A method for measuring detailed demand for workers' competences

Robert Pater, Jaroslaw Szkola, and Marcin Kozak

Abstract

There is an increasing need for analysing demand for skills at labour markets. While most studies aggregate skills in groups or use available proxies for them, the authors analyse companies' demand for individual competences. Such an analysis better reflects reality, because companies usually require from future workers particular competences rather than generally defined groups of skills. However, no method exists to analyse on a large scale which competences are required by employers. At a detailed level, there are hundreds of competences, so this demand cannot be measured in a sample survey. The authors propose a method for a continuous and efficient analysis of demand for new workers' competences. The method is based on gathering internet job offers and analysing them with data mining and text analysis tools. They applied it to analyse transversal competences on a Polish labour market during November 2012–December 2015. The authors used the detailed European Commission classification of transversal competences. They found that within the general groups of competences, companies required only certain ones, especially 'language and communication competences' and neglected others. The companies' requirements were countercyclical, that is, they increased them during recession and decreased them during economic expansion. However, the structure of the demanded competences did not change during the analysed period, suggesting that the structure is relatively stable, at least over the business cycle. The method can be used continuously. Various institutions can analyse and publish up-to-date information on the current demand for competences as well as tendencies in this demand.

Authors

Robert Pater, Department of Economics, University of Information Technology and Management, Rzeszów, Poland, rpater@wsiz.rzeszow.pl
Jaroslaw Szkola, Department of Information Systems Application, University of Information Technology and Management, Rzeszów, Poland
Marcin Kozak, Department of Quantitative and Qualitative Methods, University of Information Technology and Management, Rzeszów, Poland

1. Introduction

Looking for a job? If so, do you know what employers expect from you? The said truth is, job seekers often do not know the detailed expectations. Lack of sharing of information—here, between job seekers and employers—is called information friction. One of the most important reasons behind the structural mismatch between job seekers and employers, such information friction leads to long-lasting unemployment. Boudarbat and Chernoff (2012) claim that in building this mismatch, educational characteristics are more important than demographic and socioeconomic ones. When job seekers and employers have different information about the employment needs, the former may choose unsuitable fields of education and invest in unsuitable skills. Unsuitable educational policy may also lead to a higher or lower labour supply than is needed in some fields of education or skills. Also, requirements for a job can evolve more dynamically than skills of job seekers.

From a macroeconomic perspective, workers' skills or, more accurately, competences are measured in various studies. Examples include OECD's Survey of Adult Skills from the Program of International Assessment of Adult Competences (McGowan and Andrews 2015) and country-specific student test scores (Nordin et al. 2010). These studies provide measures of the supply of competences on the labour market. However, companies' demand for competences and competence mismatch are measured only from a microeconomic perspective (for example, Winterton et al. 2006) while similar studies are lacking from a macroeconomic perspective.

Is it worth analysing demand for individual competences? Hershbein and Kahn (2017) argue that looking directly at skill requirements in job offers instead of assuming the skills associated with a particular occupation permits to document the evolution in skill requirements for this occupation over time. Deming and Kahn (2017) categorize keywords representing skills found in Internet job offers and analyse relations between the keywords and wages as well as company performance. Various authors have analysed the importance of particular groups of skills. Deming (2017), for example, shows evidence for growing demand for social skills. But which social skills are particularly required? We need careful studies of the labour market to answer this question—and this is what we aim to do in this paper. To this end, we disaggregate competences into individual ones and analyse their changing importance within groups of skills.

Demand for specific competences, not only for occupations, is important from both theoretical and economic policy points of view. The OECD Skills Strategy (2011) formulates policy about the change, importance, and potential demand for skills. Specific, fast, and continuous information on the real demand for skills is scarce, however. As more and more countries adapt the Strategy, there is a growing need for continuous and detailed information on skills demand.

Chevalier (2011) shows that although the gap in mean salaries between studied fields is smaller than within them, the within-field variation can still be considerable. This is because absolvents of a particular field of study, though sharing the most representative competences for their field, do not share all competences. If these are not qualification or job-related competences, then they have to be transversal (general) competences.

Nordin et al. (2010) and Zhu (2014) argue that workers with job-specific competences are less likely to be horizontally mismatched than those with mainly transversal competences. Somers et al. (2016) state that general skills allow a job seeker to apply to a wider variety of jobs, thereby increasing his or her chances to get a job only indirectly related to his or her field of study. According to the human capital theory, general skills are desired because they increase workers' productivity in a wider range of occupations than do specific skills (Becker 1964).

In this article, we propose a method for a continuous and efficient analysis of demand for transversal competences. Our first research question is as follows: What is the demand for individual transversal competences, and how does it change? We do not consider other elements

of job offers, such as occupation, qualification or detailed job-related competences. While there has been a lot of research on diploma and occupation requirements, research on requirements for transversal competences has been scarce. One reason for this is a lack of methodological research that would enable such analyses. Thus, previous studies either present demand for skills from an aggregate perspective or analyse measures of job-related skills. Detailed requirements in job offers have been studied only at occupation and geographical levels (Şahin et al. 2014), at a company level (Modestino et al. 2016), or by job title (Marinescu and Wolthoff 2016). We focus on individual transversal competences, filling the gap in the existing literature.

