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Working paper

DO EDUCATIONAL REQUIREMENTS IN VACANCIES MATCH THE EDUCATIONAL ATTAINMENTS OF JOB- HOLDERS?

An analysis of web-based
data for 279 occupations in
the Czech Republic

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Abstract

European labour market policies aim to develop an early-warning tool for mismatches by monitoring job vacancies. Few studies have been able to measure these mismatches, among others because systematic information on educational requirements in vacancies is lacking. Our study explores mismatch for occupations by investigating the relationship between demand & supply ratios and the vacancies' educational requirements and jobholders' attainments. It compares the distributional characteristics of requirements and attainments using data of 14,092 vacancies of the web-database of the Czech Public Employment Service with data of 10,364 jobholders from the WageIndicator web-survey, merged into a database aggregated by 4-digit level occupations (totalling to 279 occupations). The demand & supply ratio is unbalanced with one fourth of the 279 occupations in excessive demand and one third in excessive supply. A high demand correlates with lower educational requirements. At lower skill levels, requirements are more condensed, but attainments less so. At higher skill levels, requirements are less condensed, but attainments more so. For most occupations the lowest attainment is at least one level above the required level, pointing to an overeducated workforce. For all skill levels the mean educational requirements are lower when occupations are in high demand, though not all results are statistically significant.

Keywords: job requirements, vacancies, educational attainments, adjustment strategies, job board, web survey.

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European policy-oriented research can and must deliver useful contributions to tackle the Europe 2020 challenges of Inclusive Growth. Key tools in this social sciences research are all types of data earning statistics, administrative social data, labour market data, surveys on quality of life or working conditions, policy indicators. The project aims to integrate and optimise these existing European data infrastructures and accompanying expertise.

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1. Introduction

As part of the Europe 2020 initiative ‘An Agenda for New Skills and Jobs’, the Commission launched the project ‘Monitoring labour market developments in Europe’ (European Commission, 2014). This project aims to gather up-to-date information on job vacancies, serving as an early-warning tool for bottlenecks and mismatches on the labour market. This approach firstly refers to the mismatch of the number of vacancies *vis-a-vis* the number of job seekers, as is regularly updated in the Commission’s Vacancy Monitor (<http://ec.europa.eu/social/main.jsp?catId=955>). This is by far the most studied approach and the body of knowledge is known as the Help-Wanted Advertising, Job Vacancies, and Unemployment relationship (Cardullo & Guerrazzi, 2013). Secondly, the approach refers to skills mismatch: to what extent do the job seekers and the vacancies match in terms of the attained *vis-a-vis* required skills? Our study aims to contribute to this latter approach.

Analyses of skills mismatch need data about the attained skills of job seekers in relation to the required skills in vacancies but few studies have been able to measure this mismatch, among others because information on the latter is lacking (e.g. Pellizzari & Fichen, 2013). Information about vacancies stem from three sources. Job Vacancy Surveys, held in quite a number of industrialised countries, ask employers about their most recent vacancies but neither about the required skills nor the skills of the hired workers. Job ads are a rich source of information concerning required skills, but ads need coding of unstructured text. Therefore skill requirement data from ads is not widely available. Proxies for the required skills of new hires can be taken from Labour Force Surveys, because individuals - with known educational attainments - are asked whether they have been hired for a new job in the period under study. Yet, these surveys do not ask whether the individuals have been hired because the employer had a vacancy. To phrase it differently, ‘some data is available on the supply side, but there exists no comparable measure on the demand side, in which the level of the skill required for the job is measured on an equivalent or comparable metric. As a result, we find ourselves in a situation in which literal skill mismatches cannot be directly measured.’ (Allen *et al.*, 2013, p. 2).

Our study addresses this gap in the body of knowledge regarding labour supply and demand skill characteristics by comparing the educational requirements in vacancies and the educational attainments of jobholders at the aggregate level of 4-digit occupational units. For this purpose we used Czech data of a large scale web survey of jobholders and data of the large scale EURES vacancy database of the European Employment Service. Regarding the latter, we followed Kureková, Beblavý, Haita, and Thum (2013), who used the data of the EURES vacancies portal for such purpose, which at that time also was a novelty. This paper first explores how demand and supply ratios for 4-digit occupations relate to educational requirements and attainments. Second, it investigates the skills mismatch in 4-digit occupations by comparing the skills sets required in vacancies and attained by jobholders. Third, it studies whether educational requirements are downward or upward adjusted when occupations are in short or abundant supply? The outline of our paper is as follows. Section 2 discusses the main theoretical models. Section 3 details the research objectives and the data. Section 4 presents the empirical results, whereas Section 5 provides the main conclusions of the study and discusses the results.

2. Challenges in comparing vacancy and jobholder data

2.1 Skill mismatch and the concepts of jobs and occupations

For an exploration of skills mismatches the skills required for the jobs as reported by employers need to be compared to the skills in the labour pool as reported by jobholders and job seekers. In both employer and jobholder surveys it is possible to measure generic skills, but extremely difficult to measure job-specific skills and therefore educational levels are typically used as a proxy for skills (Tijdens, De Ruijter & De Ruijter, 2012). Even when applying a proxy measure, very few studies have been able to measure skill mismatch based on a comparison between jobholders' educational attainment and the specific skill requirements of their occupations, because in many studies information on the latter is lacking (Leuven & Oosterbeek, 2011). This problem could - partly - be solved by aggregating jobs or vacancies and jobholders or job seekers into occupations, as we will do in this paper by comparing the required skills in vacancies and the attained skills of jobholders at a detailed level of occupations.

An occupation-level comparison of the required skills in vacancies and the attained skills of jobholders should preferably be investigated at the lowest level of occupational aggregation which is the 4-digit level when using the International Standard Classification of Occupations (ISCO), maintained by the International Labour Organisation (ILO). ISCO has become the global standard. In 1998 the third version of the classification was released (ISCO-88), followed by the fourth version in 2008. This ISCO-08 is a hierarchical system ranging from 433 occupational units at 4-digit level to 9 major occupational groups at 1-digit level (Hunter, 2009). On the basis of similarities in the tasks and duties performed, the 4-digit units are grouped into 3- and 2-digit groups, which on the basis of their skill level are regrouped on 1-digit level, which in turn are clustered into four skill levels, ranging from 1 = Unskilled (ISCO group 9), to 2 = Semi-skilled (ISCO group 4-8), 3 = Skilled (ISCO group 1 and 3), and 4 = Highly skilled (ISCO group 2). These levels are related to the International Standard Classification of Education ISCED-1997 (UNESCO, 2006). Given the 433 occupational units at 4-digits and the labour forces' skewed occupational distribution however, a comparison of a substantial number of occupational units poses high demands to the sample sizes at scrutiny. For this reason the European Centre for the Development of Vocational Training uses the 3-digit aggregation for its European survey about employers' skills needs (CEDEFOP, 2013). To the best of our knowledge, this is currently the most disaggregated mismatch analysis. In this paper, we use the ISCO 4-digit occupations as the unit of analysis.

2.2 Supply and demand rates

In a macro-economic approach the unemployment-vacancy (UV) space or Beveridge Curve relates unemployment to vacancy data. The UV curve determines how efficiently workers will find new jobs. For insight into the job-vacancy matching processes beyond the macro-economic approach the job allocation processes need to be disaggregated, either by industry, region or occupation. In his study of the labour market in the United States, Hobijn (2012) uses data about vacancies and about hires to construct an annual time series of job openings and hires by occupation, industry and state. He finds that job openings vary largely across occupations. Davis *et al.* (2010) argue that even

at more aggregated levels, our knowledge of vacancy behaviour is very thin compared to our knowledge of unemployment. Based on the US Job Openings and Labor Turnover Survey (JOLTS) survey, these authors show that job-filling rates rise steeply with the gross hires rate across industries, employer size classes, worker turnover groups, and employer growth rates. Following these authors, we find also that little is known about the demand & supply ratios for occupations.

Our first research objective is to cumulate knowledge by exploring the occupational distribution of vacancies and jobholders, resulting in supply and demand ratios for the 4-digit occupations. In Hypothesis H1₀ we assume that the labour supply and demand ratio is equal across the 4-digit occupations. If rejected, in Hypothesis H1a we assume that the higher the demand in an occupation the lower its skill level. In H1b we assume that labour demand is relative more frequent for occupations where vacancies have lower educational requirements. In H1c we assume that labour demand is relative more frequent for occupations where jobholders have lower educational attainments.

2.3 Skill mismatches

The political discussion about skill mismatch mostly relates to the skills of job seekers and the skill requirements of vacancies. Yet, according to Allen *et al.* (2013), measuring the demand side job requirements is still far from perfect and the mismatch research has been hindered by a relative lack of data on heterogeneity at the demand side. Demand side job requirements relate to multiple skill dimensions, covering concepts such as generic skills, soft skills, occupation-specific skills, educational attainments, and alike. Job requirements can be measured by means of systematic vacancy monitoring or by employer surveys, which both focus on the requirements for job entrants. Job requirements can - for a restricted set of occupations - be measured using licensing registers or expert surveys, indicating job requirements for job entrants and jobholders alike. Job requirements can be measured by asking jobholders about the requirements for their current jobs. However, the response might be biased towards their current attainments and mostly educational attainments of jobholders are used as a proxy for job requirements. A focus on jobholders implies that the measure is not able to grasp changes in job requirements due to new technologies or organisational changes, whereas a focus on vacancies might stress the new requirements too much.

Before the Internet era researchers typically collected and counted the job requirements from newspaper ads, such as the Help-Wanted series in the United States. This millennium has opened up new possibilities by crawling job ads posted on the Internet (see Kureková, Beblavý & Haita, 2012; 2013). Increasingly, the public employment services in European countries manage to collect and harmonise these data, as the European Union's Vacancy Monitors shows (Van der Ende, Donker van Heel, Walsh, De Wit & Ziminiene, 2012).¹ Measuring job requirements in vacancies assumes that employers formulate educational requirements for their vacancies, but according to Jackson (2001), who analysed 322 job ads chosen from national, regional and local newspapers, only 40% contained a requirement for qualifications of any kind. From these, educational qualifications were very important for the managerial and professional class, while vocational qualifications were more important for the remaining classes (Kureková, Beblavý, Haita & Thum, 2013).

Our second research objective is to explore the skills mismatch in occupations by comparing the educational requirements in vacancies with the educational attainments of jobholders. Due to data limitations the concept of skills had to be restricted to educational levels. In Hypothesis H2₀ we assume that across occupations the mean educational requirements of vacancies and the mean educational attainments are equal. If rejected, we explore whether the range of educational requirements in vacancies is more condensed for occupations at higher skill levels (H2a), whether the

¹ See Eurostat Metadata Job vacancy statistics (jvs), last update 16/04/2013, (http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/jvs_esms.htm#unit_measure1392278550953 accessed 2014-MAR-31).

range of educational attainments of jobholders is so for occupations at higher skill levels (H2b) and whether the differences between the two ranges are more condensed at higher skill levels (H2c).

2.4 Employers' adjustment strategies

Do employers adjust the educational requirements in vacancies for occupations in short or abundant supply? Studies about adjustment strategies in response to labour and skill shortages reveal strategies such as adoption of flexible working hours and increases in overtime hours, greater reliance on flexible job design and part-time workers, and implementation of self-directed work groups and problem-solving teams (Fang, 2009). Adjustment of job requirements is not often studied. One study indicates that firms vary their skills requirements over the business cycle: our empirical analysis shows that, for a given wage offer, requirements are stricter in recessions and downturns (Chen & Eriksson, 2009). Our third research objective is to explore adjustment strategies in vacancies. In Hypothesis H3 we assume that at comparable skill levels occupations in relative high demand have lower mean educational requirements compared to occupations in relative low demand.

3. Methodology

3.1 The data sources

For a comparison of the characteristics of vacancies and jobholders by 4-digit occupational units, the data sources need to be large enough to have sufficient observations for a sufficient number of occupations. Given this requirement, we choose to use data from the EURES vacancy database and from the WageIndicator jobholder web survey. Both sources are explained hereafter. We had to limit our analysis to one country, the Czech Republic, because this country provides a large number of their vacancies to EURES, these vacancies are coded at 4-digits in the occupational classification ISCO-88 and the skill requirements are coded in ISCED-1997. The Czech Republic also provides large numbers of observations in the WageIndicator jobholder database, and the respondent's occupation and education are coded ISCO-08 respectively ISCED-1997. Other EU countries lack at least one of these conditions.

