Analysis of shortage and surplus occupations based on national and Eurostat Labour Force Survey data

Shortages and surpluses 2019

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1. EXECUTIVE SUMMARY

Main findings

The objective of this study is to implement Article 30 of EURES Regulation (EU) 2016/589 and identify the surplus and shortage occupations including their gender composition, their share of vulnerable groups, their regional distribution and their potential to match shortages in an occupation with surpluses in the same occupation across frontiers and regions.

The study offers details of surplus and shortage occupations by using information provided by the EURES National Coordination Offices (NCOs) and an analysis of the European Labour Force Survey (LFS).

The NCOs provided information on shortage occupations from twenty-three Member States and three Belgian regions. Information on surplus occupations was received from only nineteen Member States, including the three Belgian regions. The top thirty shortage and surplus occupations identified in this study are reflected in the table herewith.

Table 1 Top thirty shortage and surplus occupations in 2019

Shortage	Surplus
Heavy Truck and Lorry Drivers	Accounting and Bookkeeping Clerks
Systems Analysts	Translators, Interpreters and Other Linguists
Welders and Flame Cutters	Data Entry Clerks
Ag. and Industrial Machinery Mechanics & Repairers	Graphic and Multimedia Designers
Building and Related Electricians	Hairdressers
Carpenters and Joiners	Journalists
Plumbers and Pipe Fitters	Receptionists (general)
Cooks	Secretaries (general)
Concrete Placers, Concrete Finishers and Related	Sweepers and Related Labourers
Metal Working Machine Tool Setters and Operators	Tailors, Dressmakers, Furriers and Hatters
Motor Vehicle Mechanics and Repairers	Accountants
Nursing Professionals	Administrative and Executive Secretaries
Bricklayers and Related Workers	Car, Taxi and Van Drivers
Bus and Tram Drivers	Cleaners and Helpers in Offices, Hotels etc.
Electrical Engineers	Elementary Workers
Generalist Medical Practitioners	Shop Sales Assistants
Structural Metal Preparers and Erectors	Bank Tellers and Related Clerks
Butchers, Fishmongers and Related Food Preparers	Broadcasting and Audio-visual Technicians
Chefs	Cashiers and Ticket Clerks
Civil Engineers	General Office Clerks
Other Software & Applications Developers/Analysts	Interior Designers and Decorators
Software Developers	Mixed Crop Growers
Accountants	Painters and Related Workers
Advertising and Marketing Professionals	Philosophers, Historians and Political Scientists
Air Conditioning and Refrigeration Mechanics	Primary School Teachers
Electrical Engineering Technicians	Sociologists, Anthropologists and Related
Electrical Mechanics and Fitters	Travel Guides
Electronics Engineering Technicians	
Industrial and Production Engineers	
Plasterers	
Shop Sales Assistants	
Waiters	
Web and Multimedia Developers	

The **shortages** listed in column one of Table 1[1] cover a wide spectrum, out of which many professional occupations are especially in software-related skills (4), engineering skills (3) and to a lesser extent in health-related skills (2). Accountants and marketing executives also feature on the list. The craft occupations dominate the list, especially those related to construction and engineering. Another well represented sector is the hospitality one, including cooks, chefs and waiters.

Regarding the **surpluses**, in general, the occupations listed in column two of the table are not explicitly technical in nature. As many as eight of the twenty-seven occupations on the list come from the clerical broad group of occupations. There is also a strong presence of occupations related to 'humanities' disciplines, such as philosophers and historians, sociologists' anthropologists, and journalists.

While comparing **the data from NCOs with the LFS data** we see that one in three (10) of the **shortage occupations** identified by the NCOs were also identified as shortages in the LFS data. These shortages include some professional occupations, particularly in the healthcare and software sectors. Nevertheless, just less than one in three (9) of the **surplus occupations** identified by the NCOs were also on the list of the surplus occupations identified by the analysis of LFS data. Shortage occupations were dominated by technical competences, while surpluses were generally associated with non-technical competencies.

Only twenty-four different occupations were classified as both shortage and surplus occupations by the NCOs. This represents a restrained **level of cross border matching possibilities** (24) and it reflects two aspects of the study: the relatively low number of NCOs (nineteen) who identified surplus occupations and the different occupational composition of the lists of surplus and shortage occupations submitted by the NCOs.

The list of twenty-four occupations includes occupations from the professional, craft and clerical categories. Some of the shortage occupations reported by the most NCOs such as accountants, nurses, doctors, truck drivers, cooks, waiters and shop assistants are among them, but the number of matching possibilities is restrained and often involves only one country. However, for cooks, accountants, marketing professionals, shop assistants, building workers and secondary teachers there are matching possibilities involving from three to five countries. It is notable that the analysis found that the two software occupations of 'systems analyst' and 'software developer' which are among the most widely reported shortage occupations, have no cross-border matching possibilities. This finding suggests that technical occupations in software are in short supply throughout the community.

The analysis of LFS data showed that **significant gender segmentation** was associated with **both shortage and surplus occupations** identified by the NCOs. For example, males dominate STEM (i.e. science, technology, engineering and mathematics) related occupations where there are extensive shortages, while females dominate the clerical group, which contains many surplus occupations. One of the most striking results to emerge from the analysis is that the gender composition of shortage occupations is strongly biased towards male workers.

[1] As many different NCOs reported the same number of shortage and surplus occupations, the closest number to 30 occupations was 33 shortages and 27 surpluses. See Tables 3.1 and 3.3 in the report.

However, the results of the analysis of the gender composition of shortage and surplus occupations suggests that there may be **significant potential for increasing the supply of shortage skills through upskilling** those who have a background in the occupations which have been identified as surplus to market requirements - such as clerical workers. These workers could be upskilled in the competences associated with a range of shortage occupations (e.g. competences in software).

Both the list of surplus occupations and the list of shortage occupations, identified by the PES/national sources, contained a significant number of occupations which have a large share of unqualified workers. This may reflect the fact that many labour markets in the EU are approaching the status of 'full employment' and jobseekers in these labour markets have a greater range of choice of where to work.

Recommendations

Any future report based on Article 30 of EURES Regulation (EU) 2016/589 **must ensure** that there is **a significantly greater number of NCOs which submit lists of both shortage and surplus occupations**.

In order to ensure the maximum level of coverage of all occupations which are both in shortage and in surplus in different areas of the EEA, there may be some merit in also **directly gathering information from the EURES database**.

There are practical actions which the NCOs could take to enhance 'matching' possibilities. Specifically, each national **Public Employment Service (PES)** could be requested to **develop an in-depth understanding of the nature of the mobility flows** within their own national and regional labour markets.

Finally, the significant level of **gender segmentation** in many shortage and surplus occupations suggests that there may be **opportunities for the PES to contribute to the alleviation of skill shortages by influencing the gender composition of many shortage and surplus occupations**.

1. INTRODUCTION

The purpose of this study is to implement the provisions of Article 30 of EURES Regulation (EU) 2016/589 which state:

"Each Member State shall, in particular, collect and analyse gender-disaggregated information on: (a) labour shortages and labour surpluses on national and sectoral labour markets, paying particular attention to the most vulnerable groups in the labour market and the regions most affected by unemployment; (b) EURES activities at national and, where appropriate, cross-border level. The NCOs shall be responsible for sharing the available information within the EURES network and contributing to the joint analysis".

The list of shortage and surplus occupations which was submitted by Member States was compared to a list of shortage and surplus occupations which was based on an analysis of data from the European Labour Force Survey (LFS). The purpose of making this comparison is to assess the extent to which the shortages and surpluses identified by the NCOs are similar to those identified by an analysis of the LFS.

The thirty occupations which were identified by the most NCOs as shortage occupations and the thirty occupations which were identified by the most NCOs as surplus occupations were further analysed to determine their gender composition and their share of vulnerable groups. The education level - specifically the share of workers who were unqualified - was used as a proxy of vulnerability[2].

In addition, the regional distribution of both surplus and shortage occupations was mapped. The mapping provided the opportunity to identify any occupation which appeared as a shortage in at least one country and a surplus in at least one other country. The extent to which such occupations occurred indicated the potential for matching skill shortages with skill surpluses across frontiers or regions.

However, it should be emphasised that the potential for matching is constrained by the number and type of skill shortages and surpluses identified in the study. A relatively wide range of both shortage and surplus occupations will generate a greater level of matching possibilities and vice versa. This issue is addressed further in the recommendations.

1.1 The scope of the study

A total of thirty-three NCOs were asked to submit data on shortage and surplus occupations. These NCOs represented twenty-seven Member States, the three regional PES from Belgium, and Norway, Iceland and Switzerland.

In most cases, the data gathered by the NCOs came from the national or regional office of the PES. However, a small number of NCOs did not use PES administrative data as their source of data.

Table 1.1 below shows the countries and regions which submitted lists of skill shortages and surpluses within the time allowed. A total of twenty-six NCOs submitted data on shortage occupations to the NCOs. A total of nineteen NCOs submitted lists of surplus occupations. The source of data on surplus occupations comes exclusively from the

[2] Specifically, ISCED 0-2 level was used as a proxy for unqualified workers.

administrative data in the PES, specifically the ratio of registered jobseekers to registered vacancies. Data on surpluses is not provided by any other source.[3]

Table 1.1 Participating countries and regions

Countries and regions which submitted data on shortage occupations
AT, BE-Actiris, BE-Le Forem, BE-VDAB, BG, CY, CZ, DE, EE, FR, HR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SK, SI, UK
Countries and regions which submitted data on surplus occupations
AT, BE-Le Forem, BG, CY, CZ, DE, EE, FR, HR, HU, IT, LT, LV, NL, PL, PT, RO, SE, SI

1.2 Identifying and evaluating shortages and surpluses

One of the core objectives of this study is to identify shortage and surplus occupations using the most detailed (i.e. ISCO '08 4-digit codes) data available to the national NCOs. The analysis uses two dimensions to quantify shortage and surplus occupations; the most widely reported (i.e. submitted by the most NCOs) shortage and surplus occupations and the occupations with the most severe shortages and surpluses.

Each NCO was requested to submit a range of information on the top thirty shortage occupations and the top thirty surplus occupations. In a small number of cases, less than thirty occupations were submitted by the NCOs.