Our second research question is as follows: How can we continuously measure demand for individual competences? We propose a method for this, based on gathering and analysing Internet job offers. There is a growing literature on the use of online job offers (see e.g. Kuhn and Skuterud (2004), Kuhn and Mansour (2011) and citations therein), and the market of online jobs has been rapidly developing for over a decade—thus this field offers interesting research possibilities. We will show the usefulness of the proposed method for analysing the labour market in the context of measuring the detailed structure of vacancies in terms of transversal competences. An imperfect measure of vacancies (Abraham 1987), job offers used for measuring competences have an advantage over competitive methods, all based on surveys of employers. Since employers are interested in finding efficient workers, they are also interested in listing relevant skills in job offers. Thus analysing job offers should give more accurate information about demanded skills than do surveys of employers, more and more difficult to conduct for the simple reason that employers do not want to take part in such surveys.

The question is whether Internet job offers can represent the whole vacancy market. In the second decade of 21st century, most job offers are published in the Internet. Internet penetration in Poland (but also in most European countries) is high: in 2015, 92.7% of companies and 75.8% of households had Internet access (Central Statistical Office 2016). Thus, Internet offers will be found by most job seekers. Pavlicek and Kristoufek (2015) show that job seekers in Poland extensively use the Internet to search for jobs and that their activity is related to the tendencies in unemployment rate.

Internet data are relatively easy and cheap to gather continuously. Based on such data, one can analyse the detailed profile of an average needed worker and changes of this profile over time. Such an analysis can be conducted for any frequency, if only one has such data and is able to process them; here, we will work with monthly data. The proposed method also makes it possible to search the gathered database freely and analyse it according to new criteria. All in all, Internet job offers represent the major part of the vacancy market, whose specificity makes it possible to analyse it with high frequency.

The article is organized as follows. The next section reviews definitions and classifications of workers' competences. The third section shows the research method proposed. In the fourth section, we apply the method for the Polish labour market and discuss the results. The last section summarizes the article, focusing on the usefulness of the method.

2. Measures of a competence

Job seekers need to know not only the demand for their education fields, but also for the skills or competences they have or might gain. Since the work of McClelland (1973), competence has been the main trait describing a worker's performance. Boyatzis (1982) perceives competence as 'an underlying characteristic of a person which results in effective and/or superior performance in a job.' In the economic literature, the term 'skill' is commonly used in a broad sense, encompassing all competences, and even other personality traits, like field(s) of education (qualification) or experience (see e.g. Hershbein and Kahn 2017). We decided to use the term 'competence' in meaning used by McClelland. In particular, the meaning thus does not mix competences with other personality traits, most notably with qualifications and occupations.

Most of the literature focuses on establishing competence models in a specific sector, organisation, or job. The competence model is a set of competences a worker should have to correctly do work. However, only a few general classifications of competences exist. According to a so-called KSAO concept, competence includes Knowledge, Skills, Abilities and Other characteristics, such as attitudes. Mitrani et al. (1992) understands competence as a set of traits, self-concepts, motives, values, knowledge, attitudes and behavioural and cognitive skills. Shippmann et al. (2000) underline that a 'worker's competence' must be reliably measured to assess job performance. Armstrong (2012) states that 'competency' should be distinguished from 'competence': 'competency' is connected to personal or 'soft' skills (behavioural area) while 'competence' to functional area or 'hard' skills. However, Winterton et al. (2006) find that these two terms are used inconsistently, so they propose to use just one term, 'competence,' and present a two-dimensional typology of the competence that covers both these meanings (Figure 1). We will use this typology and the term 'competence.'

Conceptual   Cognitive   Meta

Operational   Functional   Social

Occupational   *Personal*
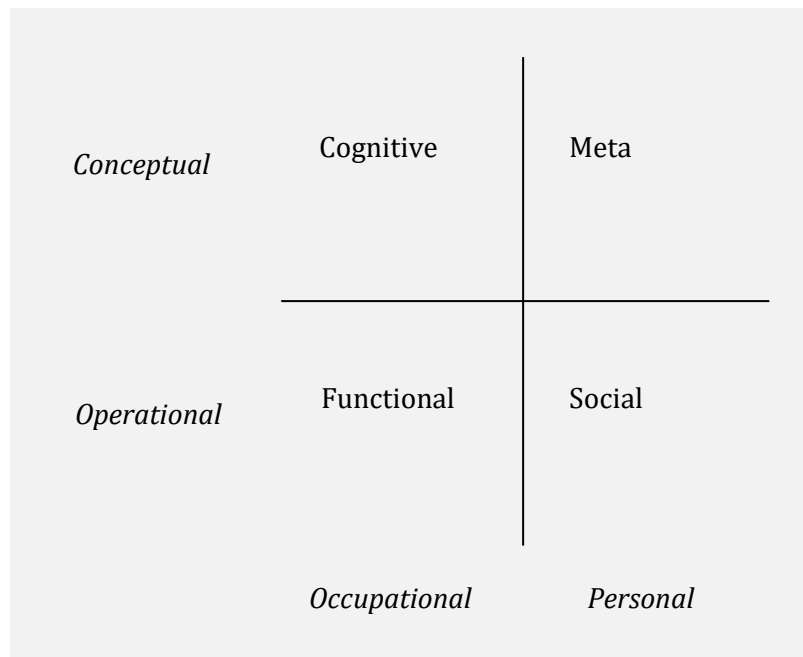
Figure 1: The typology of competence by Winterton et al. (2006)

