



A comparison of shortage and surplus occupations based on analyses of data from the European Public Employment Services and Labour Force Surveys

Labour shortages and surpluses 2017

*Written by ICON-INSTITUT Public Sector GmbH
John McGrath and Jasmina Behan*

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Unit B.1 — Employment Strategy

Contact: Jean-Pierre Callais, Benoît Paul

E-mail: EMPL-PES-SECRETARIAT@ec.europa.eu

*European Commission
B-1049 Brussels*

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EXECUTIVE SUMMARY

This is the third study on imbalances in the European labour market using a survey of national Public Employment Services (PES). The top ranking surplus and shortage occupations (ranked by the number of reporting PES) in the EU Member States, Norway, Iceland and Switzerland identified in this study are presented in Table 1E.

Table 1E Top shortage and surplus occupations in 2017

Shortage	Surplus
Cooks	General office clerks
Plumbers and pipe fitters	Shop sales assistants
Generalist medical practitioners	Advertising and marketing professionals
Welders and flamecutters	Bank tellers and related clerks
Heavy truck and lorry drivers	Sociologists, anthropologists etc.
Metal working machine tool setters	Child care workers
Nursing professionals	Hairdressers
Software developers	Journalists
Agric. and ind. machinery mechanics	Cashiers and ticket clerks
Cleaners and helpers in offices, hotels etc.	Cleaners and helpers in offices, hotels etc.
Commercial sales representatives	Hand packers
Specialist medical practitioners	Mail carriers and sorting clerks
Systems analysts	Photographers
Bricklayers and related workers	Receptionists (general)
Building and related electricians	Tailors, dressmakers, furriers and hatters
Butchers, fishmongers and related	
Motor vehicle mechanics and repairers	
Nursing associate professionals	
Sheet-metal workers	
Shop sales assistants	
Waiters	

Positive findings

- The current study attracted a greater level of engagement by the PES than previously, with a higher number of PES providing data on shortages/surpluses.
- A comparison between the lists of shortage occupations and their rankings in 2015, 2016 and 2017 showed a high level of consistency.
- The use of 4-digit ISCO classification of occupations provided more accurate and detailed information than the more aggregated 3-digit classification used in the previous studies.
- In general, the PES demonstrated a capability to distinguish between shortages caused primarily by skill deficits and shortages which primarily reflected an unwillingness of appropriately qualified job-seekers to work in the occupation in question (i.e. labour shortages).

- The list of shortage and surplus occupations identified through the PES are consistent with the recently reported Labour Force Survey (LSF) data, in particular the ratio of unemployed to new hires (the ratio is typically low for **skill** shortages and high for surpluses and **labour** shortages).
- A clear distinction has been identified between the competences associated with shortages and surpluses. Shortages were dominated by technical competences (e.g. occupations at professional, associate professional and craft level in the areas of software, engineering and healthcare), while surpluses with non-technical competencies (e.g. sales, admin, arts and humanities).
- Despite a relatively low number of PES providing data on surplus occupations, a considerable number of cross-border matching possibilities between shortage occupations in some countries and surplus occupations in others were identified.
- The concern that shortages/surpluses reported by the PES would be skewed towards lower skilled occupations (potentially reflecting the type of vacancies employers select to advertise through PES and the profile of the job-seekers) proved to be unfounded: the highest number of both shortage and surplus occupations identified were in the professional group. This was partially due to the use of sources other than PES administrative data to identify imbalances.

Negative findings

- A number of PES could not provide data on surpluses. Typically, those were PES that relied on data sources other than administrative data (e.g. employer surveys, immigration data etc.). In addition, many of PES who submitted data on surpluses, listed very few occupations (less than 20). While this may be a reflection of a more buoyant EEA labour market, it limited the extent to which cross-border matching possibilities could be identified.
- The data collected on the gender composition of shortage and surplus occupations was poor. It highlighted that gender imbalances at occupational level are best analysed using other sources (e.g. LSF data) in conjunction with the PES data.
- The analysis highlights that only about one in three PES could provide data on shortages and surpluses at sub-national level (NUTs 2, 3 or 4).
- Limiting the list of occupations to 20, irrespective of the size and characteristics of the local labour market, might have resulted in the lack of obvious patterns in the geographical distribution of shortages and surpluses.

Recommendations

- A campaign should be launched to raise awareness of the importance of comprehensive information on shortages and surpluses. This could involve the circulation of the report and presentation of key findings to the national authorities and relevant groups (e.g. Advisors for European PES Affairs and the Eures coordination group).
- In order to properly assess labour market imbalances and identify possibilities for cross-country matching of shortages and surpluses, a model for the systematic

collection of data is proposed and summarised in Figure 1E. The model draws from the findings of three bottleneck studies over the period 2015-2017.

Figure 1E Model for gathering data on shortage and surplus occupations

Sources of data on surpluses: PES, data from **other relevant agencies (EU legislation)**

Dimensions of shortages/surpluses: **extent** (number of reporting PES) and **severity** (high or low magnitude)

Type of shortage: **skill** vs. **labour** shortages

Classification of occupations used: **ISCO 08 4-digit** codes (or translation into these codes)

Accuracy test: cross-check with LSF data (**ratio of unemployed to new hires**)

Gender balance assessment: **LFS data on employment** at occupational level by gender, PES job seekers

Regional balance assessment: **LSF data, data from relevant agencies**

Number of occupations: reporting should be extended **beyond 20 occupations** but with upper limit (e.g. 50)

Timing of imbalance assessment: **September**

(features added to the methodology in this study highlighted in red)

1. INTRODUCTION

This is the third report in a series of annual reports which provide an analysis of shortage and, since 2016, surplus occupations as identified by the European PES. Each report has a somewhat different focus. The focus of this report is to ultimately draw on the findings in the whole series and create a model which can accurately and comprehensively identify imbalances and cross-border matching possibilities in a manner which is of practical use to EURES and the national VET authorities in the EEA countries.

Facilitating the matching of skills and jobs across borders in the EU contributes to the better functioning of labour markets in the EU, as pursued by the EURES network¹. Supporting the identification of skills shortages and the better matching of skills of job-seekers with the needs of employers is also among the objectives of the European Network of Public Employment Services (PES Network)².

1.1 The scope of the study

A total of thirty-three PES were asked to submit data on shortage and surplus occupations. These PES included the national PES from twenty-seven EU Member States and the three regional PES from Belgium. As in the case of the studies in 2015 and 2016, the national PES of Iceland, and Norway were also requested to submit data, while the national PES of Switzerland was included for the first time in 2017.

Table 1.1 below shows the response of the PES to these requests. A total of twenty-eight PES submitted data on shortage occupations, while a total of eighteen submitted data on surplus occupations. This represents an increase of two PES compared to the 2016 study and an increase of five PES compared to the 2015 study in respect of the number of PES who provided a list of shortage occupations, and an increase of five PES compared to the number of PES who provided lists of surplus occupations in 2016.

As shown in chapter three below, the main reason for the lower response in the case of surplus occupations were the methods used by the PES for identifying shortage occupations. Specifically, many of the PES used employer surveys as their exclusive source of information on shortages and these do not provide data on surplus occupations. To improve on data coverage, data could be collected from other bodies.

Table 1.1 Participating PES

Public employment services which submitted data on shortage occupations:

AT, BE - Actiris, BE - Le Forem, BE - VDAB, BG, CH, CY, DE, DK, EE, FI, FR, HR, HU, IE, IT, IS, LT, LU, LV, MT, NL, NO, PL, PT, SE, SK, SI

Public employment services which submitted data on surplus occupations:

LF, BG, CH, CY, DK, EE, FI, FR, HR, HU, IE, IS, LT, LV, NL, PL, SE, SK

1.2 Identifying and evaluating shortages and surpluses

One of the core objectives of this study was to identify shortage and surplus occupations using the most detailed (i.e. ISCO '08 4-digit codes) data available to the PES (in the future, where necessary, PES could augment its data using other sources). The analysis uses two dimensions to quantify shortage and surplus occupations; the most widely

¹ Regulation (EU) 2016/589 of 13 April 2016 on a European network of employment services (EURES), workers' access to mobility services and the further integration of labour markets

² As defined in Article 3 of the Decision 573/2014/EU on Enhanced Co-operation between Public Employment Services of 15 May 2014,

reported (i.e. reported by the most PES) shortage and surplus occupations and the occupations with the most severe shortages and surpluses.

Owing to limitations of space however, only lists of between twenty to thirty individual occupations could be displayed here. However, it should be noted that almost one thousand shortage occupations were reported by the twenty-eight PES of which 282 were different occupations. The number of surplus occupations reported by eighteen PES were 381 of which 196 were different occupations.³

An attempt is made to evaluate the accuracy of the PES identification of shortage and surplus occupations by comparing the most widely reported shortages and surpluses with the ratio of unemployed to new hires at EU level.

1.3 Exploring the causes of shortages

This study differs in several respects from the two previous studies. Firstly, this study attempts to identify the causes of shortage and surplus occupations. Accordingly, a number of new questions were added to the questionnaire, specifically on the nature of the shortage (i.e. was it due to a skills deficit or to a shortage of labour) and – in the case of surplus occupations – the gender composition. While many of the PES provided a classification of shortages in terms of labour versus skills shortage, the response to the question on gender share was disappointing.

The data collection template (Annex 1) also inquired of the extent to which the PES could provide the data at regional level. The purpose of including this question was to assess the feasibility of undertaking a future edition of this study at regional rather than national level. Unfortunately, the response to this question was also disappointing.

Despite the rather disappointing response to some of the new questions, the study does provide a wealth of data on shortage and surplus occupations. The vast majority of PES provided roughly twenty specific occupations which they considered to be in short supply and rated the degree of severity of the shortage. A number of PES provided a significantly greater number than twenty shortage occupations.

The existence of the previous two studies provided the basis for an assessment of the extent to which the shortages persisted over time. The fact that data on the shortages and surplus occupations in the previous studies was at a higher level of aggregation (i.e. the 3-digit occupation codes) also allowed an assessment to be made of the level of aggregation which is required to accurately identify shortage and surplus occupations. The analysis herein conclusively demonstrated that the highest level of disaggregation was required (i.e. the 4-digit occupation codes) for accurate identification as the 3-digit codes contained occupations which were not in shortage or surplus (see chapter 3 below).

The analysis also explores the extent to which the same occupations are classified as shortages in some countries 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 in the EEA group of countries.

³ A list of the occupations is shown in annexes two and three attached.

2. PROFILE OF SHORTAGE AND SURPLUS OCCUPATIONS IN 2017

2.1 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 PES were requested to identify a minimum of twenty shortage occupations and twenty surplus occupations. However, while twenty-eight PES identified at least roughly twenty shortage occupations, only eighteen PES identified any surplus occupations.

