Mapping and Analysing Bottleneck Vacancies in EU Labour Markets

Overview report
Final

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Foreword

The aim of the current study has been to identify the top-20 bottleneck occupations on the EU labour markets (per country, in all Member States and including Iceland, Norway and Liechtenstein). Bottleneck occupations should in this context be understood as occupations where there is evidence of recruitment difficulties, i.e. employers have problems finding and hiring staff to meet their needs.

European economies face considerable difficulties due to the 2008 financial crisis and the persistent economic slowdown. There are several important challenges affecting Europe's future labour market: an ageing society requires more effective use of the labour force as fewer young people replace those who retire; rapid technological changes and development; increasing demand for high skilled labour and uncertainty about future growth in the European economies.

Access to proper information on the functionality of the labour market is crucial in order to develop relevant policy measures. Ongoing and earlier studies show that currently not all vacancies in Europe can be filled and many vacancies are filled with over- or underqualified staff, i.e. a so-called skills mismatch on the labour market. While a certain extent of skills mismatch will always exist, as a part of the frictional dynamics of the labour market, persistent or structural mismatches can be detrimental to economic recovery and growth.

This study only examines and presents issues related to the demand side of the skills mismatch equation, i.e. identifying which occupations are hard to fill in which countries, the main sectors concerned as well as reasons for labour shortages. These findings are presented by country in the annexed country fiches.

It is important to note that the study design in itself leads to a risk of "over identification" of bottleneck vacancies. In each study country the research aimed at identifying 20 occupations which were hard to fill, without any means or possibilities of comparing the severity or importance of the deficit between countries or occupations. In short, what was being considered a bottleneck in one country may in another country not be experienced as a bottleneck at all, although a proper comparison would identify identical labour shortages. The focus of the study is therefore at the country level, and the current report mainly presents an overview of the information collected at national levels. When relevant and possible, the results of the current study are compared to other sources and initiatives, such as the European Vacancy and Recruitment Report (EVRR).

Executive Summary

The aim of the current study has been to identify the top-20 bottleneck occupations on the EU labour markets (in all Member States and including Iceland, Norway and Liechtenstein). The outcomes of the assignment are meant to be used for the development of policy instruments for better mitigation of existing bottleneck occupations.

Bottleneck occupations should in this context be understood as occupations where there is evidence of recruitment difficulties, i.e. employers have problems finding and hiring staff to fill vacancies.

Methodology and indicators used to identify bottlenecks

The following indicators were used in the study:

1) **Duration of vacancy filling.** In bottleneck occupations vacancies take a long time to be filled. This can be measured in terms of the time it takes an employer to fill a vacancy.
2) **Past/existing bottleneck vacancies.** In bottleneck occupations vacancies have been hard to fill. This can be measured by employers stating that they found vacancies in an occupation hard to fill. Statements should refer to a recent time period (usually the past year).
3) **Expected bottleneck vacancies.** This can be measured by employers stating they expect vacancies in an occupation will be difficult to fill. Statements should refer to the near future (usually the next year).

Data collection consisted of literature review at national level, where all available sources were examined in order to identify and when possible rank the Top 20 bottleneck occupations in each study country. Most recent research or statistics was used, which in most countries mean 2012 or 2011 data. Earlier studies or research was used to identify trends. The literature reviews at national level were complemented by interviews with key stakeholders in the study countries. The interviews served the purpose of collecting additional information on the relevant bottleneck occupations in the study countries, main reasons for the existence of these bottlenecks and initiatives by employers or other stakeholders at national and regional level to mitigate the existing bottlenecks.

The International Standard Classification of Occupations (ISCO) is a classification system composed by the ILO (International Labour Organization), consisting of a hierarchical code with the most specific classification of occupations at so called 4-digit level. Each 4-digit level occupation belongs to a sub-group at 3-digit and 2-digit level, and there are 9 major 1-digit groups. Its most recent version, ISCO-08, is used in the current study.

The study identified in total 550 bottleneck occupations, at either ISCO 4, 3 or 2-digit level. Given the hierarchical structure of the code, this means that when results are analysed at 2-digit level differ from analysis at 4-digit level, since various 4-digit level occupations belong to the same 2-digit level sub-group. For example if different specific bottleneck occupations are identified at ISCO 4-digit level that all belong to the same ISCO 2-digit occupational group, this occupational group will not be in the top at 4-digit level, but it will be at 2-digit level.

The study aimed to rank the bottleneck occupations at a country level, but due to lack of data this has not always been possible. Therefore the overview at European level has been based on assigned values, depending on available ranking at country level. This means that for bottleneck occupations where rank was available, the aggregated rank tend to be higher overall.

Specific bottleneck occupations differ across the EU

Among specific occupations Cooks was the only bottleneck occupation to be identified in a majority of countries, and was relatively high ranked in the countries. The other top-20 specific occupations were reported as a bottleneck in about one fifth to a third of the countries, with the exception of health care assistants (rank 20), which was reported in only three countries.

Top 20 bottleneck vacancies at ISCO 4-digit level European level

Rank	Specific Occupation	Number of countries reporting bottleneck vacancy
1	Cooks	17
2	Metal working machine tool setters and operators	9
3	Shop sales assistants	6
4	Nursing professionals	10
5	Heavy truck and lorry drivers	8
6	Welders and flamecutters	10
7	Mechanical engineers	9
8	Software developers	9
9	Specialist medical practitioners	10
10	Carpenters and joiners	11
11	Commercial sales representatives	6
12	Electrical engineers	8
13	Waiters	7
14	Civil engineers	6
15	Systems analysts	7
16	Primary school teachers	6
17	Plumbers and pipe fitters	8
18	Accountants	7
19	Building and related electricians	6
20	Health care assistants	3

When looking at the results of the study by "zooming out" from specific occupations to occupational groups[1], the pattern changes somewhat. Specific occupations within the top 5 occupational groups were reported as a bottleneck by a majority of the countries and concern various occupations within metal and related trades workers, science and engineering, IT and health professionals and construction workers.

[1] Each specific occupation belongs to an occupational group, for example Cooks belong to the group "Personal service workers" and "Specialist health practitioners" belong to "Health professionals".

Top 20 bottleneck vacancies at ISCO 2-digit level European level

Rank	Occupational group	Number of countries reporting	Number of bottleneck vacancies reported
1	Metal, machinery and related trades workers	23	53
2	Science and engineering professionals	22	48
3	Information and communications technology professionals	20	47
4	Health professionals	21	45
5	Building and related trades workers, excluding electricians	18	41
6	Personal service workers	22	32
7	Science and engineering associate professionals	14	29
8	Sales workers	13	14
9	Drivers and mobile plant operators	16	21
10	Food processing, wood working, garment and other	12	20
11	Teaching professionals	12	17
12	Business and administration associate professionals	13	15
13	Business and administration professionals	11	17
14	Electrical and electronic trades workers	12	15
15	Stationary plant and machine operators	9	13
16	Cleaners and helpers	8	8
17	Refuse workers and other elementary workers	5	6
18	Personal care workers	6	9
19	Administrative and commercial managers	6	11
20	Agricultural, forestry and fishery labourers	3	5

A shortage of skilled manual labour despite the economic crisis

Bottlenecks vacancies occur not only in growth occupations, but also in occupations with declining employment, as well as occupations with high replacement demand and an aging workforce. Although there are many similarities with other recent analyses of EU labour market trends, the main specificity uncovered by this study the prominent place of skilled manual occupations in the Top-20 above, which is less visible in European Vacancy and Recruitment Report[2]. Sectors like manufacturing and construction are still faced with bottlenecks, although these activities were worst affected by the crisis. This was an unexpected result in the study, and the paradox cannot be fully explained by the findings. Some possible explanations are that the crisis has made work in these types of activities less attractive (less certainty about work) and the ongoing replacement demand which leads to shortages.

Two thirds of vacancies persisted throughout the crisis

Based on the number of years the bottleneck is reported about two thirds of the bottleneck vacancies reported can be regarded as structural, as the bottlenecks have existed in 4 or 5 years during the period 2008-2012. More rigidity in the supply of skills can be found in narrower occupational groups. For most occupational groups the trend is in general stable to increasing, indicating that bottlenecks are persistent. This raises a question mark on the effectiveness of national efforts to address bottlenecks and better align skills supply to the needs on the labour market.

[2] http://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=7267&type=2&furtherPubs=yes

Manufacturing, construction and health are worst affected sectors
From the point of view of the sectors confronting bottlenecks, Manufacturing, Construction, Health, Tourism, IT, Commerce, Transport, Professional, scientific and technical activities, Financial and insurance activities and Education are the economic activities which are most affected. In manufacturing, Construction and Transport recruitment difficulties are at skilled manual level while in most other activities high skilled labour are more problematic to fill(Education, Professional, scientific and technical activities, Financial and insurance activities, ICT and Health).

Skill shortages main reason for bottlenecks
Skills shortages are the main reason for most of the bottlenecks occupations. The data also suggest a relation with skill level: a lack of skills is reported for most high skill level occupations, while the role of working conditions is of higher importance at lower skill levels.

Gender has and impact on labour shortages
For around 35% of the reported bottleneck occupations the job image is not considered gender neutral which narrows the potential workforce. The data show that this is especially the case for occupations at skilled manual level and for personal care workers, as well as for science and engineering associate professionals. For other bottleneck occupations gender is reported to be less relevant.

Regional or localised bottlenecks more often identified in high skilled occupations
Regional disparities were more often identified for high skilled and elementary occupations and to a lesser extent for skilled manual occupations. Bottlenecks for teaching professionals, health professionals, as well as cleaners and helpers, and sales workers are regarded to be partly related to regional. imbalances.

Detailed picture across main occupational groups
For each occupational group figuring in the Top 10 ranking, the study looks closer at the occupational groups in terms of countries with bottlenecks in the occupational group, specific occupations per country, main sectors concerned, main reasons as well as initiatives taken by employers to overcome recruitment problems. The analysis of occupational groups also presents examples from the country research.

Among occupational groups there are clear differences between how employers work to mitigate recruitment problems. While recruitment abroad is relatively common among health professionals, it is less used to recruit science and engineering professionals. Among the skilled manual occupations, employers mainly cope by providing training and development to existing staff, and to a limited degree on labour mobility.

Conclusions of the study and recommendations for EU action
Based on the findings in the study, there is a clear role for action at EU level, aimed at promoting labour mobility and migration in general and in specific bottleneck occupations in particular. EU action in the field of mobility should address barriers to free movement and reduction of transaction costs. EU action could also be feasible concerning training and education, for instance through dedicated actions funded by the European Social Fund (including accompanying rules concerning target groups, etc.).

At an aggregated level a majority of the countries in the study are faced with bottlenecks in the same occupational groups (especially within the top-5 at ISCO 2-digit level). However, when zooming in to specific occupations (at ISCO 4-digit level) there are no Europe wide shortages of labour. Interview evidence suggests that

bottlenecks can be more specific than 4-digit level, for specialisations within the occupations (notably cooks, nurses etc.).

These findings indicate that there are structural shortages at EU level, which should be a priority for EU level policies. When trends differ between countries, mobility can offer a good opportunity for reducing bottlenecks. This concerns especially occupational groups within the top 5 at 2-digit level. Mobility schemes could add value in this respect, but they should be narrowly defined, preferably at ISCO 4-digit level (or even more specific). For instance ICT professionals, one of the top 5 bottleneck occupational groups, schemes should be oriented to occupations within the 4-digit groups "Software developers" and "Systems analysts", which are both within the top 20 bottleneck vacancies at 4-digit level.

Solid information on mitigation strategies at national level was rarely available, or had little documented effect. The available information indicates that actions are being taken at different levels (national, region, activity/sector, company), mainly in line with each stakeholders' responsibility and interest, with limited overall coordination at national level.

The findings in the study show that there is clear need to re-orient educational and training systems at national level, bringing students choices and adult training more in line with labour market needs. Policies influencing working conditions and wages for the low skilled segment of the labour market can also address some of the structural shortages.

In the short term young people should be the main target group, as they are often more (internationally) mobile, more affected by unemployment, and on average have better language skills. Coordination of activity in this respect is necessary in order to prevent boom- and bust policies of over-orienting people towards the same occupation or region.

It is the recommendations of the study that more specific EU action could be primarily focussed on:

- Targeted mobility schemes
- Further improvement of labour market intelligence
- Reinforcement and improvement of EURES activities
- Further reduction of barriers to labour mobility
- Policy in the field of labour migration (third country nationals)
- Coordination of activities at national (and regional) level

Introduction

This document constitutes the final overview report of the study "Mapping and Analysing Bottleneck vacancies on the EU Labour Market". It consists of a presentation and analysis of common features and differences of national labour markets and the existence of bottleneck vacancies.

This is done by reporting, firstly, on the main trends in bottleneck vacancies through an analysis of the top-20 bottleneck vacancies in the study countries, accompanied by analyses of the developments in bottlenecks over time and of the skills levels that the bottlenecks are concentrated on. In order to check the results for consistency and validity, ranking is done based on ISCO 2-digit occupational groups as well specific occupations at ISCO 4-digit level.

This is followed by a description of the top-10 occupational groups (ISCO 2-digit level), where bottlenecks have been identified in the study countries. For each of these occupational groups the specific occupations concerned are listed, together with the countries where these bottlenecks are present and their rank in the countries. Furthermore, the main sectors concerned are presented as well as the main reasons for the existence or emergence of the bottlenecks within these specific occupations are described in more detail. Lastly, main initiatives taken by employers to mitigate labour shortages are presented.

The outcomes of the assignment are meant to be used for the development of policy instruments for better filling bottleneck vacancies. In the last section of the report, recommendations are presented to this end.

Objective and Scope

The study covers all EU Member States (including Croatia), plus EEA countries Norway, Liechtenstein and Iceland, in total 31 countries (hereinafter referred to as "study countries").

The outcomes of the assignment are meant to be used for the development of policy instruments for better filling bottleneck vacancies.

In order to attain the overall goals, the aims of this assignment were to:

- Clearly define and identify bottleneck vacancies on EU level and country level
- Provide reliable information on the reasons of the existence of bottleneck vacancies
- Map existing national policies, programmes and projects dealing with bottleneck vacancies.

Definitions and Methodology

In the following we briefly outline the definitions and methodology used when carrying out the study.

During the inception phase, the study team carried out a literature review of 37 recent reports and studies published by EU institutions in order to discuss the existing definitions of bottlenecks, to identify relevant indicators and to gain an overview of the existing knowledge within the area.

The definitions that could be derived from the literature review, and in particular the European Vacancy and Recruitment Report (EVRR)[3] provided for general definitions of job vacancies and bottleneck vacancies.

[3] European Commission: European Vacancy and Recruitment Report 2012, November 2012.

As defined by Eurostat a **job vacancy** is

"a paid post that is newly created, unoccupied, or about to become vacant:

- for which the employer is taking active steps and is prepared to take further steps to find a suitable candidate from outside the enterprise concerned; and
- which the employer intends to fill either immediately or within a specified period of time."

A vacant post that is only open to internal candidates is not treated as a 'job vacancy'. The stock of job vacancies is the number of job vacancies measured at a certain point in time."[4]

Bottleneck vacancies are defined as vacancies that are hard to fill. Existing vacancies can be broken down by occupations. A **bottleneck occupation**, defined in the EVRR as an occupation "for which there is evidence of recruitment difficulties"[5], can thus be seen as an occupation where vacancies are hard to fill.

It was the assessment of the study team that while the existing definitions and indicators provided a starting point for the analysis of bottleneck occupations, they did not form a sufficient basis to generate valid information for all countries included in the analysis. Instead, it was deemed necessary to gather data on the national and regional level following an iterative and inductive approach.

During the inception phase, the study team created an operational definition of bottleneck occupations, according to which bottleneck occupation can be defined as occupations which fulfil one or more of the following criteria:

1. where vacancies take a long time to be filled
2. for which employers state difficulties filling vacancies (either in the past or expected in the near future)
3. few unemployed (compared to other occupations) are available to fill vacancies
4. where the number of vacancies increases (remains stable/decreases) while the number of job-finders remains stable (decreases/decreases to a greater extent)

Points 1 and 2 provide the clearest evidence of a bottleneck, as they represent direct indicators of bottlenecks whereas the other points only provide an indirect indication of bottlenecks. In order to move beyond the results presented in the EVRR, the research and analysis in this study are focused on direct indicators of bottlenecks. To this end, the following indicators were selected to be used:

1. **Duration of vacancy filling.** In bottleneck occupations vacancies take a long time to be filled. This can be measured in terms of the time it takes an employer to fill a vacancy.
2. **Past/existing bottleneck vacancies.** In bottleneck occupations vacancies have been hard to fill. This can be measured by employers stating that they found vacancies in an occupation hard to fill. Statements should refer to a recent time period (usually the past year).
3. **Expected bottleneck vacancies.** This can be measured by employers stating they expect vacancies in an occupation will be difficult to fill. Statements should refer to the near future (usually the next year).

Key data collection consisted of a literature review at national level, where all available sources were examined in order to identify and rank the Top 20 bottleneck occupations in each study country. The literature reviews at national level were complemented by interviews with key stakeholders in the study countries. These

[4] EVRR, p. 15.
[5] EVRR, p. 74.

interviews served the purpose of collecting additional information on the relevant bottleneck occupations in the study countries, main reasons for the existence of these bottlenecks and initiatives by employers or other stakeholders at national and regional level to mitigate the existing bottlenecks.

All data collected in the study countries was filled in an online database, which consists of two separate entries, one related to overall information of data collected and approach used to identify bottleneck vacancies and a second part which contains information on the identified bottleneck vacancies, including required analysis regarding sectors, reasons and mitigation strategies. In order to enable the comparison and categorisation of data, the online database consisted of several pre-defined standardised categories for data input, including regions, sectors, occupations, reasons for bottleneck vacancies, mitigation strategies and mitigation policies, developed during the inception phase.

Based on the online database, a country fiche was developed for each Member States, stating the key findings, methodology and data sources, and ranking the top 20 bottleneck occupations (when possible). These country fiches are annexed to this report.

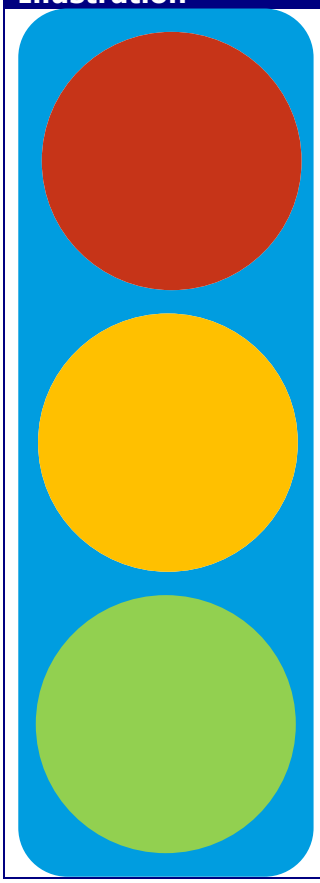
Data availability and methodology

Fieldwork has been conducted in all countries included in the study.

The data availability and reliability differ greatly from one study country to another (see Annex 1 - Overview of data availability and quality for more specific info). In several Member States relevant literature and statistics on bottlenecks are available, and where such data has not been available, the situation has been mitigated through the use of qualitative interviews. The quality of the data available differs however from one study country to another.

In order to provide a clear picture of the quality of the data, a data quality indicator has been included in the country fiches, indicating either good (green), medium (yellow) or scarce (red) quality of data. This is illustrated in the figure below.

Figure 1 Data quality indicator

Illustration	Label	Criteria
	Scarce data	No available data/very poor quality data exist on direct indicators (employer survey and/or vacancy duration) ▪ Results based solely on interviews
	Medium data	Good/fair quality data exist on direct indicators (employer survey and/or vacancy duration), but following criteria not fulfilled (partly or fully): ▪ Data is recent (2012 or 2013) ▪ Data enables ranking of bottleneck vacancies ▪ Data is available at ISCO 4-digit level or equivalent ▪ Data covers all/most sectors
	Good data	Good quality data exist on direct indicators (employer survey and/or vacancy duration): ▪ Data is recent (2012 or 2013) ▪ Data enables ranking of bottleneck vacancies ▪ Data is available at ISCO 4-digit level or equivalent ▪ Data covers all/most sectors

The study team has found analytically strong data in 9 of the study countries. For example in several of the Nordic countries, employer surveys are carried out on a regular basis, providing up-to-date and reliable information on vacancies that are hard to fill.

In 11 study countries, the findings are considered to be of medium strength. In some of these countries, representative, highly reliable and valid data is only available on ISCO 2-digit level, this is the case for example in Poland, where it is assessed that bottlenecks have not been a political issue so far. In Germany, the national representative data on vacancies was not easily translated to the ISCO-08

classification and could not be ranked. In these cases the assessment of the bottleneck occupations has been partly qualitative, which means that the developments of the bottlenecks over time are only based on estimates and an accurate ranking has not been possible.

In the remaining countries, data is assessed to be scarce and of limited quality. In most instances, the findings in these countries are based purely on interviews. This has been either due to lack of data, which is the case in Slovakia and Slovenia (no available literature, and no interviewees willing or able to express an opinion), or because no or only few bottleneck vacancies seem to exist (mainly in small countries, such as Luxembourg, but also Spain).

The majority of the analysis in this report is based on data from 29 study countries, excluding Liechtenstein and Luxembourg, due to the risk of over representativeness of the bottlenecks (Liechtenstein) or due to the lack of data (Luxembourg).

Out of the 29 countries included in the overview, it has been possible to rank the bottleneck occupations identified in 18 countries[6]. The method of ranking differs; the most common sources were employers' surveys and data from Public Employment Services (PES).

Table 1 How ranking was done at country level

Countries	How ranking was done		
	Supply - demand ratio	Employer's survey	Other ranking
Austria	■		
Belgium			■
Croatia		■	
Cyprus			■
Czech Republic	■		
Denmark		■	
Finland			■
France		■	
Hungary		■	
Italy		■	
Latvia			■
Norway		■	
Poland		■	
Portugal			■
Romania			■
Slovakia		■	
Sweden		■	
United Kingdom		■	
Total	**2**	**10**	**6**

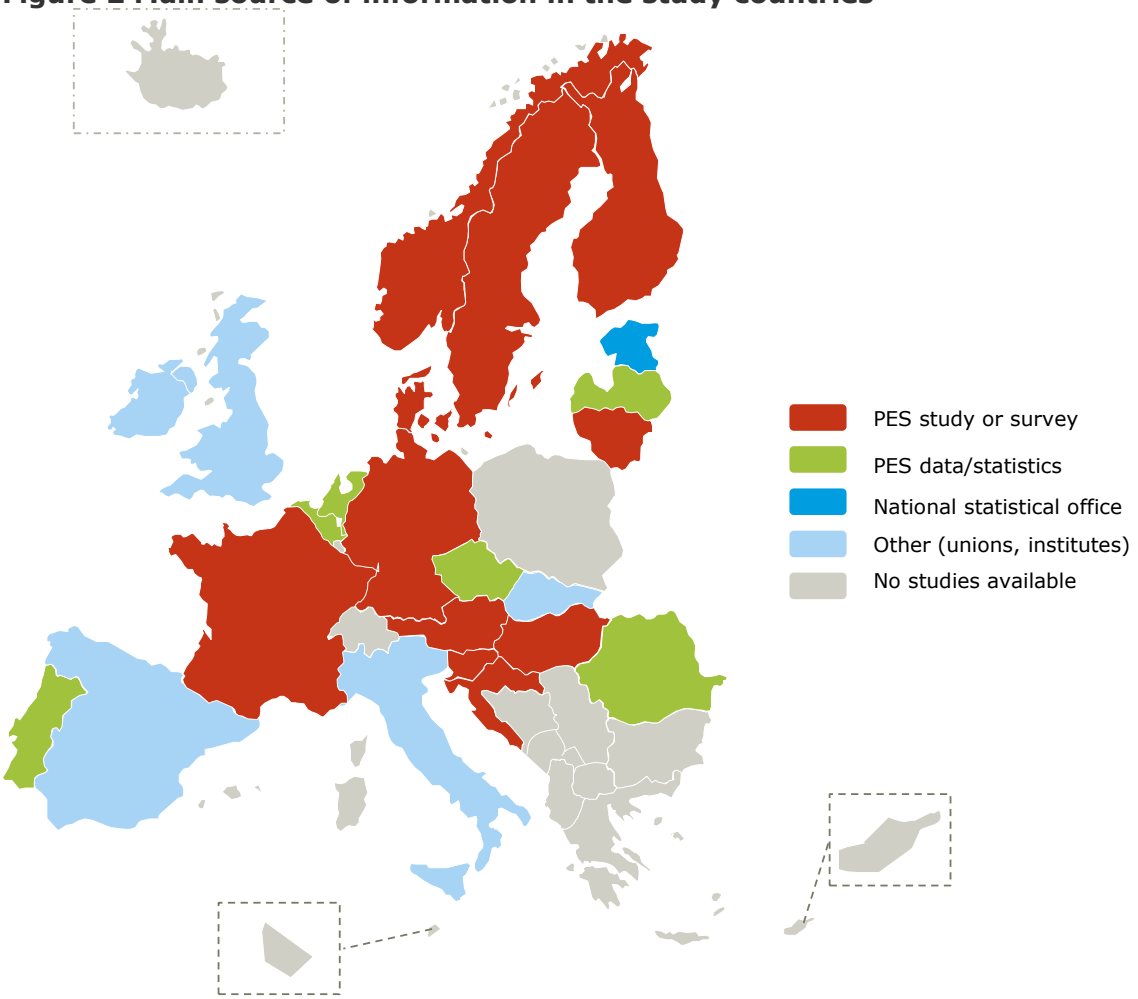
The other rankings used relate to either qualitative or ranking by triangulation (using different sources to verify results, for example in Romania and Cyprus) or to duration

[6] In the Netherlands a ranking consisting of high, medium and low was developed based on supply/demand ratio. This is not comparable or compatible with a ranking of 1 to 20, therefore the Netherlands has not been included in the table above.

of vacancy (often ranked by number of vacancies and/or duration of posting in Belgium, Finland, Latvia and Portugal).

The sources of data and studies consulted vary throughout Europe, with the Public Employment Services being the main provider of information on hard to fill vacancies. In 16 out of the 29 countries, studies and/or data from PES was used to identify the main bottleneck vacancies, as can be seen in the illustration below.

Figure 2 Main source of information in the study countries



Most commonly it is the Public Employment Services who conducts employer surveys on a periodic basis (yearly or more frequently). PES data/statistics are generally based on analysis of the stock of vacancies in the PES data base, and more specifically the time a vacancy remains posted (and a few on the vacancy/unemployed ratio). It should be noted that the "threshold" used when looking at vacancy duration varies between 3 months and 6 months, which arguably can have an impact on the identified bottlenecks at country level. While employers' surveys often cover most of the labour market, the PES data on vacancies often have the drawback of incomplete coverage of sectors, with mainly low skilled and/or manual occupations being registered with PES, thus it may have affected results in some of the countries using PES data/statistics to identify bottleneck occupations.

In Annex 1 a complete overview is given of the data used in each country, with assessment of data quality and explanation of how ranking has been done (when possible).

Main trends in Bottleneck Vacancies on EU Labour Markets

The following sections present an overview of the top-20 bottleneck occupations identified in the study, at a European level.

It is important to note that the data collected in the study concern a selective sample, as for each country the 20 occupations with most difficulties in recruitment have been collected. This would not pose a challenge, if all study countries experienced similar problems in recruitment, but that is not the case. Therefore, for any given occupation identified as a bottleneck in this study, data at European level will be incomplete as indicators differ as well as the magnitude of labour market problems.

A complete European overview of vacancies and indications for bottlenecks are provided by the European Vacancy Monitor. This study provides more details of the structural problems already identified in the monitor. Combining the available data from different countries provides a picture that differs according to the level of aggregation. In total 550 bottleneck vacancies are reported, comprising 188 occupational groups at ISCO 4-digit level, 33 at ISCO 3-digit level and 19 at ISCO 2-digit level. When results are presented at 2-digit level, various bottlenecks reported at 4-digit level belong to the same ISCO 2-digit occupational group. So, an occupational group at ISCO 4-digit that is reported by the majority of countries will be in the top 20 at every level. But if only a few countries report various occupational groups at ISCO 4-digit level that all belong to the same ISCO 2-digit level, this occupational group will not be in the top at 4-digit level, but it will be at 2-digit level.

The main bottleneck occupations are then the ones that have both characteristics (many occupational groups within a specific ISCO 2-digit group and many countries reporting this bottleneck). Although such aggregated groups are not always homogeneous (doctors and nurses for instance in health professionals) it indicates general difficulties in some specific activities.

The approach does not take into account other relevant differences between the labour markets of the various countries. Countries differ in size and in employment structure, meaning that a bottleneck occupation in a large country with a relatively high share of employment (in that particular occupation), is more important on a European scale than the same bottleneck occupation in a small country with a relatively low share of employment in that particular occupation. Therefore the size of employment at country level (in the occupational groups that have been identified as a bottleneck) has been tested as a weighting factor to gain an impression of the effect on the results. With some exceptions, this weighing hardly influences the ranking of the bottleneck occupations, wherefore weightings have not been included in the report.

Table 2 and Table 3 below present the top-20 at ISCO 4-digit and ISCO 2-digit level. To illustrate the meaning of the method applied also other indicators are taken up. By nature the number of countries reporting and the number of bottleneck vacancies reported are decisive for the top 20 bottleneck vacancies. Ranking has some influence, as is shown for shop sales assistants (4-digit level), where only 6 countries report bottleneck vacancies, but then at relatively high ranked positions. The lack of ranking at country level is for instance shown for occupations like specialist medical practitioners and system analysts, lowering the position these occupations would have attained if they had been ranked and based on the number of countries reporting.

All in all, from ISCO 4-digit perspective only one occupational group (Cooks) is a bottleneck occupation in a significant number of countries, and with a relatively high rank on average, regarding the rank value assigned. The majority of the other top-20 occupational groups are a bottleneck in about a quarter to a third of the countries. Nearly all other occupational groups (below the top-20) are reported by only a few countries.

Ranking methodology

Summing up the number of bottleneck occupations and countries is not enough. It matters whether an occupational group is in the top-5 or at position 20 at country level. A numbered ranking of the top 20 bottleneck vacancies is available for 18 countries[7]. In order to take the position in the top-20 into account, an inversed grade (rank value) is used, as follows:

- *Position 1 is valued with 30 points, 2 with 28, 3 with 26 and so on, while positions 14-20 are all valued at 5.*
- *For countries where ranking is not available a value of 10 is used for each bottleneck occupation reported.*

This approach assigns more value to occupations that are in the top-10. A low value assigned to lower ranks is acceptable, as in many cases the rank below 10 is to a large extent coincidental and positions can interchange quite easily at that rank level[8]. An average value of 10 for missing values is acceptable, as it indicates that the specific occupation could be in the top (deserving a value of 20 or above) but also in the region of rank 15 to 20 (deserving a value of 5). The study tested different sets of values to check robustness, but that did not change the top-10 significantly and small differences occurred below the rank of 10. For most countries rank values have been assigned at ISCO 4-digit level. In some cases however, when information was only available at ISCO 2- or 3-digit level, the value has been assigned at that higher aggregation level. These observations are not taken into account for the top-20 at ISCO 4-digit European level.

The rank value at ISCO 2-digit level is the sum of the values of all the ISCO 4-digit level occupational groups belonging to the ISCO 2-digit group. Nevertheless for various ISCO 2-digit groups a large proportion of the rank value is to be found in the top-20 at 4-digit level, indicating some similarity between the top-20 at different levels. However, some occupational groups, like Science and engineering associate professionals and food processing, wood working, garment, etc. end up in the top-10 at 2-digit level without having any accompanying ISCO 4-digit group in the top 20 at 4-digit level.

[7] Ranking is not available for Bulgaria, Estonia, Germany, Greece, Iceland, Ireland, Lithuania, Malta, Netherlands, Slovenia and Spain. Ranking is available for Lichtenstein, but the country has not been included in the overview due to very limited size of the labour market.

[8] For instance, when an indicator like the relation between short term unemployed and vacancies is used, a small rise in vacancies reported (without a change in the number of short term unemployed) can lead to a higher rank (though still at lower rank level), but will not immediately bring that occupational group in the top-10.

Table 2 Top 20 bottleneck vacancies at ISCO 4-digit level European level[9]

Rank at ISCO 4-digit level	ISCO code and description	Rank value	Number of bottleneck vacancies reported	% ranking available
1	5120 Cooks	244	17	76%
2	7223 Metal working machine tool setters and operators	147	9	67%
3	5223 Shop sales assistants	130	6	83%
4	2221 Nursing professionals	129	10	70%
5	8332 Heavy truck and lorry drivers	129	8	75%
6	7212 Welders and flamecutters	126	10	60%
7	2144 Mechanical engineers	115	9	56%
8	2512 Software developers	110	9	44%
9	2212 Specialist medical practitioners	108	10	50%
10	7115 Carpenters and joiners	104	11	82%
11	3322 Commercial sales representatives	101	6	67%
12	2151 Electrical engineers	100	8	50%
13	5131 Waiters	94	7	57%
14	2142 Civil engineers	93	6	67%
15	2511 Systems analysts	80	7	43%
16	2341 Primary school teachers	78	6	67%
17	7126 Plumbers and pipe fitters	75	8	63%
18	2411 Accountants	74	7	43%
19	7411 Building and related electricians	73	6	50%
20	5321 Health care assistants	70	3	100%

Bringing together the 4-digit occupations at a higher aggregation level (ISCO 2-digit) delivers a somewhat different picture. The ranking at 2-digit level differs from the 4-digit level because of:

a) Additional observations at 2- or 3- digit level, as some countries have provided only information at that level (the last column indicates to what extent the rank value was assessed at higher aggregation level);
b) In some occupational groups ISCO 2 digit level various occupational groups that are in itself low ranked at 4-digit level are brought together, while in other ISCO 2-digit groups only a few 4-digit occupational groups are reported at 4-digit level.