Spencer and Spencer (1993) define competence as 'an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation.' They present an iceberg classification of competences, dividing them to central and surface competences. Just as the bottom part of an iceberg is hidden under water, some competences are deeply rooted, hard to see at first and change, while others are visible and mostly manageable. This classification defines the following five layers of competences:

- motives: what people consistently think;
- traits: physical characteristics and consistent behaviour;
- self-concept: attitudes, self-image and values;
- knowledge: sum of information in specific areas; and
- skills: abilities to perform a specific mental and physical task.

International Standard Classification of Occupations (ISCO-08) bases on skills, defining them as 'the ability to carry out the tasks and duties of a given job' (International Labour Office 2012). This classification assumes that education can lead to the certain level of a worker's skills. Skill levels in this classification are measured according to the complexity and range of tasks performed in a given job. The skill levels are

- skill level 1 (primary education): performance of routine physical tasks (elementary occupations);
- skill level 2 (secondary education): operating, maintenance and repairing of machinery and equipment, manipulation of information (clerical support workers);
- skill level 3 (first stage of tertiary education): performance of complex practical and technical tasks that require extensive knowledge in a specialized field (technicians, associate professionals, managers); and
- skill level 4 (second stage of tertiary education): performance of tasks that require creativity, complex problem-solving, decision-making, extensive theoretical and factual knowledge in a specialized field (managers, professionals).

United Nations Industrial Development Organization (2002) groups competences in three categories:

- managerial: essential for supervisory responsibility;
- generic: essential for all staff; and
- technical/functional: essential for any job within a defined area.

Each of these categories have three levels of proficiency: knowledgeable, proficient and advanced.

Occupational Information Network presented another classification of competences (so-called O*Net; see, e.g., Deming 2017), popular in the American literature. It divides skills into six categories: basic, complex problem solving, resource management, social, systems, and technical skills. Each of them contains from one to eleven skills.

The European Commission, however, devised a more detailed classification for Europe. European Commission treats competences as links between occupation and qualification. The latter is defined as a 'formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards' (European Commission 2015). European Commission divides competences to job-specific and transversal. The former are broken down into categories according to occupation while the latter into 5 categories with 2-5 subcategories, divided by classes (43 in all). The categories with subcategories of the transversal competences are as follows:

- attitudes and values at work: values and attitudes;
- application of knowledge: information and communications, numeracy and mathematics, safety and the working environment;
- social skills and competences: working with others, leading others;
- language and communication: non-verbal and verbal communication, mother tongue and foreign language; and
- thinking skills and competences: learning, critical thinking, creative and entrepreneurial thinking, problem-solving, planning own work.

General classifications of competences share the following drawback: they attribute competences only to a particular occupation or sector. Thus any general classification may not include all possible competences. This is why we took the effort to look only at transversal competences, which can be classified globally, instead of job-specific ones, which should rather be analysed according to a particular job or sector.

3. Research method

3.1. The data

In November 2004, we started to study the market of job offers as a source of information about vacancies in Poland. During 2004-2008, we gathered job offers published in 'Gazeta Wyborcza,' back then the most popular Polish daily newspaper. We also received from 'Gazeta Wyborcza' the data for 1999-2003. During 1990s and early 2000s, the market of job offers in Poland was underdeveloped. The newspaper estimated that in 2004 it published about 70% of all job offers from Poland. Following the development of Internet websites with job offers in Poland, in 2008 we started to use them as a primary source of information about vacancies. Unfortunately, it is impossible to estimate what part of the whole market of job offers we covered in the study. We used an index form of this measure (year 2000=100), not the absolute number of job offers. Such an index proved to be a good leading indicator for unemployment because it was able to predict turning points for the unemployment rate with a few months lead. To some extent, this index also showed structural mismatch between participants of the labour market (Drozdowicz-Bieć et al. 2006; Pater 2006).

In November 2012, we started to gather job offers from all respected vacancy market websites in Poland (see Table 2 in the Appendix). These were both country-wide general websites, containing job offers for all sectors and occupations, and sectoral websites. We disregarded small local websites because they have a low share of job offers containing detailed skill requirements we aim to analyse. We gathered the data using a computer script that automated the procedure. Since then, the data have been collected on a monthly basis, at the end of a month. All job offers are downloaded and saved on a server. In the analysis (see below for details), we count only offers that are unique on a national scale. During the studied period, we failed to complete data in three months: June 2013, March 2015 and July 2015. This was due to sudden changes in some of the web designs or structure from which we gather the job offers, because of which the algorithm failed to appropriately locate the job offers. It forced us to change the gathering algorithm. Unfortunately, the changes were delayed, so even after updating the algorithm we could not collect the data for these three months.