In most cases, the data sources used to identify the occupations were less than eighteen months old. In a small number of cases, they were based on 2017 sources, and in one case they were based on a five-year forecasting exercise.

The list of the top thirty shortage and surplus occupations reported by most NCOs is compared to the lists identified by an analysis of the European Labour Force Survey (LFS).

1.3 Exploring the characteristics of shortages and surpluses

In addition to identifying lists of shortage and surplus occupations and their magnitude, this study also aims to identify the characteristics of shortage and surplus occupations. Specifically, the study explores the extent to which shortage and surplus occupations are associated with gender segmentation and high or low qualifications. This exploration is conducted through an analysis of the European Labour Force Survey (LFS) rather than through the administrative data available to the national authorities as the former provides more comprehensive data on these variables.

The study also provides a time series which shows the extent to which specific shortage occupations identified by the relevant national authorities have persisted over time. In order to provide a time series which covers all relevant previous studies, it is necessary to provide the lists of shortage occupations in the more aggregated 3-digit occupation codes.

The analysis also provides a geographic distribution of shortage and surplus occupations, and it also explores the extent to which the same occupations are classified as shortages in some countries/regions and surpluses in others, thereby creating the possibility that policies designed to enhance cross-border matching between such occupations might alleviate some skill and labour market imbalances.

[3] For example, the UK used their list of eligible occupations for work permits, while other countries used skill forecasts and surveys. These sources however, do not provide any information on skill surpluses.

2. DATA SOURCES AND METHODOLOGIES

2.1 Introduction

The indicators used to identify shortage and surplus occupations are explored to establish if the choice of indicators provides a possible explanation for the divergence between the composition of the lists of shortage and surplus occupations provided by the NCOs and the results of the analysis of LFS data (see chapter 3). The choice of indicator may also impact on the extent to which surplus occupations may be identified.

The chapter also includes an analysis of the strengths and weaknesses of PES/national sources used by the NCOs, and the Labour Force Survey as a source of data for the identification of shortage and surplus occupations.

2.2 Using PES/national sources to identify shortages and surpluses

A summary of the indicators used to identify shortage occupations is provided in Table 2.1. The number of submissions adds up to thirty-eight because more than one indicator was used by many of the Member States who responded to the survey.

Table 2.1 Indicators used by PES/national sources to identify shortages, surpluses

Indicator to identify shortages/surpluses	Number of PES/national sources
Ratio of job seekers to vacancies	14
Time to fill vacancies	8
Work permits	4
% of filled vacancies compared to average	3
Employment growth vs. education output	3
Employers views	3
Occupational barometer/multiple indicators	3

The range of indicators is dominated by indicators based on PES administrative data. These indicators include the two most frequently used indicators – the ratio of PES registered jobseekers to vacancies (fourteen PES) and the time to fill vacancies (eight PES). In addition, the percentage[4] of vacancies filled compared to the average is also an indicator exclusively based on PES administrative data (three PES).

The administrative data of the PES is limited as a source of shortage and surplus occupations because PES registered vacancies or jobseekers are not representative of all occupations.

The figures in Table 2.1 show that the maximum number of respondents who have access to a database other than one based on PES administrative data is thirteen or half the number of respondents. This may be the reason why a much lower share of the shortage occupations identified by PES/national sources were professional occupations compared to the list based on the LFS analysis (see chapter three).

It may also be the reason - as shown in chapter three - why some anomalies have appeared in the list of surplus occupations submitted by the PES/national sources. If for

[4] Even in those cases where the PES incorporate other vacancy databases into their overall vacancy database, the job-seekers are still based exclusively on registrants.

example, many engineers or accountants do not register with the PES during their job-search activities, this may create the impression that these are surplus occupations, especially if a greater number of employers are registering their vacancies in these occupations with the PES. It is particularly plausible that such an impression may be created in the increasing number of PES who are incorporating external vacancy databases into their overall database[5] - thus increasing the number of vacancies in higher level occupations, but not, at least initially, the number of registered jobseekers.[6]

However, while a strong focus on PES administrative data may be a limiting factor in devising a comprehensive, national list of shortage occupations, it is a significant advantage in the task of identifying surplus occupations. This is because many of the quantitative and qualitative methodologies designed to gather information on skill shortages such as surveys, work permit data and discussions with employers, do not provide any information on surplus occupations.

In general, the submissions in which the national or regional PES offices were prominently involved, were able to create lists of surplus occupations and this is why a total of nineteen of the twenty-six responses included surplus occupations. In contrast, a number of responses which were based on other methodologies, while they produced excellent, comprehensive lists of shortage occupations, were unable to identify surpluses.

2.3 Using LFS data to identify shortages and surpluses

The LFS systematically gathers data on the numbers recruited to the workforce and their occupation and the numbers looking for work and their previous occupation. Consequently, the LFS appears to be an excellent source for identifying skill imbalances using a ratio of the number of persons looking for work with previous working experience in the occupation to the numbers who found work in that occupation during the same reference period.

However, in practice, there are many limitations to using this ratio. Firstly, only approximately one in three unemployed respondents to the LFS state the occupation that they were previously employed in. As there are many countries in the European Economic Area which have a relatively small labour force, and the Labour Force Survey is based on a representative sample, the numbers of unemployed who state their previous occupation are too small to be statistically reliable.

These difficulties are addressed in this study by basing the ratio on the total recruited and the total unemployed in the EEA area, rather than in each individual Member State, and by using the more aggregated 3-digit occupation unit rather than individual job-titles.

This approach, while it produces statistically reliable data, has two disadvantages. Firstly, it does not capture any regional variance which might exist between occupations which are in surplus or occupations which are in shortage. While regional variance can be

[5] These anomalies may arise in situations where the PES vacancy database is augmented by external vacancy databases, but the PES registered job-seekers come from traditional occupational backgrounds. In these situations, the number of vacancies in some occupations in the external vacancy database may be greater than the number of relevant job-seekers.

[6] Of course, as a PES expands the range of occupations in its vacancy database, the range of occupations of registered job-seekers will in time also expand, reflecting the wider range of vacancies.

created by aggregating the labour force of adjacent countries, the results will tend to reflect the occupation composition of the countries with the largest labour force.[7]

Secondly, the 3-digit occupation group contains more than one occupation. For example, the 3-digit occupation unit: 'building frame and related trade workers' contains many construction craft occupations such as carpenters and roofers. It is not possible to identify which occupation(s) are in shortage. When the LFS list of shortages is compared to the list of shortage occupations identified by the PES/national sources, it exaggerates the degree of overlap because occupations will be considered identical if they belong to the same 3-digit occupation unit, although the specific shortage occupations may be quite different such as for example, roofers and carpenters.

The ratio is a relative measure of shortage or surplus. It is not the case that the values of the ratio show that there are less unemployed (shortage) or more unemployed (surplus) to meet the recruitment requirements. The ratio simply shows the occupations which have the lowest number of unemployed to recruits (shortage) or the highest number of unemployed to recruits (surplus). This is because the unemployed are only one of three sources outside the workforce who are recruited to employment. The others are first time jobseekers and the inactive. Thus, the numbers of unemployed will always understate the numbers who have been recruited to a particular occupation.

Finally, the ratio itself is suspect as a measure of relative shortage or surplus for those occupations which have few if any barriers to entry. This is because the jobseekers recruited to these occupations may have previous experience in a wide range of different occupations because previous experience in the occupation the jobseekers is being recruited into, may not be necessary.

Nevertheless, despite these considerable limitations, the list of shortage and surplus occupations produced by the analysis of LFS data for this study (see chapter three) shows a remarkable degree of consistency both with the results of other reports on shortage occupations and with common sense. For example, the list of shortage occupations is dominated by highly qualified professions, while the list of surpluses contains many operative and elementary occupations and only one professional occupation. Not surprisingly, it is a profession not associated with mandatory qualifications.

Furthermore, all of the software related professional and associate professional occupations and all of the health-related professional and associate professional occupations are presented in the lists of top shortages as are the teaching and the financial professions. These results, particularly in the case of software and healthcare occupations, correspond to the results of many studies of shortage occupations.

2.4 Conclusions

Most, but not all, of the sources used to supply data on shortage and surplus occupations to the NCOs involved the national – and in the case of Belgium – the regional offices of the Public Employment Services. A wide range of indicators were used and this resulted in a list of shortages and surpluses which included some professional occupations which

[7] See the unpublished paper 'A brief exploration of labour market imbalances in the EEA and their characteristics using data from the LFS; April 2019' which was circulated to the PES and which grouped large and small countries together. There has been criticism of the results from a 'small country' because the ensuing list of shortage and surplus occupations invariably reflected the larger labour market.

are generally not associated with the jobseekers who register with the PES or with the vacancies submitted to the PES.

Nevertheless, there was a far greater share of professional occupations on the list of shortages identified by the analysis of LFS data than on the lists submitted by the PES/national sources by the PES/national sources. This may indicate that the PES, as a source of national intelligence on shortage and surplus occupations, is limited to some extent by the occupation composition of the jobseekers and vacancies registered with them.

The LFS also has limitations as a source of intelligence on shortages and surpluses and these limitations reflect in particular the lack of data on the previous occupation of jobseekers. However, despite a considerable array of limitations, the lists of shortages and surpluses produced by the LFS are plausible as the occupations associated with relatively high qualifications dominate the list of shortages and those with relatively low qualifications dominate the list of surpluses.

3. PROFILE OF SHORTAGE AND SURPLUS OCCUPATIONS IN 2019

3.1 Introduction

This chapter contains a detailed analysis of the data on shortage and surplus occupations. The data is analysed from a number of perspectives, such as the most frequently reported shortages and surpluses and their relative magnitude. The NCOs were requested by the EURES Coordinating Office to identify a minimum of thirty shortage occupations and thirty surplus occupations. However, while twenty-six NCOs identified a list of shortage occupations, only nineteen identified any surplus occupations.

3.2 Profile of the most extensive shortage occupations

Table 3.1 shows the shortage occupations identified by the NCOs in 2019. The most striking feature of the occupations listed in Table 3.1 is that they cover such a wide spectrum. There are for example many professional occupations, especially in software-related skills (4), engineering skills (3) and to a lesser extent in health-related skills (2). Accountants and marketing executives also feature on the list.