As a consequence at 2-digit level the top 5 occupational groups are mentioned by a majority of the countries and concern various occupations within metal and related trades workers, science and engineering, IT and health professionals and construction workers. Personal service workers end up right after the top-5. This high position is dominated by two groups (cooks and waiters) and especially the high score of cooks determines the high position of this group. For the top-5 occupations at 2-digit level at about 35-50 percent of the rank value is related to a top-20 position of occupational groups at 4-digit level. Within the groups the bottlenecks are spread over various ISCO 4-digit groups.

[9] Highlighted cells indicate that less than half of identified bottleneck occupations have been ranked

Table 3 Top 20 bottleneck vacancies at ISCO 2-digit level European level[10]

Rank at ISCO 2-digit level	ISCO code and description	Rank value	Number of countries reporting	Number of bottleneck vacancies reported	% ranking available	% of value assessed at ISCO 2- or 3-digit level
1	72 Metal, machinery and related trades workers	677	23	53	72%	10%
2	21 Science and engineering professionals	576	22	48	42%	14%
3	25 Information and communications technology professionals	530	20	47	28%	22%
4	22 Health professionals	521	21	45	62%	21%
5	71 Building and related trades workers, excluding electricians	485	18	41	73%	22%
6	51 Personal service workers	438	22	32	72%	11%
7	31 Science and engineering associate professionals	310	14	29	83%	18%
8	52 Sales workers	257	13	14	79%	21%
9	83 Drivers and mobile plant operators	252	16	21	75%	29%
10	75 Food processing, wood working, garment and other craft and related trades workers	237	12	20	95%	30%
11	23 Teaching professionals	215	12	17	65%	7%
12	33 Business and administration associate professionals	204	13	15	67%	16%
13	24 Business and administration professionals	176	11	17	24%	7%
14	74 Electrical and electronic trades workers	172	12	15	53%	36%
15	81 Stationary plant and machine operators	155	9	13	69%	25%
16	91 Cleaners and helpers	145	8	8	88%	31%
17	96 Refuse workers and other elementary workers	140	5	6	100%	14%
18	53 Personal care workers	139	6	9	78%	11%
19	12 Administrative and commercial managers	119	6	11	55%	50%
20	92 Agricultural, forestry and fishery labourers	112	3	5	100%	0%

For transparency the box below depicts the top 20 at ISCO 3 digit level. It illustrates how occupations that are high ranked at 4–digit are lower ranked as a consequence of aggregating with other low ranked occupations at 4–digit level. The most striking example is cooks, which rank lowers from rank 1 at 4-digit to rank 4 at 3-digit and rank 6 at 2 digit level.

On the other hand some other occupational groups that are high ranked at 2 digit level, like metal, machinery and related trades workers (72), already have various subgroups in the top 20 at 3 digit level (721, 722 and 723) or 4 digit level (7223 and 7212).

[10] The highlighted cells show where less than half of the bottleneck occupations have been ranked and where above a quarter of the occupations have been identified at 3 or 2-digit level.

Top 20 at ISCO 3 digit level	
1	251 Software and applications developers and analysts
2	214 Engineering professionals (excluding electrotechnology)
3	721 Sheet and structural metal workers, moulders and welders, and related workers
4	512 Cooks
5	722 Blacksmiths, toolmakers and related trades workers
6	221 Medical doctors
7	311 Physical and engineering science technicians
8	712 Building finishers and related trades workers
9	711 Building frame and related trades workers
10	215 Electrotechnology engineers
11	833 Heavy truck and bus drivers
12	222 Nursing and midwifery professionals
13	332 Sales and purchasing agents and brokers
14	522 Shop salespersons
15	723 Machinery mechanics and repairers
16	741 Electrical equipment installers and repairers
17	252 Database and network professionals
18	532 Personal care workers in health services
19	921 Agricultural, forestry and fishery labourers
20	234 Primary school and early childhood teachers

These results are comparable to the outcomes of the European Vacancy and Recruitment Report. Like in our study occupations in Health (medical doctors, pharmacologists, pathologists, and related professionals, nurses and nurse assistants), ICT (IT consultants, IT support staff, software programmers, data processing technicians, IT project leaders), Engineering, Sales (sales representatives and telemarketers) and Finance (accountants, accountant assistants, and staff such as credit and risk managers) are identified as top bottleneck occupations in the EVRR. Further indications for potential bottlenecks in education and skilled trades are reported, which can both be found in the top 20 described above. Finally the EVRR concludes that bottlenecks can be limited to specific specialisations and/or occur in certain countries, which is confirmed by our study.

The main difference concerns the prominent place of skilled manual occupations in the top-20 above, which is less visible in the EVRR. At country level our results concerning the (absolute) top bottlenecks are probably more accurate, but as a consequence of the method used (selection) at European level less comparable with the results of the EVRR, since the same indicators are used across countries.

As the data collected do not comprise total labour demand or all vacancies, the data cannot be used to illustrate general trends in labour demand. The current study provides indications of the actual main bottleneck vacancies in various countries and the EU, including a picture on the structural character of bottlenecks based on trends. Cedefop[11] delivers forecasts on future supply and demand at the labour market, providing information on bottlenecks to be expected. The Cedefop data take the supply side into consideration, which is an important addition to the current study.

The Table 4 below contains data from the Cedefop forecasts for the ten occupations for which the most bottlenecks have been reported in our study. These ten occupational groups comprise about 40 percent of total expected labour demand.

The table summarises for the main bottleneck occupations the demand for workers (job openings) in the projection period (2010 – 2020) and the degree to which this demand is

[11] Cedefop, Future skills supply and demand in Europe. Forecast 2012, Research Paper no. 26, Luxembourg.

related to growth in employment and replacement of workers leaving the job (as a consequence of retirement, etc.). Furthermore the so called indicator of future imbalance on demand (IFIOD) is depicted. This indicator is currently the most robust indicator for expected imbalances in labour supply and demand. It looks at the likelihood of a job being filled in the future by someone with the same qualification level as required today and it describes the probability that the same qualification mix (share of high, medium and low qualified) in the occupation will remain. This indicator summarises the expected overall supply-demand relationship of qualification levels at the level of occupational groups. It is based on expected demand for labour on the one hand, which in turn is based on expected production growth and productivity levels and expected labour supply on the other hand, which in turn is based on demography (expected retirement, expected participation), changes in mobility patterns and (graduated) inflow from education into the labour force. In principle the value of this indicator lies between zero and one. A value of one indicates that the chance that in the near future a job is filled with the required skills is 100 percent; a value of zero that this chance is zero. In practise, at a high level of aggregation (EU level for instance) the indicator actually lies between 0.9 and 1.0[12]. The closer the indicator is to one, the lower the expected difficulties to recruit the appropriate skill mix in the near future is considered to be.

The analysis carried out by Cedefop in relation to labour market forecasts indicates a growing employment in most high skilled occupations (ISCO 1, 2, 3 first digit), a shift at skilled non manual level from clerks etc. (ISCO 4) towards service workers (ISCO 5), a decline or stabilization in employment at skilled manual level (ISCO, 6,7,8) and growth in employment at elementary level (ISCO 9). At the same time a high replacement demand is expected for various occupational groups, leading to additional vacancies.

As indicated for two of the occupational groups from the top 10 at ISCO 2-digit level in the table, growth in employment is an important determinant of demand (science and engineering professionals, IT professionals). Demand for health professionals is totally determined by replacement demand, as Cedefop does not expect a growth of employment in this occupational group. These are all high skilled professions. On the other hand at lower skill level the chance of mismatch is relatively high as the IFIOD is closer to 0.9 than to 1 (metal, machinery and related trades workers, personal service workers, building and related trades workers, drivers and mobile plant operators, sales workers and food processing, wood working and related trades). For all these occupations the majority is a consequence of replacement demand.

The findings in this current study seem not always in line with the major trends on the European labour market. Based on the Cedefop expectations especially high skilled occupations would be expected in the top bottleneck occupations, as these are the fastest growing occupations.

However bottlenecks are not only related to growth, but also to an optimal match and replacement demand. The IFIOD therefore points at expected difficulties to recruit the appropriate skill mix and this indicator is comparatively low for all skilled manual occupations, personal service workers and sales workers. In order to understand bottlenecks at these skill levels, other factors have to be taken into consideration, including factors related to the supply side (age, educational choices and the like) and demand (working conditions, wages).

These findings are important in relation to policy actions needed. The challenges differ according to the skill level of the bottleneck occupations, although at all skill levels educational choices are relevant, at least at long term. At the short term training schemes might be appropriate at skilled manual level, as bottlenecks appear in a large

[12] Lower levels of the IFIOD are found at country level, see for instance the results for Lithuania in figure 30 in the Cedefop study cited.

number of countries. For high skilled occupations labour mobility in combination with on the job training (specific knowledge for the job) can be appropriate.

Table 4 Total job openings (expansion and replacement demand) and the indicator of future imbalance on demand (IFIOD) by occupation (ISCO 2 –digit) (i)

	Rank	Number of countries reporting bottleneck	Total demand 2010-2020 (000s)	Total demand (as % of 2010 level)	Expansion demand (growth of empl)	Replacement demand	IFIOD
72 Metal, machinery and related trades workers	1	23	1,255	12%	-15%	26%	0.94
21 Science and engineering professionals	2	22	3,754	43%	14%	29%	0.99
25 Information and communications technology professionals (ii)	3	20	6,541	54%	19%	35%	0.99
22 Health professionals	4	21	1,688	40%	-1%	41%	0.99
71 Building and related trades workers, excluding electricians	5	18	4,017	31%	5%	26%	0.93
51Personal service workers	6	22	6,461	31%	3%	28%	0.94
31 Science and engineering associate professionals	7	14	2,948	34%	6%	28%	0.97
52 Sales workers	8	13	3,384	30%	5%	24%	0.94
83 Drivers and mobile plant operators	9	16	3,010	32%	-2%	34%	0.93
75 Food processing, wood working, garment and other craft and related trades worker (iii)	10	12	429	10%	-15%	25%	0.93
Top bottleneck occupations			33,487				
All occupations			83,686	36%	4%	33%	

i) Cedefop used the older version of ISCO codes
ii) Figures of the old ISCO 24 Other professionals are used for indication of this ISCO 08 group
iii) Figures of the former ISCO 74 Other crafts and related trades used for indication of this ISCO 08 group
iv) This indicator summarises the overall supply-demand relationship of qualification levels. The closer the indicator is to one, the lower the difficulties to recruit the appropriate skill mix.

Source: Cedefop (2012)

Development over time of identified top 20 bottlenecks

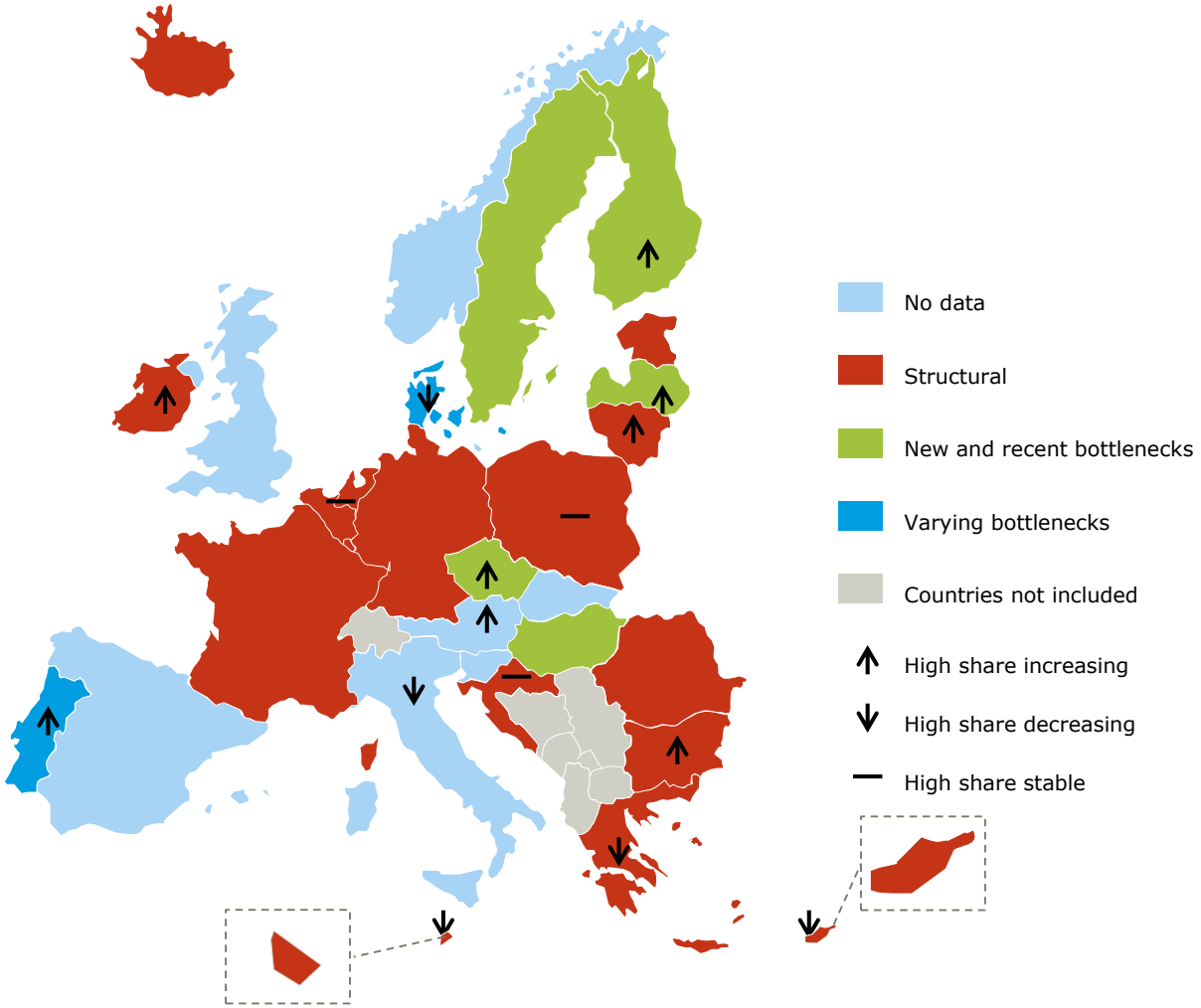
Data concerning the development of bottleneck occupations over time that are collected in this study concern (a) the trend reported for each occupational group (increasing, decreasing or stable) and (b) whether the bottleneck existed in each of the years in the period 2008-2012. Data are reported by national experts, like described before, and further explained in annex 1 and the country fiches. When information about the existence of bottlenecks in previous years and the trend in the bottleneck was available the national expert has taken up this information in the database.

Based on the number of years the bottleneck is reported about two thirds of the bottleneck vacancies reported can be regarded as structural, as these bottlenecks existed in 4 or 5 years during the period 2008-2012. About 10% of bottlenecks reported existed alternately in 2 or 3 years of this period and one in four were reported for the first time in 2012 or emerged in 2010 or 2011. Further details on the occupations concerned are discussed below.

Of the 21 countries reporting this information[13] Czech Republic, Finland, Hungary, Latvia, Portugal and Sweden had an above European average share of recently emerged bottleneck vacancies. Denmark and Portugal have an above European average share of bottlenecks with a varying pattern. The bottlenecks in other countries are in majority of a structural nature (share of structural bottleneck occupations above the European average).

[13] Data are missing for Malta, Norway, Poland, Slovakia and Spain. For Austria, Italy, Slovenia and the United Kingdom this information is reported for only a few of the bottleneck vacancies identified. Missing data is due to lack of information. Only bottlenecks with data on the five previous years are taken into consideration.

Figure 3 Nature of bottlenecks per country (a)



(a) high share of increasing/decreasing means that the share of occupations showing an increasing (or decreasing) trend in that country is above the European average.

About half of the bottlenecks reported were increasing; approximately one in four decreasing and the remaining one fourth were reported as stable. Of the 26 countries reporting this information[14] Austria, Bulgaria, Czech Republic, Finland, Ireland, Latvia, Lithuania and Portugal have a high share of increasing bottlenecks, compared to the European average. Cyprus, Denmark, Greece, Italy and Malta have a relatively high share of decreasing bottlenecks. Croatia, Netherlands and Poland reported a share of stable bottlenecks above the European average.

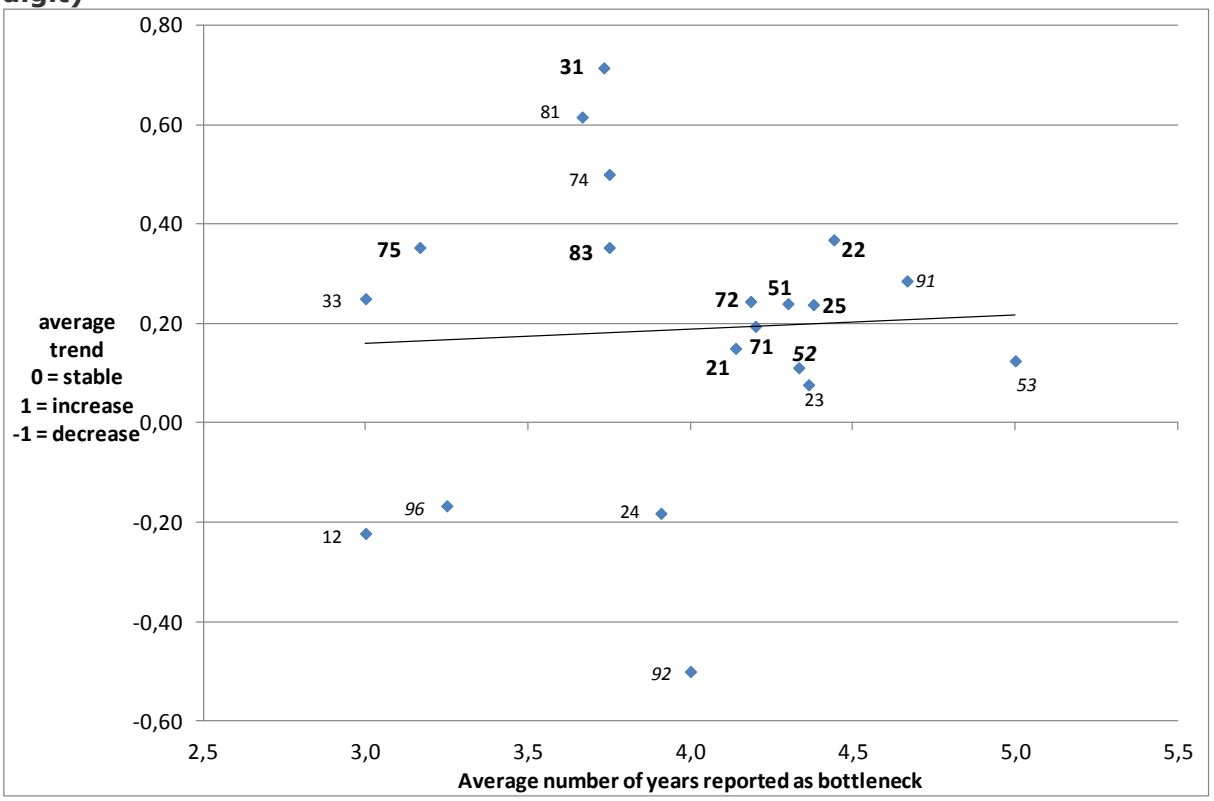
In the figures below we have combined the information on trends and the number of years the bottleneck has been reported in the period 2008-2012. As the number of observations in general is limited, the results need to be interpreted carefully[15]. The figures show that the more to the right the occupational group is depicted, the more years it has been reported to be in existence. The higher the occupational group is found in the figure, the more often an increasing trend is identified for that group at country level (both on average over all countries). The data illustrate that most bottleneck exist for quite a long time and on average tend to increase. The top-10 is more or less

[14] Data are missing for Iceland, Slovakia and the United Kingdom and for Norway this information is reported for only a few bottleneck vacancies. Missing data is due to lack of information.

[15] In many cases the standard deviation is close to or even above the mean.

concentrated around a duration of 4 to 4,5 years and on average 1 in 5 reported bottlenecks show an increasing trend.

Figure 4 Trend and duration of bottleneck occupations (overall top-20 ISCO 2-digit)



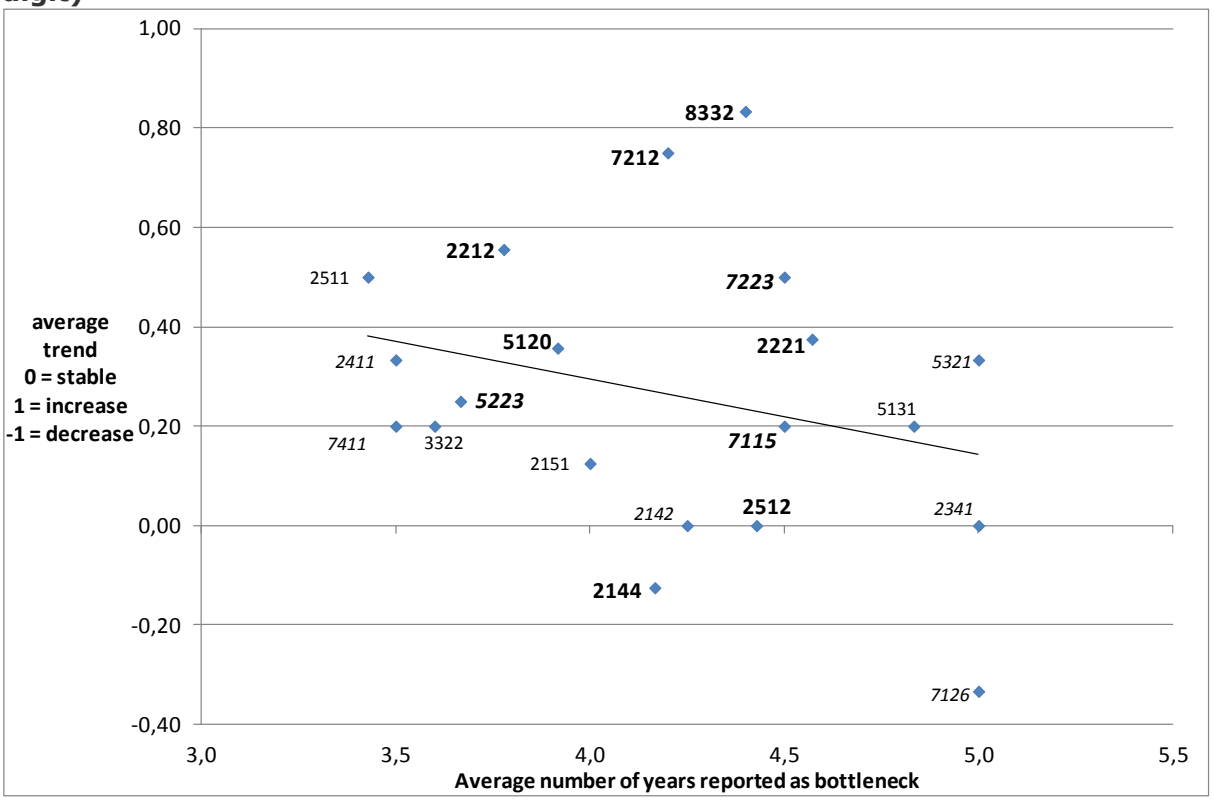
(a) Top 10 is depicted bold. Averages based on less than 7 observations are depicted italic.

72 Metal, machinery and related trades workers (1)	51Personal service workers (6)	23 Teaching professionals (11)	91 Cleaners and helpers (16)
21 Science and engineering professionals (2)	31 Science and engineering associate professionals (7)	33 Business and administration associate professionals (12)	96 Refuse workers and other elementary workers (17)
25 Information and communications technology professionals (3)	52 Sales workers (8)	24 Business and administration professionals (13)	53 Personal care workers (18)
22 Health professionals (4)	83 Drivers and mobile plant operators (9)	74 Electrical and electronic trades workers (14)	12 Administrative and commercial managers (19)
71 Building and related trades workers, excluding electricians (5)	75 Food processing, wood working, garment and other craft and related trades workers (10)	81Stationary plant and machine operators (15)	92 Agricultural, forestry and fishery labourers (20)

(Rank between brackets)

At ISCO 4-digit level the results are less concentrated, but in general comparable to the picture at 2-digit level. Differences between the 2-digit and 4-digit level are partly related to the general differences between the two levels, as described before. A striking difference can be found for occupational group 71 (building and related trades), that at 2-digit level shows an increasing trend at on average 4 year existence, while the occupational group 7126 (plumbers and pipefitters) show a strong decreasing trend at on average 5 years existence. The data are not robust enough to draw too much conclusions from it, apart from the long existence of bottleneck vacancies and a slightly increasing trend (at 2-digit level).

Figure 5 Trend and duration of bottleneck occupations (overall top-20 ISCO 4-digit)



(a) Top 10 is depicted bold. Averages based on less than 5 observations are depicted italic.

5120 Cooks(1)	7212 Welders and flamecutters (6)	3322 Commercial sales representatives (11)	2341 Primary school teachers (16)
7223 Metal working machine tool setters and operators (2)	2144 Mechanical engineers (7)	2151 Electrical engineers (12)	7126 Plumbers and pipe fitters (17)
5223 Shop sales assistants (3)	2512 Software developers (8)	5131 Waiters (13)	2411 Accountants (18)
2221 Nursing professionals (4)	2212 Specialist medical practitioners (9)	2142 Civil engineers (14)	7411 Building and related electricians (19)
8332 Heavy truck and lorry drivers (5)	7115 Carpenters and joiners (10)	2511 Systems analysts (15)	5321 Health care assistants (20)

(Rank between brackets)

The table below provides more detail on the characteristics of the overall top 10 bottleneck occupations. Like has been shown in Figure 4 for most occupational groups the bottlenecks seem to be quite structural and the trend is in general stable to increasing, indicating that problems will tend to remain, or even increase. Nevertheless at more detailed level some occupations in some countries show a decreasing trend in the bottleneck, indicating some relief. At the same time in some countries occupational groups can be identified where problems have evolved recently (bottlenecks with increase and decrease in different countries shaded blue). In every broad occupational group (ISCO 2-digit) at more detailed level (ISCO 4-digit) differences from the general trends can be assessed. These findings are in line with the European Vacancy and Recruitment Report, which concluded that bottlenecks (in a specific country) can be limited to specific specializations within occupations. The occupational and country fiches provide further details on this.

Table 5 Nature and trend in bottlenecks per occupational group (top 10 ISCO2d)

Rank	Nature of bottleneck (a)	Recently arisen or new bottlenecks	Trend in bottleneck	Occupations with a decreasing trend in bottlenecks	Occupations with a stable trend
1	**72 Metal machinery and related trades workers**				
	Structural 69% Recently rising 19% Variable 12% (N=27)	7212 Welders and flamecutters (*Bulgaria*) 7213 Sheet-metal workers (*Denmark, Sweden*) 7231 Motor vehicle mechanics and repairers (*Sweden*)	**Increasing 47%** Stable 31% Decreasing 22% (N=45)	721 Sheet and structural metal workers, moulders and welders, and related workers (*Germany*) 723 Machinery mechanics and repairers (*Germany*) 7215 Riggers and cable splicers (*Cyprus*) 7222 Toolmakers and related workers (*Czech Republic*) 7223 Metal working machine tool setters and operators (*Czech Republic*) 7231 Motor vehicle mechanics and repairers (*Belgium, Italy*)	7211 Metal moulders and coremakers (France) 7212 Welders and flamecutters (Hungary, Slovenia) 7213 Sheet-metal workers (France) 7214 Structural-metal preparers and erectors (France) 7222 Toolmakers and related workers (Hungary, Slovenia) 7223 Metal working machine tool setters and operators (Italy, Slovenia) 7231 Motor vehicle mechanics and repairers (France) 7233 Agricultural and industrial machinery mechanics and repairers (Austria, Belgium)
2	**21 Science and engineering professionals**				
	Structural 72% Recently rising 20% Variable 8% (N=36)	2132 Farming, forestry and fisheries advisers (*Bulgaria*) 2142 Civil engineers (*Sweden*) 2151 Electrical engineers (*Lithuania, Romania)*	Increasing 40% Stable 35% Decreasing 25% (N=40)	214 Engineering professionals (excluding electrotechnology) (*Germany*) 2141 Industrial and production engineers (*Greece*) 2142 Civil engineers (*Germany)* 2144 Mechanical engineers (*Denmark, Slovenia*) 2151 Electrical engineers (*Ireland, Slovenia*) 2152 Electronics engineers (*Greece*) 2153 Telecommunications engineers (*Greece*)	2141 Industrial and production engineers (Ireland) 2142 Civil engineers (Croatia) 2144 Mechanical engineers (Estonia, Germany, Italy, Netherlands, Sweden) 2151 Electrical engineers (Croatia, Estonia, Sweden) 2152 Electronics engineers (Estonia)
3	**25 Information and communications technology professionals**				
	Structural 81% Recently rising 16% Variable 3% (N=37)	2511 Systems analysts (*Italy, Portugal, Sweden*) 2512 Software developers (*Sweden*) 2514 Applications programmers (*Czech Republic*) 2519 Software and applications developers and	**Increasing 52%** Stable 19% Decreasing 29% (N=42)	25 Information and communications technology professionals (*Poland*) 2512 Software developers (*Greece, Italy, Malta*) 2513 Web and multimedia developers (*Greece*) 2519 Software and applications developers and analysts not elsewhere classified (*Denmark, Malta*)	2511 Systems analysts (Netherlands) 2512 Software developers (Latvia, Netherlands) 2521 Database designers and administrators (Spain)

Rank	Nature of bottleneck (a)	Recently arisen or new bottlenecks	Trend in bottleneck	Occupations with a decreasing trend in bottlenecks	Occupations with a stable trend
		analysts not elsewhere classified (*Ireland*)		2521 Database designers and administrators (*Greece, Spain*) 2522 Systems administrators (*Greece, Malta*) 2523 Computer network professionals (*Greece*)	
4	**22 Health professionals**				
	Structural 82% Recently rising 15% Variable 3% (N=34)	2211 Generalist medical practitioners (*Czech Republic*) 2212 Specialist medical practitioners (*Czech Republic, France, Ireland*)	Increasing 47% Stable 42% Decreasing 11% (N=38)	2212 Specialist medical practitioners (*Malta*) 2221 Nursing professionals (*Belgium*) 2240 Paramedical practitioners (*Spain*) 2262 Pharmacists (*Italy*)	2211 Generalist medical practitioners (Croatia, France) 2212 Specialist medical practitioners (Croatia, Netherlands) 2221 Nursing professionals (Lithuania, Netherlands, Sweden) 2240 Paramedical practitioners (Malta) 2250 Veterinarians (Malta) 2261 Dentists (France) 2262 Pharmacists (Croatia)
5	**71 Building and related trades workers excluding electricians**				
	Structural 72% Recently rising 16% Variable 12% (N=25)	7112 Bricklayers and related workers (*Czech Republic*) 7123 Plasterers (*Latvia*) 7131 Painters and related workers (*Portugal*) 7132 Spray painters and varnishers (*Latvia)*	Increasing 36% **Stable 47%** Decreasing 17% (N=36)	7115 Carpenters and joiners (*Cyprus, Greece*) 7124 Insulation workers (*Cyprus*) 7126 Plumbers and pipe fitters (*Greece, Italy*) 7133 Building structure cleaners (*Cyprus)*	7112 Bricklayers and related workers (Croatia, Hungary) 7114 Concrete placers, concrete finishers and related workers (Malta) 7115 Carpenters and joiners (Austria, Croatia) 7121 Roofers (Austria, France) 7126 Plumbers and pipe fitters (Austria, Croatia, France, Slovenia) 7127 Air conditioning and refrigeration mechanics (Malta)
6	**51 Personal service workers**				
	Structural 80% Recently rising 15% Variable 5% (N=20)	5120 Cooks (*Czech Republic, Estonia, Sweden*)	**Increasing 48%** Stable 28% Decreasing 24% (N=25)	5120 Cooks (*Cyprus, Denmark, Slovenia)* 5131 Waiters (*Denmark*) 5141 Hairdressers (*Italy*) 5142 Beauticians and related workers (*Italy)*	5120 Cooks (Belgium, Latvia, Romania) 5131 Waiters (Bulgaria, Malta) 5132 Bartenders (Italy)
7	**31 Science and engineering associate professionals**				
	Structural 60% Recently rising 20% Variable 20% (N=15)	311 Physical and engineering science technicians *(Romania)* 3112 Civil engineering technicians *(Sweden)*	**Increasing 76%** Stable 19% Decreasing 5% (N=21)	3113 Electrical engineering technicians *(Cyprus)*	3141 Life science technicians (excluding medical) (Malta) 3151 Ships engineers (Sweden)

Rank	Nature of bottleneck (a)	Recently arisen or new bottlenecks	Trend in bottleneck	Occupations with a decreasing trend in bottlenecks	Occupations with a stable trend
		3117 Mining and metallurgical technicians *(Sweden)* 3119 Physical and engineering science technicians not elsewhere classified *(Austria)* 3139 Process control technicians not elsewhere classified *(France, Portugal)*			
8	**52 Sales workers**				
	Structural 5 Recently rising 1 Variable 0 (N=6)	5223 Shop sales assistants *(Portugal)*	Increasing 4 Stable 2 Decreasing 3 (N=9)	5223 Shop sales assistants *(Denmark)* 5244 Contact centre salespersons (Belgium) 5246 Food service counter attendants (Italy)	5223 Shop sales assistants (Lithuania)
9	**83 Drivers and mobile plant operators**				
	Structural 58% Recently rising 16% Variable 25% (N=12)	8322 Car, taxi and van drivers *(Portugal)* 8332 Heavy truck and lorry drivers *(Czech Republic)*	Increasing 47% Stable 22% Decreasing 33% (N=17)	8322 Car, taxi and van drivers *(Denmark)*	8331 Bus and tram drivers (Italy) 8332 Heavy truck and lorry drivers (Slovenia) 8342 Earthmoving and related plant operators (Italy)
10	**75 Food processing, wood working, garment and other craft and related trades workers**				
	Structural 42% Recently rising 34% Variable 25% (N=12)	7511 Butchers, fishmongers and related food preparers *(Latvia)* 7522 Cabinet-makers and related workers *(Portugal)* 7533 Sewing, embroidery and related workers *(Czech Republic)*	Increasing 47% Stable 41% Decreasing 12% (N=17)	7512 Bakers, pastry-cooks and confectionery makers *(Cyprus)*	7511 Butchers, fishmongers and related food preparers (Croatia, Hungary) 7512 Bakers, pastry-cooks and confectionery makers (Croatia) 7531 Tailors, dressmakers, furriers and hatters(Hungary, Latvia)

Recently rising: bottleneck existed first time in 2012 or 2011
Variable: bottleneck reported in 2 or 3 of the years in the period 2008 – 2012
Structural: bottleneck existed during 4 or 5 years in the period 2008-2012

Analysis of skills level patterns

The data in the Table 6 below suggest a positive correlation between major bottlenecks and required skill level. All countries report (at 4-digit level) occupations with a high skill level in the top 20, and also the number of bottleneck vacancies reported is higher, the higher the skill level. At medium level the number of bottleneck occupations reported for skilled manual occupations is far higher than for non-manual skilled occupations.