Gathered at the end of a month, job offers do not constitute all vacancies in the economy but their specific fraction. They are the stock of vacancies at the last day of a month. Not all job offers are included because (i) vacancies posted on Internet stay on websites for unknown and varying time and (ii) vacancies not posted on Internet are missed. Because of the latter reason, vacancies from public sector and for jobs requiring lower education are quite likely underrepresented. If an advertisement is for more than one job, we counted as one advertisement and one job offer.

Another measure of vacancies in Poland is a number of job offers in public employment offices. Polish companies are supposed to post every job vacancy in a public employment office (Act on promotion of employment and labour market institutions 2004); however, this regulation is frequently ignored. In 2012 only around 50% of companies posted job offers at public employment offices and this share has decreased to 44% in 2015 (National Bank Of Poland 2012). Still another measure of vacancies in Poland is a quarterly representative survey of vacancies conducted since 2005 by the Central Statistical Office of Poland. Figure 2 presents the three measures of vacancies: Internet job offers from our data set, job offers from public employment offices and vacancies from the representative survey. From October 2012 to December 2015, the stock of Internet job offers was 45% higher than the stock of job offers from public employment offices and 48% higher than the number of job offers in the Central Statistical Office survey. It was 40% lower than the flow of the vacancies by Central Statistical Office and also most of the time lower than the number of job offers from the public employment offices.

During November 2012–December 2015, we collected on the analysed websites on average 83.4 thousand unique job offers at the last day of a month (with standard deviation of 18.6 thousand). The changes in Internet job offers were similar to changes in business cycle, measured by growth rate of real Gross Domestic Product. During 2012 – 2014, we can observe a post-crisis expansion on the Polish vacancy market. The number of Internet job offers increased from 42.4 thousand at the end of 2012Q4 to 94.1 thousand at the end of 2014Q1. In 2014, the real Gross Domestic Product growth rate stabilised. Companies reacted by decreasing labour demand for new workers (to 72.4 thousand job offers at the end of 2014Q4). In 2015, Gross Domestic Product again started to grow slightly faster, which led to an increased number of posted vacancies to 93.9 thousand at the end of 2015Q4.
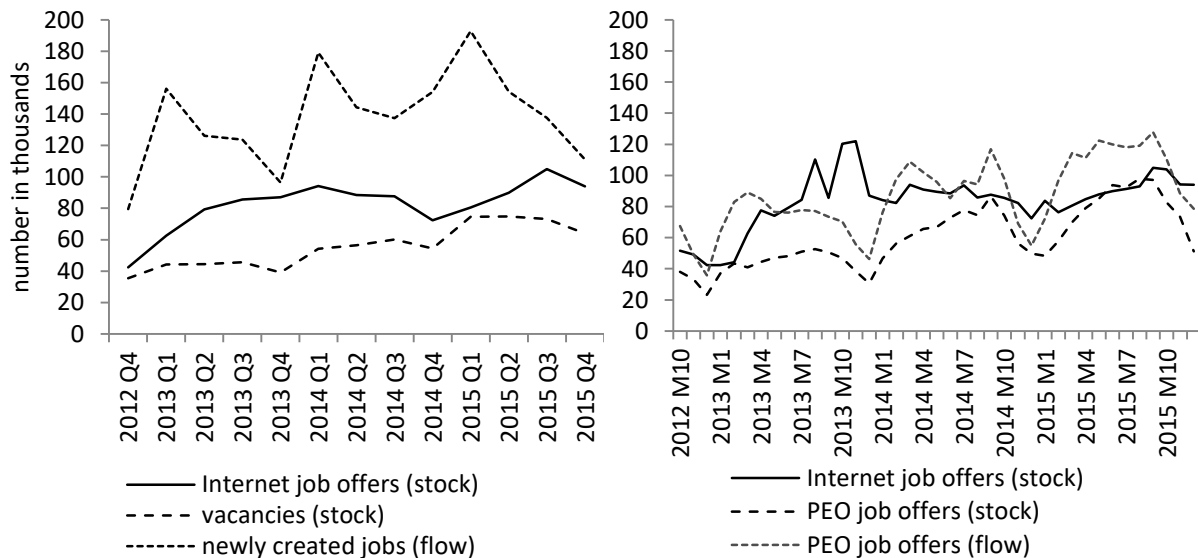
Figure 2: Internet job offers, job offers from public employment offices (PEO), vacancies and newly created jobs (in thousands)
Vacancies (stock) and newly created jobs (vacancy flow) come from the quarterly representative survey on the Demand for Labour conducted by Central Statistical Office in Poland. Internet job offers on the left chart are presented for the end of a quarter. Stock describes data at the end of a month or a quarter while flow, data for the whole month or quarter.