But the craft occupations dominate the list, especially those related to construction and engineering. Carpenters, plumbers, electricians, bricklayers, plasterers and structural metal erectors are all represented as are a range of mechanical crafts such as fitters and electrical mechanics, welders and motor, refrigeration, agricultural and industrial mechanics. The hospitality sector is well represented with the inclusion of cooks, chefs and waiters.

Table 3.1 Top thirty shortages occupations reported by NCOs[8]

Occupation (note:4 digit occupation)	Number of reporting NCOs	Occupation (note; 4 digit occupation)	Number of reporting NCOs
Heavy Truck and Lorry Drivers	15	Butchers, Fishmongers and Related	8
Systems Analysts	14	Chefs	8
Welders and Flame Cutters	14	Civil Engineers	8
Agricultural and Industrial Machinery Mechanics	13	Software & Applications Develop./Analysts	8
Building and Related Electricians	12	Software Developers	8
Carpenters and Joiners	12	Accountants	7
Plumbers and Pipe Fitters	12	Advertising and Marketing Professionals	7
Cooks	11	Air Conditioning, Refrigeration Mechanics	7
Concrete Placers, Concrete Finishers and Related	10	Electrical Engineering Technicians	7
Metal Working Machine Tool Setters/Operators	10	Electrical Mechanics and Fitters	7
Motor Vehicle Mechanics and Repairers	10	Electronics Engineering Technicians	7
Nursing Professionals	10	Industrial and Production Engineers	7
Bricklayers and Related Workers	9	Plasterers	7
Bus and Tram Drivers	9	Shop Sales Assistants	7
Electrical Engineers	9	Waiters	7
Generalist Medical Practitioners	9	Web and Multimedia Developers	7
Structural Metal Preparers and Erectors	9		

[8] The ranking of the occupations is based on the number of respondents – usually national or regional PES – who identified it as a shortage. As an occupation may be identified by the same number of respondents, the number of occupations does not add up to exactly thirty.

3.3 Profile of shortages of high magnitude

In addition to identifying shortage occupations, information was also gathered on the relative severity of the shortages. Table 3.2 below provides a list of the occupations with the most severe shortages which were reported by at least two NCOs.

There are only twenty occupations which are categorised as severe shortages. Furthermore, four of these occupations, 'contact centre salespersons', 'application programmers', 'roofers' and 'insulation workers' are not included in the overall list of shortage occupations (see Table 3.1) because that list only includes occupations which were on shortage lists submitted by at least seven NCOs and these severe shortage occupations were submitted by only two NCOs.

Table 3.2 High magnitude shortages reported by NCOs

Occupation (note: 4 digit codes)	Number stating high magnitude of shortage	Occupation (note: 4 digit codes)	Number stating high magnitude of shortage
Concrete Placers, Concrete Finishers & Related	4	Applications Programmers	2
Heavy Truck and Lorry Drivers	4	Bus and Tram Drivers	2
Bricklayers and Related Workers	3	Chefs	2
Carpenters and Joiners	3	Contact Centre Salespersons	2
Cooks	3	Generalist Medical Practitioners	2
Plumbers and Pipe Fitters	3	Insulation Workers	2
Software/Applications Developers/ Analysts	3	Roofers	2
Structural Metal Preparers and Erectors	3	Software Developers	2
Welders and Flame Cutters	3	Specialist Medical Practitioners	2
Air Conditioning and Refrigeration Mechanics	2	Waiters	2

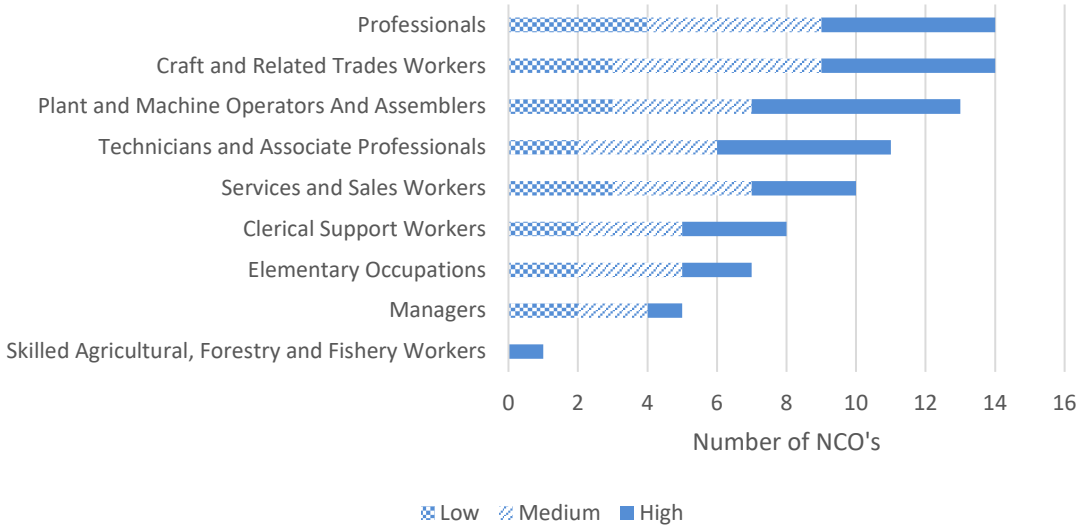
The two most frequently cited severe shortages are 'concrete placers and finishers', and 'heavy truck and lorry drivers'. Most of the software-related occupations on the list of shortages are also included on the list of severe shortages. This is also true of the hospitality occupations of cook, chef and waiter and some of the construction crafts such as carpenters and plumbers.

3.4 Broad occupational groups by shortage magnitude

Figure 3.1 below groups the shortage occupations by the broad occupation group they belong to and by the severity of the shortage. The figure shows that fourteen NCOs submitted information on the severity of shortages in professional occupations, and four of them categorised those shortages as being of high magnitude. Fourteen NCOs also classified the severity of the shortages in craft occupations and in four submissions, the shortage was classified as being of high magnitude.

Surprisingly perhaps the highest share of severe shortages was among the Plant and Machine Operators. In six of the thirteen responses, the shortage is classified as being of high magnitude.

Figure 3.1 Shortages by estimated shortage magnitude (1-digit level)



The lowest share of occupations which were classified as severe shortages was, not surprisingly, among the elementary broad group of occupations while shortages in the management group of occupations also had a relatively low share.

3.5 Profile of the most extensive surplus occupations

The NCOs were also requested to gather information on occupations for which there was an excess supply, and nineteen did so. The surplus occupations submitted by at least four different NCOs are shown in Table 3.3.

Table 3.3 Top thirty surplus occupations reported by NCOs

Occupation (note: 4 digit codes)	Number of NCOs reporting this occupation as surplus	Occupation (note: 4 digit codes)	Number of NCOs reporting this occupation as surplus
Accounting and Bookkeeping Clerks	7	Elementary Workers	5
Translators, Interpreters and Other Linguists	7	Shop Sales Assistants	5
Data Entry Clerks	6	Bank Tellers and Related Clerks	4
Graphic and Multimedia Designers	6	Broadcasting/Audio-visual Technicians	4
Hairdressers	6	Cashiers and Ticket Clerks	4
Journalists	6	General Office Clerks	4
Receptionists (general)	6	Interior Designers and Decorators	4
Secretaries (general)	6	Mixed Crop Growers	4
Sweepers and Related Labourers	6	Painters and Related Workers	4
Tailors, Dressmakers, Furriers and Hatters	6	Philosophers, Historians/Political Scientists	4
Accountants	5	Primary School Teachers	4
Administrative and Executive Secretaries	5	Sociologists, Anthropologists and Related	4
Car, Taxi and Van Drivers	5	Travel Guides	4
Cleaners and Helpers in Offices, Hotels etc.	5		

Intuitively, one might expect that an excess supply of jobseekers is more likely to occur in the case of occupations where the entry requirements are not associated with a high level of qualifications or technical skills.

This assumption appears to be borne out by the results. In general, the occupations listed in Table 3.3 are not explicitly technical in nature. Indeed, as many as eight of the twenty-seven occupations on the list come from the clerical broad group of occupations. There is a strong presence of occupations related to disciplines in the 'humanities' such as philosophers and historians, sociologists' anthropologists, and journalists. It is

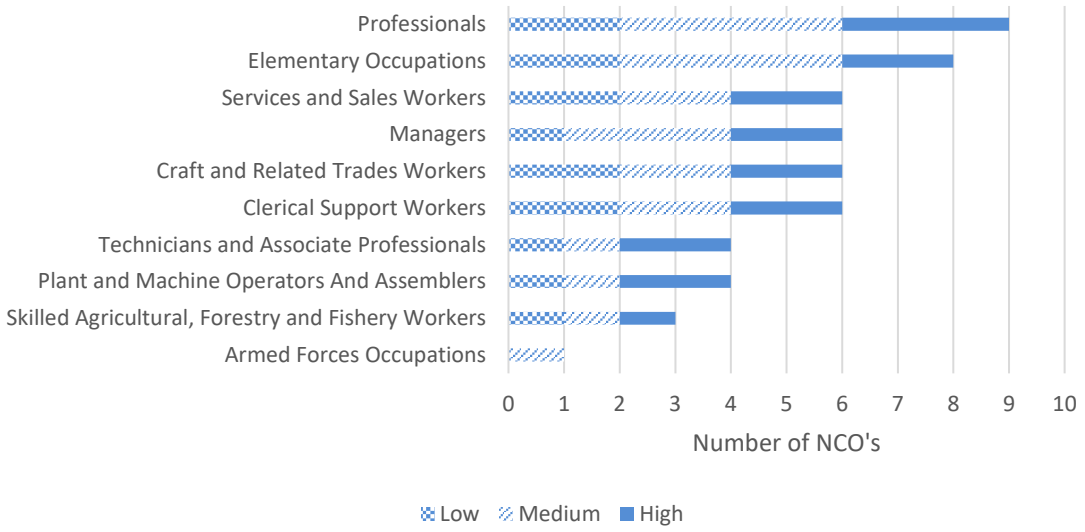
however surprising that accountants have been identified by five NCOs as a surplus occupation, as these have been identified as a shortage occupation in the analysis of LFS data (see financial professions in table 3.6).