Bulgaria, Finland, Greece, Ireland, Lithuania, Malta, Netherlands, Spain and Sweden have a relatively high share of high-skilled bottleneck occupations. A high share of high skilled bottlenecks does not necessarily mean that recruitment problems only concern high skilled occupations. In several of the countries mentioned employment has declined considerably, causing a sharp fall in labour demand and rising unemployment. This will diminish bottlenecks especially at lower skill level, as employers are able to enhance job requirements. In the other countries it is related to an ongoing increase in labour demand in general.

Denmark, Hungary, Latvia, Portugal, Romania and Slovenia report a relatively high share of bottleneck at Skilled Manual Labour level. Again backgrounds are not the same for all these countries, in some cases labour mobility may have contributed to bottlenecks, in others it is lack of interest among young people leading to a shortage of skills.

The other countries show a more equal skill pattern in the bottlenecks reported, though differences can be detected. For instance a number of countries report only a few bottleneck occupations at high skill level (Cyprus, Czech Republic, Denmark, Hungary, Latvia, Portugal, Romania, Slovenia). Other countries do not report any or only a few bottlenecks at Skilled Non manual level (Austria, Croatia, Czech Republic, France, Greece, Ireland, Lithuania).

Table 7 shows the division of skill level at 4-digit level (which was the level at which the bottleneck occupations were identified). The top 20 at 2-digit level contains a comparable division over the skill levels, with 8 high skilled occupational groups, 6 skilled manual, 3 skilled non-manual and 3 elementary occupational groups in the top 20. The fact that high skilled groups are somewhat underrepresented and elementary groups overrepresented can be related to the methods used (in some countries relying on PES data that are biased towards low and medium skilled occupations) and that at high skill level bottlenecks are spread over more 4-digit groups than elementary bottleneck occupations.

Table 6 Reported bottleneck vacancies at country level by skill level

	Elem - Elementary (ISCO first digit, 9)	SM - Skilled Manual (ISCO first digit 6, 7 and 8)	SNM - Skilled Non Manual (ISCO first digit 4 and 5)	HS - High Skilled (ISCO first digit 1,2 and 3)	1 or 4 (officers) Elementary and high skilled (officers) for military occupations (ISCO first digit 0)	Total (a)
Austria		11		9		20
Belgium	1	5	4	9	1	20
Bulgaria		3	3	14		20
Croatia	3	6	1	10		20
Cyprus	6	6	6	2		20
Czech Republic	5	8	1	6		20
Denmark	1	10	3	5	1	20
Estonia		6	1	8		15
Finland	1		4	15		20
France		11		9		20
Germany		5	3	12		20
Greece	2	1		17		20
Hungary	5	10	2	3		20
Iceland		7	3	10		20
Ireland		1		19		20
Italy	1	8	4	7		20
Latvia	1	11	3	5		20
Lithuania	1	6	1	12		20
Malta	1	3	3	13		20
Netherlands			2	16		18
Norway		7	4	9		20
Poland	2	8	3	7		20
Portugal	1	11	3	5		20
Romania	4	11	3	6		24
Slovakia		4	2	7		13
Slovenia		10	1	2		13
Spain			1	8		9
Sweden	1	2	1	13	1	18
United Kingdom	1	7	3	9		20
Number of bottleneck vacancies	37	178	65	267	3	550
Number of countries	17	26	25	29	3	29

(a) Not all countries delivered 20 observations. Lack of information caused a smaller number. A higher number is related to not being able to exactly identifying a top 20.

Sectorial pattern of bottleneck occupations

As to be expected from the nature of the bottleneck vacancies reported, Manufacturing, Construction, Health, Tourism, IT, Commerce, Transport, Professional, scientific and technical activities, Financial and insurance activities and Education are the economic activities which are most mentioned to be affected by bottleneck vacancies, as the number of bottleneck vacancies in the table below illustrate.

The structure of bottlenecks differs between sectors. Whereas manufacturing, construction and transport are confronted with bottlenecks for occupations at skilled manual level, most other activities affected by bottlenecks need high skilled labour (education, professional, scientific and technical activities, financial and insurance activities, ICT and health).

Various sectors, like manufacturing and construction are still faced with bottlenecks, although these activities were worst affected by the crisis. The data available in our study are not sufficient to explain this paradox. Some possible explanations are that the crisis has made work in these types of activities less attractive (less certainty about work) and the ongoing replacement demand. The Cedefop figures in table 5 illustrate that also in occupations with a negative expansion demand, total demand is still positive as a consequence of a high replacement demand.

In general a close relation between occupational groups and sectors can be assessed. This is partly a consequence of the method used, as the experts were asked to identify the sectors that were most affected by bottlenecks. As their assessment is based on a limited number of sources and/or interviews a selection bias may result. Nevertheless most bottleneck occupations can be found in one particular sector. Some exceptions are for instance business and administration (associate) professionals and science and engineering professionals.

Table 7 Reported bottleneck vacancies (ISCO 2-digit) by economic activities most affected (NACE section)

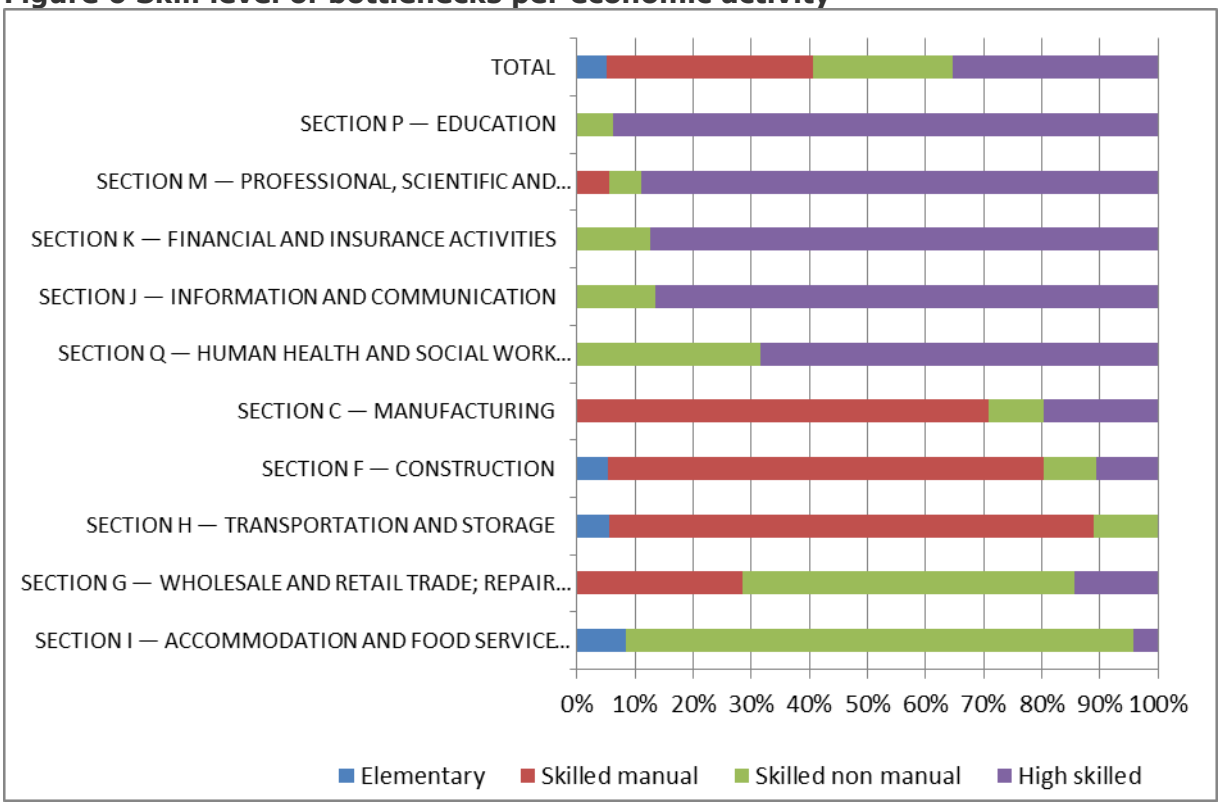
NACE SECTION	Number of bottlenecks identified	Main bottleneck occupation groups (ISCO 2d) and share at sector level (a)	
C — MANUFACTURING	127	72 Metal, machinery and related trades workers	32%
		75 Food processing, wood working, garment and other craft and related trades workers	19%
		21 Science and engineering professionals	18%
		81 Stationary plant and machine operators	15%
		31 Science and engineering associate professionals	9%
F — CONSTRUCTION	56	71 Building and related trades workers, excluding electricians	48%
		72 Metal, machinery and related trades workers	13%
		21 Science and engineering professionals	11%
		74 Electrical and electronic trades workers	9%
Q — HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	54	22 Health professionals	69%
		32 Health associate professionals	17%
		53 Personal care workers	11%
I — ACCOMMODATION AND FOOD SERVICE ACTIVITIES	48	51Personal service workers	73%
		42 Customer services clerks	6%
		91 Cleaners and helpers	6%
J — INFORMATION AND COMMUNICATION	37	25 Information and communications technology professionals	76%
		35 Information and communications technicians	14%
		12 Administrative and commercial managers	5%
		24 Business and administration professionals	5%

G — WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	21	52 Sales workers	33%
		33 Business and administration associate professionals	24%
		72 Metal, machinery and related trades workers	24%
H — TRANSPORTATION AND STORAGE	18	83 Drivers and mobile plant operators	83%
		31 Science and engineering associate professionals	11%
		96 Refuse workers and other elementary workers	6%
M — PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	18	21 Science and engineering professionals	28%
		24 Business and administration professionals	22%
		25 Information and communications technology professionals	22%
		26 Legal, social and cultural professionals	11%
		31 Science and engineering associate professionals	6%
		71 Building and related trades workers, excluding electricians	6%
K — FINANCIAL AND INSURANCE ACTIVITIES	16	24 Business and administration professionals	63%
		11 Chief executives, senior officials and legislators	25%
		42 Customer services clerks	6%
		33 Business and administration associate professionals	6%
P — EDUCATION	16	23 Teaching professionals	88%
E — WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	11	96 Refuse workers and other elementary workers	64%
		71 Building and related trades workers, excluding electricians	27%
		74 Electrical and electronic trades workers	9%
N — ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	9	24 Business and administration professionals	22%
		42 Customer services clerks	22%
		54 Protective services workers	22%
A — AGRICULTURE, FORESTRY AND FISHING	7	92 Agricultural, forestry and fishery labourers	71%
		62 Market-oriented skilled forestry, fishing and hunting workers	29%
D — ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	5	21 Science and engineering professionals	80%
		31 Science and engineering associate professionals	20%

(a) Share of the specific occupational group in total bottleneck occupations in the sector.

The Figure 6 below illustrates the relation between sector and bottleneck occupations. Manufacturing, construction and transport are faced with difficulties at skilled manual level, wholesale, etc. and tourism with bottleneck at skilled non manual level and health, ITC, Finance, Professional scientific activities and education at high skilled level.

Figure 6 Skill level of bottlenecks per economic activity

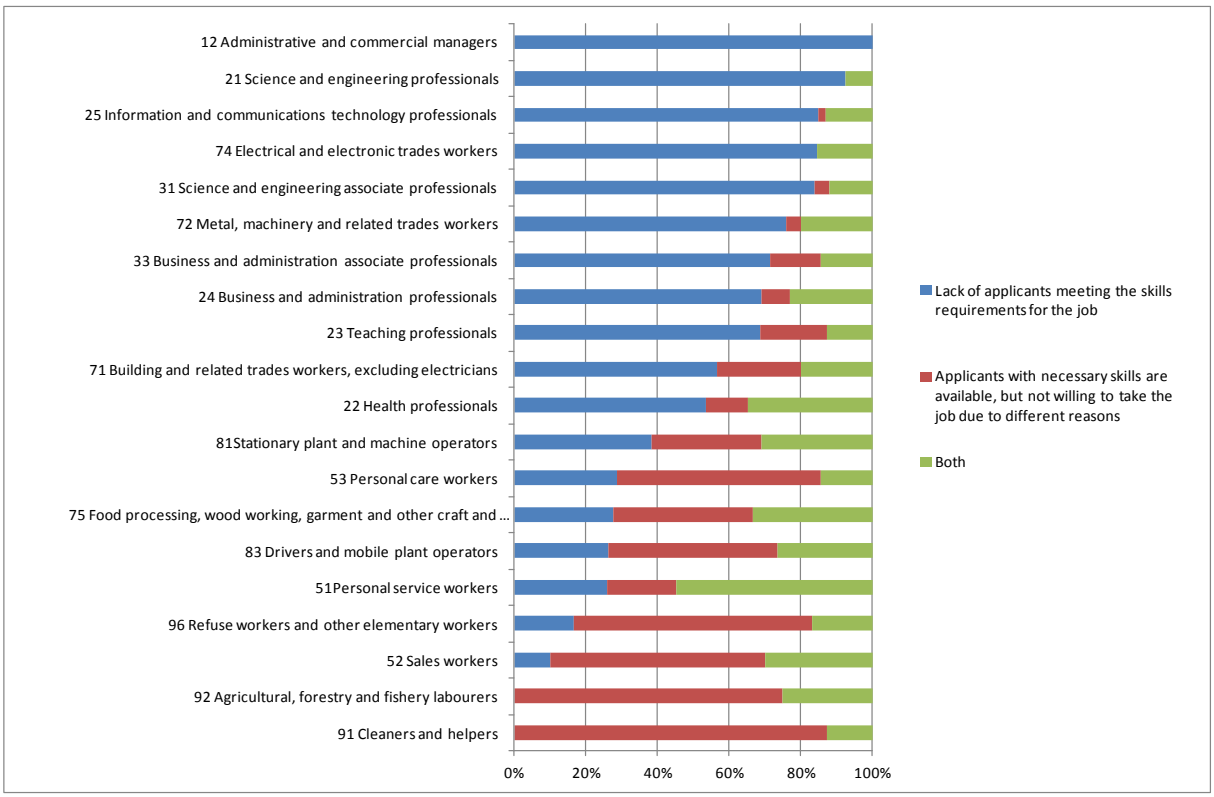


Reasons for bottlenecks

The Figure 7 below illustrates the main reasons for bottleneck vacancies as reported in the study. The data suggest that skills shortages are the main reason for most of the bottleneck occupational groups. The data also suggests a relation with skill level; a lack of skills is reported for most high skill level occupations, while the role of working conditions is of higher importance at lower skill levels. The lower the skill level of the occupation, the more shortages are determined by for example wages and working conditions. Differences in reasons between countries are not significant, indicating that reasons are primarily related to the type of occupation (i.e. skill level of the occupations). Further details are discussed in the occupational fiches.

These conclusions confirm that a combination of labour shortages and mismatch (maybe also at European level) seems to be an important reason for bottlenecks at high skilled and skilled level. This requires further action in the field of formal education, in terms of redirecting student choices towards the need of the labour market and in the field of adult training and education (both within companies, on the job and for unemployed).

Figure 7 Main reasons for bottlenecks for top 20 (ISCO 2-digit) bottleneck occupational groups

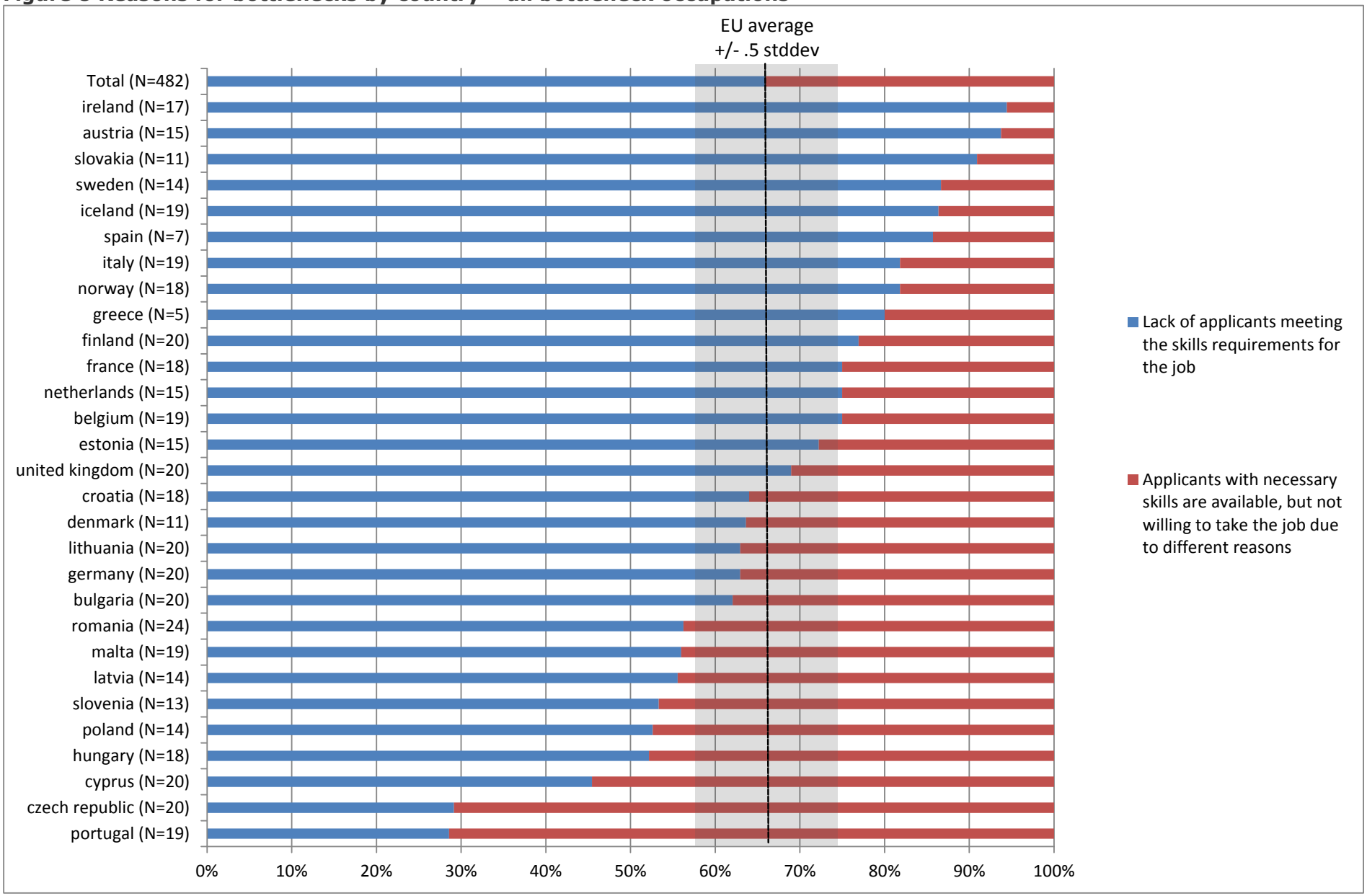


Based on the EU top 10 at 2-digit level, on average about two third of the bottleneck occupations is related to skill shortages and about one third to other reasons, see Figure 8. The variation is high, meaning that differences between countries are barely significant[16].

In four countries bottlenecks are mainly related to skills shortages (Austria, Ireland, Slovakia and Sweden) and five countries mainly to other reasons (Czech Republic, Latvia, Poland, Portugal and Slovenia). However, reasons for bottlenecks are more related to the type of occupation than to the country. In countries with an above average meaning of skills shortages the share of high skilled bottleneck is more often relatively high, while in countries with a relatively high share of manual skilled bottlenecks other reasons are often more important.

[16] When information was available national experts indicated in the database if bottleneck occupations were related to lack of skills or to other reasons, or both. The data was rearranged in order illustrate to what extent bottlenecks are related to either lack of skills or other reasons.

Figure 8 Reasons for bottlenecks by country – all bottleneck occupations



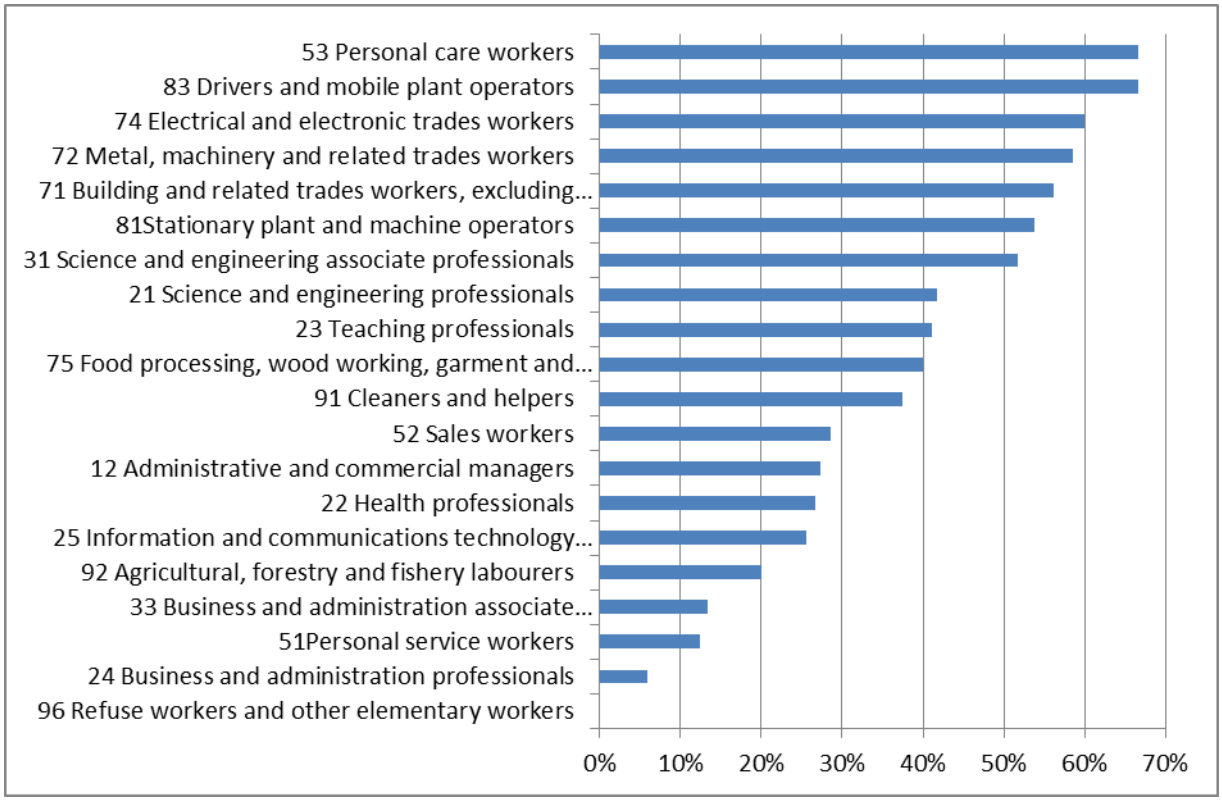
Gender dimension in bottleneck occupations

Job image being not gender neutral is the main gender issue reported in relation to bottlenecks. Other issues, like wage differences and other conditions and terms not being gender neutral, are rarely mentioned.

Figure 9 shows that on average for about 40% of the reported bottleneck occupations a not gender neutral job image is regarded as an issue in relation to the identified bottlenecks, e.g. that the active workforce is seen as being predominately male or female. The data show that this is especially the case for occupations at skilled manual level (male) and personal care workers (female). Also science and engineering associate professionals score above average. For all other bottleneck occupations gender seems less relevant.

Nevertheless, gender imbalance in specific occupations can be considered an important reason for bottlenecks, as the full potential of the workforce is not being utilised or reached to cover for the labour shortages. Reaching a more balanced gender profile within occupational groups could address shortages in many occupations, by enlarging the pool of available workforce.

Figure 9 Job image regarded not gender neutral by occupational group (top 20 ISCO 2-digit level).



Regional aspects among bottleneck occupations

The experts were asked to indicate whether regional aspects were relevant for bottleneck vacancies and, if so, whether problems concerned rural areas, urban areas or both[17]. An expert bias, both from the country experts and the interviewees cannot be ruled out. In some countries regional aspects were reported to be relevant for all or nearly all bottleneck vacancies (Norway, Denmark, Croatia, Portugal, Finland, Estonia, Slovenia, Netherlands, and Lithuania). In some other countries the regional dimension is reported to be not relevant, or only relevant for a few bottleneck occupations (Czech Republic, Malta, Slovakia, Greece, Latvia).

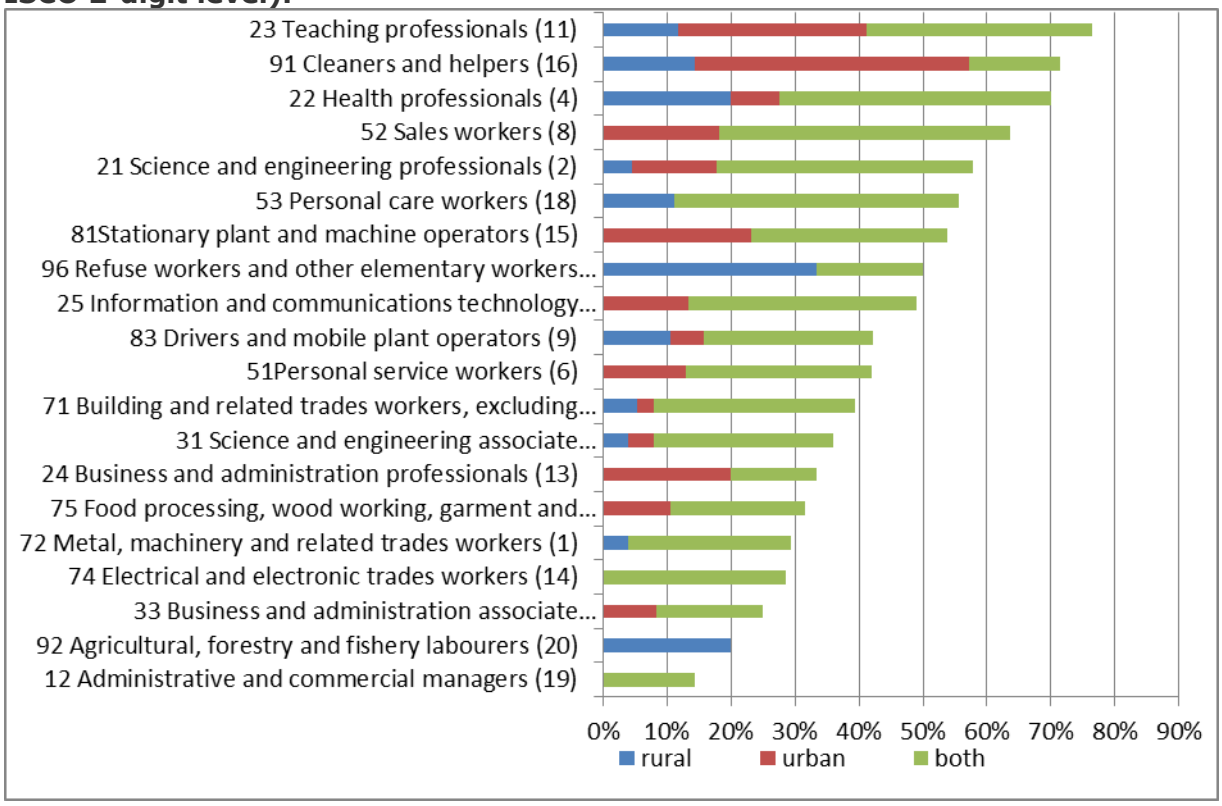
For on average about 40% of the reported bottleneck occupations regional aspects are regarded relevant. As the figure below indicates especially bottlenecks for teaching professionals, cleaners and helpers, health professionals and sales workers are regarded to be partly related to regional differences in supply and demand. But also the score for science and engineering professionals, personal care workers, stationary plant and machine operators, refuse workers and other elementary workers and ICT professionals is above average. Skill level is relevant as regional disparities are somewhat more often mentioned for high skilled and elementary occupations and to a lesser extent for skilled manual occupations, although the differences are small. Most likely the backgrounds differ. High skilled workers are in general quite mobile, but tend to prefer a residence in (sub)urban areas. Low skilled workers are less mobile and search for jobs in the close surrounding of their residence.

Difficulties in rural areas are more often mentioned for elementary jobs (cleaners and helpers, refuse workers and alike, agricultural and comparable workers), health professionals, teaching professionals and drivers and mobile plant operators. Such difficulties are more often mentioned in Norway, Cyprus, France, Sweden, Estonia, Croatia, Finland, Austria and Latvia. This in quite understandable for large countries with remote areas, like the Scandinavian countries and France, but for the other countries, also other factors (regarding demand and supply) need to be considered in order to understand the backgrounds of the difficulties completely.

Difficulties in urban areas are reported more often for cleaners and helpers, teaching professionals, sales workers and business and administration professionals. This type of difficulty is more often mentioned in Lithuania, Croatia, Netherlands, Romania and Denmark.

[17] They were also ask to indicate which NUTS regions were confronted with bottlenecks. The data on this are however scarcely provided.

Figure 10 Relevance of regional aspects for bottleneck vacancies (top 20 ISCO 2-digit level).



(a) "Both" means that bottlenecks are present in (specific) rural and urban areas.

Specific Bottleneck Occupations

In order to look at the specific bottleneck occupations, further detailed description and analysis has been conducted on the top 10 occupational groups at ISCO 2-digit level.

Table 8 Top 10 Occupational groups with high ranked bottleneck occupations

ISCO 2-digit sub-major group	Rank
72 Metal, machinery and related trades workers	1
21 Science and engineering professionals	2
25 Information and communications technology professionals	3
22 Health professionals	4
71 Building and related trades workers, excluding electricians	5
51 Personal service workers	6
31 Science and engineering associate professionals	7
52 Sales workers	8
83 Drivers and mobile plant operators	9
75 Food processing, wood working, garment and other craft and related trades workers	10

Each occupational group is specific in terms of the overall share of the workforce, national/regional differences and importance for the overall labour market and economy.

Keeping this in mind, in the following sections the study looks closer at the top 10 occupational groups in terms of:

- Countries with bottlenecks in the occupational group
- Specific Occupations at 4 digit level per country
- Main sectors concerned by bottlenecks
- Main reasons for bottleneck vacancies
- Initiatives taken by employers to overcome recruitment problems
- Possible options for EU action

The analysis of occupational groups also presents examples from the country research, to illustrate interesting aspects of the bottleneck. The selection has not been based on specific criteria, such as good practice or alike, but rather serves contextualise and exemplify bottlenecks in the national context. For more information on a specific example, please refer to the country fiche in question.

Bottlenecks in ISCO Occupational Group 72 Metal, machinery and related trades workers

Metal, machinery and related trades workers is the occupational group with most bottlenecks identified in the study countries. A total of 23 out of the 29 study countries reported bottlenecks within this occupational group. As shown in Table 9, at the ISCO-3- or 4-digit level, most bottlenecks can be found in the category of welders and flamecutters, where ten study countries reported of bottlenecks.[18]

Table 9: Metal, machinery and related trades workers

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[19]	Number of countries with bottlenecks
52	72	Metal, machinery and related trades workers	7212 Welders and flamecutters (10) 7223 Metal working machine tool setters and operators (9) 7231 Motor vehicle mechanics and repairers (6) 7222 Toolmakers and related workers (5) 7213 Sheet-metal workers (4) 7214 Structural-metal preparers and erectors (5) 7233 Agricultural and industrial machinery mechanics and repairers (4) 723 Machinery mechanics and repairers (2) 7224 Metal polishers, wheel grinders and tool sharpeners (2) 721 Sheet and structural metal workers, moulders and welders, and related workers (1) 7211 Metal moulders and coremakers (1) 7215 Riggers and cable splicers (1) 7232 Aircraft engine mechanics and repairers (1) 72 Unspecified (1)	23

In 2011-2012, app. 8,2 million persons worked in the professions related to metal, machinery and related trades in EU-27, which represents 3,9% of the total EU labour force[20]. It is forecasted that demand will decrease in coming years.[21]

The study has identified that bottlenecks occur in 15,6% of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[22]

[18] In some study countries it has not been possible to specify the bottlenecks to a 4-digit level, despite of additional research. This means that the bottlenecks in the countries, where only 2- or 3-digit levels are used may be more significant than what is evident from the data.
[19] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.
[20] Average 2011/2012, own calculation based on LFS data.
[21] Cedefop, Future skills supply and demand in Europe, 2012.
[22] Own calculation based on LFS data

It is relevant to look at the ranking of the occupations at ISCO 3- and 4-digit level, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group metal, machinery and related trades workers' are ranked. The differences in ranking are related to a relatively high number of bottlenecks being identified at the 4-digit level with a ranking, which leads to a high rank position at overall 4-digit level.