3.2. The algorithm of searching for competences in job offers

At the last day of each month during the studied period, all job offers were downloaded from the studied websites (see Table 2 in the Appendix) and stored in a local database in the original HTML format. First, we applied parsing to the data: the data stored in the standard HTML format were converted into plain text. Parsing removes such information as font size, colour, and other formatting tags.

After parsing, we lemmatised the data, that is, we identified the basic forms of all the words in the text (for example, verbs were transformed to their infinitives while nouns to their nominative cases in singular forms). For this, we developed a tool based on the Morfologik-stemming-1.9.0 library. For some words forming the competences, this library provides inconsistent lemmatised words. To deal with such situations that we spotted during the analysis, we created an additional dictionary of exceptions. At this stage, our most important task was to find specific competences in the texts of job offers. Because job offers can contain various words to describe the same competence, the algorithm should deal with the following situations:

a) the competence is mentioned in the sentence;

b) the competence is mentioned in the sentence, but with different words than in the dictionary.

7

To solve this problem, we first prepared a list of competences (based on the European Commission list of transversal competences, likely the most detailed such classification). Our approach enables us to obtain data on individual competences. Its another advantage is that it helps us detect various terms companies use to describe competences, enabling us to increase the dictionary's size. For this, we created a dictionary of synonyms based on three dictionaries (www.slownik-synonimow.eu, www.synonimy.pl, and sjp.pwn.pl). With a larger dictionary—with more phrases (including colloquial ones) describing competences and their groups—we will obtain more accurate representation of the competences demand in the labour market.

Now job offers and the dictionary of competences had the same form, so we were able to search the offers for the competences. We noticed that some of the competences were too specific for employers, for example, 'explain mathematical findings,' or 'make appropriate use of eye contact'; instead of them, employers demanded competences defined in a general way. Thus, we also searched job offers for classes of competences. For the two above examples, these were 'communicate mathematical work process' (which includes 'explain mathematical findings') and 'use non-verbal cues' (which includes 'make appropriate use of eye contact'). While none of these two competences occurred in job offers, the classes they are from did occur.

3.3. Data analysis

In the Results section, we present a number of competences per job offer. In the case of categories, subcategories, and classes of competences, one job offer can include more than one competence of a given type. That is why the number of competences per job offer in these groups of competences cannot be interpreted as shares. If a single competence occurred twice in one job offer (for example because the offer was for two positions), we counted it once. So, for a given competence, we can interpret its number per job offer as a share of job offers that contain the competence.

We study co-occurrence of competences by counting how many times their pairs (over 32 thousand) and triplets (over 513 thousand) occurred together in the same job offer. To analyse similarities in time changes between classes of competences, we apply Pearson's correlation coefficient for monthly occurrences of the classes in job offers.

The data were analysed with exploratory data analysis and graphical methods in Microsoft Excel and R (R Core Team 2016).

4. Results

4.1. Tendencies

In unique Internet job offers published during November 2012–December 2015, competences occurred on average 240.2 thousand times per month, which gives 2.8 unique competences per job offer (with 0.3 standard deviation). These two measures had quite a visible tendency over time (Figure 3); during the whole analysed period, companies increased their requirements by 0.7 competence. The lowest number of competences per job offer was at the beginning of the analysed period (2.2 competences on average). It grew until February 2015, when it reached 3.1 competences per job offer. In the next month, it slowly began to decrease, reaching 2.9 competences in December 2015.

The unemployment rate in Poland was slowly increasing since mid-2008, when the crisis affected the Polish labour market. The negative tendency continued even during the post-crisis recovery. Although the pace of growth of unemployment had slowed during 2011, it accelerated again in 2012. From 2009 to the beginning of 2012, the number of Internet job offers in Poland was increasing fast. This might indicate an increasing structural mismatch on the Polish labour market during 2009-2012. These changes were followed by an economic slowdown, which lasted until September 2013. During this period, unemployment and vacancies changed in

