275	- 1 275	10 050	11 874	12 579	1 824	705
Greece	4 937	4 806	4 529	- 130	- 278	1 679	1 274	820	- 405	- 454	2 117	2 021	2 026	- 96	5	1 141	1 512	1 682	371	171
Hungary	4 203	4 363	4 402	160	39	642	503	337	- 138	- 166	2 711	2 703	2 733	- 8	30	851	1 156	1 332	306	175
Ireland	2 040	2 137	2 053	96	- 84	584	339	203	- 245	- 136	819	857	868	38	11	637	940	982	303	42
Italy	24 451	25 988	26 856	1 536	868	10 075	8 342	6 068	- 1 733	- 2 274	10 855	12 458	14 118	1 604	1 660	3 521	5 187	6 669	1 666	1 482
Latvia	1 081	1 007	893	- 74	- 114	154	74	47	- 80	- 27	688	593	498	- 95	- 95	239	339	347	101	8
Lithuania	1 570	1 437	1 155	- 132	- 283	144	47	26	- 97	- 21	969	791	622	- 178	- 170	457	599	507	143	- 92
Luxembourg	204	266	327	62	61	62	42	25	- 20	- 16	81	94	108	13	14	61	130	194	70	63
Malta	159	185	186	26	2	99	79	50	- 21	- 28	36	60	79	24	20	24	46	57	22	11
Netherlands	8 513	8 933	9 134	420	201	2 277	1 935	1 503	- 343	- 432	3 683	3 817	3 761	134	- 56	2 553	3 181	3 870	629	689
Poland	17 161	17 427	17 193	266	- 235	1 985	1 037	687	- 948	- 349	11 924	10 666	8 712	- 1 259	- 1 954	3 252	5 725	7 793	2 473	2 068
Portugal	5 461	5 218	5 005	- 243	- 213	3 949	2 706	2 155	- 1 243	- 551	789	1 305	1 547	516	242	723	1 207	1 303	484	96
Romania	9 819	9 860	9 528	41	- 332	2 567	1 855	1 563	- 712	- 293	6 056	5 863	4 857	- 194	- 1 006	1 195	2 142	3 108	947	966
Slovakia	2 646	2 734	2 699	89	- 35	219	142	84	- 77	- 57	2 042	1 994	1 926	- 48	- 68	384	599	689	214	90
Slovenia	1 013	1 000	954	- 14	- 46	170	102	61	- 68	- 41	631	577	546	- 53	- 32	213	320	347	108	27
Spain	21 140	23 012	21 927	1 871	- 1 085	9 713	8 358	5 157	- 1 355	- 3 201	4 784	5 568	6 639	784	1 071	6 644	9 086	10 132	2 443	1 045
Sweden	4 715	5 190	5 418	475	228	790	732	553	- 58	- 179	2 576	2 449	2 380	- 127	- 70	1 349	2 008	2 486	659	477
UK	30 100	32 450	33 639	2 350	1 189	7 486	5 596	3 277	- 1 889	- 2 319	13 658	13 640	14 448	- 18	808	8 957	13 213	15 914	4 257	2 700
EU28	233 023	243 604	244 172	10 581	568	62 102	46 798	32 917	- 15 304	- 13 881	114 700	117 624	117 306	2 924	- 318	56 222	79 182	93 949	22 961	14 766
Norway	2 387	2 795	3 293	408	498	271	356	398	85	42	1 341	1 174	1 181	- 167	7	776	1 265	1 714	489	449
Switzerland	4 159	4 738	5 116	579	378	796	666	540	- 129	- 127	2 211	2 241	2 097	29	- 143	1 152	1 831	2 479	679	648
Iceland	164	188	198	23	11	69	56	44	- 14	- 11	52	69	78	17	9	43	63	76	20	13
EU28+	239 734	251 325	252 780	11 591	1 455	63 238	47 876	33 899	- 15 362	- 13 977	118 304	121 107	120 663	2 804	- 444	58 193	82 342	98 218	24 149	15 876

Source: Cedefop skills forecasts (2016).

Annex 2.
Skills demand: detailed baseline scenario results

Table A2. 1**. Employment trends by broad industry, EU-28+, 2005-25**

	Levels (000s)			Change (000s)		Share (%)			Growth p.s. (%)	
	2005	2015	2025	2005-15	2015-25	2005	2015	2025	2005-15	2015-25
Primary sector and utilities	17 298	15 211	13 066	- 2 087	- 2 144	7.7	6.5	5.4	-1.2	-1.4
Manufacturing	36 589	32 908	31 627	- 3 681	- 1 281	16.2	14.1	13.1	-1.0	-0.4
Construction	16 201	15 108	15 231	- 1 093	123	7.2	6.5	6.3	-0.7	0.1
Distribution and transport	54 862	57 810	59 912	2 948	2 102	24.3	24.7	24.9	0.5	0.4
Businessand other services	49 963	58 616	65 213	8 653	6 597	22.1	25.1	27.1	1.7	1.1
Non-marketed services	50 737	54 312	55 859	3 575	1 547	22.5	23.2	23.2	0.7	0.3
All industries	225 649	233 965	240 908	8 316	6 943	100.0	100.0	100.0	0.4	0.3

NB: For the latest update please visit: http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations

Source: Cedefop skills forecasts (2016).