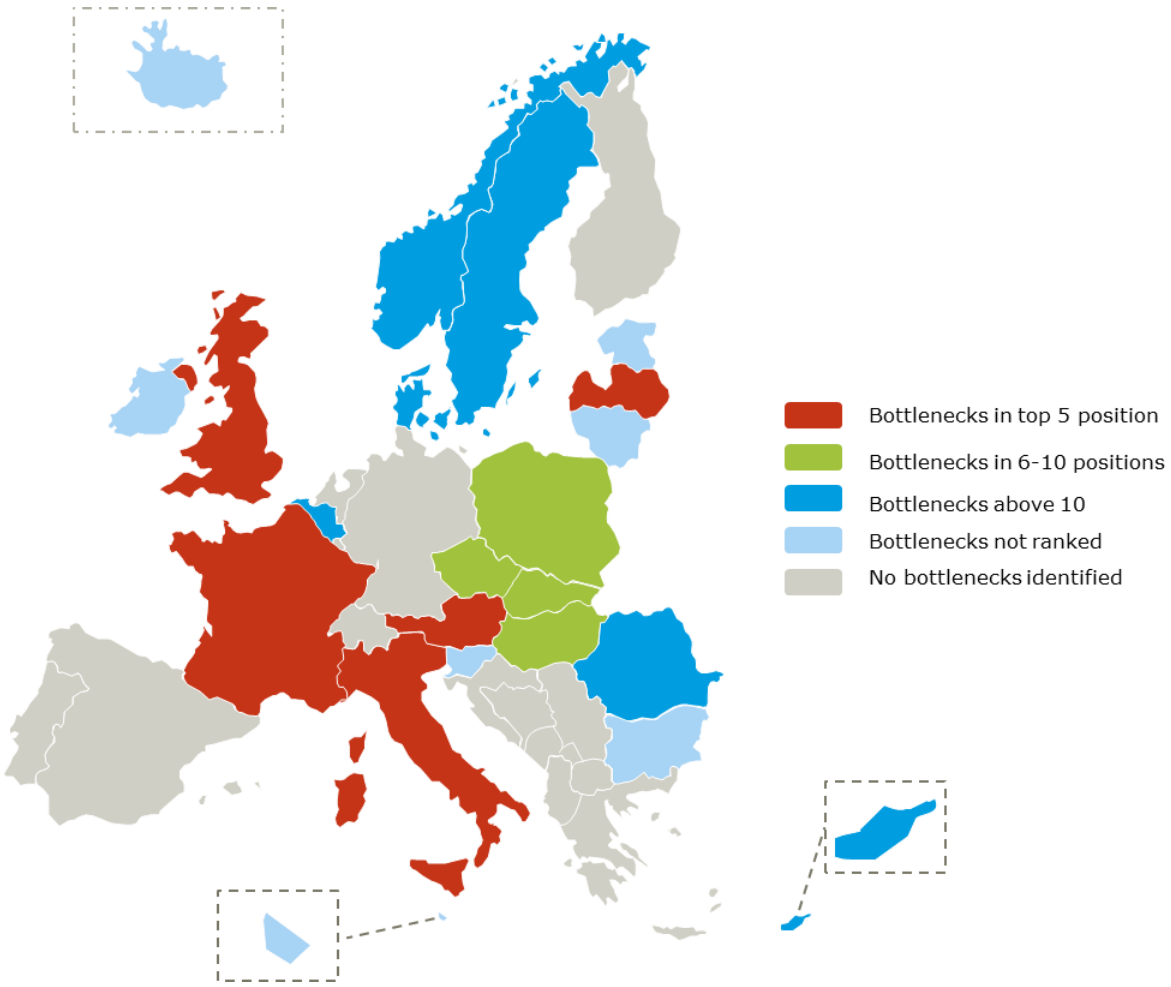
With regard to ISCO-3 level, 721 Sheet and structural metal workers, moulders and welders, and related workers is ranked 3rd, 722 Blacksmiths, toolmakers and related trades workers 5th and 723 Machinery mechanics and repairers 15th at the EU-level. At ISCO 4-digit level, the two occupational groups figuring in top-20 at EU level are 7223 Metal working machine tool setters and operators (2nd) and 7212 Welders and flamecutters (6th).

Countries with bottlenecks in occupation

Geographically, the bottlenecks in this field are dispersed relatively evenly among the study countries, with 23 countries reporting bottlenecks within this occupational group.

The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group metal, machinery and related trades workers' are in the study countries. As a country can have several specific occupations listed on different ranks, only the highest ranked specific occupation has been taken into account when elaborating the figure.

Figure 11: Ranking of bottlenecks in metal, machinery and related trades workers' occupations



There are only six countries where bottlenecks are not identified, but the importance of the bottlenecks in the national context (i.e. their ranking among all the bottlenecks in the country) differs greatly from one study country to another. The bottlenecks related to metal, machinery and related trades workers' occupations are ranked in top-5 in five of the study countries, namely Austria, France, Italy, Latvia and the UK. This means that there is at least one specific bottleneck related to metal, machinery and related trades workers' occupations in the top-5 bottlenecks in the country in question.

It is also interesting to look at the number of specific occupations which have been identified as bottlenecks in each country. This can be used as another indication of the "importance" of shortage. The countries with highest number of reported bottlenecks in metal, machinery and related trades workers' occupations are France, Austria, Italy, Slovenia and United Kingdom, with more than four specific occupations each.

The table below further specifies which occupations are concerned in each of the countries.

Table 10: Specific bottleneck occupations among metal, machinery and related trades workers[23]

Country	3 or 4-digit occupations[24] (Further specification where relevant)	Regional aspects
France	7211 Metal moulders and coremakers (7) 7213 Sheet-metal workers (specifically: sheet-metal workers (5); Pipefitters (2)) 7214 Structural-metal preparers and erectors (8) 7223 Metal working machine tool setters and operators (4) 7231 Motor vehicle mechanics and repairers (9)	
Austria	7212 Welders and flamecutters (6) 7223 Metal working machine tool setters and operators workers (specifically: Metal turners (2)) 7222 Toolmakers and related workers (15) 7224 Metal polishers, wheel grinders and tool sharpeners (specifically: Milling machinists (1)) 7233 Agricultural and industrial machinery mechanics and repairers (9)	7223: both rural and urban areas are affected 7224: rural areas affected In particular metal turners and milling machinists are lacking in rural regions, characterized by intensive industrialisation. The regions of Steiermark, Niederösterreich, and Oberösterreich have a high share of industrial production and require large numbers of employees in craft and related trades.
Italy	7214 Structural-metal preparers and erectors (14) 7223 Metal working machine tool setters and operators (specifically: Lathe turner (3)) 7231 Motor vehicle mechanics and repairers (17) 7233 Agricultural and industrial machinery mechanics and repairers (8)	7223: both rural and urban areas are affected Concerning lathe turners recruitment difficulties are registered on the whole national territory. However in the region Lombardia the level of firms expecting recruitment difficulties is higher than the national average.
Slovenia	7212 Welders and flamecutters 7222 Toolmakers and related workers 7223 Metal working machine tool setters and operators 7233 Agricultural and industrial machinery mechanics and repairers	7222: both rural and urban areas are affected 7233: both rural and urban areas are affected
United Kingdom	7214 Structural-metal preparers and erectors (specifically: Metal plate workers. and riveters (13)) 7222 Toolmakers and related workers (specifically: Toolmakers and CNC machinists (9)) 7223 Metal working machine tool setters and operators (4) 7231 Motor vehicle mechanics and repairers (specifically: Vehicle body builders & repairers (10))	

[23] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[24] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further ranking of the 3- or 4- digit level occupational category was provided, this is included in parentheses.

Belgium	7223 Metal working machine tool setters and operators (20) 7233 Machinery mechanics and repairers (16) 7231 Motor vehicle mechanics and repairers (19)	
Czech Republic	7212 Welders and flamecutters (7) 7222 Toolmakers and related workers (18) 7223 Metal working machine tool setters and operators (11)	
Estonia	7212 Welders and flamecutters 7223 Metal working machine tool setters and operators 723 Machinery mechanics and repairers	723: both rural and urban areas are affected 7212: both rural and urban areas are affected 7223: both rural and urban areas are affected
Hungary	7212 Welders and flamecutters (16) 7222 Toolmakers and related workers (8)	
Latvia	7212 Welders and flamecutters (1) 7214 Structural-metal preparers and erectors (2)	
Lithuania	7212 Welders and flamecutters 7231 Motor vehicle mechanics and repairers	7212: both rural and urban areas are affected 7231: both rural and urban areas are affected
Slovakia	7212 Welders and flamecutters (12) 7224 Metal polishers, wheel grinders and tool sharpeners (11)	
Sweden	7213 Sheet-metal workers (13) 7231 Motor vehicle mechanics and repairers (12)	
Bulgaria	7212 Welders and flamecutters	
Cyprus	7215 Riggers and cable splicers (13)	
Denmark	7213 Sheet-metal workers (20)	
Iceland	721 Sheet and structural metal workers, moulders and welders, and related workers	721: both rural and urban areas are affected
Germany	7214 Structural-metal preparers and erectors	
Ireland	7223 Metal working machine tool setters and operators (specifically: Precision toolmakers and CNC)	
Malta	7232 Aircraft engine mechanics and repairers	
Norway	7212 Welders and flamecutters (15)	7212: both rural and urban areas are affected
Poland	72 Metal, machinery and related trades workers (6)	
Romania	723 Machinery mechanics and repairers (14)	

The following box elaborates on the specificities of the Austrian labour market for metal, machinery and related trades workers' sector.

In Austria the situation is characterised by a strong regional concentration of bottlenecks. Industrial production, within which the bottlenecks in metal, machinery and related trades workers have mainly been identified, is concentrated in the NUTS level 2 regions of Steiermark, Niederösterreich and Oberösterreich. The high concentration of industrial production combined with the rural characteristics of the region make recruiting difficult, as potential applicants are mainly trained in urban centres and reluctant to relocate to the rural areas.

Main sectors concerned

There are three main sectors[25] where metal, machinery and related workers are lacking; section C - manufacturing, section F – construction, and section G – wholesale and retail trade; repair of motor vehicles and motorcycles. It is interesting to see that manufacturing is the section where the clear majority of the bottlenecks are placed (41), instead of construction, with only eight bottlenecks. This can be related to the current trends in the European economy, where the construction sector is still suffering greatly from the economic downturn, but where the manufacturing sector seems to be picking up again.

For example in the UK, the manufacturing sector currently accounts for approximately 10% of GDP, and has a wide range of skill needs. Well established strengths include engineering machinery, pharmaceuticals, chemicals and aerospace. In the manufacturing sector, 30% of vacancies were identified as hard-to-fill, equating to approximately 11,600 vacancies. The industry indicates a move toward more technical roles and a need for more young people to enter the sector with Science, Technology, Engineering and Maths (STEM) skills. Rapid advances in processes can also be seen in various industries: Toolmakers, for example, who produce precision moulds, dies etc., which are then used in manufacturing, now often need specific skillsets to manage the computer numerically controlled (CNC) processes.

[25] According to their NACE section.

Main reasons for bottleneck problem

The main reasons for labour shortages among metal, machinery and related workers is a lack of applicants meeting the skills requirements for the jobs.

Table 11 Reasons for shortages metal, machinery and related trades workers (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
7211 Metal moulders and coremakers	1	0	0	1
7212 Welders and flamecutters	7	1	2	10
7213 Sheet-metal workers	3	0	0	3
7214 Structural-metal preparers and erectors	2	0	1	3
7215 Riggers and cable splicers	1	0	0	1
7222 Toolmakers and related workers	2	1	1	4
7223 Metal working machine tool setters and operators	6	0	3	9
7224 Metal polishers, wheel grinders and tool sharpeners	2	0	0	2
7231 Motor vehicle mechanics and repairers	5	0	1	6
7232 Aircraft engine mechanics and repairers	1	0	0	1
Total	34	2	8	44

More precisely it concerns a lack of technical competencies, which is reported to be the specific reason in more than 80% of reported bottleneck problems. Consequently, other reasons such as salaries, location of work, work experience etc. are of much less importance seen on an overall EU level.

The root causes for a lack of technical competencies seems to be related to a lack of candidates who are attracted to sometimes unknown occupations. The global construction and industry sectors, especially for metallurgy, also suffer from a negative image among young people, which is identified by some stakeholders as the main reason behind these tensions (mentioned amongst others in France and Italy). Furthermore rapid technological development is mentioned, with a high demand an adaptable workforce, ready to follow technological change.

Age was mentioned as a factor in 47% of the bottlenecks, and one of the reasons is related to the current situation where working population is close to retirement age and expected to leave to pension, leaving many unfilled positions. A challenge here is often that the applicants are required to have technical expertise to be able to carry out the tasks. Physical requirements were also mentioned as a hindering factor for older employees. Hence, the current shortages are likely to be more related to replacement demand rather than growth.

Gender seems to play an important role in the emergence of bottlenecks in this occupational group. In 73% of the identified bottlenecks gender-related aspects were reported to have played a role. This is the case throughout the whole sub-major group. The main reason mentioned is that the job image in this field is not gender-

neutral and may keep potential female candidates away from the sector and relevant educational paths.

Mitigation strategies

The main strategies used by employers to ensure supply of qualified labour are reported to be:

Table 12 Reported mitigation strategies for Metal, machinery and related...

72 Metal, machinery and related trades workers (total 53)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job	11%
Reorganisation of work	2%
Providing additional training and development to existing staff	32%
Recruitment activities aimed at related occupations	11%
Campaigns and marketing	15%
Additional recruitment activities in other EU countries	23%
Additional recruitment activities outside EU	8%
Other	15%

As can be seen in the table above, the main strategies used are additional training and development of existing staff, and recruitment in other EU countries. Most of the other responses relate to either hiring of foreign workers or general increase in working hours, and increase in grey economy activity to fill up labour shortages.

Given the tradition of apprenticeship, it is not surprising that the most frequently reported mitigation strategy is additional training and development. Targeted recruitment in other countries takes place mainly from East to West, i.e. from new to old Member States. However, there is little evidence that the labour mobility is "filling" the gap; it is rather a short term solution to an imminent problem.

There are a few examples of more concerted efforts to increase the labour supply among metal machinery and related workers, notably increase in places in vocational education, collaboration between educational institutions and employers as well as campaigns to increase interest in the specific occupations. There is however little evidence so far of the effects of these initiatives, possibly due to the time needed for impact to show.

Concluding Remarks

Bottlenecks experienced for jobs within metal machinery and related workers are mainly registered in the manufacturing and the construction sectors. Notwithstanding the current economic situation in Europe, with slow growth in most countries, bottlenecks persist within these industries which are normally quickly affected by up- and down-turns in the economy.

The main reasons behind bottlenecks within this occupational group are a lack of skills and a lack of interest for professions belonging to it, especially among young people. Gender is to be considered another factor for the existence of shortages of metal machinery and related workers, as the non-gender neutral image of most occupations deters the female workforce. This said, future action could be directed to support different types of vocational education and training, apprenticeship schemes and alike, while coupling such actions with awareness-raising campaigns, to improve the image of skilled manual occupations, especially among young people.

Bottlenecks in ISCO Occupational Group 21 - Science and engineering professionals

Bottlenecks in the high-skilled occupational group science and engineering professionals have been identified in 21 of the 29 study countries. At the 3- or 4- digit level, particularly mechanical engineers, civil engineers, electrical engineers and electronics engineers are in high demand, as shown by Table 13.[26]

Table 13 Science and engineering professionals

Count of bottlenecks	ISCO	Description	ISCO 3- or 4-digit level[27]	Number of countries
47	21	Science and engineering professionals	2144 Mechanical engineers (9) 2151 Electrical engineers (9) 2152 Electronics engineers (7) 2142 Civil engineers (6) 2141 Industrial and production engineers (4) 2149 Engineering professionals not elsewhere classified (3) 214 Engineering professionals (excluding electrotechnology) (1) 216 Architects, planners, surveyors and designers (1) 2113 Chemists (1) 2132 Farming, forestry and fisheries advisers (1) 2146 Mining engineers, metallurgists and related professionals (1) 2153 Telecommunications engineers (1) 2163 Product and garment designers (1) 21 Unspecified(1)	21

In 2011-2012, app. 6,3 million people worked in professions related to science and engineering in EU-27, representing in total app. 3% of all employment in the EU[28]. It is forecasted that demand will increase in the coming years.[29]

The study has identified that bottlenecks occur in 6,5% of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[30]

When looking at the ranking of specific occupations at ISCO 4 digit level, 2144 Mechanical engineers (7), 2142 Civil engineers(14) and 2151 Electrical engineers (12) figure among the top 20 at an EU level (rank in brackets). If 3 digit level is used, 214 Engineering professionals (excluding electrotechnology) is ranked 4th at EU level, while the sub-group 215 Electrotechnology engineers is outside the top 20 list. The differences in ranking are related to a relatively high number of bottlenecks being

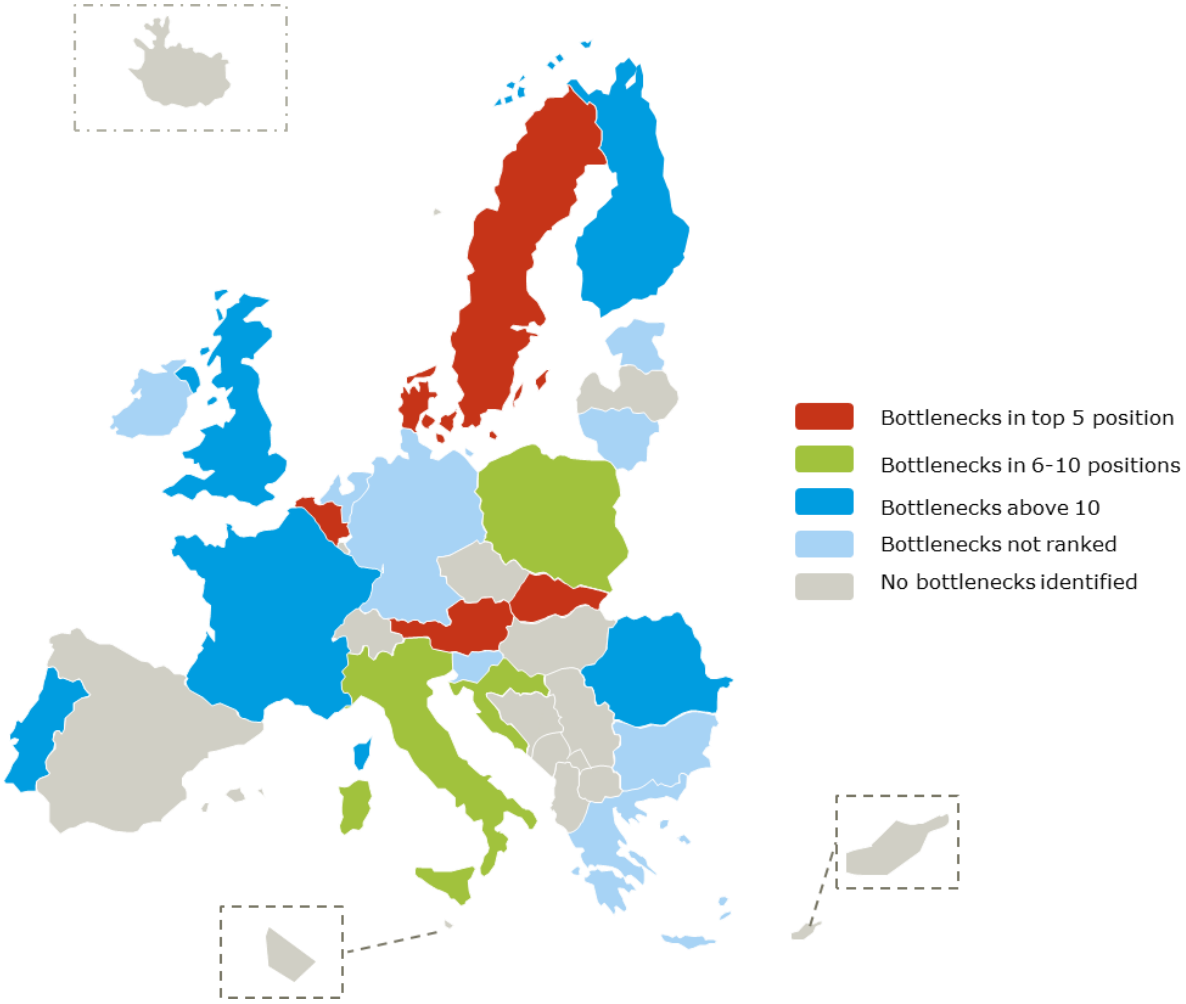
[26] In some study countries it has not been possible to specify the bottlenecks to a 4-digit level, despite of additional research. This means that the bottlenecks in the countries, where only 2- or 3-digit levels are used may be more significant than what is evident from the data.
[27] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.
[28] Average 2011/2012, own calculation based on LFS data.
[29] Cedefop, Future skills supply and demand in Europe, 2012.
[30] Own calculation based on LFS data

identified at the 4 digit level with a ranking, which means that ranking at 4 digit level becomes more prominent for the occupation.

Countries with bottlenecks in occupation

The difficulty to fill vacancies within the occupational group of science and engineering professionals seems fairly evenly spread on the European labour market. The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group science and engineering professionals are in the study countries. As a country can have several specific occupations listed on different ranks, only the highest ranked specific occupation has been taken into account when elaborating the figure.

Figure 12 Ranking of bottlenecks in science and engineering professionals' occupations



The bottlenecks related to science and engineering professionals are ranked in the top-5 in Sweden, Denmark, Belgium, Austria and Slovakia. It should be noted that several countries with a high demand for labour in the science and engineering field, notably Germany, have not been able to produce a ranking (out of the total 48 bottleneck occupations identified, 28 have not been possible to rank). Spain, Czech Republic, Latvia, Iceland, Cyprus, Malta and Hungary are the only countries not reporting bottlenecks among science and engineering professionals.

Another indication of the "importance" of shortage is the number of specific occupations which have been identified in each country. The countries with most reported bottlenecks in science and engineering professionals' occupations are Bulgaria, Germany, Greece, the Netherlands and Sweden, all of which have identified four or more specific bottleneck occupations at 3 or 4 digit level.

The table below further specifies which occupations are concerned in each of the countries.

Table 14 Specific bottleneck occupations among science and engineering professionals[31]

Country	3 or 4-digit occupations[32] (Further specification where relevant)	Regional aspects
Bulgaria	2132 Farming, forestry and fisheries advisers 2141 Industrial and production engineers 2142 Civil engineers 2151 Electrical engineers 2163 Product and garment designers	2132: rural areas affected
Germany	2149 Engineering professionals not elsewhere classified 2142 Civil engineers 2151 Electrical engineers 2144 Mechanical engineers	2149: both urban and rural areas affected 215: both urban and rural areas affected 2144: both urban and rural areas affected, particularly Western states and Thuringa
Greece	2141 Industrial and production engineers 2149 Engineering professionals not elsewhere classified 2152 Electronics engineers 2153 Telecommunications engineers	2149: both urban and rural areas affected
The Netherlands	2144 Mechanical engineers 2149 Engineering professionals not elsewhere classified 2152 Electronics engineers 216 Architects, planners, surveyors and designers	2144: both urban and rural areas affected 2149: both urban and rural areas affected
Sweden	2142 Civil engineers (6) 2144 Mechanical engineers (14) 2146 Mining engineers, metallurgists and related professionals (4) 2151 Electrical engineers (8)	2146: rural areas affected. Most mines are located in the NUTS region SE33 (North-Western Sweden) 2151: both urban and rural areas affected
Estonia	2144 Mechanical engineers 2151 Electrical engineers	2144: both urban and rural areas affected 2151: both urban and rural areas

[31] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[32] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

	2152 Electronics engineers	affected 2151: both urban and rural areas affected
Ireland	2113 Chemists (Scientists (biologists. chemists and biotechnologists) especially niche skills for the roles in Bio-pharmaceutical industry such as covigilance and product formulation and analytical development (10)) 2141 Industrial and production engineers (8) 2151 Electrical engineers (9)	
Lithuania	2141 Industrial and production engineers 2151 Electrical engineers 2152 Electronics engineers	2144: both urban and rural areas affected 2149: both urban and rural areas affected
Austria	2144 Mechanical engineers (11) 2151 Electrical engineers (5)	
Belgium	214 Engineering professionals (excluding electrotechnology) (2)	214: both urban and rural areas affected
Croatia	2142 Civil engineers (6) 2151 Electrical engineers (9)	2142: urban areas affected 2151: urban areas affected
Slovakia	2142 Civil engineers (2) 2144 Mechanical engineers (3)	
Slovenia	2144 Mechanical engineers 2151 Electrical engineers	2144: both urban and rural areas affected 2151: both urban and rural areas affected
Denmark	2144 Mechanical engineers (5)	2144: both urban and rural areas affected
France	2161 Building architects (specifically: Building designer (18))	
Italy	2144 Mechanical engineers (10)	2144: both urban and rural areas affected
Norway	2142 Civil engineers (19)	2142: both urban and rural areas affected
Poland	21 Science and engineering professionals (8)	
Portugal	2152 Electronics engineers (15)	2152: both urban and rural areas affected
Romania	2151 Electrical engineers (specifically: Electrotechnology engineers(12))	2151: urban areas affected
United Kingdom	2152 Electronics engineers (17)	

The following box elaborates on the specificities of the Bulgarian labour market for science and engineering professionals.

Bulgaria is the country with the highest number of bottlenecks within this occupational group (of the included countries). The existence of bottlenecks within this group in the country is explained by the lack of skilled workforce as a result of technological changes, the lack of relevant qualification of old generations and the few graduates in the field. The reasons are mainly structural and related to the transformation of the Bulgarian economy during the 1990s, where many specialists in the field lost their employment. When the economy turned and the need for science and engineering

professionals increased again, there were no more specialists in the field available, as the sector had become unpopular.

Main sectors concerned

Manufacturing (section C) is the main sector where science and engineering professionals are sought after. This is in particular true for the manufacture of computer, electronic and optical products. Furthermore, construction (section F), professional, scientific and technical activities (section 5) and the electricity, gas, steam and air conditioning supply sector (section D) experience lack of employees with science and engineering degrees.

In the manufacturing sector, mechanical and electronics engineers are particularly in high demand. Within the professional, scientific and technical activities, architectural and engineering activities are highly demanded; difficulties in recruiting employees are experienced also with regard to technical testing and analysis. The construction sector is mainly looking for civil engineers, while electrical engineers are looked for in the electricity, gas, steam and air conditioning sector.

In the Netherlands, where four bottlenecks have been identified, the manufacturing sector covers mainly food, chemical industry and other process based activities, metal and electro-technical industry as well as maintenance.

Main reasons for bottleneck problem

A lack of applicants meeting the skills requirement for the job is the only main reason given for the labour shortage among engineers, irrespective of specialisation.

Table 15 Reasons for shortages science and engineering professionals (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
2113 Chemists	1		0	1
2132 Farming, forestry and fisheries advisers	0		1	1
2141 Industrial and production engineers	3		0	3
2142 Civil engineers	4		1	5
2144 Mechanical engineers	8		0	8
2146 Mining engineers, metallurgists and related professionals	0		1	1
2149 Engineering professionals not elsewhere classified	1		0	1
2151 Electrical engineers	8		0	8
2152 Electronics engineers	5		0	5
2153 Telecommunications engineers				
2161 Building architects	1		0	1
2163 Product and garment designers	1		0	1
Total	32		3	35

Lack of skills refers mainly to lack of technical skills, e.g. a lack of applicants with the required qualifications, such as degrees and diplomas. Secondly, it refers to a lack of applicants with sufficient experience.

Looking specifically at the countries where several engineering occupations are identified as bottlenecks, experts identify a combination of lack of interest in the engineering professions and technological change as reasons making "older" degrees outdated and generates shortages. As mentioned earlier, in Bulgaria, the lack of skilled workforce is due to the technological changes, the lack of relevant qualification of old generations and the few graduates in the field. In Germany, high drop-out rates among STEM students as well as relatively low interest in STEM occupations, particularly among girls, are the main drivers of bottleneck vacancies in engineering industries, as illustrated by the following quote from Germany's country fiche.

> The electrical industry, as the mechanical plant engineering sector, is fundamental to Germany's economic performance. Both sectors have been experiencing significant economic growth resulting in a rising demand for high skilled as well as skilled manual STEM labour force. In Q4-2011 there were approximately 77,000 vacancies to be filled with high skilled engineers, while the demand for skilled manual STEM workers amounted to 68,000. It is assumed that the high demand for STEM labour force will increase in the future since a high proportion of engineers is close to retirement, while the number of STEM graduates is only slightly increasing. High drop-out rates among STEM students as well as relatively low interest in STEM occupations, particularly among girls, are the main drivers of bottleneck vacancies in engineering industries.

Gender issues were identified in 59% of the bottlenecks. In particular the occupational group of mechanical engineers (2144) is experiencing challenges with this regard. This is mainly due to the fact that the job image is not gender neutral. Age plays a role to a much lesser extent than gender and the only reasons given for age-related bottlenecks are related to the long experience that is required in some cases.

Mitigation strategies

The main mitigation actions by employers are to provide additional training and development, campaigns and marketing efforts to attract staff and recruitment activities aimed at other occupations. There are relatively little targeted recruitment activities in other EU countries, possibly due to differences in the educational systems and qualifications for high skilled science and engineering professionals.

Table 16 Reported mitigation strategies Science and engineering prof.

21 Science and engineering professionals (total 47)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job (e.g. increase in starting salaries)	16%
Increase the hours worked (overtime, increase working hours of part time employed, focus on staff retention in bottleneck jobs, etc.)	8%
Reorganisation of work	8%
Providing additional training and development to existing staff	31%
Recruitment activities aimed at related occupations	22%
Campaigns and marketing	29%
Additional recruitment activities in other EU countries	6%
Other	16%

Other activities aiming to increase the labour supply have been directed primarily at students, with mentoring programmes (in Germany) and different types of initiatives to attract more students to science and technology educations.

At a more overall level, several countries have increased the number of places in science and technology education, coupled with campaigns to increase interest in science and engineering professions (often targeting in particular girls/women, who are clearly underrepresented in the professions). So far the results of such efforts remain to be seen, especially as it often includes primary schools and young children.

Concluding remarks

The labour shortages in science and technology professionals are mainly due to a lack of technical skills. While there is a general lack, specific bottlenecks in different countries are mainly related to specialisations within the occupational group. In the manufacturing sector, mechanical and electronics engineers are particularly in high demand. Within the professional, scientific and technical activities, architectural and engineering activities are highly demanded; difficulties in recruiting employees are experienced also with regard to technical testing and analysis. The construction sector is mainly looking for civil engineers, while electrical engineers are looked for in the electricity, gas, steam and air conditioning sector. In many countries schemes are in place to increase interest among young people to invest in a science and technology education, including schemes directly targeting women.

Bottlenecks in ISCO Occupational Group 25 - Information and communications technology professionals

Bottlenecks have been identified in 20 of the study countries in the occupational group of information and communications technology professionals. Most of the bottlenecks are related to the minor group 251 – Software and applications developers and analysts (38 of the 48 bottlenecks are identified here). In particular software developers and systems analysts are in high demand as evident from Table 13.

The study countries have identified bottlenecks on different levels, and there are several countries where bottlenecks in this field have only been defined on three- or two-digit level. This means that these countries may be experiencing more pronounced bottlenecks than what is obvious from the data, as there may be several occupations within a sub-major category, where employers are experiencing difficulties to recruit people.