opposite directions: unemployment increased while vacancies decreased. Interestingly, during this slowdown, employers increased requirements from candidates for their vacancies because the number of competences per job offer increased. This increase might be due to the mismatch identified earlier and the period of low labour market tightness, represented by a low vacancy-to-unemployment ratio. Low labour market tightness means low labour demand and high competition between job seekers to get a job. That is why during this period employers may have had high requirements from their future workers. However, during economic slowdowns, employers may also generally search for more competent – although fewer – workers than during economic expansions. Since October 2013, the unemployment rate slowly started to decrease, but the number of competences per job offer was still increasing. It took over a year to stabilize this number in the presence of the growing labour market tightness. With decreasing unemployment and fewer people looking for a job, employers had problems with finding new workers; thus they stopped increasing their requirements from candidates and even decreased them slightly. Higher but longer-lasting job requirements during recession were also reported for the U.S. economy by Hershbein and Kahn (2017). They called this process 'upskilling'. Long-lasting upskilling effects were found in the U.S. regions that suffered most severely during the Great Recession of 2007-2010. Since this recession was milder in Poland, upskilling may have had smaller and shorter impact on the labour market. Modestino et al. (2016) reported downskilling for the U.S. economy after the Great Recession.
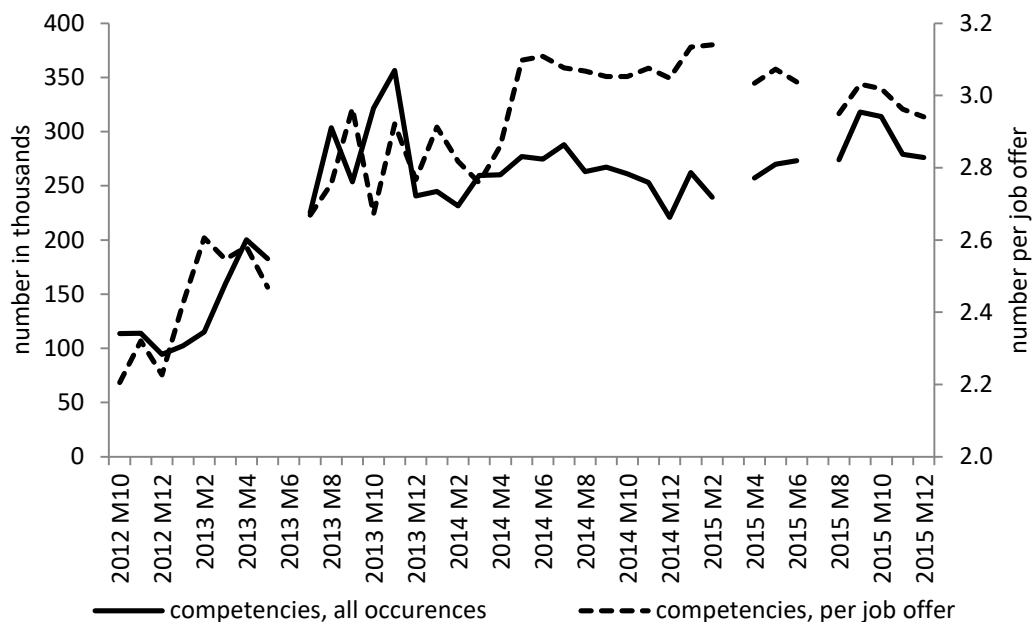
Figure 3: Transversal competences: all occurrences (left scale) and per job offer (right scale)

4.2. Popularity

European Commission divides transversal competences into five categories. Representing a structure of the competences, these categories consist of sub-categories, which in turn include classes containing single competences. This structure was fairly stable within the analysed period (see Table 1, and Table 3 in the Appendix for a detailed classification). The most frequent competences were those related to 'language and communication' as well as 'attitudes and values at work' while the least frequent was 'application of knowledge.'

Among the category 'attitudes and values at work,' Polish employers searched for workers having strong 'attitudes' rather than 'values.' This subcategory had the largest number of competences posted in vacancies: 0.81 competences from this category appeared in an average job offer. Especially desired was 'demonstrate commitment' (0.77 competences per job offer) and within this class, the following individual competences: 'meet commitments,' 'work

independently,' and 'attend to detail.' However, 'make an effort,' 'show enthusiasm,' and 'work efficiently' also occurred in many job offers. Among the 'values at work' subcategory (0.12 per job offer), 'show good manners' occurred most often.

Table 1: Number of transversal competences per job offer in Poland, November 2012–December 2015

Category	Competences	Mean	Min	Max	First	Last
I	Attitudes and values at work	0.93	0.72	1.03	0.72	0.95
II	Application of knowledge	0.05	0.04	0.06	0.04	0.05
III	Social skills and competences	0.30	0.21	0.35	0.21	0.32
IV	Language and communication	0.99	0.77	1.10	0.77	1.00
V	Thinking skills and competences	0.60	0.46	0.67	0.46	0.62
	All	2.88	2.21	3.14	2.21	2.94

Mean: mean no. of competences per job offer throughout the studied period; min, max: minimum and maximum mean no. of competences per job offer in a month; first, last: no. of competences per job offer in the first and last months of the analysis.

No competence in the 'application of knowledge' category constituted at least a percent of all. 'Information and communication' with 'numeracy and mathematics' together consisted 0.05 competences per average job offer.

In 'social skills and competences,' the most important class of competences for employers was 'work as part of a team' (0.19 per job offer), but companies did not search for any specific competence, for example 'share opinions or information,' 'collaborate on tasks.' Instead, they defined their requirements more generally. 'Leading others' (but 'build relationships' rather than 'exercise responsibility') was half as important as 'work as part of a team.'

The category of competences 'language and communication' was so popular due to the demand for workers with 'verbal communication' and 'language skills.' These two competences were equally frequent (0.50 competences per job offer each). In the 'verbal communication' subcategory, the need of 'negotiating' and 'knowledge of presentation techniques' was often underlined. The most popular foreign languages were 'English' and 'German.' Companies did not, however, consider 'non-verbal communication' important.

There were 0.60 'thinking skills and competences' per average job offer. In the majority of job offers containing competences from this category, companies expected 'plan own work' skills (0.38 competences per job offer), especially 'manage time.' 'Problem-solving' (0.10 competences per job offer) was on the second place, with the 'troubleshoot' competence being the most popular. 'Creative thinking,' 'critical thinking,' and 'learning' were less popular.