Table A2. 2**. Employment trends by NACE rev 2 industry, EU-28+, 2005-25**

	Levels (000s)			Change (000s)		Share (%)			Growth p.s. (%)	
	2005	2015	2025	2005-15	2015-25	2005	2015	2025	2005-15	2015-25
A: Agriculture, forestry and fishing	13 669	11 396	9 605	- 2 273	- 1 791	6.1	4.9	4.0	-1.7	-1.6
B: Mining and quarrying	843	796	670	- 48	- 126	0.4	0.3	0.3	-0.6	-1.6
D: Electricity, gas, steam and air conditioning supply	1 350	1 284	1 172	- 66	- 112	0.6	0.5	0.5	-0.5	-0.9
E: Water supply, sewerage, waste management and remediation activities	1 436	1 735	1 619	299	- 116	0.6	0.7	0.7	2.1	-0.7
C: Manufacturing	36 589	32 908	31 627	- 3 681	- 1 281	16.2	14.1	13.1	-1.0	-0.4
F: Construction	16 201	15 108	15 231	- 1 093	123	7.2	6.5	6.3	-0.7	0.1
G: Wholesale and retail trade, repair of motor vehicles and motorcycles	33 594	34 633	36 054	1 040	1 420	14.9	14.8	15.0	0.3	0.4
H: Transportation and storage;	11 501	12 000	12 062	499	62	5.1	5.1	5.0	0.4	0.1
I: Accommodation and food service activities	9 767	11 176	11 796	1 410	620	4.3	4.8	4.9	1.4	0.6
J : Information and communication	6 045	6 775	7 344	730	569	2.7	2.9	3.0	1.2	0.8
K: Financial and insurance activities	6 259	6 424	6 912	166	488	2.8	2.7	2.9	0.3	0.8
LM: Real estate, professional, scientific and technical activities	13 484	16 621	19 313	3 137	2 692	6.0	7.1	8.0	2.3	1.6
N: Administrative and support service activities	11 021	14 163	15 970	3 142	1 806	4.9	6.1	6.6	2.9	1.3
RSTU+: Arts, recreation, and other service activities; (Film & TV production/ broadcasting)	13 154	14 633	15 674	1 479	1 042	5.8	6.3	6.5	1.1	0.7
O: Public administration and defence, compulsory social security	15 238	14 892	14 331	- 346	- 561	6.8	6.4	5.9	-0.2	-0.4
P: Education	14 943	15 603	15 792	659	190	6.6	6.7	6.6	0.4	0.1
Q: Human health and social work activities	20 556	23 818	25 736	3 262	1 918	9.1	10.2	10.7	1.6	0.8
All industries	**225 649**	**233 965**	**240 908**	**8 316**	**6 943**	**100.0**	**100.0**	**100.0**	**0.4**	**0.3**

NB: For the latest update please visit: http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations

Source: Cedefop skills forecasts (2016).