2.2 Profile of the most extensive shortage occupations

Table 2.1 shows the shortage occupations reported by the most PES in 2017. The twenty-eight PES who submitted data on shortage occupations is two more than in the 2016 report and five more than the number that submitted such data in 2015.

The Table shows that over half of all PES (sixteen) reported shortages of cooks, making 'cooks' the occupation reported by the most PES. However, this figure underestimates the seriousness of the shortage of persons qualified in cooking skills because five PES also reported shortages of chefs and four PES reported shortages of bakers and pastry-makers.

Within the top twenty-one shortage occupations, the health related occupations dominated the list with four different occupations; these were 'generalist medical practitioners'; 'nursing professionals'; 'specialist medical practitioners' and 'associate professional nurses'. The difference between professional and associate professional nurses may reflect the fact that nursing qualifications differ across the EEA area; specifically, nurses in some countries require a degree to practice; in other countries nursing is at sub-degree level.

Table 2.1 Top 21 shortage occupations (4-digit level)

Occupation	Number of PES reporting occupation as shortage	Occupation	Number of PES reporting occupation as shortage
Cooks	16	Systems analyst	10
Plumbers and pipe fitters	13	Cleaners and helpers in offices, hotels etc.	10
Generalist medical practitioners	13	Bricklayers and related workers	9
Welders and flame cutters	12	Building and related electricians	9
Heavy truck and lorry drivers	11	Butchers, fishmongers and related food	9
Metal workers, machine tool setting and operators	11	Motor vehicle mechanics and repairers	9
Nursing professionals	11	Nursing associate professionals	9
Software developers	11	Sheet-metal workers	9
Agriculture and industrial machinery repairers	10	Shop sales assistants	9
Commercial sales representatives	10	Waiters	9
Specialist medical practitioners	10		

There may be an argument therefore for combining the associate and professional category when assessing the true extent of the shortage of nurses. This argument is particularly compelling in respect of those PES who report a shortage of associate professional nurses but *not* a shortage of professional nurses. There are four such PES; Denmark; Estonia, Luxemburg and Slovenia. If associate professional nurses are essentially doing the same job as professional nurses in these countries, the number of PES reporting a shortage of professional nurses is in effect fifteen rather than eleven.

Indeed, confining the shortage occupations to those reported by nine or more PES may disguise the true extent of shortages in health related occupations. There were many health related occupations which were identified by less than nine PES as shortage occupations. For example, seven PES reported shortages of 'healthcare assistants', five reported shortages of 'physiotherapists' and three reported shortages of 'midwives'. Both Germany and France reported many shortages of specialists within the 'nurse', and 'other healthcare professionals' categories.

Shortages of both 'software developers' and 'systems analysts' appear to be quite widespread as these occupations were reported as being in shortage by ten and eleven PES respectively. The impression of widespread shortages is supported by the fact that a number of software-related occupations such as 'application programmers', 'other software and application developers' and 'web and multi-media developers' were all reported as shortage occupations by six PES.

The main building related crafts such as 'electricians', 'plumbers' and 'bricklayers' were also prominent in the list. Indeed, only the occupation of 'cook' was reported as a shortage occupation by more PES than 'plumbers'.

In addition, eight PES reported experiencing shortages of 'concrete finishers' and 'carpenters and joiners', while six PES reported shortages of 'roofers' and 'plasterers'.

But it is the engineering occupations which demonstrate that shortages may be quite pervasive in a group of occupations despite the fact that they are not included in the list of specific occupations which were reported by the most PES. Thus, 'civil engineers', 'mechanical engineers' and both electrical and electronic engineering technicians just missed inclusion in Table 2.1 above as they were all reported as shortage occupations by eight PES. In addition, both 'electronic engineers' and 'mechanical engineering technicians' were reported as shortage occupations by seven PES.

The teaching professions also just missed inclusion in Table 2.1 because primary school teachers were reported as a shortage occupation by eight PES and secondary school teachers by seven PES.

Two occupations which feature in surveys on skill shortages and which are not included in Table 2.1 are 'accountants' and 'toolmakers'. Both occupations were reported as shortage occupations by six PES.

The total list of occupations which were identified by at least one PES as a shortage occupation is shown in Annex 2 of this report.

2.3 Profile of high magnitude shortages

In addition to identifying shortage occupations, the PES were also asked to rank the occupations in terms of the severity of the shortage. Table 2.2 below lists those occupations for which the PES identified shortages of high magnitude.

The number of PES who identify occupations which have shortages of high magnitude will be lower than the number of PES who identify occupations which have shortages irrespective of the magnitude of those shortages. As shown in Table 2.1, the list of the top twenty-one shortage occupations have been identified by at least nine different PES.

In contrast, the list of occupations which have been identified by the PES as having shortages of a high magnitude includes occupations which have been identified by as few as two PES. Therefore occupations which have not been included in the twenty one shortage occupations identified by the most PES may qualify for inclusion in the list of occupations with shortages of high magnitude.

Table 2.2 High magnitude shortages (4-digit level)

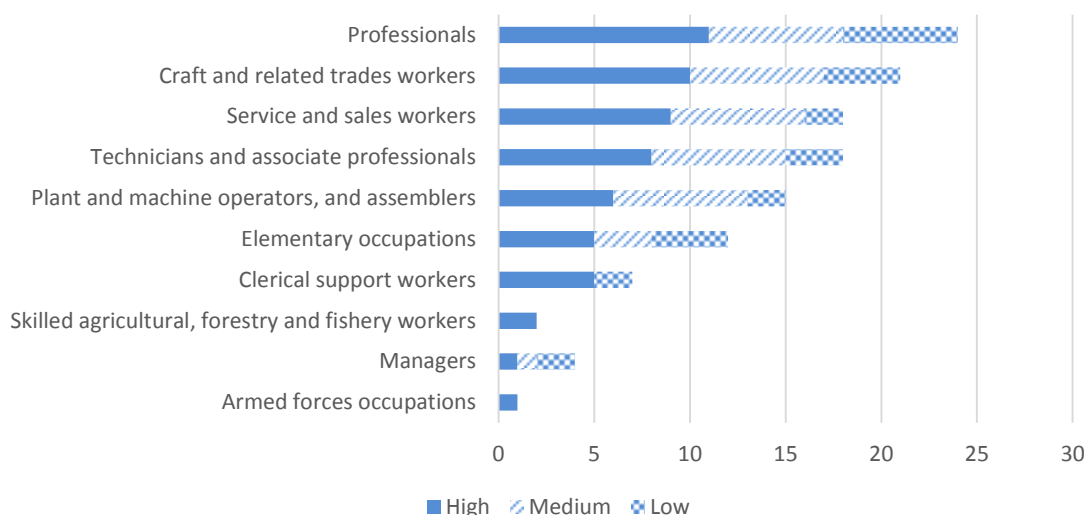
Occupation	Number of PES stating high magnitude of shortage	Occupation	Number of PES stating high magnitude of shortage
Cooks	6	Cleaners and helpers in offices	2
Systems analysts	6	Contact centre sales persons	2
Concrete placers and concrete finishers	4	Database designers and administrators	2
Plumbers and pipe fitters	4	Heavy truck and lorry drivers	2
Shops sales assistants	4	Metal working machine tool setters	2
Waiters	4	Primary school teachers	2
Welders and flame cutters	4	Secondary school teachers	2
Nursing professionals	3	Other software and application developers	2
Application programmers	3	Software developers	2
Carpenters and joiners	3		

Thus while 'cooks' retain the top ranking, there are eight occupations in the list of shortage occupations of high magnitude which are not included in the general list of shortage occupations in Table 2.1. These include two 'teacher' occupations and three new 'software' related occupations. The two software occupations on the general list of shortages in Table 2.1 are also included in this Table which means that five software related occupations are considered to have shortages of high magnitude. The position of 'systems analyst' is particularly noteworthy. A total of ten of twenty eight PES classify this occupation as a shortage and six of these PES consider the shortage to be of a high magnitude. Thus shortages in this occupation appear to be both relatively widespread and quite severe.

The other finding of interest is that there are a considerable number of craft occupations which are classified by a number of PES as shortages of high magnitude. Thus four PES rate 'plumbers and pipe fitters', 'concrete placers' and 'welders' as shortages of high magnitude, while three PES also maintain that there are serious shortages of carpenters.

2.4 Occupational groups by shortage magnitude

Figure 2.1 below shows how the PES classified shortages by broad occupational level in terms of the severity of the shortage. The figure shows that the professional shortage occupations were classified by the most PES as high magnitude, followed by the 'craft and related trade workers'. Less than ten PES classified any other occupation as a shortage of high magnitude, but interestingly - while only four PES classified skilled agricultural workers as a shortage - all of them ranked the shortage as being of high magnitude. Similarly, while only seven PES categorised any of the clerical-related occupations as a shortage, five of the seven PES classified at least one of these occupations as a shortage of high magnitude.

Figure 2.1 Shortages by estimated shortage magnitude (1-digit level)

2.5 Profile of the most extensive surplus occupations

The PES were also requested to identify occupations for which there was an excess supply, and eighteen PES did so. The surplus occupations identified by at least four different PES are shown in Table 2.3.

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.

Table 2.3 Surplus occupations (4-digit level)

Occupation	Number of PES reporting this occupation as surplus	Occupation	Number of PES reporting this occupation as surplus
Shop sales assistants	8	Tailors, dressmakers, furriers, hat makers	4
General office clerks	8	Cashiers and ticket sales	4
Advertising and marketing professionals	6	Cleaners and helpers in offices, hotels	4
Bank tellers and related clerks	6	Hand packers	4
Sociologists, anthropologists and religious	6	Mail carriers and sorting clerks	4
Child care workers	5	Photographer	4
Hairdressers	5	Receptionist (general)	4
Journalists	5		

In general, this is the case as the occupations of 'shop sales assistants', 'general office clerks', 'bank tellers and related clerks', 'cashiers and ticket sales', 'cleaners and helpers',

'hand packers', 'mail carriers and sorting clerks' and 'receptionists' would not generally require a high, formal level of qualification.

However, four of the fifteen occupations, 'advertising and marketing professionals', 'sociologists and anthropologists', 'journalists' and 'photographers' are professional occupations. Furthermore, there are many professional and associate professional occupations which are not included in the list of surplus occupations reported by the most PES because they were reported by three or fewer PES. These occupations include 'philosophers, historians and political scientists', 'musicians, singers and composers', 'economists', 'other legal professionals', 'interior decorators' and 'other artists and associate cultural workers'. A list of the surplus occupations which were reported by at least one PES is shown in Annex 3 of this report.

