Skills Mismatches – An Impediment to the Competitiveness of EU Businesses

STUDY

European Economic and Social Committee

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List of Abbreviations

ALMP	Active labour market policy
AMS	Public Employment Office (Austria)
BA	Federal Employment Agency (Germany)
Cedefop	Centre for the Development of Vocational Training
DTLA	Dynamic Trade Link Analysis
EA	Employment Agency (Bulgaria)
EC	European Commission
ECB	European Central Bank
EDIT	Economic Development via Innovation and Technology (Bulgaria)
EIB	European Investment Bank
EESC	European Economic and Social Committee
ESF	European Social Fund
ESJS	European Skills and Jobs Survey
EU	European Union
EURES	European Employment Services
EQF	European Qualifications System
FDI	Foreign direct investment
FSO	Federal Statistical Office (Germany)
GDP	Gross domestic product
GVA	Gross value added
GVC	Global value chains
IAB	Institute for Employment Research (Germany)
ICT	Information and Communications Technology
ILO	International Labour Organization
IME	Institute for Market Economics (Bulgaria)
ISCO	International Standard Classification of Occupations
IT	Information Technology
IVET	Initial vocational education and training
KldB	German classification of occupations
MPO	Mismatch priority occupation
NACE	Nomenclature of economic activities
NSI	National Statistical Institute (Bulgaria)
NQF	National Qualifications System
OECD	Organization for Economic Cooperation and Development
PIAAC	Program for the International Assessment of Adult Competencies
SA	Statistics Austria
SME	Small and medium-sized enterprises
VET	Vocational education and training
WEF	World Economic Forum
XML	Extensible Markup Language

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Abstract

Skills mismatches are widely accepted as a factor that drags down on potential economic growth and as such require concrete policy measures both at the EU and national level.

This report was prepared by the Institute for Market Economics (IME) and is dedicated to the study of skills mismatches in the EU and their effect on the competitiveness of EU businesses. It includes a comprehensive review of existing literature on the issue and outlines some of the main conclusions regarding the relation of skill mismatches to education, personal and aggregate productivity, labour market dynamics and outcomes, innovation capacity and competitiveness. The study also includes the results of a dedicated survey designed to shed further light on the causes and effects of skills mismatches from the point of view of companies.

We provide further evidence of the importance of Mismatch Priority Occupations (as identified by Cedefop), as well as additional insight into potential labour market bottleneck is five reference countries (Austria, Bulgaria, Finland, Germany and Spain).

Current and long-term demographic trends make skills mismatches an issue of particular acuteness - against a projected decline in the labour force and an increase in the average age, European economies cannot afford to waste human capital. We find that efforts in achieving effective VET, lifelong learning and labour intermediation practices have to be supported by general competitiveness-enhancing reforms in EU economies. We estimate an EU-wide annual productivity loss of 2.14% due to existing mismatches.

Executive Summary

Skills mismatches are widely accepted as a factor that drags down on potential economic growth and as such require concrete policy measures both at the EU and national level. Current and long-term demographic trends make this an issue of particular acuteness - against a projected decline in the labour force and an increase in the average age, **European economies cannot afford to waste human capital**.

Previous studies[1] on the causes and effects of skills mismatches have shown that:

- Skills mismatches can adversely affect labour productivity and can explain some of the existing cross-country productivity gaps, while also being reflective of differences in the policy environment, including education and labour market related regulations and programs;
- Economies which include larger shares of adults with irrelevant skills find it difficult to introduce productivity-enhancing technologies and new ways of working;
- Skill requirements have and will continue to change rapidly in the presence of technological advancements and increasing international competition. For instance, basic information and communications technology (ICT) skills are no longer perceived as sufficient by most EU workers – the overwhelming majority of them believe that they need moderate ICT skills in order to do their job;
- The results from both the Program for the International Assessment of Adult Competencies (PIAAC) and the European Skills and Jobs Survey (ESJS) show that a larger part of the mismatch is due to over-skilling/education;
- This is a consequence of both ineffective resource allocation (leading to underutilization of the existing stock of skills) and general imbalances between the skills of the workforce and labour market demand;
- Efficient education, vocational education and training (VET) and lifelong learning policies are key to addressing the skills mismatches problem and should be supported by adequate active labour market policies and intermediation services on behalf of employment agencies;
- Vocational education provides participants with some of the tools necessary to minimize the risk of prolonged labour market inactivity that can have lasting scarring effect on a person's long-term career prospects. The latter is of particular importance, as inactivity itself can be a potential source of skills mismatches because of the inability of the long-term unemployed to "keep up" with changing skill requirements.

This report is dedicated to the study of skills mismatches in the EU, while also providing insight on five pre-selected EU reference countries (Austria, Bulgaria, Finland, Germany and Spain). This selection ensures that both "newer" and "older", core and peripheral EU Member States are taken into account, while also controlling for variations in economic and labour market cycles.

Our findings are supported by macroeconomic, microeconomic and survey-based data, as well as an extensive review of available research related to ongoing labour market developments at the EU, national and sectoral levels.

[1] An in-depth review of existing studies is available on pages 15-25.

We conclude that:

Addressing skills mismatches can increase the competitiveness of EU businesses

- Businesses across economic activities in the majority of EU Member States have experienced a gradual increase of both qualitative and quantitative labour shortages, which is one of the main macroeconomic manifestations of skills mismatches;
- Effective labour allocation and skill-pool utilization is a vital prerequisite for ensuring the ability of EU enterprises to continue to develop their innovation capacity and to withstand increasing competitive pressures;
- Our quantitative assessment of the effect of skills mismatches on the EU economy (based on ESJS data) indicates an estimated annual productivity loss of 2.14% due to existing mismatches, which equates to EUR 0.80 per hour worked in 2014 in nominal terms (ESJS's reference year);
- Our research provides additional evidence in support of the Mismatch Priority Occupations (MPOs), established by Cedefop. These are occupations with critical shortage that have important economic implications. MPOs include both high skilled (ICT professionals, medical doctors; science, technology, engineering, and mathematics (STEM) professionals; nurses and midwives; teachers) and intermediate level skilled occupations (such as welders, cooks and truck drivers).

Businesses are affected negatively by the skills mismatches issue in a variety of ways

In order to gain additional perspective on the causes and effects of skills mismatches, the Institute for Market Economics (IME) prepared an online survey[2] that was carried out in Q4 2017 among Austrian and Bulgarian companies. The survey was designed with the aim to provide further information on different aspects of skills mismatches **from the point of view of companies**. Our results indicate that:

- Skills mismatches affect companies in a variety of ways, among which the need for additional expenditures on employee training, loss of competitiveness and slower hiring of additional workers;
- The companies that took part in our survey point to "*insufficient traditions in lifelong learning and (re)qualification*" as the most significant factor for skills mismatches;
- While skill mismatches have moderate effect on the expansion plans of companies, firms in economic activities such as professional, scientific and technical activities, ICT, transportation and manufacturing are among the most affected in this regard;
- People aged less than 24 years and over 65 years are deemed most susceptible to skills mismatches, while those aged 40-54 years are perceived as the least likely to be affected by skills mismatches;
- 71% of companies engaged in professional, scientific or technical services and 67% of ICT companies assign high significance to the effect that skill mismatches have on the hiring of additional workers;
- The general consensus among companies is that "*finding suitable employees used to be easier, is currently hard and will become increasingly difficult in the future*";

[2] The online survey was carried out in German and Bulgarian among Austrian and Bulgarian employers, respectively. It consisted of 10 questions, covering a variety of topics related to skills mismatches and the way they affect businesses. All questions are available in the Annexes.

- Companies face difficulties when trying to find highly qualified workers. They usually need more than 90 days to fill in positions for professionals and managers, technicians or associate professionals. On the other hand, finding suitable clerical support or employees in elementary occupations usually takes less than 30 days.

VET, life-long learning and effective labour intermediation - key to bridging existing skill gaps

- Efficient VET practices and their popularization, as well as further emphasis on lifelong learning are key to ensuring cross-sectoral mobility. This further fosters flexibility on the labour supply side in the face of rapid technological advances and international competitiveness pressures;
- The correct validation of skills acquired outside of formal education systems can only be supportive of labour mobility, and thus can help alleviate one of the causes of skills mismatches – informational asymmetry. This is especially true in today's context with both learning methods and skill requirements for different occupations changing rapidly with the onset of new economic and social models;
- Our own survey and the ESJS both point to the need of better points of reference that workers and companies can use in order to determine their own skill level or that of their employees. While this may be difficult to achieve in regard to transversal skills (such as teamwork), it may prove useful in terms of ICT, literacy and numeracy skill levels;
- The capacity of EU-level information and intermediation services such as EURES should be further increased by the adoption of a more closely integrated approach to government labour market intermediation services. EURES's dataset should be published as continuously updated open data. This would enable more timely and comprehensive analysis of labour market processes, which may be beneficial to both businesses and policymakers in identifying labour and skills shortages, as well as labour market bottlenecks;
- An in-depth mirror study of the ESJS (a similar study among employers) may be beneficial for the further study of skills mismatches, as there remains the concern that there is no sufficient understanding regarding the actual skill requirements of various jobs on the part of employers.

Broader reforms are also needed

- While there has been significant progress in the design and implementation of EU-wide support mechanisms that aim to increase the overall competitiveness, access to funds, as well as the innovation and internationalization capacity of EU enterprises, some of the underlying structural deterrents to the development of EU businesses are still in place;
- Certain policy-induced sources of skills mismatches can be traced back to slow educational reforms, overreaching labour market regulations, excessive labour taxation and arbitrary wage setting mechanisms. For instance, recent economic and policy developments in countries such as Finland have underlined the importance of flexible wage setting mechanisms as a tool for ensuring international competitiveness and more efficient utilization of the existing skill pool;
- Europe needs to bring the competitiveness agenda back to the centre of the economic and industrial policy debate and addressing skills mismatches is one of the key factors for these policies to be efficient;

- The successful tackling of issues related to skills mismatches require a "whole-of-government" approach which includes both national and regional authorities, educational institutions, social partners, employers and other stakeholders;
- A regulatory and institutional environment that supports the effective allocation of labour resources and thus facilitates the skill demand and supply matching process is an important prerequisite for businesses to adopt new technologies, working processes and business models;
- Smooth labour migration within the EU, as well as targeted migration from third countries, is instrumental in addressing the skills mismatches issue and labour shortages in general.

Methodology

In this research paper we adopt a multidisciplinary approach to the study of skills mismatches, in line with previous theoretic and empirical work on this topic. We have carried out a comprehensive review of existing studies on skills mismatches and have outlined some of the main conclusions regarding education, personal and aggregate productivity, labour market dynamics and outcomes, innovation capacity and competitiveness.

Our analysis relies on aggregated EU data, as well as country specific data for five reference countries (Austria, Bulgaria, Finland, Germany and Spain). We have made use of Cedefop's micro data from the European Skills and Jobs Survey (ESJS) and primary survey-based information that we have gathered via our own online survey among companies in Bulgaria and Austria. In the case of Bulgaria, we have developed a dedicated web application for collecting and processing data from the online resources of the Employment Agency (EA).

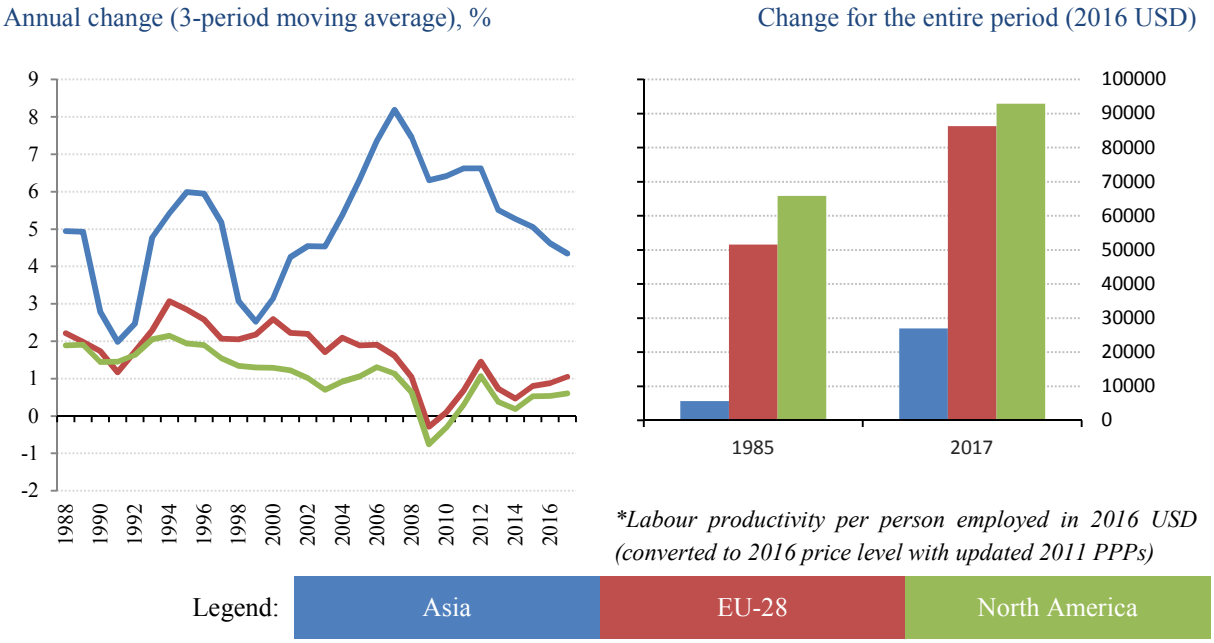
Since methods of collecting, processing and publishing relevant data differ across Member States we have tried to identify and make use of the most comprehensive official information available (usually provided by national employment agencies). Where needed, we have supplemented our analysis with additional information sources. In the country profiles section, we have relied upon the most relevant and detailed vacancy and wage statistics available, as well as previously published studies.

The policy discussion part of this research paper is based on a comprehensive review of previous studies into the causes and implications of skills mismatches. We have looked at both the policy-induced and market-related sources of skills mismatches. Finally, our recommendations are in line with what we have identified as potential best practices in addressing these issues.

1. Macroeconomic Background: Productivity and Competitiveness of EU Economies

Ever since 2013 labour productivity (per person employed) in the EU has been increasing[3] at a modest pace of about 1.0% annually, which is about two times slower that the average for the pre-crisis period. While it has traditionally surpassed growth in Northern America, other parts of the world, such as Asia, have been consistently outperforming both, as can be seen on Figure 1. Differences remain significant, but workers in Asian countries nowadays achieve 31.2% and 29.0% of the average productivity in the EU-28 and North America, respectively, compared to just 11.0% and 8.6% back in 1985.

Figure 1: Productivity Growth in the EU, North America and Asia (1985-2016)*



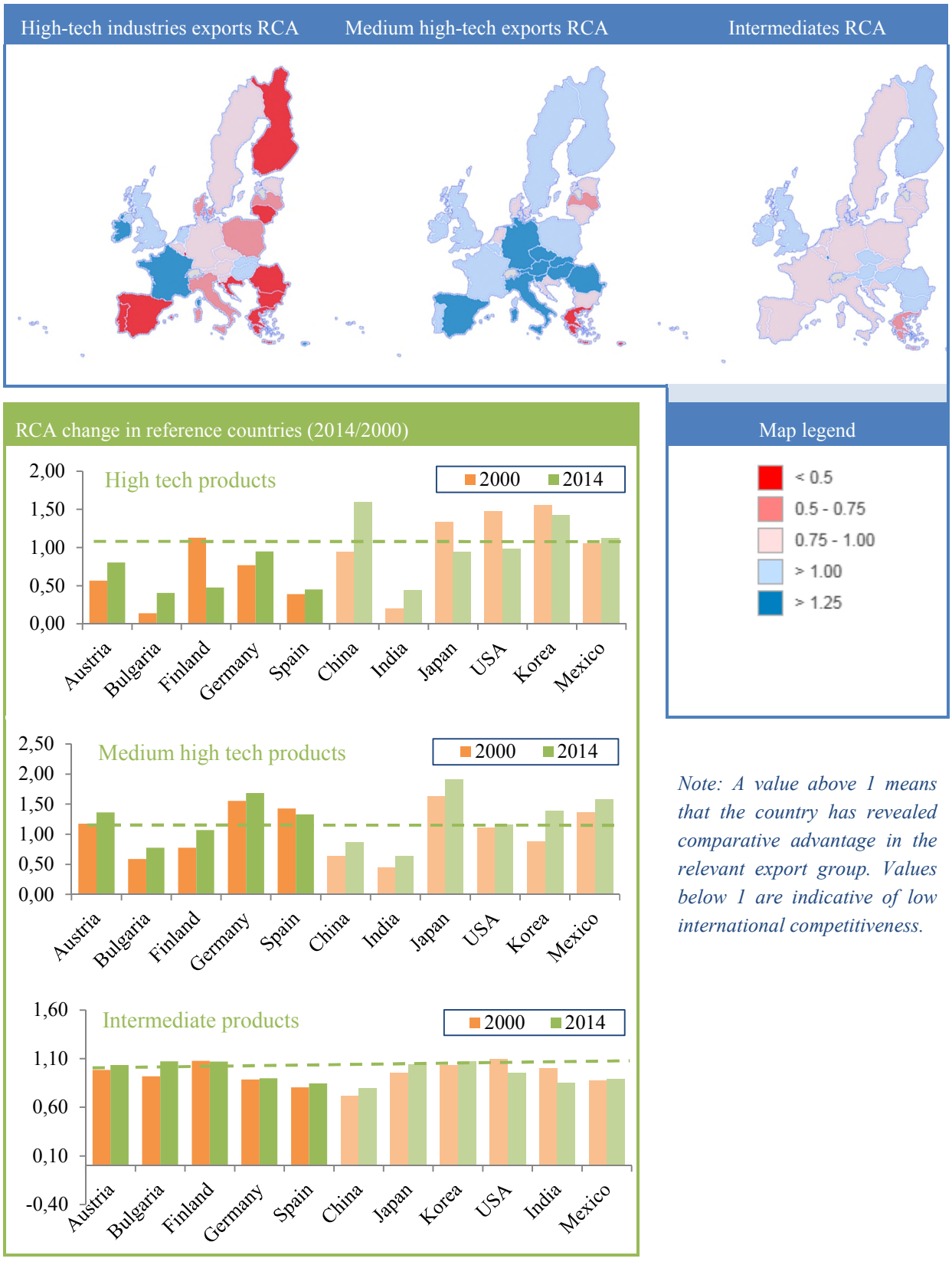
Source: The Conference Board Total Economy Database™ (Adjusted version), May 2017

The consequences of these developments in regard to export competitiveness are clearly seen in the Dynamic Trade Link Analysis[4] (DTLA) carried out by the Competitiveness Research Network[5] (CompNet). According to CompNet estimates, **EU countries and China are direct competitors in 62% of all active product markets and this share has gradually increased for all EU Member States** over time[6]. In addition, estimates show that these countries' exports are susceptible to a possible crowding-out effect by China on between 6 and 11% of these markets.

The revealed comparative advantage (RCA) of EU Member States is most prominent in medium-high tech exports (Figure 2), which is hardly surprising, since that is where most patenting and R&D activities are concentrated.

[3] European Commission. *Employment and Social Developments in Europe (ESDE), Annual Review 2017*,p. 22.
[4] DTLA monitors the trade links (viewed as a binary variable) of two exporting countries to a common destination market over time. A trade link is a binary variable that takes the value 1 if there is an active export link and 0 otherwise. By monitoring more than 5000 products in every bilateral importer-exporter relationship CompNet is able to calculate a number of variables among which the changing share of overlapping product markets between the EU and China, as well as to identify markets which the EU has "lost" to this competitor.
[5] The Competitiveness Research Network(CompNet) is a research network founded in 2012 by the European System of Central Banks (ESCB). It aims to foster the debate on competitiveness issues by providing a robust theoretical and empirical link between drivers of competitiveness and macroeconomic performance for the purposes of research and policy analysis.
[6] Karadeloglou, P et al., *Compendium on the Diagnostic Toolkit for Competitiveness*, ECB Occasional Paper No 163, July 2015, p. 37

Figure 2: Revealed Comparative Advantage of EU Countries by Export Groups (2014)



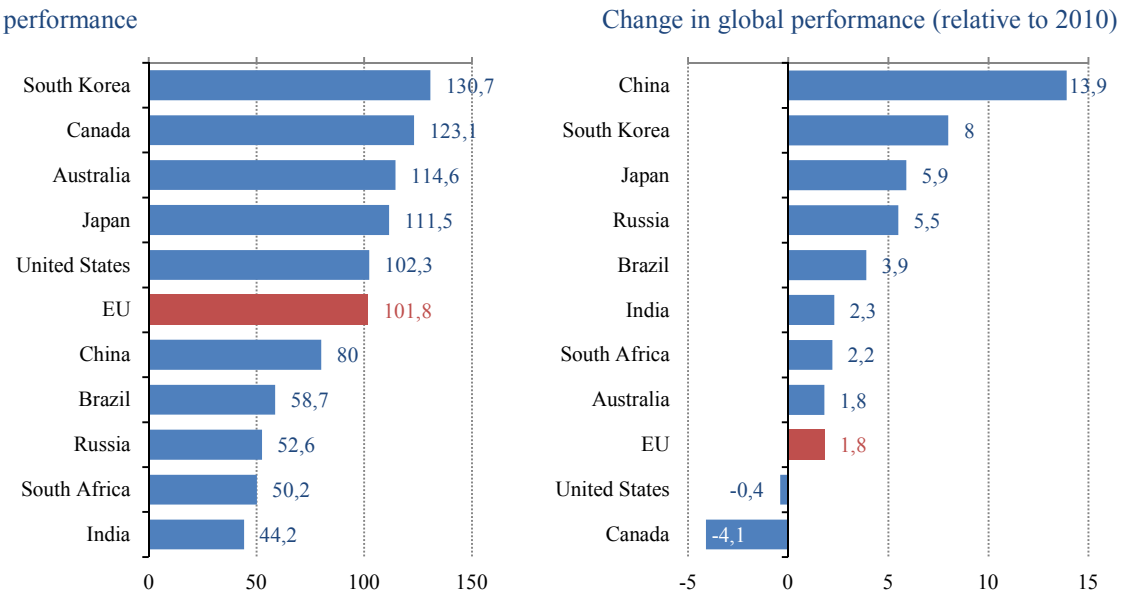
Note: A value above 1 means that the country has revealed comparative advantage in the relevant export group. Values below 1 are indicative of low international competitiveness.

Source: CompNet, IME calculations

Innovation and Competitiveness

These processes are also reflected in a number of international competitiveness and innovation rankings. According to the 2017 edition[7] of the European Innovation Scoreboard the EU is gradually catching up to USA (which has deteriorated slightly in the last few years), while still lagging behind countries such as Japan and South Korea and rapidly losing its edge to China. Further evidence in support of the need for structural reforms can be found in WEF's Global Competitiveness Index reports[8]. According to WEF's findings "*Europe's median performance is weakest across the innovation indicators*"[9].

Figure 3: European Innovation Scoreboard 2017



Source: European Innovation Scoreboard (2017)

While there has been **significant progress in the design and implementation of EU-wide support mechanisms**[10] (that aim to increase the overall competitiveness, access to financing, as well as the innovation and internationalization capacity of enterprises), some of the underlying structural deterrents to the development of EU businesses are still in place.

Governments have been slow to address long-established issues that affect both the supply and demand of labour, which has put EU businesses at a disadvantage compared to some of their international competitors. Concerns are visible even prior to the crisis with the ECB concluding[11] that "*labour regulations and relatively heavy taxation, both of households and businesses, are identified as the prime source of disadvantage, inhibiting technological innovation and ultimately possibly hurting export performance.*"

[7] *European Innovation Scoreboard*, 2017, p. 29
[8] WEF. *The Global Competitiveness Report* 2016-2017, 2016
[9] WEF (2016), p. 11
[10] Such as the 2007-2013 Competitiveness and Innovation Framework Programme (CIP) and the 2014-2017 Programme for the Competitiveness of Enterprises and SMEs (COSME).
[11] ECB, *Competitiveness and the Export Performance of the Euro Area*, ECB Occasional Papers No. 30, June 2005, p. 9

EIB's definition of competitiveness is "*the ability of firms to mobilise and efficiently employ the productive resources required to successfully offer their goods and services in a global economic environment*"[12]. If we adopt this definition, then higher productivity (at the firm, industry and national level) is key to achieving higher international competitiveness[13] **with efficient matching of skills demand and supply being one of the key factors for success**. The latter is especially important when we take into account the relative differences in the price of the factors of production (most notably labour) between EU and some of its major export competitors[14].

Effective capital and labour allocation, as well as skill-pool utilization is a vital prerequisite for ensuring the ability of EU enterprises to continue developing their innovation capacity and to withstand increasing competitive pressures[15].

[12] EIB. *Restoring EU Competitiveness: 2016 Updated Version*. Projects Directorate and the Economics Department of the EIB, 2016, p. 11

[13] Another good starting point in understanding the interlinked factors behind increasing competitiveness is Michael Porter's Diamond Model of the competitive position of a nation in global environment (see Porter, M. *The Competitive Advantage of Nations*. The Free Press, 1990.). It looks beyond the classical factors for comparative advantage (such as land, location, natural resources, labour and population size) and presents four advanced factors, also interlinked, all of which are to some extent influenced by government policy: 1) Firm strategy, structure and rivalry (competition breeds innovation and raises productivity); 2) Factor conditions (access to human, physical, knowledge, capital and infrastructure resources); 3) Related support industries (the mutual influence between firms and their suppliers); 4) Demand conditions (such as the size and growth of domestic demand and the level of buyers' sophistication, which pushes innovation).

[14] China, in particular, is catching up not only in terms of innovation, but in terms of product sophistication as well.

[15] Indeed, the development of more sophisticated intra-EU value chains via the outsourcing of production processes to newer EU member states in the last decade has been an undoubtedly export-enhancing factor for many industries, including the automotive industry, ICT and business services.

2. The Study of Skills Mismatches

Skills mismatches are a growing concern in the EU, despite the fact that the characteristics and severity of the problem vary across member states, economic activities and occupations. Public policy, human capital and formal education institutions find it increasingly difficult to adjust to rapidly changing labour market conditions. It is this trend, brought upon by globalization and technological advances, as well as intra- and extra-EU competitive pressures, which determines the rising importance of lifelong learning, effective VET practices, validation of competences and other relevant public policies.

The two main factors behind skills mismatches can be generally described as follows:

- Slow adaptability of education and training systems (and thus skills in general) to the process of creative destruction[16] in the economy - i.e. the permanent replacement of established products, businesses and activities with new alternatives;
- Low labour mobility across economic activities and regions, including due to cultural factors, information asymmetries, labour market bottlenecks (including diploma/qualification recognition), deficiencies in labour intermediation and existing public policies and regulations.

There are five widely accepted[17] forms of skills mismatches, as presented in Figure 4.

Figure 4: Forms of Skills Mismatches

Skill shortage	Demand for a particular type of skill exceeds the supply of people with that skill at equilibrium rates of pay.
Qualification mismatch	The level/field of qualification is different from that required to perform the job adequately.
Over-(Under-) qualification/education	The level of qualification/education is higher or lower than what is required to perform the job adequately.
Skill gap	The type or level of skills is different from that required to perform the job adequately.
Over-(Under-) skilling	The level of skill is higher or lower than required to adequately perform the job.

Sources: OECD, Cedefop, WEF

Skills mismatches are also related to other labour market and economic phenomena that are increasingly monitored and analysed in recent years such as rate of underemployment, structural unemployment, unemployment and inactivity traps, job polarization, income inequality, etc. The higher the mismatches (in all their dimensions), the larger the drag on actual and potential economic growth. This issue is of particular acuteness in Europe, which ranks among the world's regions with the worst demographic trends.