Table A2. 3. **Employment trends by occupation (ISCO 08), EU-28+, 2005-25**

	Levels (000s)			Change (000s)		Share (%)			Growth p.s. (%)	
	2005	2015	2025	2005-15	2015-25	2005	2015	2025	2005-15	2015-25
1 Legislators, senior officials and managers	**13 727**	**14 693**	**16 047**	**966**	**1 354**	**6.1**	**6.3**	**6.7**	**0.7**	**0.9**
11. Chief executives, senior officials and legislators	1 617	1 873	2 021	255	149	0.7	0.8	0.8	1.6	0.8
12. Administrative and commercial managers	3 564	3 820	4 323	256	503	1.6	1.6	1.8	0.7	1.3
13. Production and specialised services managers	4 464	4 879	5 274	415	394	2.0	2.1	2.2	0.9	0.8
14. Hospitality, retail and other services managers	4 081	4 121	4 428	40	307	1.8	1.8	1.8	0.1	0.7
2 Professionals	**34 934**	**40 781**	**43 980**	**5 847**	**3 199**	**15.5**	**17.4**	**18.3**	**1.7**	**0.8**
21. Science and engineering professionals	5 470	6 426	7 216	956	790	2.4	2.7	3.0	1.7	1.2
22. Health professionals	5 124	5 803	6 142	679	339	2.3	2.5	2.5	1.3	0.6
23. Teaching professionals	9 989	10 220	9 948	231	- 272	4.4	4.4	4.1	0.2	-0.3
24. Business and administration professionals	6 837	8 656	9 798	1 820	1 141	3.0	3.7	4.1	2.7	1.3
25. Information and communications technology professionals	2 751	3 658	4 109	907	451	1.2	1.6	1.7	3.3	1.2
26. Legal, social and cultural professionals	4 764	6 019	6 768	1 254	749	2.1	2.6	2.8	2.6	1.2
3 Technicians and associate professionals	**34 330**	**37 515**	**41 406**	**3 186**	**3 891**	**15.2**	**16.0**	**17.2**	**0.9**	**1.0**
31. Science and engineering associate professionals	7 795	8 215	8 353	419	138	3.5	3.5	3.5	0.5	0.2
32. Health associate professionals	5 219	5 868	6 432	649	563	2.3	2.5	2.7	1.2	1.0
33. Business and administration associate professionals	14 940	16 829	18 064	1 889	1 235	6.6	7.2	7.5	1.3	0.7
34. Legal, social, cultural and related associate professionals	4 690	4 769	6 622	79	1 853	2.1	2.0	2.7	0.2	3.9
35. Information and communications technicians	1 686	1 835	1 936	149	101	0.7	0.8	0.8	0.9	0.6
4 Clerks	**24 672**	**24 162**	**23 400**	**- 510**	**- 762**	**10.9**	**10.3**	**9.7**	**-0.2**	**-0.3**
41. General and keyboard clerks	7 688	7 321	6 618	- 367	- 703	3.4	3.1	2.7	-0.5	-1.0
42. Customer services clerks	5 155	5 779	6 929	624	1 151	2.3	2.5	2.9	1.2	2.0
43. Numerical and material recording clerks	8 530	8 115	7 305	- 415	- 811	3.8	3.5	3.0	-0.5	-1.0
44. Other clerical support workers	3 298	2 947	2 549	- 352	- 398	1.5	1.3	1.1	-1.1	-1.4
5 Service workers and shop and market sales workers	**36 316**	**39 694**	**40 392**	**3 377**	**698**	**16.1**	**17.0**	**16.8**	**0.9**	**0.2**
51. Personal service workers	10 456	11 607	11 763	1 151	156	4.6	5.0	4.9	1.1	0.1
52. Sales workers	15 433	16 309	16 522	876	213	6.8	7.0	6.9	0.6	0.1
53. Personal care workers	6 902	7 966	8 351	1 064	386	3.1	3.4	3.5	1.5	0.5
54. Protective services workers	3 526	3 812	3 755	286	- 57	1.6	1.6	1.6	0.8	-0.1
6 Skilled agricultural and fishery workers	**11 272**	**9 654**	**8 416**	**- 1 619**	**- 1 238**	**5.0**	**4.1**	**3.5**	**-1.4**	**-1.3**
61. Market-oriented skilled agricultural workers	10 058	8 684	7 577	- 1 375	- 1 107	4.5	3.7	3.1	-1.4	-1.3
62. Market-oriented skilled forestry, fishery and hunting workers	491	421	395	- 70	- 26	0.2	0.2	0.2	-1.4	-0.6
63. Subsistence farmers, fishers, hunters and gatherers	723	549	444	- 174	- 105	0.3	0.2	0.2	-2.4	-1.9
7 Craft and related trades workers	**30 226**	**27 037**	**25 518**	**- 3 189**	**- 1 519**	**13.4**	**11.6**	**10.6**	**-1.1**	**-0.6**
71. Building and related trades workers, excluding electricians	9 174	8 981	9 251	- 193	270	4.1	3.8	3.8	-0.2	0.3
72. Metal, machinery and related trades workers	9 664	8 735	7 826	- 930	- 908	4.3	3.7	3.2	-1.0	-1.0
73. Handicraft and printing workers	1 815	1 323	1 214	- 493	- 108	0.8	0.6	0.5	-2.7	-0.8
74. Electrical and electronic trades workers	3 999	3 568	3 337	- 431	- 231	1.8	1.5	1.4	-1.1	-0.6
75. Food processing, wood working, garment and other craft and related trades	5 573	4 430	3 889	- 1 143	- 541	2.5	1.9	1.6	-2.1	-1.2
8 Plant and machine operators and assemblers	**17 767**	**16 540**	**16 242**	**- 1 227**	**- 298**	**7.9**	**7.1**	**6.7**	**-0.7**	**-0.2**
81. Stationary plant and machine operators	6 010	5 308	5 035	- 701	- 273	2.7	2.3	2.1	-1.2	-0.5
82. Assemblers	2 238	1 661	2 043	- 577	382	1.0	0.7	0.8	-2.6	2.3
83. Drivers and mobile plant operators	9 519	9 571	9 164	52	- 407	4.2	4.1	3.8	0.1	-0.4
9 Elementary occupations	**20 925**	**22 643**	**24 408**	**1 718**	**1 765**	**9.3**	**9.7**	**10.1**	**0.8**	**0.8**
91. Cleaners and helpers	8 540	9 683	10 527	1 144	844	3.8	4.1	4.4	1.3	0.9
92. Agricultural, forestry and fishery labourers	1 843	2 000	2 088	157	88	0.8	0.9	0.9	0.9	0.4
93. Labourers in mining, construction, manufacturing and transport	6 328	6 510	7 311	182	800	2.8	2.8	3.0	0.3	1.2
94. Food preparation assistants	1 678	1 809	1 795	131	- 14	0.7	0.8	0.7	0.8	-0.1
95. Street and related sales and service workers	201	192	173	- 9	- 19	0.1	0.1	0.1	-0.4	-1.0
96. Refuse workers and other elementary workers	2 335	2 448	2 514	114	65	1.0	1.0	1.0	0.5	0.3
All occupations	**225 649**	**233 965**	**240 908**	**8 316**	**6 943**	**100.0**	**100.0**	**100.0**	**0.4**	**0.3**

NB: All occupations include also armed forces (not presented in the table).
Source: Cedefop skills forecasts (2016).

Table A2. 4. **Total job opportunities (expansion and replacement demand) by occupation, EU-28+**