In theory, the fact that both the list of shortage occupations and the list of surplus occupations contain many professional and associate professional occupations should give rise to many cross-border matching possibilities. However, this is not the case because virtually none of the professional or associate professional occupations appear on both lists. In general, the professional and associate professional occupations identified as being in surplus by the PES reflect disciplines in the humanities or the creative arts. In sharp contrast, the professional and associate professional occupations identified as shortage occupations by the PES are technical in nature and are dominated by software and health related occupations.

There is no doubt that many of the occupations identified by the PES as surplus occupations are attractive to young people. This is particularly so of occupations associated with the creative arts. But the analysis of PES data on shortages and surpluses in this report would suggest that at least some of these occupations are associated with limited career possibilities and that occupations of a technical nature have superior career prospects.

There are however two occupations, 'shop sales assistants' and 'cleaners and helpers' who appear in both the lists of shortages and surplus occupations, and there are clearly matching possibilities in these cases. However, the matching possibilities are not limited to these two occupations; there are many surplus occupations which have been identified by less than four PES which have also been classified as shortage occupations by other PES. These cross-border matching possibilities are explored in chapter four.

2.6 Profile of high magnitude surpluses

Only seven of the fifteen occupations listed as surplus occupations in Table 2.3 are not classified as surpluses of high magnitude in Table 2.4. The list includes two more professional occupations; 'biologists, botanists and zoologists' and 'management and organisation analysts'. Both 'journalists' and 'advertising and marketing professionals' which are included in the list of surplus occupations reported by the most PES are also on the list of occupations with high magnitude surpluses.

One of the occupations which is new to the list is 'bricklayers and related workers'. As this occupation was also identified as a shortage occupation by nine PES, its inclusion does give rise to some cross-border matching possibilities.

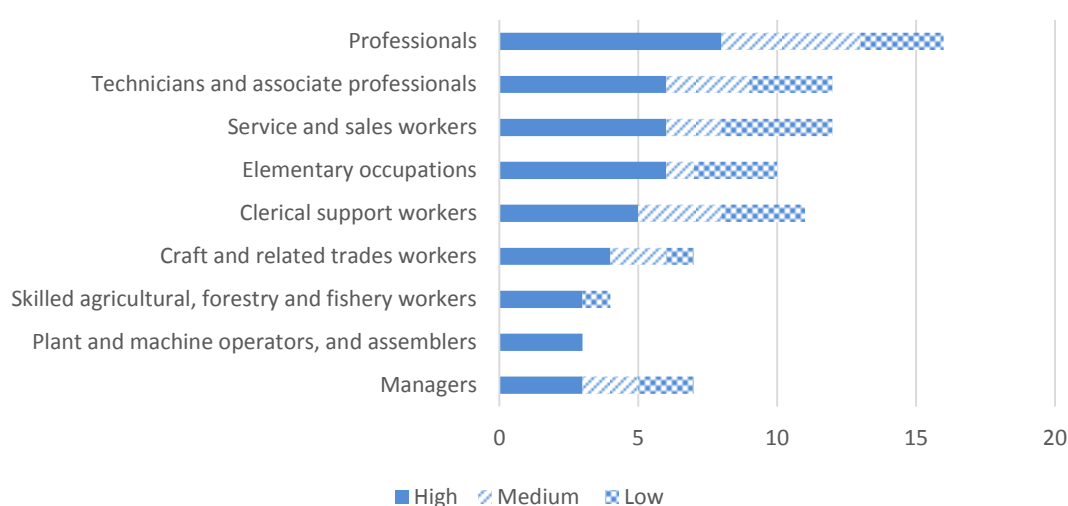
Table 2.4 High magnitude surplus occupations (4-digit level)

Occupation	Number of PES stating high magnitude of surplus	Occupation	Number of PES stating high magnitude of surplus
General office clerks	4	Journalists	2
Advertising and marketing professionals	3	Management and organisation analysts	2
Receptionist (general)	3	Manufacturing labourers	2
Shop sales assistants	3	Odd job persons	2
Biologists, botanists, zoologists and related	2	Photographers	2
Bricklayers and related workers	2	Bank tellers and related clerks	2
Child care workers	2	Security guards	2
Cleaners and housekeepers supervisors	2	Travel guides	2
Gardeners, horticulturalists and nursery workers	2		

2.7 Broad occupational groups by surplus magnitude

As in the case of shortages, the professional group of occupations dominated the occupations which were considered by the PES to have surpluses of high magnitude (Figure 2.2). Indeed, eight of the sixteen PES who rated surplus occupations by their degree of severity identified at least one professional occupation as being in severe over-supply.

Interestingly, the three PES who identified surplus occupations among plant and machine operators and assemblers rated all the occupations they identified in this group as being surplus occupations of high magnitude.

Figure 2.2 Surpluses by estimated surplus magnitude

2.8 Comparison of shortages and surpluses by broad occupation

The issues which have been discussed above can be summarised in Table 2.5 below. The figures show that the 26 PES who reported at least one professional occupation as a shortage, represented 93% of all PES and that, in total, these PES identified 261 professional occupations as shortages.

The situation is not quite as dramatic in respect of surplus occupations. Nevertheless, fifteen PES representing 83% of all reporting PES identified a total of 88 professional occupations as surplus occupations.

However, the most widespread reported surplus occupations were among the service and sales group of occupations, with almost 90% of PES reporting at least one surplus occupation in this group. The difference in the share of PES reporting shortages and surpluses in the clerical group of occupations is also noteworthy. Half the PES reported at least one shortage occupation in this group but almost 80% of reporting PES included at least one surplus occupation from this group.

Table 2.5 Shortages and surpluses by broad occupation group

Broad occupation group	Number of shortage occupations identified	Number of PES reporting shortages in this broad group	% of PES reporting shortages in this group	Number of surplus occupations identified	Number of PES reporting surpluses in this broad group	% of PES reporting surpluses in this broad group
Professionals	261	26	93%	88	15	83%
Craft and related trades	237	25	89%	44	11	61%
Associated professional. technical	176	27	97%	53	15	83%
Services and sales	100	23	82%	72	16	89%
Plant and machinery	79	22	79%	10	8	44%
Elementary	53	14	50%	37	12	67%
Managers	43	11	39%	16	7	39%
Clerical support	34	14	50%	47	14	78%
Skilled agriculture	13	6	21%	14	5	28%
Armed forces	6	1	4%	0	0	0

2.9 Cross-check with LSF data

Finally, it is important to assess the extent to which the shortage and surplus occupations identified by the PES in 2017 are accurate. For this task, we use the findings from the 2016 study, which are based on the LSF data and the ratio of the unemployed to new hires (Annex 4).

Although based on different levels of aggregation (4-digit vs 3-digit respectively), the comparison of the PES reported shortages and surpluses in 2017 and the 2016 study LSF ratio of unemployed and new hires suggests a high level of consistency. Specifically, PES identified shortage occupations typically have the low ratio of unemployed to new hires, while the surplus occupations typically have the high ratio of unemployed to new hires.

The only exceptions are the occupations of 'cleaners', 'waiters' and 'shop sales assistants'. However, this result is understandable as these occupations were classified by the PES⁴ as labour shortages rather than skill shortages, and consequently, the relatively high ratio could reflect the fact that there are a significant number of unemployed available to work in these occupations.

2.10 Conclusions

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

Firstly, the widespread concern that using data from the PES may produce a significant bias in the list of shortages and surpluses because the PES attract less vacancies and job-seekers from higher skilled occupations appears to be unfounded. Ironically, the professional occupations were the most frequently reported occupations in both the list of shortages and surpluses.

Secondly, there is a distinct difference in the type of competences and qualifications identified by the PES as shortages and surplus occupations and this difference was evident throughout the different occupation groups. In general, the shortage occupations embodied technical skills whether in health-related, software-related or engineering-related occupations at professional, technical and craft levels.

In sharp contrast, the surplus occupations embodied selling, service and clerical skills, cultural and artistic skills and competencies in the humanities.

Finally, the type of occupations which the PES associated with shortages and surpluses are highly plausible. In general, the shortage occupations have a low ratio of unemployed to new hires while the surplus occupations have a high ratio. This consistency extended to the occupations which the PES identified as labour shortages, which exhibited a high ratio.

The classification of skill and labour shortages is one of the issues discussed in the next chapter.

⁴ While this is true when all three occupations are aggregated, only two of five PES categorised 'cleaners' as a labour shortage – see chapter 3.

3 PROFILE OF SHORTAGES AND SURPLUSES IN SPACE AND TIME

3.1 Introduction

In this chapter, we analyse the occupations which have been identified by the European PES as shortage and surplus occupations from the perspective of space and time. We review the geographical distribution of these occupations to ascertain if this distribution provides an insight into what may have given rise to these shortages and surplus occupations and we also examine the extent to which the same shortage and surplus occupations have persisted over time using the findings from previous studies.

3.2 PES methods used for identifying shortages and surpluses

In the previous chapter, it was noted that only eighteen of twenty-eight PES submitted a list of surplus occupations. A review of the methods used by the PES to identify shortage occupations may provide an insight into why ten PES did not provide any data on surplus occupations.

A summary of the methods used to identify shortage occupations is provided in Table 3.1 below. The data indicates that exactly ten PES did not use any administrative data in identifying their shortage occupations, but rather used other sources, such as employer surveys, national forecasting studies or immigration data. It is tempting to conclude that this is the reason why only 18 out of 28 PES provided data on surplus occupations as these methodologies are not generally associated with the provision of information on occupations which are in surplus.

However, such a conclusion would not be entirely accurate. The analyses found that the use of survey data did not necessarily preclude a PES from identifying surplus occupations. The Danish PES for example used the results of their Labour Market Balance Survey and was able to provide a comprehensive list of surplus occupations. In contrast, the Italian and Norwegian PES who relied on national forecasts and surveys respectively were unable to provide such a list.

Furthermore, not all of the PES who based their identification of shortages on their administrative data systems provided a list of surplus occupations. Those who did, generally used the ratio of job-seekers to vacancies to identify whether an occupation was a shortage or surplus occupation. But a number of PES, such as the German and Luxemburg PES and the Belgium regional PES Actiris, while basing their identification of shortage and surplus occupations on administrative data, used quite sophisticated techniques such as the share of vacancies filled and the duration of vacancy filling. Unlike the ratio of job-seekers to vacancies, such techniques do not readily provide an indicator for identifying an occupation as a surplus occupation.⁵

⁵ While it is reasonable to classify an occupation as a shortage occupation if the filling of vacant posts in that occupation takes on average an exceptionally long time, identifying surplus occupations is somewhat more problematic using this method.