Nine NCOs provided information on the extent of the surplus, but only three of these submissions contained occupations which had surpluses of high magnitude. In two of these submissions, 'financial managers' were surprisingly identified as a severe surplus, while two identified 'translators, interpretations and linguists' also as a surplus of high magnitude.

3.6 Broad occupational groups by surplus magnitude

As shown in Figure 3.2 below, professional occupations were categorised as having a high level of magnitude in submissions by more NCOs (3) than any other group of occupations. This is despite the fact that professional occupations were also categorised as having a medium level of magnitude in four other responses. Elementary occupations were also categorised as having a medium level of magnitude in four responses, but only in the case of two responses, were elementary occupations categorised as having a high level of magnitude. However, the broad occupation groups which had the highest share of responses showing surpluses of high magnitude was the 'plant and machine operators and assemblers' and the 'technicians and associate professionals'.

Figure 3.2 Surpluses by estimated surplus magnitude



3.7 Comparison of shortages and surpluses by broad occupation

The issues which have been discussed above can be summarised in Table 3.4 below. The Table provides a detailed summary of all the information which was submitted by the twenty-six NCOs. The number of mentions is considerably higher than the number of occupations because many of the same occupations occur in different responses.

Table 3.4 Shortages and surpluses by broad occupation group

	Shortages				Surpluses			
	Number of occupations ISCO08 4	Number of mentions	Number of NCA's	% of NCOs	Number of occupations ISCO08 4	Number of mentions	Number of NCOs	% of NCOs
Armed Forces Occupations	1	1	1	4%	2	3	2	11%
Managers	17	53	15	58%	16	25	8	42%
Professionals	64	254	24	92%	68	139	18	95%
Technicians and Associate Professionals	47	131	24	92%	44	84	15	79%
Clerical Support Workers	18	39	17	65%	23	69	14	74%
Services and Sales Workers	26	81	21	81%	31	72	17	89%
Skilled Agricultural, Forestry and Fishery	4	5	4	15%	9	22	9	47%
Craft and Related Trades Workers	48	237	23	88%	32	49	15	79%
Plant and Machine Operators & Assemblers	27	94	23	88%	17	27	11	58%
Elementary Occupations	23	63	15	58%	24	65	14	74%
Total	275	958	26	100%	266	555	19	100%

The Table shows that there was a total of two hundred and seventy-five distinct occupations identified as shortages in the twenty-six responses and a total of two hundred and sixty-six distinct occupations identified as surplus occupations in the nineteen responses which contained information on surplus occupations. Even allowing for the fact that a significant number of occupations occur at least once in both the list of shortage and surplus occupations, the figures suggest that there is an extensive lack of balance between demand and supply in the European labour market.[9]

Most of the shortage occupations (64) belong to the professional groups of occupations, followed by the craft group (48) and the technicians and associate professionals (47). Each of the other groups of occupations had notably less shortage occupations, especially the clerical support workers which contained less shortage occupations than even the elementary group of occupations. These results further support the conclusion that shortage occupations are most prevalent among either occupations which require relatively high qualifications or occupations which are technical in nature or a combination of both.

Surprisingly, the professional group of occupations also contained the most surplus occupations (68) followed by the associate professionals (44) and craft workers (32) which contain almost the same number of surplus occupations as the service and sales group of workers.

The distribution of surplus occupations by broad occupation group is counter-intuitive and it includes a high share of occupations which require relatively high qualifications. This result is not apparent when only the surplus occupations identified by the most NCOs (see Table 3.3) are included on the list and it suggests that - while there was a very wide range of distinct professional and associate professional occupations identified as being in surplus - these occupations were identified in very few responses. As surplus occupations had to be identified by a minimum of four NCOs to qualify for inclusion in Table 3.3, many of these occupations are absent from that Table.

[9] There are less than 450 4-digit occupations in ISCO-08 in total, including over 90 professional occupations.

3.8 Comparison with LFS identified shortages and surpluses

Finally, it is important to assess the extent to which the lists of shortage and surplus occupations submitted by the NCOs correspond to the lists of shortage and surplus occupations identified through an analysis of the LFS data. As the latter were classified in 3-digit ISCO codes, the shortages submitted by the NCOs are aggregated to the 3-digit classification to enable a direct comparison.

Table 3.5: Top 30 shortage occupations – national vs. LFS data

Shortage occupations identified by PES/national sources	Shortage occupations identified by analysis of LFS
Building Finishers and Related Trades Workers	Medical doctors
Building Frame and Related Trades Workers	Telecommunications and broadcasting technicians
Sheet, Structural Metal Workers, Moulders Welders	Nurses and midwives associate professionals
Software and Applications Developers and Analysts	Legal professionals
Blacksmiths, Toolmakers and Related Trades Workers	Other health professionals
Electrical Equipment Installers and Repairers	Nursing and mid-wife professionals
Heavy Truck and Bus Drivers	Database and network professionals
Machinery Mechanics and Repairers	Administration professionals
Physical and Engineering Science Technicians	Software and application developers
Engineering Professionals (excluding Electro-technology)	Engineering professionals
Cooks	Secondary education teachers
Nursing and Midwifery Professionals	Social and religious professionals
Sales, Marketing and Public Relations Professionals	Other health associate professionals
Client Information Workers	Finance professionals
Finance Professionals	University and higher education teachers
Food Processing and Related Trades Workers	Primary school and early childhood teachers
Medical Doctors	Government regulatory associate professionals
Shop Salespersons	Business services agents
Assemblers	Physical and engineering technicians
Database and Network Professionals	Legal, social and religious associate professionals
Electro-technology Engineers	Electro-technology engineers
Protective Services Workers	Life science professionals
Sales, Marketing and Development Managers	Sales, marketing and public relations professionals
Artistic, Cultural and Culinary Associate Professionals	Vocational education teachers
Manufacturing, Construction Distribution Managers	Medical and pharmaceutical technicians
Material recording and Transport Clerks	Financial and mathematical technicians
Mining and Construction Labourers	Physical and earth science professionals
Sales and Purchasing Agents and Brokers	Information and communication technicians
Textile, Fur and Leather Products Machine Operators	Keyboard operators
Waiters and Bartenders	Heavy truck and bus drivers

The method used for identifying shortage and surplus occupations in the LFS data is broadly similar to the method used in most of the responses by the NCOs; specifically, the ratio of PES registered jobseekers to PES registered vacancies. In the case of the analysis of LFS data, this ratio is replaced by the ratio of the number of recruits to the occupation divided by the number of unemployed with previous experience of working in that occupation over the same reference period.

The list of shortages in Table 3.5 show that there is a significant difference in the composition of the occupations. The list of occupations based on the LFS ratio includes eighteen professional occupations and ten associate professional occupations and only two occupations from the machinery and operatives group.

In sharp contrast, the list submitted by the NCOs only includes nine professional occupations, and three associate professional occupations. This significant difference in the composition of the two lists of top shortages limits the extent to which there is an overlap of occupations between them. Nevertheless, one in three of the occupations (10) do occur in both lists mainly due to the overlap between the professional occupations, particularly those in healthcare and software.

Table 3.6: Top 30 surplus occupations – national vs. LFS data

Top surplus occupations identified by PES/national sources	Top surplus occupations ranked by LFS
Authors, Journalists and Linguists	Street and Related Services Workers
Social and Religious Professionals	Agricultural, Forestry and Fishery Labourers
Garment and Related Trades Workers	Ships' Deck Crews and Related Workers
Architects, Planners, Surveyors and Designers	Refuse Workers
Artistic, Cultural and Culinary Associate	Mining and Construction Labourers
Client Information Workers	Painters, Building Structure Cleaners and Related
Creative and Performing Artists	Street and Market Salespersons
Numerical Clerks	Other Stationary Plant and Machine Operators
Domestic, Hotel and Office Cleaners and Helpers	Textile, Fur and Leather Machine Operators
Hairdressers, Beauticians and Related Workers	Food and Related Products Machine Operators
Keyboard Operators	Building Frame and Related Trades Workers
Other Elementary Workers	Cooks
Shop Salespersons	Creative and Performing Artists
Administrative and Specialized Secretaries	Manufacturing Labourers
Agricultural, Forestry and Fishery Labourers	Waiters and Bartenders
Business Services Agents	Food Processing and Related Trades Workers
Car, Van and Motorcycle Drivers	Market Gardeners and Crop Growers
Finance Professionals	Domestic, hotel and office cleaners
Market Gardeners and Crop Growers	Forestry and Related Workers
Other Teaching Professionals	Mobile Plant Operators
Refuse Workers	Mining and Mineral Processing Plant Operators
Secretaries (general)	Travel Attendants, Conductors and Guides
Telecommunications and Broadcasting Technicians	Ship and Aircraft Controllers and Technicians
Tellers, Money Collectors and Related Clerks	Client Information Workers
Building and Housekeeping Supervisors	Protective Services Workers
Protective service workers	Manufacturing Labourers
Librarians, Archivists and Curators	Food Preparation Assistants
Other Clerical Support Workers	Garment and related trades workers
Painters, Building Structure Cleaners Trades	Wood treaters, cabinet makers and related trades
Primary School and Early Childhood Teachers	Building finishers and related trades
Engineering professionals	Wood processing and paper making operatives

There is also a significant difference between the two lists of surplus occupations. However, in this case, most of the professional occupations (8) are in the responses of the NCOs; indeed there is only one professional occupation in the list based on an analysis of LFS data and it is an occupation; 'creative and performing artists' which is not associated with a high level of formal qualifications or barriers to entry.

Three of the eight broad professional occupation categories on the list submitted by the NCOs are not in general associated with relatively high qualifications[10]. However, this does not apply to the other five professional occupations on the list and the inclusion of

[10] For example, in some of the occupations in the three broad groups 'authors, journalists and linguists' and 'creative and performing artists' and 'artists, cultural and culinary associate professionals' relatively high qualifications are not mandatory.

'primary school and early childhood teachers' and, in particular, 'professional engineers' is very surprising. While these occupations have the lowest ranking, they were nevertheless identified as surplus occupations in responses by eight NCOs.