Despite numerous attempts by organizations and individual researchers to develop methodologies for the identification and evaluation of skill mismatches, a more widely accepted approach is yet to be adopted. As with other economic and social phenomena that have relatively recently gained wider recognition as drivers for public policy, the main challenges to the development of a comprehensive

[16] Schumpeter, J. *Capitalism, Socialism and Democracy*. 1942, pp 81-86.
[17] WEF. *Matching Skills and Labour Market Needs Building Social Partnerships for Better Skills and Better Jobs*. Global Agenda Council on Employment at the World Economic Forum (WEF), 2014, p. 7.

theoretical apparatus are the lack of accumulated data and (to a lesser extent) studies on the subject. Since the "skills" of the labour force are not measured by regular EU-wide statistical surveys, it is common to analyse their relation to labour market developments by adopting the use of proxy indicators such as education levels and duration of unemployment spells, as well as labour demand and wage dynamics across sectors and occupations.

Some studies[18] rely on **comparable cross-country macroeconomic data** (such as that provided by regular labour force surveys) in order to construct coefficients of variation among the employed people by educational attainment, Beveridge curves, and variance of relative unemployment rates. Relative wage levels and wage growth rates, as well as employment and unemployment rates and job vacancy ratios in different occupations are also among the most widely used indicators of skill shortage in an economy or a particular sector.

This approach has been most promising when used in medium- and long- term analysis of general labour market dynamics. In the current EU context, skill mismatches should not be analysed in a "labour cost free vacuum", since both labour and capital are able to move relatively freely across borders. This allows employers to adopt a variety of approaches to address the skill mismatches problem - such as investment in contemporary capital equipment that reduces the labour input required, outsourcing of activities (including abroad), as well as purely organizational means (such as redistributing the workload).

In their analysis for the Employment and Social Affairs Committee (EMPL) Reymen, D. et al. (2015) point to employers and national governments as the prime actors in addressing labour shortages, but also underline EU's role in supporting measures aimed at increasing intra-union mobility, labour market transparency and the efficient use of structural funds. They make an important distinction[19] between quantitative and qualitative labour shortages:

- In case of a **quantitative labour shortage**, there is an absolute lack of workers in the labour market. Labour demand is larger than labour supply, resulting in a large share of difficult-to-fill vacancies and a low unemployment rate.
- In case of a **qualitative labour shortage**, labour demand and labour supply are roughly in equilibrium, but a large share of unfilled vacancies and a high unemployment rate exist simultaneously, which implies lack of relevant skills.

In some cases, qualitative shortages can be traced back to the lack of sufficient and correct labour market information both on the demand and the supply side (i.e. employers and employees), but may also be a function of low labour mobility, or low job attractiveness due to a wide variety of country specific or even international factors.

Other studies focus on the analysis of data from **specialized surveys** such as OECD's Programme for the International Assessment of Adult Competencies (PIAAC) and the European Skills and Jobs Survey (ESJS), conducted by the European Centre for the Development of Vocational Training (Cedefop). This approach allows for a more in-depth review of various countries and economic

[18] A comprehensive review of various methodologies is provided by Johansen, J., Gatelli, D. *Measuring Mismatch in ETF Partner Countries: A Methodological Note*, European Training Foundation (ETF), 2012.
[19] Reymen D. et al. *Labour Market Shortages in the European Union*, Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy, March 2015.

activities and in some cases, manages to better address the heterogeneity of labour markets and the extent to which skills are over- or underutilized.

However, the data that they rely on is still not collected regularly and in general does not allow for mid- or long-term comparisons. Sloane (2014) points out that ideally comprehensive analysis of education and skill mismatches and their relation to job dynamics, satisfaction, mobility and wages "requires the use of panel data, which consist of repeated observations for the same individuals over time"[20].

2.1 Skills Mismatches and Labour Market Outcomes

Skill mismatches can affect the labour market behaviour of both employers and employees. Gambin et al. (2016) argue[21] that **employers are risk averse when they are looking to recruit**, which means that they are unlikely to expand their employee base unless they are confident in the abilities of potential employees to fulfil the tasks required. In addition, a study by Howard and Rimini (2016) indicates[22] that public perception of the appeal of VET still leaves a lot to be desired. Many employers are yet to be convinced in the medium to long-term effects of the reliance upon contemporary VET systems, which also relates to their insecurity when it comes to retaining the employees that they have invested in.

Varhaest and Omey (2006) conclude that **matched workers are more likely to engage in on-the-job training** than workers who consider themselves over-skilled. The latter are inclined to search for new job opportunities[23], since their skills are underutilized[24], which may also result in a relative wage penalty, as well as lower job satisfaction. Some researchers view over-qualification as a transitional phenomenon, arguing that the probability of it occurring decreases with time as workers gain additional labour market experience. In addition, instances of over-skilling may be attributed to factors, which are hard to control for in practice, such as non-pecuniary advantages of the job in question, personal interests, household characteristics, etc. In his panel data analysis[25] of the Australian labour market Sloane (2014) comes to another conclusion - there is no wage penalty for males which are overeducated or over-skilled, but there is a penalty to those that are both. He also argues that **overeducated workers find it easier to change jobs than over-skilled workers**.

Other researchers are of the opinion that increasing skill surpluses (i.e. overeducation and overqualification) pose a significant threat to prosperity on both the national and EU-wide level. Holmes and Mayhew (2015) argue[26] that the EU has in general seen its supply of graduates increase at a pace that outstrips the growth of high-skilled jobs. They claim that **demand for graduates has not kept up with their increasing supply**, which can lead to instances of underemployment and lower job satisfaction. This has caused a "filtering down" process that has left some workers with jobs that

[20] Sloane, P. *Overeducation, Skill mismatches, and Labour Market Outcomes for College Graduates*. IZA World of Labour 2014: 88, p. 9
[21] Gambin et al. *Research to Understand the Extent, Nature and Impact of Skills Mismatches in the Economy*. BIS Research Paper №265, Department for Business, Innovation and Skills, January 2016.
[22] Howard, C. Rimini, C. *Skills Mismatch 3: Apprenticeship Supply in the European Union, Youth Engagement and theLabour Market*, Think Young, 2016.
[23] See also Sicherman, N. *"Overeducation" in the Labour Market*, Journal of Labour Economics, Vol. 9, pp.101-122, 1991
[24] It is possible that due to the so-called "job-up-skilling process", some over-skilled workers eventually find themselves matched to their occupation, provided they stay long enough in the job.
[25] Sloane uses data from the Household, Income, and Labour Dynamics in Australia (HILDA) survey, which allows for such comparisons over time.
[26] See Holmes, C. Mayhew, K. *Over-qualification and Skills Mismatch in the Graduate Labour Market*. CIPD Policy Report, August 2015., p. 30

do not require higher education and thus – do not fully utilize their abilities[27]. On the other hand, Quintini, G. (2011) concludes that over-qualification may "hide skill heterogeneity – a skill deficit of over-qualified workers relative to well-matched workers with the same qualifications – rather than a systematic underutilization of skills"[28]. In some cases the reasons behind this process may be traced back to the increasing accessibility of higher education. Such a country is Bulgaria, where traditional but also government-inspired stress[29] on the importance of higher education in pursuit of Europe 2020 targets and the struggle for state subsidies on behalf of universities has lead to an "inflationary" effect on diplomas with universities continuously lowering both entrance and graduation standards with the aim of securing state funding[30].

2.2 Skills Mismatches, Education and Productivity

The direct effects of mismatches on productivity are yet to be thoroughly explored by economists, but there is increasing evidence that suggests that skills **mismatches can explain some of the existing cross-country productivity gaps** and that they are also **reflective of differences in the policy environment**, including education and labour market related regulations and programs. Labour mobility and adaptability are also determined by the quality and reliance upon contemporary VET systems and lifelong learning practices.

2.2.1. Relevant literature

Adalet and Andrews (2015) analyze[31] the link between skill and qualification mismatches and labour productivity across 19 OECD countries, concluding that **mismatches can adversely affect labour productivity** via the allocation of employment across firms of varying productivity levels. From the perspective of any given company, employment of over-skilled workers may prove beneficial, provided their excess productivity is not offset by any adverse effects (such as low job satisfaction). In the short term this resource misallocation may lead to a crowding out effect of high-productivity companies with more growth potential by less productive ones, especially in the case of labour markets with low regional, sectoral and occupational mobility, as well as inflexible wage setting. Thus, **aggregate productivity is being suppressed** due to the difficulties that more productive enterprises face in attracting suitable labour since human talent is occupied by inefficient companies/activities.

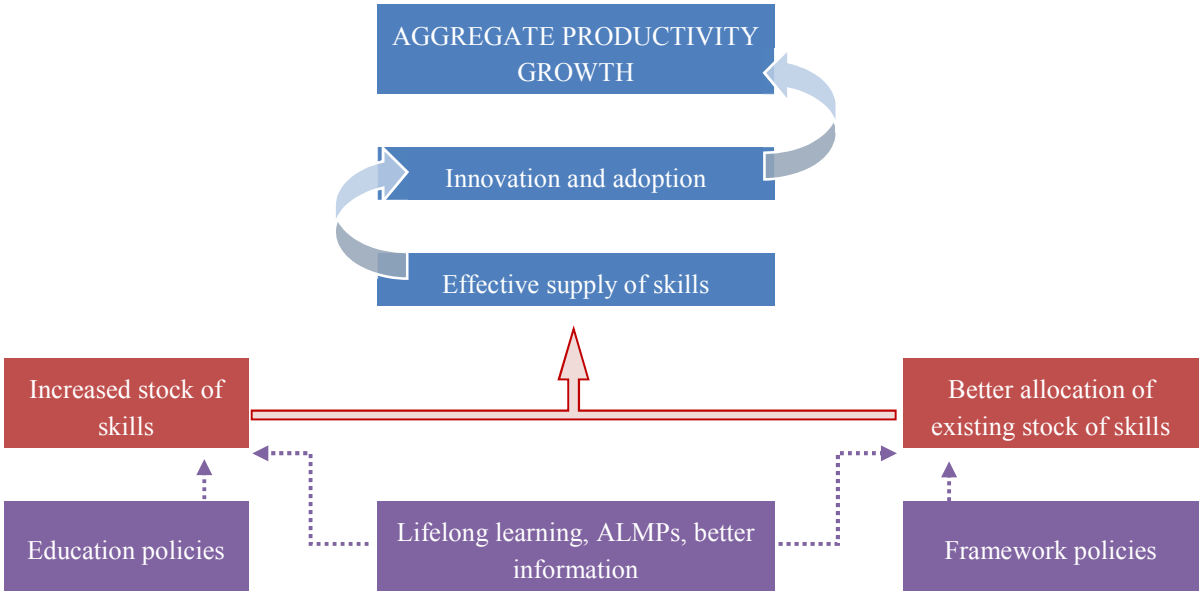
According to Adalet and Andrews[32]**the level of skill use (constructed from PIAAC data) can explain some of the cross-country variation in aggregate labour productivity** even amongst developed countries. Simply put, they view over-qualification and over-skilling as positively related

[27] The opposite process is often referred to as "job-upgrading", meaning that the actual skill requirements of some economic activities and occupations have been increasing as a result of changes in economic and labour market relations.
[28] Quintini, G. *Over-Qualified or Under-Skilled: A Review of Existing Literature*, OECD Social, Employment and Migration Working Papers, No. 121, OECD Publishing, Paris, 2011, p. 21
[29] Nikolov, A. *Financing Higher Education: Perspectives for Bulgaria in Light of International Experience*. Institute for Market Economics (IME), April 2013.
[30] The bulk of state subsidies to universities in Bulgaria depend on the number of students.
[31] Adalet McGowan, M., D. Andrews. *Labour Market Mismatch and Labour Productivity: Evidence from PIAAC Data*, OECD Economics Department Working Papers, No. 1209, OECD Publishing, Paris, 2015.
[32] Adalet and Andrews (2015), p. 32

with within-firm productivity, but as negatively related to the efficiency of allocation and thus – aggregate productivity[33].

In their theoretical model (Figure 5) an increased stock of skills and its effective allocation leads to more innovation and faster adoption of best practices, which in turn raises aggregate productivity. **Education, VET and lifelong learning policies all contribute to this process** and should be supported by effective **active labour market policies (ALMPs) and labour intermediation**.

Figure 5: Skills, Productivity Growth and Public Policy



Source: Adalet and Andrews (2015)

Naturally, skill requirements will continue to change rapidly in the presence of technological advancements and increasing international competition. **Employee proficiency in foundational skills such as literacy, numeracy, problem solving and (increasingly) digital literacy are no longer "supportive", but rather indicative of any firm's capacity to adopt new practices and technologies.**

These studies, among many others, underline the importance of well-informed policy responses and efficient labour market regulation in the face of increasing labour shortages. Stringent labour market regulations, as well as structural factors such as low regional and cross-country labour mobility (including, but not limited to EU Member States), may also hamper wage adjustments across industries. **Skills mismatches are not only deterrents to productivity and innovation**, but also affect the social well-being of individuals, by extending potential unemployment and inactivity spells and suppressing employment opportunities – all at the cost of aggregate productivity losses.

2.2.2. Estimated Quantitative Effects of Existing Mismatches on Productivity

Since the ESJS dataset does not contain a direct measure of productivity, our quantitative assessment of the effect of skills mismatches on the EU economy uses the wages reported by respondents as a proxy indicator. The assumption we make is that the variation in the wages of workers with different

[33] We would argue this may be even more significant in economic activities where wage differences between companies are not large enough to encourage a quicker cross-company turnover of workers (i.e. sectors where labour costs are determined via collective bargaining).

skill levels is an appropriate proxy for the difference in their productivity – i.e. that employers reward higher productivity with higher salary, without taking into account any other considerations.

Our country aggregation estimate puts the lost productivity at 2.14%. This means that under our assumptions, the **actual productivity in the EU is 2.14% lower** than the one that would have been achieved if all the workers had the productivity of the workers who perceive themselves to be perfectly matched for their jobs.

The OECD puts the average productivity in the EU expressed as GDP per hour worked in 2014 at 36.16 euro per hour, which in turn means that if there were no skills mismatches, the productivity would have instead reached 36.93 euro per hour, using the country aggregation. Thus, based on this approach we can, with a decent degree of certainty, claim that **the loss of productivity due to skills mismatches in the EU is around 0.8 euro for every hour worked**.

Figure 6: Skills Mismatch and Productivity: Methodological Approach

In order to avoid equating mismatches in different skills, we used ESJS data regarding EU workers' self-evaluation of overall skills (on a scale from 1 to 3).

On the basis of this self-evaluation, the arithmetic mean salary of the respondents was calculated for the three separate skill levels across EU countries. The non-euro mean salaries were recalculated in euro, on the basis of the average annual exchange rate for the year of conducting of the interviews.

Assuming that the middle skill level approximates matched skills, the lower one – underskilled and the higher one – overskilled workers, a new mean wage per country was calculated on the basis of the mean earnings of matched workers and the difference in the number of matched workers and the number of mismatched workers.

Finally, the estimated effect of mismatches of productivity was calculated as the difference between the actual mean salary per country and the salary which could have been achieved in a hypothetical situation where all the workers have perfectly matched skills. This estimation, expressed as an equation takes the following form:

$$\text{Mismatch loss} = \frac{\sum_{i=1}^{n} x * y}{\sum_{i=1}^{n} z * y}$$

where x is the actual salary of the workers in the ESJS dataset, z is the salary of those workers in a scenario with full skills match, and y is the number of workers in the particular countries and economic activities.

The EU-level aggregation was done by weighing the country-level losses by the number of respondents included in the dataset, under the assumption that they are representative for EU member-states. Consequently, as the estimate is based on the complete ESJS dataset, it has the same statistical power as the rest of the statistics derived from it. For the EU-wide conclusions this would mean a margin of error of 0.5% on the 99% confidence level – sufficiently precise for the needs of this study.

2.3 The Role of VET

There is broad academic and political consensus about the growing importance of VET and its role in limiting skills mismatches. This is especially relevant in regard to economic activities and occupations in which skill obsolescence is a growing concern. The development of tools for understanding and anticipating future skill needs is an important prerequisite for the effective structuring of both educational and active labour market policies.

According to Cedefop, about 90% of secondary school graduates are satisfied with their general skills, but in terms of practical skills the share of satisfied vocational education graduates (87%) is much higher than their counterparts in general education – 62%. This is why vocational education plays a key role in matching the supply of worker skills and labour market demand.

Cedefop's opinion survey[34] on vocational education and training in Europe shows that vocational education participants face a shorter time lapse between finishing their studies and finding a job – 60% of them have managed to do it before, or less than a month after completing their education, compared to 49% for general education participants.

It is no coincidence that countries such as Germany and Austria, in which the share of vocational education graduates is higher than the EU average, also post some of the lowest youth unemployment numbers. Weiner (2015) points out[35] that even during the crisis, countries that have work-based or dual vocational education register relatively lower youth unemployment levels. This is due to the system's improved chances of early market attachment (including differentiated minimum

Figure 7: Conceptions of Vocational Education

Cedefop outlines four main conceptions of vocational education. While most of them co-exist in EU Member States, there is usually a dominant model in each country.

VET as work-based or dual initial training
Mainly found in: Germany, Denmark and Austria
Some elements in: Slovakia and Hungary

This model is centred on the concept of "learning by doing" (apprenticeship system) as a first step into a possible career towards the degree of "Meister" which then qualifies to be trainer/teacher and opens the perspective for entrepreneurship ("Meisterbetrieb"). This system relies upon an active participation on behalf of businesses (through both financial and organizational means) and close coordination between the social partners. Companies are the de-facto learning sites and the main reference persons are in-company trainers, rather than teachers.

VET as initial vocational education
Mainly found in: Bulgaria, Spain, Malta, Romania
Some elements in: most CEE countries

Education takes place primarily in government-run and state-financed schools (participants are students). It includes the development of practical skills, but this usually happens under the supervision of teachers and in the schools themselves. The focal point of this model is individual progression, rather than ensuring the supply of qualified workforce.

VET as further training
Mainly found in: UK and Ireland
Some elements in: Cyprus

VET is mainly understood as on-the-job training for all age groups and its main goal is to increase labour market participation by increasing the employability of the workforce.

VET as (part of) lifelong learning
Mainly found in: Finland, France
Some elements in: Greece, Croatia, Italy and Luxembourg

VET includes a diverse set of learning approaches, learning providers and sites for different age groups that lead to different occupation specific and broader vocational outcomes.

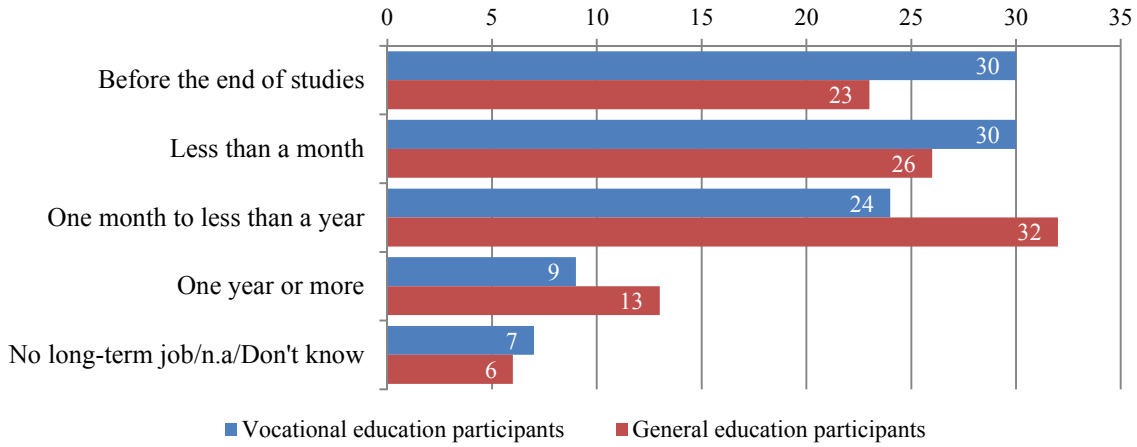
Source: Cedefop (2017). The Changing Nature and Role of Vocational Education and Training in Europe. Volume 2: Results of a Survey among European VET Experts. Luxembourg: Publications Office. Cedefop research paper; No 64.

[34] Cedefop. *Cedefop Opinion Survey on Vocational Education and Training in Europe*, 2017
[35] Eichhorst, W. *Does vocational training help young people find a (good) job*, IZA (Institute for the Study of Labor), 2015, p. 3.

wages for apprentices in countries such as Germany), concluding that *"... wages are higher following an apprenticeship, with better job placement rates and lower job destruction rates after some years of experience.*" After studying[36] the work-to-school transition of Hungarian graduates, Horn (2013) estimates that vocational education that includes on-the-job training and is not limited to the school system itself provides students with 10-15% better chance of being employed right after graduation, as well as higher likelihood of receiving long-term work contracts.

Vocational education provides participants with some of the tools necessary to minimize the risk of prolonged labour market inactivity that can have lasting scarring effect on a person's long-term career prospects. The latter is of particular importance, as inactivity itself can be a potential source of skills mismatches because of the inability of the long-term unemployed to "keep up" with changing skill requirements.

Figure 8: Labour Market Outcomes – Time Lapse before Finding a Job (%)



Source: Cedefop

Despite its proven effectiveness in providing employment opportunities, vocational education remains less popular[37] than its alternatives. The dedicated EU-wide Cedefop opinion survey has shown that 23% out of a total 35,646 respondents claim that vocational education for people aged 16-18 has a negative image in their country. The advantages[38] that vocational education graduates enjoy when it comes to labour market prospects have been well documented[39], but there are concerns that the image of VET suffers from a perceived "narrowness" in comparison with general education. Some vocational education programs provide little pathways for follow-up education, thus implying a hard-to-reverse choice of skill specialization relatively early in students' life.

[36] Horn, D. *School-based vocational or workplace-based apprenticeship training? Evidence on the school-to-work transition of Hungarian graduates*, European University Institute, 2013.
[37] The share of EU citizens that believe it is possible to obtain skills outside formal education (62%), through on-the job training (54%), or even via self-education (47%) is relatively higher than those who would choose "courses other than schools, VET or university" (45%), or online courses (27%). See: European Commission. *Special Eurobarometer 417: European Area of Skills and Qualifications*, 2014, pp 15-16.
[38] Evidence of higher wages, labour mobility and productivity are provided in Cedefop's European Centre for the Development of Vocational Training see: Cedefop. *The Benefits of Vocational Education and Training*, Luxembourg: Publications Office. Research Paper No 10, 2011.
[39] See: Hoeckel, K. *Costs and Benefits in Vocational Education and Training*, OECD, 2008

This argument, however, is mostly relevant in regard to apprenticeship-type and IVET systems (Figure 7) and not to VET as part of lifelong learning and further training. Improving the image[40] of vocational education is a vital prerequisite for ensuring the much needed supply of qualified labour in a number of economic activities and professional occupations.

2.4 Validation and Recognition of Skills

While mismatches in terms of skills can be argued to have higher practical significance than mismatches in qualification or education, the latter are still important factors in ensuring the efficiency of labour markets and high labour mobility across economic activities, occupations and countries.

This is especially true in today's context with both learning methods and skill requirements for different occupations changing rapidly with the emergence of new economic and social models. The **validation** of informally acquired competences, as well as competences acquired under different educational systems, are issues of utmost importance that have received growing attention not only at the EU and the national level, but worldwide. More than 150 countries are currently developing National Qualifications Frameworks (NQFs), which classify qualifications by level, based on the individual learning outcomes of different types of education. Efforts in Europe are centred on the European Qualifications Framework[41] (EQF).

Villalba, E. and Bjørnåvold, J. (2017) refer to the period[42] after 2012 as "*internalisation of the validation norm*" – i.e. the "*the acknowledgement that all learning, irrespective of the context in which it takes place should be recognised*". Indeed, the contemporary stage of the development of validation mechanisms[43] began after the European Council adopted the recommendation on validation of non-formal and informal learning (2012/C 398/01), describing it[44] as: "…*a process of confirmation by an authorised body that an individual has acquired learning outcomes measured against a relevant standard*".

Despite the fact that a total of 39 countries[45] are currently taking part in EQF's implementation[46], as of June 2017 Cedefop considers[47] just 17 EU countries as having operational NQFs. Since most NQFs were only set up in the last decade, it is hardly surprising that current assessments show a limited impact on policies and practice.

In its sixth NQF monitoring report Cedefop asks the important question *"...whether these new frameworks are mere 'policy hypes', destined to fade away, or whether they are being turned into*

[40] Cedefop. *Attractiveness of Initial Vocational Education and Training*, Publication Office of the European Union, Research Paper No 39, 2014.
[41] The EQF is a tool that tries to make qualifications more easily understandable across different countries, while at the same being used to support national governments in developing their own NQFs.
[42] Villalba, E., Bjørnåvold, J. *Validation of Non-Formal and Informal Learning: A Reality in Europe?*, Global Inventory of Regional and National Qualifications Frameworks 2017. Cedefop. 2017, pp 72-81.
[43] The European Training Foundation (ETF), outlines four foundational components of a sustainable qualifications system: (a) the legal and regulatory framework; (b) effective stakeholder dialogue; (c) institutional arrangements; (d) quality assurance systems.
[44] The validation process consists of four distinct phases: 1) Identification through dialogue of particular experiences of an individual; 2) Documentation to make visible the individual's experiences; 3) A formal assessment of these experiences; 4) Certification of the results of the assessment which may lead to a partial or full qualification.
[45] Apart from the 28 EU Member States the EQF also includes Albania, Bosnia and Herzegovina, The Former Yugoslav Republic of Macedonia, Iceland, Kosovo, Lichtenstein, Montenegro, Norway, Serbia, Switzerland and Turkey.
[46] The only countries that are yet to formally adopt NQFs through a legislative procedure are Albania, Italy, Serbia and Spain.
[47] Cedefop. *National Qualifications Framework Developments in European Countries: Analysis and Overview 2015-16*. Luxembourg: Publications Office. Cedefop research paper; No 65, 2018.

integrated parts of national and regional qualifications policies and systems". The report states the importance of ensuring key stakeholder's commitment to the long-term development of the frameworks, as well as the need to further support the visibility[48] of NQFs, so that they can be of value to EU citizens.

2.5 Skill Obsolescence

The ongoing transformation of economic relations (often referred to as Industry 4.0) is bound to play a major role as a driver of skill requirement changes. While history has repeatedly shown that automation and optimization of production do not necessarily lead to overall drop in employment levels, skill and occupational obsolescence is a typical consequence of technological, economic and social developments.

Allen, J. and De Grip, A. (2007) find[49] that workers who experience skill obsolescence participate more often in training and point out that *"... most scholars implicitly treat skill levels of workers as essentially static states interrupted by discrete intervals of formal training*". They also note that:

- it is safe to assume that in the aggregate a technological change „*will lead to a decrease in the volume of skills that are productively utilized*";
- such changes are often market- or context-driven, which makes the worker's prospects of obtaining a similar or better position unfavourable.

Their dynamic model of the relationship between technological change, skill obsolescence, formal and informal learning and labour market exit shows that training participation has a significant, negative effect on the chance of loss of work.

De Grip, A., Van Loo, J. (2002) put forward a typology[50] that differentiates between two general types of skills obsolescence (technical and economic), that are further split into five different sub-types.

Figure 9: Typology of Skill Obsolescence

Technical obsolescence	Economic obsolescence
○ Wear of skills (natural ageing process, injuries or illness) ○ Atrophy of skills (lack of, or insufficient use of skills)	○ Job specific skills obsolescence (changing skill demands due to technological or organizational developments in the production process) ○ Shifts in the sector structure of employment (skills remain adequate, but demand for them is falling) ○ Firm-specific skill obsolescence

Source: De Grip, A., Van Loo, J. (2002)

[48] These are some concerns among EU citizens that validation of competences is to a large extend used by people with higher education. 77% think that their qualifications will be recognized in other Member state, compared to just 37% among people with secondary education and 20% of those with no qualification. See. European Commission. *Special Eurobarometer 417: European Area of Skills and Qualifications*, 2014, p 44.

[49] Allen, J., De Grip, A. *Skill Obsolescence, Lifelong Learning and Labour Market Participation*. Faculty of Economics and Business Administration, Maastricht University, 2007, p. 3.

[50] De Grip, A., Van Loo, J. *The Economics of Skills Obsolescence: A Review*, 2002, pp 3-5.