The jobholder data used in this study stem from the self-administered, volunteer, multi-country web survey, which is posted continuously at the 80 national WageIndicator websites, all providing job related content. In 2013 the websites received 23 million visitors. In return for the free information provided, web visitors are invited to voluntarily complete a continuous web survey with a lottery prize incentive. Given the need for a large dataset, we merged the annual data of the Czech WageIndicator web survey data from 2010/01 to 2013/12, thereby increasing the number of observations substantially (2010 $n=2,519$; 2011 $n=1,326$; 2012 $n=2,924$; 2013 $n=3,751$; total $n=10,520$). We trust pooling the annual data, because the means and standard deviations of the educational attainments of the jobholders within occupations hardly vary across the years. Moreover, the number of vacancies is much more likely to vary with the business cycle than the labour force (Hobijn, 2012).

Being an online non-probability sample, we investigated the self-selection bias by comparing our sample to Eurostat's Czech labour force data for the years 2010-2012 (2013 data was incomparable because education was coded according to ISCED-2011). The comparison shows that in all years the high educated are overrepresented in the web sample for both genders, whereas the low and middle educated are underrepresented (see Appendix 1). On average over the three years, the low educated comprise 6% of the Labour Force and 4% of the web sample for women, and respectively 3% and 2% for men. The middle educated comprises respectively 74% and 60% for women and 78% and 56% for men. The high educated comprise 20% and 37% for women respectively 19% and 42% for men. Eurostat does not provide a cross table for education by occupation. Therefore, we preferred not to apply proportional weights and decided to use the unweighted data and consider the results as exploratory rather than representative. Other studies into the sample bias of the WageIndicator survey also indicate that higher educated people are overrepresented in European countries (De Pedraza, Tijdens, Muñoz de Bustillo & Steinmetz, 2010). This is partly also an effect of the fact that illiterate workers, who most likely are unskilled, by definition will not complete the web survey.

In December 2013 the job vacancy data was collected from the EURES website, which constitutes a European network and platform with harmonized job vacancy data with the aim to improve labour mobility in Europe (<https://ec.europa.eu/eures/home.jsp?lang=en>). EURES was set up 1993 by the European Union's DG Employment, operating on a partnership principle with national Public Employment Services (PES). The PES's provide a total or partial selection of job

vacancies to the EURES platform. Kureková *et al.* (2012) summarized key features of the dataset: the portal holds around 1.5 million job vacancy advertisements in 31 EU and associated countries. The average number of monthly visits amounted to 3.6 million and it is further increasing (Ackers 2012). Despite the selective nature of the job vacancy posting, Ackers (2012) estimates that the portal covers on average around 30-40% of overall job vacancies in the concerned countries. The Czech Republic requires all vacancies to be notified to the national PES, and therefore coverage is much higher. A comparison between the number of vacancies posted on the Czech PES website and the EURES website shows that the ratio of vacancies not uploaded on the EURES database is negligible. On December 9th 2013 the Czech PES registered 15,140 vacancies and the EURES database shows 15,198. The small difference is mainly due to the uploading delay as the EURES database is only uploaded once a day.

3.2 Coding occupations and educations

Two variables are critical for our study: occupation and education. For the latter we restrict the concept of skill requirements to educational requirements. The Czech PES has coded the required educational levels of the vacancies, but we are unable to trace how they exactly did so. Although they applied their own educational classification, this was rather comparable to ISCED-1997. In the jobholders survey, the respondents are asked to tick their highest educational category from a list of national educational categories, which are mapped to ISCED-1997. The vacancy database has a category 0 ‘None specified’ and the jobholder database has 0 ‘No education’, but in both databases these categories have very few observations (vacancies 0.5%, jobholders 0.2%). Therefore, we merged category 0 with category 1. See Table 3.1 for the comparability of the educational categories. In sum, educations range from 1 = primary education, to 5 = higher education.

Table 3.1 Educational categories in the vacancy and jobholder databases

Code	Vacancy database EURES	Code	Jobholder database WageIndicator
1	Compulsory Education/Professional Initiation, incl. none specified	1	Primary education, incl. no education
2	Vocational Training/Apprenticeships	2	Lower secondary education
3	Higher Technical Training	3	Upper secondary education
4	Advanced Technical Training	4	Post-secondary non-tertiary education
5	Higher Training, Including Academic	5	First and second stage of tertiary education

Regarding occupations, the Czech PES has coded the vacancies’ job titles according to ISCO-88, mostly with a 4-digit code but few with only 1-, 2-, or 3-digit codes. For the purpose of comparison with the jobholder data, our analysis is restricted to the vacancies with a 4-digit code, thereby excluding the higher-level coded vacancies. In the jobholders survey, the respondents are asked to self-identify their occupation using text search with a look-up database of approximately 1,700 occupational titles, all coded according to ISCO-08. The ISCO-88 classification includes 388 occupational units at 4-digit level, whereas ISCO-08 counts 433 units. ILO’s correspondence tables ISCO-88 to ISCO-08 and *vice versa* are of the multi-parent-multi-children nature. Hence, our study faces the problem of mapping the two versions. We recoded the ISCO-88 occupational units into ISCO-08, because the 88-08 correspondence table has approximately a quarter less partial mappings than the 08-88 one, making the former more reliable. We assigned only one ISCO-08 code to the ISCO-88 occupational units with multiple ISCO-08 correspondence codes. For example, the *Production and operations department managers in construction* (ISCO-88 code 1223) falls apart into two ISCO-08 codes, 1323 and 3123, of which we chose code 3123 *Construction supervisors*. Accordingly, in the jobholder database the not-assigned ISCO-08 codes are recoded into the chosen ISCO-08 code, thus all cases with code 1323 are recoded into 3123. The three occupational units

for the armed forces are excluded from the analysis and so are all ISCO-08 occupational units without an equivalent in the ISCO-88 classification, for example the Web and multimedia developers (code 2513), which did not exist in 1988. Appendix 2 shows the details of our mapping exercise. Our final ISCO-08 list counts 309 occupational units (see Table 3.2).

3.3 The aggregated database

The initial EURES dataset holds data about 14,092 vacancies and the initial WageIndicator dataset does so for 10,364 jobholders. Both data sources have been aggregated and then merged into one database of occupational units. After recoding ISCO-88 into ISCO-08, the vacancies database holds data for 244 occupational units and the jobholders database holds data for 238 units, with 203 units from both sources (Table 3.2). The merged database has data for 279 units from either source.

For the 279 occupations we computed a variable indicating the demand & supply ratio, based on its proportion in the entire database, thereby clustering the ratio into thirteen groups, ranging from 1 ‘Supply, no demand’, 2 ‘Supply > 5 * demand’, 3 ‘Supply is 4-5 * demand’, etcetera to 12 ‘Demand > 5 * supply’ and 13 ‘Demand, no supply’ (see Figure 4.1). For the second research objective we have restricted the aggregated database to those occupations for which both sources deliver at least 5 observations per 4-digit ISCO-08 unit, resulting in 133 units with observations ranging from 5 to 925 vacancies and from 5 to 902 jobholders per unit.

For each occupational unit, we have extracted the lowest and highest educational requirements and attainments from the vacancy database respectively the jobholders database. In the merged database we computed the mean and standard deviation of the educational requirements respectively attainments. From now on, to serve readability, we prefer the word occupation instead of occupational unit.

Table 3.2 Number of occupational units in the aggregated vacancy and jobholder dataset

Occupational units	Number	%
Maximum set of ISCO-08 occupational units	309	100
Occupational units in EURES vacancy database	244	79
Occupational units in WageIndicator jobholder database	238	77
Occupational units in either database	279	90
Occupational units in both databases	203	66
Occupational units in both databases, excl. occupations with equal demand/supply ratio	192	62
Occupational units in both databases with 5 or more lower level observations (vacancies and jobholders)	133	43

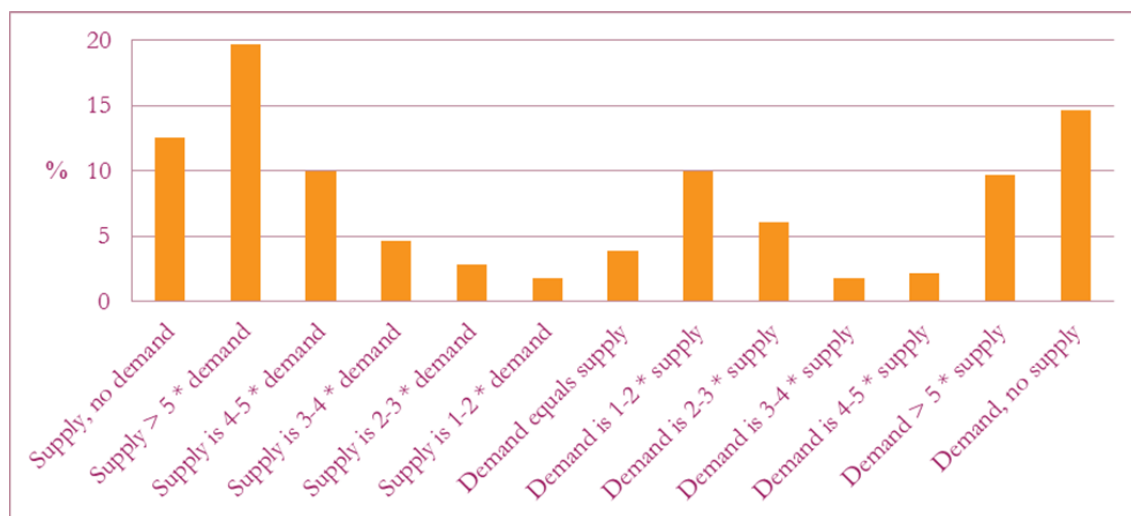
Source Aggregated database

4. Results

4.1 Supply and demand ratios by occupation

We assume that the labour supply and demand ratios are equal across the 4-digit occupations ($H1_0$). Using the aggregated database with 279 occupations for which either supply or demand data are available, Figure 4.1 depicts a very unequal distribution in the thirteen demand & supply ratio groups. In 144 of the 279 occupations, the relative supply is higher than the relative demand, including no demand, whereas in 124 occupation the opposite holds. When defined as at least five times the supply, for one in three occupations the demand is excessive (32%). At the other end of the spectrum, for one in four the supply is excessive (25%). For less than one in five occupations the demand & supply ratios are balanced with less than twice vacancies to jobholders (2%), equal shares of vacancies to jobholders (4%) or at most twice jobholders to vacancies (10%). Hence, supply and demand are largely mismatched across occupations and $H1_0$ is therefore rejected. This is in line with findings for the United States that job openings vary largely across occupations (Hobijn 2012).

Figure 4.1 Distribution of 279 occupations over demand & supply ratio groups



Source Aggregated database, selection 279 occupational units in either database

Having rejected the equal distribution assumption, we aim to explore the relationship between the demand & supply ratios and the occupations' skill levels, the vacancies' educational requirements and the jobholders' educational attainments ($H1a$, $H1b$, $H1c$). As explained in section 3, for each occupation the lowest, mean and highest educational levels of both vacancies and jobholders are known. Limiting the analysis to the 203 occupations with both vacancy and jobholder data, Table 4.1 shows that the mean skill level of occupations in relative large supply are slightly higher than when in large demand, though bivariate analyses for the 203 occupations reveal no significant relationship between the skill levels and the demand & supply ratio groups ($r=-0.09$, *ns*, respectively $r=-0.21$, $p<0.001$). Hence, we find only partial support for assumption $H1a$ that the higher the demand in an occupation the lower its skill level.

When turning to the educational requirements in vacancies, Table 4.1 shows that the demand & supply ratios and the ratio groups are negatively correlated to the means of the mean educational requirements of occupations, as hypothesized ($r=-0.13$, $p<0.1$ for ratios; $r=-0.30$, $p<0.01$ for ratio groups). The relationship to the means of the lowest educational requirements is even stronger ($r=-0.17$, $p<0.05$ for ratios; $r=-0.39$, $p<0.01$ for ratio groups). The relationship to the means of the highest educational requirements is weaker with no significance for the demand & supply ratios, only for the ratio groups ($r=-0.02$, *ns*; respectively $r=-0.16$, $p<0.05$). Hence, in large demand occupations we find that the distribution of educational requirements within these occupations becomes more skewed to the left. We conclude that our assumption H1b is supported. The higher the demand in occupations, the lower the educational requirements of the vacancies in these occupations.