Table 3.1 Methods used by the PES to identify shortage occupations

PES methods for identifying shortages and surpluses	Number of PES
Combination of administrative data, PES surveys and expert opinion	1
Combination of administrative data, PES surveys and 3 rd party data	1
Combination of administrative data and PES surveys	7
Combination of administrative data and 3 rd party data	1
Combination of administrative data and expert opinion	2
PES work permit data only	2
PES administrative data only	6
PES survey data only	2
PES warehousing data only	1
3 rd party surveys and forecasts	5
Total	28

The fact that only eighteen PES provided a list of surplus occupations is a serious weakness of this study because it places a limit on the potential of the analyses to identify cross border matching opportunities between shortage and surplus occupations. Consequently, in the future, every effort should be made to significantly increase the number of PES providing a list of surplus occupations, even if this means that a significant number of PES use alternative methodologies to identify shortage and surplus occupations rather than a single methodology to do both, as has occurred in both the 2016 study and the current study.⁶

3.3 Geographic distribution of shortages and surpluses

The 28 PES who submitted data on shortages cover a very wide geographic area, which include labour markets with very different characteristics. It may be informative therefore to assess the extent to which the distribution of shortage occupations differed between different countries.

Table 3.2 below shows the number of reported shortage occupations within their broad occupation group and the PES who reported the occupation as a shortage⁷.

While each PES was requested to submit a maximum of twenty shortage occupations, a total of ten PES provided more than that and in the case of the Slovenian, French and the regional Belgian PES, Actiris, significantly more.

A total of six PES identified less than twenty shortage occupations, but in most cases, the difference was negligible.

The Croatian and Portuguese PES were the only PES which did not identify any professional occupation in their list of shortage occupations. This may reflect the type of vacancies which are notified by employers to these PES, because both these PES use their own administrative data systems exclusively to identify shortage occupations.

⁶ In the 2016 study, while 26 PES provided data on shortage occupations, 13 provided data on surplus occupations.

⁷ Three groups are excluded from the Table; managers (43); skilled agricultural (13) and armed forces (1) as the figures are quite small.

Table 3.2 Shortages: number of mentions (4-digit) in broad occupation (1-digit)

PES	Professional	Technical	Clerical	Craft	Service	Plant	Elementary	Total
Austria	4	11	1	12	2	0	0	30
Actiris	28	22	6	11	13	2	0	82
Le Forem	6	6	0	6	0	0	0	18
VDAB	4	7	1	4	1	3	0	20
Bulgaria	7	0	0	4	5	3	2	21
Croatia	0	1	0	13	1	3	2	20
Cyprus	6	1	2	5	5	1	6	26
Denmark	5	1	0	7	3	2	1	19
Estonia	10	7	0	0	2	1	0	20
Finland	12	5	1	7	2	2	3	32
France	18	27	2	27	1	26	2	103
Germany	16	19	0	10	2	1	1	49
Hungary	2	6	6	8	14	3	12	51
Iceland	6	3	0	5	2	1	3	20
Ireland	13	2	0	4	1	1	0	21
Italy	2	2	1	7	4	1	3	20
Latvia	7	1	1	9	0	0	0	18
Lithuania	1	2	0	15	0	2	0	20
Luxemburg	8	4	0	0	0	0	0	12
Malta	5	3	3	4	6	1	4	26
Netherlands	20	11	3	23	2	1	0	60
Norway	13	3	0	10	10	4	1	41
Poland	10	6	2	2	3	3	4	30
Portugal	0	1	0	8	3	3	0	15
Slovakia	6	6	2	5	5	2	0	26
Slovenia	23	13	3	30	11	13	9	102
Sweden	15	2	0	1	2	0	0	20
Switzerland	14	4	0	0	0	0	0	18
Total	261	176	34	237	100	79	53	940

The stipulation to only provide a list of twenty shortage occupations may have prevented any pattern from emerging in the figures. For example, there does not appear to be any relationship between the numbers of employed and unemployed in a specific labour market and the number of shortage occupations identified by its national PES.

The two PES who submitted the highest volumes of shortage occupations - the French and Slovenian PES - vary greatly in terms of the relative size of their labour force while for example, the Norwegian PES submitted significantly more shortage occupations than much larger countries such as Germany and Poland.

As a way of controlling for the variation in the total number of shortage occupations, it may be useful to compare the variation within the list of shortage occupations identified by each PES. However, no obvious patterns emerge when a number of hypotheses are tested using this approach. For example, there appears to be no relationship between countries which are associated with strong apprenticeship systems such as Germany, Austria, Denmark and Switzerland and their share of shortages among the craft group of occupations. The Swiss PES does not contain any craft occupations in its list of shortage occupations, while the craft group of occupations contain the most shortage occupations in the lists provided by both the Austrian and Danish PES. In the case of the German PES, the share of craft occupations is a little above the average.

Table 3.3 Surpluses: number of mentions (4-digit) in broad occupation (1-digit)

PES	Professional	Technical	Clerical	Craft	Service	Plant	Elementary	Total
Le Forem	2	1	1	1	6	0	8	19
Bulgaria	6	3	2	0	4	0	2	17
Switzerland	0	4	2	4	1	2	3	16
Cyprus	5	0	0	2	0	0	3	10
Denmark	3	2	3	0	6	1	4	19
Estonia	6	2	3	2	6	0	1	20
Finland	16	7	6	10	3	1	0	43
France	10	10	1	2	5	1	0	29
Croatia	4	0	0	0	0	0	0	4
Hungary	6	9	3	16	15	1	2	52
Ireland	1	1	4	3	5	1	7	22
Iceland	11	1	2	2	1	0	1	18
Lithuania	0	3	1	0	2	2	0	8
Latvia	4	4	0	0	3	1	3	15
Netherlands	3	2	9	0	9	0	1	24
Poland	0	0	0	0	1	0	0	1
Sweden	4	3	7	1	3	0	2	20
Slovakia	7	1	3	1	2	0	0	14
Total	88	53	47	44	72	10	37	351

The most striking aspect of the geographical distribution of surplus occupations is the relatively low number of occupations which were reported. Most of the reporting PES (eleven) provided less than the twenty surplus occupations they were requested to submit. Furthermore, if the contributions from the Hungarian and Finnish PES are excluded, the average number of surplus occupations submitted by the other PES is sixteen.

With the exception of the Icelandic, Finnish, French and Hungarian PES, the list of surplus occupations remains in single figures across all the broad occupational groups. Such low figures result in limited cross-border matching possibilities, which are explored in the next chapter.

The PES were also asked to indicate the lowest regional level at which they could provide data on both shortage and surplus occupations. Their response is outlined in Table 3.4 above. A total of twenty PES responded positively in the case of shortage occupations and twelve in the case of surplus occupations. In the case of shortage occupations, nine PES indicated that they could provide data at NUTs3 level, while eight PES stated that they could provide the data at NUTs1 level. In the case of surplus occupations, five PES indicated that they could provide the data at NUTs1 level and another five PES responded that they could provide the data at NUTs 3 level. There were very few PES who indicated that the lowest level at which they could provide data was at NUTs2 or NUTs4 levels.

Table 3.4 Availability of data on shortages/surpluses at regional levels

Country	Shortage occupations					Surplus occupations			
	NUTS1	NUTS2	NUTS3	NUTS4	No data	NUTS1	NUTS2	NUTS3	NUTS4
Austria			X						
Belgium Actiris		X							
Belgium Le Forem	X					X			
Belgium VDAB					X				
Bulgaria			X		X				X
Croatia	X					X			
Cyprus					X				X
Denmark			X					X	
Estonia	X					X			
Finland					X				X
France			X					X	
Germany	X								
Hungary					X				X
Iceland	X					X			
Ireland	X					X			
Italy			X						
Latvia			X					X	
Lithuania				X					X
Luxembourg	X								
Malta					X				
Netherlands					X				X
Norway					X				
Poland		X					X		
Portugal			X						
Slovakia			X					X	
Slovenia	X								
Sweden			X					X	
Switzerland					X				X

Note: Bulgaria has regional data for some occupations

3.4 Tracking shortages over time

This is the third annual study on 'Bottleneck Occupations'; the previous two studies were undertaken in 2016 and 2015. The findings in both of those studies were presented in 3-digit codes. To make the findings comparable over time, the 4-digit shortage and surplus occupations from the current study are aggregated up to 3-digit occupations as shown in Table 3.5.

A striking aspect of the list of occupations in Table 3.5 is the degree of consistency displayed over the period 2015-2017 inclusive, not simply in terms of the occupations reported by the PES, but also in terms of the number of PES who identified them as shortages (i.e. their ranking). Not only does the 3-digit occupation category of 'software and applications developers' occupy the top ranking in each of the years, five of the top ranking six occupations are the same. The only notable exception is that the finance professional and associate professional occupations featured in the list of most reported shortage occupations in 2015, but slipped out of this list in 2016 and 2017.

Table 3.5 Ranking of shortage occupations (3-digit)

Top occupations in 2017	Rank		
	2017	2016	2015
Software and application developers	1	1	1
Sheet and structural metal workers;	2	3	2
Medical doctors	3	5	2
Blacksmiths, toolmakers and related trades	4	3	4
Building finishes and related trade workers	4	6	4
Building frame and related trade workers	4	3	4
Cooks	4	7	7
Engineering professionals	5	6	6
Physical and engineering science technicians	6	7	n/a
Electrical equipment installers and repairers	7	4	5
Heavy truck and bus drivers	7	5	4
Machinery mechanics and repairers	8	7	5
Nursing and midwifery professionals	8	6	n/a
Sales and purchasing agents and brokers	9	2	5
Shop salespersons	10	7	8
Electro technology engineers	10	n/a	n/a
Primary school and early childhood teachers	10	n/a	n/a
Domestic, hotel and office cleaners and helpers	10	n/a	n/a
Waiters and bartenders	10	n/a	n/a

3.5 3-digit vs 4-digit

There are advantages and disadvantages associated with using the more aggregated 3-digit occupation classification as it was done in previous studies. The bundling of individual occupations into families, provides greater visibility of shortages at a broad skill level (e.g. all software related occupations).

However, there are distinct disadvantages in using the 3-digit occupations and these apply particularly to their practical usefulness to education and training providers. In many cases, shortages identified at 3-digit level do not provide a reliable basis for identifying the specific skill which is in shortage or surplus.

By combining the analyses of the 4-digit and corresponding 3-digit classifications in this report, many examples are revealed of how an exclusive reliance on the 3-digit classification could be seriously misleading. Thus, the findings in this report show that within the 3-digit classification of 'sheet and structural metal workers, moulders and welders' the 4-digit occupation which is in short supply is 'welders' and not for example 'sheet metal workers'. This is an important insight because in many European countries, the skills of welding and sheet metal work are provided through entirely different vocational programmes.⁸

There are many examples of this phenomenon in the 3-digit occupations in Table 3.5. For example, the analysis in this report shows that toolmakers are a shortage occupation,

⁸ In Ireland, for example, sheet metal workers and welders undertake entirely different apprenticeships

but blacksmiths are not. Furthermore, the 3-digit classification disguises the extent of the reported shortage. Thus while the 3-digit occupation of professional nursing and midwifery is shown in the current report as being shortage occupations, a total of eleven PES reported professional nursing as a shortage compared to only three PES reporting professional midwifery as a shortage. By bundling these occupations together, the significant difference in the relative severity of the shortage is not apparent.