We would argue that job specific skill obsolescence and skill obsolescence due to structural employment changes are arguably the two most important issues as far as public policy responses are concerned. At the same time, they require specific approaches.

Job specific skills obsolescence can be best addressed though effective qualification practices and lifelong learning, including on-the-job training. Since the development of technology and production patterns are irreversible and their stipulations have to be observed by companies, public policy efforts should primarily focus on establishing the necessary institutional and legislative environment that enables companies to "find their way" through the changing requirements of the field they operate in.

Shifts in the sector structure of employment however, require timely and comprehensive reforms in formal education curriculum, based on effective skill need anticipation mechanisms. These would probably result in the need of narrowing down public funding for educational institutions that prepare students for occupations that are deemed to be in "surplus". Such an approach would also require constant vigilance in terms of the adequate qualification and supply of educational personnel, as well as the development and popularization of career guidance[51] services.

In terms of **technical obsolescence**, it has to be noted that atrophy of skills may be viewed as not only a cause, but as a result of skills mismatches, especially in terms of over-skilled workers that are continuously engaged with activities in which they do not make optimal use of their skills. In view of Cedefop's findings regarding the large share of over-skilled workers in the EU[52], this constitutes a serious concern.

Most policy alternatives to these approaches inevitably suggest the implementation of more or less protectionist practices in regard to the affected sectors or occupations. However, such sources of artificially increased job security (and thus inflated productivity) risk further accumulation of mismatches and in the long-term – hard-to-reverse competitiveness losses.

There is a broad academic consensus that the effects produced by technological changes can be expected to lead to growing demand for workers with higher skills and falling demand for low-skilled labour. Increasing the flexibility of active labour market policies, curriculum and VET systems is of major importance in ensuring that current and future generations remain competitive in an ever changing and increasingly global labour market. It is important that EU policymakers and social partners put themselves before the curve on this issue and act in a forward-looking way, attempting to anticipate changes and respond to them as early as possible.

[51] While EU citizens have a generally positive view on the usefulness of career guidance services (71% agree that they are useful for making the right choice for further studies), only a quarter of them have actually used them. See European Commission. *Special Eurobarometer 417: European Area of Skills and Qualifications*, 2014, pp 84-85.
[52] See pages 33-36

3. Skills Mismatches in the EU

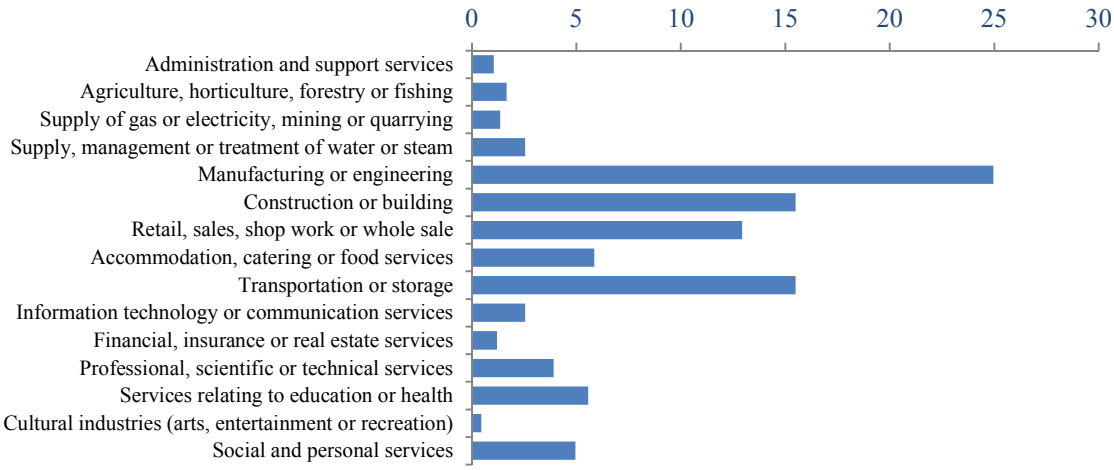
3.1 IME Survey on Skills Mismatches

In order to gain an additional perspective of the causes and effects of skills mismatches, the Institute for Market Economics (IME) facilitated a project dedicated online survey[53] that was carried out in Q4 2017 among companies from Austria and Bulgaria. The survey included a total of 10 questions designed to throw further light on different aspects of skills mismatches **from the point of view of companies**. By the end of the reference period the survey was filled in by 683 companies (94 Bulgarian and 589 Austrian companies). With the aim of ensuring comparability to ESJS, we used the same definitions of economic activities, company size and types of skills.

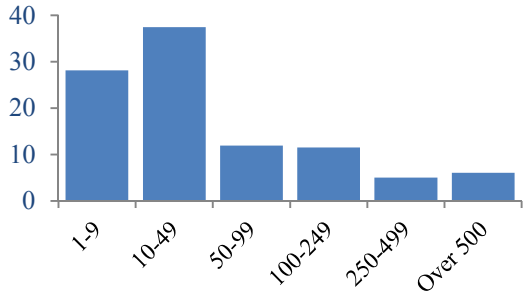
While we managed to reach companies across all economic activities, our findings are most representative for the economic activities of manufacturing, construction, trade, accommodation and transportation.

Figure 10: Main Characteristics of Reporting Companies

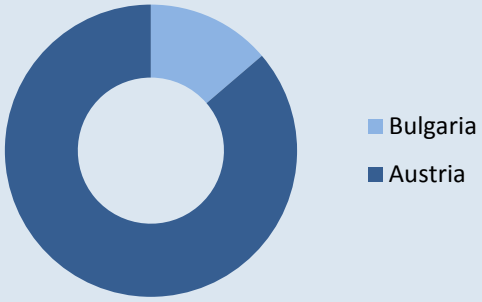
Q1: What is your company's main economic activity? (%)



Q2: How many people work at your company? (%)



Country of operation

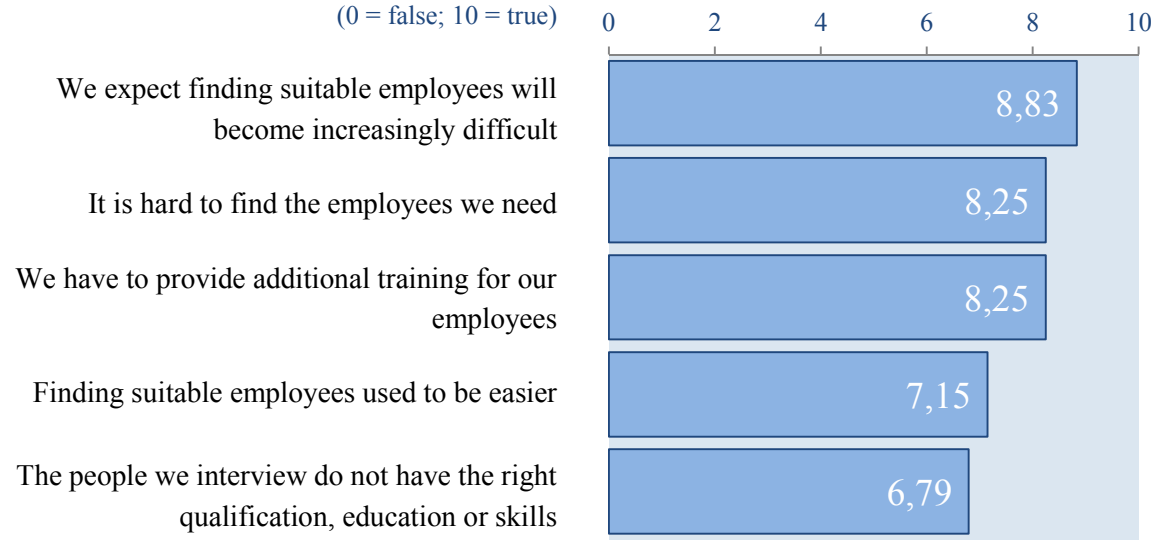


Source: IME

[53] The online survey was carried out in German and Bulgarian among Austrian and Bulgarian companies, respectively, and consisted of 10 questions, covering a variety of topics related to skills mismatches and the way they affect businesses. All questions are available in the Annexes.

Figure 11: Company Perceptions Regarding Employee Recruitment

Q3: To what extent are the following statements true or false regarding your company? (weighted average score on the scale from 0 to 10)



Source: IME

The concern that **finding suitable employees is going to become increasingly difficult** is widely spread across industrial and agricultural enterprises, as well as in some services such as professional, scientific or technical services.

It is interesting to note that ICT, financial and real estate companies, while still expecting that finding suitable employees will become increasingly difficult, are among the least pessimistic in this regard. In these economic activities the share of companies that choose a response scored between 8 and 10 is about 65%, compared to an average of 84% across all activities. At the same time ICT companies are the ones that most strongly disagree with the statement that "*Finding suitable employees used to be easier*". This result may be indicative of a perceived increase in public awareness for the possibilities that a career in ICT can offer. EU policy initiatives such as Green card programs for highly skilled foreign workers, as well as market forces (high wage levels and wage growth) are expected to lead to an increase in labour supply.

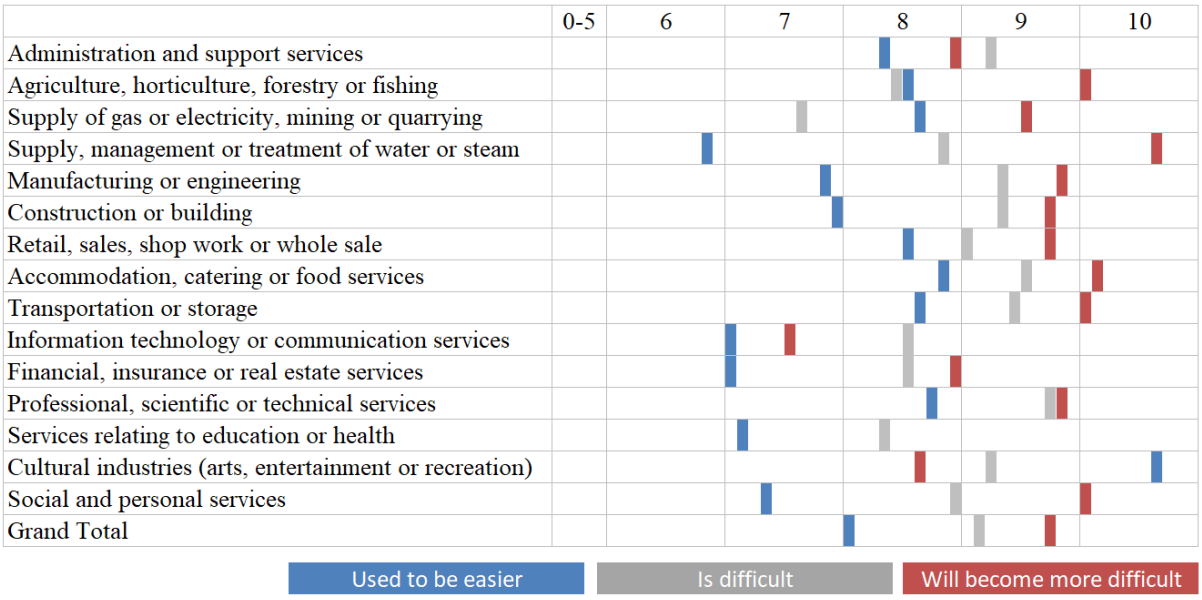
For most surveyed companies finding suitable employees is already a challenge, regardless of their economic activity or size. Figure 12 shows the difference[54] in the assessment of companies regarding their current recruitment difficulties, their past experience and future expectations. It is clear that there are very few exceptions to the already established observation that "finding suitable employees used to be easier, is currently hard and will become increasingly difficult in the future".

[54] Since there are no economic activities, in which the weighted average score is lower than 5, this part of the distribution has been omitted to allow a clearer comparison.

Figure 12: Company Perceptions Regarding Employee Recruitment (Past, Present and Future)

Q3: True/False assessment of the statements: "Finding suitable employees used to be easier"; "It is hard to find the employees we need"; "We expect finding suitable employees to become increasingly difficult" (weighted average score on the scale from 0 to 10)

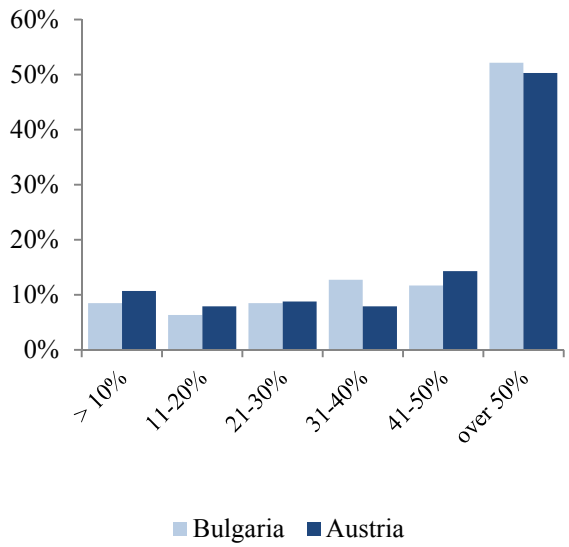
0 = false; 10 = true



Source: IME

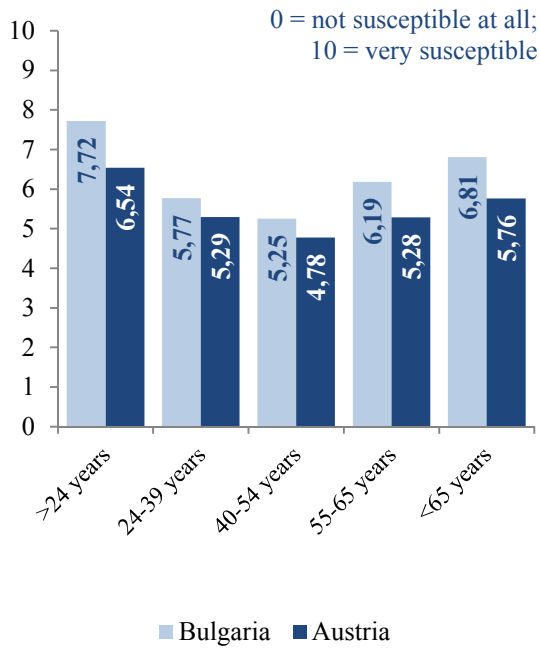
Figure 13: Additional Training and Susceptibility to Skills Mismatches

Q4 - What share of your employees have needed to undergo additional training after they started work at your company?



- Both Bulgarian and Austrian companies have had to provide additional training to more than half of their employees after they started working for them.
- While this observation holds true for most economic activities, there are some in which a significant share of responses is concentrated in the 0-40% range, which refers to the share of employees that have had to undergo additional training. Such are accommodation and food services (49% of companies have had to train less than 40% of their employees), social and personal services (47%), construction (43%) and agriculture (55%).
- Austrian manufacturing and transportation companies are less likely to have to provide additional training for their employees than

Q5 - To what extend do you feel that different age groups are susceptible to skills mismatches in general?



Bulgarian ones, but the difference is not that significant – 60% of Bulgarian manufacturers needed to provide training for more than half of their workers, compared to 55% in Austria.

- Most service activities show the need for additional training, even when it comes to retail trade, sales and shop work.

- Austrian workers are perceived to be less susceptible to skills mismatches in comparison to Bulgarian ones, and this observation holds true for all age groups.
- In both countries people aged less than 24 years and over 65 years are deemed the riskiest groups, while those aged 24-54 years are perceived as the least likely to be affected by skills mismatches.
- Austrian workers aged 40-54 years are the only age group with an average weighted rank under 5.

Source: IME

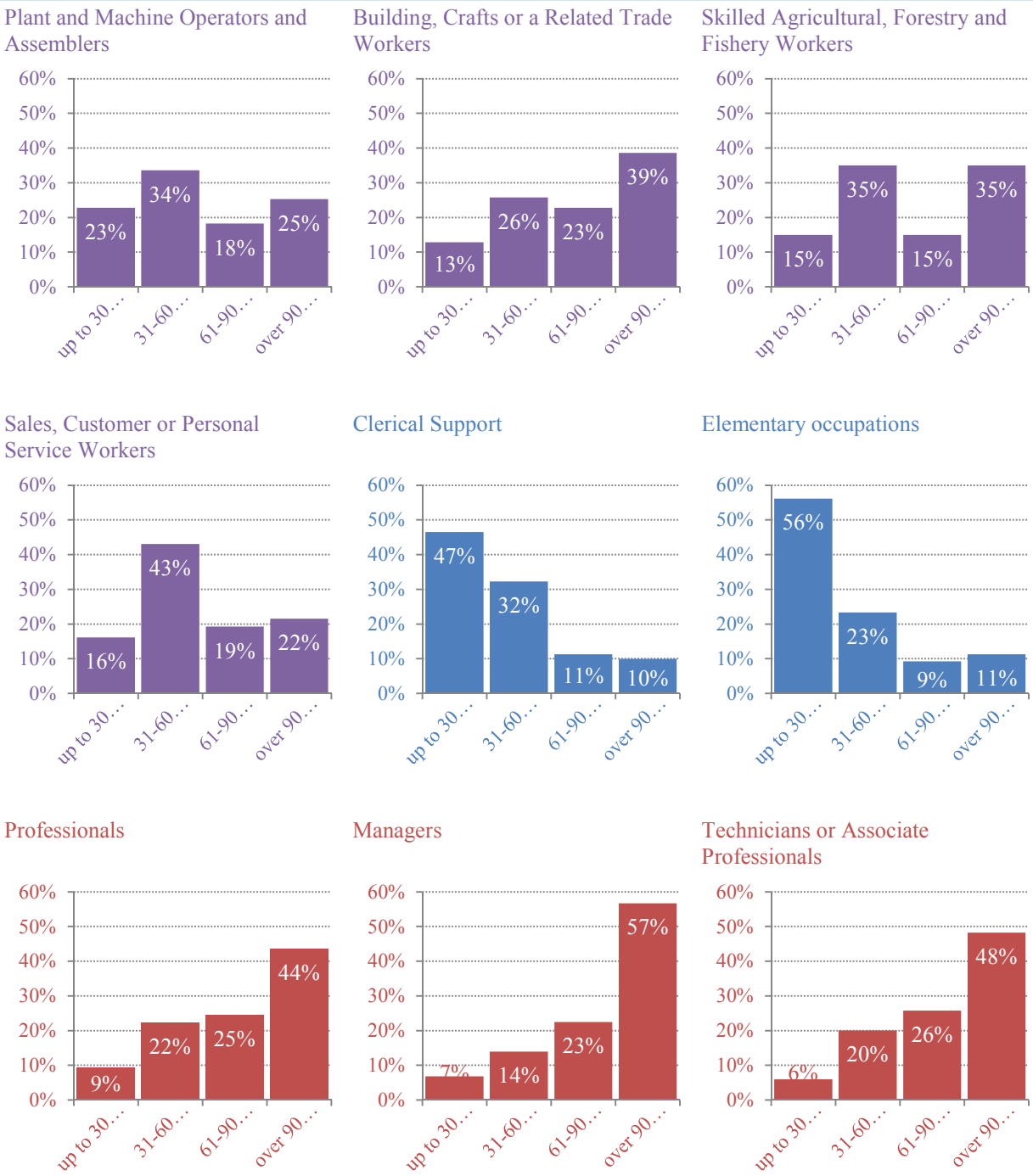
Companies were also asked to evaluate the average time they need to fill-in a vacancy with a suitable candidate. Figure 14 shows the distribution of their answers in four 30-day periods for each of the main occupational groups. Depending on the shape of the distribution the occupations have been separated into three groups:

- Occupations in which finding suitable candidates for available vacancies is relatively easier – i.e. usually takes less than 60 days and in most cases – less than 30 days (blue). These include clerical support professionals and employees in elementary occupations.
- Occupations in which finding suitable candidates for available vacancies is relatively harder – i.e. usually takes more than 60 days and in most cases – more than 90 days (red). These include managers, professionals in various fields (science, education, healthcare, ICT, business administration, etc.), technicians and related occupations.
- Occupations with no clear pattern and relatively even distribution across the different options (purple). These include various occupations in manufacturing, construction and agriculture, as well as sales, customer or personal service workers.

These results are in line with both Cedefop's mismatch priority occupations, as well as the overall vacancy rate dynamics in the EU, as published by Eurostat.

Figure 14: Time Required to Fill-In a Vacancy

Q6: What is the average time you need in order to fill-in a vacancy with a suitable candidate? (%)



Legend:

Occupations with relatively even distribution	Occupations for which filling-in vacancies is relatively easier	Occupations for which filling-in vacancies is relatively harder

Source: IME

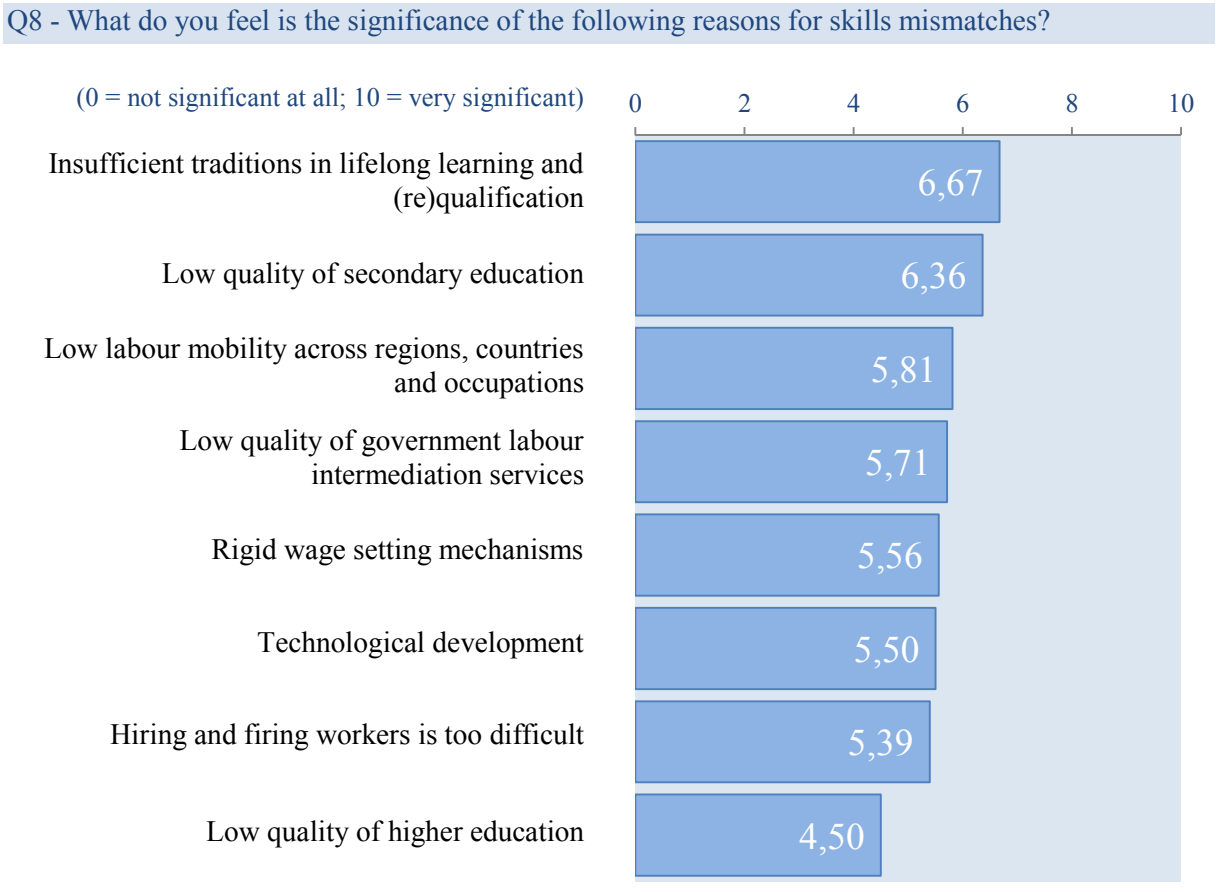
Reasons for and Consequences of Skills Mismatches

IME's survey also included questions that allow respondents to evaluate some of the most widely accepted reasons for and consequences of skills mismatches.

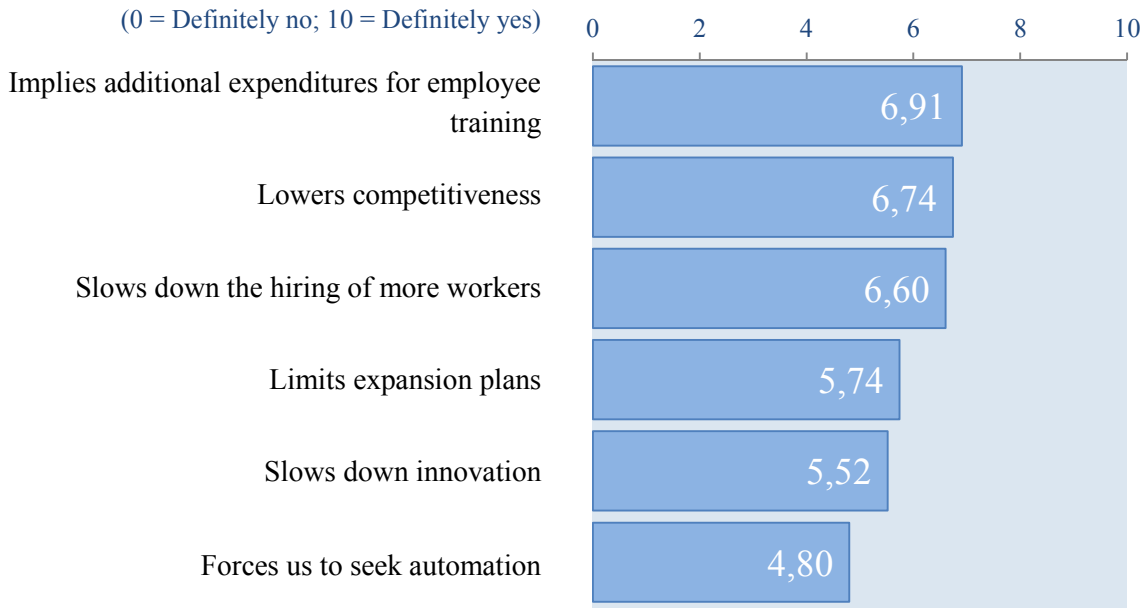
As regards the reasons for skills mismatches:

- The companies that took part in our survey point to "*Insufficient traditions in lifelong learning and (re)qualification*" as the most significant factor for skills mismatches.
- Concerns about the quality of education and VET practices outweigh some of the widely accepted policy-induced causes of mismatches such as rigid wage setting mechanisms and restrictive labour legislation.
- The emphasis that respondents put on the quality of secondary education rather than on higher education may be due to the fact that most of them are manufacturing companies, the majority of whose employees have secondary education.
- ICT companies are the only ones that point to technological development as a serious concern, probably due to the ever changing skill requirements as a result of the rapid development of the sector in the last two decades.
- Difficulties in the hiring and firing of workers are of moderate concern for some companies in manufacturing, construction and trade.

Figure 15: Causes and Effects of Skills Mismatches



Q9 - Below you can find some of the most widely perceived effects of skills mismatches. How would you rate them in regard to your company?



Source: IME

As regards the effects of skills mismatches, the survey results point to the following conclusions:

- Skills mismatches affect companies in a variety of ways, among which most notably the need for additional expenditures on employee training and loss of competitiveness;
- While skill mismatches have moderate effect on the expansion plans of companies, firms in economic activities such as professional, scientific and technical activities, ICT, transportation and manufacturing are among the most affected in this regard.
- 71% of the companies engaged in professional, scientific or technical services and 67% of the ICT companies assign high significance to the effect that skill mismatches have on the hiring of additional workers (i.e. they choose a mark from 8 to 10).
- It is interesting to note that a significant share of companies do not perceive skills mismatches as a driver of automation with manufacturing and accommodation and food service companies being something of an exception.

3.2 A Review of ESJS Results

Skills mismatches have been a growing EU-wide concern, which has caused significant efforts in their study and evaluation. The pilot edition of the European Skills and Jobs Survey (ESJS) has revealed[55] that about **45% of working adults believe that their skills can either be better developed** (i.e. consider themselves under-skilled – 5.4%) **or better utilized at work** (over-skilled - 39.8%).