When turning to the educational attainments in the occupations, the third panel in Table 4.1 shows that the means of the mean educational attainments in occupations are not significantly correlated to the demand & supply ratios, but they are to the ratio groups ($r=-0.07$, *ns*; respectively $r=-0.22$, $p<0.01$). A similar though stronger relationship can be noticed for the means of the highest educational attainments ($r=-0.17$, $p<0.01$; respectively $r=-0.29$, $p<0.01$). However, when focussing on the lowest educational attainments a reverse mechanism can be noticed. The higher the demand in occupations, the higher the means of the lowest attainments ($r=0.17$, $p<0.05$ for ratios; $r=0.22$, $p<0.01$ for ratio groups). This may indicate that the jobholders with low educations are squeezed out of the occupations in large demand, but we are not able to explore this empirically. We conclude that our assumption H1c is in part supported. The higher the demand in occupations, the lower the educational attainments of the jobholders in these occupations, though not for the lowest educational attainment.

Table 4.1 Descriptive statistics of occupational skill levels (1 = unskilled, ..., 4 = highly skilled) and required and attained educational levels (1 = primary, ..., 5 = tertiary) by demand & supply ratio groups

	Occupations: mean skill levels	Occupations: mean educational requirements in vacancies			Occupations: mean educational attainments of jobholders			N
		lowest	mean	highest	lowest	mean	highest	
Supply > 5 * demand	2.85	2.56	3.20	3.87	2.24	3.88	4.89	55
Supply is 3-5 * demand	2.59	1.85	2.74	3.93	2.41	3.60	4.66	41
Supply is 1-3 * demand	2.38	1.31	2.57	3.69	2.38	3.49	4.69	13
Demand equals supply	2.45	1.55	2.38	3.09	2.36	3.11	3.64	11
Demand is 1-3 * supply	2.60	1.56	2.60	3.60	2.84	3.67	4.60	45
Demand is 3-5 * supply	2.00	1.27	1.98	3.27	2.27	3.08	4.18	11
Demand > 5 * supply	2.33	1.33	2.34	3.41	2.81	3.46	4.19	27
Total	2.58	1.83	2.71	3.67	2.50	3.61	4.57	203
Correlations to d/s ratio	-0.09	-0.17**	-0.13*	-0.02	0.17**	-0.07	-0.17**	
Corr. to d/s ratio group	-0.21***	-0.39***	-0.30***	-0.16**	0.22***	-0.22***	-0.29***	

* significant at 10%.

** significant at 5%.

*** significant at 1%.

Source Aggregated database, selection 203 occupational units in both databases

4.2 Educational requirements and educational attainments by occupation

The second research objective aims to explore occupational skills mismatch by comparing the educational requirements of the vacancies and the educational attainments of the jobholders for the 4-digit occupations. In Hypothesis H2₀ we assume that across occupations the mean educational requirements of vacancies and the mean educational attainments are equal. We restrict the aggregated database to the 133 occupations with at least five jobholder and five vacancy observations to achieve sufficient variation of educational levels of vacancies and jobholders within each occupa-

tion. For these 133 occupations $H2_0$ is not supported (*mean educational requirements* = 2.72, *sd*=0.96; *mean educational attainments* = 3.64, *sd*=0.61). The assumption is also not supported when focusing on the lowest educations in occupations (*mean lowest educational requirements* = 1.62, *sd*=0.93; *mean lowest educational attainments* = 2.35, *sd*=0.90). It is also not supported when focussing on the highest educations in occupations (*mean highest educational requirements* = 3.93, *sd*=1.15; *mean highest educational attainments* = 4.77, *sd*=0.58).

To shed further light on the differences between vacancies and jobholders, Table 4.2 reveals the distributional characteristics. For only one in three occupations the lowest educational levels of vacancies and jobholders are equal (33% of the 133 occupations, Table 4.2). For the majority of occupations the lowest education of the jobholders is at least one level above that of the vacancies (57%). In two occupations the lowest attained educational level is even three levels above the lowest required education, notably the *Chemical engineers* and the *Medical imaging and therapeutic equipment technicians*. In only twelve occupations the lowest education of the jobholders is one or two levels lower than that of the vacancies (9%). Hence, educational levels of vacancies and jobholders are not equal when comparing the lowest levels across occupations.

The second panel of Table 4.2 compares the mean attained and required educational levels of the 133 occupations. For almost half of the occupations the mean attained and required educations are equal (47%), whereas for a fourth the attained education is one level above the required education (24%) and for another fourth the attained education is even two levels above the required education (25%). Only in three occupations the attained level is below the required level (2%).

The third panel of Table 4.2 compares the highest attained and required educations. Here $H2_0$ is also not supported, though not as strong as in the previous panels. In more than half of the occupations the highest attained and required education levels are equal (55%). In more than a third the attained education is one or two levels above the required level (37%), and in a minority this is three levels (7%). Only in one occupation the highest attained education is one level below the highest required education, notably the *Home-based personal care workers*.

In conclusion, we confirm again that $H2_0$ is not supported. In the 133 occupations the required educational levels in vacancies are largely below the attained levels of the jobholders. This analysis emerges a picture of an overeducated workforce compared to the skills needs of the employers.

Table 4.2 Distribution of occupations across six categories of educational differences for the lowest, mean and highest educations of vacancies and jobholders (1 = primary, ..., 5 = tertiary education)

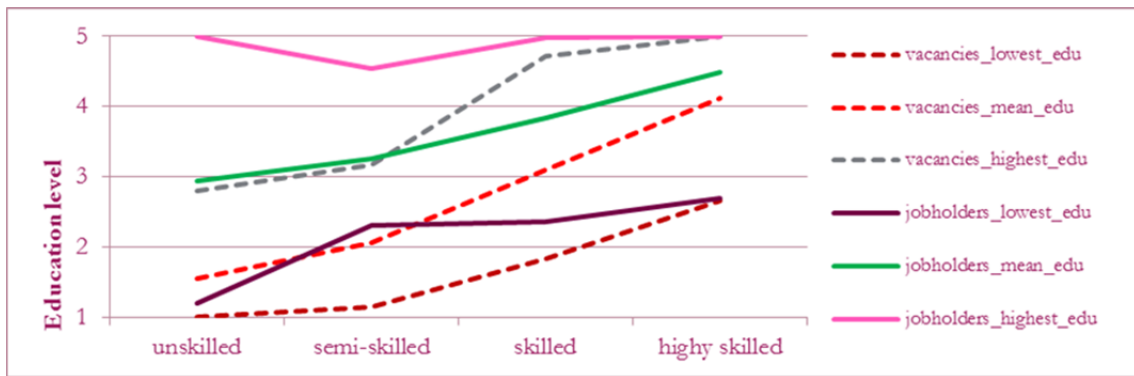
	Lowest educations		Mean educations		Highest educations	
	%	N	%	N	%	N
Vacancies 2 edulvls higher than jobholders	3.00	4	0.00	0	0.00	0
Vacancies 1 edulvls higher than jobholders	6.00	8	2.30	3	0.80	1
Vacancies edulvls equals jobholders	33.10	44	46.60	62	54.90	73
Vacancies 1 edulvls lower than jobholders	32.30	43	24.10	32	11.30	15
Vacancies 2 edulvls lower than jobholders	24.10	32	24.80	33	26.30	35
Vacancies 3 edulvls lower than jobholders	1.50	2	2.30	3	6.80	9
Total (n=133)	100.00	133	100.00	133	100.00	133
Mean (range -2 to +3)	0.73		0.78		0.83	
Std Dev	1.04		0.92		1.05	

Source Aggregated database, selection 133 occupational units in both databases with five or more observations per occupational unit

Rejecting the assumption about the equal educational requirements and attainments in occupations, we explore whether the range of educational requirements in vacancies is more condensed for occupations at higher skill levels compared to lower skill levels (H2a), and whether the range of educational attainments of jobholders is more condensed for higher skilled occupations (H2b) and whether the differences between the two ranges are more condensed at higher skill levels (H2c).

Figure 4.2 provides descriptive information about the means of the occupations' lowest, mean and highest educational requirements and attainments by skill level. It shows clearly that for higher occupations' skill levels the educational requirements and attainments increase both. The exception concerns the unskilled occupations where the highest educational attainment of the jobholders is at level 5, the highest education level.

Figure 4.2 Educational requirements (dotted) and educational attainments (lines) in occupations, by skill group



Source Aggregated database, selection 133 occupational units in both databases with five or more observations per occupational unit

Table 4.3 reveals the mean ranges and standard deviations for the three hypotheses. H2a is not supported, on the contrary. The range of educational requirements in vacancies is wide instead of condensed in skilled and highly skilled occupations, whereas it is most condensed for the unskilled occupations ($r=0.22, p<0.05$). H2b is also not supported, though here the correlation between range and skill level is insignificant ($r=-0.04, ns$). However, H2c is supported, showing that in the unskilled occupations the range is widest. The correlation coefficient has the expected sign and is significant ($r=-0.22, p<0.05$).

Table 4.3 Means ranges between the lowest and highest educational levels (range varies between 0 and 4) for vacancies and jobholders and for range differences, by four skill levels

	Vacancies		Jobholders		Range difference		N
	Mean range	Sd	Mean range	Sd	Mean difference	Sd	
Unskilled occupations	1.80	0.45	3.80	0.45	2.00	0.71	5
Semi-skilled occupations	2.02	0.92	2.24	1.11	0.23	1.26	66
Skilled occupations	2.89	1.04	2.61	0.84	-0.28	1.00	36
Highly skilled occupations	2.35	1.20	2.31	1.19	-0.04	1.31	26
Total	2.31	1.06	2.41	1.08	0.11	1.26	133
Pearson Corr.	0.22**		-0.04		-0.22**		

** significant at 5%.

Source Aggregated database, selection 133 occupational units in both databases with five or more observations per occupational unit

4.3 Adjustment strategies of educational requirements in vacancies by occupation

Do employers adjust the educational requirements downwards in vacancies in case of large demand for occupations in similar skill levels? As shown in section 4.1, in case of large demand the educational requirements in vacancies are lower. To explore this, we hypothesize that at comparable skill levels occupations in relative high demand have lower mean educational requirements compared to occupations in relative low demand (H3). We restrict the aggregated database of 203 occupations to

192 occupations, thereby excluding occupations in the group with equal supply and demand. For each skill level we applied a t-test of the mean educational requirements of occupations in high and in low demand. As Table 4.4 shows, for all skill levels the mean educational requirements are lower when occupations are in high demand, but this is only significant for the skill levels with large numbers of observations.

Table 4.4 Means, standard deviations and significance levels of the t-test of the mean educational requirements in vacancy's occupations, by skill level and by demand & supply divide

		Mean	Sd	Sign. T-test	N
Unskilled occupations	Low demand: supply larger than demand	1.49	0.35	ns	4
	High demand: demand larger than supply	1.45	0.16		4
Semi-skilled occupations	Low demand: supply larger than demand	2.26	0.63	***	52
	High demand: demand larger than supply	1.92	0.24		50
Skilled occupations	Low demand: supply larger than demand	3.19	0.71	ns	26
	High demand: demand larger than supply	3.10	0.26		18
Highly skilled occupations	Low demand: supply larger than demand	4.26	0.65	ns	27
	High demand: demand larger than supply	4.04	0.79		11
All occupations	Low demand: supply larger than demand	2.95	1.08	***	109
	High demand: demand larger than supply	2.43	0.88		83

Source Aggregated database, selection 192 occupational units in both databases, excluding units with equal supply & demand

5. Conclusions and discussion

5.1 Conclusion

Mismatches on the labour market are a main worry for policy makers, referring to both the numerical mismatch of job seekers *vis-a-vis* vacancies and the mismatch of the attained skills of job seekers and the required skills of vacancies. Beyond national-level data on employed and unemployed for the numerical mismatch, data sources to investigate the skills mismatch are little and a comparison between jobholders' attainment and the required skills in vacancies is difficult, because information on the latter is lacking when aiming to cover an entire national labour market. Aggregating data seems a viable way to solve this problem of unmatched micro-data, for example by aggregating into occupations. However, analyses for detailed occupations require huge datasets when aiming for sufficient observations in each unit, because the distribution over occupations of both vacancies and jobholders is very skewed.

This paper provides a first attempt to explore mismatch at such a detailed level. It investigates the relationship between demand and supply ratios and the educational requirements in vacancies and attainments of jobholders for ISCO 4-digit occupations. It then compares the distributional characteristics of the educational requirements in vacancies and the educational attainments of jobholders for these occupations. Finally, it explores the educational requirements adjustment strategies when labour is in large supply or large demand. Using the educational characteristics of 15,140 vacancies from the Public Employment Service and 10,520 jobholders from a web survey on work and wages, a database was merged, aggregated by ISCO 4-digit occupations. The Czech Republic is the only European country for which such data is available. For these occupations and for vacancies and for jobholders the lowest, mean, and highest educational requirements respectively attainment were analysed. The merged database resulted in data for 279 occupations.