With the exception of a small number of professional occupations in the list of surplus occupations submitted by the NCOs, the occupations in each list - while different from each other - come from occupation groups which in general have a low barrier to entry. Indeed, as shown in chapter five, the level of qualifications associated with these occupations is in general less than the level of qualifications associated with the list of shortage occupations.

3.9 Conclusions

There are a number of significant conclusions which may be drawn from the analysis of shortage and surplus occupations in this chapter.

Firstly, the list of top shortage occupations reported by NCOs included occupations from all the broad occupation groups, including professional and associate professional occupations. However, despite the inclusion of a range of professional software, healthcare, engineering and financial occupations in the lists of shortages submitted by the NCOs, there was a greater predominance of professional occupations in the list of shortages identified in the analysis of LFS data. This difference may reflect the different data sources used, as discussed in chapter two.

Secondly, the list of surplus occupations submitted by the NCOs contained a small number of occupations - most notably finance and engineering professionals - which also appear on both the NCOs list and the LFS list of shortage occupations. While this overlap did not occur in the same NCO submission, it is nevertheless surprising because these occupations are generally considered to be occupations in shortage.

Thirdly, there is a distinct difference in the type of competences and qualifications associated with shortage and surplus occupations identified in both the submissions by the NCOs and in the findings of the analysis of LFS data. Specifically, the shortage occupations for the most part are associated with relatively high levels of formal education qualifications or specific technical vocational qualifications. In sharp contrast, the surplus occupations in general embodied either selling, service and clerical skills, or cultural and artistic skills or competencies in the humanities.

In general - despite a few exceptions – the results of the analysis show that the type of occupations on the lists of shortage and surpluses are plausible. Nevertheless, the limitations of the data sources highlighted in chapter two, combined with an albeit small number of surprising results from the analysis of shortage and surplus occupations, suggest that the sources used in this study - at least in their current formats[11] - are not ideal for the comprehensive and accurate identification of shortage and surplus occupations. For this reason, there are recommendations in this study both to significantly increase the number of NCOs submitting data on both shortage and surplus occupations and to directly explore the potential of the EURES database to deliver a comprehensive and accurate list of shortage and surplus occupations, and where appropriate, to make recommendations on how that potential can be fully developed.

[11] In time, the systematic integration of other vacancy databases might encourage more highly qualified job-seekers to be considered, thus improving the representation of occupations in the ratio of job-seekers to vacancies.

4. PROFILE OF SHORTAGES AND SURPLUSES IN SPACE AND TIME

4.1 Introduction

In this chapter, the shortage and surplus occupations submitted by the NCOs are analysed from the perspective of time and space. Specifically, the chapter includes an analysis of the shortage occupations identified in the four most recent previous studies to ascertain the extent to which shortage occupations have varied over time. The geographic distribution of shortages and surpluses is also explored to ascertain if there are significant differences in the spatial distribution of shortage and surplus occupations.

4.2 Tracking shortages over time

Table 4.1 below shows the top shortage occupations in terms of their identification by the most respondents over the last four years of studies on skills shortages and surpluses.[12] The occupations are classified in 3-digits because that is how the information was gathered in the first study. The results show a strong level of consistency in terms of the type of occupations which were identified as shortages.

Table 4.1 Ranking of shortage occupations (3-digit)

	Rank[13]			
Top occupations in 2019	**2019**	**2017**	**2016**	**2015**
Building Finishers and Related Trades Workers	1	4	6	4
Building Frame and Related Trades Workers	2	4	3	4
Sheet and Structural Metal Workers, Moulders and Welders, and Related Workers	3	2	3	2
Software and Applications Developers and Analysts	3	1	1	1
Blacksmiths, Toolmakers and Related Trades Workers	4	4	3	4
Electrical Equipment Installers and Repairers	4	7	4	5
Heavy Truck and Bus Drivers	4	7	5	4
Machinery Mechanics and Repairers	5	8	7	5
Physical and Engineering Science Technicians	6	6	7	n/a[14]
Engineering Professionals (excluding Electro-technology)	7	5	6	6
Cooks	8	4	7	7
Nursing and Midwifery Professionals	8	8	6	n/a
Sales, Marketing and Public Relations Professionals	8	n/a	n/a	n/a
Client Information Workers	9	n/a	n/a	n/a
Finance Professionals	9	n/a	n/a	n/a
Food Processing and Related Trades Workers	9	n/a	n/a	n/a

Indeed, the top eight shortage occupations are the same in the case of all four studies, and the top twelve shortage occupations are also the same when only the last three studies are taken into account. Their ranking between 'first' and 'eight' varies over the years, although the variation in general is quite small. Thus, the software occupations, which were ranked as the most widespread shortage in the first three years of the study, drop to third in this study, while for example, 'heavy truck and bus drivers' move between rank 'four' and 'rank 'seven'.

[12] In previous studies, it was the PES who submitted the lists of shortages and surpluses directly to the Commission; in this study that function was performed by the NCO's.
[13] This is based on when the identification was made rather than the year of publication.
[14] N/A means that the occupation does not appear in the other lists of top-ranking occupations.

4.3 Geographic distribution of shortages and surpluses

Some indication of the relative geographic distribution of shortage and surplus occupations may be derived from an analysis which combines the composition of these occupations by broad group with the country or region of the NCO which submitted the occupations.

Table 4.2 Shortages: number of mentions (4-digit) in broad occupation (1-digit)

PES	Armed Forces	Prof	Technicians	Clerical	Service	Skilled Ag	Craft	Operative	Element.	Total
Austria		5	6		1		16	2		30
Belgium Actiris		34	22	5	9		13	5		100
Belgium Le Forem		6	6				9	5	1	30
Belguim VDAB		11	15	2	2		9	4	1	50
Bulgaria		10	3	2	5		4	4	1	30
Croatia			1		3		13	5	4	26
Cyprus		8	1		6	1	10	1	3	30
Czech Republic				3	3			2	7	15
Estonia		3	1	2	8		8	4	7	34
France		4	8	1	1		6	5	1	30
Germany		7	7		1		11	4		30
Hungary		1	2	2	5		5	3	12	30
Ireland		23	8	4	1		11	3	2	54
Italy		12		1						15
Latvia		5	2	1	1		18	3		30
Lithuania		10	2		2		11	2		27
Luxembourg		8	4	1						20
Malta		3	3	3	6		6	3	5	30
Netherlands		9	1	3		1	12	4		30
Poland		10	6	1	1		2	1		30
Portugal		3	1	2	3		15	5	1	30
Romania		3	4	3	2	1	8	5	3	30
Slovakia		2	1		1		11	10	5	30
Slovenia	1	27	15	3	11	2	28	12	10	111
Sweden		26	7		9		8	2		52
UK		24	5				3			34
Total	1	254	131	39	81	5	237	94	63	958

Shortages in professional occupations were particularly prominent in the lists of shortages submitted by Ireland, Belgium (Actiris), Slovenia, Sweden, Poland and the UK. Associate professional occupations were also prominent in Belgium (Actiris and VDAB) and Slovenia. Shortages in clerical occupations were very low, only one PES (Actiris) classifying five of the twenty-nine occupations in this group as shortages. Shortages in craft occupations were prominent in Slovenia, Latvia, Portugal and Austria. The number of craft occupations in the list of shortages submitted by the PES/national sources was almost as high as the number of professional occupations, and these two groups combined contained just over half of all the shortages identified by the NCOs.

However, the distribution of shortages does not reveal any obvious spatial pattern. Poland, Sweden, the UK, Belgium (Actiris) and Italy have a much larger share of occupations associated with high qualifications (i.e. professional and associate

professional) in their list of shortages than the average, while Slovakia and Hungary have a much higher share of occupations associated with low qualifications.

Table 4.3 Surpluses: number of mentions (4-digit) in broad occupation (1-digit)

PES	Armed Forces	Prof	Technicians	Clerical	Service	Skilled Ag	Craft	Operative	Element.	Total
Austria		7	3	3	3	1	5	1	7	30
Belgium Le Forem		4	3	3	11	1	2	1	5	30
Bulgaria		4	4	3	2	3	6		7	30
Croatia		2								2
Cyprus		5	3	9	5		4	1	1	30
Czech Republic					1		1	11	2	15
Estonia	2	25	12	8	5	2	10	5	6	86
France	1	10	9		4		2			30
Germany		4		1	3		1	2	9	20
Hungary		18	5			2	2	1	1	30
Italy		4		1	2		1		4	13
Latvia		2	6	3	5	2	1	1	6	30
Lithuania		5	5	2	3			1		16
Netherlands		9	4	4	8					26
Poland		2	7		3	7	8	2	1	30
Portugal		9	1	4	8	1		1	6	30
Romania		11	10	2	1	3	2		1	30
Slovenia		12	4	5	1		1			23
Sweden		6	8	21	7		3		9	54
Total	3	139	84	69	72	22	49	27	65	555

The most striking aspect of the spatial distribution of surplus occupations are the number of NCOs who included a high share of professional occupations in their lists. The most prominent is Estonia who identified twenty-five professional occupations among their surpluses, but Romania, Slovenia, Hungary, France and Lithuania also have a high share of surplus occupations among the professional and associate professional groups of occupations.

4.4 Conclusions

The analysis in this chapter shows that there is a high level of consistency between the lists of shortage occupations identified in previous studies of shortage and surplus occupations and the current study. The level of consistency is to some extent exaggerated by comparing the occupations at the 3-digit level rather than by individual job-titles. However, as the occupations which are grouped under 3-digits classifications are broadly similar[15], it is reasonable to deduce that while the level of consistency will not be as high if specific job-titles are compared over time, the similarity between the job-titles will nevertheless be very close.

Mapping the composition of shortage and surplus occupations against the location of the NCOs who submitted them, does not reveal a distinctive pattern between types of

[15] For example, some of the shortages relating to software occupations at 3-digit level may refer to a 'systems analyst' or a 'software programmer' at the four digit level, but while these are different job-titles, they will all be professional software occupations.

shortage (e.g. predominantly professional, craft) or surplus occupation and specific geographic locations. NCOs in countries as diverse in their locations as Italy, UK, Poland, Sweden and Slovenia had a high share of shortages among professional occupations. The professional group of occupations also contained the most surplus occupations, and these surplus occupations were particularly prominent in Estonia and Hungary.