In order to gain a more in-depth understanding of the causes and effects of skills mismatches and their effect on EU competitiveness, we need to answer some additional questions such as:

The ESJS database[56] makes it possible to narrow down the analysis[57] of skills mismatches to the country and economic activity level.

3.2.1 Which Skills Are the Most Important?

In order to correctly evaluate the significance of skills mismatches across economic activities, we first need to compare the importance of different fundamental and transversal skills.

Fundamental skills include literacy, numeracy and ICT, while transversal skills include technical skills, communication skills, team-working skills, foreign language skills, customer handling skills, problem solving skills, learning skills and planning and organization skills. In terms of fundamental skills, the ESJS gives respondents the ability to evaluate their importance in two steps.

1) Respondents are asked to first choose the highest level of the skill in question (i.e. basic or advanced literacy) that is required for them to do their job – this is done for fundamental skills only;
2) They self-evaluate their own skill level on the scale of 0 to 10, where 0 means "My level of skill is a lot lower than required"; 5 means "My level of skill is matched to what is required"; and 10 means "My level of skill is a lot higher than required".

There are indeed some economic activities, in which there is no visible consensus among workers as to what is the appropriate level of fundamental skills. For instance, Figure 16shows that in manufacturing and construction there is a de-facto split between workers that think they need basic literacy and those that think they need advanced literacy in order to do their job well.

The same applies to numeracy skills in regard to financial, insurance and real estate services, as well as professional, scientific and technical services.

While occupational differences may be an explanation, the relative share of (for instance) the managerial personnel in each of these activities is no way sufficient to exert a major influence on average levels.

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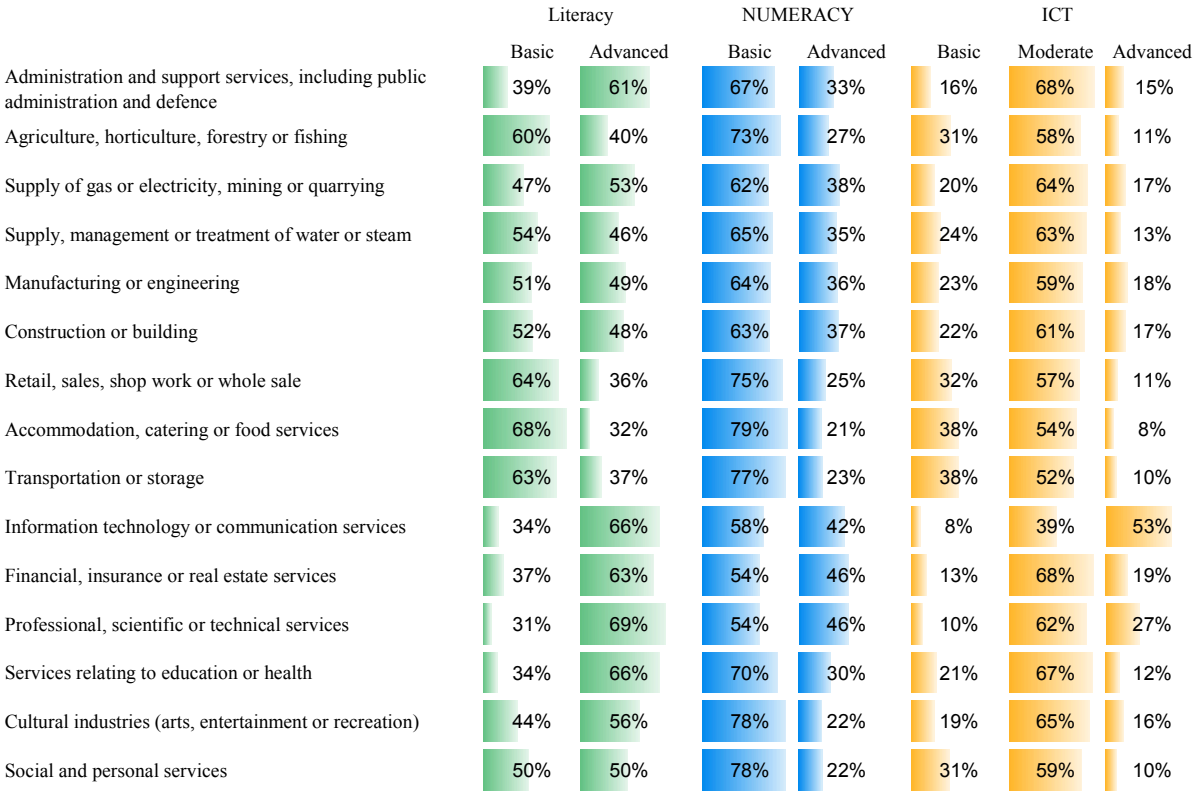
[55] These results are based on CEDEFOP's initial findings, which identify instances of over-skilling or under-skilling based on the original scale that respondents have used to evaluate their own skill levels. In this paper we will adopt a somewhat more conservative approach to the evaluation of over- and under-skilling (also used in other studies) that presumes the existence of an upward bias in self-evaluation surveys.

[56] Cedefop's survey includes 49 thousand respondents from all 28 EU Member States, among which 4 thousand from Germany and Spain each, 2 thousand from Finland and a thousand from Austria and Bulgaria each.

[57] European Centre for the Development of Vocational Training (Cedefop). *Cedefop European Skills and Jobs Survey (ESJS)*, Wave 1, Spring 2014, 1st edition, Thessaloniki: Greece.

Figure 16: Share of Workers According to Chosen Level of Required Fundamental Skills



Source: IME calculations based on ESJS data

Figure 17 shows the perceived importance of the predominantly chosen highest level of fundamental skill required in each economic activity, as well as that of all transversal skills. The five most relevant skills for every economic activity are then highlighted in blue.

We see that:

- In the case of 7 out of the 15 activities, basic literacy skills are deemed sufficient for what is required, while advanced literacy is needed primarily in service sector activities;
- The majority of EU workers think that basic numeracy skills are sufficient for them to do their job and there are no economic activities in which more than half of respondents have pointed out the advanced level as necessary;
- Basic ICT skills are no longer perceived as sufficient by EU workers – the overwhelming majority of them believe that they need moderate ICT skills in order to do their job;
- Only ICT professionals point to advanced ICT skills as the required level for their job;
- The three most important transversal skills are communication skills, teamwork and problem solving (the latter two are of great importance for virtually all economic activities);
- The two least important transversal skills are foreign languages and planning skills;
- Learning skills are among the five most important in some manufacturing and service sector activities.

Figure 17: Importance of Fundamental and Transversal Skills

ECONOMIC ACTIVITY / SKILL (0 = not important at all; 10 = very important)	**Basic** literacy	**Advanced** literacy	**Basic** numeracy	**Advanced** numeracy	**Basic** ICT	**Moderate** ICT	**Advanced** ICT	Technical skills	Communication skills	Teamwork skills	Foreign languages	Customer work skills	Problem solving skills	Learning skills	Planning skills
	Fundamental skills							Transversal skills							
Administration and support services	8.0	8.3	7.3	8.2	8.2	8.3	8.6	7.1	8.0	7.9	5.4	7.2	8.0	7.6	7.6
Agriculture, horticulture, forestry or fishing	7.6	8.0	7.6	8.2	8.2	8.1	8.2	7.6	7.6	8.0	4.9	6.7	7.9	7.6	7.6
Supply of gas or electricity, mining or quarrying	7.9	7.9	7.6	8.1	8.1	8.1	8.4	7.9	7.9	8.1	5.4	6.4	8.3	7.8	7.6
Supply, management or treatment of water or steam	8.0	7.5	7.4	8.2	8.2	8.3	8.3	7.8	7.7	8.0	4.8	6.9	8.2	7.7	7.5
Manufacturing or engineering	7.7	8.0	7.5	8.3	8.3	8.2	8.6	7.8	7.7	8.0	5.6	6.1	8.2	7.8	7.5
Construction or building	7.6	7.8	7.6	8.3	8.3	8.1	8.4	7.9	7.6	7.9	4.8	6.8	8.1	7.7	7.7
Retail, sales, shop work or whole sale	7.8	7.7	7.7	8.0	8.0	8.1	8.2	7.2	8.1	8.0	5.4	8.4	8.1	7.5	7.4
Accommodation, catering or food services	7.5	7.4	7.3	8.0	8.0	7.9	7.9	7.1	8.0	8.3	6.2	8.1	8.0	7.3	7.6
Transportation or storage	7.7	7.7	7.2	7.9	7.9	8.0	8.4	7.3	7.7	7.6	5.4	7.1	7.9	7.3	7.3
Information technology or communication services	8.0	8.1	7.2	8.0	8.0	8.5	9.1	8.0	8.2	8.1	6.5	7.3	8.6	8.2	7.8
Financial, insurance or real estate services	8.4	8.2	8.0	8.4	8.4	8.3	8.8	7.5	8.3	8.2	5.5	7.8	8.4	8.0	7.9
Professional, scientific or technical services	8.1	8.4	7.6	8.3	8.3	8.4	8.8	7.9	8.2	8.1	6.3	7.2	8.5	8.2	8.1
Services relating to education or health	8.3	8.3	7.3	8.2	8.2	8.2	8.7	7.2	8.7	8.5	5.4	7.6	8.4	8.2	8.1
Cultural industries (arts, entertainment or recreation)	7.8	8.2	7.0	7.9	7.9	8.2	8.6	7.3	8.2	8.1	5.8	7.6	8.1	7.7	7.7
Social and personal services	7.9	8.0	6.9	7.9	7.9	8.0	8.3	6.7	8.3	8.1	4.8	7.7	8.2	7.5	7.6

Note: The five most relevant skills for every economic activity are then highlighted in blue.

Source: IME calculations based on ESJS data

3.2.2 How Do EU Workers Rate Their Own Skill Level?

After rating the importance of transversal and fundamental skills in relation to their job, ESJS respondents evaluate their own skill level on the scale of 0 to 10, where: 0 means "My level of skill is a lot lower than required"; 5 means "My level of skill is matched to what is required"; 10 means "My level of skill is a lot higher than required".

After careful examination of the initial results, we've decided to adopt the approach used by Żurawski and Chłoń-Domińczak[58] (2017), who assess that respondents in the ESJS survey are considered "under-skilled" if their response is from 0 to 4, "matched" if the response is between 5 and 8 and "over-skilled" if their response is 9 or 10[59]. The combined share of under-skilled and over-skilled workers in each country or economic activity constitutes the total share of employees, whose skills are considered to be mismatched in relation to their occupation. Figures 18 and 19 present the EU average share of mismatched workers in the relevant skill/economic activity, as well as the share of over-skilled and under-skilled workers in each breakdown.

> *The example below shows that workers in administration and support services consider **advanced literacy to be the most appropriate level** of this skill, required by their job (thus the level of mismatched workers is highlighted in purple). It also shows that total 42% of workers in administration and support services consider their advanced literacy skills as higher (39.4% - over-skilled), or lower (3% - under-skilled) than what is required by their job.*

	Basic literacy		Advanced literacy	
Administration and support services	46% (average EU mismatch rate)	43.4% (overskilled workers)	42% (average EU mismatch rate)	39.4% (overskilled workers)
		2.1% (underskilled workers)		3% (underskilled workers)

These diverse results across economic activities are reflective of some of the issues in the evaluation of required and actual skill levels for a given job. Even if we do control for fundamental skill levels that the majority of EU workers deem surplus to requirements (such as advanced numeracy and advanced ICT), the share of mismatched workers in the EU, on the average, remains around 40%, in line with Cedefop's overall assessment.

Mismatch shares in transversal skills are more evenly distributed, which, among other reasons, probably reflects the larger number of received responses - every worker evaluates his/her skill level in each of them (rather than choose a "suitable" level as it is with transversal skills). Here we find the two skills with the largest share of under-skilled workers – customer work skills and foreign languages. It is interesting to note that the share of overqualified and under-skilled workers in terms of foreign language skills is actually comparable (about 20%). It is possible that this peculiarity in the data is due to the fact that unlike most other transversal skills, command of foreign languages is easily measurable and thus a person's self-assessment is supported by a point of reference such as the possession of a certificate.

[58] Żurawski, A. Chłoń-Domińczak, A. (2017), p. 9.
[59] This approach is made necessary by the skewness of the data, caused by the widely discussed in the theory tendency of employee-based surveys to overstate their own skills and to underestimate the skill requirements of their job.

Figure 18: Share of Workers Reporting a Highest Mismatch Rate in Fundamental Skills (%)

Economic activity/ Fundamental Skill	Basic literacy		Advanced literacy		Basic numeracy		Advanced numeracy		Basic ICT		Moderate ICT		Advanced ICT	
Administration and support services	46	43.4 2.1	42	39.4 3.0	39	35.4 3.1	44	41.7 2.6	38	34.8 3.6	39	37.0 2.5	49	44.7 3.8
Agriculture, horticulture, forestry or fishing	41	38.6 2.7	40	37.5 2.2	39	36.0 3.4	41	39.4 1.8	37	28.3 8.2	39	36.9 2.5	42	39.0 2.6
Supply of gas or electricity, mining or quarrying	41	36.5 4.6	38	33.7 4.2	37	33.8 2.9	37	33.7 3.5	31	26.4 5.0	39	34.7 3.9	45	37.7 7.2
Supply, management or treatment of water or steam	45	42.4 2.5	40	33.7 6.4	41	37.1 4.2	39	36.0 2.7	43	35.4 7.3	41	37.9 3.1	50	46.3 3.7
Manufacturing or engineering	43	40.9 2.4	37	34.3 3.2	39	36.3 2.9	39	36.4 2.7	38	32.1 6.0	38	35.3 2.6	43	39.2 3.8
Construction or building	39	36.4 2.8	41	37.3 3.4	39	34.7 4.2	42	38.4 3.5	35	27.0 8.5	38	35.3 3.0	46	42.9 2.9
Retail, sales, shop work or whole sale	52	49.7 2.2	41	38.7 2.7	47	44.0 2.9	44	40.4 3.5	46	41.8 4.4	42	39.0 3.1	46	41.8 4.6
Accommodation, catering or food services	52	50.2 2.0	41	37.5 3.2	46	41.9 3.7	42	39.5 2.9	42	37.1 4.7	39	35.6 3.3	43	38.6 4.5
Transportation or storage	51	48.7 2.1	42	38.5 3.3	44	41.5 2.6	41	36.4 4.6	39	35.1 4.0	39	37.1 2.4	48	44.2 4.1
Information technology or communication services	49	47.2 1.5	39	36.6 2.9	41	38.0 3.0	39	36.1 2.4	54	51.4 2.9	42	39.8 2.2	45	41.6 3.6
Financial, insurance or real estate services	48	46.6 1.1	40	38.2 1.5	42	40.7 1.7	42	39.8 2.7	43	39.9 3.0	39	37.1 2.0	48	44.4 3.6
Professional, scientific or technical services	47	45.7 1.7	40	37.2 2.4	41	38.6 2.6	39	34.9 3.9	38	33.2 4.5	38	36.3 2.1	47	42.4 4.1
Services relating to education or health	47	45.2 1.5	42	39.6 2.3	37	34.2 3.1	43	39.7 3.6	37	31.9 4.8	38	34.9 3.4	48	44.9 3.6
Cultural industries (arts, entertainment or recreation)	49	48.3 0.8	44	41.5 3.0	40	36.4 3.8	36	33.7 2.3	41	36.6 4.3	39	36.4 3.0	49	47.0 2.2
Social and personal services	47	44.6 2.2	41	38.0 2.6	39	34.9 4.5	43	37.7 5.1	39	33.4 5.8	39	35.7 3.5	50	44.1 5.9

Note: Dark purple cells represent the share of mismatched workers in the most commonly referenced level that is required in each individual skill according to the economic activity (see the example on p.37). For instance, if advanced literacy is highlighted and basic literacy is not, this means that most workers have chosen advanced literacy as the required level.

Source: IME calculations based on ESJS data

Figure 19: Share of Workers Reporting a Highest Mismatch Rate in Transversal Skills (%)

Economic activity/ Fundamental Skill	Technical		Communic.		Teamw.		Foreign languages		Customer work		Problem solving		Learning		Planning	
Administration and support services	38	31.7 6.0	42	38.9 3.2	43	40.5 2.7	42	21.5 20.1	42	36.4 5.8	43	39.8 2.7	41	38.4 2.7	41	37.1 3.7
Agriculture, horticulture, forestry or fishing	40	34.8 5.1	43	37.4 5.3	45	42.8 2.7	44	17.1 27.0	39	29.9 8.9	41	37.3 4.0	40	36.3 3.4	41	36.5 4.4
Supply of gas or electricity, mining or quarrying	41	36.8 4.5	40	34.5 5.3	43	39.7 3.3	44	19.1 24.7	40	28.9 10.8	42	39.2 2.9	40	37.2 3.2	41	36.1 4.9
Supply, management or treatment of water or steam	44	39.6 4.9	40	34.1 5.8	43	38.8 4.3	46	18.3 27.8	43	34.3 9.0	44	40.3 3.7	41	36.9 4.1	42	36.9 5.1
Manufacturing or engineering	40	35.5 4.4	38	33.5 4.6	41	38.2 3.2	42	19.1 23.1	39	25.9 13.3	41	38.3 2.8	39	36.6 2.8	40	34.6 5.1
Construction or building	40	35.9 4.4	39	34.3 5.2	41	38.0 3.0	43	17.6 25.3	39	30.3 8.7	41	37.9 3.2	39	35.9 3.1	40	35.3 4.3
Retail, sales, shop work or whole sale	41	35.5 5.8	47	43.9 3.2	47	44.4 2.8	42	21.0 21.0	50	46.0 4.0	46	42.9 2.8	45	42.3 3.0	44	38.9 4.8
Accommodation, catering or food services	42	36.7 5.1	48	44.9 3.3	51	48.0 2.7	45	27.6 17.6	49	45.1 3.7	46	43.3 3.0	44	40.9 3.5	45	40.3 4.4
Transportation or storage	41	36.3 4.3	43	39.0 3.8	43	40.2 3.3	42	21.8 20.4	44	36.3 7.3	46	43.0 2.8	41	37.2 3.5	43	38.6 4.6
Information technology or communication services	42	37.7 3.9	43	39.4 4.0	44	40.7 2.8	40	25.6 14.2	42	34.8 7.0	46	44.7 1.8	42	39.3 2.5	41	36.0 5.0
Financial, insurance or real estate services	38	33.8 4.4	44	41.1 3.2	44	41.8 2.5	41	22.5 18.4	44	39.7 4.3	45	42.8 1.8	42	40.0 2.1	39	35.9 3.5
Professional, scientific or technical services	41	37.0 4.3	41	37.0 4.1	42	38.8 2.9	42	24.6 17.0	39	30.9 7.9	43	40.6 2.1	43	40.9 2.3	41	37.4 4.0
Services relating to education or health	38	31.8 6.1	46	43.0 2.8	44	41.6 2.4	41	20.9 20.2	43	36.2 6.4	42	39.3 2.4	42	39.8 2.3	42	38.6 3.0
Cultural industries (arts, entertainment or recreation)	38	31.1 6.7	44	39.8 4.2	41	37.8 3.5	41	23.6 17.7	43	37.7 5.7	43	39.3 3.6	42	39.3 3.1	41	35.9 4.8
Social and personal services	36	29.6 6.8	45	41.0 3.8	46	42.0 3.6	44	20.2 23.3	45	39.2 6.2	42	38.9 3.4	40	35.1 4.5	41	36.8 4.4

Note: Workers do not choose from different appropriate levels of transversal skills (like it is with "basic" or "advanced" numeracy) and are instead evaluated in all of them on a single scale from 0 to 10. This is why the values of all transversal skills are highlighted in purple.

Source: IME calculations based on ESJS data

3.3 Which Skills Actually Matter?

Following ESJS's approach, we asked companies to evaluate the importance of fundamental and transversal skills from the point of view of the employer. Figure 20 presents a comparison between our results and the ESJS results (discussed previously) in five economic activities - agriculture, manufacturing, ICT, retail and trade and professional, scientific or technical services.

The data for all other economic activities is available in the Annexes of this report.

We see that the only economic activity, in which employer perceptions of the importance of all surveyed skills are on average marginally higher than the ones perceived by employees, is "*Professional, scientific or technical services*". A close match between employer and employee assessments is visible in *"Information technology or communication services"*, while the largest discrepancies are observed in *"Agriculture, horticulture, forestry or fishing"*, *"Accommodation, catering or food services"* and *"Social and personal services"*.

Figure 20: Discrepancies between the Perceived Importance of Skills by Employees and Employers

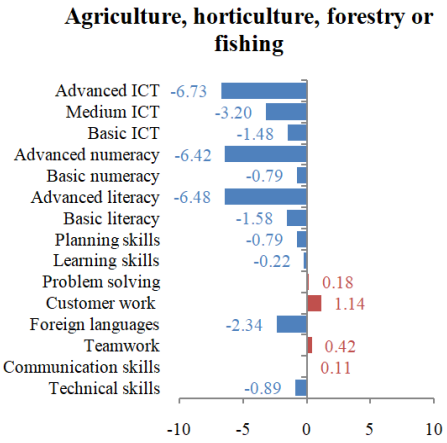
Q10: Importance of Skills (IME survey: Q10; ESJS: Q21C - Q23_B_8_scale)

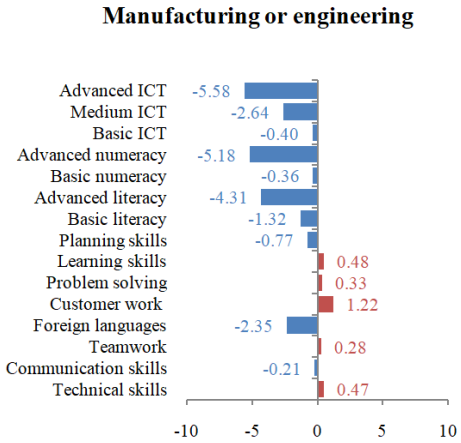
weighted average score on the scale from 0 (not important at all) - 10 (very important)

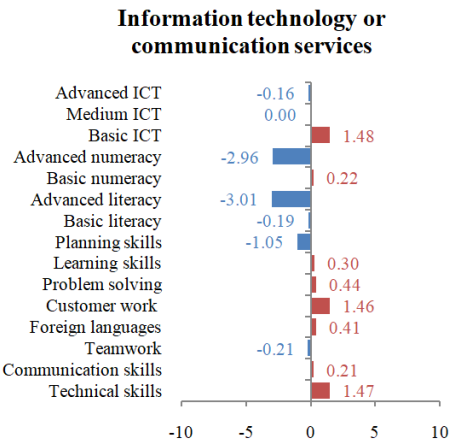
The following charts show the spread between the importance of various skills as perceived by employers (IME data) and employees (ESJS data). For instance, if construction workers think that advanced literacy skills have an importance of 8/10 (i.e. are quite important), but employers think they have an importance of 5/10, the bar is coloured in blue and gets the value of -3.

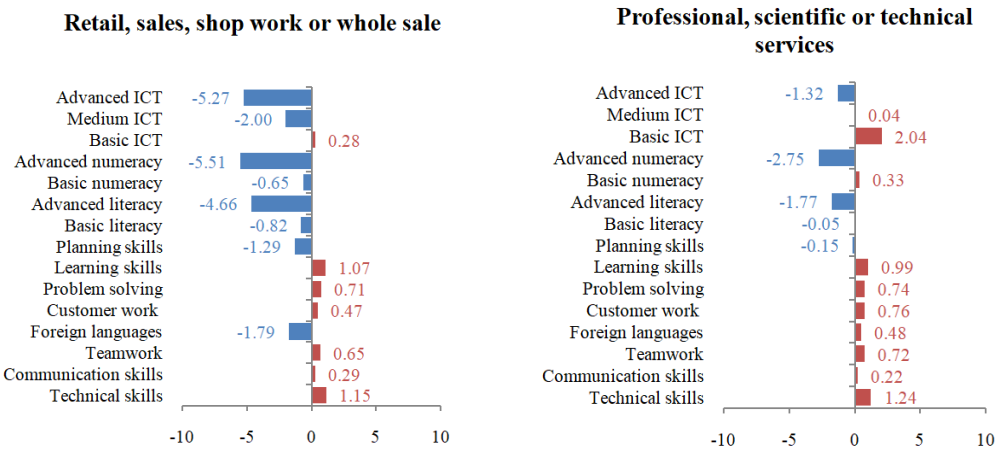
LEGEND

Employers think this skill is less important than the assessment of employees	Employers think that this skill is more important than the assessment of employees





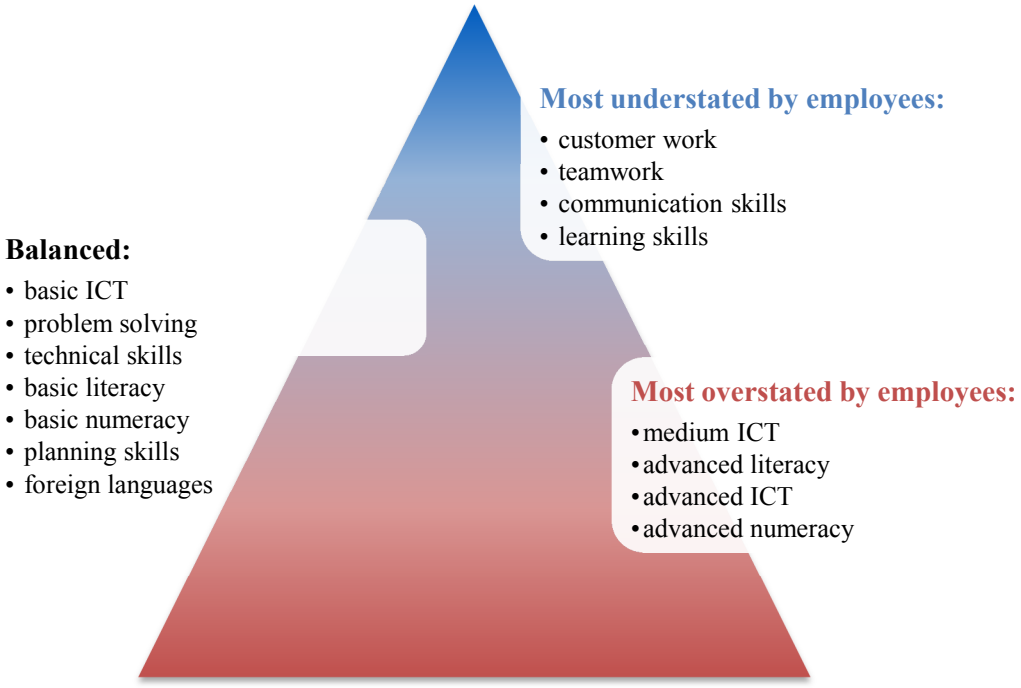




The comparison between ESJS and our own survey data suggest that:

- Advanced numeracy (*calculations using advanced mathematical or statistical procedures*), and advanced ICT (*developing software, apps or programming; computer syntax or statistical analysis*) are the skills whose importance is most often "overstated" by employees (employees attribute more significance to them than companies);
- The importance of some transversal skills such as customer work is most often than not understated by employees, except for activities;
- Despite the fact that teamwork is almost universally among the 5 most important skills, as perceived by employees, the actual importance that employers put on this skill is even higher on a 0-10 scale.

Figure 21: Overview of Employee Perception Regarding the Importance of Skills



Source: IME

While IME's company level data (that these observations are based on) is not sufficiently representative, the established differences are significant enough to warrant further investigation. An in-depth mirror study of the ESJS (a similar study among employers) may be beneficial for the further study of skills mismatches, but there is a legitimate concern that there is no sufficient understanding about the actual skill requirements of various jobs on the part of both employees and employers.

It may well prove to be the case that just as the ESJS suffers from an upward[60] bias in terms of skills self-evaluation on behalf of employees, the opposite (i.e. undervaluation of worker skills) may well be true for employers. This may not only hamper direct comparisons between what is required and provided in terms of skill levels, but also in terms of the overall share of workers whose skills are higher or lower than required.