During the analysed period, a positive tendency occurred for four classes of competences out of 43, namely, 'demonstrate commitment,' 'examine evidence,' 'manage the learning self,' and 'work as part of a team'. For most classes of competences, we observed a positive but unstable trend in a number per job offer. Some of them, for example 'exercise responsibility' or 'take action to solve a problem,' had been at a stable level for at least a year since the beginning of the analysed period and then this level shifted up and remained higher till the end. The other classes increased over time, but with large fluctuations, without any clear trend. For ten classes, the number of competences per job offer increased in the middle of the analysed period and then again decreased. Examples are 'set targets' and 'turn new ideas into action.' Nine classes of competences have shown no visible tendency.

In 2015, 'meet commitments' (category I) became slightly less important for companies, while 'work as part of a team' (category III) and 'take action to solve the problem' (category V) slightly more important than in 2012. Among the five categories, demand for competences from

10

category II was most stable. From category IV, companies started to value 'language skills' slightly more than 'verbal communication.' English language became even more important.

Among particular competences, 'English' occurred most often (in 30% of all job offers, Figure 4). Several other languages were also among the most wanted competences, with German being second most wanted language (it occurred in 11% of job offers). 'Work out time line' was the second most desired competence (category V). The most frequent were competences from the category 'attitudes and values at work,' especially 'meet commitments,' 'work independently,' and 'attend to details.' Besides languages, 'verbal communication' subcategory of category I was among the most frequent. 'Facilitate groups' from social competences occurred on the 14th place. The second thinking competence, 'use operating systems' (category V), was on the 22nd place. The most frequently wanted competences from the 'application of knowledge' category, 'demonstrate tolerance' and 'use electronic databases,' were on the 20th and 25th place. For the competences 'German' and 'demonstrate tolerance,' we can observe short periods with untypically many occurrences. So, these competences occurred unevenly during the analysed period.
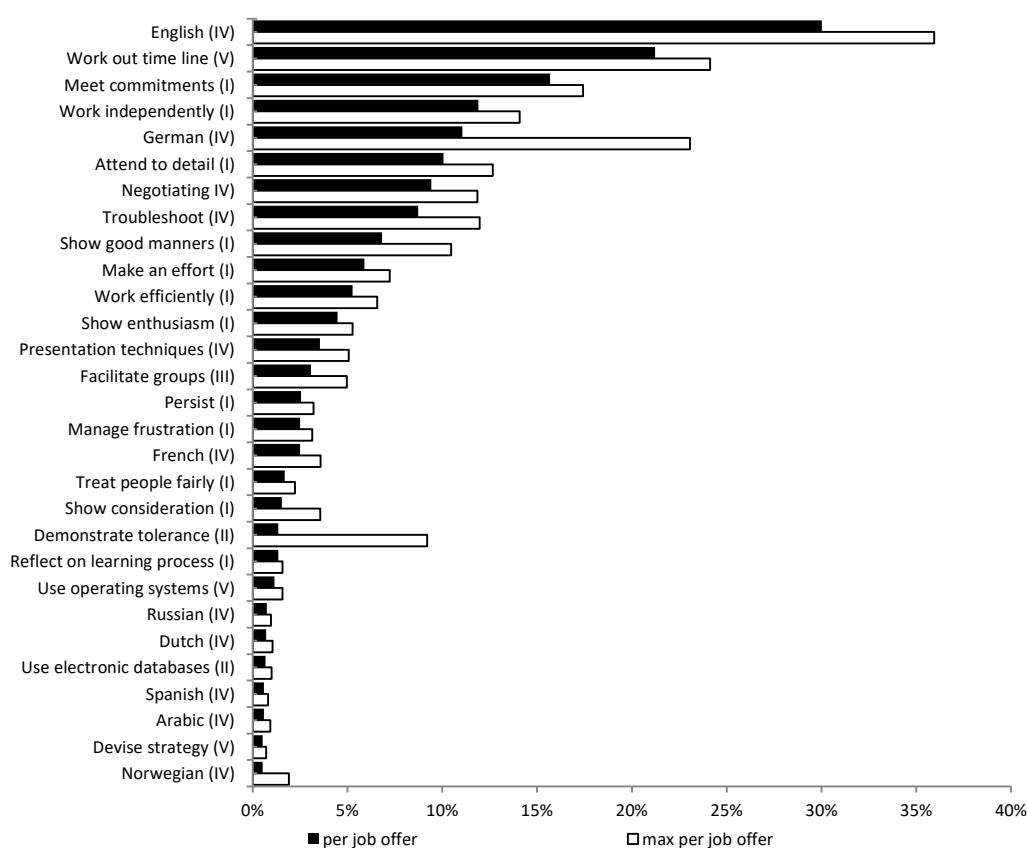
Figure 4: The number (per job offer) of the most frequent competences (with their categories)
The graph includes 29 competences that occurred in at least 0.5% of job offers. Grey bars represent a mean value for the whole period, while white bars, the maximum monthly number of occurrences per job offer.