This phenomenon applies equally to the surplus occupations which were identified in this report. For example, 'childcare workers' were described as a surplus occupation by five PES. But in the 3-digit classification they are bundled together with 'special needs teachers' which was not identified as a surplus occupation.

3.6 Conclusions

There are a number of conclusions which can be drawn from the analyses in this chapter.

Firstly, the sources used by many of the PES to identify shortage occupations is one of the main reasons why only eighteen PES provided data on surplus occupations. Many of the PES relied on the results of employer surveys, forecasting models and immigration data to identify shortages and these sources in general do not provide data on surplus occupations. However, it was by no means the only reason why so many PES did not provide data on surplus organisations and this issue will have to be addressed before the commencement of the 2018 study. In the future, PES data should be augmented by data collected by other bodies, as outlined in the new EU Regulation.

Secondly, there is no obvious explanation for the geographic distribution of shortages and surpluses. In some cases, countries with relatively small labour forces have a relatively high number of shortage occupations, while a strong apprenticeship system does not appear to prevent a relatively high share of the identified shortages being in the craft occupations. It may be that the stipulation to only include twenty shortage and surplus occupations has created a situation where some countries with a relatively large labour force are artificially constrained to submit a much smaller number of shortage occupations than they actually have.

Thirdly, there is a high degree of stability in relation to the occupations which were identified as shortages in the 2015, 2016 and 2017 editions of the Bottleneck report.

Finally, providing information on shortage and surplus occupations at 4-digit level is much more useful from a policy perspective than providing the data at a more aggregated level. The results of the analyses at 4-digit level show which specific occupations in the bundle of occupations used in the previous reports were in shortage and which were not. This is also true of the occupations which were identified as surplus occupations. A more aggregated group of occupations does not allow for the targeting of specific individual occupations either for increasing training provision or for enhancing cross border mobility. Indeed, as a number of specific examples show, were providers of vocational training or indeed policy makers to act on the basis of the 3-digit shortage and surplus occupations identified in previous reports, they could very well have assign resources to occupations which were neither in shortage nor in surplus.

4 THE CAUSES OF SKILL SHORTAGES AND POTENTIAL SOLUTIONS

4.1 Introduction

The focus of this chapter is on identifying the possible causes of skills shortages and surpluses and exploring ways in which these imbalances may be resolved. The chapter begins with a review of the nature of skills and labour market imbalances, and concludes with an exploration of the extent to which enhanced cross-border mobility policies and more equal gender representation could contribute to the alleviation of skills and labour imbalances in certain shortage occupations in the EEA labour market.

4.2 The role of skills and labour shortages in skills imbalances

One of the new questions included in the current study asks the PES to identify the nature of the shortage (i.e. is it a skill shortage or a labour shortage) in relation to each shortage occupation they identified. It was explained in the questionnaire that labour shortages occur when there are a sufficient number of appropriately qualified job-seekers to fill the vacancies which arise, but for a variety of reasons, many of them do not wish to work in the occupation in question. Their response to this question is summarised in Table 4.1, in respect of the twenty occupations which were reported by the most PES.

A total of twenty-six PES classified their shortage occupations as skill or labour shortages, and they classified most of the occupations as skill shortages. Indeed, in the case of seven occupations, plumbers, doctors, software developers, electricians, electronic engineers, electronic engineering technicians, bus and tram drivers and mechanical engineers, all of the reporting PES classified the shortage as a skills deficit.

Each labour market within the EEA is regulated in a particular manner and conditions of employment even within the same occupation vary throughout the region. This is why many occupations, while classified by most of the PES as reflecting skill deficits, nevertheless are classified by some PES as labour shortages.

However, the number of PES involved is very small indeed. Only in the case of three occupations, 'waiters', 'shop sales assistants' and 'primary school teachers' are there more PES classifying the shortage as a labour shortage than a skills deficit. The first two occupations are undoubtedly labour shortages. This is because there are few, if any, barriers to working in these occupations.⁹

The inclusion of 'primary school teachers' as a labour shortage is however a surprise. It was identified by eight PES as a shortage occupation, two of whom classified the occupation as a shortage of high magnitude. It would be necessary to conduct research into the conditions of employment – including qualification criteria – within the countries where the reporting PES are located to establish if this classification of the occupation as a labour shortage is warranted.

With some notable exceptions, the response of the PES to classifying their shortage occupations as skill or labour shortages demonstrates that the PES understand these concepts. Occupations such as professional nurses which are obviously suffering from a shortage of qualified job-seekers in the EEA are overwhelmingly categorised as a skills shortage, while less skilled occupations such as cleaners are categorised as being on the borderline between skills and labour shortages.

⁹ Both occupations have relatively high ratios of unemployed to new hires (Annex 4).

Table 4.1 Skill and labour shortages

Occupation	Number of PES reporting occupation as skills shortage	Number of PES reporting occupation as labour shortage	Number of PES reporting occupations as skill and labour shortage	Total number of PES reporting on skills/labour shortage
Cooks	9	1	0	10
Plumbers and pipe fitters	8	0	0	8
Generalist medical Practitioners	7	0	0	7
Heavy truck and lorry drivers	4	2	1	7
Metal workers, machine tool setting and operators	3	3	1	7
Welders and flame cutters	4	2	1	7
Nursing professionals	5	1	0	6
Software developers	6	0	0	6
Systems analyst	5	1	0	6
Bricklayers and related trades	4	1	0	5
Building and related electricians	5	0	0	5
Butchers, fishmongers and related food	3	2	0	5
Cleaners and helpers in offices	3	2	0	5
Commercial sales representatives	2	2	1	5
Electronic engineers	5	0	0	5
Manufacturing supervisors	4	1	0	5
Motor vehicle mechanics and repairers	3	1	1	5
Nursing associate professionals	4	1	0	5
Primary school teachers	2	3	0	5
Shop sales assistants	1	4	0	5
Waiters	2	3	0	5
Agriculture and industrial machinery repairers	3	1	0	4
Application programmers	3	1	0	4
Bus and tram drivers	4	0	0	4
Electronic engineering technicians	4	0	0	4
Health care assistants	3	1	0	4
Mechanical engineers	4	0	0	4
Sheet metal workers	3	1	0	4
Structural metal preparers and erectors	3	1	0	4
Total number of PES reporting	16	8	2	26

The atypical working hours associated with heavy goods vehicle driving is recognised by two of the six PES who classify shortages in the occupation as labour shortages, while the unpleasant conditions associated with working in butchery shops and abattoirs is reflected in the fact that two of the five PES who categorised the occupation as a shortage occupation classify it as a labour shortage.

4.3 Location of skill imbalances and cross border mobility

In recent years, there has been considerable discussion on the potential role which enhanced cross-border mobility could play in alleviating labour market imbalances. The attractiveness of such a policy is obvious. The European Union is a very large

marketplace embracing a very large labour force; if even some of the shortages which are reported by EEA countries could be resolved by exploiting the surpluses which are reported by other EEA countries, it could form the basis of a number of win-win solutions for both job-seekers and businesses.

An additional attraction of this policy is that it could potentially successfully address both skills and labour shortages as working conditions associated with some labour shortages in one country might be perceived as significantly more attractive in a different EEA country.

Table 4.4 provides a list of the top twenty shortage occupations which have at least one PES in another EEA country reporting the occupation as a surplus.

There are a number of aspects of the Table which are notable. Firstly, the list of top occupations has changed quite dramatically from the list in Table 2.1; specifically, none of the professional and associate professional occupations are now on the list, including the four professional and associate professional health-related occupations or the two professional software occupations. What the Table shows is that there are no surpluses reported in any of the EEA countries of doctors or nurses; software developers or systems analysts. While the occupation of healthcare assistants is in surplus in many countries, it was not included in the list of top occupations because it was reported as a shortage by only two PES.

The figures in Table 4.2 show that there are three cross-border matching possibilities in the case of bricklayers and motor mechanics and two possibilities in the case of plasterers, health care assistants and secondary school teachers.

There is just one matching possibility in respect of a wide range of occupations including cooks, truck drivers, commercial sales representatives, electricians, carpenters, civil engineers, primary school teachers, manufacturing supervisors, telecentre salespersons, childhood education teachers, floor layers and roofers.

The fact that primary school teachers have only one cross border matching possibility suggest that the classification of the occupation as a labour shortage by three of five PES is an error. In general, labour shortages would be expected to have more cross border matching possibilities than skill shortages because there are many job-seekers eligible to work in the occupation in question and working conditions vary quite significantly from country to country. Indeed, it is notable that the two other occupations which were classified by the PES as predominantly labour shortages, waiters and shop sales assistants have a relatively high number of matching possibilities; eight in the case of shop sales assistants and three in the case of waiters.

In general, the PES did not classify the same occupation as both a shortage and a surplus. A striking exception is the Danish PES which categorised four of its shortage occupations as surplus occupations also. This is most likely due to the higher level of granularity available in the Danish data (below 4-digit), so that some job titles within an occupation are considered labour shortage, while others skill shortage.

4.4 Assessing gender composition of surpluses

The PES were asked to estimate the share of females in the occupations which they identified as 'surplus' occupations. The restricting of this question to surplus occupations was to avoid giving the impression that shortages were arising because of discriminatory recruitment policies.

A total of 13 PES reported any data on gender composition of surpluses. However, the quality of information submitted did not provide a sufficient basis for an accurate estimation of the gender composition of surpluses in some of the cases.

It is suggested that in order to address gender imbalances in relation to shortages and surpluses, data from PES on job seekers should be combined with the LSF data on employment by occupation.

4.5 Conclusions

The analysis in chapter four has produced a number of interesting findings. The analysis reveals that the PES, in general, has the capacity to distinguish between skill and labour shortages and to identify shortage occupations which have some cross-border matching possibilities.

The relatively low number of surplus occupations reflects two factors; firstly, only eighteen PES submitted a list of surplus occupations and secondly, in many cases, the lists did not include the maximum number of twenty occupations which were requested.

This response has to be viewed against the background of an EEA labour market where employment is expanding and unemployment is contracting. However, while this is a positive development, the relatively low number of surplus occupations has placed a significant limit on the extent to which there were cross-border possibilities of matching shortage with surplus occupations.

The data indicates that there is a limitation to the extent to which the PES can be used to identify the gender imbalances (e.g. under-representation of females in some occupations) and that other sources should be explored.