Our analyses of the mismatch show that supply and demand are largely mismatched across occupations, as was also found for the US. More specifically, the higher the demand in an occupation - when measured in demand & supply ratio groups - the lower the occupation's skill level, the lower the educational requirements of vacancies, and the lower the educational attainments of the jobholders in these occupations, though the latter does not hold for the lowest educational attainment. The range of educational attainments is wide for the unskilled occupations, and more condensed in skilled and highly skilled occupations. In contrast, the range of educational requirements in vacancies is most condensed for the unskilled occupations, whereas it is wide in the skilled and highly skilled occupations. This indicates that whereas the ISCO skill levels are assumed to reflect the required educational levels, this does not turn out to be the case in our study.

When comparing the distributional characteristics of the educational requirements in vacancies and the educational attainments of jobholders for the same occupations a picture arises of an over-educated workforce. When comparing the lowest educational levels of vacancies and jobholders, it turns out that in one in three occupations the required and attained levels are equal, but that for the majority of occupations the lowest education of jobholders is at least one level above that of the vacancies. When comparing the mean educational levels, in almost half of the occupations these are equal, for a fourth the attained education is one level above the required education and for another fourth this is even two levels above the required education. When comparing the highest educational levels, in more than half of the occupations these are equal, in one in ten this is one level above and in a quarter this is two levels above the required level.

Finally, we analysed whether employers adjust the educational requirements downwards when occupations are in large demand. Indeed, for all skill levels the mean educational requirements are lower when occupations are in high demand, though not all results are statistically significant.

5.2 Discussion

Being one of the first comparisons of vacancy data and jobholder data by occupation, further discussions are definitely needed about the underlying concepts. The first consideration concerns the concept of registered vacancies, as the demand for labour will be broader. A second consideration is that educational levels may be a poor proxy of the skills mismatch in the labour market, requiring greater detail with respect to attained and required skills. A legitimate question addresses the issue to what extent the educational requirements in vacancies reflect the true requirements for the job at scrutiny. This worry is also expressed by Allen *et al.* (2013). Additionally the validity of the educational coding of vacancies may need further investigation. A third consideration relates to the concept of skills mismatch, mostly referred to as the relationship between the skills requirements in jobs and the skills and competencies of jobholders. However, skills mismatch sometimes refers to the skills and competencies of job seekers and not jobholders or, as in this paper, it refers to the skills requirements in vacancies, which of course also is different from all jobs. Findings for selected groups cannot be generalised to the entire population.

Finally, limitations of the data must be mentioned. Online data may entail some concerns about selection of the data. The first one relates to the finding of the overeducated workforce. This may in part be attributed to the bias in the WageIndicator jobholders web survey, but this finding is fully in line with general findings indicating that one quarter to one third of the labour force in industrialised countries is overeducated (Leuven & Oosterbeek, 2012). The EURES vacancy database might underestimate the educational requirements of the stock of vacancies, because vacancies for jobs with high educational requirements may selectively be posted at the Public Employment Agencies. Yet, given that it is obligatory to post all vacancies at the national PES, this most likely hardly will be the case in the Czech Republic. Despite these limitations, this explorative study contributes to the understanding of supply and demand mismatch.

appendix 1

Table a1.1 Distribution over gender and education levels for Eurostat LFS data and WageIndicator web survey data by year

Source	Gender	ISCED	2010_n	2011_n	2012_n	2010_%	2011_%	2012_%
Eurostat	Females	ISCED 0-2	134.30	125.50	115.00	0.07	0.06	0.06
Eurostat	Females	ISCED 3-4	1,539.70	1,521.50	1,502.60	0.75	0.74	0.72
Eurostat	Females	ISCED 5-6	382.60	416.30	460.70	0.19	0.20	0.22
Eurostat	Females Total	ISCED-1997 levels	2,057.10	2,063.50	2,078.60	1.00	1.00	1.00
Eurostat	Males	ISCED 0-2	100.20	90.90	90.30	0.04	0.03	0.03
Eurostat	Males	ISCED 3-4	2,162.70	2,120.80	2,105.70	0.79	0.78	0.77
Eurostat	Males	ISCED 5-6	489.10	520.90	535.50	0.18	0.19	0.20
Eurostat	Males Total	ISCED-1997 levels	2,752.50	2,732.80	2,731.80	1.00	1.00	1.00
WageIndicator	Females	ISCED 0-2	35	26	21	0.03	0.05	0.02
WageIndicator	Females	ISCED 3-4	693	336	455	0.69	0.63	0.48
WageIndicator	Females	ISCED 5-6	279	170	481	0.28	0.32	0.50
WageIndicator	Females Total	ISCED-1997 levels	1007	532	957	1.00	1.00	1.00
WageIndicator	Males	ISCED 0-2	14	19	48	0.02	0.03	0.02
WageIndicator	Males	ISCED 3-4	545	423	853	0.65	0.60	0.43
WageIndicator	Males	ISCED 5-6	275	267	1,066	0.33	0.38	0.54
WageIndicator	Males Total	ISCED-1997 levels	834	709	1,967	1.00	1.00	1.00

appendix 2

Table a2.1 Correspondence table IsCO-88 into ISCO-08 according to ILO and according to this study

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Legislators	1110	1111		1111	Legislators
Senior government officials	1120	1112		1112	Senior government officials
Traditional chiefs and heads of villages	1130	1113		1113	Traditional chiefs and heads of villages
Senior officials of political-party organisations	1141	1114	p	1114	Senior officials of special-interest organizations
Senior officials of employers', workers' and other economic-interest organisations	1142	1114	p	1114	Senior officials of special-interest organizations
Senior officials of humanitarian and other special-interest organisations	1143	1114	p	1114	Senior officials of special-interest organizations
Directors and chief executives	1210	1120		1120	Managing directors and chief executives
Production and operations department managers in agriculture, hunting, forestry and fishing	1221	1311		1311	Agricultural and forestry production managers
Production and operations department managers in agriculture, hunting, forestry and fishing	1221	1312		1311	Aquaculture and fisheries production managers
Production and operations department managers in manufacturing	1222	1321	p	1321	Manufacturing managers
Production and operations department managers in manufacturing	1222	1322	p	1321	Mining managers
Production and operations department managers in construction	1223	1323	p	3123	Construction managers
Production and operations department managers in construction	1223	3123	p	3123	Construction supervisors
Production and operations department managers in wholesale and retail trade	1224	1420	p	1420	Retail and wholesale trade managers
Production and operations department managers in restaurants and hotels	1225	1411	p	1411	Hotel managers
Production and operations department managers in restaurants and hotels	1225	1412	p	1411	Restaurant managers
Production and operations department managers in transport, storage and communications	1226	1324	p	1324	Supply, distribution and related managers
Production and operations department managers in transport, storage and communications	1226	1330	p	1324	Information and communications technology service managers
Production and operations department managers in business services	1227	1219	p	1219	Business services and administration managers not elsewhere classified
Production and operations department managers in business services	1227	1346		1219	Financial and insurance services branch managers
Production and operations department managers in personal care, cleaning and related services	1228	1219	p	1219	Business services and administration managers not elsewhere classified
Production and operations department managers not elsewhere classified	1229	1213	p	1219	Policy and planning managers
Production and operations department managers not elsewhere classified	1229	1219	p	1219	Business services and administration managers not elsewhere classified
Production and operations department managers not elsewhere classified	1229	1341	p	1219	Child care services managers
Production and operations department managers not elsewhere classified	1229	1342	p	1219	Health services managers
Production and operations department managers not elsewhere classified	1229	1343	p	1219	Aged care services managers

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Production and operations department managers not elsewhere classified	1229	1344	p	1219	Social welfare managers
Production and operations department managers not elsewhere classified	1229	1345	p	1219	Education managers
Production and operations department managers not elsewhere classified	1229	1349	p	1219	Professional services managers not elsewhere classified
Production and operations department managers not elsewhere classified	1229	1439	p	1219	Services managers not elsewhere classified
Production and operations department managers not elsewhere classified	1229	2654	p	1219	Film, stage and related directors and producers
Production and operations department managers not elsewhere classified	1229	3435	p	1219	Other artistic and cultural associate professionals
Finance and administration department managers	1231	1211	p	1219	Finance managers
Finance and administration department managers	1231	1219	p	1219	Business services and administration managers not elsewhere classified
Personnel and industrial relations department managers	1232	1212	p	1212	Human resource managers
Sales and marketing department managers	1233	1221	p	1221	Sales and marketing managers
Advertising and public relations department managers	1234	1222	p	1222	Advertising and public relations managers
Supply and distribution department managers	1235	1324	p	1324	Supply, distribution and related managers
Computing services department managers	1236	1330	p	1330	Information and communications technology service managers
Research and development department managers	1237	1223	p	1223	Research and development managers
Other department managers not elsewhere classified	1239	1213	p	1213	Policy and planning managers
General managers in agriculture, hunting, forestry and fishing	1311	6111	p	6113	Field crop and vegetable growers
General managers in agriculture, hunting, forestry and fishing	1311	6112	p	6113	Tree and shrub crop growers
General managers in agriculture, hunting, forestry and fishing	1311	6113	p	6113	Gardeners, horticultural and nursery growers
General managers in agriculture, hunting, forestry and fishing	1311	6114	p	6113	Mixed crop growers
General managers in agriculture, hunting, forestry and fishing	1311	6121	p	6113	Livestock and dairy producers
General managers in agriculture, hunting, forestry and fishing	1311	6122	p	6113	Poultry producers
General managers in agriculture, hunting, forestry and fishing	1311	6130	p	6113	Mixed crop and animal producers
General managers in agriculture, hunting, forestry and fishing	1311	6210	p	6113	Forestry and related workers
General managers in agriculture, hunting, forestry and fishing	1311	6221	p	6113	Aquaculture workers
General managers in agriculture, hunting, forestry and fishing	1311	6222	p	6113	Inland and coastal waters fishery workers
General managers in agriculture, hunting, forestry and fishing	1311	6223	p	6113	Deep-sea fishery workers
General managers in manufacturing	1312	1321	p	1321	Manufacturing managers
General managers in manufacturing	1312	1322	p	1321	Mining managers
General managers in construction	1313	1323	p	1323	Construction managers
General managers in wholesale and retail trade	1314	1420	p	1420	Retail and wholesale trade managers
General managers in wholesale and retail trade	1314	5221		1420	Shopkeepers
General managers of restaurants and hotels	1315	1411	p	1411	Hotel managers
General managers of restaurants and hotels	1315	1412	p	1411	Restaurant managers
General managers in transport, storage and communications	1316	1324	p	1324	Supply, distribution and related managers
General managers in transport, storage and communications	1316	1330	p	1324	Information and communications technology service managers
General managers of business services	1317	1211	p	1219	Finance managers
General managers of business services	1317	1212	p	1219	Human resource managers
General managers of business services	1317	1219	p	1219	Business services and administration managers not elsewhere classified
General managers of business services	1317	1221	p	1219	Sales and marketing managers
General managers of business services	1317	1222	p	1219	Advertising and public relations managers

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
General managers of business services	1317	1330	p	1219	Information and communications technology service managers
General managers of business services	1317	1346		1219	Financial and insurance services branch managers
General managers in personal care, cleaning and related services	1318	1219	p	1219	Business services and administration managers not elsewhere classified
General managers not elsewhere classified	1319	1223	p	1349	Research and development managers
General managers not elsewhere classified	1319	1341	p	1349	Child care services managers
General managers not elsewhere classified	1319	1342	p	1349	Health services managers
General managers not elsewhere classified	1319	1343	p	1349	Aged care services managers
General managers not elsewhere classified	1319	1344	p	1349	Social welfare managers
General managers not elsewhere classified	1319	1345	p	1349	Education managers
General managers not elsewhere classified	1319	1349	p	1349	Professional services managers not elsewhere classified
General managers not elsewhere classified	1319	1431		1349	Sports, recreation and cultural centre managers
General managers not elsewhere classified	1319	1439	p	1349	Services managers not elsewhere classified
Physicists and astronomers	2111	2111		2111	Physicists and astronomers
Meteorologists	2112	2112		2112	Meteorologists
Chemists	2113	2113		2113	Chemists
Chemists	2113	2262	p	2113	Pharmacists
Geologists and geophysicists	2114	2114		2114	Geologists and geophysicists
Mathematicians and related professionals	2121	2120	p	2120	Mathematicians, actuaries and statisticians
Statisticians	2122	2120	p	2120	Mathematicians, actuaries and statisticians
Computer systems designers and analysts	2131	2511		2519	Systems analysts
Computer systems designers and analysts	2131	2512		2519	Software developers
Computer systems designers and analysts	2131	2513	p	2519	Web and multimedia developers
Computer systems designers and analysts	2131	2519	p	2519	Software and applications developers and analysts not elsewhere classified
Computer systems designers and analysts	2131	2521		2519	Database designers and administrators
Computer systems designers and analysts	2131	2522		2519	Systems administrators
Computer systems designers and analysts	2131	2523		2519	Computer network professionals
Computer programmers	2132	2513	p	2519	Web and multimedia developers
Computer programmers	2132	2514		2519	Applications programmers
Computer programmers	2132	2519	p	2519	Software and applications developers and analysts not elsewhere classified
Computing professionals not elsewhere classified	2139	2513	p	2529	Web and multimedia developers
Computing professionals not elsewhere classified	2139	2519	p	2529	Software and applications developers and analysts not elsewhere classified
Computing professionals not elsewhere classified	2139	2529	p	2529	Database and network professionals not elsewhere classified
Architects, town and traffic planners	2141	2161		2161	Building architects
Architects, town and traffic planners	2141	2162		2161	Landscape architects
Architects, town and traffic planners	2141	2164		2161	Town and traffic planners
Civil engineers	2142	2142		2142	Civil engineers
Electrical engineers	2143	2151		2151	Electrical engineers
Electronics and telecommunications engineers	2144	2152		2153	Electronics engineers