Shortages in craft occupations were quite prominent, especially in countries which have an extensive apprenticeship system. The craft occupations accounted for at least half of all shortage occupations in Austria, Croatia, Latvia and Portugal, and at least one in three shortage occupations in Germany, the Netherlands, Lithuania, Slovakia and Cyprus.

However, surplus occupations among the craft group of occupations were not very numerous; there were more surplus occupations identified among professional, technical, clerical, services and elementary group of occupations. While this result is not surprising in view of the large number of craft shortage occupations submitted by many NCOs, it does suggest that the opportunities to match craft shortage and surplus occupations across regions and frontiers is limited. This issue is covered in the next chapter.

5. THE CAUSES OF SKILLS SHORTAGES AND POTENTIAL SOLUTIONS

5.1 Introduction

The focus of this chapter is on identifying the possible causes of skills shortages and surpluses and exploring potential solutions. From the outset, a distinction is made between shortages which arise because there are not a sufficient number of jobseekers with the appropriate level of qualification and skills to fill existing vacancies (i.e. skill shortages) and shortages which arise because - although there are a sufficient number of suitable jobseekers, they do not apply for vacancies in sufficient numbers (i.e. labour shortage).

The analysis also examines the extent to which gender segmentation is contributing to skill shortages and the relationship between these shortages and education qualifications. Finally, the potential for cross border matching between shortage and surplus occupations is explored.

5.2 The role of skills and labour shortages in labour market imbalances

It is important for those involved in labour market policies to understand the difference between a skills shortage and a labour shortage. While the solution to the former lies in increasing the supply of appropriately qualified jobseekers, the solution to labour shortages may ultimately involve other measures, such as improving the working conditions associated with the occupation.

The respondents were asked to identify whether or not each occupation which they classified as a shortage was primarily a labour shortage or a skills shortage. The results are shown in Table 5.1 below.

The results show that there is a good understanding of the difference between skill and labour shortages. There are five job-titles in the list which are associated with relatively high qualifications ‘systems analysts’; ‘nursing professionals’; ‘software developers’; ‘civil engineers’ and electrical engineers’. With the exception of one respondent who categorised the latter as a labour shortage, none of the other respondents classified any of these occupations as primarily a labour shortage. Interestingly however, two respondents classified shortages in the nursing profession as a combination of skills and labour shortages suggesting that they viewed conditions of work within nursing as contributing to the shortages in that profession.

In the case of two occupations, ‘cooks’ and ‘heavy truck drivers’ which are associated with unsocial work hours, half the respondents categorised the shortage as a skills shortage and half classified it as a labour shortage. Interestingly, slightly more respondents (3) classified chefs as a skill rather than a labour shortage (2). This is consistent as ‘chefs’ would be expected to have specific culinary qualifications which would not always be the case with ‘cooks’.

Table 5.1 Skill and labour shortages

Occupation	Number of responses reporting occupation as skills shortage	Number of responses reporting occupation as labour shortage	Number of responses reporting occupations as skill and labour shortage	Total number of responses reporting on skills/labour shortage
Heavy Truck and Lorry Drivers	6	6	1	13
Welders and Flame Cutters	8	2	0	10
Agricultural & Industrial Machinery Mechanics/Repairers	5	3	2	10
Cooks	5	5	0	10
Plumbers and Pipe Fitters	8	0	1	9
Systems Analysts	7	0	1	8
Bus and Tram Drivers	6	2	0	8
Carpenters and Joiners	6	2	0	8
Nursing Professionals	6	0	2	8
Building and Related Electricians	5	3	0	8
Structural Metal Preparers and Erectors	5	2	1	8
Concrete Placers, Concrete Finishers and Related	4	2	1	7
Generalist Medical Practitioners	5	0	1	6
Software and Applications Developers and Analysts	5	0	1	6
Butchers, Fishmongers and Related Food Preparers	4	2	0	6
Metal Working Machine Tool Setters and Operators	4	1	1	6
Bricklayers and Related Workers	3	3	0	6
Motor Vehicle Mechanics and Repairers	3	2	1	6
Civil Engineers	5	0	0	5
Electrical Engineers	4	1	0	5
Electronics Engineering Technicians	4	0	1	5
House Builders	4	1	0	5
Plasterers	4	1	0	5
Chefs	3	2	0	5
Early Childhood Educators	3	1	1	5
Advertising and Marketing Professionals	2	2	1	5
Building Construction Labourers	1	4	0	5
Waiters	1	4	0	5

A majority of respondents classified two occupations as labour shortages; 'waiters' and 'labourers'. This is not surprising as there are few if any barriers to entry to many labouring jobs or indeed to some jobs as waiters.[16]

The only surprising result is that two of five respondents classified 'advertising and marketing professionals' as a labour shortage. It is not apparent why this would be the case.

5.3 Gender segmentation and skills imbalances

To meet the specifications associated with Article 30, an exploration of the extent to which gender segmentation contributes to both skill shortages and skill surpluses is

[16] Clearly some positions in up-market hotels and restaurants may require certain competences but in general specific qualifications are not required in many 'waiting' positions.

required. The 3-digit occupation unit is used so that the gender profile of every shortage and surplus occupation can be shown. In any event, the individual job-titles within the 3-digit unit are very similar and consequently the gender composition of each job-title (i.e. 4-digit) would not be significantly different from their share in the 3-digit unit of occupations.

Table 5.2 Gender segmentation in top thirty shortage occupations[17]

Top shortage occupations identified by PES/national sources	Share of females
Building Finishers and Related Trades Workers	1.25%
Building Frame and Related Trades Workers	1.47%
Sheet, Structural Metal Workers, Moulders Welders	3.06%
Software and Applications Developers and Analysts	16.5%
Blacksmiths, Toolmakers and Related Trades Workers	8.09%
Electrical Equipment Installers and Repairers	2.75%
Heavy Truck and Bus Drivers	3.05%
Machinery Mechanics and Repairers	2.26%
Physical and Engineering Science Technicians	19.34%
Engineering Professionals (excluding Electro-technology)	18.84%
Cooks	48.76%
Nursing and Midwifery Professionals	89.07%
Sales, Marketing and Public Relations Professionals	45.84%
Client Information Workers	72.63%
Finance Professionals	48.86%
Food Processing and Related Trades Workers	34.42%
Medical Doctors	51.27%
Shop Salespersons	65.53%
Assemblers	38.22%
Database and Network Professionals	17.27%
Electro-technology Engineers	8.82%
Protective Services Workers	15.42%
Sales, Marketing and Development Managers	31.11%
Artistic, Cultural and Culinary Associate Professionals	39.53%
Manufacturing, Construction Distribution Managers	15.58%
Material recording and Transport Clerks	39.82%
Mining and Construction Labourers	3.15%
Sales and Purchasing Agents and Brokers	35.09%
Textile, Fur and Leather Products Machine Operators	74.57%
Waiters and Bartenders	59.78

The results for shortage occupations are shown in Table 5.2 above. The figures show that the share of females in the top thirty shortage occupations submitted by the NCOs is very low. Indeed, only in one in five of the occupations is the female representation higher than the male representation. Even allowing for the fact that there are more males within the work force[18] this is a surprising finding and illustrates two aspects which in combination explains this result. Firstly, shortages are generally associated with technical occupations and secondly, females are not very well represented in technical occupations. Thus, the two software related occupations on the list have a female

[17] The figures on gender share are based on 2017 LFS data and applied to the relevant occupations.

[18] The share of females in the EU workforce is 46% - much higher than the share in many of these occupations

representation of only 17%. Engineering professionals are broadly similar at 19% although electro-technology engineers had only 9%.

Table 5.3 Gender segmentation in top thirty surplus occupations[19]

Top surplus occupations identified by PES/national sources	Share of females
Authors, Journalists and Linguists	55.36%
Social and Religious Professionals	67.90%
Garment and Related Trades Workers	71.46%
Architects, Planners, Surveyors and Designers	39.85%
Artistic, Cultural and Culinary Associate	39.53%
Client Information Workers	72.63%
Creative and Performing Artists	39.81%
Numerical Clerks	74.71%
Domestic, Hotel and Office Cleaners and Helpers	86.80%
Hairdressers, Beauticians and Related Workers	86.78%
Keyboard Operators	68.88%
Other Elementary Workers	36.20%
Shop Salespersons	65.53%
Administrative and Specialized Secretaries	72.06%
Agricultural, Forestry and Fishery Labourers	30.60%
Business Services Agents	48.09%
Car, Van and Motorcycle Drivers	17.30%
Finance Professionals	48.86%
Market Gardeners and Crop Growers	26.51%
Other Teaching Professionals	72.99%
Refuse Workers	20.20%
Secretaries (general)	89.10%
Telecommunications and Broadcasting Technicians	14.17%
Tellers, Money Collectors and Related Clerks	63.46%
Building and Housekeeping Supervisors	41.22%
Protective service workers	15.42%
Librarians, Archivists and Curators	70.10%
Other Clerical Support Workers	63.51%
Painters, Building Structure Cleaners Trades	9.99%
Primary School and Early Childhood Teachers	87.42%
Engineering professionals	18.84%

The share of females in lower level technical occupations is in many cases even lower than in the professional technical occupations. Females are virtually non-existent in the construction and mechanical related occupations at both technician and craft and operative levels.

The share of females in the top thirty surplus occupations was much higher. Indeed, just over half (16) of all the surplus occupations on the list in Table 5.3 had a higher female representation than males. The presence of a significant number of clerical occupations contributes to this result because clerical occupations have been a traditional source of significant female employment.

[19] The figures on gender share are based on 2017 LFS data and applied to the relevant occupations.

5.4 Qualifications profile of shortage and surplus occupation

It is of interest to investigate if there is any correlation between the top shortage occupations and persons with little or no qualifications (i.e. ISCED 0-2). The results of this analysis are shown in Table 5.4 below, and display a mixed message.