Table 17 Information and communications technology professionals

Count of bottlenecks	ISCO	Description	ISCO 3- or 4-digit level[33]	Number of countries
48	25	Information and communications technology professionals	2512 Software developers (9) 2511 Systems analysts (7) 251 Software and applications developers and analysts (6) 2521 Database designers and administrators (6) 2513 Web and multimedia developers (4) 2519 Software and applications developers and analysts not elsewhere classified (4) 2514 Applications programmers (3) 2522 Systems administrators (3) 2523 Computer network professionals (3) 252 Database and network professionals (2) 25 Unspecified (1)	20

In 2011-2012, on average 3,1 million people worked in professions related to information and communications technology in the EU, which corresponds to 1,5% of all the employment in the European Union.[34] The study has identified that bottlenecks occur in 5,6% of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[35]

In order to understand better, which specific occupations within this occupational group are in particular demand at overall EU level, it is relevant to look at the ranking of the occupations at ISCO 3- and 4-digit level, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group information and communications technology professionals are. At ISCO 3-digit level, group 251 Software and applications developers and analysts is on the top of ranking, i.e. the most important group of bottlenecks in the EU on this level. At ISCO 4-digit level the

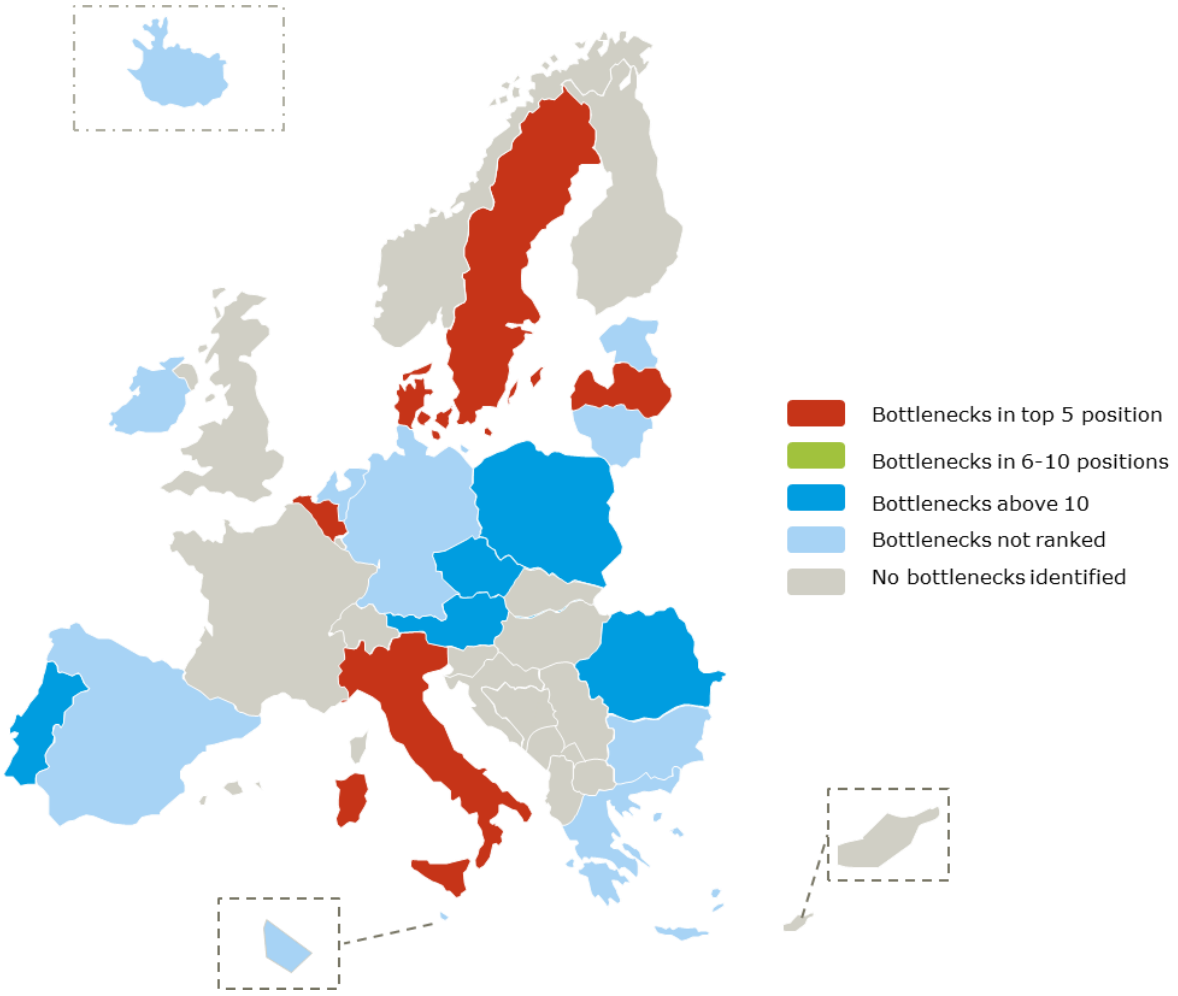
[33] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.
[34] Average 2011/2012, own calculation based on LFS data.
[35] Own calculation based on LFS data.

specific group 2512 Software developers ranks 8th and 2511 Systems analysts 15th, showing that the bottlenecks within this area are important in the EU-wide context. The differences in ranking are related to a relatively high number of bottlenecks being identified at the 3-digit level with a ranking, and which means that ranking at 3-digit level becomes more prominent for the occupation. The reverse is true for occupations which have mainly been identified at 4-digit level and/or have not been ranked.

Countries with bottlenecks in occupation

Information and communications technology professionals are in high demand in most of the European countries. The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list information and communications technology professionals rank in the study countries. As a country can have several specific occupations listed on different ranks, only the highest ranked specific occupation has been taken into account when elaborating the figure.

Figure 13 Ranking of bottlenecks in information and communications technology professionals' occupations



The bottlenecks within this occupational group are ranked at top-5 in Belgium, Denmark, Italy, Latvia and Sweden. The above figure shows also that there is a high number of countries where bottlenecks have been identified within this occupational category, but where a ranking of those bottlenecks has not been possible.

This is for example the case in three study countries, which have identified numerous bottlenecks within this occupational group: Ireland, Spain and Greece. As can be seen

from the table below, in these countries, the study has identified bottlenecks in five or more specific occupations within this occupational group, but as the bottlenecks are not ranked in importance it is not possible to assess their importance in the overall context of bottlenecks in the country in question.

Table 18 Specific bottleneck occupations among information and communications technology professionals[36]

Country	3 or 4-digit occupations[37]	Further specification (when relevant)	Regional aspects
Ireland	2512 Software developers 2513 Web and multimedia developers 2514 Applications programmers 2519 Software and applications developers and analysts not elsewhere classified 2523 Computer network professionals	2513: Cloud computing specialists (e.g. Shell. Pearl. Python and Virtualisation Technologies. namely FlexNetwork and Microsoft Application Virtualization) Web and multimedia developers - Web development (e.g. HTML/XHTML. JavaScript. and CSS). and client computing Web and multimedia developers - Animation 3D (gaming industry). C++/Java.net	2512: rural and urban areas affected 2513: rural and urban areas affected. The recruitment difficulty follows the pattern of sector activity, jobs are mainly in Dublin. Galway and Cork. 2514: rural and urban areas affected 2519: urban areas affected 2523: rural and urban areas affected
Spain	2514 Applications programmers 2519 Software and applications developers and analysts not elsewhere classified 2521 Database designers and administrators	2521: ABAP Programmer Oracle Database Administrator Cobol Programmer JAVA Architect	
Greece	2512 Software developers 2513 Web and multimedia developers 2521 Database designers and administrators 2522 Systems administrators 2523 Computer network professionals	2512 and 2513: Mobile applications, Java, J2EE, .NET, C#, PHP and Drupal Framework, web user interface designing, Web Developments, LINUX and system testing for specific protocols (e.g. TCP/UDP/GTP/SIP)	
The Netherlands	2511 Systems analysts 2512 Software developers	2511: Computer scientists Systems Analysts Technical Systems Analysts	2511: rural and urban areas affected 2512: 2511: rural and urban areas affected
Iceland	2511 Systems analysts	n/a	

[36] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[37] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available.

	2512 Software developers 2522 Systems administrators		
Malta	2512 Software developers 2519 Software and applications developers and analysts not elsewhere classified 2522 Systems administrators	2519: Software testers	
Sweden	251 Software and applications developers and analysts (see further specification) 2511 Systems analysts (16) 2512 Software developers (2)	251: IT architects (5)	2511: urban areas affected
Bulgaria	251 Software and applications developers and analysts 252 Database and network professionals	n/a	
Italy	2511 Systems analysts (1) 2512 Software developers (see further specification)	2512: IT system designer (18)	2511: rural and urban areas affected 2512: rural and urban areas affected
Lithuania	251 Software and applications developers and analysts 252 Database and network professionals	n/a	251: urban areas affected 252: urban areas affected
Austria	2512 Software developers (see further specification)	2512: Systems analysts; Software developers; Computer network and systems technicians (17)	
Belgium	251 Software and applications developers and analysts (4)	n/a	251: rural and urban areas affected
Czech Republic	2514 Applications programmers (15)	n/a	
Denmark	2519 Software and applications developers and analysts not elsewhere classified (see further specification)	2519: Software and applications developers and analysts (3)	2519: rural and urban areas affected
Estonia	251 Software and applications developers and analysts	n/a	251: rural and urban areas affected
Germany	2521 Database designers and administrators 2523 Computer network professionals	n/a	
Latvia	2512 Software developers (5)	n/a	
Poland	25 Information and communications technology professionals (12)	n/a	25: urban areas affected
Portugal	2511 Systems analysts (17)	n/a	2511: rural and urban areas affected
Romania	251 Software and applications developers and analysts (16)	n/a	251: urban areas affected

The following boxes elaborate on the specificities of the Irish and Greek labour market for ICT professionals.

In Ireland, which is the country with most bottlenecks in this category, there are more than 75,000 employed in the ICT sector. It has experienced strong expansion between 2007 and 2012, with overall employment in IT occupations steadily increasing. There are currently over 4,500 difficult to fill vacancies in the sector, with a particular demand for software developers and programmers, mobile technology application programmers, IT project managers with technical backgrounds, and network security specialists. The FIT ICT Skills Audit (2012) reports that many vacancies are at intermediate level and could be addressed with short term training programmes (6-24 months). Future demand is expected for roles related to cloud computing, service design, database management, social networks and media and development of e-commerce applications. IT user support positions are also identified as hard to fill, with many contact centre roles requiring fluency in European languages (French, German, Spanish, Dutch, Flemish and Swedish) or relevant product knowledge. There has been a decrease in computing and engineering graduate numbers since 2002, although the education system has been responding rapidly and intake into science and technology courses has continued to expand. There is an objective to double the number of ICT graduates to 2000 by 2018.

In Greece the employers in the ICT sector are looking for workers specialized in specific programming languages, developments and applications, especially mobile applications, Java, J2EE, .NET, C#, PHP and Drupal Framework, web user interface designing, Web Developments, LINUX and system testing for specific protocols (e.g. TCP/UDP/GTP/SIP). Senior developers are also in demand. The period needed to fill vacancies has decreased due to the high number of unemployed. Nevertheless, employers are more cautious and adopt more complicated recruitment processes to fill vacancies during the crisis period, to avoid the cost of failed recruitment.

Main sectors concerned

Information and communication technology professionals are almost exclusively sought after in the sector of information and communication (section J), where the majority of the vacancies are related to computer programming, consultancy and related activities as well as information service activities.

It is also interesting to see that Spain and Greece, which have both been strongly hit by the economic crisis, are suffering from a high demand of ICT professionals.

For example in Spain, the information and communication sector is mainly looking for experienced workforce, which is why young professionals have difficulties to enter in the market. As a consequence, the enrolment in IT careers has dropped by 40% between 2002 and 2010. Another issue concerns the geographical mobility reluctance of candidates while vacancies offered are concentrated in Madrid and Barcelona (80% of the vacancies).

Main reasons for bottleneck problem

As for many other high skilled professions, the lack of applicants meeting the skills requirement for the job is the main reason for labour shortages within ICT professions.

Table 19 Reasons for shortages information and communication technology professionals (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
2511 Systems analysts	7	0	0	7
2512 Software developers	8	0	1	9
2513 Web and multimedia developers	4	0	0	4
2514 Applications programmers	3	0	0	3
2519 Software and applications developers and analysts not elsewhere classified	3	0	1	4
2521 Database designers and administrators	4	1	0	5
2522 Systems administrators	2	0	1	3
2523 Computer network professionals	2	0	0	2
Total	33	1	3	37

Skills requirements relate primarily to technical skills, e.g. relevant degree or technical knowledge, but there is also a significant share of the bottlenecks which are reported as lack of work experience (almost 50%). This is higher than in other high skill professions with severe lack of applicants. One underlying factor for this might be the speed with which technological change takes place in the ICT field, making knowledge quickly obsolete.

In Spain the ICT sector increasingly requires more specialised profiles with high level of expertise, but there is not skilled workforce to fulfil this demand. One effect of the recent economic crisis in the country has been the internationalisation of the economic activities aiming to reach new markets, meaning that more and more posts in the labour market request foreign language skills, which applicants lack. In Sweden, which has a vibrant and growing ICT sector, lack of skilled workforce is due to too few graduates in the field, apart from a higher demand for experienced recruits.

This occupational group is also characterised by the existence of gender-related challenges to recruitment. The study countries reported that, in 42% of the bottleneck vacancies, gender-related aspects can be linked to the existence of the bottleneck. This is in particular true for software developers and web and multimedia developers. While wage-differences do not seem to be the problem (no country reported lower wages for females to be an issue), the most important gender-related aspect is that the job image is not gender neutral.

Besides gender, age seems to play an even bigger role in the existence of bottlenecks within this occupational group. Age-related aspects have been identified in 58% of the

bottlenecks. While on the one hand experience is often required in this sector, on the other concerns that the older employees' knowledge is outdated exist, due to the sector constant development. ´

Mitigation strategies

The main strategies identified to mitigate lack of skilled workforce are to provide additional training to staff as well as recruitment in other EU countries and outside EU. For several bottlenecks it was also reported (in "other") that outsourcing was used to cover for labour shortages (and possibly also lower costs, although this has not been assessed by the study).

Table 20 Reported mitigation strategies ICT professionals

25 Information and communications technology professionals (total 48)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job (e.g. increase in starting salaries)	19%
Increase the hours worked (overtime, increase working hours of part time employed, focus on staff retention in bottleneck jobs, etc.)	11%
Providing additional training and development to existing staff	47%
Recruitment activities aimed at related occupations	26%
Campaigns and marketing	26%
Additional recruitment activities in other EU countries	34%
Additional recruitment activities outside EU	36%
Other	53%

Other mentioned strategies related mainly to campaigns or initiatives aiming to get more students into relevant educations, including targeting high skilled asylum seekers for training and recruitment (Sweden).

It has been reported that turnover is high, which makes investment in existing staff risky, but this does not seem to deter employers from investing. Overall, ICT seems to be a sector where employers are pro-actively attempting to mitigate shortages through different means (to a higher extent that has been reported in other professional groups).

Concluding remarks

The information and communication technology professionals are almost exclusively sought after in the sector of information and communication (section J). While the number of countries reporting bottlenecks in ICT is high, there are large labour markets where ICT professionals are not identified as bottleneck occupations, such as France and the UK. Some of the shortages are in countries where the ICT industry is in strong growth, such as Ireland and Sweden. Other countries reporting shortages are Spain and Greece, where there is a lack of experienced workforce, even though the industry as such is not growing at the moment. Overall bottlenecks seems to be persistent in the ICT sector, notwithstanding employers are highly proactive in trying to alleviate them.

Bottlenecks in ISCO Occupational Group 22 - Health professionals

The high-skilled occupations of health professionals include bottlenecks in 21 of the 29 countries presented in this report. Employers are experiencing difficulties in recruiting in particular specialist medical practitioners and nursing professionals (Table 21). In several study countries the bottleneck has not been defined on 4-digit level, but the bottleneck is instead presented on a more general 3-digit level, stating the existence of shortages with respect to recruitment of medical doctors and nursing and midwifery professionals[38].

Table 21 Health professionals

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[39]	Number of countries with bottlenecks
47	22	Health professionals	2212 - Specialist medical practitioners (11) 2221 - Nursing professionals (11) 2211 - Generalist medical practitioners (7) 221 – Medical doctors (4) 2262 - Pharmacists (3) 222 – Nursing and midwifery professionals (2) 2240 - Paramedical practitioners (2) 2261 - Dentists (2) 2222 - Midwifery professionals (1) 2250 - Veterinarians (1) 2266 - Audiologists and speech therapists (1) 2269 - Health professionals not elsewhere classified (1) 22 - Unspecified (1)	21

In 2011-2011, on average app. 5,7 million people worked as health professionals in EU-27. They represented 2,7% of the total labour force in the EU.[40] It is foreseen that demand will be stable in coming years.[41]

Based on data from 2011 and 2012, the study has identified that bottlenecks occur in 13,2% of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[42]

In order to understand better, which specific occupations within this occupational group are in particular demand at overall EU level, it is relevant to look at the ranking of the occupations at ISCO 3- and 4-digit level, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group metal, machinery and related trades workers' are. At ISCO 3-digit level, group 221 Medical doctors ranks 6th, while group 222 Nursing and midwifery professionals ranks 12th among bottlenecks in

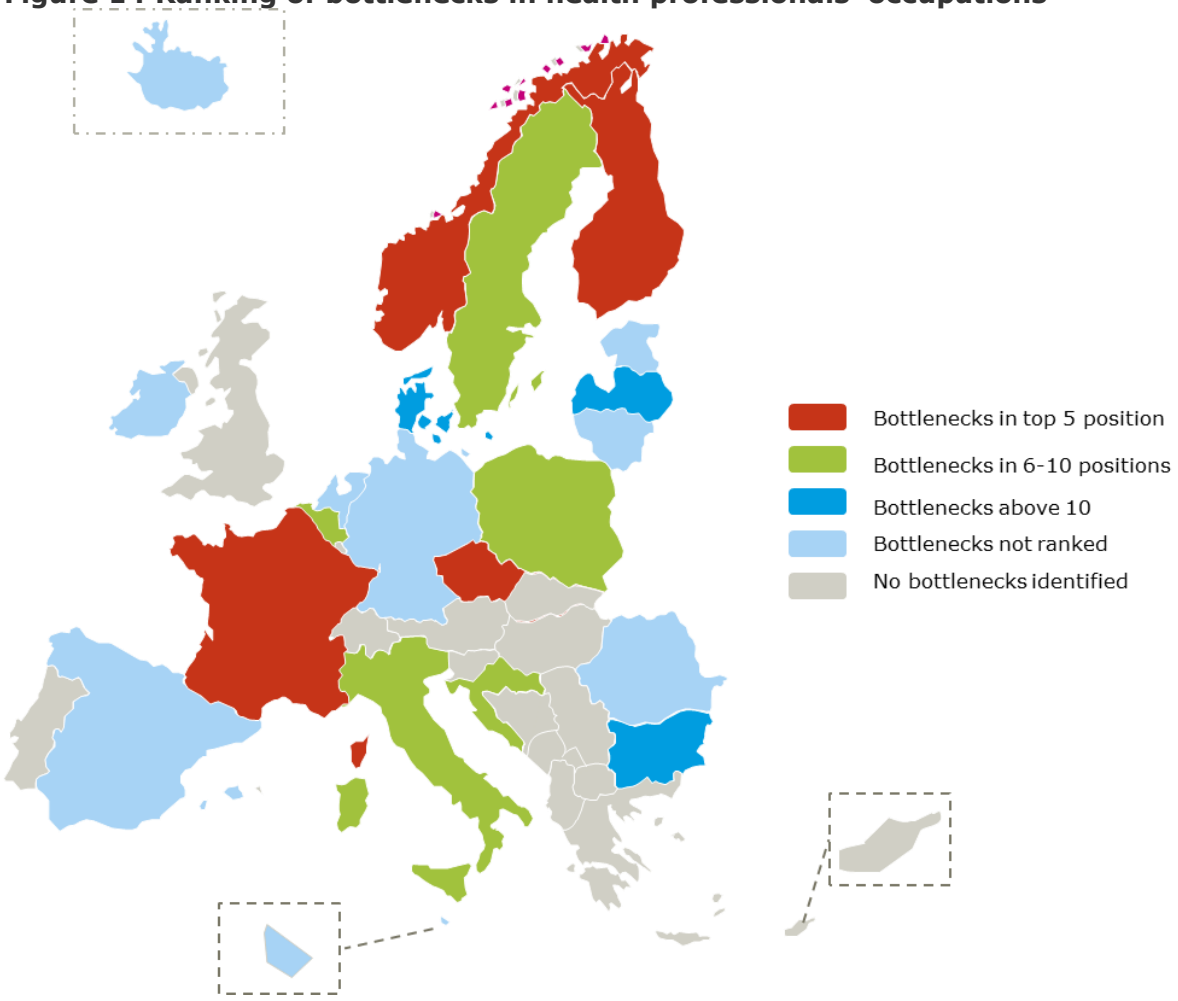
[38] During the field work, interviews have been used to further specify to four digit level when possible, but in some cases interviewees have not been able to further specify to four digit level (for example in Germany).
[39] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.
[40] Average 2011/2012, own calculation based on LFS data.
[41] Cedefop, Future skills supply and demand in Europe, 2012
[42] Own calculation based on LFS data

Europe. At ISCO 4-digit level the specific group 2221 Nursing professionals however is on 5th place, whereas 2212 Specialist medical practitioners is on the 9th place in ranking of all occupational groups with bottlenecks. The differences in ranking are related to a relatively high number of bottlenecks being identified at the 3-digit level with a ranking, and which means that ranking at 3-digit level becomes more prominent for the occupation. The reverse is true for occupations which have mainly been identified at 4-digit level and/or have not been ranked.

Countries with bottlenecks in occupation

As reported, 21 out of the 29 countries where research has been completed experience recruitment difficulties in the health care professions. The figure below shows the ranking of bottlenecks in the study countries. As a country can have several specific occupations listed on different ranks, only the highest ranked specific occupation has been taken into account when elaborating the figure.

Figure 14 Ranking of bottlenecks in health professionals' occupations



The bottlenecks within the group of health professionals are in the top-5 of all bottlenecks in Czech Republic, Finland, France and Norway. This means that there is at least one specific bottleneck related to health professionals' occupations in top-5 of the bottlenecks in these countries. The bottlenecks do however seem to be divided relatively evenly across the countries, and as there are several countries reporting of bottlenecks where ranking has not been possible, it is difficult to assess the magnitude of the problem on the European level.

One indicator to trying ranking the magnitude of the bottlenecks in the occupational sector is to consider how many bottlenecks have been reported on 4-digit level. The

countries with most reported bottlenecks in health professionals are Finland, Croatia, France, Malta and Romania.

The table below further specifies which occupations are concerned in the specific countries.

Table 22 Specific bottleneck occupations among health professionals[43]

Country	3 or 4-digit occupations[44] (further specification when relevant)	Regional aspects
Finland	221 Medical doctors (2) 2221 Nursing professionals (specifically: Nurse; Laboratory nurses and radiographers (1)) 2261 Dentists (7) 2262 Pharmacists (16) 2266 Audiologists and speech therapists (17) 2269 Health professionals not elsewhere classified (15)	221: rural and urban areas affected. There is a shortage of labour in the whole country (all NUTS 3 regions). Remote areas have particularly had trouble attracting qualified doctors. 221: urban areas affected 2262: rural and urban areas affected
Croatia	2211 Generalist medical practitioners (7) 2212 Specialist medical practitioners (8) 222 Nursing and midwifery professionals (20) 2262 Pharmacists (19)	222: rural and urban areas affected. Particular problem in isolated areas and on islands. 2211: rural and urban areas affected 2212: rural and urban areas affected 2262: urban areas affected
Malta	2212 Specialist medical practitioners 222 Nursing and midwifery professionals 2240 Paramedical practitioners 2250 Veterinarians	
France	2211 Generalist medical practitioners (12) 2212 Specialist medical practitioners (15) 2261 Dentists (1)	2211: rural areas affected 2212: rural areas affected 2262: rural areas affected. Strong disparity are observed between the north (less attractive excepted for Alsace Bretagne and Ile-de-France) and the south in terms of dentists density. Density in attractive regions like Provence-Alpes-Côte d'Azur are more than twice compared to some unattractive regions like Basse-Normandie. Picardie or Haute-Normandie. But even in high density regions. 100%. recruitment difficulties are observed like in Alsace. The 100%. recruitment difficulties régions are listed in Nuts code.
Romania	2211 Generalist medical practitioners (20) 2212 Specialist medical practitioners (20)	

[43] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[44] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

	2221 Nursing professionals (20)	
Bulgaria	2212 Specialist medical practitioners 2221 Nursing professionals	
Czech Republic	2211 Generalist medical practitioners (20) 2212 Specialist medical practitioners (3)	
Denmark	221 Medical doctors 2221 Nursing professionals (16)	221: rural and urban areas affected
Germany	2211 Generalist medical practitioners 2212 Specialist medical practitioners 2221 Nursing professionals 2222 Midwifery professionals	2211: rural and urban areas affected 2212: rural and urban areas affected 2221: rural and urban areas affected 2222: rural and urban areas affected
Iceland	2211 Generalist medical practitioners 2212 Specialist medical practitioners	2211: rural and urban areas affected
Lithuania	2211 Generalist medical practitioners 2221 Nursing professionals (specifically: Nurses of general practice)	2211: rural and urban areas affected
Netherlands	2212 Specialist medical practitioners (specifically: Specialist medical doctors, especially geriatric medicine. doctors for mentally handicapped. First aid doctors (specific certified education) and psychiatrists.) 2221 Nursing professionals	2212: rural and urban areas affected 2221: urban areas affected
Norway	2221 Nursing professionals (specifically: Nurses (2); Specialist nurses (13))	2221: rural and urban areas affected
Sweden	221 Medical doctors (7) 2221 Nursing professionals (specifically: Operation theatre nurse (15); Psychiatric nurse (17); Emergency care nurses (19))	221: rural and urban areas affected 2221: rural and urban areas affected
Belgium	2221 Nursing professionals (6)	2221: rural and urban areas affected
Estonia	221 Medical doctors	221: rural areas affected
Ireland	2212 Specialist medical practitioners (specifically: Non-consultant hospital doctors - trainee doctors who have not yet reached the rank of specialist hospital consultant)	
Italy	2262 Pharmacists (6)	2262: rural areas affected
Latvia	2212 Specialist medical practitioners (13)	2212: rural areas affected
Poland	22 Health professionals (9)	22: rural areas affected
Spain	2263 Environmental and Occupational Health and Hygiene Professionals 2262: Occupational therapist	

The following box elaborates on the specificities of the Finnish labour market for health professionals.

In Finland, which is the study country with most bottlenecks in the sub-major group "health professionals", the bottlenecks are explained by the demographic challenges that Finland is experiencing. While the demand for health care services increases, there are not enough applicants for the vacant positions.[45] Importantly, the lack of sufficient starting places at educational institutions is not the main reason for bottlenecks in the health care sector. A key problem is that a significant proportion of the qualified workforce works in other tasks. For example, there are 20,000 qualified practical nurses working outside the health care sector. Salaries in the health care sector are fairly low, the work physically and mentally demanding and the working conditions often unfavourable. This partly explains why many decide to opt for another job in another sector. For many of the listed bottlenecks, the regulations require the applicants to hold appropriate qualifications (degree). Health professionals, such as nurse, medical doctor, practical nurse, special education teacher and dentists are good examples of professions with strict qualification requirements.

Main sectors concerned

The public health care sector is clearly affected by the shortages experienced. In addition it is foreseen that demand will continue to grow as most populations are aging. The majority of the bottlenecks in healthcare are in the public sector, where in particular the 2-digit section of human health activities is mainly suffering from shortages of labour. There is little evidence of problems in private health care, but in most European countries private health care provision is of rather limited scope.

In Croatia, bottleneck vacancies in the health care sector affect both urban and rural areas, but there are bigger problems with filling vacancies in rural and underdeveloped areas, including islands. In Iceland, the health care sector has faced considerable cuts after the onset of the economic crisis. This has led to increased workloads and may affect professional development in the long run as a higher proportion of the working hours of medical professionals is spent on basic and administrative activities. As health care professionals are a fairly mobile workforce, low salaries, coupled with a fall in purchasing power, have undermined the competitiveness of the Icelandic health care sector conpared to those of some neighbouring countries. A recent survey of students at the University of Iceland, School of Health Sciences revealed that medical students are unenthusiastic about taking up employment in Landspitali University Hospital, the single largest employer in the health care sector. Instead they are looking to develop their careers abroad. This suggests that bottlenecks may be a growing and a long-term problem for the health care sector.

[45] In 2013, there were only 992 applicants for the 7827 open vacancies for nurses.

Main reasons for bottleneck problem

Among health professionals the main reason for bottleneck problems is a lack of applicants with the required qualifications, e.g. the degree required for the work.

Table 23 Reasons for shortages Health Professionals (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
2211 Generalist medical practitioners	2	0	4	6
2212 Specialist medical practitioners	4	2	4	10
2221 Nursing professionals	6	0	3	9
2240 Paramedical practitioners	0	1	1	2
2250 Veterinarians	1	0	0	1
2261 Dentists	1	0	1	2
2262 Pharmacists	2	0	0	2
2266 Audiologists and speech therapists	1	0	0	1
2269 Health professionals not elsewhere classified	1	0	0	1
Total	18	3	13	34

The reasons for the shortage differ between countries, in most of EU 15 it is due to not enough people being educated, whereas in the newer Member States labour mobility plays a large role. Old Member States use targeted recruiting, which combined with better salaries and working conditions, leads to labour mobility and consequent labour shortages in countries of origin, as illustrated by the following example from Poland.

Most vacancies in the health sector remain unfilled due to low pay and unfavourable working conditions. In general, employers in the health sector reported hard-to-fill-vacancies for medical doctors of all disciplines mainly due to the high emigration rates of "health professionals" heading towards Western and Northern parts of the EU, e.g. Germany, United Kingdom and Scandinavia. Better working conditions and payment are the main drivers of emigration.

For generalist practitioners and also to some extent nursing professionals, labour shortages seem to be concentrated in rural areas, with applicants unwilling to move from urban centres to more remote locations.

Furthermore, salaries are considered low in several countries; low salary is reported as the most important reason for applicants not being willing to take the job. In EU 15 staff shortages and general resource constraints in the public health sector are reported to lead to unfavourable working conditions, such as is the case in Finland and Sweden.

While gender plays in general a small role in the bottlenecks within the occupational group of health professionals, it plays a highly important role in the more specific occupations of nursing and midwifery professionals (222) and more specifically, nursing professionals (2221). The main reason is the non-gender neutral job image.

Age-related issues have been identified more evenly throughout the occupational group, in particular because of high expected outflow from the professions to retirement.

Mitigation strategies

Health care sector is traditionally known for attracting employees across borders, as also indicated by the mitigation strategies reported as being used by employers to fill the gaps in recruitment of health professionals. In 38% of the bottlenecks, the employers have used additional recruitment activities in other EU countries as a mitigating action, while in 27% of the cases additional recruitment activities outside the EU have been used (Table 24Table 24). One region, where recruitment from neighbouring countries is high, is the Nordic countries, where in particular Norway is attracting labour force from the neighbouring countries. Other mitigation strategies that are often used are the improvement of terms and conditions as well as campaigns and marketing.

Additional training and development to existing staff is in these highly-skilled occupations not often an option, as the bottlenecks exist among the highly experienced and specialised medical fields.

Table 24 Reported mitigation strategies Health professionals

22 Health professionals (total 47)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job (e.g. increase in starting salaries)	24%
Increase the hours worked (overtime, increase working hours of part time employed, focus on staff retention in bottleneck jobs, etc.)	11%
Reorganisation of work	13%
Providing additional training and development to existing staff	9%
Recruitment activities aimed at related occupations	9%
Campaigns and marketing	22%
Additional recruitment activities in other EU countries	38%
Additional recruitment activities outside EU	27%
Other specify	24%

Other interesting mitigating actions mentioned include moving educational institutions to where the biggest bottlenecks exist regionally (Sweden), or provision of scholarships to pursue the line of studies abroad, in order to ensure eligible applicants for the open positions in the future (Malta). Malta has also a "bridging" scheme available to health professionals who opt to return. It provides for the recognition of all services upon return to be reflected in the salary, progression of scales and computation of service. In Finland, several campaigns have been undertaken to improve the image of the health care sector jobs (esp. nurses and practical nurses). Given the difficulty of attracting men to the sector, several campaigns have also been aimed at men to make health care occupations more attractive. In the Netherlands experiments designed to attract nurses from abroad have been implemented, but without success. The language barrier proved to be a major obstacle. In France the related mitigation actions have aimed to attract more medical practitioners in rural or suburban areas. For example, the initiative "Operation Wanted", in Allier, offers financing of €40,000 for the establishment of generalist medical practitioners who recently graduated.

Concluding remarks

The number of countries experiencing bottlenecks within the occupational group of health professionals is high and in many of the cases there are regional aspects involved, i.e. the bottlenecks are not equal on a national level, but accentuated either in rural areas or in the bigger cities where health care services are centralised.

The main reason for the bottlenecks is the lack of applicants with the required qualifications and, for some countries, mobility of qualified medical practitioners to other parts of the EU, the latter being at the same time one of the mitigation strategies used by the employers of "attractive" countries to alleviate bottlenecks on the national market.

Bottlenecks in ISCO Occupational Group 71 - Building and related trades workers, excluding electricians

Building and related trades workers, excluding electricians, are the second biggest group of skilled manual occupations, where bottlenecks have been identified. All in all 41 bottlenecks exist in 18 of the 29 study countries included in this report. As shown in Table 25, the division between the specific occupations is rather clear-cut: in particular carpenters and joiners (11 bottlenecks) and plumbers and pipe fitters (8 bottlenecks) are in high demand, whereas one or two bottlenecks exist for most of the other specific occupations within this occupational group.[46]

Table 25 Building and related trades workers, excluding electricians

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[47]	Number of countries with bottlenecks
41	71	Building and related trades workers, excluding electricians	7115 Carpenters and joiners (11) 7126 Plumbers and pipe fitters (8) 711 Building frame and related trades workers (2) 7111 House builders (2) 7112 Bricklayers and related workers (2) 7114 Concrete placers, concrete finishers and related workers (2) 7121 Roofers (2) 7123 Plasterers (2) 7127 Air conditioning and refrigeration mechanics (2) 7131 Painters and related workers (2) 712 Building finishers and related trades workers (1) 713 Painters, building structure cleaners and related trades workers (1) 7119 Building frame and related trades workers not elsewhere classified (1) 7124 Insulation workers (1) 7132 Spray painters and varnishers (1) 71 Unspecified (1)	18

In 2011-2012, on average app. 8,9 million people worked in building and related trades in EU-27. They represented approximately 4,2% of the labour force in the European Union.[48] It is foreseen that demand will increase in coming years. [49]

[46] In some study countries it has not been possible to specify the bottlenecks to a 4-digit level, despite of additional research. This means that the bottlenecks in the countries, where only 2- or 3-digit levels are used may be more significant than what is evident from the data.

[47] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.

[48] Average 2011/2012, own calculation based on LFS data.