Scenario	Change 2015-25 (000s)			Change 2015-25 (% of 2015 level)		
Measures	Expansion demand	Replacement demand	Total job opportunities	Expansion demand	Replacement demand	Total job opportunities
1 Legislators, senior officials and managers	**1 354**	**7 979**	**9 332**	**9.2**	**54.3**	**63.5**
11. Chief executives, senior officials and legislators	149	1 303	1 452	7.9	69.6	77.5
12. Administrative and commercial managers	503	1 470	1 973	13.2	38.5	51.6
13. Production and specialised services managers	394	2 756	3 150	8.1	56.5	64.6
14. Hospitality, retail and other services managers	307	2 450	2 757	7.5	59.5	66.9
2 Professionals	**3 199**	**18 217**	**21 416**	**7.8**	**44.7**	**52.5**
21. Science and engineering professionals	790	2 183	2 972	12.3	34.0	46.3
22. Health professionals	339	2 988	3 328	5.8	51.5	57.3
23. Teaching professionals	- 272	5 030	4 759	-2.7	49.2	46.6
24. Business and administration professionals	1 141	3 815	4 956	13.2	44.1	57.3
25. Information and communications technology professionals	451	1 608	2 059	12.3	44.0	56.3
26. Legal, social and cultural professionals	749	2 593	3 342	12.4	43.1	55.5
3 Technicians and associate professionals	**3 891**	**13 848**	**17 738**	**10.4**	**36.9**	**47.3**
31. Science and engineering associate professionals	138	2 803	2 941	1.7	34.1	35.8
32. Health associate professionals	563	2 008	2 571	9.6	34.2	43.8
33. Business and administration associate professionals	1 235	6 708	7 942	7.3	39.9	47.2
34. Legal, social, cultural and related associate professionals	1 853	1 721	3 574	38.9	36.1	74.9
35. Information and communications technicians	101	609	710	5.5	33.2	38.7
4 Clerks	**- 762**	**8 402**	**7 640**	**-3.2**	**34.8**	**31.6**
41. General and keyboard clerks	- 703	2 530	1 827	-9.6	34.6	25.0
42. Customer services clerks	1 151	1 795	2 945	19.9	31.1	51.0
43. Numerical and material recording clerks	- 811	2 972	2 162	-10.0	36.6	26.6
44. Other clerical support workers	- 398	1 105	706	-13.5	37.5	24.0
5 Service workers and shop and market sales workers	**698**	**12 975**	**13 673**	**1.8**	**32.7**	**34.4**
51. Personal service workers	156	3 952	4 108	1.3	34.0	35.4
52. Sales workers	213	5 001	5 215	1.3	30.7	32.0
53. Personal care workers	386	2 735	3 120	4.8	34.3	39.2
54. Protective services workers	- 57	1 287	1 230	-1.5	33.8	32.3
6 Skilled agricultural and fishery workers	**- 1 238**	**7 073**	**5 834**	**-12.8**	**73.3**	**60.4**
61. Market-oriented skilled agricultural workers	- 1 107	6 394	5 288	-12.7	73.6	60.9
62. Market-oriented skilled forestry, fishery and hunting workers	- 26	294	268	-6.3	69.8	63.5
63. Subsistence farmers, fishers, hunters and gatherers	- 105	384	279	-19.2	70.0	50.8
7 Craft and related trades workers	**- 1 519**	**9 315**	**7 796**	**-5.6**	**34.5**	**28.8**
71. Building and related trades workers, excluding electricians	270	2 980	3 250	3.0	33.2	36.2
72. Metal, machinery and related trades workers	- 908	2 978	2 069	-10.4	34.1	23.7
73. Handicraft and printing workers	- 108	545	437	-8.2	41.2	33.0
74. Electrical and electronic trades workers	- 231	1 233	1 002	-6.5	34.5	28.1
75. Food processing, wood working, garment and other craft and related trades	- 541	1 580	1 039	-12.2	35.7	23.4
8 Plant and machine operators and assemblers	**- 298**	**6 170**	**5 872**	**-1.8**	**37.3**	**35.5**
81. Stationary plant and machine operators	- 273	1 686	1 413	-5.1	31.8	26.6
82. Assemblers	382	483	865	23.0	29.1	52.1
83. Drivers and mobile plant operators	- 407	4 000	3 594	-4.2	41.8	37.5
9 Elementary occupations	**1 765**	**10 246**	**12 011**	**7.8**	**45.3**	**53.0**
91. Cleaners and helpers	844	4 773	5 617	8.7	49.3	58.0
92. Agricultural, forestry and fishery labourers	88	1 044	1 132	4.4	52.2	56.6
93. Labourers in mining, construction, manufacturing and transport	800	2 112	2 913	12.3	32.4	44.7
94. Food preparation assistants	- 14	974	960	-0.8	53.8	53.1
95. Street and related sales and service workers	- 19	87	68	-9.6	45.1	35.4
96. Refuse workers and other elementary workers	65	1 257	1 322	2.7	51.3	54.0
All occupations	**6943.0**	**94402.8**	**101345.8**	**3.0**	**40.3**	**43.3**

NB: All occupations include also armed forces (not presented in the table).
Source: Cedefop skills forecasts (2016).

Table A2. 5. **Employment trends by qualification, EU-28+, 2005-25**

	Levels (000s)			Change (000s)		Share (%)			Growth p.s. (%)	
Years	2005	2015	2025	2005-15	2015-25	2005	2015	2025	2005-15	2015-25
Low	57 503	44 590	37 172	- 12 913	- 7 418	25.5	19.1	15.4	-2.2	-1.7
Medium	110 973	113 923	111 175	2 950	- 2 748	49.2	48.7	46.1	0.3	-0.2
High	57 173	75 453	92 560	18 279	17 108	25.3	32.2	38.4	3.2	2.3
All qualifications	**225 649**	**233 965**	**240 908**	**8 316**	**6 943**	**100.0**	**100.0**	**100.0**	**0.4**	**0.3**

NB: All occupations include also armed forces (not presented in the table).
Source: Cedefop skills forecasts (2016).

Table A2. 6. **Total job opportunities (expansion and replacement demand) by qualification, EU-28+, (000s)**

Scenario	Baseline			Change 2015-25 (% of 2015 level)		
Measures	Expansion demand	Replacement demand	Total job opportunities	Expansion demand	Replacement demand	Total job opportunities
Low	- 7 418	20 364	12 947	-16.6	45.7	29.0
Medium	- 2 747	42 180	39 432	-2.4	37.0	34.6
High	17 108	31 859	48 967	22.7	42.2	64.9
EU-28+	**6 943**	**94 403**	**101 346**	**3.0**	**40.3**	**43.3**

NB: All occupations include also armed forces (not presented in the table).
Source: Cedefop skills forecasts (2016).