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Electronics and telecommunications engineers	2144	2153		2153	Telecommunications engineers
Mechanical engineers	2145	2144		2144	Mechanical engineers
Chemical engineers	2146	2145		2145	Chemical engineers
Mining engineers, metallurgists and related professionals	2147	2146		2146	Mining engineers, metallurgists and related professionals
Cartographers and surveyors	2148	2165		2165	Cartographers and surveyors
Architects, engineers and related professionals not elsewhere classified	2149	2141		2149	Industrial and production engineers
Architects, engineers and related professionals not elsewhere classified	2149	2143		2149	Environmental engineers
Architects, engineers and related professionals not elsewhere classified	2149	2149		2149	Engineering professionals not elsewhere classified
Biologists, botanists, zoologists and related professionals	2211	2131	p	2131	Biologists, botanists, zoologists and related professionals
Biologists, botanists, zoologists and related professionals	2211	2133		2131	Environmental protection professionals
Pharmacologists, pathologists and related professionals	2212	2131	p	2131	Biologists, botanists, zoologists and related professionals
Pharmacologists, pathologists and related professionals	2212	2212		2212	Specialist medical practitioners
Pharmacologists, pathologists and related professionals	2212	2250	p	2212	Veterinarians
Agronomists and related professionals	2213	2132	p	2132	Farming, forestry and fisheries advisers
Medical doctors	2221	2211		2212	Generalist medical practitioners
Medical doctors	2221	2212		2212	Specialist medical practitioners
Dentists	2222	2261		2261	Dentists
Veterinarians	2223	2250	p	2250	Veterinarians
Pharmacists	2224	2262	p	2262	Pharmacists
Health professionals (except nursing) not elsewhere classified	2229	2263	p	2269	Environmental and occupational health and hygiene professionals
Health professionals (except nursing) not elsewhere classified	2229	2269	p	2269	Health professionals not elsewhere classified
Nursing and midwifery professionals	2230	1342	p	2221	Health services managers
Nursing and midwifery professionals	2230	1343	p	2221	Aged care services managers
Nursing and midwifery professionals	2230	2221	p	2221	Nursing professionals
Nursing and midwifery professionals	2230	2222	p	2221	Midwifery professionals
Nursing and midwifery professionals	2230	3221	p	3221	Nursing associate professionals
Nursing and midwifery professionals	2230	3222	p	2221	Midwifery associate professionals
College, university and higher education teaching professionals	2310	2310		2310	University and higher education teachers
College, university and higher education teaching professionals	2310	2320	p	2310	Vocational education teachers
Secondary education teaching professionals	2320	2320	p	2330	Vocational education teachers
Secondary education teaching professionals	2320	2330		2330	Secondary education teachers
Primary education teaching professionals	2331	2341	p	2341	Primary school teachers
Pre-primary education teaching professionals	2332	2342	p	2342	Early childhood educators
Special education teaching professionals	2340	2352	p	2352	Special needs teachers
Education methods specialists	2351	2351	p	2351	Education methods specialists
School inspectors	2352	2351	p	2351	Education methods specialists
Other teaching professionals not elsewhere classified	2359	2353	p	2359	Other language teachers
Other teaching professionals not elsewhere classified	2359	2354		2359	Other music teachers
Other teaching professionals not elsewhere classified	2359	2355	p	2359	Other arts teachers
Other teaching professionals not elsewhere classified	2359	2356	p	2359	Information technology trainers
Other teaching professionals not elsewhere classified	2359	2359	p	2359	Teaching professionals not elsewhere classified

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Accountants	2411	2411	p	2411	Accountants
Accountants	2411	2412	p	2411	Financial and investment advisers
Personnel and careers professionals	2412	2263	p	2423	Environmental and occupational health and hygiene professionals
Personnel and careers professionals	2412	2423		2423	Personnel and careers professionals
Personnel and careers professionals	2412	2424		2423	Training and staff development professionals
Business professionals not elsewhere classified	2419	2412	p	3339	Financial and investment advisers
Business professionals not elsewhere classified	2419	2413		3339	Financial analysts
Business professionals not elsewhere classified	2419	2421		3339	Management and organization analysts
Business professionals not elsewhere classified	2419	2422		3339	Policy administration professionals
Business professionals not elsewhere classified	2419	2431		3339	Advertising and marketing professionals
Business professionals not elsewhere classified	2419	2432		3339	Public relations professionals
Business professionals not elsewhere classified	2419	3339	p	3339	Business services agents not elsewhere classified
Lawyers	2421	2611		2611	Lawyers
Judges	2422	2612		2612	Judges
Legal professionals not elsewhere classified	2429	2619		2619	Legal professionals not elsewhere classified
Archivists and curators	2431	2621		2621	Archivists and curators
Librarians and related information professionals	2432	2622		2622	Librarians and related information professionals
Economists	2441	2631		2631	Economists
Sociologists, anthropologists and related professionals	2442	2632		2632	Sociologists, anthropologists and related professionals
Philosophers, historians and political scientists	2443	2633		2633	Philosophers, historians and political scientists
Philologists, translators and interpreters	2444	2643		2643	Translators, interpreters and other linguists
Psychologists	2445	2634		2634	Psychologists
Social work professionals	2446	2635		2635	Social work and counselling professionals
Authors, journalists and other writers	2451	2431		2642	Advertising and marketing professionals
Authors, journalists and other writers	2451	2432		2642	Public relations professionals
Authors, journalists and other writers	2451	2641		2642	Authors and related writers
Authors, journalists and other writers	2451	2642	p	2642	Journalists
Sculptors, painters and related artists	2452	2651		2651	Visual artists
Composers, musicians and singers	2453	2652	p	2652	Musicians, singers and composers
Choreographers and dancers	2454	2653	p	2653	Dancers and choreographers
Film, stage and related actors and directors	2455	2654	p	2654	Film, stage and related directors and producers
Film, stage and related actors and directors	2455	2655		2654	Actors
Religious professionals	2460	2636		2636	Religious professionals
Chemical and physical science technicians	3111	3111		3111	Chemical and physical science technicians
Civil engineering technicians	3112	3112	p	3112	Civil engineering technicians
Electrical engineering technicians	3113	3113	p	3113	Electrical engineering technicians
Electronics and telecommunications engineering technicians	3114	3114	p	3522	Electronics engineering technicians
Electronics and telecommunications engineering technicians	3114	3522		3522	Telecommunications engineering technicians
Mechanical engineering technicians	3115	3115	p	3115	Mechanical engineering technicians
Chemical engineering technicians	3116	3116		3116	Chemical engineering technicians
Mining and metallurgical technicians	3117	3117	p	3117	Mining and metallurgical technicians

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Draughtspersons	3118	3118		3118	Draughtspersons
Physical and engineering science technicians not elsewhere classified	3119	3119		3119	Physical and engineering science technicians not elsewhere classified
Computer assistants	3121	3512		3512	Information and communications technology user support technicians
Computer assistants	3121	3513	p	3512	Computer network and systems technicians
Computer assistants	3121	3514	p	3512	Web technicians
Computer equipment operators	3122	3511		3511	Information and communications technology operations technicians
Computer equipment operators	3122	3514	p	3511	Web technicians
Industrial robot controllers	3123	3139	p	3139	Process control technicians not elsewhere classified
Photographers and image and sound recording equipment operators	3131	3431		3521	Photographers
Photographers and image and sound recording equipment operators	3131	3521	p	3521	Broadcasting and audio-visual technicians
Broadcasting and telecommunications equipment operators	3132	3521	p	3522	Broadcasting and audio-visual technicians
Broadcasting and telecommunications equipment operators	3132	3522		3522	Telecommunications engineering technicians
Medical equipment operators	3133	3211		3211	Medical imaging and therapeutic equipment technicians
Ships' engineers	3141	3151		3151	Ships' engineers
Ships' deck officers and pilots	3142	3152		3152	Ships' deck officers and pilots
Aircraft pilots and related associate professionals	3143	3153	p	3153	Aircraft pilots and related associate professionals
Air traffic controllers	3144	3154		3154	Air traffic controllers
Air traffic safety technicians	3145	3155		3155	Air traffic safety electronics technicians
Building and fire inspectors	3151	3112	p	3112	Civil engineering technicians
Building and fire inspectors	3151	3359	p	3112	Regulatory government associate professionals not elsewhere classified
Safety, health and quality inspectors	3152	2263	p	3257	Environmental and occupational health and hygiene professionals
Safety, health and quality inspectors	3152	3113	p	3257	Electrical engineering technicians
Safety, health and quality inspectors	3152	3114	p	3257	Electronics engineering technicians
Safety, health and quality inspectors	3152	3115	p	3257	Mechanical engineering technicians
Safety, health and quality inspectors	3152	3117	p	3257	Mining and metallurgical technicians
Safety, health and quality inspectors	3152	3257	p	3257	Environmental and occupational health inspectors and associates
Safety, health and quality inspectors	3152	7543		3257	Product graders and testers (excluding foods and beverages)
Life science technicians	3211	3141		3141	Life science technicians (excluding medical)
Life science technicians	3211	3212		3141	Medical and pathology laboratory technicians
Agronomy and forestry technicians	3212	3142		3142	Agricultural technicians
Agronomy and forestry technicians	3212	3143		3142	Forestry technicians
Farming and forestry advisers	3213	2132	p	2132	Farming, forestry and fisheries advisers
Medical assistants	3221	2240		3256	Paramedical practitioners
Medical assistants	3221	3253		3256	Community health workers
Medical assistants	3221	3256		3256	Medical assistants
Sanitarians	3222	2263	p	3257	Environmental and occupational health and hygiene professionals