[49] Cedefop, Future skills supply and demand in Europe, 2012

Bottlenecks occur in 5,1% of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[50]

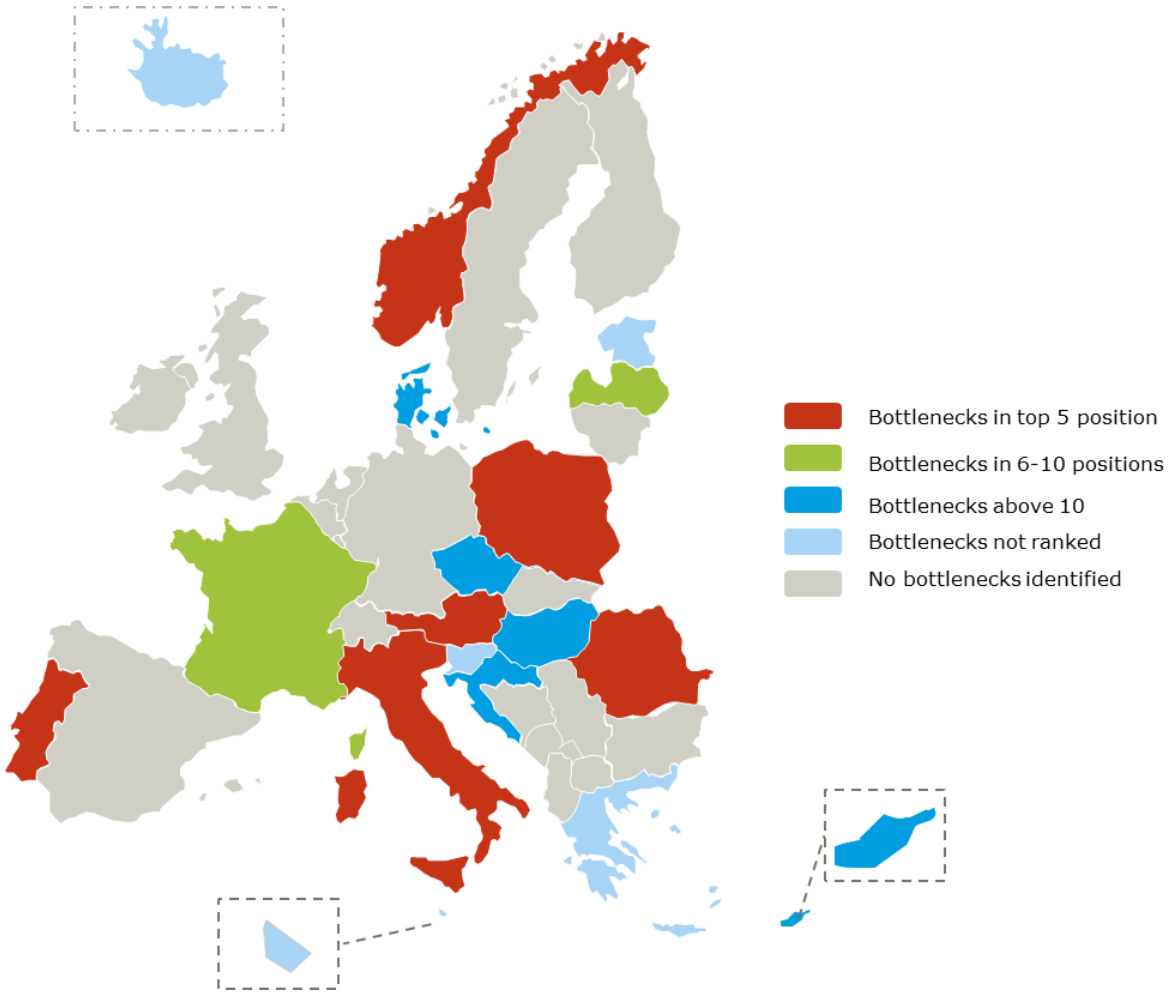
In order to understand better, which specific occupations within this occupational group are in particular demand at overall EU level, it is relevant to look at the ranking of the occupations at ISCO 3- and 4-digit level, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group building and related trades workers, excluding electricians, are. At ISCO 3-digit level, group 712 Building finishers and related trades workers figure on the 8th place in the EU, whereas group 711 Building frame and related trades workers are ranked 9th among the top-20 occupations. At ISCO 4-digit level the specific group 7115 Carpenters and joiners are ranked 10th and 7126 Plumbers and pipe fitters 17th among the top-20 occupations. The differences in ranking are related to a relatively high number of bottlenecks being identified at the 3-digit level with a ranking, and which means that ranking at 3-digit level becomes more prominent for the occupation. The reverse is true for occupations which have mainly been identified at 4-digit level and/or have not been ranked.

Countries with bottlenecks in occupation

The bottleneck vacancies within this occupational group are geographically relatively evenly divided among the study countries. The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group building and related trades workers, excluding electricians, are in the study countries. As a country can have several specific occupations listed on different ranks, only the highest ranked specific occupation has been taken into account when elaborating the figure.

[50] Own calculation based on LFS data

Figure 15 Ranking of bottlenecks in building and related trades workers, excluding electricians' occupations



As can be seen from the figure above, the bottlenecks in this group are ranked in the top-5 positions in Austria, Italy, Norway, Poland, Portugal and Romania. This means that in these countries there is at least one specific bottleneck related to building and related trades workers occupations, excluding electricians, in the top-5 of the bottlenecks. The above map provides a relatively clear picture of the ranking of bottlenecks within this occupational group, as there are only four countries which have identified bottlenecks within the occupational group, without having been able to rank them in the order of importance.

Another way of assessing the importance of the bottlenecks is to look at the specific occupations per study country, where bottlenecks have been identified. The countries with the highest number of reported bottlenecks among building and related trades workers, excluding electricians, are Austria, Croatia, Cyprus, Denmark, Iceland, Romania and Slovenia. For most of these countries, building and related trades workers, excluding electricians, does not represent one of the top-ranked occupational groups with bottlenecks in the country. However, due to the widespread need for in particular carpenters and joiners, as well as plumbers and pipe fitters, this occupational group is among the main groups where employers have difficulties in recruiting people.

Table 26 Specific bottleneck occupations among building and related trades workers, excluding electricians[51]

Country	3 or 4-digit occupations[52] (specification when relevant)	Regional aspects
Austria	7115 Carpenters and joiners (specifically: Carpenter (7); Joiner (13); Construction- and furniture joiner (16)) 7121 Roofers (4) 7126 Plumbers and pipe fitters (12)	The regions of Steiermark, Niederösterreich, and Oberösterreich have a high share of industrial production and require large numbers of employees in craft and related trades.
Croatia	7112 Bricklayers and related workers (13) 7115 Carpenters and joiners (14) 7126 Plumbers and pipe fitters (15)	7112: urban areas affected 7115: rural areas affected 7126: rural areas affected
Cyprus	7115 Carpenters and joiners (12) 7124 Insulation workers (16) 7131 Painters and related workers (14)	
Denmark	7115 Carpenters and joiners (specifically: Carpenter (7); Joiner (13); Construction- and furniture joiner (16))	
Iceland	7111 House Builders 7114 Concrete placers, concrete finishers and related workers 7126 Plumbers and pipe fitters	7111: rural and urban areas affected 7114: rural and urban areas affected 7126: rural and urban areas affected
Romania	711 Building frame and related trades workers (9) 712 Building finishers and related trades workers (2) 713 Painters, building structure cleaners and related trades workers (3)	
Slovenia	7115 Carpenters and joiners 7123 Plasterers (specifically: Workers in drywall construction and similar) 7126 Plumbers and pipe fitters	7115: rural and urban areas affected 7123: rural and urban areas affected 7126: rural and urban areas affected
France	7121 Roofers (6) 7126 Plumbers and pipe fitters (specifically: Pipe fitters(20))	
Greece	7115 Carpenters and joiners 7126 Plumbers and pipe fitters	
Italy	7126 Plumbers and pipe fitters (specifically: Plumbers (5)) 7127 Air conditioning and refrigeration mechanics	7126: rural and urban areas affected. Difficulties in recruitment for plumbers in the Lazio region are higher than the national

[51] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[52] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

	(specifically:Heating system mechanic (2))	average.
Latvia	7123 Plasterers (16) 7132 Spray painters and varnishers (10)	
Malta	7114 Concrete placers, concrete finishers and related workers 7127 Air conditioning and refrigeration mechanics	
Norway	7115 Carpenters and joiners (4) 7126 Plumbers and pipe fitters (14)	7115: rural and urban areas affected 7126: rural and urban areas affected
Portugal	7119 Building frame and related trades workers not elsewhere classified (2) 7131 Painters and related workers (20)	7119: rural and urban areas affected 7131: rural and urban areas affected
Czech Republic	7112 Bricklayers and related workers (specifically: Bricklayers (16))	
Estonia	711 Building frame and related trades workers	711: rural and urban areas affected
Hungary	7112 Bricklayers and related workers (18)	
Poland	71 Building and related trades workers, excluding electricians (1)	

The following box elaborates on the specificities of the Icelandic labour market for building and related trades workers, excluding electricians.

In Iceland, insufficient supply of workers with the requisite skills is the most widespread reason for recruitment difficulties. In the case of the construction sector, the emigration during the economic crisis is one of the main reasons behind the lack of skilled labour. It is also assessed that Icelandic companies are unable to compete with other European and North American companies in terms of salaries and intrinsic qualities of jobs, which leads to bottlenecks in this sector. Skilled manual work also has a low status in Iceland, which leads to recruitment problems already at the level of vocational training. This is the case, even though skilled manual workers often enjoy relatively high material living standards.

Main sectors concerned

Building and related trades workers, excluding electricians, are mainly needed in the European construction industry, where almost all bottlenecks within this occupation group were identified. More specifically, construction of buildings and specialised construction activities are in need of qualified employees representing this occupational group. In the construction sector the lack of labour force is in many countries related to labour mobility, as can be seen from the section below.

Main reasons for bottleneck problem

For building and related trades workers, the main reason for shortage of labour force is a lack of applicants with the required skills. Only in one professions this was not reported as main factor, namely among bricklayers.

Table 27 Reasons for shortages building and related trades workers, excluding electricians (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
7111 House builders	1	0	0	1
7112 Bricklayers and related workers	0	1	1	2
7114 Concrete placers, concrete finishers and related workers	1	1	0	2
7115 Carpenters and joiners	3	1	0	4
7119 Building frame and related trades workers not elsewhere classified	0	1	0	1
7121 Roofers	0	0	1	1
7123 Plasterers	2	0	0	2
7124 Insulation workers	0	0	1	1
7126 Plumbers and pipe fitters	4	1	1	6
7127 Air conditioning and refrigeration mechanics	2	0	0	2
7131 Painters and related workers	0	0	1	1
7132 Spray painters and varnishers	0	1	0	1
7133 Building structure cleaners	0	1	0	1
Total	13	7	5	25

The lack of skilled workforce is reported to stem from an overall unfavourable perception of manual construction work, with few young people interested in the occupations. It is also mentioned that pay is considered low in some countries, and that the status of the occupations is low, as presented in the earlier example from Iceland and the following example from France.

The main reason for recruitment difficulties reported by employers in the overall labour market is the lack of candidates, especially of skilled candidates. Lack of candidates is the reason identified behind many of the top 20 bottleneck occupations identified. This includes low numbers of candidates due to low interest in certain occupations. Evidence suggests that the poor image and lack of attractiveness of the construction and industry sectors lead to shortages in candidates for needed skilled manual occupations.

In the new Member States, part of the reason is also labour mobility. In Romania, mobility can explain the shortages experience in building and related occupations. The fact that part of the workforce leaves the country results in both a labour and a skills shortage, as those remaining lack adequate qualifications. For the people who decide to stay in Romania, the low salaries and the unattractive working conditions characterizing many elementary occupations create a disincentive to take these jobs.

In Austria, the lack is also attributed to a decrease in training offer, as can be seen in the following quote from the country fiche.

> A combination of school– and firm-based apprenticeship system has traditionally been the backbone of the Austrian vocational education and training (VET) system. However a decrease in the willingness of firms to offer VET has been observed for the past years. Enterprises, especially small and medium-sized ones (SMEs) fear the investment connected with offering VET.

Gender-related issues were reported in connection with 76% of the bottlenecks within this occupational group and are thus an important factor in the existence of bottlenecks among building and related trades workers, excluding electricians. The main gender-related issue is the non-gender neutral image of the professions.

Age plays only a limited role and has mainly been mentioned in connection with the occupational group 7126, plumbers and pipe-fitters. This is mainly due to the high average working age of the working population, making this occupational category vulnerable as more jobs will become available while the employers are having difficulties recruiting new employees.

Mitigation strategies

As can be seen from the table below, the share of employers making use of different types of initiatives is clearly smaller than for the bottleneck occupations presented above. However, the share of employers who have taken initiatives targeted at recruiting employees from other EU countries or outside the EU is fairly high. Furthermore, there are some employers who are providing additional training and development to existing staff in order to mitigate for the bottlenecks.

Table 28 Reported mitigation strategies Building and related trades…

71 Building and related trades workers, excluding electricians (total 41)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job (e.g. increase in starting salaries)	5%
Increase the hours worked (overtime, increase working hours of part time employed, focus on staff retention in bottleneck jobs, etc.)	7%
Providing additional training and development to existing staff	17%
Recruitment activities aimed at related occupations	10%
Campaigns and marketing	5%
Additional recruitment activities in other EU countries	27%
Additional recruitment activities outside EU	24%
Other specify	10%

In France employers and PES are using a specific recruitment method in sectors such as construction, "Méthode de Recrutement par Simulation – MRS". The MRS evaluates candidates by testing and identifying their skills. It does not refer to usual recruitment criteria such as experience and qualification. This recruitment method is based on transferable competences and helps to overcome a lack of candidates. In Slovakia some employers have increased their cooperation with schools and provide equipment for practical training rooms or opportunities for students to gain practical working experience in the factory. In Romania specific job fairs have been organised to stimulate the return of Romanian workers in the construction sector who are currently working (or unemployed) in Spain and Italy.

Concluding remarks

One of the main reasons mentioned for bottlenecks among building and related trade workers concerns the poor image of those professions and the lack of attractiveness of the construction sector. This is confirmed by the opinions of the employers of the sector, who do not indicate improvements of terms of conditions offered as an element which can solve the bottlenecks in this field. In this context, awareness-raising campaigns to attract employees to building and related trades workers and to the industry in general, can be considered a viable strategy to alleviate the lack of interest towards those profession.

Labour mobility is also to be mentioned as causing bottlenecks in some of the European countries, where qualified workers left to work in the construction sector in other European countries. The economic crisis, however, has partly diminished the needs in the construction sectors of some of the receiving countries, as for instance Spain, making return schemes relevant.

Bottlenecks in ISCO Occupational Group 51 - Personal service workers

In the major category 5, service and sales workers, the most bottlenecks can be found in the occupational group 51 – personal service workers. The bottlenecks in this group are highly concentrated on two specific occupations, cooks and waiters as evident from Table 29. Cooks, with 16 bottlenecks identified on 4-digit level and one on 3-digit level, is the specific occupation with most bottlenecks overall among all the specific occupations covered in this study.[53]

Table 29 Personal service workers

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[54]	Number of countries with bottlenecks
31	51	Personal service workers	5120 Cooks (16) 5131 Waiters (7) 5141 Hairdressers (2) 51 Unspecified (1) 512 Cooks (1) 5113 Travel guides (1) 513 Waiters and bartenders (1) 5132 Bartenders (1) 5142 Beauticians and related workers (1)	22

In 2011-2012, on average app. 9,7 million people were employed in professions related to personal service workers in EU-27.They represent approximately 4,6% of the total labour force of the European Union.[55] It is foreseen that demand will increase slightly in coming years.[56] Based on data from 2011 and 2012, the study has identified that bottlenecks occur in 7,6% of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[57]

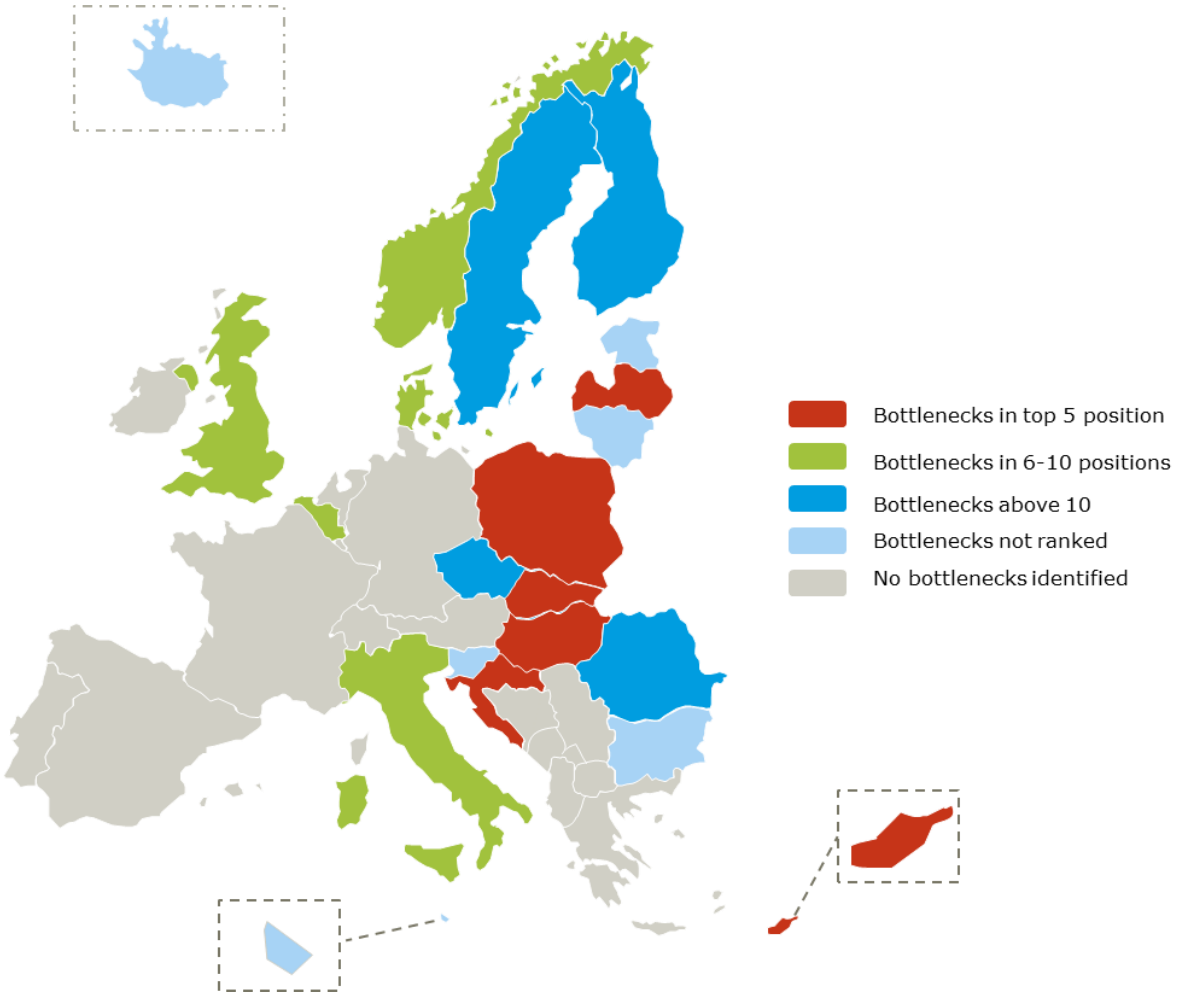
In order to understand better, which specific occupations within this occupational group are in particular demand at overall EU level, it is relevant to look at the ranking of the occupations at ISCO 3- and 4-digit level, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group personal service workers are. At ISCO 3-digit level, group 512 Cooks can be found on the 4th place in an overall ranking of bottleneck occupations in the EU, whereas the other 3-digit groups are outside of the top-20 groups. At ISCO 4-digit level the group 5120 Cooks is ranked as the top specific occupation where bottlenecks exist in the whole of the EU. Group 5131 Waiters can be found on the 13th place in top-20 ranking. This confirms the general EU trend of need for cooks. The differences in ranking are related to a relatively high number of bottlenecks being identified at the 4-digit level with a ranking, and which means that ranking at 4-digit level becomes more prominent for the occupation. The reverse is true for occupations which have mainly been identified at 3- or 2-digit level and/or have not been ranked (see for example health professionals).

[53] In some study countries it has not been possible to specify the bottlenecks to a 4-digit level, despite of additional research. Within the occupational category 51 the 3-digit level is however relatively narrow and it is not likely that the bottlenecks are significantly larger than what the data suggests.
[54] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.
[55] Average 2011/2012, own calculation based on LFS data.
[56] Cedefop, Future skills supply and demand in Europe, 2012
[57] Own calculation based on LFS data

Countries with bottlenecks in occupation

All in all, 22 countries identified in total 31 bottlenecks within the occupational group, which makes it an interesting occupational group to look at in terms of possibilities for labour mobility schemes. This is in particular true for the occupational group of cooks, where the working environment is already highly international and characterised by high mobility. The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group service workers are in the study countries.

Figure 16 Ranking of bottlenecks in personal service workers' occupations



The bottlenecks within this occupational group are ranked at top-5 in Croatia, Cyprus, Hungary, Latvia, Poland and Slovakia. This means that there is at least one specific bottleneck related to personal service workers' occupations in top-5 of the bottlenecks in these countries. As can be seen from the figure above, there are also several countries, where the bottlenecks are in 6-10 positions, showing that where employers are looking to employ within this occupational group, bottlenecks are often present.

As bottlenecks have been identified in only a few specific occupations within the group of personal service workers, none of the study countries, where research has been concluded, identified more than three bottlenecks within this occupational group. Italy is the only country with three bottleneck occupations within this occupational group, whereas Belgium, Bulgaria, Croatia, Denmark, Iceland, Romania, Slovakia and the United Kingdom all identified two bottleneck vacancies.

The table below further specifies which occupations are concerned in the specific countries.

Table 30 Specific bottleneck occupations among personal service workers[58]

Country	3 or 4-digit occupations (Further specification when relevant)[59]	Regional aspects
Italy	5132 Bartenders (19) 5141 Hairdressers (9) 5142 Beauticians and related workers (16)	5132: rural and urban areas affected 5141: rural and urban areas affected 5142: rural and urban areas affected
Bulgaria	5120 Cooks 5131 Waiters	
Croatia	5120 Cooks (2) 5131 Waiters (1)	5120: urban areas affected. In particular Adriatic Croatia with the touristic regions by the sea. 5131: rural and urban areas affected
Denmark	5120 Cooks (specifically: highly experienced chefs (6)) 5131 Waiters (10)	
Iceland	5113 Travel guides 5131 Waiters	
Romania	512 Cooks (11) 513 Waiters and bartenders (11)	512: urban areas affected 513: urban areas affected
Slovakia	5120 Cooks (5) 5131 Waiters (13)	
United Kingdom	5120 Cooks (8) 5141 Hairdressers (specifically: Hairdressers and beauticians (6))	
Cyprus	5120 Cooks (Specifically: Cooks (specialized in Asian cuisine) (4)	
Czech Republic	5120 Cooks (13)	
Estonia	5120 Cooks	5120: rural and urban areas affected
Finland	5120 Cooks (specifically: Chefs and cooks (20))	5120: rural and urban areas affected
Hungary	5120 Cooks (5)	
Latvia	5120 Cooks (4)	
Lithuania	5120 Cooks	
Malta	5131 Waiters	
Norway	5120 Cooks (10)	5120: rural and urban areas affected
Poland	51 Personal service workers (3)	
Slovenia	5120 Cooks	5120: rural and urban areas affected
Sweden	5120 Cooks (11)	5120: urban areas affected

[58] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[59] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

The following box elaborates on the specificities of the Croatian labour market for personal service workers.

The tourism sector is experiencing growing recruitment problems. Thus, many waiters, cooks, cleaners and helpers in offices, hotels and other establishments (chambermaids) are in demand, but due to the seasonal work and limited employment possibilities out of season, young people are not willing to enrol in educational programmes for these occupations. The current bottleneck vacancies within this sector have been persistent or increasing since 2008. The accommodation and food preparation sector (heavily involved in tourism) is very important for the Croatian economy in terms of its share of GDP and employment. Tourist resorts are concentrated on the coast and particularly on Istria Peninsula and the whole of Dalmatia. Problems with bottleneck occupations in this sector are mostly related to its seasonal character, which brings with it strenuous work during the tourist season and limited employment possibilities out of season. Furthermore shortages are accentuated by the fact that few applicants are willing to move to the regions were work is demanded. Moreover, some occupations suffer from relatively low public status and image. The above mentioned factors often force workers to seek work outside of the sector, or seek permanent jobs.

Main sectors concerned

Almost all bottlenecks within this occupational group can be found in the accommodation and food service activities sector (section I), where in particular food and beverage service activities as well as accommodation activities are in the biggest need of labour force.

In Denmark, the hospitality industry reports that 6% of all employers experienced recruitment difficulties in the first half of 2013 and that 17% of these had to turn down requests for services. This serves to show how bottleneck vacancies can affect companies' ability to respond to demands and subsequently limit the companies' turnover and potentially their growth.

Main reasons for bottleneck problem

Among personal service workers, the reasons for labour shortages are a combination of lack of applicants with adequate skills and lack of willingness to take jobs. For most specific occupations both main reasons are reported.

Table 31 Reasons for shortages personal service workers (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
5113 Travel guides	0	0	1	1
5120 Cooks	4	4	8	16
5131 Waiters	2	2	3	7
5132 Bartenders	0	0	1	1
5141 Hairdressers	1	0	1	2
5142 Beauticians and related workers	1	0	0	1
Total	8	6	14	28

The main reasons behind the lack of willingness to take jobs in this occupational group are reported to be working hours, low salary and seasonal nature of jobs, as was illustrated earlier by the example in Croatia.

In Denmark, for cooks/chefs evidence suggested that employers may experience difficulty in retaining employees from their 30s and onwards, because this profession often requires evening and night work.

In Italy, for occupations such as bartender and food service counter attendant, other reasons are also evidenced rather than the lack of qualified workforce. Changes in the extension of opening hours, for example, has increased the demand for flexibility and adaptation of workers, often entailing also shift work or working unsocial hours.

Interestingly, personal services are also one of the few occupations where lack of soft skills/workplace competencies is mentioned in several instances as a reason for lack of qualified candidates (cooks and waiters).

Almost no gender-related issues were identified in relation to the bottlenecks within this occupational group – only 23% of the bottlenecks had a gender-related issue connected with them.

This was also the case with age, which was not considered to be highly related to any of the specific occupations within this category. Some limitations were identified in relation to the specific occupation of cooks, where the hard working conditions and difficult working hours can be a hindering factor for older employees, as specified in the example of Denmark.

Mitigation strategies

Relatively few mitigation strategies have been used by the employers in the personal service workers occupational group. The main instruments have been the improvement of terms and conditions offered and additional recruitment activities outside the EU. For example in Croatia this has led to employers paying skilled workers also out of the season to ensure that they can stay in business.

Table 32 Reported mitigation strategies Personal service workers

51 Personal service workers (total 31)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job (e.g. increase in starting salaries)	22%
Increase the hours worked (overtime, increase working hours of part time employed, focus on staff retention in bottleneck jobs, etc.)	9%
Reorganisation of work	3%
Providing additional training and development to existing staff	16%
Recruitment activities aimed at related occupations	16%
Campaigns and marketing	16%
Additional recruitment activities in other EU countries	16%
Additional recruitment activities outside EU	19%
Other specify	9%

In Slovenia, employers are making use of more flexible forms of employment, especially for the occupations that require less specialisation, such as waiters. Due to government initiatives, employers hiring students to fill the bottlenecks benefit from lower taxation and more flexible conditions. These types of contracts are mainly used to fill shortages in seasonal jobs in tourism. The students normally work part-time.

Concluding remarks

Bottlenecks among personal service workers concern mainly cooks and waiters. The main reasons behind them are the lack of qualified candidates and the lack of interest of potential employees to take up employment within the occupational group, being this often related to the seasonality of occupations within it. Moreover, the labour turnover within these occupations is very high, making recruitment an on-going issue for the employers, who experience difficulties recruiting, also as a consequence of the fact that the pool of possible employees is constantly changing and thus difficult to gain an overview of.

Bottlenecks in ISCO Occupational Group 31 - Science and engineering associate professionals

Science and engineering associate professionals is the occupational group within the category of technicians and associate professionals (major group 3) with most bottlenecks identified at 4-digit level among the countries included in this report. 14 of the 29 study countries reported bottlenecks within this occupational group, and as can be seen from Table 33 below, the 29 bottlenecks are divided rather equally between the specific occupations within this occupational group.

Table 33 Science and engineering associate professionals

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[60]	Number of countries with bottlenecks
29	31	Science and engineering associate professionals	3115 Mechanical engineering technicians (4) 311 Physical and engineering science technicians (3) 3118 Draughtspersons (3) 3112 Civil engineering technicians (2) 3113 Electrical engineering technicians (2) 3114 Electronics engineering technicians (2) 3117 Mining and metallurgical technicians (2) 3119 Physical and engineering science technicians not elsewhere classified (2) 3139 Process control technicians not elsewhere classified (2) 3151 Ships engineers (2) 31 Unspecified (1) 3122 Manufacturing supervisors (1) 3123 Construction supervisors (1) 3141 Life science technicians (excluding medical) (1) 3152 Ships deck officers and pilots (1)	14

In 2011-2012, on average app. 7,8 million people were employed in professions related to science and engineering associate professionals in EU-27. They represent approximately 3,7% of the total labour force of the European Union.[61] It is foreseen that demand will increase in coming years[62]. Based on data from 2011 and 2012, the study has identified that bottlenecks occur in 6,4% of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[63]

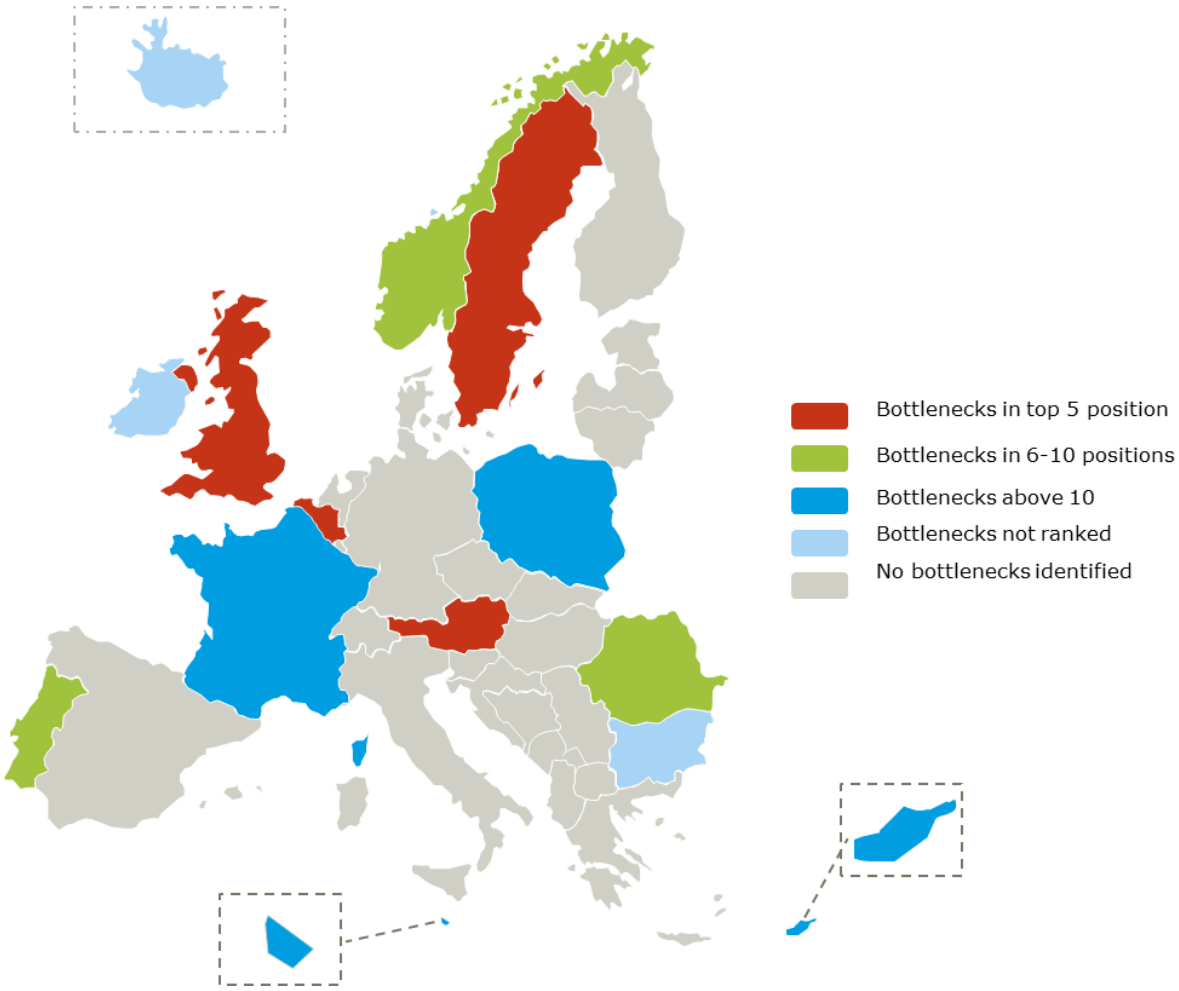
[60] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.
[61] Average 2011/2012, own calculation based on LFS data.
[62] Cedefop, Future skills supply and demand in Europe, 2012
[63] Own calculation based on LFS data

None of the specific occupations in this occupational group can be found within the top-20 bottlenecks, when looking at the 4-digit level. However, when looking at the 3-digit level, 311 Physical and engineering science technicians figures on the 7th place. The differences in ranking are related to a relatively high number of bottlenecks being identified at 2- or 3-digit level and/or have not been ranked. The reverse is true for occupations which have mainly been identified at the 4-digit level with a ranking (see for example Drivers and mobile plant operators).