Table A2. 7. **Total job openings (expansion and replacement demand) by occupation and qualification, 2015-25, EU-28+, (000s)**

Qualifications	Low qualification			Medium qualification			High qualification			All qualifications		
Measures	Expansion demand	Replacement demand	Total job opportunities	Expansion demand	Replacement demand	Total job opportunities	Expansion demand	Replacement demand	Total job opportunities	Expansion demand	Replacement demand	Total job opportunities
0 Armed forces	- 44	27	- 17	- 139	94	- 45	36	58	94	**- 147**	**179**	**32**
1 Legislators, senior officials and managers	69	970	1 039	- 336	2 748	2 412	1 621	4 260	5 881	**1 354**	**7 979**	**9 332**
2 Professionals	128	429	557	825	3 015	3 839	2 247	14 773	17 020	**3 199**	**18 217**	**21 416**
3 Technicians and associate professionals	8	1 264	1 272	- 943	6 866	5 923	4 825	5 718	10 543	**3 891**	**13 848**	**17 738**
4 Clerks	- 418	1 234	816	- 2 108	4 917	2 809	1 765	2 251	4 016	**- 762**	**8 402**	**7 640**
5 Service workers and shop and market sales workers	- 1 790	3 255	1 464	- 611	7 613	7 002	3 100	2 107	5 206	**698**	**12 975**	**13 673**
6 Skilled agricultural and fishery workers	- 1 281	3 533	2 252	- 322	2 857	2 535	364	683	1 047	**- 1 238**	**7 073**	**5 834**
7 Craft and related trades workers	- 1 138	2 778	1 641	- 1 247	5 784	4 537	866	753	1 619	**- 1 519**	**9 315**	**7 796**
8 Plant and machine operators and assemblers	- 884	2 046	1 162	- 50	3 699	3 649	636	425	1 061	**- 298**	**6 170**	**5 872**
9 Elementary occupations	- 2 067	4 827	2 761	2 185	4 587	6 772	1 647	832	2 479	**1 765**	**10 246**	**12 011**
All occupations	**- 7 418**	**20 364**	**12 947**	**- 2 747**	**42 180**	**39 432**	**17 108**	**31 859**	**48 967**	**6 943**	**94 403**	**101 346**

NB: For the latest update please visit: http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations
Source: Cedefop skills forecasts (2016).

Table A2. 8. **Employment trends by country (total employment), 2005-25**

Scenario	Levels (000s)			Change (000s)		Share of EU-28+ total (%)			Growth p.s. (%)	
Years	2005	2015	2025	2005-15	2015-25	2005	2015	2025	2005-15	2015-25
Austria	3 852	4 300	4 449	449	148	1.7	1.8	1.8	1.2	0.3
Belgium	4 260	4 591	5 016	331	425	1.9	2.0	2.1	0.8	0.9
Bulgaria	3 480	3 387	3 334	- 93	- 53	1.5	1.4	1.4	-0.3	-0.2
Croatia	1 396	1 614	1 694	218	80	0.6	0.7	0.7	1.6	0.5
Cyprus	364	354	408	- 11	54	0.2	0.2	0.2	-0.3	1.5
Czech Republic	4 907	5 159	5 293	252	133	2.2	2.2	2.2	0.5	0.3
Denmark	2 754	2 785	2 948	31	163	1.2	1.2	1.2	0.1	0.6
Estonia	606	632	606	26	- 26	0.3	0.3	0.3	0.4	-0.4
Finland	2 382	2 505	2 625	123	120	1.1	1.1	1.1	0.5	0.5
Germany	39 054	42 352	41 532	3 298	- 820	17.3	18.1	17.2	0.8	-0.2
France	26 283	27 373	29 184	1 090	1 811	11.6	11.7	12.1	0.4	0.7
Greece	4 636	3 783	3 963	- 853	179	2.1	1.6	1.6	-1.8	0.5
Hungary	4 169	4 151	4 198	- 17	47	1.8	1.8	1.7	0.0	0.1
Ireland	1 929	1 921	2 195	- 8	274	0.9	0.8	0.9	0.0	1.4
Italy	24 317	24 389	25 474	72	1 085	10.8	10.4	10.6	0.0	0.4
Latvia	1 022	912	901	- 111	- 11	0.5	0.4	0.4	-1.1	-0.1
Lithuania	1 440	1 327	1 346	- 113	19	0.6	0.6	0.6	-0.8	0.1
Luxembourg	298	394	437	95	43	0.1	0.2	0.2	3.2	1.1
Malta	153	185	186	31	2	0.1	0.1	0.1	2.0	0.1
Netherlands	8 250	8 617	8 983	366	367	3.7	3.7	3.7	0.4	0.4
Poland	14 203	15 888	16 166	1 685	277	6.3	6.8	6.7	1.2	0.2
Portugal	5 122	4 466	4 561	- 656	95	2.3	1.9	1.9	-1.3	0.2
Romania	9 262	9 226	9 027	- 36	- 200	4.1	3.9	3.7	0.0	-0.2
Slovakia	2 077	2 218	2 385	141	167	0.9	0.9	1.0	0.7	0.8
Slovenia	929	911	921	- 18	10	0.4	0.4	0.4	-0.2	0.1
Spain	18 711	17 365	17 894	- 1 347	530	8.3	7.4	7.4	-0.7	0.3
Sweden	4 357	4 705	4 957	349	251	1.9	2.0	2.1	0.8	0.5
United Kingdom	28 686	30 529	31 858	1 843	1 330	12.7	13.0	13.2	0.6	0.4
EU-28	**218 900**	**226 039**	**232 540**	**7 138**	**6 501**	**97.0**	**96.6**	**96.5**	**0.3**	**0.3**
Norway	2 355	2 779	3 020	425	241	1.0	1.2	1.3	1.8	0.9
Switzerland	4 233	4 972	5 159	739	187	1.9	2.1	2.1	1.7	0.4
Iceland	162	175	188	14	13	0.1	0.1	0.1	0.8	0.7
EU-28+	**225 649**	**233 965**	**240 908**	**8 316**	**6 943**	**100.0**	**100.0**	**100.0**	**0.4**	**0.3**

NB: For the latest update please visit: http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations

Source: Cedefop skills forecasts (2016).