4. Labour Shortages as a Manifestation of Skills Mismatches

The mismatch between the skills of the workforce and the requirements of businesses can result in labour shortages – a situation in which demand for labour is persistently unable to meet adequate demand. Bottlenecks can occur at all levels of specialization, regardless of the required level of education and skill and can lead to both economic losses (unrealized production due to insufficient labour supply for the need of companies) and social losses (lower employment that would otherwise have been achieved).

As discussed previously in this study, labour market "bottlenecks" can be both qualitative (lack of workers with specific skills) and quantitative (an absolute lack of workers) and sometimes an economy can experience both at the same time.

Demographic projections leave little room for interpretation – many EU economies currently face and will most probably continue to face quantitative labour shortages in future. This makes skill anticipation an important tool for identifying and (possibly) alleviating qualitative shortages that can arise from both sectoral shifts in the structure of employment and changing skill requirements in different economic activities and occupations.

4.1 Labour Market Overview

While slow productivity growth during the last several years can be attributed to macroeconomic developments (faster than anticipated employment recovery amidst moderate GDP expansion in most EU countries), other factors such as the greater use of part-time jobs also come into play[61]. These developments, together with low inflation may explain why the significant fall of the EU-average unemployment rate has been relatively slow to affect wages. Eurostat data show that among the five reference countries, in the period between 2013 and 2016 wages have risen most in Bulgaria, followed by Austria, Germany and Finland, while a still struggling labour market in Spain has seen a decrease in average wages.

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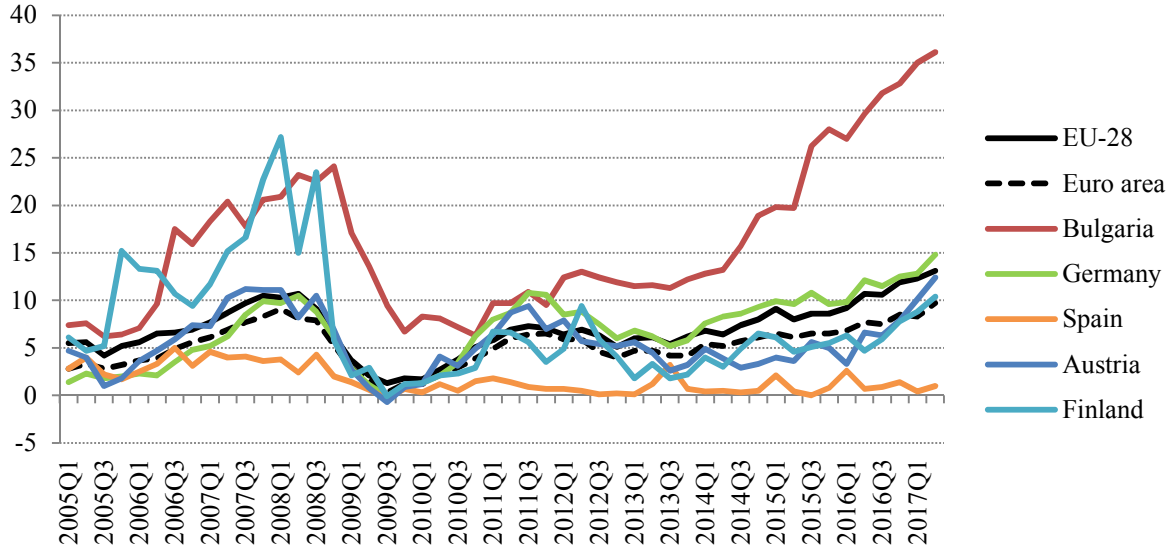
[60] Żurawski, A. Chłoń-Domińczak, A. (2017), p. 9.

[61] Part-time employment increased steadily between 2006 and 2013 - a trend that is especially visible during the crisis years. Ever since 2014 both part-time employment and its involuntary component (people who would like to work full time, but are unable to secure such employment) have seen a gradual decline, but remain well above pre-crisis levels.

Another factor that may explain the subdued growth of wages is the somewhat rarely discussed, but steadily **rising economic activity rate of the population in the EU** during the last decade. Compared to 2006 it has increased from 70 to 73% and is currently even higher than the one in the US. The main groups that drive this process are older workers, mainly due to increases in statutory retirement ages in many EU countries, and women due to the higher need for second earners in households during the crisis years. The fact that more people are available and looking for work (including by prolonging their labour market activity) puts downward pressure on wages, thus offsetting some of the effects of falling unemployment and increasing competition among workers. These positive developments, however, have brought to light some of the existing structural problems in EU labour markets.

Figure 22: Factors Limiting Production – Labour (Seasonally Adjusted Data)



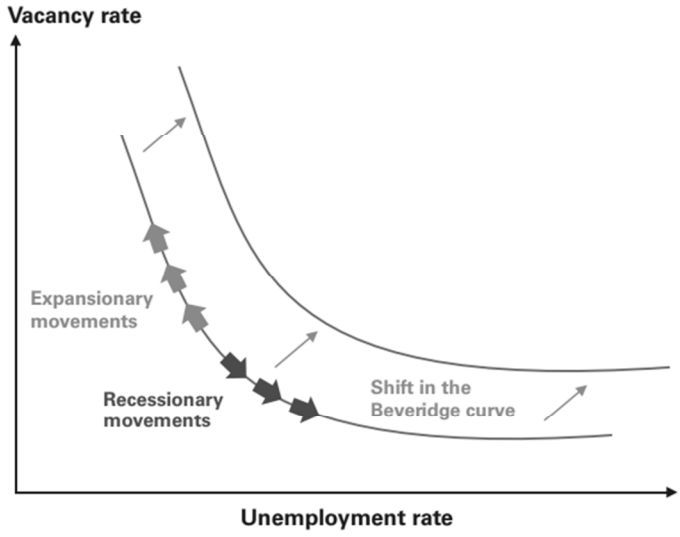
Source: Eurostat

Despite the already mentioned rise in economic activity in most EU member states and dropping unemployment, **the increase of labour force participation has not stopped labour shortages** from emerging (Figure 22).

In the 13 quarters after the beginning of 2014 the share of enterprises that point to labour as a factor limiting their production capacity has doubled, reaching an EU average of 13.1% (9.7% in the euro zone). Among the five reference countries levels vary from 1.0% in Spain to 36.1% in Bulgaria.

The shifts of the Beveridge curve for the EU and the five reference countries (Figure 24) are indicative of the ongoing labour market recovery process. However, falling unemployment and the gradual improvement in general economic conditions have led to a rise in labour shortages that is faster than expected based on historic data.

Figure 23: The Beveridge Curve Explained



In order to explore the dynamics of labour shortage and unemployment, we have constructed separate Beveridge curves, depicting labour market dynamics in each of the reference countries, as well as their relation to average EU levels in the Q1 2007 – Q2 2017 period.

The Beveridge curve (Figure 23) shows the changing relationship between a labour demand side indicator[62] placed at the y-axis and a supply side indicator (the unemployment rate) placed at the x-axis. Ideally higher labour demand should lead to lower unemployment with both converging to 0 in the state of perfect labour market equilibrium where all companies have the labour they need while all people who want to work have a job.

To the contrary, shifts in the Beveridge curve as shown in Figure 23 indicate a decline in the efficiency of the matching process since higher demand is accompanied by a rising unemployment rate. Movements along the curve are indicative of expansionary or recessionary phases and cannot be directly attributed to labour market efficiency. Vacancy and unemployment rates are negatively correlated over the course of the business cycle, resulting in high job vacancy rates and low unemployment rates during periods of economic growth and low job vacancy rates and high unemployment rates during contractions.

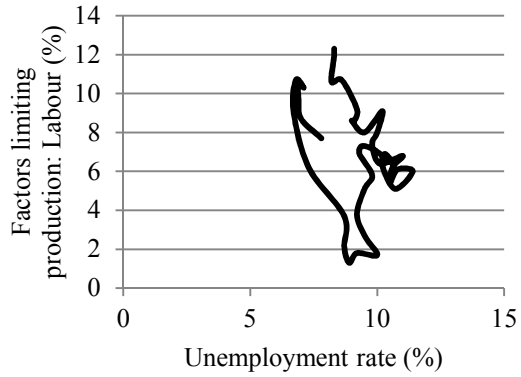
Our analysis of 2007-2017 unemployment and labour shortage data suggests that other things being equal the continuing fall of the unemployment rate in the five reference countries may lead to most significant labour shortages in Bulgaria and Finland, followed by Germany. In general, the German and Austrian labour markets appear to be the most efficient. However, while the German labour market is showing clear signs of quantitative shortages (an absolute lack of workers), labour shortages in Austria seem to indicate the emergence of qualitative labour shortages, as will be further discussed in this paper.

Based on historic data the Spanish economy is unlikely to face visible labour shortages at the macroeconomic level until unemployment drops below 10%, while the data for Austria suggest that labour shortages should decrease once unemployment drops below 5%. However, recent demographic developments (including, but not limited to the inflow of Middle East refugees) may lead to different than historically established trends. We will look more closely at each of the 5 country's Beveridge curves in the next section of this report.

[62] In this paper we adopt a labour shortage indicator, derived from EU's business survey results (% of enterprises pointing to labour shortage as a factor limiting production). It is commonly used in the Commission's own documents as a proxy indicator for the overall economy and seems to better reflect the short-term dynamics of labour markets when compared to the traditional vacancy rate. See for instance: EC. *Employment and Social Developments in Europe (ESDE), Annual Review*, 2013, pp 37-38.

Figure 24: Beveridge Curves for the EU and the Reference Countries (Q1 2007-Q1 2017)

EU

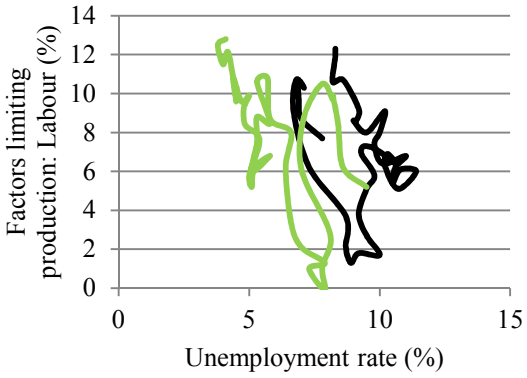


Austria

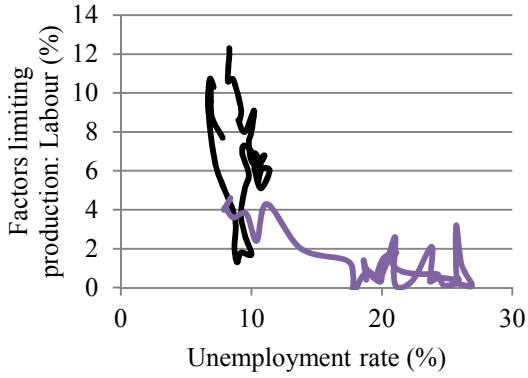
Bulgaria

Finland

Germany



Spain

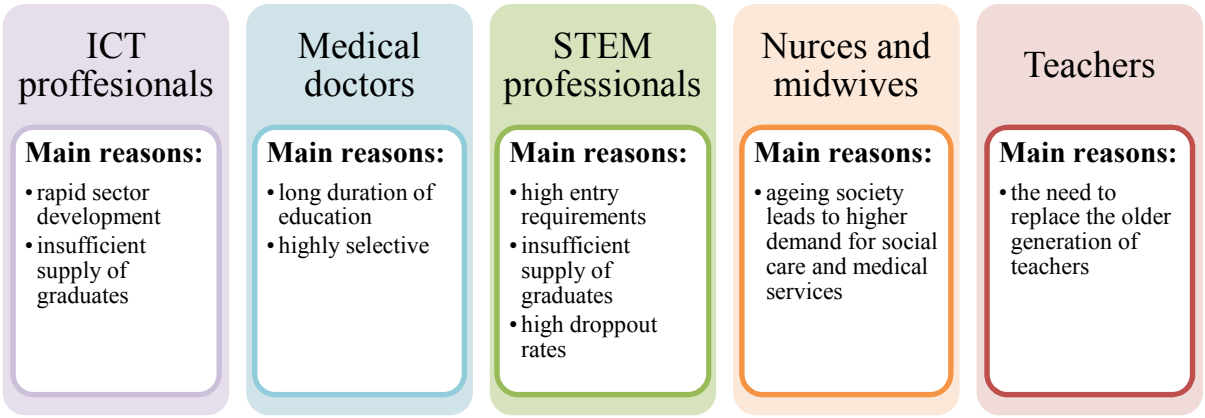


Source: IME calculations based on Eurostat data

4.2 Mismatch Priority Occupations

In 2016 Cedefop outlined[63] 5 priority mismatch priority occupations (MPOs), defining them as occupations with critical shortage that have important economic implications.

Figure 25: Higher Skill Level Mismatch Priority Occupations According to Cedefop



Source: Cedefop

Apart from MPOs that require higher skill levels, Cedefop lists several intermediate skill level MPOs such as cooks, welders and truck drivers, as well as a number of "surplus MPOs" – occupations in which the demand for skills is unable to meet the existing supply (due to a variety of factors, among which automation and projected shifts in the structure of employment). Among these are building and related trade workers, labourers in mining, construction, manufacturing and transport, plant and machine operators, elementary occupations, secretaries and keyboard operators and social and religious professionals. Cedefop argues that such instances of "skill surpluses" represent "*a misallocation of resources and a loss of investment in education and training*".

Our analysis of EURES[64] data, as well as our labour market analysis of the five reference countries, suggests that **Cedefop's list of high and intermediate skill MPOs is indeed reflective of the current labour market situation**. Evidence of the existence of labour market bottlenecks in many of the MPOs can be found in EURES's data on posted job vacancies[65] by ISCO codes.

By analysing EURES data for the five reference countries[66]in the months of January in 2015, 2016 and 2017, respectively, we have come up with a list of 65 occupations[67], which:

- Have registered an increase in the stock of vacancy posts for two consecutive years;
- Register an increase both in Germany on the one hand and the rest of the reference countries (Austria, Bulgaria, Finland and Spain) on the other[68];

[63] Cedefop. *Briefing note - Skill shortage and surplus occupations in Europe*, 2016
[64] EURES aims to provide job seekers with the opportunity to consult job vacancies posted by Member States' employment services and also to enable employers to find suitable candidates from abroad. This way the service plays an important role in supporting labour mobility within the EU as a shock-absorption mechanism by reducing cross-country asymmetry of information.
[65] While the vacancy database that EURES supports is impressive (about 2.7 million posts in September 2017), it does not include all job vacancies posted by national employment agencies – some countries only provide data for job posts that are deemed suitable for international candidates. This is especially visible in the cases of Bulgaria and Spain, where coverage is quite limited – just 26% and 1% of all national posted vacancies respectively. Despite these limitations, an overall trend of increasing vacancies in some occupations and their related economic activities is evident.
[66] A breakdown of job posts by country is available in Annex 1.
[67] IME calculations based on the number of vacancies posted by Bulgarian and Spanish national employment agencies and EURES as of 03.10.2017.

- Register a higher than the average 43% increase in the number of posts in 2017 compared to 2016;
- Offer at least 1000 posts.

Figure 26: ISCO Groups of Posts (January 2017)

ISCO Group	Posts	of which:	Posts	yoy change (%)
Managers	7854	1323 : Construction managers	2802	237
		1342 : Health services managers	5052	64
Professionals	54026	2142 : Civil engineers	6166	51
		2152 : Electronics engineers	1984	102
		2221 : Nursing professionals	3531	117
		2222 : Midwifery professionals	3139	419
		2411 : Accountants	5461	132
		2421 : Management and organization analysts	8284	45
		2423 : Personnel and careers professionals	4914	263
		2433 : Technical and medical sales professionals	18336	160
		2434 : ICT sales professionals	2211	152
Technicians and Associate Professionals	240273	3112 : Civil engineering technicians	4068	51
		3113 : Electrical engineering technicians	6487	49
		3114 : Electronics engineering technicians	3344	262
		3221 : Nursing associate professionals	179760	86
		3254 : Dispensing opticians	4701	45
		3259 : Health associate professionals not elsewhere classified	1966	352
		3313 : Accounting associate professionals	21771	54
		3331 : Clearing and forwarding agents	2119	194
		3339 : Business services agents nec.	1182	89
		3341 : Office supervisors	6032	61
		3513 : Computer network and systems technicians	8843	49
Clerical Support Workers	181837	4120 : Secretaries (general)	62577	330
		4211 : Bank tellers and related clerks	9423	73
		4224 : Hotel receptionists	8228	49
		4311 : Accounting and bookkeeping clerks	17873	132
		4321 : Stock clerks	57764	59
		4322 : Production clerks	9786	380
		4323 : Transport clerks	10959	54
		4416 : Personnel clerks	5227	524
Services and Sales Workers	133507	5151 : Cleaning and housekeeping supervisors	5803	155
		5223 : Shop sales assistants	116624	65
		5230 : Cashiers and ticket clerks	8946	61
		5242 : Sales demonstrators	2134	176
Skilled Agricultural, Forestry and Fishery Workers	8280	6113 : Gardeners, horticultural and nursery growers	8280	45
Craft and	387212	7111 : House builders	1837	127

[68] The number of posts for Germany amount to 92% of the cumulative posts in all 5 reference countries.

		7114 : Concrete placers, concrete finishers and related workers	5312	63
		7115 : Carpenters and joiners	9136	81
		7122 : Floor layers and tile setters	13803	51
		7127 : Air conditioning and refrigeration mechanics	4008	59
		7212 : Welders and flame cutters	39702	57
		7213 : Sheet-metal workers	5942	151
		7214 : Structural-metal preparers and erectors	19632	73
		7223 : Metal working machine tool setters and operators	46143	46
		7224 : Metal polishers, wheel grinders and tool sharpeners	2724	74
		7231 : Motor vehicle mechanics and repairers	40031	51
		7233 : Agricult. and industrial machinery mechanics and repairers	92754	126
		7322 : Printers	1678	46
		7411 : Building and related electricians	50856	52
		7412 : Electrical mechanics and fitters	43560	80
		7523 : Woodworking-machine tool setters and operators	1370	123
		7533 : Sewing, embroidery and related workers	1550	64
		7543 : Product graders and testers (excl. foods and beverages)	7174	166
Plant and Machine Operators and Assemblers	70688	8153 : Sewing machine operators	1502	339
		8159 : Textile, fur and leather products machine operators nec.	2553	802
		8160 : Food and related products machine operators	4244	68
		8211 : Mechanical machinery assemblers	8057	79
		8212 : Electrical and electronic equipment assemblers	14348	504
		8344 : Lifting truck operators	39984	61
Elementary Occupations	129950	9112 : Cleaners and helpers	43415	59
		9214 : Garden and horticultural labourers	3591	71
		9333 : Freight handlers	76431	45
		9612 : Refuse sorters	4708	330
		9622 : Odd job persons	1805	115

Source: IME calculations based on EURES data

Based on this data, there seems to be a rising demand for:

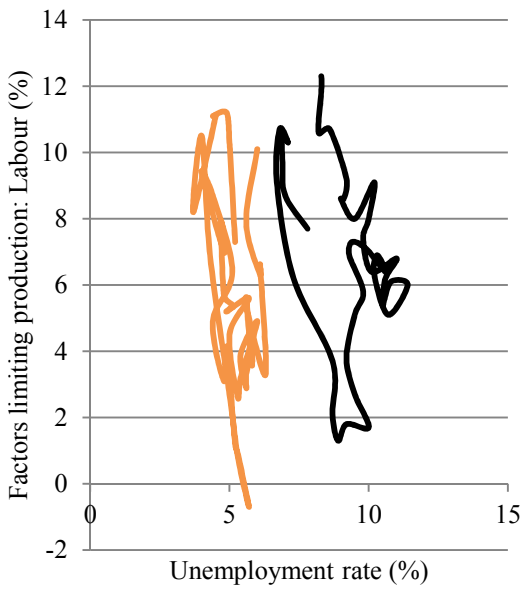
- Healthcare professionals (incl. health service managers, nurses, midwives and associated professionals);
- Construction professionals (incl. managers, civil engineers and technicians, floor layers and tile setters, carpenters and joiners, concrete placers and finishers, house builders, etc.);
- Various service sector activities (accountants and associate professionals, sales professionals and clerks);
- ICT professionals;
- Others (incl. accommodation and hospitality professionals, transportation professionals, gardeners, shop assistants, motor vehicle mechanics and repairers.

EURES's data also indicates rising shortages in a number of manufacturing occupations (incl. welders and flame cutters, metal and woodwork machine tool setters and operators, professionals in the textile industry, various types of engineers and technicians).

5. Reference Country Labour Market Profiles

5.1 Austria

Figure 27: Beveridge Curve for Austria (Q1 2007-Q1 2017)



Source: Eurostat

The movement of the country's Beveridge curve shows that the Austrian labour market is in general more balanced than that of most other EU countries. At no point during the last decade did unemployment in Austria exceed 6.3%, or drop below 3.7%. However, the Austrian labour market has somewhat deviated from overall EU trends in the last few years.

With the exception of a few quarters at the beginning of the crisis, labour shortages have remained ever present, albeit moderate and comparable to average EU levels until the end of 2012. In the Q1 2013 – Q1 2016 period labour shortages decreased with average EU levels being persistently 2-6 pp higher than the ones in Austria.

However, ever since the beginning of 2016 the share of businesses that point to lack of qualified labour as a factor limiting production has increased rapidly, reaching a record 12.4% in Q2 2017. This is the highest level in the reference period, thus surpassing average euro zone levels and once again approaching the EU-average.

In the last few quarters for which there is available data Austrian GDP growth has outperformed the EU average, reaching a 2.9% annual growth in Q2 2017. This has had a positive effect on a somewhat struggling labour market with unemployment dropping below 6% for the first time since 2015. At the same time the seasonally adjusted employment rate of the population aged 20-64 years has surpassed 75% for the first time on record[69]. Our analysis confirms OECD's conclusion[70] that migration has fostered labour supply with a large share of immigrants[71] successfully finding their way into the labour market[72], but the economy has so far fell short of absorbing the increase in the number of potential workers[73].

Ever since 2012 the Federal Minister of Labour in consultation with the Federal Minister of Economics and the social partners publish a list of labour shortage occupations[74], which third-country

[69] It has to be noted that most jobs created in the last few years has been in part-time jobs. Labour force participation has also been supported by the increase in the effective retirement age and the government's decision to limit access to early retirement and disability pension schemes as of 2014.
[70] OECD, *2017 OECD Survey of Austria*, July 2017
[71] SA assigns a foreign background only to people both of whose parents are born abroad.
[72] However, some studies suggest that this may not be the case in terms of refugees that have been granted asylum - see Bock-Schappelwein, J. Huber, P. *Zur Arbeitsmarktintegration von Asylsuchenden in Österreich*, Austrian Institute of Economic Research (WIFO), 2016.
[73] See also European Commission, *Country Report Austria 2017*, 22.02.2017, Brussels, p. 26
[74] The full list is available at the Federal Government's official information website on migration to Austria (migration.gv.at)

citizens can apply[75] for. While the 2012 list included a total of 26 professional occupations, by 2017 their number dropped to 11, despite rising labour shortages in the economy[76]. Among the most persistent are some manufacturing occupations such as **milling mechanists** and **metal turners**, but also **data processing technicians**, **power and mechanical engineers** and different types of **construction workers** (esp. roofers).

Our analysis, based on monthly data[77] for the 2008-2016 period, indicates that the Austrian labour market may well be facing both qualitative and quantitative shortages. Despite the fact that unemployment is still relatively high for Austrian standards, more than half of the 88 economic activities for which the Public Employment Office, AMS, provides data register higher than expected[78] vacancy rates. While some of those are what we would describe as marginal economic activities in terms of the actual number of people employed and available vacancies, others are among the activities that generate the bulk of employment in the country. Below are some of the clearest examples of economic activities that have registered both an increase in the number of people employed, as well as an increase in job vacancy rates.

Among the manufacturing activities where labour shortages have been increasing are the manufacture of **food products** and the manufacturing of **chemical and pharmaceutical products**. Despite the fact that the number of people employed has been steadily increasing since mid-2013, vacancy rates in these economic activities didn't pick up until two years later.

A clearly defined long-term trend of rising labour shortages is evident in the **IT sector** with the job vacancy rate reaching a high of 1.43% in the beginning of 2016, despite ever rising employment. In the 2008-2016 period alone, the number of people employed in this economic activity has increased from 26.4 to 39.6 thousand people. In 2016 Austria ranks fourth in terms of the share of enterprises which tried to recruit ICT specialists[79], but found it difficult to do so. Hard-to-fill vacancies are reported by 61% of such enterprises, compared to an EU-28 average of 41%. Similar, though less pronounced trends are visible **in information service activities**, as well as **legal and accounting activities** where rising employment has so far managed to find adequate supply and job vacancy rates have remained low, despite recent upward trends.

In the beginning of 2016 the number of people employed in **transportation** surpassed 108 thousand for the first time since 2008 with most job gains taking place in the last two years. Ever since the beginning of 2015 job vacancy rates have also been on a rise, but wage levels have been slow to follow and have been rising two times slower than the country average. Christl et al. (2016) attribute[80]these developments to higher competition from Eastern European countries that continue to gain market share in the Austrian transportation market.

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[75] The so called Red-White-Red Card is issued if applicants can prove that they possess the necessary qualifications and provide a declaration of commitment from an Austrian employer.

[76] An in-depth review of developments surrounding managed immigration in Austria is provided by Gächter (et. al) *Determining Labour Shortages and the Need for Labour Migration from Third Countries in Austria*, International Organization for Migration (IOM), May 2015

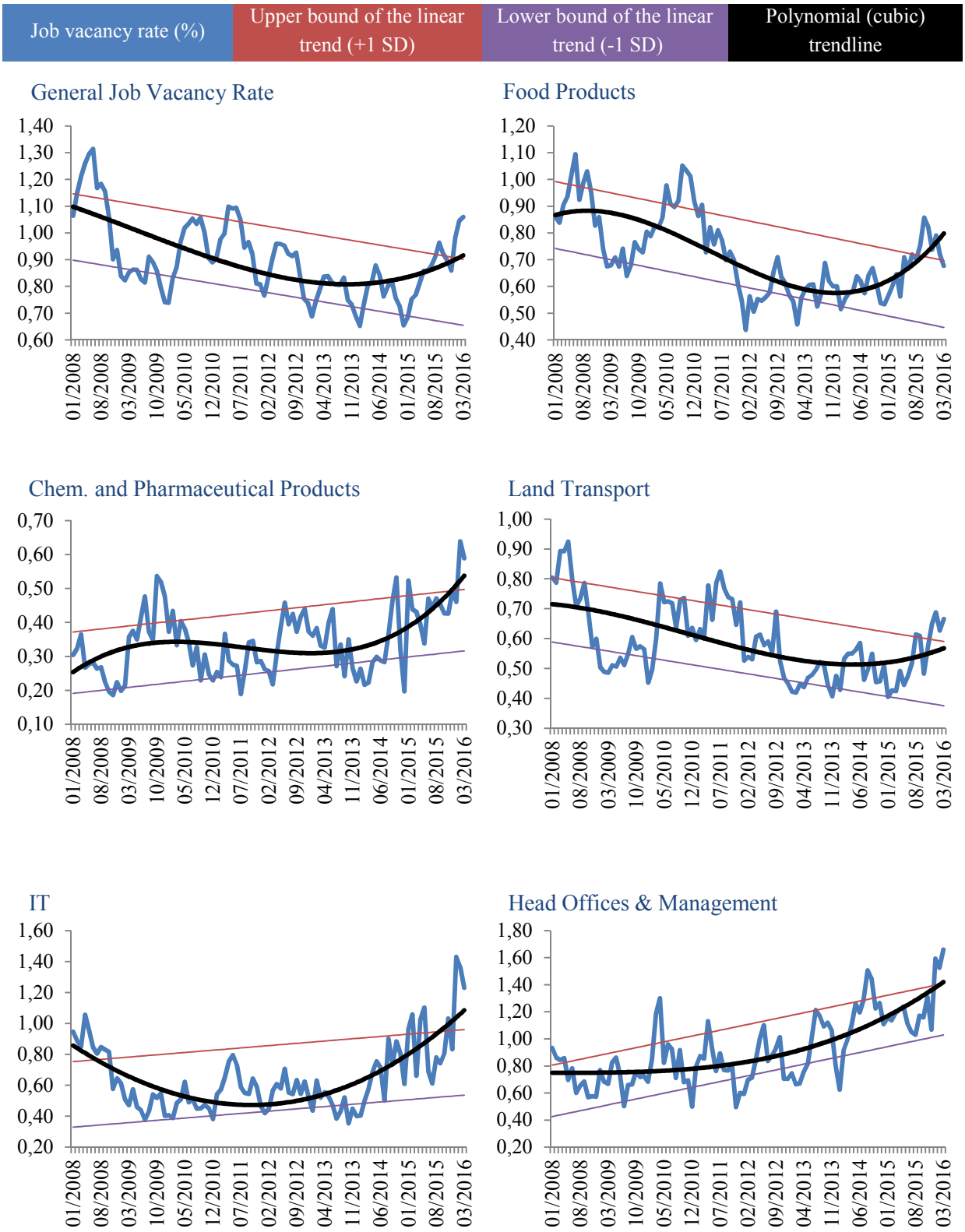
[77] Eurostat's data on job vacancies in Austria is less detailed than that for other countries, which is why we rely upon data from Statistics Austria (SA) regarding vacancies registered with the Public Employment Office (Arbeitsmarktservice, AMS) as well as data from the Open Jobs Survey (Offene-Stellen-Erhebung, OSE).