Table 4.3: The potential for cross-border matching of shortage and surplus occupations

No. PES	Occupation	PES reporting shortage																PES reporting surplus					No. PES				
16	Cooks	AT	Art	BG	CY	DK	HR	IE	IS	IT	MT	NL	NO	PT	SE	SI	SK	<-->			HU			1			
11	Truck drivers	ART	VDAB	BG		DK	HR		LT	IT		NL	NO	PT	SE	SI	SK	<-->	DK					1			
10	Cleaners, helpers				CY	DK	HR	FI	IS		HU	NL	NO	PT		SI		<-->	DK	LF	NL		IE	4			
10	Commercial sales	VDAB	ART			DK		FI	FR	IT	IE			PT	PL	SI		<-->	DK					1			
9	Sales assistants	AT	ART	BG	CY	DK				IT			NO			SI	SK	<-->	DK	LF	SE	NL	BG	CH	FI	IE	8
9	Bricklayers		ART		DE	DK	HR	HU	LT			NL		PT		SI		<-->		CY	HU			IE	3		
9	Motor mechanics	AT	VDAB	ART	LF	DK				IT			NO	PT		SI		<-->				SK	CH	EE		3	
9	Waiters	ART	BG	CY					IS	IT		MT	NO	PT		SI		<-->			HU			EE	IE	3	
9	Electricians	ART	VDAB	DE		DK			IS	IT		NL	NO			SI		<-->		FR						1	
8	Carpenters					DK	HR	HU	FI			NL	NO	PT		SI		<-->			HU					1	
8	Civil engineers	ART	CH	DE				FI	FR				NO		SE	SI		<-->		CY						1	
8	Primary teachers	ART		BG		DK			IS				NO		SE	SI	SK	<-->		CY						1	
7	Healthcare assist.			CY		DK	EE					NL	NO			SI	SK	<-->	DK		NL				2		
7	Second. teacher	ART		BG					FR			NL	NO			SI	SK	<-->		CY				FI		2	
7	Man. supervisors	ART	VDAB	LF	DE		EE		FR								SK	<-->				BG				1	
6	Plasterers						HR	HU	FI	LT		NL				SI		<-->			HU			IE	2		
6	Tele centre sales	ART					HU	FI	FR		MT		NO					<-->						EE		1	
6	Childhood educ.							FI		LT			NO		SE	SI	SK	<-->		CY						1	
6	Floor layers					HU	HR	FI	FR	LT	LV							<-->			HU					1	
6	Roofers						HR	FI	FR	LT	LV					SI		<-->			HU					1	

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The terms of reference for this study emphasise the desirability of creating a process for the systematic collection of data on surplus and shortage occupations in the EEA area which could be effectively used by EURES for cross border matching of shortage occupations in some EEA countries with surplus occupations in others.

The authors have responded to this emphasis by using a process which ensures that the data gathered on shortage and surplus occupations is comprehensive, accurate and of practical use to EURES and the providers of education and training programmes. The process is comprehensive because it gathers information both on the extent of shortages and surpluses and on their relative severity. It is accurate because the list of shortage and surplus occupations are shown to be consistent with the estimated value of the ratio of unemployed to new hires. Finally, the process provides information which is of practical use to EURES and the national providers of VET because the data gathered is on individual occupations rather than on 'bundles of occupations' as in previous studies. The analyses in this report shows that while these bundles of occupations contain some occupations which are identified by the PES as shortage and surplus occupations, they also contain occupations which are neither in shortage nor in surplus, and it is impossible to distinguish one from the other.

The data gathering process used in this report, however, was not devoid of weaknesses. Fortunately, these weaknesses reflect the *modus operandi* of the PES and may be rectified by including other institutions and agencies in the process. For example, the PES use the same sources for the identification of both shortage and surplus occupations. This may have advantages in terms of accuracy when those sources include employers' surveys, immigration data and the results of forecasting exercises. However, these sources are not suitable for gathering data on surplus occupations and they are the main reason why the number of surplus occupations provided by the PES were almost half the number requested. In the future, PES data could be augmented by data gathered by other bodies, as outlined in recent EU Regulation 2016/589.

In addition, the response to the question on the capacity of the PES to deliver data on shortage and surplus occupations at a regional level was also disappointing, perhaps reflecting a misalignment in some EEA countries between the geographic configuration of the local PES network and the NUTs regions.

The analysis highlighted that in order to assess gender imbalances of shortages and surpluses, PES data needs to be augmented by other sources.

Finally, despite the low number of surplus occupations submitted by the PES, it was nevertheless possible to identify twenty shortage occupations in the EEA labour market which had at least one cross-border matching possibility and many more than one in the case of some shortage occupations.

5.2 Recommendations

Based on the findings from the three bottleneck studies undertaken to date, a model for the gathering of data on shortages and surpluses is proposed (Figure 5.1). The model includes features of the methodology applied in this study, which were successful. It also includes a number of features which should be introduced to the process in order to address some of the weaknesses which were identified in this study (highlighted in red).

However, before this methodology is implemented, it would be prudent to discuss data requirements with PES and invite a broader range of institutions and agencies to participate in aspects of the data gathering process in addition to the PES. EURES Regulation (EU) 2016/589 of the European Parliament and of the Council which obliges the appropriate national authorities to furnish such data annually is fortuitous in this regard and should facilitate the implementation of this recommendation.

In addition, the results of these and other relevant studies should be disseminated to PES, Eures coordination group and other relevant agencies and institutions in order to emphasise the importance of data and analysis in informing policy at EU and national level which aims to resolve labour market imbalances.

Figure 5.1: Model for gathering data on shortage and surplus occupations

Sources of data on surpluses: PES, data from **other relevant agencies**

In those cases where the source used by the PES to identify shortage occupations cannot be used to identify surplus occupations, other institutions or other sources or both should be availed of to ensure that comprehensive data on surplus occupations are provided to the appropriate national authority.

Dimensions of shortages/surpluses: **extent** (number of reporting PES) and **severity** (high or low magnitude)

Data should be systematically gathered on both the extent of shortage and surplus occupations in the EEA and on their relative severity.

Type of shortage: **skill** vs. **labour** shortages

The providers of the data on shortage occupations must also distinguish between skill and labour shortages because this distinction is necessary for the accurate identification of shortage occupations and for the choice of the appropriate policy response to identified shortages.

Classification of occupations used: **ISCO 08 4-digit** codes (or translation into these codes)

All data should be either initially gathered in ISCO 08 4-digit codes, or translated into these codes. This ensures that the data refers to specific individual occupations, and is of practical use to EURES and the national providers of VET.

Accuracy test: cross-check with LSF data (**ratio of unemployed to new hires**)

The accuracy of the submitted lists of shortage and surplus occupations should be assessed by comparing the most widely reported surplus and shortage occupations with the estimated values of the ratios of employed (by previous occupation) to new hires at the aggregated EU28 level. These ratios should be based on an analysis of the most up-to date Labour Force Survey (LFS) data.

Gender balance assessment: **LFS data on employment** at occupational level by gender, PES job seekers

The gender composition of shortage and surplus occupations should be based on the most up to date analyses of LFS data on employment by gender and the PES job seeker data.

Regional balance assessment: **LSF data, data from relevant agencies**

Where regional data is required, other agencies and institutions should be requested to provide the data in those cases where the data cannot be provided by the regional PES network because it is not geographically aligned to the NUTs regions.

Number of occupations: reporting should be extended **beyond 20 occupations** but with upper limit (e.g. 50)

Consideration should be given to allowing the agencies responsible for identifying shortage and surplus occupations a greater range of flexibility in terms of the numbers of occupations which should be identified. A minimum to maximum range would be a more realistic approach as it would reflect the fact that the labour markets of the EEA vary significantly in size and performance.

Timing of imbalance assessment: **September**

It is proposed that the data gathering exercise should be brought forward to early September and that expert advice should be available on line throughout the data gathering exercise.

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 20 occupations; if your list contains less than 20 occupations, please provide a brief explanation in your email response for why the number is lower than 20; second, list occupations for which there is a surplus; the list should contain a maximum of 20 occupations ; if your list contains less than 20 occupations, please provide a brief explanation in your email response for why the number is lower than 20;
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 200 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 20 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. 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 3 leave this column black
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'
Source of information on shortages/surpluses (e.g. PES administrative data (vacancies, job seekers), PES survey, third party survey, Occupational forecasts, other (specify) etc.)	Indicate the source used to identify shortage/surplus for this occupation; did you derive it from the PES administrative data on PES vacancies and/or job seekers, did you conduct a survey, did you commission a third party to conduct a survey for you, did you have occupational forecasts available, did you use other research; type in free text the full description of the source(s) e.g. National Employment Survey conducted by PES etc.

Date for source of information	Indicate the year that the information on shortages/surpluses (column 7) refers to e.g. type '2016' for a survey of difficult to fill vacancies conducted in 2016, even if the report was published in 2017
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, 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.
% Share of females among job seekers in this occupation (surplus occupations only)	Indicate the percentage share of females among all job seekers in this occupation; this is only applicable to surplus occupations
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
Indicate the availability of data on shortages/surpluses at regional level? (NUTS1, NUTS2, NUTS3, No data)	Indicate if data is available on the regional breakdown of shortages/surpluses by indicating the level of regional data available; if multiple levels of regional disaggregation are available, indicate the lowest level of disaggregation (e.g. NUTS3 rather than NUTS2); if there is no regional data available use 'no data'

ANNEX 2 SHORTAGE OCCUPATIONS

Shortage occupation	PES count
Cooks	16
Plumbers and pipe fitters	13
Generalist medical practitioners	12
Welders and flamecutters	12
Heavy truck and lorry drivers	11
Metal working machine tool setters and operators	11
Nursing professionals	11
Software developers	11
Agricultural and industrial machinery mechanics and repairers	10
Cleaners and helpers in offices, hotels and other establishments	10
Commercial sales representatives	10
Specialist medical practitioners	10
Systems analysts	10
Bricklayers and related workers	9
Building and related electricians	9
Butchers, fishmongers and related food preparers	9
Motor vehicle mechanics and repairers	9
Nursing associate professionals	9
Sheet-metal workers	9
Shop sales assistants	9
Waiters	9
Carpenters and joiners	8
Civil engineers	8
Concrete placers, concrete finishers and related workers	8
Electrical engineering technicians	8
Electronics engineering technicians	8
Mechanical engineers	8
Primary school teachers	8
Structural-metal preparers and erectors	8
Electronics engineers	7
Health care assistants	7
Manufacturing supervisors	7
Mechanical engineering technicians	7
Secondary education teachers	7
Accountants	6
Applications programmers	6
Bus and tram drivers	6
Contact centre salespersons	6
Early childhood educators	6
Electrical mechanics and fitters	6
Floor layers and tile setters	6
Plasterers	6
Roofers	6
Sewing machine operators	6
Software and applications developers and analysts not elsewhere classified	6
Toolmakers and related workers	6
Web and multimedia developers	6
Air conditioning and refrigeration mechanics	5
Building frame and related trades workers not elsewhere classified	5
Chefs	5
Civil engineering labourers	5
Construction supervisors	5
Earthmoving and related plant operators	5
Electrical engineers	5
Electrical line installers and repairers	5
Engineering professionals not elsewhere classified	5
Hairdressers	5
Information and communications technology operations technicians	5
Manufacturing managers	5
Physiotherapists	5
Real estate agents and property managers	5
Research and development managers	5
Spray painters and varnishers	5
Accounting associate professionals	4
Bakers, pastry-cooks and confectionery makers	4