Table A2. 9. **Employment trends by country and broad sectors, 2015-25, (000s)**

Broad sectors	Primary sector and utilities		Manufacturing		Construction		Distribution and transport		Business and other services		Non-marketed services		All sectors	
Years	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025
Austria	237	216	638	626	293	285	1 181	1 261	979	1 043	972	1 018	**4 300**	**4 449**
Belgium	107	102	513	519	276	274	980	1 029	1 319	1 550	1 397	1 541	**4 591**	**5 016**
Bulgaria	733	681	566	519	182	192	834	842	511	565	562	533	**3 387**	**3 334**
Croatia	196	132	252	244	175	210	459	484	104	125	429	499	**1 614**	**1 694**
Cyprus	14	13	26	27	26	27	120	151	90	105	77	84	**354**	**408**
Czech Republic	287	264	1 271	1 252	455	465	1 292	1 345	982	1 060	871	907	**5 159**	**5 293**
Denmark	97	80	296	292	161	170	703	705	664	774	864	927	**2 785**	**2 948**
Estonia	45	35	115	102	48	46	149	148	126	134	149	141	**632**	**606**
Finland	144	132	363	368	190	190	532	565	566	655	710	716	**2 505**	**2 625**
France	1 062	992	2 779	2 868	1 810	1 828	6 378	6 508	7 367	8 496	7 976	8 492	**27 373**	**29 184**
Germany	1 215	1 046	7 431	6 939	2 456	2 293	9 695	9 224	11 787	12 355	9 767	9 675	**42 352**	**41 532**
Greece	537	463	321	316	173	208	1 195	1 322	709	796	849	857	**3 783**	**3 963**
Hungary	379	255	810	785	268	290	1 003	948	758	878	933	1 041	**4 151**	**4 198**
Ireland	138	128	212	211	112	217	503	547	465	535	491	558	**1 921**	**2 195**
Italy	1 168	897	4 254	4 128	1 598	1 579	5 935	6 140	7 047	8 072	4 387	4 658	**24 389**	**25 474**
Latvia	87	69	133	136	66	68	240	246	198	209	187	173	**912**	**901**
Lithuania	152	142	202	194	100	94	360	373	220	249	293	295	**1 327**	**1 346**
Luxembourg	9	8	32	30	40	51	95	103	139	167	79	78	**394**	**437**
Malta	10	9	21	17	9	10	47	50	53	57	44	44	**185**	**186**
Netherlands	286	280	811	744	442	466	2 210	2 380	2 575	2 760	2 293	2 354	**8 617**	**8 983**
Poland	2 428	1 887	2 993	2 864	1 138	1 388	3 956	4 409	2 316	2 557	3 058	3 061	**15 888**	**16 166**
Portugal	517	524	660	621	308	327	1 191	1 301	852	934	938	854	**4 466**	**4 561**
Romania	2 923	2 534	1 698	1 670	664	577	1 926	2 050	945	1 105	1 071	1 091	**9 226**	**9 027**
Slovakia	110	103	463	466	167	175	609	698	421	510	447	434	**2 218**	**2 385**
Slovenia	95	81	180	172	63	65	191	206	204	223	178	173	**911**	**921**
Spain	971	815	1 884	1 739	1 005	1 008	5 099	5 679	4 745	5 290	3 661	3 363	**17 365**	**17 894**
Sweden	169	173	564	540	322	356	957	946	1 089	1 178	1 604	1 763	**4 705**	**4 957**
United Kingdom	700	641	2 472	2 318	1 994	1 812	8 112	8 309	9 462	10 686	7 789	8 093	**30 529**	**31 858**
EU-28	**14 815**	**12 701**	**31 959**	**30 707**	**14 540**	**14 670**	**55 954**	**57 969**	**56 694**	**63 070**	**52 077**	**53 423**	**226 038**	**232 540**
Norway	162	147	242	219	211	224	637	660	531	615	995	1 155	**2 779**	**3 020**
Switzerland	223	208	687	681	348	326	1 186	1 245	1 334	1 467	1 195	1 233	**4 972**	**5 159**
Iceland	11	11	20	20	9	10	33	37	58	61	44	48	**175**	**188**
EU28+	**15 211**	**13 066**	**32 908**	**31 627**	**15 108**	**15 231**	**57 810**	**59 912**	**58 616**	**65 213**	**54 312**	**55 859**	**233 965**	**240 908**

NB: For the latest update please visit: http://www.cedefop.europa.eu/en/events-and-projects/projects/forecasting-skill-demand-and-supply/data-visualisations

Source: Cedefop skills forecasts (2016).