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Sanitarians	3222	3257	p	3257	Environmental and occupational health inspectors and associates
Dieticians and nutritionists	3223	2265		2265	Dieticians and nutritionists
Optometrists and opticians	3224	2267		2267	Optometrists and ophthalmic opticians
Optometrists and opticians	3224	3254		2267	Dispensing opticians
Dental assistants	3225	3251		3251	Dental assistants and therapists
Physiotherapists and related associate professionals	3226	2264		2264	Physiotherapists
Physiotherapists and related associate professionals	3226	2269	p	2264	Health professionals not elsewhere classified
Physiotherapists and related associate professionals	3226	3255		2264	Physiotherapy technicians and assistants
Physiotherapists and related associate professionals	3226	3259	p	2264	Health associate professionals not elsewhere classified
Veterinary assistants	3227	3240		3240	Veterinary technicians and assistants
Pharmaceutical assistants	3228	3213		3213	Pharmaceutical technicians and assistants
Modern health associate professionals (except nursing) not elsewhere classified	3229	2230	p	3259	Traditional and complementary medicine professionals
Modern health associate professionals (except nursing) not elsewhere classified	3229	2266		3259	Audiologists and speech therapists
Modern health associate professionals (except nursing) not elsewhere classified	3229	2267	p	3259	Optometrists and ophthalmic opticians
Modern health associate professionals (except nursing) not elsewhere classified	3229	2269	p	3259	Health professionals not elsewhere classified
Modern health associate professionals (except nursing) not elsewhere classified	3229	3259	p	3259	Health associate professionals not elsewhere classified
Nursing associate professionals	3231	3221	p	3221	Nursing associate professionals
Midwifery associate professionals	3232	3222	p	3222	Midwifery associate professionals
Traditional medicine practitioners	3241	2230	p	3259	Traditional and complementary medicine professionals
Traditional medicine practitioners	3241	3230	p	3259	Traditional and complementary medicine associate professionals
Faith healers	3242	3413	p	3413	Religious associate professionals
Primary education teaching associate professionals	3310	2341	p	2341	Primary school teachers
Pre-primary education teaching associate professionals	3320	2342	p	2342	Early childhood educators
Special education teaching associate professionals	3330	2352	p	2352	Special needs teachers
Other teaching associate professionals	3340	2353	p	2359	Other language teachers
Other teaching associate professionals	3340	2355	p	2359	Other arts teachers
Other teaching associate professionals	3340	2356	p	2359	Information technology trainers
Other teaching associate professionals	3340	2359	p	2359	Teaching professionals not elsewhere classified
Other teaching associate professionals	3340	3153	p	2359	Aircraft pilots and related associate professionals
Other teaching associate professionals	3340	3423	p	2359	Fitness and recreation instructors and program leaders
Other teaching associate professionals	3340	3435	p	2359	Other artistic and cultural associate professionals
Other teaching associate professionals	3340	5165		2359	Driving instructors
Securities and finance dealers and brokers	3411	2412	p	3311	Financial and investment advisers
Securities and finance dealers and brokers	3411	3311		3311	Securities and finance dealers and brokers
Insurance representatives	3412	3321		3321	Insurance representatives
Estate agents	3413	3334		3334	Real estate agents and property managers
Travel consultants and organisers	3414	4221	p	4221	Travel consultants and clerks
Technical and commercial sales representatives	3415	2433		3322	Technical and medical sales professionals (excluding ICT)
Technical and commercial sales representatives	3415	2434		3322	Information and communications technology sales professionals
Technical and commercial sales representatives	3415	3322		3322	Commercial sales representatives
Buyers	3416	3323		3323	Buyers
Appraisers, valuers and auctioneers	3417	3315		3315	Valuers and loss assessors

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Appraisers, valuers and auctioneers	3417	3339	p	3315	Business services agents not elsewhere classified
Finance and sales associate professionals not elsewhere classified	3419	3312		3312	Credit and loans officers
Trade brokers	3421	3324		3324	Trade brokers
Clearing and forwarding agents	3422	3331		3331	Clearing and forwarding agents
Employment agents and labour contractors	3423	3333	p	3333	Employment agents and contractors
Business services agents and trade brokers not elsewhere classified	3429	3339	p	3339	Business services agents not elsewhere classified
Administrative secretaries and related associate professionals	3431	3341	p	3341	Office supervisors
Administrative secretaries and related associate professionals	3431	3342	p	3343	Legal secretaries
Administrative secretaries and related associate professionals	3431	3343	p	3343	Administrative and executive secretaries
Administrative secretaries and related associate professionals	3431	3344	p	3343	Medical secretaries
Legal and related business associate professionals	3432	3411		3411	Legal and related associate professionals
Bookkeepers	3433	3313	p	3313	Accounting associate professionals
Statistical, mathematical and related associate professionals	3434	3313	p	3313	Accounting associate professionals
Statistical, mathematical and related associate professionals	3434	3314		3313	Statistical, mathematical and related associate professionals
Administrative associate professionals not elsewhere classified	3439	3332		3343	Conference and event planners
Administrative associate professionals not elsewhere classified	3439	3343	p	3343	Administrative and executive secretaries
Administrative associate professionals not elsewhere classified	3439	3359	p	3343	Regulatory government associate professionals not elsewhere classified
Administrative associate professionals not elsewhere classified	3439	3433	p	3343	Gallery, museum and library technicians
Customs and border inspectors	3441	3351		3351	Customs and border inspectors
Government tax and excise officials	3442	3352		3352	Government tax and excise officials
Government social benefits officials	3443	3353		3353	Government social benefits officials
Government licensing officials	3444	3354		3354	Government licensing officials
Customs, tax and related government associate professionals not elsewhere classified	3449	3359	p	3359	Regulatory government associate professionals not elsewhere classified
Police inspectors and detectives	3450	3355		3411	Police inspectors and detectives
Police inspectors and detectives	3450	3411		3411	Legal and related associate professionals
Social work associate professionals	3460	3412		3412	Social work associate professionals
Decorators and commercial designers	3471	2163		2166	Product and garment designers
Decorators and commercial designers	3471	2166		2166	Graphic and multimedia designers
Decorators and commercial designers	3471	3432		2166	Interior designers and decorators
Decorators and commercial designers	3471	3433	p	2166	Gallery, museum and library technicians
Decorators and commercial designers	3471	3435	p	2166	Other artistic and cultural associate professionals
Radio, television and other announcers	3472	2642	p	2656	Journalists
Radio, television and other announcers	3472	2656		2656	Announcers on radio, television and other media
Street, night-club and related musicians, singers and dancers	3473	2652	p	2652	Musicians, singers and composers
Street, night-club and related musicians, singers and dancers	3473	2653	p	2652	Dancers and choreographers
Clowns, magicians, acrobats and related associate professionals	3474	2659		2659	Creative and performing artists not elsewhere classified
Athletes, sportspersons and related associate professionals	3475	3421		3421	Athletes and sports players
Athletes, sportspersons and related associate professionals	3475	3422		3421	Sports coaches, instructors and officials
Athletes, sportspersons and related associate professionals	3475	3423	p	3421	Fitness and recreation instructors and program leaders
Religious associate professionals	3480	3413	p	3413	Religious associate professionals

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Stenographers and typists	4111	3341	p	4131	Office supervisors
Stenographers and typists	4111	4131	p	4131	Typists and word processing operators
Word-processor and related operators	4112	3341	p	4131	Office supervisors
Word-processor and related operators	4112	4131	p	4131	Typists and word processing operators
Data entry operators	4113	4132	p	4132	Data entry clerks
Calculating-machine operators	4114	3341	p	4132	Office supervisors
Calculating-machine operators	4114	4132	p	4132	Data entry clerks
Secretaries	4115	3341	p	4120	Office supervisors
Secretaries	4115	3342	p	4120	Legal secretaries
Secretaries	4115	3344	p	4120	Medical secretaries
Secretaries	4115	4120		4120	Secretaries (general)
Accounting and bookkeeping clerks	4121	3341	p	4311	Office supervisors
Accounting and bookkeeping clerks	4121	4311		4311	Accounting and bookkeeping clerks
Accounting and bookkeeping clerks	4121	4313		4311	Payroll clerks
Statistical and finance clerks	4122	3341	p	4312	Office supervisors
Statistical and finance clerks	4122	4312		4312	Statistical, finance and insurance clerks
Stock clerks	4131	3341	p	4321	Office supervisors
Stock clerks	4131	4321		4321	Stock clerks
Production clerks	4132	3341	p	4322	Office supervisors
Production clerks	4132	4322		4322	Production clerks
Transport clerks	4133	3341	p	4323	Office supervisors
Transport clerks	4133	4323		4323	Transport clerks
Library and filing clerks	4141	3341	p	4411	Office supervisors
Library and filing clerks	4141	4411		4411	Library clerks
Library and filing clerks	4141	4415		4411	Filing and copying clerks
Mail carriers and sorting clerks	4142	3341	p	4412	Office supervisors
Mail carriers and sorting clerks	4142	4412		4412	Mail carriers and sorting clerks
Coding, proof-reading and related clerks	4143	3252		4413	Medical records and health information technicians
Coding, proof-reading and related clerks	4143	3341	p	4413	Office supervisors
Coding, proof-reading and related clerks	4143	4413		4413	Coding, proof-reading and related clerks
Scribes and related workers	4144	3341	p	4414	Office supervisors
Scribes and related workers	4144	4414		4414	Scribes and related workers
Other office clerks	4190	3341	p	4110	Office supervisors
Other office clerks	4190	4110		4110	General office clerks
Other office clerks	4190	4227		4110	Survey and market research interviewers
Other office clerks	4190	4416		4110	Personnel clerks
Other office clerks	4190	4419		4110	Clerical support workers not elsewhere classified
Cashiers and ticket clerks	4211	4211	p	5230	Bank tellers and related clerks
Cashiers and ticket clerks	4211	4212	p	5230	Bookmakers, croupiers and related gaming workers
Cashiers and ticket clerks	4211	5230		5230	Cashiers and ticket clerks
Tellers and other counter clerks	4212	4211	p	4211	Bank tellers and related clerks
Bookmakers and croupiers	4213	4212	p	4212	Bookmakers, croupiers and related gaming workers

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Pawnbrokers and money-lenders	4214	4213		4213	Pawnbrokers and money-lenders
Debt-collectors and related workers	4215	4214		4214	Debt-collectors and related workers
Travel agency and related clerks	4221	4221	p	4221	Travel consultants and clerks
Receptionists and information clerks	4222	3341	p	4226	Office supervisors
Receptionists and information clerks	4222	4222		4226	Contact centre information clerks
Receptionists and information clerks	4222	4224		4226	Hotel receptionists
Receptionists and information clerks	4222	4225		4226	Enquiry clerks
Receptionists and information clerks	4222	4226		4226	Receptionists (general)
Receptionists and information clerks	4222	4229		4226	Client information workers not elsewhere classified
Telephone switchboard operators	4223	3341	p	4223	Office supervisors
Telephone switchboard operators	4223	4223		4223	Telephone switchboard operators
Travel attendants and travel stewards	5111	5111		5111	Travel attendants and travel stewards
Transport conductors	5112	5112		5112	Transport conductors
Travel guides	5113	5113		5113	Travel guides
Housekeepers and related workers	5121	5151		5152	Cleaning and housekeeping supervisors in offices, hotels and other establishments
Housekeepers and related workers	5121	5152		5152	Domestic housekeepers
Cooks	5122	3434		5120	Chefs
Cooks	5122	5120		5120	Cooks
Cooks	5122	9411		5120	Fast food preparers
Waiters, waitresses and bartenders	5123	5131		5131	Waiters
Waiters, waitresses and bartenders	5123	5132		5131	Bartenders
Child-care workers	5131	5311		5311	Child care workers
Child-care workers	5131	5312		5311	Teachers' aides
Institution-based personal care workers	5132	3258		5321	Ambulance workers
Institution-based personal care workers	5132	5321		5321	Health care assistants
Institution-based personal care workers	5132	5329		5321	Personal care workers in health services not elsewhere classified
Home-based personal care workers	5133	5322		5322	Home-based personal care workers
Personal care and related workers not elsewhere classified	5139	5164		5329	Pet groomers and animal care workers
Personal care and related workers not elsewhere classified	5139	5329		5329	Personal care workers in health services not elsewhere classified
Hairdressers, barbers, beauticians and related workers	5141	5141		5141	Hairdressers
Hairdressers, barbers, beauticians and related workers	5141	5142		5141	Beauticians and related workers
Companions and valets	5142	5162		5162	Companions and valets
Undertakers and embalmers	5143	5163		5163	Undertakers and embalmers
Other personal services workers not elsewhere classified	5149	5169	p	5169	Personal services workers not elsewhere classified
Astrologers and related workers	5151	5161	p	5161	Astrologers, fortune-tellers and related workers
Fortune-tellers, palmists and related workers	5152	5161	p	5161	Astrologers, fortune-tellers and related workers
Fire-fighters	5161	5411		5411	Fire fighters
Police officers	5162	5412		5412	Police officers
Prison guards	5163	5413		5413	Prison guards
Protective services workers not elsewhere classified	5169	5414	p	5414	Security guards
Protective services workers not elsewhere classified	5169	5419		5414	Protective services workers not elsewhere classified