Shortage occupation	PES count
Blacksmiths, hammersmiths and forging press workers	4
Civil engineering technicians	4
Crane, hoist and related plant operators	4
Database designers and administrators	4
Industrial and production engineers	4
Painters and related workers	4
Physical and engineering science technicians not elsewhere classified	4
Plastic products machine operators	4
Social work and counselling professionals	4
Accounting and bookkeeping clerks	3
Administrative and executive secretaries	3
Ambulance workers	3
Building construction labourers	3
Car, taxi and van drivers	3
Cartographers and surveyors	3
Cleaning and housekeeping supervisors in offices, hotels and other establishments	3
Contact centre information clerks	3
Draughtspersons	3
Fast food preparers	3
Freight handlers	3
Gardeners, horticultural and nursery growers	3
Home-based personal care workers	3
Hotel receptionists	3
Information and communications technology installers and servicers	3
Insulation workers	3
Kitchen helpers	3
Manufacturing labourers not elsewhere classified	3
Medical imaging and therapeutic equipment technicians	3
Metal moulders and coremakers	3
Metal polishers, wheel grinders and tool sharpeners	3
Midwifery professionals	3
Other language teachers	3
Personal services workers not elsewhere classified	3
Pharmacists	3
Policy administration professionals	3
Printers	3
Process control technicians not elsewhere classified	3
Sales and marketing managers	3
Shop supervisors	3
Special needs teachers	3
Stock clerks	3
Supply, distribution and related managers	3
Survey and market research interviewers	3
Systems administrators	3
Technical and medical sales professionals (excluding ICT)	3
Translators, interpreters and other linguists	3
Transport clerks	3
Vocational education teachers	3
Advertising and marketing professionals	2
Audiologists and speech therapists	2
Bartenders	2
Beauticians and related workers	2
Cashiers and ticket clerks	2
Chemical engineers	2
Child care workers	2
Computer network and systems technicians	2
Computer network professionals	2
Construction managers	2
Craft and related workers not elsewhere classified	2
Credit and loans officers	2
Crop farm labourers	2
Database and network professionals not elsewhere classified	2
Dentists	2
Domestic cleaners and helpers	2
Door to door salespersons	2
Driving instructors	2
Electrical and electronic equipment assemblers	2
Electronics mechanics and servicers	2
Elementary workers not elsewhere classified	2
Employment agents and contractors	2

Shortage occupation	PES count
Field crop and vegetable growers	2
Financial analysts	2
Financial and investment advisers	2
Forestry and related workers	2
Garbage and recycling collectors	2
General office clerks	2
Graphic and multimedia designers	2
Information and communications technology service managers	2
Insurance representatives	2
Locomotive engine drivers	2
Mail carriers and sorting clerks	2
Management and organization analysts	2
Mathematicians, actuaries and statisticians	2
Mechanical machinery assemblers	2
Medical and dental prosthetic technicians	2
Medical assistants	2
Messengers, package deliverers and luggage porters	2
Metal finishing, plating and coating machine operators	2
Metal processing plant operators	2
Optometrists and ophthalmic opticians	2
Personal care workers in health services not elsewhere classified	2
Police officers	2
Policy and planning managers	2
Production clerks	2
Restaurant managers	2
Retail and wholesale trade managers	2
Sales workers not elsewhere classified	2
Sewing, embroidery and related workers	2
Street food salespersons	2
Tailors, dressmakers, furriers and hatters	2
Telecommunications engineers	2
Advertising and public relations managers	1
Aged care services managers	1
Agricultural technicians	1
Aircraft engine mechanics and repairers	1
Aircraft pilots and related associate professionals	1
Assemblers not elsewhere classified	1
Authors and related writers	1
Bank tellers and related clerks	1
Bleaching, dyeing and fabric cleaning machine operators	1
Bookmakers, croupiers and related gaming workers	1
Business services agents not elsewhere classified	1
Buyers	1
Cabinet-makers and related workers	1
Cement, stone and other mineral products machine operators	1
Chemical and physical science technicians	1
Chemical engineering technicians	1
Chemical processing plant controllers	1
Chemical products plant and machine operators	1
Chemists	1
Conference and event planners	1
Customs and border inspectors	1
Data entry clerks	1
Dental assistants and therapists	1
Dieticians and nutritionists	1
Dispensing opticians	1
Domestic housekeepers	1
Economists	1
Education methods specialists	1
Environmental and occupational health and hygiene professionals	1
Environmental and occupational health inspectors and associates	1
Fibre preparing, spinning and winding machine operators	1
Finance managers	1
Financial and insurance services branch managers	1
Fire-fighters	1
Fitness and recreation instructors and program leaders	1
Food and beverage tasters and graders	1
Food and related products machine operators	1

Shortage occupation	PES count
Food service counter attendants	1
Forestry labourers	1
Fruit, vegetable and related preservers	1
Fur and leather preparing machine operators	1
Glass and ceramics plant operators	1
Hand launderers and pressers	1
Hand packers	1
Handicraft workers in textile, leather and related materials	1
Health associate professionals not elsewhere classified	1
Health professionals not elsewhere classified	1
House builders	1
Human resource managers	1
Incinerator and water treatment plant operators	1
Information and communications technology user support technicians	1
Judges	1
Lawyers	1
Legal and related associate professionals	1
Legal professionals not elsewhere classified	1
Library clerks	1
Lifting truck operators	1
Livestock and dairy producers	1
Livestock farm labourers	1
Medical and pathology laboratory technicians	1
Medical secretaries	1
Metal production process controllers	1
Mining and quarrying labourers	1
Mining engineers, metallurgists and related professionals	1
Mixed crop and animal producers	1
Mixed crop growers	1
Motorcycle drivers	1
Odd job persons	1
Other cleaning workers	1
Other music teachers	1
Paper products machine operators	1
Personnel and careers professionals	1
Personnel clerks	1
Pet groomers and animal care workers	1
Physicists and astronomers	1
Physiotherapy technicians and assistants	1
Potters and related workers	1
Power production plant operators	1
Prison guards	1
Product and garment designers	1
Psychologists	1
Pulp and papermaking plant operators	1
Railway brake, signal and switch operators	1
Receptionists (general)	1
Refuse sorters	1
Riggers and cable splicers	1
Scribes and related workers	1
Secretaries (general)	1
Securities and finance dealers and brokers	1
Security guards	1
Senior government officials	1
Senior officials of special-interest organizations	1
Shelf fillers	1
Ships' engineers	1
Shoemaking and related machine operators	1
Social work associate professionals	1
Stall and market salespersons	1
Stationary plant and machine operators not elsewhere classified	1
Stonemasons, stone cutters, splitters and carvers	1
Street and related service workers	1
Sweepers and related labourers	1
Teaching professionals not elsewhere classified	1
Telecommunications engineering technicians	1
Textile, fur and leather products machine operators not elsewhere classified	1
Trade brokers	1
Travel attendants and travel stewards	1
Travel guides	1

Shortage occupation	PES count
Tree and shrub crop growers	1
Underwater divers	1
University and higher education teachers	1
Vehicle cleaners	1
Veterinarians	1
Weaving and knitting machine operators	1
Web technicians	1
Wood processing plant operators	1
Woodworking-machine tool setters and operators	1

ANNEX 3 SURPLUS OCCUPATIONS

Surplus occupation	PES count
General office clerks	8
Shop sales assistants	8
Advertising and marketing professionals	6
Bank tellers and related clerks	6
Sociologists, anthropologists and related professionals	6
Child care workers	5
Hairdressers	5
Journalists	5
Cashiers and ticket clerks	4
Cleaners and helpers in offices, hotels and other establishments	4
Hand packers	4
Mail carriers and sorting clerks	4
Photographers	4
Receptionists (general)	4
Tailors, dressmakers, furriers and hatters	4
Accounting and bookkeeping clerks	3
Administrative and executive secretaries	3
Beauticians and related workers	3
Biologists, botanists, zoologists and related professionals	3
Bricklayers and related workers	3
Broadcasting and audio-visual technicians	3
Civil engineering labourers	3
Economists	3
Gardeners, horticultural and nursery growers	3
Interior designers and decorators	3
Kitchen helpers	3
Legal professionals not elsewhere classified	3
Manufacturing labourers not elsewhere classified	3
Motor vehicle mechanics and repairers	3
Musicians, singers and composers	3
Other artistic and cultural associate professionals	3
Painters and related workers	3
Philosophers, historians and political scientists	3
Security guards	3
Sweepers and related labourers	3
Travel consultants and clerks	3
Waiters	3
Actors	2
Archivists and curators	2
Bakers, pastry-cooks and confectionery makers	2
Bartenders	2
Building construction labourers	2
Business services and administration managers not elsewhere classified	2
Cabinet-makers and related workers	2
Car, taxi and van drivers	2
Chemists	2
Cleaning and housekeeping supervisors in offices, hotels and other establishments	2
Credit and loans officers	2
Customs and border inspectors	2
Elementary workers not elsewhere classified	2
Film, stage and related directors and producers	2
Financial analysts	2
Forestry and related workers	2
Freight handlers	2
Graphic and multimedia designers	2
Health care assistants	2
Hotel receptionists	2
Lawyers	2
Legal and related associate professionals	2
Library clerks	2
Livestock and dairy producers	2
Management and organization analysts	2
Messengers, package deliverers and luggage porters	2
Odd job persons	2
Office supervisors	2
Plasterers	2