Table A2. 10. **Employment trends by country and occupation, 2015-25, (000s)**

Major occupation group	1 Legislators, senior officials and managers		2 Professionals		3 Technicians and associate professionals		4 Clerks		5 Service workers and shop and market sales		6 Skilled agricultural and fishery workers		7 Craft and related trades workers		8 Plant and machine operators and assemblers		9 Elementary occupations		All occupations	
Years	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025	2015	2025
Austria	196	200	629	702	837	917	455	421	819	866	186	182	525	478	251	234	392	440	**4300**	**4449**
Belgium	384	428	1 048	1 170	703	832	589	565	577	644	66	71	446	393	287	386	461	508	**4591**	**5016**
Bulgaria	193	175	468	469	292	329	226	247	593	577	343	292	404	364	435	419	409	445	**3387**	**3334**
Croatia	77	80	301	352	248	281	158	173	176	189	135	86	227	240	143	131	131	147	**1614**	**1694**
Cyprus	15	27	54	63	48	53	40	49	72	81	6	5	35	35	17	19	60	71	**354**	**408**
Czech Republic	305	330	696	730	959	1 135	506	506	782	775	70	60	894	840	660	654	273	248	**5159**	**5293**
Denmark	59	73	702	811	514	616	216	183	530	537	53	41	230	218	157	156	314	303	**2785**	**2948**
Estonia	63	69	125	121	84	84	39	40	83	79	11	7	87	77	82	76	55	51	**632**	**606**
Finland	86	91	555	621	463	510	166	148	462	452	94	87	299	306	205	211	163	190	**2505**	**2625**
France	2 077	2 335	4 458	4 991	5 475	6 039	2 478	2 165	4 738	4 998	932	983	2 284	2 142	1 710	1 613	3 012	3 736	**42352**	**41532**
Germany	1 874	1 796	6 674	6 991	9 093	9 208	5 768	5 514	6 502	6 281	733	755	5 207	4 804	2 626	2 427	3 700	3 622	**27373**	**29184**
Greece	169	159	636	681	301	376	403	421	791	877	452	375	421	426	254	261	290	323	**3783**	**3963**
Hungary	228	252	678	805	633	673	323	318	627	609	147	96	564	490	547	538	388	410	**4151**	**4198**
Ireland	154	189	395	440	219	283	201	196	356	380	98	91	207	279	113	128	172	204	**1921**	**2195**
Italy	1 031	1 435	3 112	3 619	4 258	4 742	3 273	3 396	4 068	3 834	569	458	3 405	3 268	1 585	1 492	2 841	2 954	**24389**	**25474**
Latvia	90	94	155	165	115	124	54	53	137	130	24	17	121	118	82	77	129	119	**912**	**901**
Lithuania	102	100	267	288	149	175	49	41	195	193	87	94	197	194	155	143	120	112	**1327**	**1346**
Luxembourg	12	13	110	134	78	85	42	51	47	45	7	7	43	43	25	26	30	33	**394**	**437**
Malta	19	19	32	35	27	28	21	21	34	34	4	3	17	17	12	11	17	16	**185**	**186**
Netherlands	607	615	1 960	2 139	1 355	1 405	863	912	1 716	1 800	195	173	735	697	357	363	808	862	**8617**	**8983**
Poland	1 072	1 225	2 955	3 195	1 852	2 061	1 239	1 279	1 873	1 783	1 634	1 183	2 404	2 477	1 595	1 589	1 184	1 317	**15888**	**16166**
Portugal	332	331	661	703	466	527	361	344	718	741	423	428	601	557	347	345	533	569	**4466**	**4561**
Romania	209	203	1 329	1 454	585	607	408	440	1 111	1 224	2 090	1 709	1 431	1 201	960	1 003	1 039	1 133	**9226**	**9027**
Slovakia	117	140	297	311	392	450	207	209	413	454	21	18	341	348	258	257	162	178	**2218**	**2385**
Slovenia	85	96	200	216	124	137	67	56	110	104	42	23	117	112	78	70	84	101	**911**	**921**
Spain	885	928	2 625	2 576	2 085	2 492	2 016	2 089	3 708	3 976	455	342	1 884	1 792	1 330	1 303	2 287	2 318	**17365**	**17894**
Sweden	263	310	1 113	1 205	824	902	279	232	1 006	1 073	89	83	486	476	381	398	253	269	**4705**	**4957**
United Kingdom	3 373	3 679	6 675	6 828	3 911	4 792	3 075	2 777	5 981	6 106	479	554	2 480	2 207	1 477	1 467	3 009	3 396	**30529**	**31858**
EU-28	**14 078**	**15 393**	**38 912**	**41 815**	**36 090**	**39 865**	**23 522**	**22 846**	**38 223**	**38 841**	**9 445**	**8 225**	**26 092**	**24 596**	**16 127**	**15 799**	**22 316**	**24 074**	**226039**	**232540**
Norway	179	172	654	793	474	548	187	175	619	693	58	43	271	269	202	196	121	117	**2779**	**3020**
Switzerland	410	447	1 178	1 330	919	958	446	372	822	830	144	141	656	636	201	238	196	208	**4972**	**5159**
Iceland	26	34	37	43	32	34	8	7	29	27	7	7	18	17	9	9	9	10	**175**	**188**
EU-28+	**14 693**	**16 047**	**40 781**	**43 980**	**37 515**	**41 406**	**24 162**	**23 400**	**39 694**	**40 392**	**9 654**	**8 416**	**27 037**	**25 518**	**16 540**	**16 242**	**22 643**	**24 408**	**233965**	**240908**

Source: Cedefop skills forecasts (2016).

Table A2. 11. **Employment trends by country and qualification, 2015-25, (000s)**