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Fashion and other models	5210	5241		5241	Fashion and other models
Shop salespersons and demonstrators	5220	5222		5223	Shop supervisors
Shop salespersons and demonstrators	5220	5223		5223	Shop sales assistants
Shop salespersons and demonstrators	5220	5242		5223	Sales demonstrators
Shop salespersons and demonstrators	5220	5245		5223	Service station attendants
Shop salespersons and demonstrators	5220	5246	p	5223	Food service counter attendants
Shop salespersons and demonstrators	5220	5249		5223	Sales workers not elsewhere classified
Stall and market salespersons	5230	5211		5211	Stall and market salespersons
Stall and market salespersons	5230	5246	p	5211	Food service counter attendants
Field crop and vegetable growers	6111	6111	p	6111	Field crop and vegetable growers
Tree and shrub crop growers	6112	6112	p	6112	Tree and shrub crop growers
Gardeners, horticultural and nursery growers	6113	6113	p	6113	Gardeners, horticultural and nursery growers
Gardeners, horticultural and nursery growers	6113	9214		6113	Garden and horticultural labourers
Mixed-crop growers	6114	6114	p	6114	Mixed crop growers
Dairy and livestock producers	6121	6121	p	6121	Livestock and dairy producers
Poultry producers	6122	6122	p	6122	Poultry producers
Apiarists and sericulturists	6123	6123	p	6123	Apiarists and sericulturists
Mixed-animal producers	6124	6121	p	6121	Livestock and dairy producers
Mixed-animal producers	6124	6122	p	6121	Poultry producers
Mixed-animal producers	6124	6123	p	6121	Apiarists and sericulturists
Market-oriented animal producers and related workers not elsewhere classified	6129	5164		6129	Pet groomers and animal care workers
Market-oriented animal producers and related workers not elsewhere classified	6129	6129		6129	Animal producers not elsewhere classified
Market-oriented crop and animal producers	6130	6130	p	6130	Mixed crop and animal producers
Forestry workers and loggers	6141	6210	p	6210	Forestry and related workers
Charcoal burners and related workers	6142	6210	p	6210	Forestry and related workers
Aquatic-life cultivation workers	6151	6221	p	6221	Aquaculture workers
Inland and coastal waters fishery workers	6152	6222	p	6222	Inland and coastal waters fishery workers
Inland and coastal waters fishery workers	6152	7541	p	6222	Underwater divers
Deep-sea fishery workers	6153	6223	p	6223	Deep-sea fishery workers
Hunters and trappers	6154	6224		6224	Hunters and trappers
Subsistence agricultural and fishery workers	6210	6310		6330	Subsistence crop farmers
Subsistence agricultural and fishery workers	6210	6320		6330	Subsistence livestock farmers
Subsistence agricultural and fishery workers	6210	6330		6330	Subsistence mixed crop and livestock farmers
Subsistence agricultural and fishery workers	6210	6340		6330	Subsistence fishers, hunters, trappers and gatherers
Miners and quarry workers	7111	3121		8111	Mining supervisors
Miners and quarry workers	7111	8111	p	8111	Miners and quarriers
Shotfirers and blasters	7112	7542		7542	Shotfirers and blasters
Stone splitters, cutters and carvers	7113	7113	p	7113	Stonemasons, stone cutters, splitters and carvers
Builders, traditional materials	7121	7111	p	7111	House builders
Bricklayers and stonemasons	7122	7112		7112	Bricklayers and related workers
Bricklayers and stonemasons	7122	7113	p	7112	Stonemasons, stone cutters, splitters and carvers
Concrete placers, concrete finishers and related workers	7123	7114		7114	Concrete placers, concrete finishers and related workers

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Carpenters and joiners	7124	7115		7115	Carpenters and joiners
Building frame and related trades workers not elsewhere classified	7129	3123	p	7119	Construction supervisors
Building frame and related trades workers not elsewhere classified	7129	7111	p	7119	House builders
Building frame and related trades workers not elsewhere classified	7129	7119		7119	Building frame and related trades workers not elsewhere classified
Roofers	7131	7121		7121	Roofers
Floor layers and tile setters	7132	7122		7122	Floor layers and tile setters
Plasterers	7133	7123		7123	Plasterers
Insulation workers	7134	7124		7124	Insulation workers
Glaziers	7135	7125		7125	Glaziers
Plumbers and pipe fitters	7136	7126		7126	Plumbers and pipe fitters
Building and related electricians	7137	7411		7411	Building and related electricians
Painters and related workers	7141	7131		7131	Painters and related workers
Varnishers and related painters	7142	7132		7132	Spray painters and varnishers
Building structure cleaners	7143	7133		7133	Building structure cleaners
Building structure cleaners	7143	7544		7133	Fumigators and other pest and weed controllers
Metal moulders and coremakers	7211	7211		7211	Metal moulders and coremakers
Welders and flamecutters	7212	7212		7212	Welders and flamecutters
Sheet-metal workers	7213	7213		7213	Sheet-metal workers
Structural-metal preparers and erectors	7214	7214		7214	Structural-metal preparers and erectors
Riggers and cable splicers	7215	7215		7215	Riggers and cable splicers
Underwater workers	7216	7541	p	7541	Underwater divers
Blacksmiths, hammer-smiths and forging-press workers	7221	7221		7221	Blacksmiths, hammersmiths and forging press workers
Tool-makers and related workers	7222	7222		7222	Toolmakers and related workers
Machine-tool setters and setter-operators	7223	7223	p	7223	Metal working machine tool setters and operators
Metal wheel-grinders, polishers and tool sharpeners	7224	7224		7224	Metal polishers, wheel grinders and tool sharpeners
Motor vehicle mechanics and fitters	7231	7231		7231	Motor vehicle mechanics and repairers
Motor vehicle mechanics and fitters	7231	7234		7231	Bicycle and related repairers
Aircraft engine mechanics and fitters	7232	7232		7232	Aircraft engine mechanics and repairers
Agricultural- or industrial-machinery mechanics and fitters	7233	7127		7233	Air conditioning and refrigeration mechanics
Agricultural- or industrial-machinery mechanics and fitters	7233	7233		7233	Agricultural and industrial machinery mechanics and repairers
Electrical mechanics and fitters	7241	7412		7412	Electrical mechanics and fitters
Electronics fitters	7242	7421	p	7422	Electronics mechanics and servicers
Electronics fitters	7242	7422	p	7422	Information and communications technology installers and servicers
Electronics mechanics and servicers	7243	7421	p	7422	Electronics mechanics and servicers
Electronics mechanics and servicers	7243	7422	p	7422	Information and communications technology installers and servicers
Telegraph and telephone installers and servicers	7244	7422	p	7422	Information and communications technology installers and servicers
Electrical line installers, repairers and cable jointers	7245	7413		7413	Electrical line installers and repairers

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Electrical line installers, repairers and cable jointers	7245	7422	p	7413	Information and communications technology installers and servicers
Precision-instrument makers and repairers	7311	3214		7311	Medical and dental prosthetic technicians
Precision-instrument makers and repairers	7311	7311		7311	Precision-instrument makers and repairers
Musical instrument makers and tuners	7312	7312		7312	Musical instrument makers and tuners
Jewellery and precious-metal workers	7313	7313		7313	Jewellery and precious-metal workers
Abrasive wheel formers, potters and related workers	7321	7314		7314	Potters and related workers
Glass-makers, cutters, grinders and finishers	7322	7315		7315	Glass makers, cutters, grinders and finishers
Glass-makers, cutters, grinders and finishers	7322	7549		7315	Craft and related workers not elsewhere classified
Glass engravers and etchers	7323	7316	p	7316	Sign writers, decorative painters, engravers and etchers
Glass, ceramics and related decorative painters	7324	7316	p	7316	Sign writers, decorative painters, engravers and etchers
Handicraft workers in wood and related materials	7331	7317	p	7319	Handicraft workers in wood, basketry and related materials
Handicraft workers in wood and related materials	7331	7319	p	7319	Handicraft workers not elsewhere classified
Handicraft workers in textile, leather and related materials	7332	7318	p	7318	Handicraft workers in textile, leather and related materials
Compositors, typesetters and related workers	7341	7321	p	7322	Pre-press technicians
Compositors, typesetters and related workers	7341	7322	p	7322	Printers
Stereotypers and electrotypers	7342	7321	p	7321	Pre-press technicians
Printing engravers and etchers	7343	7321	p	7321	Pre-press technicians
Photographic and related workers	7344	8132	p	8132	Photographic products machine operators
Bookbinders and related workers	7345	7323	p	7323	Print finishing and binding workers
Silk-screen, block and textile printers	7346	7322	p	7322	Printers
Butchers, fishmongers and related food preparers	7411	7511		7511	Butchers, fishmongers and related food preparers
Bakers, pastry-cooks and confectionery makers	7412	7512		7512	Bakers, pastry-cooks and confectionery makers
Dairy-products makers	7413	7513		7513	Dairy-products makers
Fruit, vegetable and related preservers	7414	7514		7514	Fruit, vegetable and related preservers
Food and beverage tasters and graders	7415	7515		7515	Food and beverage tasters and graders
Tobacco preparers and tobacco products makers	7416	7516		7516	Tobacco preparers and tobacco products makers
Wood treaters	7421	7521		7521	Wood treaters
Cabinet-makers and related workers	7422	7522		7522	Cabinet-makers and related workers
Woodworking-machine setters and setter-operators	7423	7523	p	7523	Woodworking-machine tool setters and operators
Basketry weavers, brush makers and related workers	7424	7317	p	7317	Handicraft workers in wood, basketry and related materials
Fibre preparers	7431	7318	p	7318	Handicraft workers in textile, leather and related materials
Weavers, knitters and related workers	7432	7318	p	7318	Handicraft workers in textile, leather and related materials
Weavers, knitters and related workers	7432	8152	p	7318	Weaving and knitting machine operators
Tailors, dressmakers and hatters	7433	7531	p	7531	Tailors, dressmakers, furriers and hatters
Furriers and related workers	7434	7531	p	7531	Tailors, dressmakers, furriers and hatters
Textile, leather and related pattern-makers and cutters	7435	7532		7532	Garment and related pattern-makers and cutters
Sewers, embroiderers and related workers	7436	7533		7533	Sewing, embroidery and related workers
Upholsterers and related workers	7437	7534		7534	Upholsterers and related workers
Pelt dressers, tanners and fellmongers	7441	7535		7535	Pelt dressers, tanners and fellmongers
Shoe-makers and related workers	7442	7536		7536	Shoemakers and related workers
Mining-plant operators	8111	3121		8111	Mining supervisors

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Mining-plant operators	8111	8111	p	8111	Miners and quarriers
Mineral-ore- and stone-processing-plant operators	8112	8112		8112	Mineral and stone processing plant operators
Well drillers and borers and related workers	8113	8113		8113	Well drillers and borers and related workers
Ore and metal furnace operators	8121	3135	p	8121	Metal production process controllers
Ore and metal furnace operators	8121	8121	p	8121	Metal processing plant operators
Metal melters, casters and rolling-mill operators	8122	3135	p	8121	Metal production process controllers
Metal melters, casters and rolling-mill operators	8122	8121	p	8121	Metal processing plant operators
Metal-heat-treating-plant operators	8123	3135	p	8121	Metal production process controllers
Metal-heat-treating-plant operators	8123	8121	p	8121	Metal processing plant operators
Metal drawers and extruders	8124	3135	p	8121	Metal production process controllers
Metal drawers and extruders	8124	8121	p	8121	Metal processing plant operators
Glass and ceramics kiln and related machine operators	8131	8181	p	8181	Glass and ceramics plant operators
Glass, ceramics and related plant operators not elsewhere classified	8139	8181	p	8181	Glass and ceramics plant operators
Wood-processing-plant operators	8141	8172		8172	Wood processing plant operators
Paper-pulp plant operators	8142	3139	p	8171	Process control technicians not elsewhere classified
Paper-pulp plant operators	8142	8171	p	8171	Pulp and papermaking plant operators
Papermaking-plant operators	8143	3139	p	8171	Process control technicians not elsewhere classified
Papermaking-plant operators	8143	8171	p	8171	Pulp and papermaking plant operators
Crushing-, grinding- and chemical-mixing machinery operators	8151	8131	p	8131	Chemical products plant and machine operators
Chemical-heat-treating-plant operators	8152	3133	p	8131	Chemical processing plant controllers
Chemical-heat-treating-plant operators	8152	8131	p	8131	Chemical products plant and machine operators
Chemical-filtering- and separating-equipment operators	8153	3133	p	8131	Chemical processing plant controllers
Chemical-filtering- and separating-equipment operators	8153	8131	p	8131	Chemical products plant and machine operators
Chemical-still and reactor operators (except petroleum and natural gas)	8154	3133	p	8131	Chemical processing plant controllers
Chemical-still and reactor operators (except petroleum and natural gas)	8154	8131	p	8131	Chemical products plant and machine operators
Petroleum- and natural-gas-refining-plant operators	8155	3134		8131	Petroleum and natural gas refining plant operators
Petroleum- and natural-gas-refining-plant operators	8155	8131	p	8131	Chemical products plant and machine operators
Chemical-processing-plant operators not elsewhere classified	8159	3133	p	8131	Chemical processing plant controllers
Chemical-processing-plant operators not elsewhere classified	8159	8131	p	8131	Chemical products plant and machine operators
Power-production plant operators	8161	3131		3131	Power production plant operators
Steam-engine and boiler operators	8162	8182		8182	Steam engine and boiler operators
Incinerator, water-treatment and related plant operators	8163	3132		3132	Incinerator and water treatment plant operators
Automated-assembly-line operators	8171	3122	p	3139	Manufacturing supervisors
Automated-assembly-line operators	8171	3139	p	3139	Process control technicians not elsewhere classified
Industrial-robot operators	8172	3122	p	3139	Manufacturing supervisors
Industrial-robot operators	8172	3139	p	3139	Process control technicians not elsewhere classified
Machine-tool operators	8211	3122	p	7223	Manufacturing supervisors
Machine-tool operators	8211	7223	p	7223	Metal working machine tool setters and operators
Cement and other mineral products machine operators	8212	8114		8114	Cement, stone and other mineral products machine operators
Pharmaceutical- and toiletry-products machine operators	8221	3122	p	8131	Manufacturing supervisors
Pharmaceutical- and toiletry-products machine operators	8221	8131	p	8131	Chemical products plant and machine operators
Ammunition- and explosive-products machine operators	8222	3122	p	8131	Manufacturing supervisors