Table 5.4 share of lowly educated (ISCED 0-2) in top thirty shortage occupations

Top shortage occupations identified by PES/national sources	Share of lowly educated
Building Finishers and Related Trades Workers	27.31%
Building Frame and Related Trades Workers	35.28%
Sheet, Structural Metal Workers, Moulders Welders	26.79%
Software and Applications Developers and Analysts	2.07%
Blacksmiths, Toolmakers and Related Trades Workers	21.10%
Electrical Equipment Installers and Repairers	15.53%
Heavy Truck and Bus Drivers	30.15%
Machinery Mechanics and Repairers	20.09%
Physical and Engineering Science Technicians	6.41%
Engineering Professionals (excluding Electro-technology)	1.34%
Cooks	29.85%
Nursing and Midwifery Professionals	0.80%
Sales, Marketing and Public Relations Professionals	3.74%
Client Information Workers	13.60%
Finance Professionals	1.41%
Food Processing and Related Trades Workers	33.47%
Medical Doctors	0.05%
Shop Salespersons	20.85%
Assemblers	25.38%
Database and Network Professionals	2.33%
Electro-technology Engineers	2.89%
Protective Services Workers	17.79%
Sales, Marketing and Development Managers	3.69%
Artistic, Cultural and Culinary Associate Professionals	7.87%
Manufacturing, Construction Distribution Managers	11.08%
Material recording and Transport Clerks	14.16%
Mining and Construction Labourers	47.00%
Sales and Purchasing Agents and Brokers	9.16%
Textile, Fur and Leather Products Machine Operators	42.26%
Waiters and Bartenders	30.48%

As might be expected, the share of persons with virtually no qualifications is extremely low for all professional and associate professional shortage occupations. However, when the management (2), professional (8) and associate professional (2) occupations are removed from the analysis, one in five of those working in thirteen of the remaining eighteen occupations have little or no qualifications.

This is a surprising result as it suggests that there are few if any barriers to entry to theses occupations and therefore they may be considered labour rather than skill shortages, as many jobseekers would be eligible to work in them. This interpretation is supported by the fact that as many as nine of these occupations are classified as surplus occupations according to the ratio of recruitment to jobseekers in the LFS analysis (see Table 3.7 above).

Perhaps the simplest explanation for this situation is that as a result of the significant improvement in recent years in the performance of many of the labour markets of the Member States, jobseekers have a much greater choice of where to work, and they are

eschewing employment in less desirable occupations, thus creating shortages in areas of work where there are effectively no barriers to entry (i.e. labour shortages).

Table 5.5 share of lowly educated (ISCED 0-2) in top thirty surplus occupations

Top surplus occupations identified by PES/national sources	Share of lowly educated (ISCED 0-2)
Authors, Journalists and Linguists	2.30%
Social and Religious Professionals	1.08%
Garment and Related Trades Workers	31.63%
Architects, Planners, Surveyors and Designers	2.37%
Artistic, Cultural and Culinary Associate	7.87%
Client Information Workers	13.60%
Creative and Performing Artists	6.30%
Numerical Clerks	6.39%
Domestic, Hotel and Office Cleaners and Helpers	49.76%
Hairdressers, Beauticians and Related Workers	18.35%
Keyboard Operators	12.85%
Other Elementary Workers	40.19%
Shop Salespersons	20.85%
Administrative and Specialized Secretaries	7.64%
Agricultural, Forestry and Fishery Labourers	61.53%
Business Services Agents	6.82%
Car, Van and Motorcycle Drivers	29.65%
Finance Professionals	1.14%
Market Gardeners and Crop Growers	37.11%
Other Teaching Professionals	2.04%
Refuse Workers	56.81%
Secretaries (general)	8.10%
Telecommunications and Broadcasting Technicians	8.32%
Tellers, Money Collectors and Related Clerks	9.52%
Building and Housekeeping Supervisors	23.45%
Engineering professionals	1.03%
Librarians, Archivists and Curators	1.96%
Other Clerical Support Workers	15.93%
Painters, Building Structure Cleaners Trades	32.96%
Primary School and Early Childhood Teachers	0.66%
Protective services workers	17.79%

In ten surplus occupations, more than one in five of the workers have very low education qualifications (ISCED 0-2). In more than half of these occupations, the share of lowly qualified is more than one in three.

The list also contains six occupations which are clerical in nature and as shown in Table 5.3, they are dominated by female workers, many of whom are well qualified. Only eight percent of secretaries, for example, are poorly qualified yet almost ninety percent of the workers are female. These figures suggest that there may be significant opportunities for upskilling some of these clerical workers in the competences required in many of the occupations, which - on the basis of this study - are experiencing extensive shortages such as software-related occupations.[20]

[20] Software related occupations have been identified as a top shortage in both the list of shortages submitted by the NCO's and by the analysis of LFS data. Furthermore, as shown in Table 4.1, they have been ever present in the list of top shortages in previous studies.

5.5 Location of skills imbalances and cross border mobility

One method for alleviating skill imbalances is to match an occupation which is in surplus in one region or country within the EEA to an occupation which is in surplus in another country or region in the EEA. Table 5.6 below shows the list of occupations which have been identified by some countries or regions as being in shortages and by some other countries and regions as being in surplus.

The limiting factor in creating the potential for matching is the relatively low number of countries or regions which have identified a surplus occupation which matches an identified shortage occupation in another country or region.

The highest incidence of such matching is in five countries or regions and this occurs in respect of only two occupations. Furthermore, in the case of one of those occupations, 'accountants' a cautious approach should be adopted because this occupation is usually classified as a shortage. As indicated in chapter two, the inclusion of this occupation as a surplus occupation may be an anomaly which reflects the limitations of the source data rather than a genuine matching possibility.

There are no such reservations with the second occupation 'shop sales assistants'. On the contrary, the evidence would suggest that de-facto extensive matching is occurring in this occupation in many Member States as nationals from other countries are frequently encountered working in this occupation.

A similar situation exists for cooks, motor mechanics and building labourers. The analysis shows that each of these occupations have three country or regional matching possibilities and their presence can certainly be encountered working in other Member States. This is also true of 'waiters' and it is perhaps surprising that only two matching possibilities were identified for this occupation.

In total, the analysis uncovered twenty-four occupations which have matching possibilities, some of which are quite intriguing. There are for example two matching possibilities identified for civil engineers and one for nursing.

The significant improvement in the performance of the labour markets in the EEA will reduce the number of occupations which are classified as 'surpluses' because the volume of recruitment relative to jobseekers is greater in relatively tight labour markets. Ironically, the prevalence of relatively strong performing labour markets however may encourage a higher level of de-facto matching as jobseekers move to countries where employment conditions are better.

This raises the question of whether an analysis of shortage and surplus occupations is a good indicator of matching possibilities or whether an analysis of 'nationality' is a better proxy of the de-facto incidence of occupation matching across frontiers. The latter approach may provide a more accurate measure of the extent to which employment in certain occupations contains a high share of other nationals. However, not all of the occupations which contain high shares of other nationals will have been identified as surplus occupations in the workers' own national labour market. Indeed, in some cases, the occupations may be classified as a shortage occupation and to this extent, represent a 'brain drain'. The advantage of only matching occupations which involve identified shortages and surpluses by the relevant NCO is that the 'brain drain' issue is avoided.

5.6 Conclusions

The analysis in this chapter identifies a number of factors which contribute to shortages in the European economy. These factors include an insufficient number of jobseekers with the appropriate skills and qualifications to fill vacancies; a shortage of jobseekers willing to take-up relatively unskilled employment; a significant over-employment and under-employment of a particular gender and a limited number of matching possibilities across frontiers and regions between occupations in shortage in one country/region and occupations in surplus in another.

The existence of skill shortages is reflected in the wide range of occupations on the list of shortages which require specific qualifications. These include occupations at professional, technical, craft and operative levels. However, the list of shortages also includes a number of occupations in which at least thirty percent of workers have few, if any qualifications. In these cases, the shortage is unlikely to be due to a lack of qualifications, rather it reflects a lack of jobseekers interested in working in the occupation.

The analysis of occupations which were identified as shortages in some Member States or regions, and surpluses in others, revealed a limited number of matching possibilities (24). However, the results of the analysis of the gender composition of shortage and surplus occupations suggests that there may be significant potential for increasing the supply of shortage skills through up-skilling those who have a background in the occupations which have been identified as surplus to market requirements - such as clerical workers. Such workers could be upskilled in the competences associated with a range of shortage occupations (e.g. competences in software).

Table 5.6: The potential for cross-border matching of shortage and surplus occupations

	Occupations	Reporting Shortages	Reporting Surpluses
1.	Truck drivers	BE-Actiris, BE-Le Forem, BE-VDAB, CY, EE, HR, HU, IE, LT, LV, NL, PT, SE, SI, SK	CZ
2.	Welders	AT, BG, CY, DE, EE, HR, IE, LT, LV, NL, PT, SI, SK, UK	CZ
3.	Industrial Mechanics	AT, BE-Actiris, BE-Le Forem, BE-VDAB, DE, EE, FR, HU, IE, NL, PT, SE, SI	BG
4.	Electricians	BE-Actiris, BE-Le Forem, BE-VDAB, CY, DE, EE, IE, NL, PT, RO, SE, SI	FR
5.	**Cooks**	**BG, CY, EE, HR, HU, LT, MT, PT, SE, SI, SK**	**CZ, NL, PL**
6.	Motor Mechanics	AT, BE-Actiris, BE-Le Forem, BE-VDAB, DE, EE, NL, PT, SE, SI	AT, CY
7.	Nursing	BE-Actiris, BE-Le Forem, BE-VDAB, BG, CY, IE, IT, SE, SI, UK	EE
8.	Bricklayers	AT, BE-Actiris, HR, HU, LT, LV, PT, SI, SK	CY, HU
9.	Doctors	BE-Actiris, BE-Le Forem, BG, IE, IT, SE, SI, SK, UK	EE
10.	Civil Engineers	BE-Actiris, BE-VDAB, CY, DE, IE, LT, SI, UK	IT, PT

11.	**Accountants**	**BE-Actiris, BE-Le Forem, BE-VDAB, IE, LU, NL, SI**	**CY, EE, HU, LV, PT**
12.	**Marketing Professionals**	**BE-Actiris, CY, IE, IT, LT, MT, SI**	**EE, LV, PT**
13.	Electrical Engineers	AT, BE-Actiris, BE-VDAB, DE, LT, SE, SI	EE
14.	Electrical Fitters	AT, BE-Actiris, CY, DE, FR, PT, SI	AT, EE
15.	Plasterers	CY, HR, LT, LV, RO, SI, SK	BE-Le Forem, EE
16.	**Shop Assistants**	**BE-Actiris, CZ, EE, HR, HU, LT, SI**	**BE-Le Forem, BG, CY, PT, SE**
17.	Waiters	BE-Actiris, BG, CY, EE, HR, MT, SI	BE-Le Forem, IT
18.	Bakers	BE-Actiris, CY, HR, HU, LT, SI	PL
19.	**Building labour**	**CY, EE, HR, HU, SI, SK**	**CZ, DE, IT**
20.	Sales Representatives	BE-Actiris, BE-VDAB, IE, PL, SE, SI	CY
21.	Contact Centre	BE-Actiris, BE-VDAB, IE, MT, PL, PT	BG, EE
22.	ICT Manager	BE-Actiris, IE, IT, LU, PL, UK	EE
23.	**Secondary Teachers**	**BE-Actiris, BG, EE, IE, SE, UK**	**AT, PT, RO**
24.	Security	BE-Actiris, BE-VDAB, CY, CZ, EE, SI	DE, LT

6. RECOMMENDATIONS

Most of the NCOs who submitted data on skill shortages and surpluses based the analysis on PES administrative data. This is not surprising as the ratio of PES registered jobseekers to PES registered vacancies is one of the few indicators which is capable of identifying both shortage occupations and surplus occupations.