Countries with bottlenecks in occupation

14 out of the 29 countries where research has been concluded identified bottlenecks within the occupational group of science and engineering associate professionals. The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group science and engineering associate professionals are in the study countries.

Figure 17 Ranking of bottlenecks in science and engineering associate professionals' occupations



As can be seen from the figure above, bottlenecks within this category are ranked in the top-5 positions in Austria, Belgium, Sweden and the UK. The bottlenecks are relatively dispersed among the European countries, but as a general trend the study countries where bottlenecks ranked high also have bottlenecks in several of the specific occupations within this occupational group. The countries with the highest number of reported bottlenecks among science and engineering associate professionals are Austria with five and Norway with four specific occupations, while

France, Sweden and United Kingdom have identified three specific bottleneck occupations each.

As mentioned above, the occupations are very specific to each country and no overall European trends can hence be identified. For example in Norway, both the mining and the oil related industries are in need of mining and metallurgical technicians, while in Sweden the bottlenecks in this specific category are caused by the re-emergence of the mining industry.

The table below further specifies which occupations are concerned in the specific countries.

Table 34 Specific bottleneck occupations among science and engineering associate professionals[64]

Country	3 or 4-digit occupations (Further specification when relevant)[65]	Regional aspects
Austria	3115 Mechanical engineering technicians (specifically: with higher level of training (3); Mechanical engineering technicians (14)) 3113 Electrical engineering technicians (18) 3114 Electronics engineering technicians (10) 3119 Physical and engineering science technicians not elsewhere classified (20)	
Norway	3112 Civil engineering technicians (11) 3115 Mechanical engineering technicians (20) 3117 Mining and metallurgical technicians (17) 3119 Physical and engineering science technicians not elsewhere classified (9)	3112: rural and urban areas affected 3119: rural and urban areas affected
France	3118 Draughtspersons (specifically: Draughtspersons (electric and electronic) (14); Draughtspersons (metal industry) (13)) 3139 Process control technicians not elsewhere classified (19)	
Sweden	3112 Civil engineering technicians (18) 3117 Mining and metallurgical technicians (3) 3151 Ships engineers (20)	3112: rural and urban areas affected 3117: rural areas affected. Most mines are located on the NUTS Region SE 33 in North-Western Sweden.
United Kingdom	3118 Draughtspersons (20) 3123 Construction supervisors (5) 3152 Ships deck officers and pilots (7)	
Belgium	311 Physical and engineering science technicians (pecifically: Technicians (3); Draughtsperson (industrial. electric/mechanic. civil) (17))	311: rural and urban areas affected.
Bulgaria	3114 Electronics engineering technicians 3115 Mechanical engineering technicians	

[64] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[65] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

Cyprus	3113 Electrical engineering technicians (15)	
Iceland	3151 Ships' engineers	3151: rural and urban areas affected.
Ireland	3122 Manufacturing supervisors (pecifically: Process control technicians - production and process engineers. Especially process automation & system control engineers.)	
Malta	3141 Life science technicians (excluding medical)	
Poland	31 Science and engineering associate professionals (13)	
Portugal	3139 Process control technicians not elsewhere classified (8)	3139: rural and urban areas affected.
Romania	311 Physical and engineering science technicians (7)	311: urban areas affected.

The following box elaborates on the specificities of the Norwegian labour market for science and engineering associate professionals.

There is a general lack of engineers in Norway, but the numbers vary within different industries and sectors. For example, the mining industry experiences a lack of mining and metallurgical technicians, whereas there is a lack of civil engineers in both construction and manufacturing sectors. The municipal sector, in particular, faces considerable challenges in recruiting engineers.

Main sectors concerned

Within the occupational group of science and engineering associate professionals the main sectors affected by bottlenecks are, once again, the manufacturing and construction sectors. More specifically, the manufacture of basic metals, the manufacture of basic pharmaceutical products and pharmaceutical preparations, as well as civil engineering, are the specific sectors affected by bottlenecks.

Following from the above example from Norway, the sectors concerned are mainly affected because of the increased investment in oil, which peaked in 2012. Services involving extraction of crude petroleum and natural gas have had the greatest growth in gross product, making the oil sector the one with the greatest relative growth in production last year, as compared to the year before. The strong pull of high wages in this industry, contributes to the crowding out of senior science and engineering associates from other sectors, which prove to be unable to retain senior labour.

Main reasons for bottleneck problem

Similar to Science and Engineering professionals, the main reason for lack of labour among Science and Engineering associate professions is a lack of skilled applicants, due to shortages of the required technical skills.

Table 35 Reasons for shortages science and engineering associate professionals (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
3112 Civil engineering technicians	1	0	0	1
3113 Electrical engineering technicians	2	0	0	2
3114 Electronics engineering technicians	2	0	0	2
3115 Mechanical engineering technicians	3	0	0	3
3117 Mining and metallurgical technicians	2	0	0	2
3118 Draughtspersons	3	0	0	3
3119 Physical and engineering science technicians not elsewhere classified	2	0	0	2
3122 Manufacturing supervisors	1	0	0	1
3123 Construction supervisors	1	0	0	1
3139 Process control technicians not elsewhere classified	1	1	0	2
3141 Life science technicians (excluding medical)	0	0	1	1
3151 Ships engineers	1	0	0	1
3152 Ships deck officers and pilots	0	0	1	1
Total	19	1	2	22

There is little further evidence about the root causes for lack of technical skills, but it is likely to be similar to Science and Engineering professions, i.e. a low interest from young people to pursue an education in the field.

Gender issues were identified in relation to 64% of the bottlenecks within this occupational category and were, as for many other occupational groups, mainly related to the fact that the job image is not gender neutral.

Age plays a role similar for extent to the one of gender, as age-related issues were identified in 62% of the bottlenecks. The main reason for this being that the workforce is ageing and that there is a high expected outflow to pension from this occupational group. Furthermore, the employers have difficulties attracting senior workforce in this field (civil engineering technicians in Norway), whereas in Cyprus the professions are not popular among young people (electrical engineering technicians).

Mitigation strategies

The main strategies employers reported to use in order to ensure supply of qualified labour are presented in the table below.

Table 36 Reported mitigation strategies for science and engineering associate professionals

31 Science and engineering associate professionals (total 29)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job	14%
Providing additional training and development to existing staff	17%
Recruitment activities aimed at related occupations	14%
Campaigns and marketing	21%
Additional recruitment activities in other EU countries	28%
Additional recruitment activities outside EU	10%
Other	21%

Additional recruitment activities in other EU countries, as well as campaigns and marketing used to display the vacancies within the occupational group are the main strategies adopted by employers. In Sweden, for instance, campaigns and marketing initiatives have been introduced to make the mining and IT industries better known among young people and attract them to the relevant educational paths.

Concluding remarks

Bottlenecks vacancies among science and associate engineering professionals are not concentrated in one of the specific occupations belonging to this group, but tend to be distributed among them. The occupations, indeed, are very specific to each country, and it is not possible to identify a European trend with respect to which are the most affected specific occupations. The reason behind labour shortages in this field is mainly the lack of skilled applicants in possession of the technical skills required in the job. This, similarly to engineering professions, is related to the low interest of young people for occupations of the kind and, to a relatively high extent, to gender aspects, being the occupational group mainly dominated by male labour.

Bottlenecks in ISCO Occupational Group 52 Sales workers

Out of the 29 study countries, 13 reported bottlenecks in the occupational group of sales workers. Most bottlenecks within this occupational group are registered with regard to shop sales assistants, as evident from Table 37.[66]

Table 37 Sales workers

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[67]	Number of countries with bottlenecks
14	52	Sales workers	5223 Shop sales assistants (6) 52 Unspecified (2) 5244 Contact centre salespersons (2) 5246 Food service counter attendants (2) 522 Shop salespersons (1) 5249 Sales workers not elsewhere classified (1)	13

In 2011-2012, on average app. 15,6 million people worked in the professions related to sales workers in EU-27. They represented approximately 7,4% of the total labour force in the European Union.[68] It is forecasted that the number of persons occupied in this field will increase and that there will be both an expansion demand as well as a replacement demand in the years up to 2020.[69] Based on LFS data from 2011 and 2012, the study has identified that bottlenecks occur in 9,8 % of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[70]

At ISCO 4-digit level, the specific occupation 5223 Shop sales assistants ranks 3rd as bottleneck on an EU level, and at 3-digit level the rank is 14th. No other specific occupation in the group occurs in the top 20 lists at EU level. The differences in ranking are related to a relatively high number of bottlenecks being identified at the 4-digit level with a ranking, and which means that ranking at 4-digit level becomes more prominent for the occupation. The reverse is true for occupations which have mainly been identified at 2- or 3-digit level and/or have not been ranked (see, for example, health professionals).

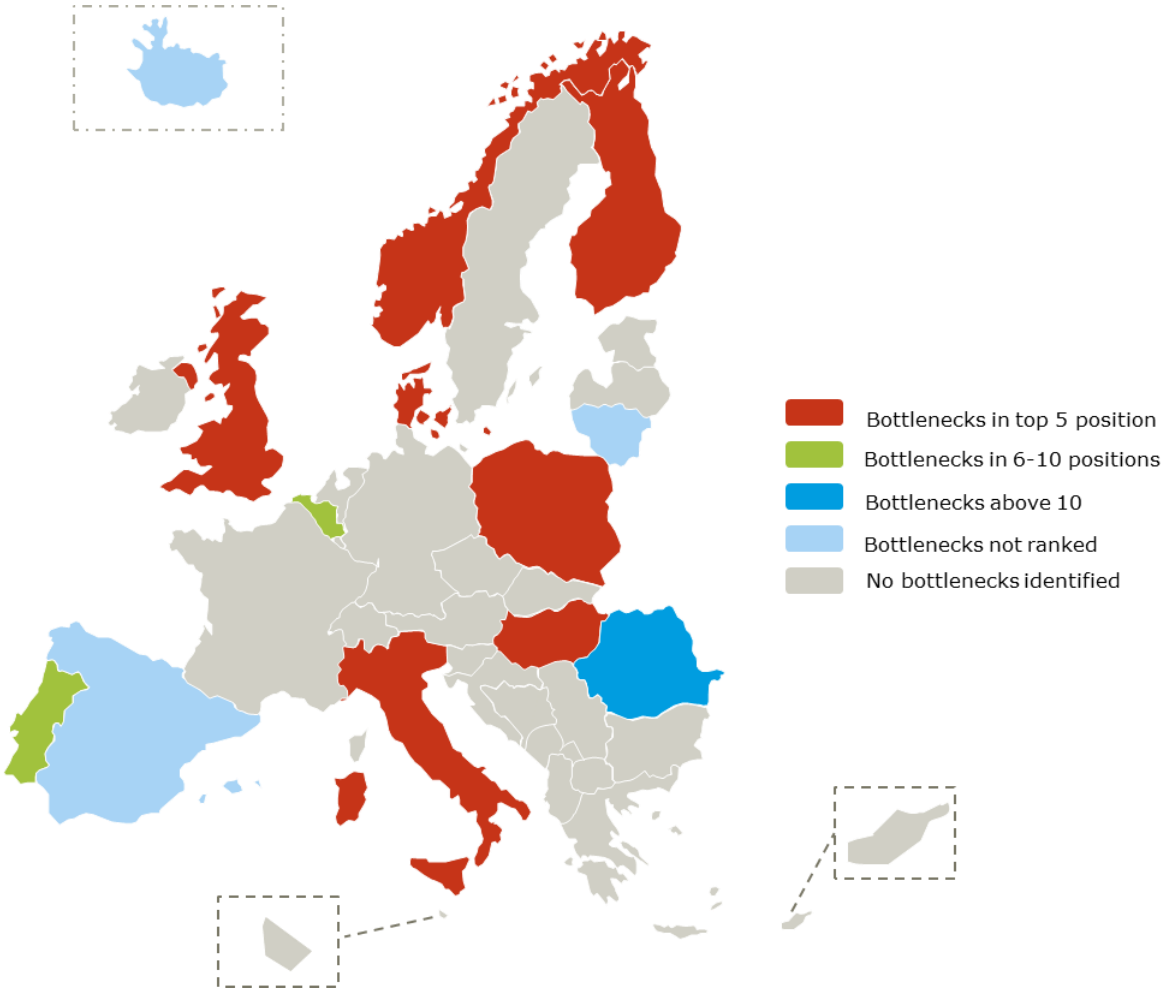
Countries with bottlenecks in occupation

Difficulties to fill vacancies within the occupational group of sales workers are unevenly distributed in the EU.

The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group sales workers are in the study countries.

[66] In some study countries it has not been possible to specify the bottlenecks to a 4-digit level, despite of additional research. This means that the bottlenecks in the countries, where only 2- or 3-digit levels are used may be more significant than what is evident from the data.
[67] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.
[68] Average 2011/2012, own calculation based on LFS data.
[69] Cedefop, Future skills supply and demand in Europe, 2012
[70] Own calculation based on LFS data

Figure 18 Ranking of bottlenecks in sales workers' occupations



Whereas the bottleneck occupations occur in the top-5 positions in seven countries (Denmark, Finland, Hungary, Italy, Norway, Poland, UK), there are only a few countries where the bottlenecks are ranked in 6-10 position or lower, or where the bottleneck exists but has not been ranked. This is evidence of a highly uneven balance in terms of the occupational category, as some countries have a very high need of sales workers, whereas the majority of the countries do not experience bottlenecks that would be among the top-20 in the respective country.

Moreover, with the exception of Norway, there are no countries that have more than two bottlenecks within the occupational group of sales workers.

The table below further specifies which occupations are concerned in the specific countries.

Table 38 Specific bottleneck occupations among sales workers[71]

Country	3 or 4-digit occupations (further specification when necessary)[72]	Regional aspects
Norway	5223 Shop sales assistants (3) 5244 Contact centre salespersons (7)	5223: rural and urban areas affected
Belgium	5244 Contact centre salespersons (10)	5244: rural and urban areas affected
Denmark	5223 Shop sales assistants (4)	5223: rural and urban areas affected
Finland	52 Sales workers (specifically: Sales worker and telemarketer (4))	
Hungary	5223 Shop sales assistants (4)	5223: rural and urban areas affected
Iceland	5246 Food service counter attendants	
Italy	5246 Food service counter attendants (4)	
Lithuania	5223 Shop sales assistants (4)	
Poland	52 Sales workers (4)	
Portugal	5223 Shop sales assistants (6)	5223: rural and urban areas affected
Romania	522 Shop salespersons (17)	
Spain	5249 Sales workers not elsewhere classified (specifically: Energy performance salesperson)	
United Kingdom	5223 Shop sales assistants (specifically: Merchandisers and window dressers (3))	5223: urban areas affected

The following box provides an example of the issues related to sales workers in the Norwegian labour market.

In 2011, 167,000 people were working as shop sales assistants (ISCO 5223). This skilled non-manual occupation is in particular experiencing problems of recruitment in the cities, where many of the jobs are concentrated. One of the explanatory factors in terms of the Norwegian market concerns the lack of interest from the part of young people to work in professions requiring a vocational education. In general in Norway, vocationally oriented education has a low number of applicants, partly because of job-image, partly due to young people being uncertain about different occupations.

Main sectors concerned

The bottleneck occupations within the occupational group sales workers can be mainly found in two sectors (NACE): section G — Wholesale and retail trade, and section I — Accommodation and food service activities.

[71] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[72] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

Main reasons for bottleneck problem

The main reasons for labour shortages among sales workers is related to applicants not willing to take the job due to different motivations (Table 39).

Table 39 Reasons for shortages sales workers (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
5223 Shop sales assistants	0	3	2	5
5244 Contact centre salespersons	1	0	0	1
5246 Food service counter attendants	0	1	0	1
Total	1	4	2	7

More specifically, in a high share of the reported cases in the study, it was said that the salary was considered to be too low (64%), and the job entails shift work or unsociable hours (57%). The array of reasons is however broader and among the underlying reasons for bottlenecks were mentioned: lack of skills, work experience, workplace competences, the part-time nature of the work and the unwillingness of applicants to move to where the job is.

Gender plays a role to some extent in the emergence of bottlenecks in this occupational group. In 45% of the cases there is a gender issue. This is in particular the case in the case of shop sales assistants, which is also the specific group with most bottlenecks identified. Here, a gender issue was mentioned in 80% of the cases, being the most important reason for this the job image, which is considered to be not neutral.

Age does not play an important role in the emergence of this bottleneck, but in the future there will be a replacement demand which may lead to a further increase in the existence of bottlenecks within this occupational group.

Mitigation strategies

According to the study, the main strategies employers use to ensure supply of qualified labour are presented in the following table.

Table 40 Reported mitigation strategies for sales workers

52 Sales workers (total 14)	
Initiatives by Employers	% of bottlenecks targeted by
Improvement of terms and conditions offered for the job	29%
Increase the hours worked (overtime, increase working hours of part time employed, focus on staff retention in bottleneck jobs, etc.)	21%
Reorganisation of work	14%
Providing additional training and development to existing staff	29%
Recruitment activities aimed at related occupations	14%
Campaigns and marketing	21%
Other	14%

The main strategies used are the improvement of terms and conditions offered for the job as well as additional training and development of existing staff, but also, to some

extent, the increase of working hours as well as campaigns and marketing to attract employees to the professions.

Concluding remarks

Bottlenecks among sales workers are highly asymmetric, being registered only in a limited number of countries, where, however, in most cases they rank within the top-5 bottlenecks. In this sense, bottlenecks within this occupational group affect only some of the European countries, while shortages are not at all perceived in the rest of Europe. Bottlenecks within this group are registered mainly with regard to shop assistant positions, while the reasons behind their existence vary greatly, being, however, the most recurrent ones law salary and unsociable hours. This said, the occupational group is characterised by a high labour turnover, which makes recruitment an on-going issue for the employers. The figures are thus fluctuating and it is relevant to discuss, whether the occupations can be characterised as "real" bottlenecks.

Bottlenecks in ISCO Occupational Group 83 - Drivers and mobile plant operators

In the ISCO major group 8, plant and machine operators, and assemblers, most bottleneck vacancies were found within occupational group 83, drivers and mobile plant operators. 20 bottleneck vacancies were identified in approximately half of the countries where research has been concluded (16 out of 29). These are mainly in the minor group 833 – heavy truck and bus drivers, where 13 specific bottleneck vacancies have been identified. Some countries have been able to identify specific occupations on a 4-digit level, while others have identified a more general bottleneck within the occupation of heavy truck and bus drivers in general.[73]

Table 41 Drivers and mobile plant operators

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[74]	Number of countries with bottlenecks
20	83	Drivers and mobile plant operators	8332 Heavy truck and lorry drivers (8) 8331 Bus and tram drivers (3) 832 Car, van and motorcycle drivers (2) 833 Heavy truck and bus drivers (2) 8322 Car, taxi and van drivers (2) 8342 Earthmoving and related plant operators (1) 8343 Crane, hoist and related plant operators (1) 83 Unspecified (1)	16

In 2011-2012, on average app. 8,9 million people were employed in professions related to drivers and mobile plant operators in EU-27. They represented approximately 4,2% of the total EU labour force.[75] The demand is forecasted to be stable in coming years[76]. Based on LFS data from 2011 and 2012, the study has identified that bottlenecks occur in 4,7 % of the labour market for the occupational group. The share is calculated by adding the number of employed in the countries where bottlenecks have been identified, and divided by the total at EU level.[77]

In the ranking at EU level, the ISCO 4 digit occupation 8332 Heavy truck and lorry drivers rank as number 4, while at the 3-digit level 833 Heavy truck and bus drivers is ranked at 11th place. The differences in ranking are related to a relatively high number of bottlenecks being identified at the 4-digit level with a ranking, and which means that ranking at 4-digit level becomes more prominent for the occupation. The reverse is true for occupations which have mainly been identified at 2- or 3-digit level and/or have not been ranked (see for example health professionals).

[73] In some study countries it has not been possible to specify the bottlenecks to a 4-digit level, despite of additional research. This means that the bottlenecks in the countries, where only 2- or 3-digit levels are used may be more significant than what is evident from the data. Due to the limited number of such bottlenecks this is however not deemed to be an issue affecting the data in the study.

[74] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.

[75] Average 2011/2012, own calculation based on LFS data.

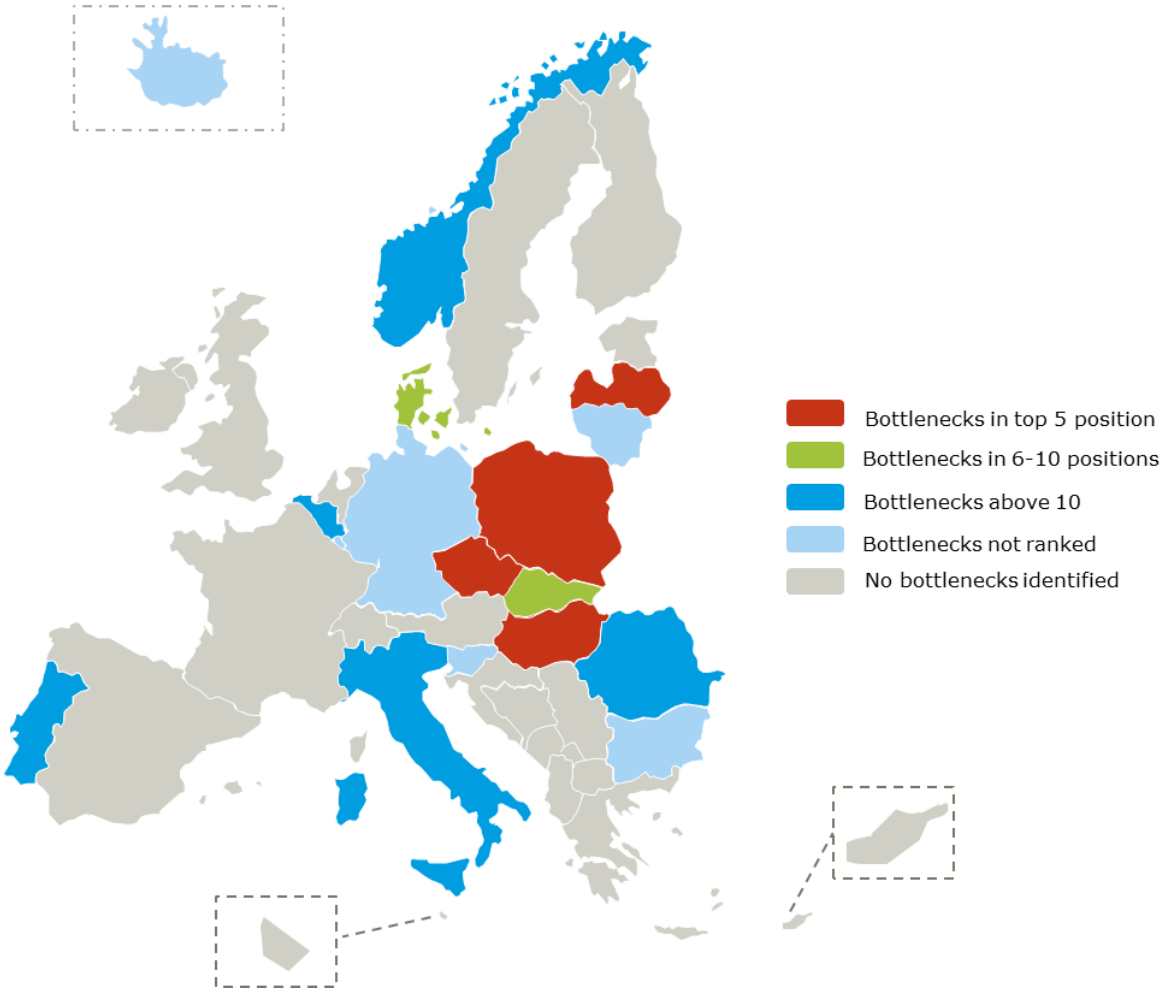
[76] Cedefop, Future skills supply and demand in Europe, 2012

[77] Own calculation based on LFS data

Countries with bottlenecks in occupation

16 out of 29 14 out of the 29 countries where research has been concluded identified bottlenecks within the occupational group of Drivers and mobile plant operators. The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group drivers and mobile plant operators are in the study countries. As a country can have several specific occupations listed on different ranks, only the highest ranked specific occupation has been taken into account when elaborating the figure.

Figure 19 Ranking of bottlenecks in drivers and mobile plant operators' occupations



Countries where specific occupations within the group have ranked in the top-5 positions include Poland, Czech Republic, Hungary and Latvia. In other countries, where bottlenecks have been identified, they are mainly ranked between 11 and 20 (apart from Denmark and Slovakia where they ranked in the 6-10 positions). Hence it can be concluded that bottlenecks within the occupational group 83 Drivers and mobile plant operators are fairly dispersed across Europe.

Several countries where research has been concluded identified two specific bottleneck vacancies within this occupational group. These countries include Denmark, Italy, Norway, Portugal and Romania.

The specific occupations identified in each country are listed in the table below.

Table 42 Specific bottleneck occupations among drivers and mobile plant operators[78]

Country	3 or 4-digit occupations (Further specification when relevant)[79]	Regional aspects
Denmark	832 Car, van and motorcycle drivers (8) 8322 Car, taxi and van drivers (specifically: Taxi drivers (17))	
Italy	8331 Bus and tram drivers (12) 8342 Earthmoving and related plant operators (specifically: Mechanical digger driver (13))	
Norway	8331 Bus and tram drivers (18) 8332 Heavy truck and lorry drivers (16)	8331: rural areas affected 8332: rural areas affected
Portugal	8322 Car, taxi and van drivers (19) 8343 Crane, hoist and related plant operators (11)	8322: rural and urban areas affected 8343: rural and urban areas affected
Romania	832 Car, van and motorcycle drivers (20) 833 Heavy truck and bus drivers (18)	
Belgium	8332 Heavy truck and lorry drivers	8332: rural and urban areas affected
Bulgaria	833 Heavy truck and bus drivers	
Czech Republic	8332 Heavy truck and lorry drivers (2)	
Hungary	8332 Heavy truck and lorry drivers (specifically: Truck driver (3))	8332: rural and urban areas affected
Iceland	8331 Bus and tram drivers	
Latvia	8332 Heavy truck and lorry drivers (3)	
Lithuania	8332 Heavy truck and lorry drivers	8332: urban areas affected
Poland	83 Drivers and mobile plant operators (2)	
Slovakia	8332 Heavy truck and lorry drivers (8)	
Slovenia	8332 Heavy truck and lorry drivers (specifically: Lorry and hauler driver)	8332: rural and urban areas affected

[78] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[79] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

The following box elaborates on the specificities of the Portuguese labour market for drivers and mobile plant operators.

The Portuguese labour market has been strongly affected by the economic downturn. The pool of active population available to work has remained stable, but total employment recorded a considerable decline, and there has been a decrease of 360,000 jobs over a three year period (2008-2011). At the same time, during this period unemployment reached historically high levels. However, bottleneck vacancies still exist in the Portuguese labour market in particular within the lower-skilled occupations, including car, taxi and van drivers, as well as crane, hoist and related plant operators. The bottlenecks in these two occupations have been increasing since 2008. Unattractive terms and conditions (including low salary) is one the most frequent reasons identified for these occupations. The difficulties experienced in low-skilled occupations are also associated with a social devaluation of occupations.

Main sectors concerned

The transportation and storage sectors and, more specifically, the sector of land transport and transport via pipelines are the ones mainly affecting from bottlenecks within the occupational group of drivers and mobile plant operators. However, several other sectors are directly dependent from the transportation and storage sector for delivering material and parts (manufacturing) or delivering good to be consumed (accommodation). This is why bottlenecks within this sector can have a broader impact on the performance of several other sectors.

Main reasons for bottleneck problem

The lack of workforce within Drivers and mobile plant operators is reported as to be due more to unwillingness to take the job, than a lack of applicants with the required skills.

Table 43 Reasons for shortages drivers and mobile plant operators (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
8322 Car, taxi and van drivers	0	2	0	2
8331 Bus and tram drivers	2	0	1	3
8332 Heavy truck and lorry drivers	2	3	2	7
8342 Earthmoving and related plant operators	1	0	0	1
8343 Crane, hoist and related plant operators	0	1	0	1
Total	5	6	3	14

The main reasons behind the unwillingness to take jobs falling within this occupation group are shift times, unsociable working hours and low salaries. When there is a lack of applicants with the right skills requirements, this seems to be due instead to a lack of technical skills. Interestingly, mobility is not mentioned as a reason for the existence of bottlenecks.

This occupational group is characterised by highly gender-dependent bottlenecks, as gender issues have been identified in 78% of the occupations. The main reason is, as

for several other occupational groups, the lack of gender-neutral job image, but there are also a few cases where it is reported that conditions and terms of the jobs are not gender neutral. This is for instance the case of heavy truck and lorry driver jobs, characterised by long shifts and partly also dangerous working conditions.

Age was reported to be an issue in relation to 41% of the bottlenecks within this occupational group and mainly related to the high average age of the working population within this occupational group.

Mitigation strategies

The data collected in this study does not allow for presentation of initiatives by employers to cope with bottlenecks, as the number of identified bottlenecks is small.

Concluding Remarks

Bottlenecks among drivers and mobile plant operators are registered mainly among heavy truck and bus drivers and are fairly dispersed among the study countries. The main reason behind the existence of bottlenecks within this occupational group is a widespread unwillingness to take the job, mostly because of its unsociable hours and low salaries.

Bottlenecks in ISCO Occupational Group 75 - Food processing, wood working, garment and other craft and related trades workers

The occupational group of skilled manual workers in food processing, wood working, garment and other craft and related trades workers consists of a multitude of different types of professions, from tailors and dressmakers to butchers, fishmongers and cabinet-makers. As can be seen from the table below, there are only three specific occupations which have experienced difficulties in recruitment in three study countries; for all other bottleneck occupations the needs are country specific or at a maximum exist in two countries.[80]

Table 44 Food processing, wood working, garment and other craft and related trades workers

Count of bottlenecks (4-digit level)	ISCO 2-digit	Description	ISCO 3- or 4-digit level[81]	Number of countries with bottlenecks
20	75	Food processing, wood working, garment and other craft and related trades workers	7533 Sewing, embroidery and related workers (3) 7511 Butchers, fishmongers and related food preparers (3) 7512 Bakers, pastry-cooks and confectionery makers (3) 752 Wood treaters, cabinet-makers and related trades workers (2) 7531 Tailors, dressmakers, furriers and hatters (2) 7543 Product graders and testers (excluding foods and beverages) (2) 753 Garment and related trades workers (1) 7522 Cabinet-makers and related workers (1) 7523 Woodworking-machine tool setters and operators (1) 7549 Craft and related workers not elsewhere classified (1) 75 Unspecified (1)	12

In the years 2011 and 2012, the average number of persons employed in the occupational group was 4,4 million. This represents 2% of the EU labour market[82]. It is forecasted that the number of persons occupied in this field will decrease significantly in the years up to 2020[83].

When looking at the ranking of bottlenecks at 3-and 4-digit levels, no specific occupations from group 75 rank in the top-20 at EU level.

[80] In some study countries it has not been possible to specify the bottlenecks to a 4-digit level, despite of additional research. This means that the bottlenecks in the countries, where only 2- or 3-digit levels are used may be more significant than what is evident from the data. Due to the limited number of such bottlenecks this is however not deemed to be an issue affecting the data in the study.

[81] The number in parentheses specifies the number of bottlenecks identified within these specific occupations in total.

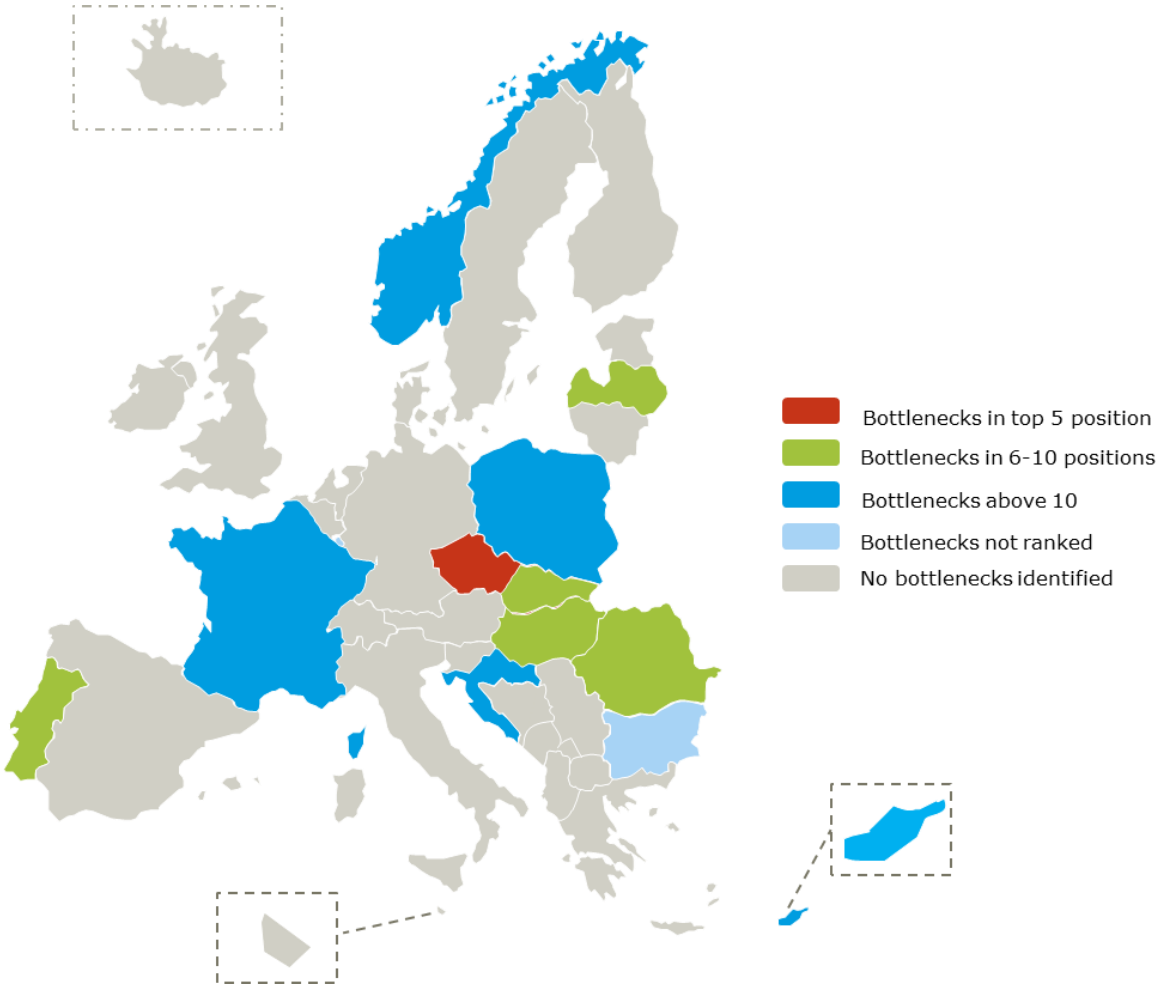
[82] Own calculations based on LSF data.