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Ammunition- and explosive-products machine operators	8222	8131	p	8131	Chemical products plant and machine operators
Metal finishing-, plating- and coating-machine operators	8223	3122	p	8122	Manufacturing supervisors
Metal finishing-, plating- and coating-machine operators	8223	8122		8122	Metal finishing, plating and coating machine operators
Photographic-products machine operators	8224	3122	p	8132	Manufacturing supervisors
Photographic-products machine operators	8224	8132	p	8132	Photographic products machine operators
Chemical-products machine operators not elsewhere classified	8229	3122	p	8131	Manufacturing supervisors
Chemical-products machine operators not elsewhere classified	8229	8131	p	8131	Chemical products plant and machine operators
Rubber-products machine operators	8231	3122	p	8141	Manufacturing supervisors
Rubber-products machine operators	8231	8141		8141	Rubber products machine operators
Plastic-products machine operators	8232	3122	p	8142	Manufacturing supervisors
Plastic-products machine operators	8232	8142		8142	Plastic products machine operators
Wood-products machine operators	8240	3122	p	7523	Manufacturing supervisors
Wood-products machine operators	8240	7523	p	7523	Woodworking-machine tool setters and operators
Printing-machine operators	8251	3122	p	7322	Manufacturing supervisors
Printing-machine operators	8251	7322	p	7322	Printers
Bookbinding-machine operators	8252	3122	p	7323	Manufacturing supervisors
Bookbinding-machine operators	8252	7323	p	7323	Print finishing and binding workers
Paper-products machine operators	8253	3122	p	8143	Manufacturing supervisors
Paper-products machine operators	8253	8143		8143	Paper products machine operators
Fibre-preparing-, spinning- and winding-machine operators	8261	3122	p	8151	Manufacturing supervisors
Fibre-preparing-, spinning- and winding-machine operators	8261	8151		8151	Fibre preparing, spinning and winding machine operators
Weaving- and knitting-machine operators	8262	3122	p	8152	Manufacturing supervisors
Weaving- and knitting-machine operators	8262	8152	p	8152	Weaving and knitting machine operators
Sewing-machine operators	8263	3122	p	8153	Manufacturing supervisors
Sewing-machine operators	8263	8153		8153	Sewing machine operators
Bleaching-, dyeing- and cleaning-machine operators	8264	3122	p	8157	Manufacturing supervisors
Bleaching-, dyeing- and cleaning-machine operators	8264	8154		8157	Bleaching, dyeing and fabric cleaning machine operators
Bleaching-, dyeing- and cleaning-machine operators	8264	8157		8157	Laundry machine operators
Fur- and leather-preparing-machine operators	8265	3122	p	8155	Manufacturing supervisors
Fur- and leather-preparing-machine operators	8265	8155		8155	Fur and leather preparing machine operators
Shoemaking- and related machine operators	8266	3122	p	8156	Manufacturing supervisors
Shoemaking- and related machine operators	8266	8156		8156	Shoemaking and related machine operators
Textile-, fur- and leather-products machine operators not elsewhere classified	8269	3122	p	8159	Manufacturing supervisors
Textile-, fur- and leather-products machine operators not elsewhere classified	8269	8159		8159	Textile, fur and leather products machine operators not elsewhere classified
Meat- and fish-processing-machine operators	8271	3122	p	8160	Manufacturing supervisors
Meat- and fish-processing-machine operators	8271	8160	p	8160	Food and related products machine operators
Dairy-products machine operators	8272	3122	p	8160	Manufacturing supervisors
Dairy-products machine operators	8272	8160	p	8160	Food and related products machine operators
Grain- and spice-milling-machine operators	8273	3122	p	8160	Manufacturing supervisors
Grain- and spice-milling-machine operators	8273	8160	p	8160	Food and related products machine operators
Baked-goods, cereal and chocolate-products machine operators	8274	3122	p	8160	Manufacturing supervisors

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Baked-goods, cereal and chocolate-products machine operators	8274	8160	p	8160	Food and related products machine operators
Fruit-, vegetable- and nut-processing-machine operators	8275	3122	p	8160	Manufacturing supervisors
Fruit-, vegetable- and nut-processing-machine operators	8275	8160	p	8160	Food and related products machine operators
Sugar production machine operators	8276	3122	p	8160	Manufacturing supervisors
Sugar production machine operators	8276	8160	p	8160	Food and related products machine operators
Tea-, coffee-, and cocoa-processing-machine operators	8277	3122	p	8160	Manufacturing supervisors
Tea-, coffee-, and cocoa-processing-machine operators	8277	8160	p	8160	Food and related products machine operators
Brewers-, wine and other beverage machine operators	8278	3122	p	8160	Manufacturing supervisors
Brewers-, wine and other beverage machine operators	8278	8160	p	8160	Food and related products machine operators
Tobacco production machine operators	8279	3122	p	8160	Manufacturing supervisors
Tobacco production machine operators	8279	8160	p	8160	Food and related products machine operators
Mechanical-machinery assemblers	8281	3122	p	8211	Manufacturing supervisors
Mechanical-machinery assemblers	8281	8211		8211	Mechanical machinery assemblers
Electrical-equipment assemblers	8282	3122	p	8212	Manufacturing supervisors
Electrical-equipment assemblers	8282	8212	p	8212	Electrical and electronic equipment assemblers
Electronic-equipment assemblers	8283	3122	p	8212	Manufacturing supervisors
Electronic-equipment assemblers	8283	8212	p	8212	Electrical and electronic equipment assemblers
Metal-, rubber- and plastic-products assemblers	8284	3122	p	8219	Manufacturing supervisors
Metal-, rubber- and plastic-products assemblers	8284	8219	p	8219	Assemblers not elsewhere classified
Wood and related products assemblers	8285	3122	p	8219	Manufacturing supervisors
Wood and related products assemblers	8285	8219	p	8219	Assemblers not elsewhere classified
Paperboard, textile and related products assemblers	8286	3122	p	8219	Manufacturing supervisors
Paperboard, textile and related products assemblers	8286	8219	p	8219	Assemblers not elsewhere classified
Other machine operators and assemblers	8290	3122	p	8183	Manufacturing supervisors
Other machine operators and assemblers	8290	8183		8183	Packing, bottling and labelling machine operators
Other machine operators and assemblers	8290	8189		8219	Stationary plant and machine operators not elsewhere classified
Other machine operators and assemblers	8290	8219	p	8219	Assemblers not elsewhere classified
Locomotive-engine drivers	8311	8311		8311	Locomotive engine drivers
Railway brakemen, signallers and shunters	8312	8312		8312	Railway brake, signal and switch operators
Motor-cycle drivers	8321	8321		8321	Motorcycle drivers
Car, taxi and van drivers	8322	8322		8322	Car, taxi and van drivers
Bus and tram drivers	8323	8331		8331	Bus and tram drivers
Heavy truck and lorry drivers	8324	8332		8332	Heavy truck and lorry drivers
Motorised farm and forestry plant operators	8331	8341		8341	Mobile farm and forestry plant operators
Earth-moving- and related plant operators	8332	8342		8342	Earthmoving and related plant operators
Crane, hoist and related plant operators	8333	8343		8343	Crane, hoist and related plant operators
Lifting-truck operators	8334	8344		8344	Lifting truck operators
Ships' deck crews and related workers	8340	8350		8350	Ships' deck crews and related workers
Street food vendors	9111	5212		5212	Street food salespersons
Street vendors, non-food products	9112	9520		9520	Street vendors (excluding food)
Door-to-door and telephone salespersons	9113	5243		5244	Door to door salespersons
Door-to-door and telephone salespersons	9113	5244		5244	Contact centre salespersons

ISCO-88 Title EN	ISCO88 code	ISCO 08 code	ISCO 08 partial	ISCO 08 study	ISCO 08 Title EN
Shoe cleaning and other street services elementary occupations	9120	9510		9510	Street and related service workers
Domestic helpers and cleaners	9131	9111		9111	Domestic cleaners and helpers
Helpers and cleaners in offices, hotels and other establishments	9132	9112		9112	Cleaners and helpers in offices, hotels and other establishments
Helpers and cleaners in offices, hotels and other establishments	9132	9412		9112	Kitchen helpers
Hand-laundrerers and pressers	9133	9121		9121	Hand launderers and pressers
Building caretakers	9141	5153		5153	Building caretakers
Vehicle, window and related cleaners	9142	9122		9129	Vehicle cleaners
Vehicle, window and related cleaners	9142	9123		9129	Window cleaners
Vehicle, window and related cleaners	9142	9129		9129	Other cleaning workers
Messengers, package and luggage porters and deliverers	9151	9621	p	9621	Messengers, package deliverers and luggage porters
Doorkeepers, watchpersons and related workers	9152	5414	p	5414	Security guards
Doorkeepers, watchpersons and related workers	9152	9621	p	5414	Messengers, package deliverers and luggage porters
Doorkeepers, watchpersons and related workers	9152	9629		5414	Elementary workers not elsewhere classified
Vending-machine money collectors, meter readers and related workers	9153	9623		9623	Meter readers and vending-machine collectors
Garbage collectors	9161	9611		9611	Garbage and recycling collectors
Garbage collectors	9161	9612	p	9611	Refuse sorters
Sweepers and related labourers	9162	9613		9622	Sweepers and related labourers
Sweepers and related labourers	9162	9622		9622	Odd job persons
Sweepers and related labourers	9162	9624		9622	Water and firewood collectors
Farm-hands and labourers	9211	9211		9214	Crop farm labourers
Farm-hands and labourers	9211	9212		9214	Livestock farm labourers
Farm-hands and labourers	9211	9213		9214	Mixed crop and livestock farm labourers
Farm-hands and labourers	9211	9214		9214	Garden and horticultural labourers
Forestry labourers	9212	9215		9215	Forestry labourers
Fishery, hunting and trapping labourers	9213	9216		9216	Fishery and aquaculture labourers
Mining and quarrying labourers	9311	9311		9311	Mining and quarrying labourers
Construction and maintenance labourers: roads, dams and similar constructions	9312	9312		9312	Civil engineering labourers
Building construction labourers	9313	9313		9313	Building construction labourers
Assembling labourers	9321	9329	p	9329	Manufacturing labourers not elsewhere classified
Assembling labourers	9321	9612	p	9329	Refuse sorters
Hand packers and other manufacturing labourers	9322	9321		9329	Hand packers
Hand packers and other manufacturing labourers	9322	9329	p	9329	Manufacturing labourers not elsewhere classified
Hand or pedal vehicle drivers	9331	9331		9331	Hand and pedal vehicle drivers
Drivers of animal-drawn vehicles and machinery	9332	9332		9332	Drivers of animal-drawn vehicles and machinery
Freight handlers	9333	9333		9333	Freight handlers
Freight handlers	9333	9334		9333	Shelf fillers

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InGRID

Inclusive Growth Research Infrastructure Diffusion

Referring to the EU2020-ambition of Inclusive Growth, the general objectives of InGRID – Inclusive Growth Research Infrastructure Diffusion – are to integrate and to innovate existing, but distributed European social sciences research infrastructures on ‘Poverty and Living Conditions’ and ‘Working Conditions and Vulnerability’ by providing transnational data access, organising mutual knowledge exchange activities and improving methods and tools for comparative research. This integration will provide the related European scientific community with new and better opportunities to fulfil its key role in the development of evidence-based European policies for Inclusive Growth. In this regard specific attention is paid to a better measurement of related state policies, to high-performance statistical quality management, and to dissemination/outreach activities with the broader stakeholder community-of-interest, including European politics, civil society and statistical system.

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More detailed information is available on the website: www.inclusivegrowth.be

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Infrastructure Diffusion
Contract No 312691

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