The list of shortage occupations identified by the PES and other national sources contained less professional and associate professional occupations than the lists of shortage occupations identified by an analysis of Labour Force Survey (LFS) data. Nevertheless, some of the most acute shortages in professional occupations including those related to software and healthcare identified in the LFS, were identified by the PES and other national sources.

It is reasonable to assume that the lower number of professional and associate professional occupations on the shortage list to some extent reflects the fact that the vacancies submitted to the PES is more representative of vocational qualifications than education qualifications – especially third-level education qualifications.

The NCOs were able to provide the specific job-titles of the individual shortage and surplus occupations – a result which could not be produced accurately by the LFS, where a number of occupations had to be aggregated together to provide a statistically reliable result. The resulting 3-digit occupation codes was the unit of analysis used when the list of shortage and surplus occupations based on the two sources were compared.

The list of shortages produced by the NCOs contained some occupations which were categorised as surplus occupations by the analysis of LFS data – indicating that the occupations were associated with a relatively high number of jobseekers who had previous experience of working in the occupations. It is argued in this study that these occupations should be considered to be ‘labour’ rather than ‘skill’ shortages because a lack of jobseekers with the appropriate qualifications or experience does not appear to be the factor responsible for the shortage.

One of the most striking results to emerge from the analysis is that the gender composition of shortage occupations is strongly biased towards male workers. This reflects the fact that technical occupations, whether at professional, technical, craft or operative levels, dominate the shortage list, and female representation tends to be very low in technical occupations.

The mirror image of this situation is that clerical occupations tend to be dominated by female workers and many of these occupations are classified as surpluses in the study.

Only twenty-four different occupations were classified as both shortage and surplus occupations by the NCOs – albeit in different Member States and regions. This represents a restrained level of cross border matching possibilities and it reflects two aspects of the study; the relatively low number of NCOs (nineteen) who identified surplus occupations and the different occupational composition of the lists of surplus and shortage occupations submitted by the NCOs. As shown in chapter three, the highest number of top shortage occupations were among the craft group of occupations, while the highest number of top surplus occupations were among the clerical group of occupations.

Finally, the findings of this study show that there is a high level of consistency between the shortage occupations identified in this study and recent relevant studies. Furthermore, while professional occupations featured less in the list of top shortages

identified by the NCOs compared to the list of shortages identified in the analysis of LFS data, the professional occupations which are most associated with shortages - software and health related occupations - do feature in the list of shortage occupation's identified by the PES/national sources.

The analysis of shortage and surplus occupations undertaken for this study has revealed a number of possibilities which the NCOs could explore further to address imbalances in their labour market. These actions could also be reflected in the programming of the EURES activities.

For example, they could encourage jobseekers with experience of employment in surplus occupations to upskill in the competences required in a range of shortage occupations. The gender composition of both shortage and surplus occupations shows that there is significant potential for converting jobseekers from skills which are in surplus to skills which are in shortage

They could also familiarise themselves with the mobility flows within their own labour market, with a view to developing strong bilateral relationships with their colleagues who are located in countries or regions which are a source of these mobility flows. Movers represent a significant, potential source of shortage skills which the NCOs could develop by acquiring an in-depth understanding of their characteristics and increasing their level of engagement with them.

However, the most significant finding from this study is that the rather modest number of NCOs who reported surplus occupations (i.e. nineteen) places a significant constraint on the potential for the data to generate matching possibilities across frontiers and regions – that is possibilities for identifying occupations which are both in shortage and in surplus – albeit in different regions or countries of the EEA.

This constraint must be addressed because one of the core objectives of Article 30 is to utilise the geographic distribution of shortages and surpluses within the same occupations as a means of creating greater balance between skills demand and supply across the EEA.

In this context, there are two proposals which are presented as the core recommendations of this report. Firstly, a dialogue must commence between ECO and the NCOs with the specific purpose of creating the conditions to ensure that the maximum number of NCOs submit a list of both shortage and surplus occupations for the next study. These conditions might involve conducting the survey at a different time of the year, or including an analysis of PES administrative data in all the submissions of the NCOs or both. But irrespective of what adjustments are made to the approach used in the next study, it is a fundamental prerequisite of a successful implementation of Article 30 that the effect of these adjustments must be that much more NCOs submit both lists of shortage and surplus occupations.

Finally, there may be merit in the Commission embarking on a detailed assessment of the capacity of the EURES database to generate comprehensive and accurate lists of skill shortages and surpluses. There could be two very useful outputs from such a project. Firstly, a list of shortage and surplus occupations could be produced based on the database as it is currently formatted and these lists could be used as the basis for matching occupations which have both shortages and surpluses across the EU.

Secondly, a formal assessment of the capacity of the EURES database - as it is currently formatted - could be undertaken and where appropriate, recommendations could be

proposed on how to further enhance the capacity of the database (e.g. similar ‘closing’ time for vacancies) to generate ‘matching’ possibilities across frontiers and regions.

ANNEX 1 DATA COLLECTION TEMPLATE

Information sought	Explanation
Occupation title (text)	Type in free text a list of occupations (one row one occupation) for which shortages and surpluses exist; first list occupations for which there is a shortage; the list should contain a maximum of 30 occupations; if your list contains less than 30 occupations, please provide a brief explanation in your email response for why the number is lower than 30; second, list occupations for which there is a surplus; the list should contain a maximum of 30 occupations ; if your list contains less than 30 occupations, please provide a brief explanation in your email response for why the number is lower than 30;
Shortage/surplus indicator	For each occupation indicate if it refers to a shortage by typing in 'shortage' or surplus by typing in 'surplus'; to identify surplus occupations you can examine for each occupation the ratio of the number of job seekers to the number of vacancies at the end of each year; for example if there are 5,000 shop assistants seeking employment and there are 300 vacancies at the end of the reference period, the ratio is 25:1; you can rank the calculated ratios and report the occupations associated with the 30 highest ratios
Occupational classification used in your country	For each occupation indicate what occupational classification (if any) was used to identify this occupation; for instance, you can report a country specific classification, ISCO, ROME, SOC, etc. If you don't use occupational classifications, type 'None'
Occupation code to the lowest level of disaggregation (e.g. ROME, SOC, ISCO at 4 digits)	If you have indicated a classification used, type the code for each occupation; use the lowest level of disaggregation (e.g. 4-digit ISCO code); if you don't use occupational classification leave black
ISCO-08 code at 4-digit level (or lower if 4-digit not available)	If you use occupational classification which is not ISCO-08 and if it is possible, provide a translation of the national code to ISCO-08 code; ISCO is the International Standard Classification of Occupations which is used to report to Eurostat; code should be at 4 digits; if this is not available than the lowest level of disaggregation that is available should be reported (3 digits if 4-digit code is not available; 2 digits if neither 4-digit nor 3-digit code is available; 1 digit if neither 4-digit, 3-digit nor 2-digit code is available); if it is not possible to provide translation to ISCO-08, leave black; if you have already reported ISCO-08 code in column 4 leave column 5 blank
Estimate of shortage/surplus magnitude (high (>3% of employment), medium (1%-3% of employment), low (<1% of employment))	For each occupation, indicate a broad estimate of the magnitude of the shortage/surplus; if you estimate that the shortage/surplus is less than 1% of the total employment in the occupation in question, type 'low', if between 1%-3% type 'medium', if greater than 3%, type 'high'; if you cannot provide a rough estimate of magnitude, type 'don't know'
Current shortage/surplus (C), future short term (FST), future medium term (FMT), future long term (FLT), don't know (indicate all that apply)	Against each occupation, indicate if the identified shortage/surplus refers to present situation, by typing 'C', if the shortage is expected to occur in the short term future i.e. within 12 months, by typing 'FST', if it is expected to occur over the medium term (within 1-5 years) by typing 'FMT', if it is expected to occur in the long term (in 5 or more years) by typing 'FLT'; if more than one time period applies, indicate all relevant ones (e.g. for current shortages/surpluses that are expected to persist over the short term type 'C', 'FST'); if you don't know type 'don't know'

Year for which the shortage/surplus refers to (YYYY)	Indicate the year that the information on shortages/surpluses (column 7) refers to e.g. type '2018' for a survey of difficult to fill vacancies conducted in 2018, even if the report was published in 2019
What indicator(s) suggested that there is a shortage/surplus?	Indicate what criteria was used to conclude that this occupation is associated with a shortage/surplus; for instance, ratio of registered job seekers to vacancies, employers views, sourcing from abroad to fill vacancies, growth in employment faster than growth in education/training output, time required to fill vacancies higher than average, etc.
Skill or labour shortage	Indicate if a shortage refers to a skill or labour shortage; a skill shortage occurs where there is an insufficient supply of persons with the appropriate skills; labour shortages occur where there is a sufficient number of skilled persons, however, an insufficient number of them is willing to take up employment in the occupation in question

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