[83] Cedefop, Future skills supply and demand in Europe, 2012

Countries with bottlenecks in occupation

12 of the 29 countries where research has been concluded identified bottlenecks within the occupational group food processing, wood working, garment and other craft and related trades workers' occupations. The figure below shows the ranking of bottlenecks in the study countries, i.e. how high on the list of all the bottlenecks the bottlenecks within the occupational group health professionals are in the study countries. As a country can have several specific occupations listed on different ranks, only the highest ranked specific occupation has been taken into account when elaborating the figure.

Figure 20 Ranking of bottlenecks in food processing, wood working, garment and other craft and related trades workers' occupations



The bottlenecks are concentrated in the Central and Eastern European countries as well as in Cyprus, France, Norway and Portugal, indicating partly the importance of the skilled-manual work for the labour markets of some of these countries. Czech Republic is the only country, where at least one of the bottlenecks within this occupational group is ranked in top-5 of the bottlenecks, but there are also several countries, where the bottlenecks are among the top 6-10 of all the bottlenecks in the study country in question.

In order to better understand that types of bottlenecks that exist and whether there are several specific occupations in demand in the study countries, it is relevant to look at the specific occupations per study country. The countries with most reported bottlenecks in the specific occupations among food processing, wood working, garment and other craft and related trades workers' group are Hungary, Latvia and Romania. The bottlenecks in the occupational group 7533, sewing, embroidery and related workers can be found in Latvia, Bulgaria and Czech Republic, which all have

important textile industries. Furthermore, employers in Romania, where bottlenecks have been identified on the less specific 3-digit level, are experiencing difficulties in recruiting more generally within the sector of garment and related trades workers, also strongly in relation to the textile industry in the country.

The specific occupations identified in each country are listed in the table below.

Table 45 Specific bottleneck occupations among food processing, wood working, garment and other craft and related trades workers[84]

Country	3 or 4-digit occupations (Further specification when relevant)[85]	Regional aspects
Hungary	7511 Butchers, fishmongers and related food preparers (specifically: Meat processor (7)) 7512 Bakers, pastry-cooks and confectionery makers (specifically: Baker, confectionery maker (6)) 7531 Tailors, dressmakers, furriers and hatters (specifically: Tailor, sewer (10))	
Latvia	7511 Butchers, fishmongers and related food preparers (14) 7531 Tailors, dressmakers, furriers and hatters (12) 7533 Sewing, embroidery and related workers (9)	
Romania	751 Food processing and related trades workers (15) 752 Wood treaters, cabinet-makers and related trades workers (8) 753 Garment and related trades workers (1)	752: urban areas are affected
Croatia	7511 Butchers, fishmongers and related food preparers (17) 7512 Bakers, pastry-cooks and confectionery makers (16)	7511: rural and urban areas are affected 7512: urban areas are affected
Portugal	7522 Cabinet-makers and related workers (18) 7523 Woodworking-machine tool setters and operators (10)	7522: rural and urban areas are affected 7523: rural and urban areas are affected
Bulgaria	7533 Sewing, embroidery and related workers	
Cyprus	7512 Bakers, pastry-cooks and confectionery makers (11)	
Czech Republic	7533 Sewing, embroidery and related workers (5)	
France	752 Wood treaters, cabinet-makers and related trades workers (11)	
Norway	7549 Craft and related workers not elsewhere classified (12)	7549: rural and urban areas are affected

[84] The countries are listed according to how many bottleneck occupations they have identified and the specific occupations in question, and are hence not in an alphabetic order.

[85] The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

Poland	75 Food processing, wood working, garment and other craft and related trades workers (11)	
Slovakia	7543 Product graders and testers (10)	

The box below provides an illustration of the specificities of the Romanian labour market in the field of food processing, wood working, garment and other craft and related trades workers

In Romania, the manufacturing industry, and more specifically the textile and garments sector have the highest rates of skills shortages and lack of labour. In the manufacturing sector the main problem lies with specialised profiles with occupations that would require specific vocational training or technical school education. The lack of workforce is to a high extent caused by labour mobility, as qualified workforce is leaving Romania. As for those people who decide to stay, the low salaries and the unattractive working conditions entailed by many elementary occupations discourage them to take on these jobs. Indeed, even though the average net salary has grown steadily from RON1309 in 2008 to RON1606 (approx. EUR390) in June 2013, it still remains one of the lowest in the EU. On the other hand, employers are reluctant to increase compensation as cheap labour is one of the main competitive advantages of the production system.

Main sectors concerned

The occupational group consists of different specific occupations, however all bottlenecks within this group can be found in the broader sector of manufacturing. More specifically, the bottlenecks are located in the sectors of manufacture of food products, manufacture of textiles, as well as manufacture of wearing apparel. The box below provides an example of the current situation in the textile manufacturing sector in Latvia, based on the country fiche.

Despite a rapid decrease of production volumes in 2009 (- 38.6%) the manufacture of textile is experiencing recovery mainly driven by exports (in 2011 83.3% of production was exported). Problems with bottleneck occupations in manufacture of textile are mainly connected with the lack of sufficient labour force with the necessary technical competencies and skills. Another prospected problem is related to the ageing workforce: 46% of the workforce is aged 40 and over. There are 26 educational institutions (vocational education institutions, colleges and institutions of higher education) in Latvia where it is possible to educate specialists for the textile industry. However, according to a survey among employers, 50% of the interviewees evaluate theoretical knowledge of young specialists as being medium or low and not meeting the actual needs of the industry. Despite an increase in the production volumes in the industry, during 2009 and 2010 the average level of salaries decreased. Low salaries, monotonous work and high risk of occupational diseases increase the number of vacancies in the sector and make it difficult to attract young people to this sector.

Main reasons for bottleneck problem

Among food processing, wood, garment and related workers, the main reason for labour shortages are due to applicants' unwillingness to take the jobs, or to a combination of lack of skills and not willing to take the jobs.

Table 46 Reasons for shortages food processing, wood working, garment and other craft and related trades workers (4-digit level)

Specific occupation	Main reason			Total
	Lack of applicants meeting the skills requirements for the job	Applicants with necessary skills are available, but not willing to take the job due to different reasons	Both	
7511 Butchers, fishmongers and related food preparers	0	1	2	3
7512 Bakers, pastry-cooks and confectionery makers	1	0	2	3
7522 Cabinet-makers and related workers	0	1	0	1
7523 Woodworking-machine tool setters and operators	0	1	0	1
7531 Tailors, dressmakers, furriers and hatters	0	1	1	2
7533 Sewing, embroidery and related workers	0	2	0	2
7543 Product graders and testers (excluding foods and beverages)	1	0	0	1
7549 Craft and related workers not elsewhere classified	1	0	0	1
Total	3	6	5	14

The lack of skills relate equally to technical skills and to workplace competencies (soft skills). However, the strongest specific reason not to take a job is low salary, with above 80% of the reported bottlenecks referring to this factor. Once again, the work is considered unattractive, and few unemployed are willing to seek employment in the field.

As only a limited number of bottlenecks have been identified in each specific occupation under this occupational category, the views on gender- and age-related aspects are highly divergent and it is not possible to present a clear picture. This is due to the fact that, as mentioned, the specific occupations covered by this occupational group differ highly from each other, and while several of the bottlenecks are characterised by gender-related aspects, they may be very specific to the country in question. However, it is relevant to mention that where gender-related aspects are mentioned, they are mainly related to the lack of gender-neutral image for the specific occupation. Age-related issues have generally not been reported.

Mitigation strategies

The data collected in this study does not allow for presentation of initiatives by employers to cope with bottlenecks, as the number of identified bottlenecks is small.

Concluding remarks

The occupational group of skilled manual workers in food processing, wood working, garment and other craft and related trades workers consists of a multitude of different types of professions. For this reason the bottlenecks registered vary from country to country according to the specific needs of the national markets. Broadly speaking, however, the totality of the bottlenecks in this group falls within the manufacturing sector, from manufacture of textiles and wearing apparel to food production. In this context, the countries where the bottlenecks are most concentrated are often those in which those sectors are very important for the national economy, as it is the textiles sector for Latvia, Czech Republic and Bulgaria.

Conclusions and recommendations

Most bottleneck occupations identified in this study are structural, meaning that the bottlenecks existed already for several years. Many have even increased in recent years, despite the economic crisis and subsequent slowdown on the labour market. In a few occupational groups such as health associate professionals, business and administration associate professionals and food processing a higher proportion of the bottlenecks have emerged in recent years or show a variable trend.

Bottlenecks vacancies occur not only in growth occupations, but also in occupations with declining employment, as well as occupations with high replacement demand and an aging workforce. The identified reasons for bottlenecks indicate that at high skilled and skilled level structural problems are for a large part related to a shortage of labour supply and/or mismatch in educational choices and insufficient adaptation of education and training systems. In some occupations like metal, machinery and related trades workers, building and related trades workers and health professionals skills obsolescence among older workers and insufficient up-skilling support might contribute to the bottlenecks and additional support (training) of older workers can contribute to mitigation of bottlenecks. In various bottlenecks, like different manual skilled occupations and personal care workers, a lack of gender neutral image narrows available labour supply. This concerns about 35 percent of the top-20 bottleneck occupations.

At low skill levels, unfavourable working conditions and/or high labour turnover are more important for explaining structural recruitment difficulties. This indicates a need for concerned Member States labour markets to move from a low skill equilibrium to a high skill equilibrium and a move away from low productivity, low wage business models. The type and scope of (policy) action needed in this respect is quite comprehensive, far outside the scope of our study.

At an aggregated level, a majority of the countries in the study are faced with bottlenecks in the same occupational groups (especially within the top-5 at ISCO 2-digit level). However, when narrowing down to specific occupations (at ISCO 4-digit level) there are less Europe wide shortages of labour. There is even anecdotal evidence that bottlenecks can be more specific than 4-digit level, for example for specialisations within the occupations (notably cooks, nurses etc.). In some countries specific bottleneck occupations are identified that show a decreasing trend, also within occupational groups that at a high level of aggregation (ISCO 2-digit) have bottlenecks that are regarded as structural. Different trends are for instance identified for civil engineers in Sweden (increasing bottleneck), Germany (bottleneck decreasing) and Croatia (stable trend) and for software and application developers in Ireland (increasing) and Denmark and Malta (decreasing).

These findings indicate that there are structural shortages at EU level, which should be a priority for EU level policies. When trends differ between countries, migration and mobility can offer a good opportunity for reducing bottlenecks. This concerns especially occupational groups within the top 5 at 2-digit level. Mobility schemes could add value in this respect, but they should be narrowly defined, preferably at ISCO 4-digit level (or even more specific). For instance ICT professionals, one of the top 5 bottleneck occupational groups, schemes should be oriented to occupations within the 4-digit groups “Software developers” and “Systems analysts”, which are both within the top 20 bottleneck vacancies at 4-digit level.

Solid information on mitigation strategies at national level was rarely available, or had little documented effect. The available information indicates that actions are being taken at different levels (national, region, activity/sector, company), mainly in line with each stakeholders’ responsibility and interest. There is limited strategic coordination of measures addressing bottlenecks.

Below a summary of findings regarding mitigation is presented.

- Only half of the study countries have structural policy actions in place to deal with the existing bottlenecks, although bottlenecks have been identified in all of the study countries. Systemic policy actions to mitigate the bottleneck vacancies were identified at national or regional levels, concentrating on increasing labour supply by means of training and education. Intermediate organisations and educational organisations are involved, rather than individual employers.
- At occupational, or sector level, employers (or employers' organisations) try different means to mitigate bottlenecks, but strategies used differ greatly from one occupational group to another. It can range from recruitment activities, to campaigns and changes in working conditions.
- Recruitment in other EU countries is reportedly used for occupational groups like health professionals, ICT professionals, Science and engineering associate professionals, Building and related trade workers and Metal, machinery and related workers. However, it is only mentioned for on average about 30% of the bottleneck occupations identified in these occupational groups. Recruitment outside the country is less common or even not mentioned for occupational groups like Science and engineering professionals, Business and administration (associate) professionals, Sales workers and Teaching professionals.

The findings in the study show that there is clear need of reinforcement of educational and training systems at national level, bringing students choices and adult training more in line with labour market needs. This need is also expressed by the forecasts of Cedefop, that indicate that despite an expected growth of the high skilled labour force, mismatch can occur if student choices are not enough in line with (future) labour market needs. The high replacement demand, especially in various skilled manual occupational groups is expected to be accompanied by recruitment difficulties[86].

In relation to other mitigation activities and strategies further action at national level is desirable. Although the data on both bottlenecks and mitigation strategies collected in the study may be incomplete, the available information suggests that mitigation strategies (at specific occupational level) may not be as diversified as needed. Additional activity should especially focus on sectors and occupations with a low tendency to recruit internationally. Furthermore cooperation of the Public Employment Services with more specialised private employment and recruitment services could be of value, as these providers may have more knowledge of specific bottlenecks and shortages in specific sectors.

Summarising, bottleneck vacancies should be solved:

1. At national level through further strengthening and improvement of mitigation activities, with a clear focus on improvement of activities in the field of education and (adult) training, in combination with regular PES activities in relation to unemployed and the inactive labour force. Action should focus on improving knowledge about effectiveness of policy (best practice, proven effectiveness), enhancing dissemination of this knowledge and the design and implementation of campaigns. The current study has delivered some examples of promising practises concerning mitigation actions which can be further explored or assessed.

[86] Cedefop, Future skills supply and demand in Europe. Forecast 2012, Research Paper no. 26, Luxembourg. In its forecasts Cedefop takes changes in both demand and supply into account. Changes in labour supply are for instance related to demographic development and school enrolment, changes in demand to changes in production and productivity. Cedefop splits total labour demand into expansion demand, caused by additional production (which can be negative in case of declining economic activity) and replacement demand, caused by workers leaving employment as a consequence of retirement or other reasons.

The country fiches deliver some relevant examples concerning (PES) action aimed at unemployed and inactive labour force, like:

- PES allowing more time for jobseekers in bottleneck occupations to look for jobs (UK);
- PES prioritising training in shortage occupations (BE);
- Income guaranty for unemployed accepting a part time job at low wage level[87] (BE).

Examples of mitigation actions aiming at reducing bottlenecks to mobility or making specific occupations more attractive are for instance:

- Financing for the establishment in bottleneck regions of recently graduated generalist medical practitioners and dentists (FR);
- Contractual obligations for student doctors in education to fill in positions in remote regions and/or pay back money spent on their education in case of migration abroad (LT);
- Tax benefits for specific positions (MT, RO);
- Financial compensation in case of moving for jobs (SK, LV);
- Efforts to fight undeclared labour in elementary occupations (DK).

Examples of mitigation actions aiming at improvement of the employability of the working labour force are for example:

- Conversion courses for the IT industry (IR);
- Programmes aimed at recognition of competences acquired outside formal education (NL, NO).

Various initiatives aimed at improvement of the educational system can also be found in the country fiches, like:

- additional student places (SE);
- additional apprenticeships and internships (NL);
- bonus points scheme in education for courses or grades with high demand (IR);
- improvement of conditions (including fee) for specific grades (NL);
- direct cooperation with companies, concerning training courses (IS, IR).

2. At national and EU level through migration from third countries. At the short term additional labour from third countries could relieve tension in occupational groups facing structural bottlenecks (the top 5). Especially at high skill level the labour market is becoming more global and high skilled professionals are moving to other parts of the world. Several national level initiatives were already taken in this direction:

    - A special work permit to facilitate employment of foreigners in certain occupations, mainly technical related/industrial occupations (AT) or easing regulations for employment permits for skilled workforce from outside EU (DE);
    - International recruitment for health care professionals (FI).

3. At EU level by increasing mobility.

Based on the findings in the study, there is a clear role for action at EU level, aimed at promoting labour mobility (??) in general and in specific bottleneck occupations in particular. The (unrealised) potential of labour mobility is high as actual labour mobility within the EU is low in comparison to other regions like Australia and the United States of America. Labour mobility in the EU is still on the increase, as can be deducted from the growing number of EU working force being economically active in another Member State than their nationality (excluding frontier workers). There is also an increasing number of job seekers registered on the EURES portal and a growing number of EU citizens that, according to surveys, would like to move to other EU countries. The most important reason for not moving to another EU Member State is concern about leaving home, family and friends, followed by problems learning a new language and various practical issues (social security, housing, childcare, etc.). Also difficulties with recognition of acquired skills and competences are barriers to mobility.

[87] The so called *Inkomensgarantie uitkering (IGU)* (income garantee benefit), is supplied by PES, although restricted by a number of additional criteria.

According to the 2014 Eurobarometer, mainly for these reasons, last year 6% of EU citizens have unsuccessfully tried to move to another EU country for study or work.

EU action in the field of mobility and labour migration should address the above mentioned barriers to mobility and reduction of transaction costs. EU action could also be feasible concerning training and education, for instance through dedicated actions funded by the European Social Fund (including accompanying rules concerning target groups, etc.).

In the short term young people should be the main target group, as they are often more (international) mobile, more than average in unemployment, and on average have better language skills. Coordination of activity in this respect is necessary in order to prevent boom-and bust policies of over-orienting people towards the same occupation or region.

It is **the recommendations of the study** that more **specific EU action could be primarily focussed** on:

1. **Targeted mobility schemes.** These should concern specific, narrow occupational groups (ISCO 4-digit level). More specialised schemes are likely to be more successful as they can better match specific skills demands. However, they need to rely on large pools of jobseekers in order to increase the chance of a successful match of skills .

Based on our study targeted mobility schemes could entail the following:

- Identification of relevant occupational groups. The information in the attached country fiches provide a first guide for the identification of occupational groups relevant for mobility schemes.
- Directed at target groups with a sufficient level of skills, but low participation rates, low employment rates and/ or a low tendency to migrate.
- Directed at activities (sectors) facing bottlenecks, but with a low tendency to recruit cross border.
- Additional measures, like (short term) training, subsidies for removal and interview costs.

Based on these criteria especially occupations at manual and non-manual skilled level are relevant, like specific occupations within associate health professionals and building and related trade workers. But some criteria also indicate into the direction of high skilled professionals, like teachers.

As part of the EU programme for Employment and Social Innovation (EaSI) within EURES budget is allocated for targeted mobility schemes when an economic need exists. The Your first EURES job (YfEy) projects have identified that as far as vulnerable groups are concerned, career guidance, adequate profiling or pre-placement skills assessment and mentoring over the mobility process are also very important for a successful matching. The support measures being featured for the jobseekers should also help employers to gain more confidence in the transnational recruitment process.88 YfEj has also been confronted with employers having hard to fill vacancies but suspicious of transnational recruitment (fear of failure or legal problems, workers' inability to integrate in the job or the country, how to assess skills, etc.). Additional action towards employers might entail dissemination of good practice through (local or regional) business clubs and employers (network) meetings, guidance for employers or even a temporary subsidy (one or two months).

Both PES and private agencies could be involved in TMS, depending on the specific occupational group concerned. In some cases, like IT jobs, private agents have more

[88] See for instance European Commission, Your first EURES job, Progress Summary, 2014Q1,May 2014.

expertise on specific job requirements and skills assessment and are better integrated into networks of employers (organisations).

2. **Further improvement of labour market intelligence**. This concerns the EU Skills Panorama, as a central access point to labour market information and the European Vacancy Monitor, which reports quarterly about vacancies in EU Member States. Based on the study some specific points of attention can be made:

- Information on bottleneck occupations is primarily strategic and should be used in order to send the right signals to education and training systems throughout Europe. At national level this also requires more attention to (future) working opportunities abroad.
- Better intelligence will also contribute to mitigate bottlenecks, as part of a coordinated approach to support mobility.
- It will be important to provide wage information and information on the language requirements by occupation, as well as information on living and working conditions. Successful mobility is more likely from low to high wage regions and in occupations where proficiency in the local language is not an absolute must.
- Information about the labour supply needs to be made available. Germany for instance has information on unemployment rates by occupation. But also other countries (i.e. Belgium, Netherlands) have opportunities to deliver information about unemployment by latest occupation and/or desired occupation.

A system of early identification and immediate action is recommended, at the European level. Critical values of (expected) demand supply ratios at disaggregated level could be used for this purpose. Any systematic monitoring system must also take the supply side into account in order to identify possibilities to reduce bottlenecks by means of mobility schemes. Early warning should identify also shortages at EU level, which should be properly signalled to national authorities.

Furthermore, the study shows that a warning system on persistent, structural bottlenecks would also be a valuable addition to existing labour market intelligence. The duration of a bottleneck and/or continuous high demand supply ratios could be used for this purpose.

3. **Reinforcement and improvement of EURES activities**[89], continuing the existing reform efforts. Strengthening EURES' capacity along the lines proposed in the Commission's proposal for a EURES regulation would provide more support services towards individuals and companies. From the perspective of bottleneck occupations, employers demand should be leading in the matching process and priority should be given to SME as large companies in general are better equipped to recruit in other countries.

4. **Further reduction of barriers to labour mobility.** This subject has not been in the focus of our study, but literature points out that uncertainty about consequences for income, (social) insurance and other regulation, along with difficulties in recognition of skills and a series of practical issues (housing, childcare and the like) still act as major barriers to labour mobility in the EU. This needs to be taken into account in any future schemes at the EU level.

5. **Coordination of activities at national (and regional) level.** Action should support the improvement of knowledge about effectiveness of policy (best practice,

[89] EURES, the job mobility portal, which has the purpose to provide information, advice and recruitment/placement (job-matching) services for the benefit of workers and employers as well as any citizen wishing to benefit from the principle of the free movement of persons. It has a network of about 900 EURES advisers that are in daily contact with jobseekers and employers across Europe. In cross border regions EURES has an important role to play in providing information about and helping to solve all sorts of problems related to cross-border commuting that workers and employers may experience

proven effectiveness), enhancing dissemination of this knowledge and the design and implementation of campaigns. This could include the support of pilots, examples of international cooperation in the field of international labour migration as a means to reduce bottlenecks. Such pilots can be used to test and identify good practice.

To sum up, given the structural nature of many bottleneck occupations and the unrealised potential of labour mobility and labour migration to reduce discrepancies at the EU labour markets and optimize allocation, additional action at national and European level to enhance mobility in case of specific occupations has a clear potential. Improving the transparency of the labour market throughout Europe and additional support to mobility, including reducing barriers to free movement, will be important to this end. Targeted mobility schemes should be explored; focussing on specific occupations with confirmed shortages.

Annex 1 - Overview of data availability and quality

Overview of data availability and quality

Country	Sources used to identify bottlenecks	Methodology used for identification/ranking	Year	ISCO level used	Interviews conducted	Analytical strength/quality (good/medium/scarce)
AT	Ratio between unemployed and ready-to-fill vacancies, a yearly ranking is produced through a negotiation process with social partners (relevant employer associations) - Mangelberufsliste 2013.	Main source/report used fully	2012	4-digit level	6 interviews	Good
BE	The main sources for the identification of the bottleneck vacancies were the lists of bottleneck vacancies published by the three Public Employment Service agencies: Le Forem (Wallonia), VDAB (Flanders) and Actiris (Brussels.	For each occupation reported, the number of vacancies was summed over the three regions for the period 2008-2012. As national data on employment by occupation are missing, the ranking is based on the number of vacancies in 2012 among the identified bottleneck vacancies (highest number of vacancies rank 1 etc).	2012	3 and 4-digit	3 interviews	Good
BG	Identification through 4 main sources: Manpower surveys on employment, 2011, 2012, and 2013, based on employers' opinion. 24 reports: Sector's analysis of labour force competences. Scarce jobs, professions developed by the Bulgarian Industrial Association. Interviews with experts on internal labour market. The statistical data of the National Statistical Institute and the Employment Agency.	Not ranked. Combination of sources: Initial list developed using the Manpower Survey and the 24 reports. Interviews used to cross-check: only occupations defined as bottlenecks by at least three of the interviewed experts have been included in the final list.	2013	4-digit level	4 interviews	Scarce
CY	Interviews with key actors involved	Interviews with PES of Cyprus	2013	4-digit level	5 interviews	Medium

Country	Sources used to identify bottlenecks	Methodology used for identification/ranking	Year	ISCO level used	Interviews conducted	Analytical strength/quality (good/medium/scarce)
	in planning and implementing strategies and interventions for the mitigation of bottlenecks.	were based on quantitative data extracted from the registry of unemployed people and vacancies, the requests for foreign workforce as well as the monthly reports of the local employment offices. A high level of agreement was registered for the top bottlenecks position.				
CZ	Data collected by the Ministry of Labour and Social Affairs—reported by employers. Quarterly in the period 2008 -2011—vacancies unoccupied longer than 12 months. (Data collection continued till 2011 when it was discontinued, no further data are available).	Main source used 100%. However, it is estimated that only small proportion of employers provided the information on vacancies. Comparison with the ranking of bottleneck vacancies elaborated by the Manpower agency validate the hard to fill vacancies though in a different order.	2011	4-digit level	4 interviews	Scarce
DE	Report (FDZ-Methodenreport 03/2013) published by the Institute for Employment Research (IAB), the research institute of the Federal Employment Agency (Bundesagentur für Arbeit).	One main source, not ranked. Main source verified through interviews	2011	4-digit level	5 interviews	Medium
DK	Main source: report from the Danish National Labour Market Authority: Arbejdsmarkedsstyrelsen (2013) Recruitment, Spring 2013	Yes. One main source -crossed-checked with interviews	2013	3 and 4-digit level	10 interviews	Good
EE	Cross-study analysis by using the following data sources: 5 sectorial studies (energy, machinery, construction,	Not ranked. Combination of 3 main sources for identification. Method: only those occupations identified as bottlenecks by	2010-2013	3 and 4-digit level	6 interviews	Scarce

Country	Sources used to identify bottlenecks	Methodology used for identification/ranking	Year	ISCO level used	Interviews conducted	Analytical strength/quality (good/medium/scarce)
	agricultural, food and forestry, and ICT) 1 study on Estonian changing labour market and vocational education.	different sources were chosen + supply-demand ratio				
EL	Interviews with representatives of the Ministry of Labour, Social Security and Welfare, OAED (Manpower Employment Organization), employers and employees associations, chambers, HR companies and centres for educational training.	Not ranked. (Interview sources used - verified by the recruitment agency's data base of 93,000 job advertisements, covering the period 2008-2012)	2013	4-digit	14 interviews	Scarce
ES	Three reports from: leading recruitment agency (Infojobs), based on their website database; the Spanish PES, based on their demand and supply database; c) Infoempleo, a private employment firm.	Not ranked, main source indirect indicator: candidates per vacancy from Infojobs. Verified by sector reports and PES data.	2012	4-digit	3 interviews	Scarce
FI	Regional and National Barometers, short term forecasts of labour demand	Ranked using main sources: National and regional barometers. The national aggregate results are based on the regional barometers results.	2013	4-digit level	6 interviews	Good
FR	Besoins en Main-d'Oeuvre-BMO" annual survey from Pole d'Emploie	One source used to create ranking, as it had the most complete coverage.	2013	4-digit	7 interviews	Good
HR	Main source: Employer survey conducted by PES	One source used to create ranking, validated by interviews and other sources.	2013	N/A	8 interviews	Medium
HU	Main source: Vacancies reported by employers to PES (obligatory requirement, 45.000 Employers,	One source used to create ranking of top 20, but the indicator is weak (vacancies re-	2013	N/A	5 interviews conducted	Medium

Country	Sources used to identify bottlenecks	Methodology used for identification/ranking	Year	ISCO level used	Interviews conducted	Analytical strength/quality (good/medium/scarce)
	incomplete coverage of industries) A joint report of PES and the Research Institute of the Chamber of Commerce and Industry on labour market forecast and demand for different occupations, based on a survey of approximately 7000 employers.	posted after 3 months). 10 of the bottlenecks were validated by the employers survey.				
IE	Recruitment Agency Survey included in the National Skills Bulletin 2013 and conducted by SLMRU	Not ranked, one source used identify bottleneck vacancies. Validated by other sources.	2012	4-digit level	4 interviews	Medium
IS	Qualitative data cross-checked against (limited) survey data	Not ranked. Main source: interview, which were crossed-checked against 2 surveys.	2013	4-digit	12 interviews	Scarce
IT	www.excelsior.unioncamere.it Database of the Excelsior Survey, conducted by Unioncamere and the Ministry of Laboue, annual survey.	Ranked using one source (data base) cross-checked with other sources, such as sectoral studies and interviews. Led to minor changes in rank/list of occupations.	2012	4-digit	8 interviews	Good
LI	Shortlist of bottleneck vacancies created by the Liechtenstein Chamber of Industry and Commerce (Wirschaftskammer Liechtenstein für Gewerbe, Handel und Dienstleistung); Experts' opinion of hard-to-fill vacancies presented in interviews.	Not ranked, in general very difficult to identify/verify existence of bottlenecks	2012	4-digit-level & 3-digit level	2 interviews	Medium (NB: not included in overview)
LT	Main source was a PES employer survey on occupations in demand and comparing it with interviews.	Not ranked, the list was created using list of and crossed-checked with interviews.	2012	4-digit	11 interviews	Medium
LU	No relevant data/studies available, unable to identify relevant interviewees.	N/A	N/A	N/A	N/A	N/A

Country	Sources used to identify bottlenecks	Methodology used for identification/ranking	Year	ISCO level used	Interviews conducted	Analytical strength/quality (good/medium/scarce)
LV	PES data 2008-2012 on duration of vacancy (over 3 months), validated by report "Labour market short-term forecasts for the first half-year of 2013" (Projektu un kvalitates vadiba Ltd., contractor-PES of Latvia).	Rank based on duration of vacancy (over 3 months) and number of vacancies (higher number, higher rank). Validated by findings from survey.	2012	4-digit level	9 interviews	Medium
MT	Several sources, data provided by PES (duration of vacancy, literature mapping dating back to 2005 and interviews	Not ranked. Qualitative and quantitative information has been cross checked so that only those occupations which **one or more** sources clearly indicated as encountering recruitment difficulties have been shortlisted.	N/A	4-digit level	15 interviews	Scarce
NL	Main source is data from PES with tension indicator for occupational groups, relation between the nr of vacancies and the nr of short term unemployed.	Ranked high/medium/low (1,2,3) using one source, supply/demand ratio. Incomplete coverage of industries.	2013	4-digit	4 interviews	Medium
NO	The bottleneck vacancies have been identified using one main source, a periodic report from the Norwegian Labour and Welfare Administration (NAV), based on employer survey.	Rank based on one source.	2013	4-digit level	9 interviews	Good
PL	A comprehensive study on the employer's view of the Polish labour market comparing survey results obtained in 2010-2012	Rank based on one source, only available on ISCO 2 digit level.	2012	2-digit level	4 interviews	Medium
PT	Main source is data from the PES, on vacancy duration.	Ranking based on data from PES of vacancy duration, incomplete coverage industries. Results validated through interviews.	2012	4-digit	5 interviews	Medium
RO	Several sources, studies, employer	Rank created using employer	2012	3 and 4-digit	7 interviews	Medium

Country	Sources used to identify bottlenecks	Methodology used for identification/ranking	Year	ISCO level used	Interviews conducted	Analytical strength/quality (good/medium/scarce)
	survey on labour demand, and data from PES.	survey and data from PES on vacancy duration. Combined with interviews to compensate for limited coverage of certain sectors (public sector) and high skilled occupations.		level		
SE	Main source is a bi-annual employer survey by the PES, secondly the National Statistics Bureau, with a report on labour market demand for different occupations, based on employer survey	Ranked using PES as main source, validated by NSB report. Very few differences between two reports.	2012	4-digit level	4 interviews	Good
SI	Bottleneck vacancies identified through the National employment agency by collecting data from all vacancies reported on the market and comparing data to the structure and number of unemployed available on the market (supply/demand ratio)	Not ranked	2013	4-digit	5 interviews	Scarce
SK	Manpower survey and a quarterly survey mapping bottleneck vacancies (ESF project).	Manpower used to rank the top-10. Ranking 11—13 is based on the results of interviews and of the employer survey. Limited samples/coverage.	2012	4-digit level	4 interviews	Scarce
UK	UK Commission's Employer Skills Survey, 2011[90]	Ranked with one source used	2011	4-digit level	3 interviews	Good

[90] A UK Commission's Employer Skills Survey report has been published after finalising data collection, covering 2013.