Qualifications	Low		Medium		High		All qualifications	
Years	2015	2025	2015	2025	2015	2025	2015	2025
Austria	634	598	2 819	2 890	847	961	**4 300**	**4 449**
Belgium	815	602	1 785	1 935	1 991	2 479	**4 591**	**5 016**
Bulgaria	342	289	2 002	1 894	1 044	1 150	**3 387**	**3 334**
Croatia	153	95	994	1 074	468	524	**1 614**	**1 694**
Cyprus	65	58	129	127	160	222	**354**	**408**
Czech Republic	219	199	3 834	3 474	1 107	1 620	**5 159**	**5 293**
Denmark	675	713	1 151	964	959	1 271	**2 785**	**2 948**
Estonia	58	71	324	269	249	267	**632**	**606**
Finland	302	253	1 260	1 443	943	930	**2 505**	**2 625**
France	5 371	3 913	11 906	12 076	10 097	13 196	**27 373**	**29 184**
Germany	5 338	4 881	25 487	25 095	11 527	11 557	**42 352**	**41 532**
Greece	1 079	975	1 479	1 456	1 225	1 532	**3 783**	**3 963**
Hungary	412	302	2 588	2 271	1 150	1 625	**4 151**	**4 198**
Ireland	314	226	708	812	899	1 157	**1 921**	**2 195**
Italy	7 559	5 497	11 699	12 474	5 131	7 503	**24 389**	**25 474**
Latvia	79	100	516	412	317	389	**912**	**901**
Lithuania	55	62	712	588	560	696	**1 327**	**1 346**
Luxembourg	68	48	160	168	165	221	**394**	**437**
Malta	75	48	61	80	48	58	**185**	**186**
Netherlands	1 914	1 550	3 587	3 409	3 116	4 024	**8 617**	**8 983**
Poland	841	656	9 098	6 628	5 950	8 881	**15 888**	**16 166**
Portugal	2 652	2 185	900	1 118	914	1 258	**4 466**	**4 561**
Romania	2 057	2 184	5 210	4 098	1 960	2 745	**9 226**	**9 027**
Slovakia	79	79	1 621	1 525	518	781	**2 218**	**2 385**
Slovenia	94	62	547	521	270	337	**911**	**921**
Spain	5 978	5 397	4 468	5 265	6 919	7 232	**17 365**	**17 894**
Sweden	588	536	2 283	1 955	1 835	2 465	**4 705**	**4 957**
United Kingdom	5 568	4 227	13 095	14 124	11 866	13 507	**30 528**	**31 858**
EU-28	**43 319**	**35 761**	**110 361**	**108 105**	**72 358**	**88 673**	**226 038**	**232 540**
Norway	622	881	1 120	904	1 038	1 235	**2 779**	**3 020**
Switzerland	684	533	2 351	2 112	1 937	2 514	**4 972**	**5 159**
Iceland	63	59	60	65	53	64	**175**	**188**
EU-28+	**44 590**	**37 172**	**113 923**	**111 175**	**75 453**	**92 560**	**233 965**	**240 908**

Source: Cedefop skills forecasts (2016).

Annex 3.
List of contributing individual country experts

Country of expertise	Surname	Name	Institution
Austria	Bock-Schappelwein	Julia	Austrian Institute of Economic Research
	Horvath	Thomas	Austrian Institute of Economic Research
	Huemer	Ulrike	Austrian Institute of Economic Research
	Mahringer	Helmut	Austrian Institute of Economic Research
Belgium	Hendrickx	Koen	Federal Planning Bureau
Bulgaria	Dimitrova	Elka	Ministry of Labour and social Policy
Croatia	Nestić	Danijel	Institute of Economics of Zagreb
	Pavkov	Marija	Ekopid d.o.o.
Cyprus	Mourouzides	Yiannis	Human Resource Development Authority of Cyprus
Czech Republic	Vavrinova	Tereza	National Training Fund
Denmark	Hanne	Shapiro	Danish Technological Institute
Estonia	Lambing	Mario	Ministry of Economic Affairs and Communications
Finland	Tiainen	Pekka	Ministerial counsellor at the Ministry of Employment and Economy
France	Argouarc'h	Julie	French Ministry of Labour
	Aboubadra	Sandrine	Commissariat Général à la Stratégie et à la Prospective
	Lainé	Frédéric	Centre d'Analyse Stratégique
FYROM	Nikoloski	Dimitar	Faculty of economics of Prilep
Germany	Helmrich	Robert	Federal Institute for Vocational Training and Education (BIBB)
	Maier	Tobias	Federal Institute for Vocational Training and Education (BIBB)
Greece	Chletsos	Michael	University of Ioannina
Hungary	Bako	Tamas	Institute of Economics, Research centre for Economic and Regional Studies, Hungarian Academy of Sciences
Iceland	Sigurdson	Karl	Directorate of Labour
Ireland	Behan	Jasmina	Irish Further Education and Training Authority (SOLAS)
	Shally	Caroline	Irish Further Education and Training Authority (SOLAS)
	McGrath	John	Irish Further Education and Training Authority (SOLAS)
Italy	Colombo	Emilio	University Milano-Bicocca
Latvia	Ozols	Normunds	Ministry of Economics of Republic of Latvia

Country of expertise	Surname	Name	Institution
Lithuania	Martinaitis	Žilvinas	Visionary Analytics
	Beleckiene	Giedre	Freelance expert
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Malta	Felix	Borg	Employment and Training Corporation
Netherlands	Kriechel	Ben	Economix Research and Consulting
Norway	Stølen	Nils Martin	Statistics Norway
Poland	Gajdos	Artur	University of Lodz
	Sienkiewicz	Łukasz	Warsaw School of Economics (Szkoła Główna Handlowa w Warszawie)
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Slovakia	Stefanik	Miroslav	Slovak Academy of Sciences
	Radvansky	Marek	Institute of Economic Research, Slovak Academy of Sciences (Ekonomický ústav SAV)
Slovenia	Magda	Zupancic	Ministry of Labour, Family and Social Affairs
Spain	Amor Bravo	Elias Manuel	Fundacion Servicio Valenciano de Empleo
	Caprile Elola-Olaso	Maria	NOTUS, applied social research
Sweden	Hellsing	Eric	Statistics Sweden
	Zetterberg-Grünewald	Karin	Statistics Sweden (SCB)
Switzerland	Babel	Jacques	Swiss Federal Statistical Office
Turkey	Ercan	Hakan	Middle East Technical University
United Kingdom	Wilson	Robert	University of Warwick

Future skill needs in Europe: critical labour force trends

The European labour market is challenged by changes in the demographic composition of the labour force and increasing work complexities and processes. Skills forecasting makes useful contribution to decisions by policy-makers, experts and individuals. In this publication, Cedefop presents the latest results of skills supply and demand forecasts. Alongside the most likely scenario, it shows the impact of alternative labour market activation or migration policies on future labour market imbalances, illustrating the effects of the 'highest possible' labour market activity rates based on past and possible future baseline trends. The role of migration in mitigating labour market imbalances is incorporated into the scenario, responding to available job opportunities, income differentials and unemployment levels across Member States.

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