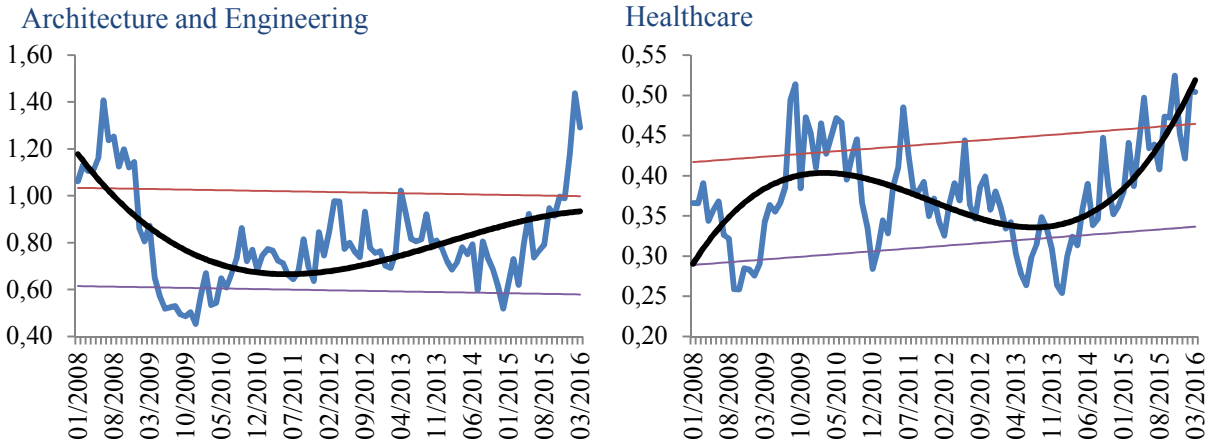
[78] We look at economic activities in which vacancy rates are higher than the upper bound of the standard deviation of their expected long-term linear average, as well as their cubic polynomial.

[79] According to Eurostat data from the ICT usage in enterprises database (isoc_e).

[80] Christl, M. Köppl–Turyna, M. Kucsera, D., *Structural Unemployment after the Crisis in Austria*, IZA Journal of European Labour Studies, 2016.

Figure 28: Economic Activities with Rising Employment and Job Vacancy Rates in Austria





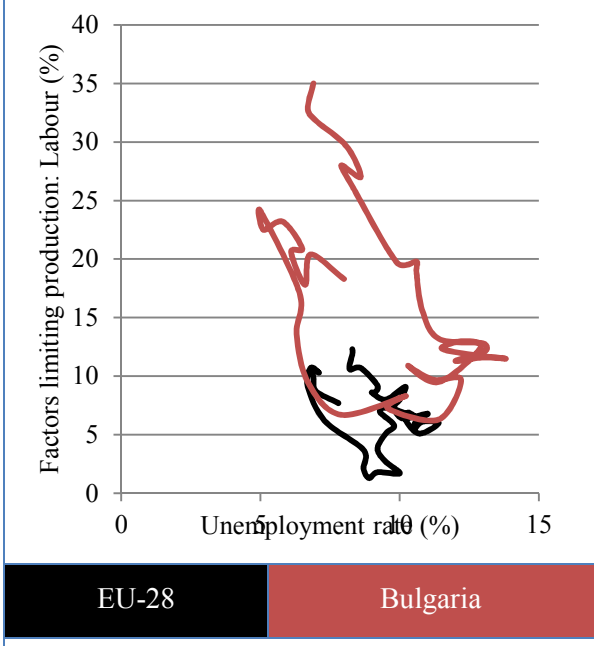
Source: SA data, IME calculations

While overall vacancy rates in **healthcare** have been relatively low, they have been steadily increasing since the beginning of 2014 and nurses in particular have been counted among the labour shortage occupations since 2012. Vacancy rates in **architectural and engineering services** remained relatively stable in the 2009-2014 period, but there has been a sharp increase in the last two years, while occupations related to management activities and head offices have been on a long-term upward trend.

Despite rising wages and employment, labour shortages are also emerging in some of the lower-paid, less qualification-intensive economic activities in the service sector, which have also been arguably the main beneficiaries of the recent tax reform. By far the fastest wage increases have been registered in **accommodation and food services**, where wages have increased by around 55% in the 2008-2016 period (twice as fast as the average). Despite that they remain quite low, amounting to just 62% of the country average, compared to 50% in 2008. Wages in the **trade** have also been increasing faster than average and in 2016 amount to 90.7% of the average wage, compared to just 84.3% back in 2008.

5.2 Bulgaria

Figure 29: Beveridge Curve for Bulgaria (Q1 2007-Q1 2017)



Source: Eurostat

While the Bulgarian labour market has followed closely overall EU trends, unemployment and labour shortage swings in both directions have been vastly more significant, pointing to the existence of cyclical vulnerabilities as well as structural deficiencies.

The significance of the structural component of unemployment was made particularly visible during the Q1 2011 – Q3 2013 period, when both unemployment rates and labour shortages increased simultaneously, despite modest gains in economic activity in the second half of the period.

Ever since Q3 2013 labour shortages have been increasing rapidly, while unemployment has decreased and economic activity has stagnated. In Q2 2017 the share of enterprises pointing to labour as a factor limiting production reached an unprecedented 36.1%, thus surpassing the pre-crisis high of 24.1%. At the same time unemployment is still 2 pp higher than its pre-crisis levels, despite recent positive developments.

Recent employment numbers point to the conclusion that the labour market is already approaching its new equilibrium point where further employment growth would be null or marginal against severe labour shortages.

Ever since the beginning of 2012 the Bulgarian labour market data show persistently high job vacancy rate in "**Mining and quarrying**". Wages in this sector are about 1.4 times the country average, but have been growing at a slower than average pace during the last two years. Since 2014 financial market developments, as well as some political turmoil, have put downward pressure on job openings in this economic activity and employment has fallen, but as of Q1 2017 the vacancy rate still remains nearly double the country average of 0.8%. Falling employment numbers and persistent labour shortage in the sector are due primarily to the relatively low appeal of mining sector occupations and related education, but may also reflect the gradual increase in automation and the need for differently qualified personnel. Significant investments in equipment (including fixed tangible assets with environmental purpose) and ongoing modernization have made it so that the sector need less numerous, but more highly skilled personnel, while somewhat struggling to keep up with average wage increases.

Transportation and storage is another economic activity in which the number of job vacancies has recently been visibly higher than the country average. Despite the fact that the accumulation of hard-to-fill vacancies should put upward pressure on wages, the average gross wage in the sector fell below the country average in 2013 and has continued to underperform ever since, probably due to

traditionally low wages in the subsectors of storage and related activities. Our analysis of the Bulgarian Employment Agency datasets[81] suggests that most of the labour shortage is concentrated in transportation, as 76% of all active job vacancies are related to this sub-activity. Based on our calculations the job vacancy rate for transportation-related activities is 1.7 times higher than that of activities related to storage, posts and logistics, while the payment offered is 1.3 times higher. In particular, there is an evident shortage of truck drivers, which has put an upward pressure on wages of such workers. In August 2017 the average gross wage, offered for an 8-hour working day reaches BGN 1,058, which is well above the average of BGN 660 in the job vacancies posted by the Employment Agency[82].

Stronger than anticipated tourist seasons in 2016 and 2017 have generated rising demand for workers in **accommodation and food services**. The 2016 season in particular marked an all-time high in both the number of tourists (3.4 million), as well as then number of guest nights (16.2 million) – not least to the start of regular "Ryanair" flights to and from Sofia in 2016. Since this is by far the lowest paid economic activity in the country (not least thanks to a significant share of informal economy in the sector and mass practices for underreporting of wages and formal part-time hiring), the increase in wages in tune with the average pace means that the nominal difference has continued to increase. Regardless of whether we accept that wage data for this sector of the Bulgarian economy is being heavily influenced by widespread undeclared/under-declared work and income practices or not, many qualified workers prefer securing employment in other nearby tourist countries, especially Greece. In early 2016 this resulted in significant labour shortage, which in turn forced the government to vote amendments to the Labour Migration and Labour Mobility Act, allowing easier access of Bulgarian businesses to seasonal workers from third countries. Despite these changes the job vacancy rate reached 5.2% in Q1 2017, which is the highest number on record, pushing the 4-period moving average to 2.2%.

The data for Bulgaria show that the most persistent and significant labour shortage is in **healthcare**, where vacancy rates remained above 2% in the entire Q1 2009 – Q1 2017 period and in some quarters of 2016 even pushed the 3% barrier. While wages in the sector are equivalent with the country average (like in all five reference countries), high demand for healthcare professionals abroad, including Germany[83], has left Bulgarian healthcare establishments devoid of labour force. However, between 2011 and 2016 the private sector's share of the employees in this economic activity increased from 20 to 25%, accompanied by a 45% rise in wages, compared to just 27% in the public sector. This dynamic of wage data indicates that most of the actual labour shortage is concentrated in the private sector, but it may also be the case that slower wage growth in the public sector has "driven out" employees and thus has created secondary shortages, due to slower adjustment of wages.

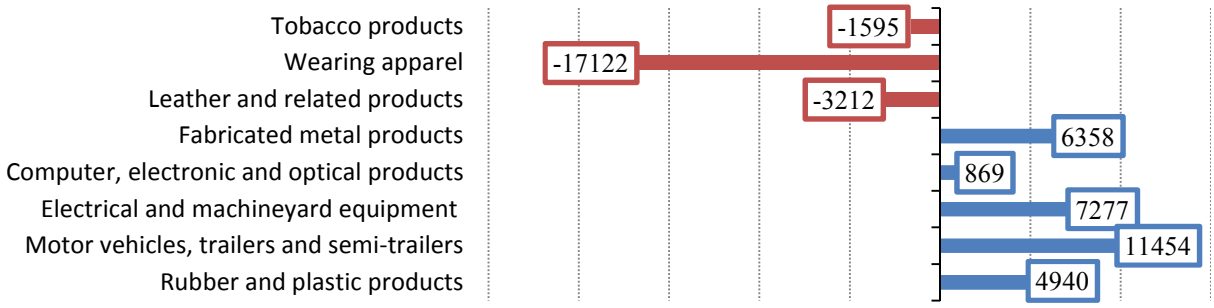
While macro level vacancy related data show no clear labour shortage in the **ICT** sector and **manufacturing**, wage and employment data indicate that there are some structural shifts taking place within these economic activities.

[81] The EA's open data is provided as a XML web service that contains information about all currently active job vacancies that have been registered with the EA. The IME has developed a special web application that collects stores and systemizes some of the data provided by the EA, which allows us to observe long term trends. In the current analysis we've used data as recent as September 2017.

[82] While EA's data is quite comprehensive, it is not representative of the labour market situation in the country. This is why we have also made use of NSI data, especially in regard to economic activities and occupations that require higher qualifications.

[83] According to a 2015 report by the German Federal Medical Council the number of Bulgarian medical doctors and specialist medical practitioners working in Germany has increased from 770 to 1427 between 2010 and 2014.

Figure 30: Change in the Number of People Employed in Bulgarian Manufacturing (Q4 2016/Q4 2010)

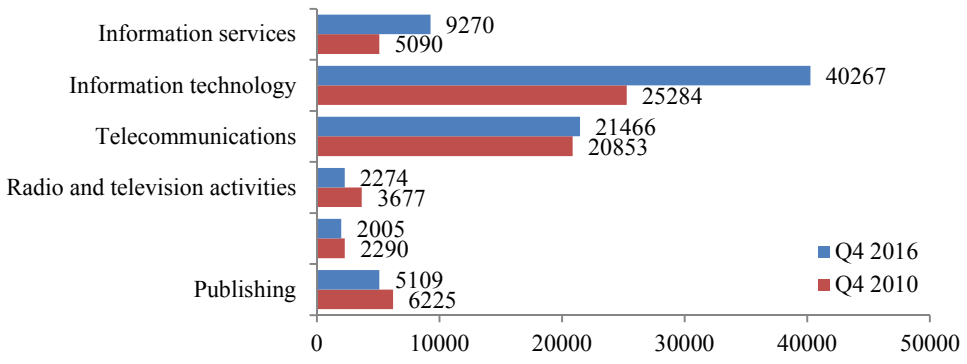


Source: NSI, IME calculations

We see a gradual increase in the number of people employed in **higher value-added manufacturing activities** such as the manufacturing of electrical and machine yard equipment and vehicles and parts thereof. At the same time the number of workers engaged with traditionally low paid activities such as the manufacturing of tobacco products, wearing apparel and leather has been declining. This has lead to a gradual increase in manufacturing wages that has continued to outperform the country average ever since the Q2 2014. The open datasets of the Bulgarian Employment Agency show that there is significant labour demand in the food manufacturing industry that had led to 1.2 times higher-than-average wage offers. Similar trends are observed in regard to stationary plant and machine operators, assemblers, blacksmiths, toolmakers and related trades workers, sheet and structural metal workers, moulders and welders, electrical equipment installers and repairers.

The **ICT sector** has been undergoing an even more clearly visible internal restructuring process. Since Q4 2010 the number of the employed in the broad ICT sector has increased by 27%. What's notable is that 88% of the newly created jobs can be attributed specifically to the **IT sector**. In the last 6 years the number of people employed in this activity increased from 25 to over 40 thousand people. Another significant gain (about 4 thousand jobs, making for an 82% increase in the number of people employed) is also visible in information service activities such as data processing and web portal management.

Figure 31: Number of People Employed in the Bulgarian ICT Sector (Q4 2016/Q4 2010)



Source: NSI, IME calculations

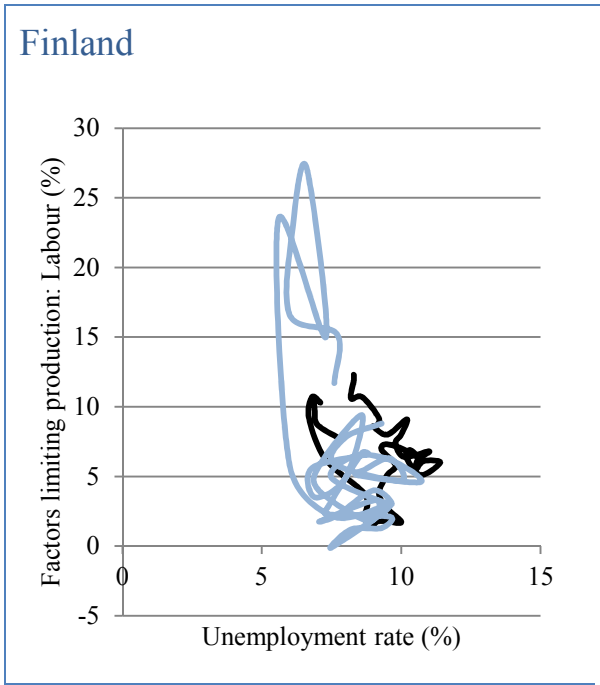
On the other hand, the number of people employed in publishing, programming and broadcast has dropped, while employment in the telecommunications sector overall has remained flat. Since freelancing is widespread in this sector we can confidently assume that both the actual expansion and existing labour shortages are more significant than what the structural business statistics show. Indeed, the results of the first countrywide survey of Bulgarian digital SMEs[84] show that:

- 91% of companies plan to expand their employee base in the next 12 months;
- 32% of companies experience difficulties in finding suitable personnel;
- 72% of companies look for suitable employees by themselves, while less than 10% use HR agencies or other intermediaries;
- 68% of companies outsource activities to freelancers.

At the same time the tertiary education system has been slow to increase the supply of graduates with relevant skills, which has caused the emergence of private sector education initiatives such as the "Telerik" Academy.

5.3 Finland

Figure 32: Beveridge Curve for Finland (Q1 2007-Q1 2017)



Source: Eurostat

The movement of Finland's Beveridge curve in the reference period can be broken down into 3 distinct periods.

The first period saw persistent labour shortages and close to EU-average unemployment rates, but 5-6 pp higher than average employment and economic activity rates amid a slowly decreasing, but still positive net migration rate.

The second period (between 2008 and 2012) was characterized by close to the average rates of labour shortage and unemployment.

The third period (since the beginning of 2013) has been marked by slowly increasing labour shortages despite persistent unemployment numbers. Employment has been slow to recover, but has remained above average EU levels.

Overall Finland's labour market development is in relative equilibrium with EU trends. However, it can be argued that in the years following the crisis the Finnish labour market has displayed that it is somewhat more effective in allocating human resources, as both unemployment and labour shortage have been lower that the EU average, despite higher employment and activity rates.

[84] Economic Development via Innovation and Technology (EDIT). *Bulgarian Digital SMEs: November 2016 National Survey*, 2017

In the years prior to the crisis nominal unit labour costs in Finland outperformed those in most other EU Member States, which put some Finnish businesses at a disadvantage vis-à-vis their international competitors. As a result, weak export performance led to a significant drop in the number of manufacturing jobs – they decreased by 1/5th between 2008 and 2015. This is due to a combination between shrinking working-age population and subdued total factor productivity growth following (in particular) the decline of Finland's electronics and paper industry during the last decade.

This process has resulted in a shift in both the export and the sector structure of employment – away from IT manufacturing into ICT services. A long-term projection by the Finnish Information Processing Association shows that despite the country's traditions in the ICT sector, there will be a shortage of 15,000 skilled ICT workers by 2020.

In 2017 the number of occupations affected by skill shortages in the list published by Ministry of Economic Affairs and Employment increased[85] from 12 to 24. In line with the country-relevant MPOs established by Cedefop, the Ministry's list includes social workers (social work and counselling professionals and home-based care workers) and healthcare professionals[86] (dentists, general practitioners, nursing associate professionals and other medical specialists). Among the other most demanded occupations (outside of social and healthcare workers) are early childhood educators, civil engineers, as well as some low-skilled occupations such as sanitation and construction workers.

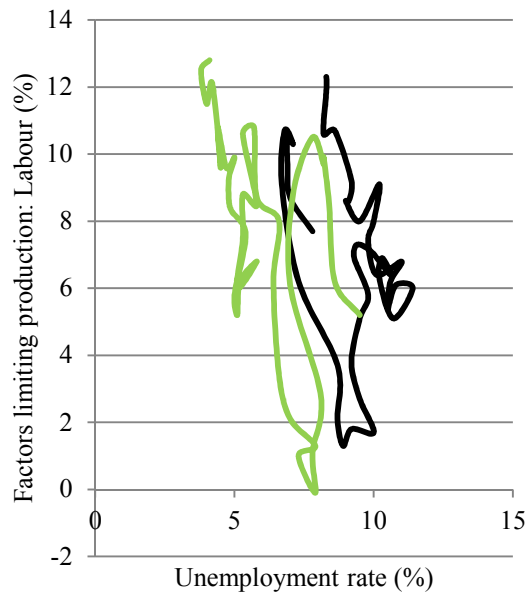
The latest biannual data from the Employment Office's Occupational Barometer shows that there is around a 2-1 ratio between the number of job vacancies and the available dentists, general practitioners and specialist medical practitioners.

These issues have all been well documented and thoroughly analysed in the recently published Government Migration Policy Programme[87]. In recent years the Government has made significant efforts to address some of the existing competitiveness issues, by facilitating the so-called "Competiveness Pact". The Pact foresaw a freeze of wages in 2017 and an extension of annual working hours, combined with a reduction of taxes and social contributions. A 2015 pension reform has also come into force since the beginning of 2017, seeking a gradual increase in the statutory retirement age to 65 years by 2025.

[85] See the press-release of Ministry of Economic Affairs and Employment and Finland's Employment Office Occupational Barometer.
[86] Despite the increase in the total number of occupations affected by skill shortages, as of mid-2017 skill shortages in some occupations that exhibited severe undersupply (such as doctors and surgeons), have decreased.
[87] Ministry of the Interior. *Work in Finland - Government Migration Policy Programme to Strengthen Labour Migration*, Ministry of the Interior Publication 5/2018

5.4 Germany

Figure 33: Beveridge Curve for Germany (Q1 2007-Q1 2017)



Source: Eurostat

In large parts of the reference period the movement of Germany's Beveridge curve is the actual antithesis of average EU trends.

At the beginning of 2007 unemployment stood at 9.5% - the highest among the five reference countries. Unlike EU-wide trends, the crisis period saw a drop in labour shortage that was not accompanied by a rise in unemployment. To the contrary – unemployment continued its gradual decline throughout the period, reaching a low of 3.8% in Q1 2017. For a sustained period between 2011 and 2013 the German labour market saw both unemployment and labour shortage declining.

Labour shortages did not begin to emerge until the beginning of 2014 when unemployment reached around 5%. However, their subsequent rise has been in line with EU trends with 12.8% of enterprises assessing labour as a factor limiting production in Q1 2017.

It has to be noted that both economic activity and employment rates in Germany stand at 4 and 6 pp above average EU levels, respectively, which indicates that existing labour shortages may actually reflect a scarcity of human resources to a bigger extent than skill mismatches.

Our analysis of Eurostat's data seems to support the conclusions of a 2015 study by the Institute for Employment Research (Institut für Arbeitsmarkt-und Berufsforschung, IAB), which argues[88] that while the declining labour supply potential in Germany may lead to skilled labour shortages in the medium or long run, the most pressing issue at present is the lack of labour supply in general[89]. Businesses in practically all economic activities are experiencing a significant decrease in the number of potential workers and a significant increase in the average time that it takes to fill a job vacancy.

Labour shortages are made clearly visible when we look at the data[90]on the average time span during which positions remain vacant, published by the BA (Bundesagentur für Arbeit). It measures the period in which a job cannot be filled, thus causing lost added value for the economy. In addition, the BA measures the number of currently unemployed people, who would consider each vacancy a "target job", based on the German classification of occupations[91] (KldB 2010). This allows them to

[88] Schanne, N. Wapler, R. Weyh, A. *Regionale Arbeitsmarktprognosen. Sozialversicherungspflichtig Beschäftigte und Arbeitslose 2015*, Institut für Arbeitsmarkt- und Berufsforschung (IAB), 2015, p. 2.
[89] See also: Vollmer, M. *Determining Labour Shortages and the need for Labour Migration in Germany: Focus-Study by the German National Contact Point for the European Migration Network (EMN)*, Federal Office for Migration and Refugees, Working Paper 64, 2015
[90] All BA data cited here is from their regular analyses of labour market bottlenecks ("Analyse der gemeldeten Arbeitsstellennach Berufen (Engpassanalyse)")"
[91] The official English translation of the KldB is available at BA's webpage.

calculate unemployed-per-suitable vacancy ratio that provides information virtually inaccessible in other countries.

Figure 34: Job Vacancy Statistics for Germany

Indicator/KldB 2010	Average vacancy length (days)		Number of unemployed per vacancy	
	Dec 2013	Dec 2016	Dec 2013	Dec 2016
Agriculture, forestry and gardening	68	92	613	315
Business services	71	81	292	210
Company management and organization	49	62	1044	541
Construction	88	107	461	287
Food and Hospitality	78	99	446	261
Humanitarian sciences and artists	49	66	606	382
IT and science	93	100	327	255
Manufacturing	92	105	254	153
Manufacturing (Engineers)	99	110	187	124
Medical and non-medical health care professionals	93	113	174	113
Sanitation	66	87	868	421
Security	97	124	1291	585
Trade	74	95	619	327
Transport and logistics	72	94	574	302
Total	79	96	411	251

Source: BA

Both headers in KldB's classification that relate to **manufacturing activities** point to a severe labour shortage resulting in persistent labour market bottlenecks. They are estimated to be among the most affected economic activities both in terms of the time it takes to fill a given vacancy and in terms of the number of people that are actually employable in such occupations. Among the most demanded but difficult to find professionals are those in the fields of plumbing, heating and air-conditioning, manufacturing of leather products, electric technicians, precision mechanics and tool making, manufacturing of electronic components and boards, mechatronics and automations, metal construction and wielding, colour coating and varnishing, wood working, production of building materials and many others.

While the vacancy rate in German **healthcare** has remained below the national average, it has been increasing and is at present the second highest among the five member states – 2.4% in Q1 2017, compared to 2.8% in Bulgaria and less than 1.5% in the other reference countries. In order to address this issue, German healthcare establishments have been attracting medical specialists from abroad, including from Bulgaria and Austria. Between 2010 and 2014 the total number of foreign doctors and healthcare professionals has increased from 25.3 to 39.7 thousand with 8.2% of these additional specialists coming from the two above-mentioned countries. BA's data shows that medical and non-medical healthcare personnel vacancies are the second hardest to fill in terms of the average time it takes (113 days). The number of potential employees per vacancy is 113 people, which is 2.2 times lower than the country average and is the lowest among all economic activities. Despite the reliance on foreign specialists, wages in the sector have also risen faster than the national average, thus revealing the significance of labour shortages on the supply side.

Construction is another economic activity with high job vacancy rate in Germany in the last few years. Ever since the beginning of 2016 it has remained above 3% and has been on an upward trend, thus becoming the 4th hardest to fill occupation in terms of the number of days it takes to close a vacancy (according to the BA). The number of people employed in construction has been increasing, reaching 2.3 million in 2016 in line with growing output and an increasing number of issued building permits[92]. It is interesting to note that traditional seasonal changes in this type of employment have somewhat mitigated as of the last few quarters for which there is data, which may be indicative of more full-time employment opportunities as companies try to hold on to their workers in anticipation of future orders. The BA estimates that as of December 2016 it takes 107 days to fill a vacancy in this economic activity, compared to 96 days on average. Among the specialists in highest demand are floor layers and workers engaged in interior construction and dry walling, insulation, carpentry, glazing, roller shutter and jalousie installation.

Moderate labour shortages have also been present in the **ICT sector**, as well as and **transportation and storage**. Employment in ICT has been fluctuating between 1 and 1.2 million people and wages have been increasing only modestly, probably due to opportunities of outsourcing activities to other countries. As of July 2017 however ICT vacancies rank as the 10th hardest to fill among more than 100 occupations. It has to be noted that while overall ICT vacancy rates are somewhat higher and the number of suitable potential employees is lower (BA estimates), the rise of labour shortage in transportation and storage has been more rapid and visible, especially since the beginning of 2016. Eurostat estimates that as of Q1 2017 the number of job vacancies in these two economic activities is more than 40% higher, compared to the same period of 2016.