Surplus occupation	PES count
Police officers	2
Pre-press technicians	2
Print finishing and binding workers	2
Printers	2
Prison guards	2
Product and garment designers	2
Psychologists	2
Public relations professionals	2
Religious professionals	2
Secondary education teachers	2
Secretaries (general)	2
Social work and counselling professionals	2
Stall and market salespersons	2
Stock clerks	2
Teachers' aides	2
Telephone switchboard operators	2
Travel guides	2
Visual artists	2
Advertising and public relations managers	1
Agricultural technicians	1
Announcers on radio, television and other media	1
Assemblers not elsewhere classified	1
Building and related electricians	1
Building architects	1
Building caretakers	1
Building frame and related trades workers not elsewhere classified	1
Business services agents not elsewhere classified	1
Buyers	1
Carpenters and joiners	1
Chemical engineers	1
Civil engineers	1
Clearing and forwarding agents	1
Clerical support workers not elsewhere classified	1
Commercial sales representatives	1
Conference and event planners	1
Contact centre information clerks	1
Contact centre salespersons	1
Cooks	1
Crane, hoist and related plant operators	1
Creative and performing artists not elsewhere classified	1
Dancers and choreographers	1
Data entry clerks	1
Database designers and administrators	1
Domestic cleaners and helpers	1
Domestic housekeepers	1
Draughtspersons	1
Driving instructors	1
Early childhood educators	1
Electronics mechanics and servicers	1
Farming, forestry and fisheries advisers	1
Fashion and other models	1
Fast food preparers	1
Field crop and vegetable growers	1
Filing and copying clerks	1
Finance managers	1
Financial and insurance services branch managers	1
Financial and investment advisers	1
Fire-fighters	1
Fitness and recreation instructors and program leaders	1
Floor layers and tile setters	1
Food service counter attendants	1
Fruit, vegetable and related preservers	1
Gallery, museum and library technicians	1
Garbage and recycling collectors	1
Garment and related pattern-makers and cutters	1
Glass and ceramics plant operators	1
Government tax and excise officials	1
Hand launderers and pressers	1

Surplus occupation	PES count
Heavy truck and lorry drivers	1
House builders	1
Hunters and trappers	1
Information and communications technology installers and servicers	1
Information and communications technology user support technicians	1
Insurance representatives	1
Jewellery and precious-metal workers	1
Judges	1
Legal secretaries	1
Librarians and related information professionals	1
Life science technicians (excluding medical)	1
Lifting truck operators	1
Managing directors and chief executives	1
Manufacturing supervisors	1
Medical and dental prosthetic technicians	1
Metal moulders and coremakers	1
Mining and quarrying labourers	1
Mixed crop and animal producers	1
Mixed crop growers	1
Mobile farm and forestry plant operators	1
Musical instrument makers and tuners	1
Other language teachers	1
Pawnbrokers and money-lenders	1
Personnel and careers professionals	1
Pet groomers and animal care workers	1
Photographic products machine operators	1
Physical and engineering science technicians not elsewhere classified	1
Physicists and astronomers	1
Police inspectors and detectives	1
Precision-instrument makers and repairers	1
Primary school teachers	1
Process control technicians not elsewhere classified	1
Product graders and testers (excluding foods and beverages)	1
Production clerks	1
Professional services managers not elsewhere classified	1
Protective services workers not elsewhere classified	1
Research and development managers	1
Retail and wholesale trade managers	1
Roofers	1
Sales workers not elsewhere classified	1
Senior government officials	1
Service station attendants	1
Shelf fillers	1
Shop supervisors	1
Social work associate professionals	1
Special needs teachers	1
Spray painters and varnishers	1
Statistical, mathematical and related associate professionals	1
Stonemasons, stone cutters, splitters and carvers	1
Street food salespersons	1
Supply, distribution and related managers	1
Teaching professionals not elsewhere classified	1
Technical and medical sales professionals (excluding ICT)	1
Training and staff development professionals	1
Translators, interpreters and other linguists	1
Transport conductors	1
Tree and shrub crop growers	1
Typists and word processing operators	1
Undertakers and embalmers	1
Vocational education teachers	1
Weaving and knitting machine operators	1
Woodworking-machine tool setters and operators	1

ANNEX 4 THE RATIO OF UNEMPLOYED TO NEW HIRES

ISCO-08 title	2015		
	UE	Recruited in the last year (<12 months)	Ratio of UE to new recruits
Street and related service workers	8.5	10.4	0.8
Agricultural, forestry and fishery labourers	391.3	534.3	0.7
Mining and construction labourers	193.7	352.5	0.5
Creative and performing artists	61.0	111.5	0.5
Refuse workers	103.6	192.3	0.5
Painters, building structure cleaners and related trades workers	111.6	211.7	0.5
Street and market salespersons	19.5	38.9	0.5
Building frame and related trades workers	363.2	735.3	0.5
Mining, manufacturing and construction supervisors	62.6	131.5	0.5
Ships' deck crews and related workers	5.3	11.4	0.5
Market gardeners and crop growers	147.1	320.7	0.5
Managing directors and chief executives	30.4	66.7	0.5
Travel attendants, conductors and guides	22.9	53.8	0.4
Wood treaters, cabinet-makers and related trades workers	49.1	115.9	0.4
Manufacturing labourers	164.0	390.9	0.4
Domestic, hotel and office cleaners and helpers	567.9	1354.5	0.4
Other stationary plant and machine operators	82.2	196.1	0.4
Mobile plant operators	103.8	249.7	0.4
Building finishers and related trades workers	151.9	368.0	0.4
Textile, fur and leather products machine operators	43.1	104.8	0.4
Garment and related trades workers	42.2	104.7	0.4
Chemical and photographic products plant and machine operators	15.7	38.9	0.4
Food processing and related trades workers	93.0	233.0	0.4
Vehicle, window, laundry and other hand cleaning workers	29.1	75.4	0.4
Sheet and structural metal workers, moulders and welders, and related workers	99.6	260.3	0.4
Waiters and bartenders	439.9	1159.5	0.4
Cooks	152.9	403.9	0.4
Metal processing and finishing plant operators	20.8	55.7	0.4
Printing trades workers	20.3	54.8	0.4
Forestry and related workers	13.0	35.1	0.4
Protective services workers	134.7	365.8	0.4
Transport and storage labourers	253.2	693.9	0.4
Fishery workers, hunters and trappers	4.6	12.8	0.4
Material-recording and transport clerks	167.1	463.0	0.4
Process control technicians	17.9	51.7	0.3
Mining and mineral processing plant operators	9.4	27.4	0.3
Telecommunications and broadcasting technicians	17.7	51.9	0.3
Blacksmiths, toolmakers and related trades workers	81.6	240.9	0.3
Building and housekeeping supervisors	67.8	204.5	0.3
Secretaries (general)	107.2	325.9	0.3
Assemblers	85.0	258.6	0.3
Other craft and related workers	25.8	81.0	0.3
Shop salespersons	660.0	2104.2	0.3
Electrical equipment installers and repairers	95.8	306.0	0.3
Food and related products machine operators	43.7	140.0	0.3
Other sales workers	108.7	351.0	0.3
Food preparation assistants	164.6	533.7	0.3
Mixed crop and animal producers	38.7	126.0	0.3
Car, van and motorcycle drivers	115.5	376.4	0.3
Client information workers	199.3	653.1	0.3
Sports and fitness workers	60.5	198.4	0.3
Handicraft workers	19.4	63.8	0.3
Life science technicians and related associate professionals	8.2	27.1	0.3
Keyboard operators	28.3	94.0	0.3
Electronics and telecommunications installers and repairers	29.0	96.3	0.3
Other personal services workers	31.3	104.7	0.3
Vocational education teachers	27.9	94.0	0.3
Other teaching professionals	74.4	251.8	0.3
General office clerks	96.6	327.2	0.3
Authors, journalists and linguists	33.5	113.5	0.3
Hairdressers, beauticians and related workers	80.6	279.6	0.3

ISCO-08 title	2015		
	UE	Recruited in the last year (<12 months)	Ratio of UE to new recruits
Animal producers	18.9	66.0	0.3
Other elementary workers	97.6	340.1	0.3
Machinery mechanics and repairers	113.4	396.2	0.3
Ship and aircraft controllers and technicians	8.0	28.1	0.3
Hotel and restaurant managers	34.4	122.0	0.3
Cashiers and ticket clerks	90.8	322.0	0.3
Retail and wholesale trade managers	22.4	80.9	0.3
Sales, marketing and development managers	31.1	112.4	0.3
Physical and engineering science technicians	120.4	436.6	0.3
Administrative and specialised secretaries	110.6	404.0	0.3
Sales and purchasing agents and brokers	129.4	475.4	0.3
Rubber, plastic and paper products machine operators	25.6	94.1	0.3
Artistic, cultural and culinary associate professionals	51.1	190.6	0.3
Numerical clerks	94.4	353.2	0.3
Other services managers	18.4	69.1	0.3
Child care workers and teachers' aides	133.5	500.5	0.3
Heavy truck and bus drivers	142.6	534.9	0.3
Business services and administration managers	38.3	143.9	0.3
Information and communications technology service managers	6.7	25.7	0.3
Regulatory government associate professionals	20.9	80.7	0.3
Life science professionals	17.6	68.1	0.3
Wood processing and papermaking plant operators	9.7	37.9	0.3
Locomotive engine drivers and related workers	4.6	17.9	0.3
Legal professionals	31.5	124.5	0.3
Personal care workers in health services	219.5	878.7	0.2
Physical and earth science professionals	8.5	34.5	0.2
Street vendors (excluding food)	5.0	20.4	0.2
Architects, planners, surveyors and designers	51.5	209.2	0.2
Other clerical support workers	90.1	365.7	0.2
Business services agents	51.0	211.4	0.2
Manufacturing, mining, construction, and distribution managers	36.1	150.7	0.2
Tellers, money collectors and related clerks	38.1	161.2	0.2
Librarians, archivists and curators	5.8	24.8	0.2
Medical and pharmaceutical technicians	25.5	109.9	0.2
University and higher education teachers	30.1	133.3	0.2
Information and communications technology operations and user support technicians	41.8	188.8	0.2
Legal, social and religious associate professionals	92.0	434.8	0.2
Financial and mathematical associate professionals	60.1	285.2	0.2
Sales, marketing and public relations professionals	86.5	417.2	0.2
Finance professionals	47.2	228.1	0.2
Engineering professionals (excluding electrotechnology)	63.5	311.8	0.2
Other health associate professionals	53.1	265.7	0.2
Social and religious professionals	46.0	231.7	0.2
Professional services managers	17.6	89.1	0.2
Nursing and midwifery associate professionals	55.6	285.5	0.2
Legislators and senior officials	5.3	28.6	0.2
Database and network professionals	8.3	45.5	0.2
Administration professionals	64.1	367.3	0.2
Primary school and early childhood teachers	57.5	334.5	0.2
Electrotechnology engineers	14.2	82.7	0.2
Secondary education teachers	47.1	281.2	0.2
Other health professionals	34.6	208.3	0.2
Nursing and midwifery professionals	27.3	176.0	0.2
Software and applications developers and analysts	63.1	415.9	0.2
Medical doctors	29.3	194.4	0.2
No occupation	15289.4	0.0	
No answer	253.1	57.8	4.4
Total	24956.1	29493.7	0.8

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