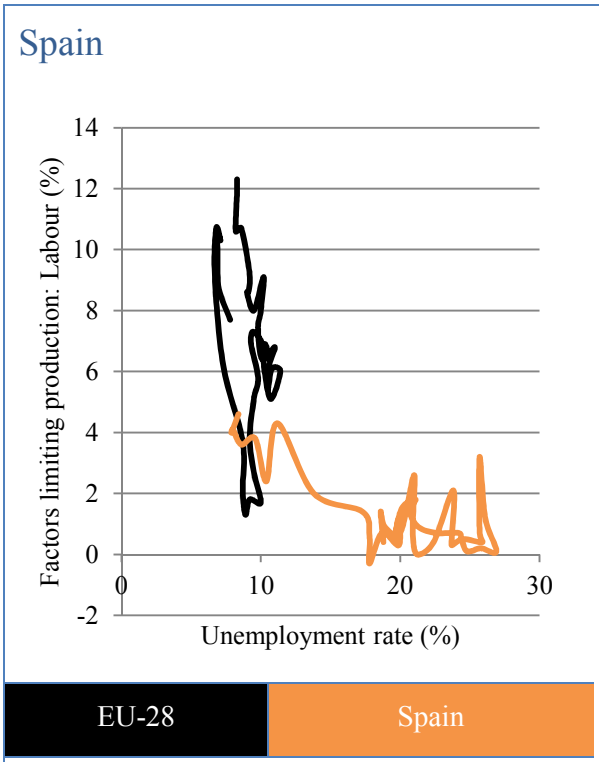
While labour shortages in **accommodation and food services** remain significant (a job vacancy rate of around 4% in Q12017), they have somewhat decreased compared to the 2013-2015 period and are probably caused by relatively low wages (and thus low labour supply), rather than lack of adequate labour. This remains by far relatively the lowest paid economic activity in all five reference countries, including Germany. However, it is in Germany where the spread between the wage in this economic activity and the average wage is largest. Wages in accommodation and food services constitute just 60% of the average German wage, compared to 64% in the country with the second lowest relative share - Bulgaria.

Similar trends of high vacancy rates, but relatively low wages are observed in **administrative and support services**. On a few separate occasions during the last few years the job vacancy rate even surpassed 6%. This is the economic activity that, while being among the lowest paid, has seen the most significant increase in wages during the last decade, outperformed only by the financial and the public sector in Germany.

[92] Additional data may be found at the website of the Federal Statistical Office.

5.5 Spain

Figure 35: Beveridge Curve for Spain (Q1 2007-Q1 2017)



Source: Eurostat

Severe economic disturbances and persistently high unemployment rates during the reference period have turned labour shortages into a non-issue among Spanish enterprises.

The unemployment rate in Spain tripled in less than five years, this shifting the country's Beveridge curve down and to the right as a classical example of the effects that a severe economic downturn can inflict upon labour markets. What's more - while labour market conditions deteriorated, economic activity rates continued rising, thus supporting a further increase of the unemployment rate.

Despite the fact that unemployment has been decreasing since Q2 2013, it remains 10 pp higher than pre-crisis levels, standing at 18.8% in Q1 2017. The long-term projections of the Beveridge curve make it unlikely for significant economy-wide labour shortage tensions to manifest before unemployment drops below 10%.

It has to be noted that with unemployment at such high levels, a lack of labour shortage at the macro level is in no way indicative of a labour market that is free of skill mismatches.

Persistent low vacancy rates in Spain are indicative of what might be considered the initial stages of a long overdue labour market recovery. Since employment bottomed out in the first quarter of 2014 the number of employed persons has increased by nearly 2 million people.

High unemployment levels have meant that hard-to-fill vacancies and labour market bottlenecks (and thus high job vacancy ratios) have been a non-issue for the entirety of the reference period, regardless of whether the economy was losing[93] or creating jobs. The fact that wages in some economic activities have remained almost unchanged since 2010 is also reflective of this dynamic. Spain has seen by far the most negative wage developments in all economic activities among the five reference countries.

Data for job vacancies in Spain is somewhat skewed by the dominant role of the public sector in the provision of job vacancies (economic activities related to "*Public administration and defence; compulsory social security*"). Despite significant cutbacks in public employment as a result of the severe economic and fiscal crisis in the country, this sector has continued to be a major "provider" of officially registered job vacancies. The latter may also be a result of falling nominal wages in public

[93] The vast majority of job losses during the devastating labour market crisis in Spain were for positions held by workers with low or intermediary levels of education – primarily in construction and manufacturing. Many of these jobs were actually held by foreign workers employed during the pre-crisis construction sector boom in the country. See: Jansen, M. et al. *The Legacy of the Crisis: The Spanish Labour Market in the Aftermath of the Great Recession*, Fedea, 2016

sector dominated activities as a result of fiscal measures – causing some people to seek opportunities in the private sector.

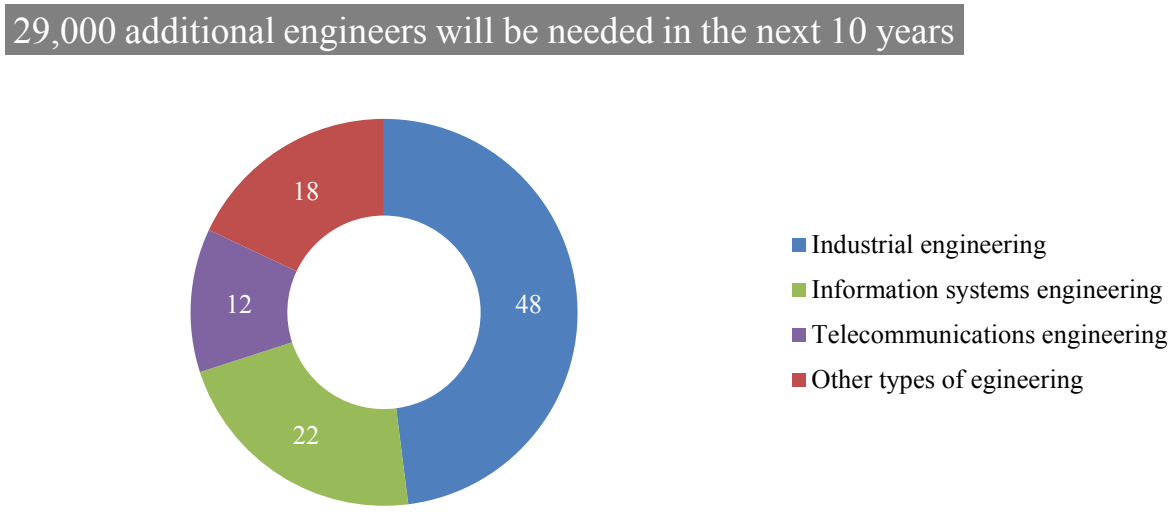
An important characteristic of the Spanish labour market is that a disproportionally large share (close to 40%) of the employees is in temporary employment. The local market is also impacted by the underperformance of some of the most important education-related indicators.

According to Eurostat data, despite recent improvements, the school dropout rate stands at 19% in 2016 and remains almost double the EU average as well as the second highest among Member States. Spain is underway to meeting its Europe 2020 target in that regard (15%), but efforts will have to continue in the following period as well, if the country is to narrow the gap with EU average levels. Spain is also the only EU country in which the share of people aged 17-33 with tertiary education has actually decreased compared to 2008.

According to Cedefop's assessment MPOs in Spain include ICT specialists; engineering and production related, high level, professionals; managerial, sales and shipping related professionals; medical doctors and other health related professionals.

The healthcare-related occupations feature occupations that have registered a continuous increase in the number of people employed in the 2014-2017 period, in line with Cedefop's assessment and over-performing national averages. In the 2014-2017 period the number of physiotherapists and specialized nurses (except midwives) increased by more than 35%, along with other medical specialists (24%) and pharmacists (13%).

Figure 36: Labour Demand for Engineers in Catalonia (%)



Source: AIEC (2017)

Indeed, some of EU-wide trends in regard to job vacancies are also present in the Spanish labour market. For instance, ever since the end of 2014 the only economic activity that has continuously registered a higher-than-average vacancy rate is "**Information and communication**". Ever since Q3 2016 the job vacancy rate in ICT has remained above 1%, reaching a 5-year high of 1.1% in 2017. The number of people employed in a number of ICT-related occupations such as **computer**

programmers; computer network and systems technicians; broadcasting and audio-visual technicians has registered a 45-49% increase in the 2014-2017 period. The main difference between labour market dynamics in Spain and that in most EU countries is that although ICT[94] wages have outperformed the country average, they have nevertheless been stagnating in line with the general situation in the economy.

A recent survey[95] by the Association of Industrial Engineers of Catalonia (AIEC) has pointed out that the local economy alone will require **29 thousand additional engineers**, if its business network is to maintain and improve its competitive position in the next 10 years (Figure 36). These findings are based on a survey that includes 1000 local engineers and 500 local companies and shows that **industrial engineers** (48%) and **information system engineers** (22%) will be the most sought for in the next decade.

[94] Servicio Público de Empleo Estatal (SEPE). *Observatorio de las Ocupaciones: Año Ocupaciones 2017 con Tendencia Positiva en la Contratación*, 2018.
[95] Association of Industrial Engineers of Catalonia. *L'Observatori de L'Enginyeria*, 2017

6. Policy Discussion and Recommendations

While there is plenty of research concerned with the identification and analysis of instances of skill mismatches, literature on policy responses and their effect is scarce. Cedefop points out[96] that copy-paste approaches to transferring policies or measures across countries are rarely useful, because of the specifics of different labour markets, educational systems and institutional frameworks. This is also one of the conclusions of the 2016 Skills Summit[97] in Bergen, Norway under the chair of the country's Minister of Education and Research. They argue for the need of a "whole-of-government" approach which includes both national and regional authorities, supported by social partners, employers and other stakeholders.

At present there are a number of existing national and EU-wide policies that seek to alleviate the negative effects of skill mismatches. The EURES network is a good example of a functional intra-EU tool for addressing one of the main causes of skills mismatches – the information barriers to intra-EU labour mobility. In addition, labour market transparency is supported by monitoring tools such as the European Vacancy Monitor (EVM) and the EU Skills Panorama, while most active labour market policies are being supported by the European Social Fund (ESF) and the European Globalization Adjustment Fund (EGAF), as well as initiatives such as the European Youth Guarantee.

It is of vital importance that policymakers in EU countries successfully determine the factors that impose frictions on the efficient functioning of labour markets. A **regulatory environment that supports the effective allocation of labour resources** and thus facilitates the skill demand and supply matching process is an important prerequisite for the ability of businesses to adopt new technologies, working processes and business models.

This is especially true in the wake of Industry 4.0 – the ongoing transformation in the design, manufacture, operation and service of manufacturing systems and products. The increased economy-wide application of ICT technologies, cyber-physical systems, network communications, big data and cloud computing are bound to change the way that businesses operate and generate value. The EU and its Member States have to make sure that they are well positioned to face these economic and social challenges and make efficient use of their human capital[98]. This can be achieved in variety of ways, among which:

- Adopting policy measures and developing programs aimed at increasing labour mobility across sectors, regions and countries (incl. third countries);
- Further popularisation of VET practices and lifelong learning - since skill mismatches are one of the main reasons for labour market shortages and bottlenecks, increasing the adaptability of the workforce is an essential precondition to reducing these in the future[99];
- Adopting a more sophisticated approach to labour intermediation - the capacity of existing services such as EURES should be further increased by the adoption of a more closely integrated approach to government labour market intermediation services;
- Improved flexibility of labour market regulations;

[96] Cedefop. *Tackling Unemployment While Addressing Skill Mismatch: Lessons from Policy and Practice in European Union Countries*. Luxembourg: Publications Office. Cedefop research paper No 46, 2015.
[97] Isaksen, T. *Skills Strategies for Productivity, Innovation and Inclusion*, 2016 Skills Summit, Bergen, Norway, 29-30 June 2016
[98] Adalet and Andrews (2015)
[99] Eichhorst, W. (2015)

- Structural and administrative reforms aimed at improving the competitiveness of EU enterprises.

Labour shortages are evident but not enough is being done

Our review of EU labour markets has shown **that its smooth operation is hindered by some evident labour market bottlenecks**. Labour shortages are evident not only in the five Mismatch Priority Occupations (ICT and STEM professionals, medical doctors, teachers, nurses and midwives), as identified by Cedefop, but also in regard to occupations that are deemed "surplus" (i.e. in which labour supply should exceed demand). In some cases (such as the migration of healthcare professionals from Austria and Bulgaria to Germany), shortages are due to the outward migration of workers to other Member States where demand is even higher.

In order to answer reduced labour supply, many Member States (among which Austria, Bulgaria, France, Italy, Spain and the UK) have adopted **shortage lists**, consisting of occupations (usually high-skilled ones) in which there are hard-to-fill vacancies. However, targeted migration from third countries is also quite relevant in regard to low-skilled workers in construction (most recently in Finland), agriculture and tourism (Bulgaria). These shortage lists are usually constructed on the basis of evidence of existing labour market bottlenecks (determined via unfilled vacancies and their duration), but in some cases are put under scrutiny by opponents of the free movement of labour.

The **EU Blue Card program** (which is supported in all EU countries except Denmark, Ireland and the UK) is another instrument that has been widely used in order to attract high-skilled specialists. However, certain conditions attached to the provision of EU Blue Card **artificially and unnecessarily compromise its effectiveness**. One such caveat is that foreign workers should receive at least 1.5 times the average gross wage for the accepting country. While few exceptions to this rule do exist, most Member States adhere to this threshold, which limits their ability to attract talent from abroad. While the number of issued EU Blue Cards is increasing every year, it remains relatively small (21 thousand cards issued in 2016). In addition, a staggering 85% of all EU Blue Cards issued so far have been issued by Germany (according to Eurostat) and there are 15 countries in which less than 100 EU Blue Cards have been issued for the entire 2012-2016 period. It is evident that both further popularization of the EU Blue Card program and possibly a revision of some of its general requirements may be necessary if the program is to fulfil its goals. Making Blue Cards easier to acquire may be of particular importance to countries that are net donors of qualified professionals within the EU, such as Bulgaria.

Emphasis on VET and lifelong learning

Automation is an ever more visible trend that can be the source of increasing skills mismatches, since **current and future graduates in various economic sectors may find their skills obsolete**[100] once they enter the labour market. While until recently this was a trend mainly visible in manufacturing, technological developments have made it clear that many service sector jobs are also vulnerable (including agricultural activities, some ICT and even financial service jobs).

[100] Allen, J., De Grip, A. (2007)

Efficient VET practices and their popularization, as well as further emphasis on lifelong learning are key to ensuring cross-sectoral mobility, thus fostering flexibility on the labour supply side in the face of technological advances and increasing international competitive pressures. This is especially true in today's context with both learning methods and skill requirements for different occupations changing rapidly with the emergence of new economic and social trends. Vocational education provides participants with some of the tools necessary to minimize the risk of prolonged labour market inactivity that can have lasting scarring effect on a person's long-term career prospects.

The 2015 Riga conclusions[101], as accepted in the Declaration of the Ministers in charge of vocational education and training, foresaw deliverables in support of this goal., including:

- the promotion of work-based learning;
- the development of quality assurance mechanisms in VET;
- the strengthening of key competences in VET;
- the introduction of systematic approaches and opportunities for professional development of VET teachers, trainers and mentors.

The Riga conclusions also point out the importance of validation mechanisms and include a commitment to "*continue work on implementation of National Qualifications Frameworks, linked to EQF, by embedding also qualifications obtained outside formal education and training systems*". Indeed, while mismatches in terms of skills can be argued to have higher practical significance than mismatches in qualification or education, the latter are still important factors in ensuring the efficiency of formal and informal education and training. The **correct validation of skills**[102] acquired outside of formal education systems can only be supportive of labour mobility, and thus can help alleviate one of the causes of skills mismatches – informational asymmetry. Despite the fact that most National Qualifications Frameworks (NQFs) have yet to reach maturity and full operational status, some assessments[103] show that they have a limited impact on policies and practice. It is important that stakeholders remain committed to the long-term development of these frameworks and that they view them as a continuous process rather than isolated policy initiatives.

Policy induced sources of skills mismatches

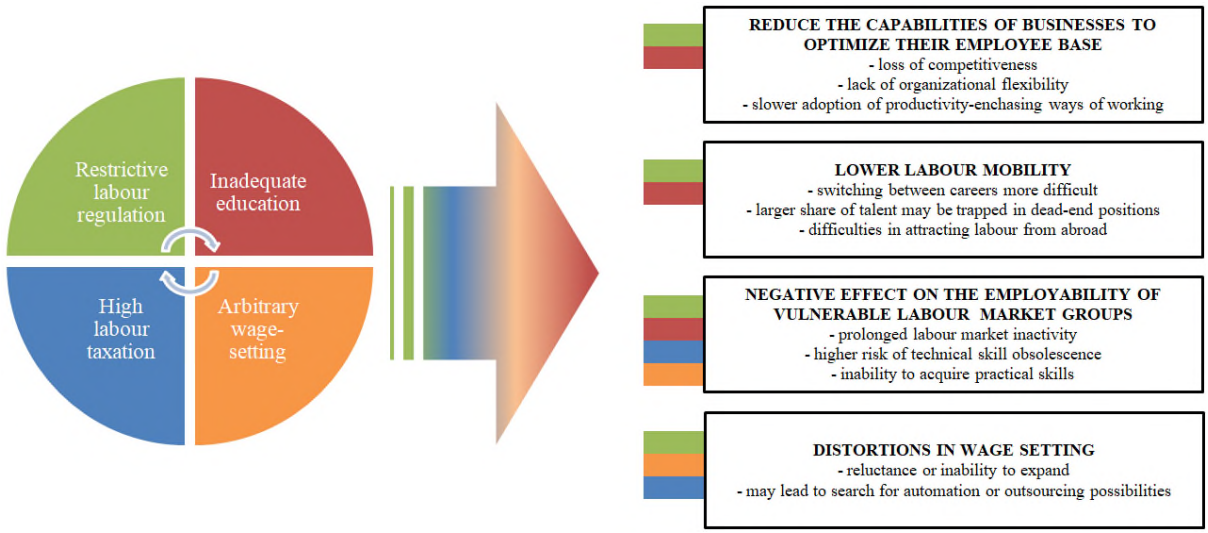
Some of the main policy-induced sources of skills mismatches can be traced back to slow or inadequate educational reforms[104], overreaching labour market regulations, excessive labour taxation[105] and arbitrary wage setting mechanisms[106]. These issues may affect the efficient allocation of labour in a variety of ways:

- They may reduce the capabilities of businesses to optimize their employee base, thus causing loss of competitiveness, lack of organizational flexibility[107] and lower capacity to introduce productivity-enchasing ways of working;

[101] Riga Conclusions 2015
[102] Villalba, E., Bjørnåvold, J (2017)
[103] Cedefop (2018)
[104] Holmes and Mayhew (2015)
[105] ECB (2005)
[106] Implications stemming from the gradual loss of cost-competitiveness (due to rigid wage setting and excessive taxation of labour) have been the main driver Finland's recent tax and labour market reforms.
[107] Gambin et al. (2016)

- They may have a negative effect on the employability of vulnerable labour market groups (including young people), which may lead to prolonged labour market inactivity and thus – higher risk of technical skill obsolescence (in the form of atrophy of existing skills developed during education) or inability to acquire practical skills;
- They may reduce labour mobility, thus making switching between careers more difficult (especially when moving from an unregulated to a regulated industry), which may also result in a larger share of talent that has been trapped in dead-end positions[108];
- They may limit businesses' options in regard to attracting labour from abroad (including third countries) thus forcing them to move productive capital outside of the EU;
- They may lead to distortions in wage-setting mechanisms that make businesses reluctant (or unable) to expand their employee base and instead look for automation or outsourcing possibilities;

Figure 37: Policy Induced Sources of Skills Mismatches



Source: IME

Since all of these issues fall under national jurisdiction, their effects are hard to evaluate on the EU level. However, WEF's Global Competitiveness Index reports[109] show that businesses across the EU perceive them among the problematic factors for doing business.

- **Tax rates** are among the top 5 concerns for all of the reference countries, ranking as a top concern in Spain, as the second most problematic concern in Germany and Finland and the third most problematic concern in Austria. In all of these countries except Spain, **tax regulations** are also viewed as a serious problem.
- **Restrictive labour regulations** rank as a top 5 concern in all countries except Bulgaria, with respondents in Austria and Finland deeming it the most problematic of all evaluated factors.
- **The adequate education** of the labour force is among the top five problems in Austria, Bulgaria and Germany, while Bulgarians also suffer from **poor work ethic**.

[108] Cedefop (2015)
[109] WEF. The Global Competitiveness Report 2016-2017, 2016

Figure 38: Most Problematic Factors for Doing Business in the Reference Countries (% of Companies)

	Austria	Bulgaria	Finland	Germany	Spain
Access to financing	4.0	8.0	10.5	5.3	11
Corruption	0.1	12.9	0.0	2.2	7.4
Crime and theft	0.4	3.2	0.0	2.0	0.0
Foreign currency regulations	0.4	0.9	0.0	2.0	0.4
Government instability	0.1	5.9	1.6	2.4	1.4
Inadequate supply of infrastructure	1.3	9.4	0.5	3.8	2.5
Inadequately educated workforce	6.5	10.9	0.8	11.1	6.1
Inefficient government bureaucracy	21.2	6.5	9.4	12.0	14.0
Inflation	0.5	3.6	0.8	1.4	0.2
Insufficient capacity to innovate	4.3	3.9	8.3	6.3	12.1
Policy instability	2.5	4.7	9.2	5.2	9.1
Poor public health	0.0	1.5	0.0	1.6	0.0
Poor work ethic in national labour force	2.1	9.9	0.3	5.7	3.7
Restrictive labour regulations	23.6	5.6	29.4	10.6	13.2
Tax rates	19.8	8.9	19.1	14.1	14.5
Tax regulations	13.1	4.2	10.3	14.3	4.4

Source: Global Competitiveness Index (2016-2017)

The effect that labour regulation, taxation and wage setting mechanisms can have on the ability of EU economies to efficiently allocate existing labour resources should not be underestimated in the general debate on skills mismatches. It is evident that there are significant differences in the extent to which some of the policy induced factors behind skills mismatches affect EU companies in various Member States. While a country-by-country approach may be required in identifying and addressing most of these issues, it seems evident that the competitiveness agenda has to be brought back to the centre of the economic and industrial policy debate if EU economies are to preserve and expand their international positions.

The study of skills mismatches

While there has been much effort put into the study of skills mismatches, our findings suggest that more should be done:

- An **in-depth mirror study of the ESJS** (a similar study among employers) may be beneficial and even necessary for the further study of skills mismatches; there remains the concern that there is insufficient understanding regarding the actual skill requirements of various jobs, which may lead to ill-informed policy responses;
- The introduction of **longitudinal components** to future skills mismatch surveys (such as the ESJS) can help track both the evolution of skill requirements on behalf of businesses and the development of skills by EU workers;
- The parallels that we draw between data derived from our own survey and the ESJS point to the need of better points of reference that workers and companies can use in order to

determine their own skill level or that of their employees. While this may be difficult to achieve in regard to transversal skills (such as teamwork), it may prove useful in terms of ICT, literacy and numeracy skill levels.

- The **capacity of already in-place services such as EURES should be further increased** by the adoption of a more closely integrated approach to government labour market intermediation services. EURES's dataset should be published as continuously updated **open data**. This would enable more timely and comprehensive analysis of ongoing labour market processes, which may be beneficial to both businesses and policy makers in identifying labour shortages and labour market bottle-necks. In the age of big data, we can see no legal or arguments against such a decision.

References

Association of Industrial Engineers of Catalonia. L'Observatori de L'Enginyeria, 2017

Andrews, D. Cingano, F. Public Policy and Resource Allocation: Evidence from firms in OECD countries. Economic Policy, Issue 74 April.2014, p. 11.

Allen, J., De Grip, A. Skill Obsolescence, Lifelong Learning and Labour Market Participation. Faculty of Economics and Business Administration, Maastricht University, 2007.

Bock-Schappelwein, J. Huber, P. Zur Arbeitsmarktintegration von Asylsuchenden in Österreich, Austrian Institute of Economic Research (WIFO), 2016.

Cedefop. Attractiveness of Initial Vocational Education and Training, Publication Office of the European Union, Research Paper No 39, 2014.

Cedefop. Briefing note - Skill Shortage and Surplus Occupations in Europe, 2016.

Cedefop. Cedefop European Skills and Jobs Survey (ESJS), Wave 1, 1st edition, Thessaloniki: Greece, 2014.

Cedefop. Cedefop Opinion Survey on Vocational Education and Training in Europe, 2017.

Cedefop. European Skills Survey: Key Findings Report, 2015.

Cedefop. National Qualifications Framework Developments in European Countries: Analysis and Overview 2015-16. Luxembourg: Publications Office. Cedefop research paper; No 65, 2018.

Cedefop. Tackling Unemployment While Addressing Skill Mismatch: Lessons from Policy and Practice in European Union Countries. Luxembourg: Publications Office. Cedefop research paper No 46, 2015.

Cedefop. The Benefits of Vocational Education and Training, Luxembourg: Publications Office. Research Paper No 10, 2011.

Cedefop (2017). The Changing Nature and Role of Vocational Education and Training in Europe. Volume 2: Results of a Survey among European VET Experts. Luxembourg: Publications Office. Cedefop research paper; No 64. http://dx.doi.org/10.2801/548024

Chłoń-Domińczak, A., Żurawski, A. Measuring Skills Mismatches Revisited – Introducing Sectoral Approach, IBS Working Paper 03/2017.

Christl, M. Köppl–Turyna, M. Kucsera, D., Structural Unemployment after the Crisis in Austria, IZA Journal of European Labour Studies, 2016.

De Grip, A., Van Loo, J. The Economics of Skills Obsolescence: A Review, 2002.

ECB, Competitiveness and the Export Performance of the Euro Area, ECB Occasional Papers No. 30, June 2005.

Economic Development via Innovation and Technology (EDIT). Bulgarian Digital SMEs November 2016 National Survey, 2017.

EIB, Restoring EU Competitiveness: 2016 Updated Version, Projects Directorate and the Economics Department of the EIB, 2016.

Eichhorst, W. Does Vocational Training Help Young People Find a (Good) Job, IZA (Institute for the Study of Labour), 2015.

European Commission. Country Report Austria 2017, 2017.

European Commission. Employment and Social Developments in Europe (ESDE), Annual Review, 2013.

European Commission. Employment and Social Developments in Europe (ESDE), Annual Review, 2017.

European Commission. Special Eurobarometer 417: European Area of Skills and Qualifications, 2014.

European Innovation Scoreboard, 2017.

Gambin et al. Research to Understand the Extent, Nature and Impact of Skills Mismatches in the Economy. BIS Research Paper №265, Department for Business, Innovation and Skills, January 2016.

Gächter, A. Manahl, C. Koppenberg, S. Determining Labour Shortages and the Need for Labour Migration from Third Countries in Austria, International Organization for Migration (IOM), May 2015.

Holmes, C. Mayhew, K. Over-qualification and Skills Mismatch in the Graduate Labour Market. CIPD Policy Report, August 2015.

Hoeckel, K. Costs and Benefits in Vocational Education and Training, OECD, 2008.

Horn, D. School-based Vocational or Workplace-Based Apprenticeship Training? Evidence on the School-to-Work Transition of Hungarian Graduates, European University Institute, 2013.

Howard, C. Rimini, C. Skills Mismatch 3: Apprenticeship Supply in the European Union, Youth Engagement and the Labour Market, Think Young, 2016.

ILO Department of Statistics. Skills Mismatch in Europe, Geneva, September 2014.

Isaksen, T. Skills Strategies for Productivity, Innovation and Inclusion, 2016 Skills Summit, Bergen, Norway, 29-30 June 2016.

Jansen, M. et al. The Legacy of the Crisis: The Spanish Labour Market in the Aftermath of the Great Recession, Fedea, 2016

Johansen, J., Gatelli, D. Measuring Mismatch in ETF Partner Countries: A Methodological Note, European Training Foundation (ETF), 2012.

Karadeloglou, P et al., Compendium on the Diagnostic Toolkit for Competitiveness, ECB Occasional Paper No 163, July 2015.

McGowan, M., Andrews D. Labour Market Mismatch and Labour Productivity: Evidence from PIAAC Data, OECD Economics Department Working Papers, No. 1209, OECD Publishing, 2015.

McGowan M. et al., The Future of Productivity, OECD, 2015.

Ministry of the Interior. Work in Finland - Government Migration Policy Programme to Strengthen Labour Migration, Ministry of the Interior Publication 5/2018

Nikolov, A. Financing Higher Education: Perspectives for Bulgaria in Light of International Experience. Institute for Market Economics (IME), April 2013.

OECD, 2017 OECD Survey of Austria, July 2017.

OECD. Skills Matter: Further Results from the Survey of Adult Skills, OECD Skills Studies, OECD Publishing, 2016.

OECD, The Future of Productivity, Joint Economics Department and the Directorate for Science, Technology and Innovation Policy Note, July 2015.

Porter, M. The Competitive Advantage of Nations. The Free Press, 1990.

Quintini, G. Over-Qualified or Under-Skilled: A Review of Existing Literature, OECD Social, Employment and Migration Working Papers, No. 121, OECD Publishing, Paris, 2011.

Reymen D. et al. Labour Market Shortages in the European Union, Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy. March 2015.

Schanne, N. Wapler, R. Weyh, A., Regionale Arbeitsmarktprognosen. Sozialversicherungspflichtig Beschäftigte und Arbeitslose 2015, Institut für Arbeitsmarkt- und Berufsforschung (IAB), 2015.

Schumpeter, J. Capitalism, Socialism and Democracy, 1942.

Servicio Público de Empleo Estatal (SEPE). Observatorio de las Ocupaciones: Año Ocupaciones 2017 con Tendencia Positiva en la Contratación, 2018.

Sicherman, N. “Overeducation” in the Labour Market, Journal of Labour Economics, Vol. 9, 1991.

Sloane, P. Overeducation, Skill Mismatches and Labour Market Outcomes for College Graduates. IZA World of Labour 2014: 88.

Villalba, E., Bjørnåvold, J. Validation of Non-Formal and Informal Learning: A Reality in Europe? Global Inventory of Regional and National Qualifications Frameworks 2017. Cedefop, 2017.

Vollmer, M. Determining Labour Shortages and the Need for Labour Migration in Germany: Focus-Study by the German National Contact Point for the European Migration Network (EMN), Federal Office for Migration and Refugees, Working Paper 64, 2015.

WEF. Matching Skills and Labour Market Needs Building Social Partnerships for Better Skills and Better Jobs. Global Agenda Council on Employment at the World Economic Forum (WEF), 2014.

WEF. The Global Competitiveness Report 2016-2017, 2016.

World Bank Group. 2017. Global Economic Prospects, June 2017: A Fragile Recovery. Washington, DC: World Bank. doi: 10.1596/978-1-4648-1024-4. License: Creative Commons Attribution CC BY 3.0 IGO.

Annexes

Annex 1: EURES Job posts by ISCO codes

AUSTRIA

ISCO Code	01.2015	01.2016	01.2017
Total	65,246	71,222	84,080
5223 : Shop sales assistants	4,465	4,940	5,776
5131 : Waiters	4,607	4,776	5,460
9112 : Cleaners and helpers	2,504	2,649	3,591
5120 : Cooks	2,921	3,259	3,556
9329 : Manufacturing labourers nec.	1,526	1,917	2,458
9412 : Kitchen helpers	1,566	1,751	2,085
7233 : Agricultural and industrial machinery mechanics and repairers	1,000	1,262	1,679
7411 : Building and related electricians	1,138	1,199	1,528
9333 : Freight handlers	918	1,203	1,518
3115 : Mechanical engineering technicians	1,369	1,323	1,447
7126 : Plumbers and pipe fitters	1,295	1,202	1,438
7222 : Toolmakers and related workers	1,002	1,036	1,425
7223 : Metal working machine tool setters and operators	1,178	1,143	1,352
4110 : General office clerks	1,051	1,204	1,341
5230 : Cashiers and ticket clerks	926	1,068	1,335
7412 : Electrical mechanics and fitters	918	930	1,185
7231 : Motor vehicle mechanics and repairers	685	844	1,105
5141 : Hairdressers	1,052	919	1,083
7522 : Cabinet-makers and related workers	777	836	1,062
8332 : Heavy truck and lorry drivers	665	721	1,050
7115 : Carpenters and joiners	590	742	1,022
5222 : Shop supervisors	811	896	1,014
3119 : Physical and engineering science technicians nec.	672	900	976
9622 : Odd job persons	606	739	956
3322 : Commercial sales representatives	938	1,040	915

Source: IME calculations, based on EURES data

BUGARIA

ISCO Code	01.2015	01.2016	01.2017
Total	14,093	13,829	18,216
8212 : Electrical and electronic equipment assemblers	0	0	1,262
8153 : Sewing machine operators	0	0	1,223
7533 : Sewing, embroidery and related workers	512	411	845
9622 : Odd job persons	0	0	800
5414 : Security guards	0	0	754
5223 : Shop sales assistants	0	0	721
9329 : Manufacturing labourers nec.	0	0	702
7531 : Tailors, dressmakers, furriers and hatters	690	287	483
8332 : Heavy truck and lorry drivers	162	471	471
7223 : Metal working machine tool setters and operators	285	428	403
9112 : Cleaners and helpers	0	0	331

9321 : Hand packers	0	0	321
7212 : Welders and flamecutters	94	193	297
5322 : Home-based personal care workers	1,345	422	272
7318 : Handicraft workers in textile, leather and related materials	92	107	257
5131 : Waiters	0	0	236
5113 : Travel guides	7	4	215
2330 : Secondary education teachers	0	0	210
5230 : Cashiers and ticket clerks	0	0	207
7222 : Toolmakers and related workers	55	98	192
8322 : Car, taxi and van drivers	54	88	188
5120 : Cooks	0	0	183
2221 : Nursing professionals	0	3	152
8131 : Chemical products plant and machine operators	0	45	134
3322 : Commercial sales representatives	23	6	131

Source: IME calculations, based on EURES data

GERMANY

ISCO Code	01.2015	01.2016	01.2017
Total	1,125,125	1,525,794	2,223,994
3221 : Nursing associate professionals	31,899	95,733	178,853
5223 : Shop sales assistants	9,856	58,970	104,785
7233 : Agricultural and industrial machinery mechanics and repairers	5,377	39,588	90,485
9329 : Manufacturing labourers nec.	6,713	60,845	86,377
9333 : Freight handlers	5,928	50,127	73,461
4120 : Secretaries (general)	813	13,734	61,701
4321 : Stock clerks	3,965	35,832	56,967
4222 : Contact centre information clerks	4,940	40,142	52,725
7411 : Building and related electricians	5,680	31,598	48,281
5322 : Home-based personal care workers	1,728	8,034	44,144
7223 : Metal working machine tool setters and operators	21,176	29,695	44,019
7412 : Electrical mechanics and fitters	38,296	22,971	41,951
7126 : Plumbers and pipe fitters	45,130	37,391	41,502
8344 : Lifting truck operators	18,711	24,293	39,233
7231 : Motor vehicle mechanics and repairers	3,251	25,403	38,364
8332 : Heavy truck and lorry drivers	21,997	35,677	38,161
7212 : Welders and flamecutters	25,525	24,361	37,952
9112 : Cleaners and helpers	1,838	22,122	36,609
5414 : Security guards	3,227	47,549	32,300
3322 : Commercial sales representatives	2,997	27,195	31,821
5131 : Waiters	3,972	23,047	31,513
7522 : Cabinet-makers and related workers	17,895	18,639	24,376
7131 : Painters and related workers	24,767	14,808	23,450
3313 : Accounting associate professionals	11,082	13,356	20,883
5321 : Health care assistants	2,817	22,133	20,609

Source: IME calculations, based on EURES data

FINLAND

ISCO Code	01.2015	01.2016	01.2017
Total	59,843	66,893	75,098

3322 : Commercial sales representatives	6,284	6,671	5,761
5223 : Shop sales assistants	6,159	6,782	5,332
9112 : Cleaners and helpers	1,826	2,520	2,839
5321 : Health care assistants	1,668	1,763	2,755
6113 : Gardeners, horticultural and nursery growers	1,239	1,375	2,230
2221 : Nursing professionals	1,507	1,509	2,105
8160 : Food and related products machine operators	1,258	992	2,054
5120 : Cooks	1,262	1,655	1,960
5131 : Waiters	1,206	1,610	1,724
5244 : Contact centre salespersons	2,023	2,730	1,674
8211 : Mechanical machinery assemblers	916	777	1,612
9412 : Kitchen helpers	964	1,138	1,472
2151 : Electrical engineers	414	1,246	1,426
9333 : Freight handlers	1,187	1,394	1,385
7111 : House builders	407	654	1,226
5322 : Home-based personal care workers	1,029	1,048	1,057
3412 : Social work associate professionals	1,112	1,016	1,012
7411 : Building and related electricians	217	532	925
5153 : Building caretakers	1,257	806	883
5249 : Sales workers nec.	386	556	863
7115 : Carpenters and joiners	360	426	849
8332 : Heavy truck and lorry drivers	320	509	799
9313 : Building construction labourers	284	441	706
4120 : Secretaries (general)	513	623	665
2431 : Advertising and marketing professionals	679	869	643

Source: IME calculations, based on EURES data

SPAIN

ISCO Code	01.2015	01.2016	01.2017
Total	4,862	2,624	3,889
5244 : Contact centre salespersons	161	270	260
3423 : Fitness and recreation instructors and program leaders	163	362	250
3322 : Commercial sales representatives	547	269	187
5249 : Sales workers nec.	448	38	184
4222 : Contact centre information clerks	119	319	164
5131 : Waiters	70	43	140
6113 : Gardeners, horticultural and nursery growers	21	0	117
5113 : Travel guides	171	96	116
3422 : Sports coaches, instructors and officials	26	46	96
5120 : Cooks	60	16	92
7112 : Bricklayers and related workers	15	5	80
9329 : Manufacturing labourers nec.	57	32	59
4110 : General office clerks	49	20	57
2512 : Software developers	122	44	57
8331 : Bus and tram drivers	5	5	56
3221 : Nursing associate professionals	43	7	54
5311 : Child care workers	2	2	54
7413 : Electrical line installers and repairers	154	11	54
7212 : Welders and flamecutters	12	5	53

9313 : Building construction labourers	12	4	47
9112 : Cleaners and helpers	140	29	45
8322 : Car, taxi and van drivers	7	0	43
5322 : Home-based personal care workers	2	0	41
8332 : Heavy truck and lorry drivers	7	8	37
7114 : Concrete placers, concrete finishers and related workers	0	1	37

Source: IME calculations, based on EURES data

Annex 2: Perceived Importance of Skills by Employees and Employers

Q10: Importance of Skills (IME survey: Q10; ESJS: Q21C - Q23_B_8_scale)

weighted average score on the scale from 0 (not important at all) - 10 (very important)

The following charts show the spread between the importance of various skills as perceived by employers (IME data) and employees (ESJS data). For instance, if construction workers think that advanced literacy skills have an importance of 8/10 (i.e. are quite important), but employers think they have an importance of 5/10, the bar is coloured in blue and gets the value of -3.

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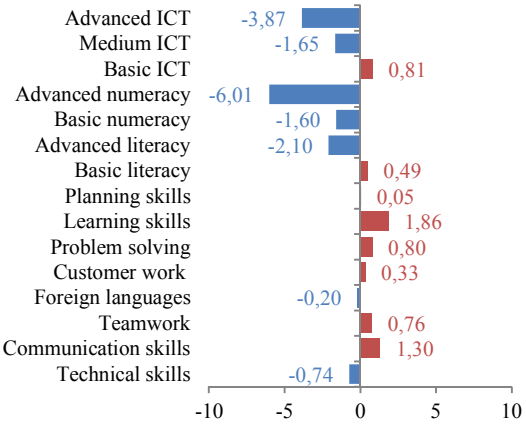
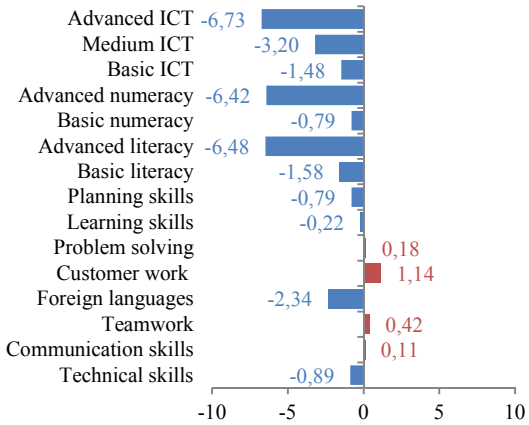
LEGEND

Employers think this skill is less important than the assessment of employees	Employers think that this skill is more important than the assessment of employees

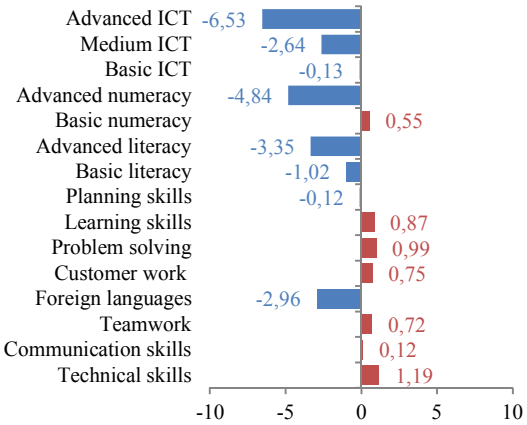
Administration and support services



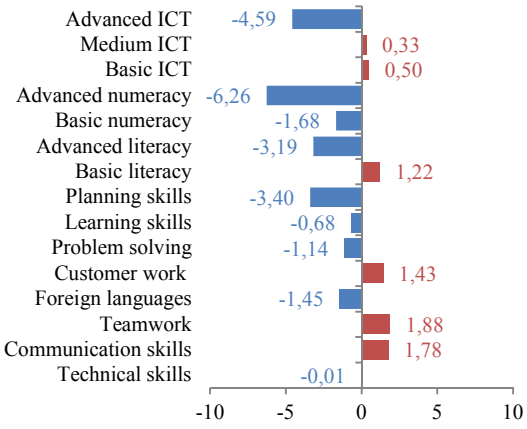
Agriculture, horticulture, forestry or fishing



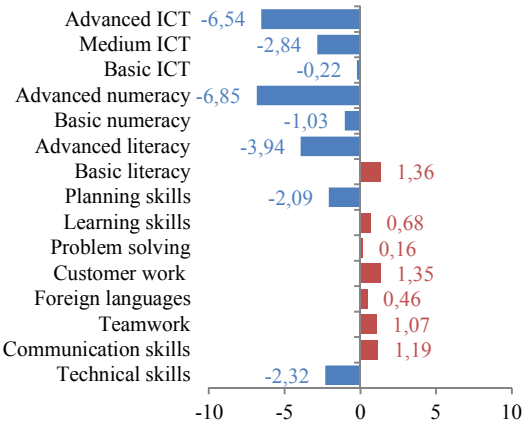
Construction or building



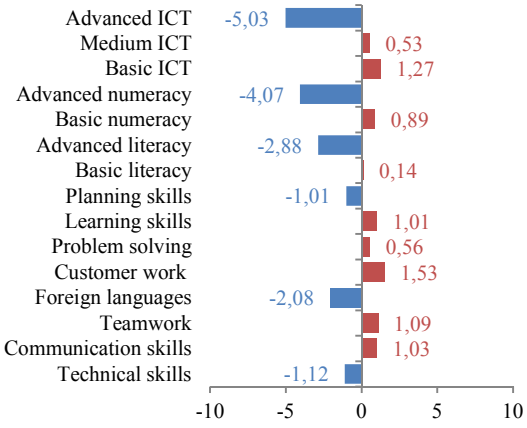
Cultural industries (arts, entertainment or recreation)



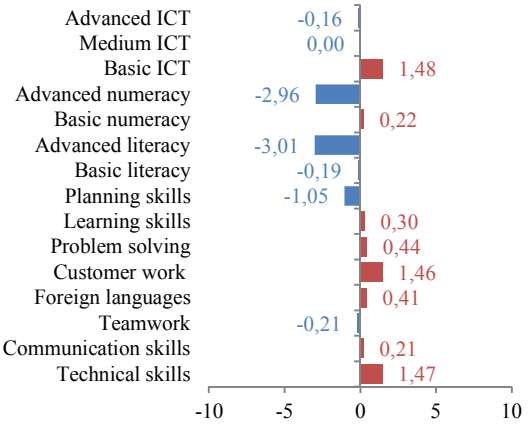
Accommodation, catering or food services



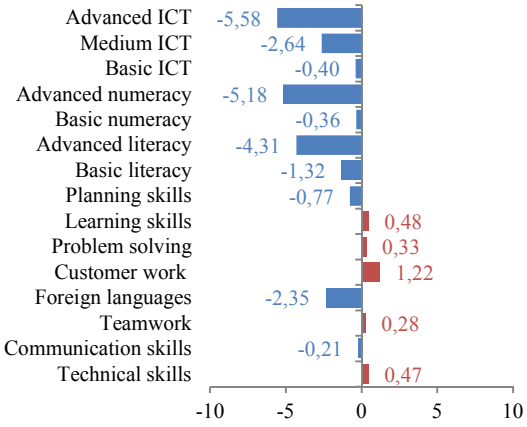
Financial, insurance or real estate services



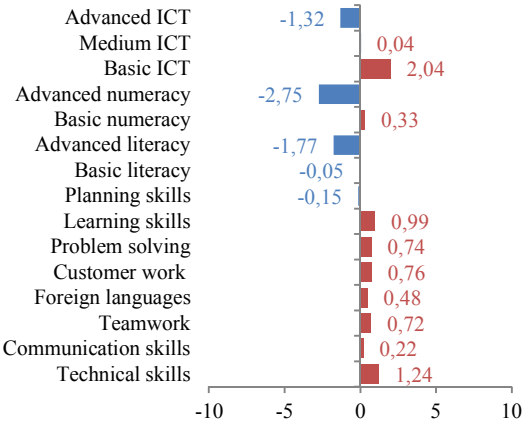
Information technology or communication services



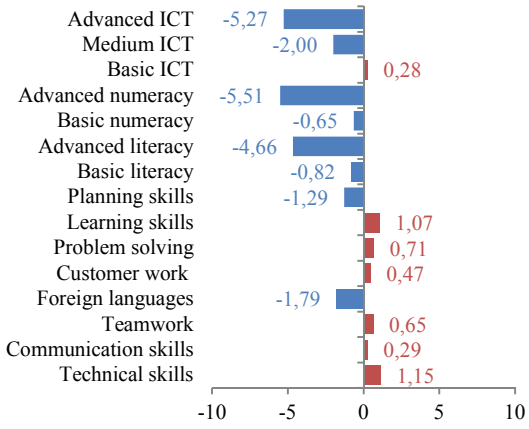
Manufacturing or engineering



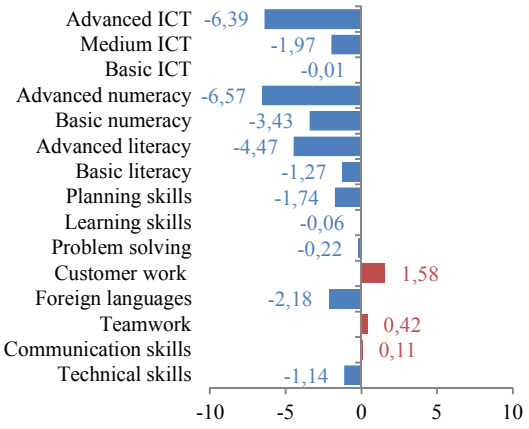
Professional, scientific or technical services



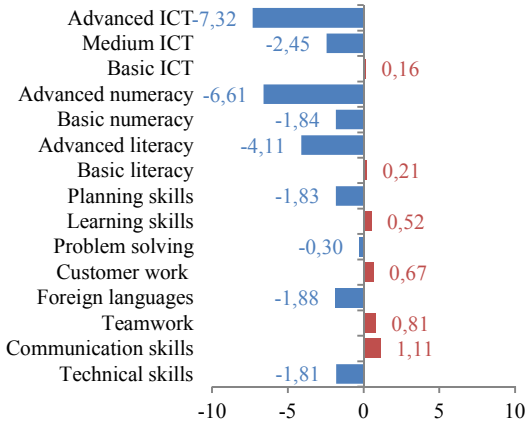
Retail, sales, shop work or whole sale



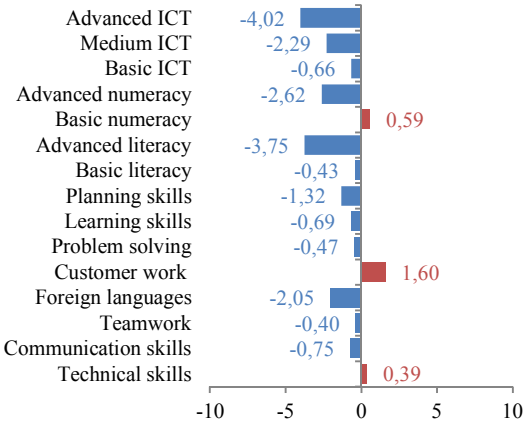
Services relating to education or health



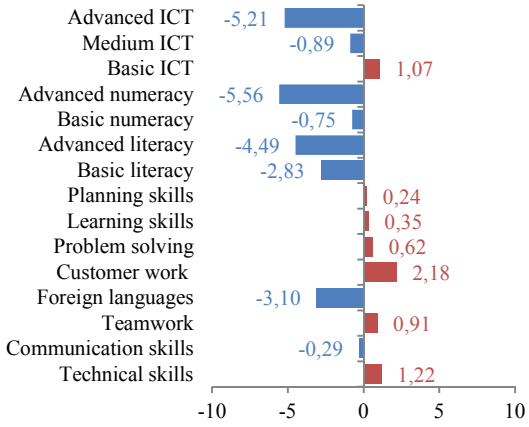
Social and personal services



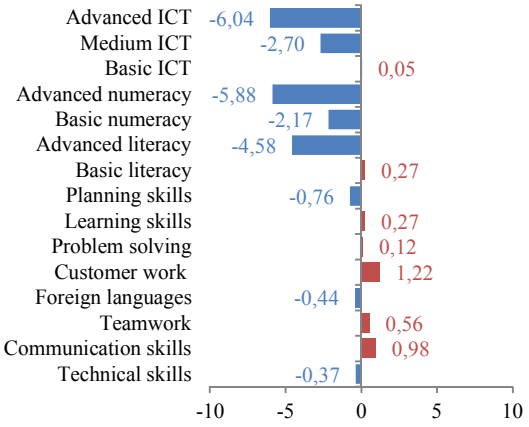
Supply of gas or electricity, mining or quarrying



Supply, management or treatment of water or steam



Transportation or storage



Annex 3: Survey Questionnaire

№	Question	Options
1	**What is your main economic activity?**	…choose from 16 NACE Rev. 2 economic activities
2	**How many people work at your company?**	(1-9; 10-49; 50-99; 100-249; 250-499; 500 and over) / 99 don't know; it varies; not applicable
3	**To what extend are the following statements TRUE or FALSE regarding your company?**	
3.1	It is hard to find the employees we need	0 (TRUE) - 10 (FALSE) / 99 (don't know)
3.2	The people that we interview do not have the right qualification, education or skills	0 (TRUE) - 10 (FALSE) / 99 (don't know)
3.3	We have to provide additional training for our employees	0 (TRUE) - 10 (FALSE) / 99 (don't know)
3.4	We expect finding suitable employees to become increasingly difficult	0 (TRUE) - 10 (FALSE) / 99 (don't know)
3.5	Finding suitable employees used to be easier	0 (TRUE) - 10 (FALSE) / 99 (don't know)
4	**What share of your employees have needed to undergo additional training after they started work at your company?**	(less than 10%; 11-20%; 21-30%; 31-40%; 41-50%; more than 50%)
5	**To what extend do you feel that different age groups are susceptible to skills mismatches in general?**	
5.1	under 24 years	0 (not susceptible at all) - 10 (very susceptible) / 99 (don't know)
5.2	24-39 years	0 (not susceptible at all) - 10 (very susceptible) / 99 (don't know)
5.3	40-54 years	0 (not susceptible at all) - 10 (very susceptible) / 99 (don't know)
5.4	55-65 years	0 (not susceptible at all) - 10 (very susceptible) / 99 (don't know)
5.5	over 65 years	0 (not susceptible at all) - 10 (very susceptible) / 99 (don't know)
6	**What is the average time you need in order to fill-in a vacancy with a suitable candidate?**	
6.1	Plant and Machine Operator and Assemblers	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.2	Building, Crafts or a Related Trade Person	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.3	A Skilled Agricultural, Forestry and Fishery Worker	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.4	A Sales, Customer or Personal Service Worker	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.5	Clerical Support	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.6	A Technician or Associate Professional	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.7	Professionals	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.8	Managers	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
6.9	Elementary occupations	(less than 30 days; 31-60 days; 61-90 days; more than 90 days; don't know/not applicable)
7	**Which concrete positions in your company do you find most difficult to fill in? Please point out up to 5 positions, by using the provided fields.**	
7.1	Position 1	...fill in
7.2	Position 2	...fill in
7.3	Position 3	...fill in
7.4	Position 4	...fill in

7.5	Position 5	...fill in
8	**What do you feel is the significance of the following reasons for skills mismatches**	
8.1	Low quality of secondary education	0 (not significant) - 10 (very significant) / 99 (don't know)
8.2	Low quality of higher education	0 (not significant) - 10 (very significant) / 99 (don't know)
8.3	Low labour mobility across regions, countries and occupations	0 (not significant) - 10 (very significant) / 99 (don't know)
8.4	Hiring and firing workers is too difficult	0 (not significant) - 10 (very significant) / 99 (don't know)
8.5	Low quality of government labour intermediation services	0 (not significant) - 10 (very significant) / 99 (don't know)
8.6	Insufficient traditions in lifelong learning and (re)qualification	0 (not significant) - 10 (very significant) / 99 (don't know)
8.7	Technological development	0 (not significant) - 10 (very significant) / 99 (don't know)
8.8	Rigid wage setting mechanisms	0 (not significant) - 10 (very significant) / 99 (don't know)
9	**Below you can find some of the most widely perceived effects of skills mismatches. How would you rate them in regard to your company?**	…choose
9.1	Limits expansion plans	0 (definitely no) - 10 (definitely yes) / 99 (don't know)
9.2	Slows down innovation	0 (definitely no) - 10 (definitely yes) / 99 (don't know)
9.3	Implies additional expenditures for employee training	0 (definitely no) - 10 (definitely yes) / 99 (don't know)
9.4	Lowers competitiveness	0 (definitely no) - 10 (definitely yes) / 99 (don't know)
9.5	Slows down the hiring of more workers	0 (definitely no) - 10 (definitely yes) / 99 (don't know)
9.6	Forces us to seek automation	0 (definitely no) - 10 (definitely yes) / 99 (don't know)

		Importance of skill	**Perceived current average employee possession of skill**
		0 (not important at all) - 10 (very important) - 99 (don't know/not applicable)	0 (much less than required) - 5 (in line with requirements) - 10 (much more than required) - 99 (don't know/not applicable)
17.1	Basic literacy skills (Reading manuals, procedures, letters or memos)	0-10/99	0-5-10/99
17.2	Advanced literacy skills (Writing long documents such as long reports, handbooks, articles or books)	…	…
17.3	Basic numeracy skills (Using decimals, percentages or fractions, understanding tables and graphs)	…	…
17.4	Advanced numeracy skills (Calculations using advanced mathematical or statistical procedures	…	…
17.5	Basic ICT skills (Using a PC, tablet or mobile device for email, internet browsing)	…	…
17.6	Moderate ICT skills (Word-processing, using or creating documents and/or spreadsheets)	…	…
17.7	Advanced ICT skills (Developing software, apps or programming; computer syntax or statistical analysis)	…	…
17.8	Technical skills	…	…
17.9	Communication skills	…	…
17.10	Teamwork skills	…	…
17.11	Foreign languages	…	…

17.12	Customer work	…	…
17.13	Problem solving skills	…	…
17.14	Learning skills	…	…
17.15	Planning skills	…	…

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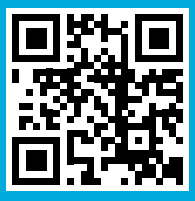

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