Among the 50 most popular competences, only 'attend to detail' and 'share information' showed a visible positive trend over time. The most numerous were competences whose number per job offer increased since 2012, but the growth was unstable, especially in 2014-2015. There were also sub-periods during which nine competences grew in average number per job offer, but only temporarily. This phenomenon might have been due to certain investments that suddenly increased labour demand for particular competences, but only for a short period of time. For other nine competences, no visible tendency occurred. The decline occurred only for 'Russian' language skills.

4.3. Relations

Applying correlation coefficients for monthly occurrences of classes of competences, we analysed similarities in time changes between them (Figure 5). We found high positive correlations between:

- 'demonstrate commitment' and: 'handle challenges,' 'work as part of a team,' 'manage the learning self,' 'take action to solve a problem,' and 'manage time';
- 'work as part of a team' and: 'negotiate/resolve conflict,' 'manage the learning self,' 'explore issues,' 'take action to solve a problem,' and 'manage time'; and
- 'spoken interaction' and: 'build relationships' and 'manage time.'
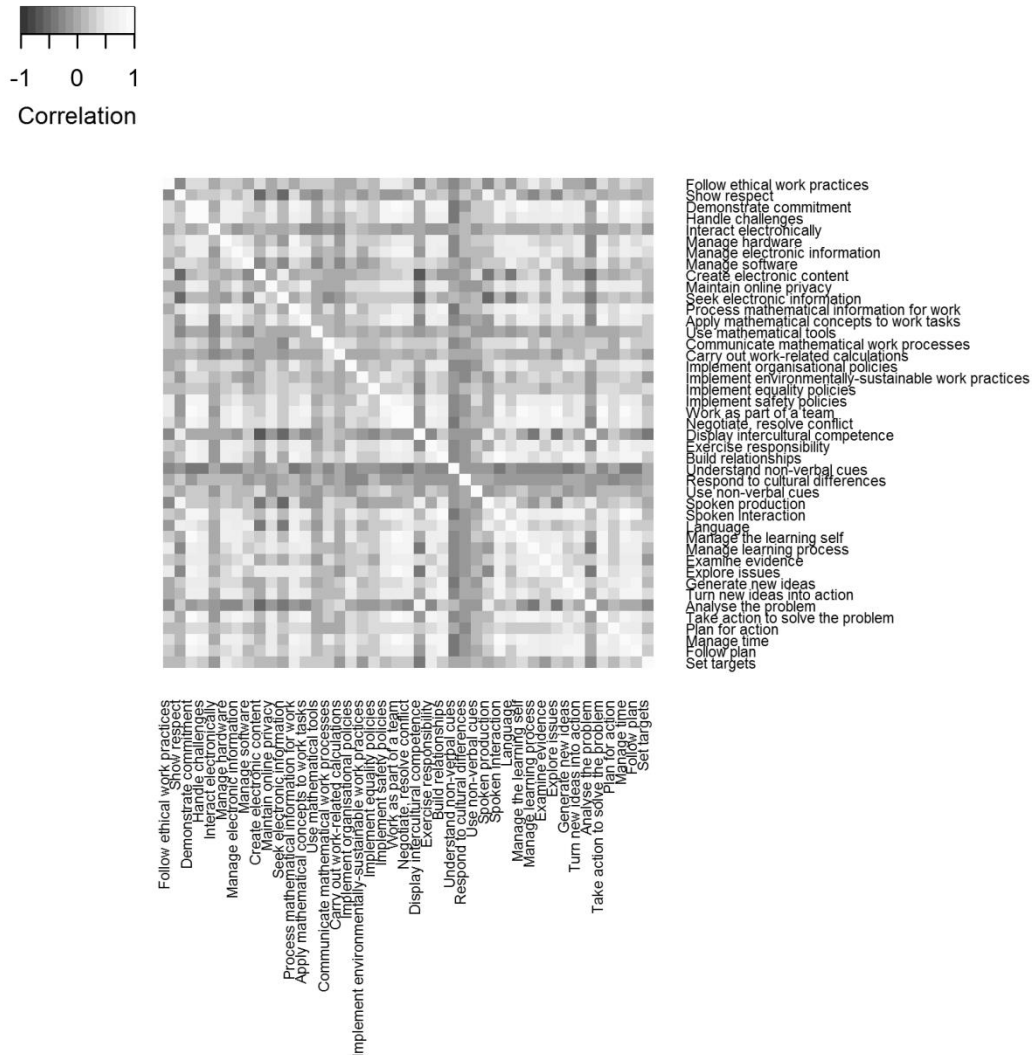
Figure 5: Correlation coefficients representing co-occurrence of classes of competences, estimated based on monthly numbers of their occurrences in job offers

A strong correlation between two classes of competences means that the demand for them develops in the same direction or is reported by employers in the same phases of the business cycle. Time changes in 'understand non-verbal cues' were negatively correlated with most other classes of competences. Some of the classes of competences were not correlated with others, namely 'respond to cultural differences,' 'use non–verbal cues,' 'analyse the problem,' 'use mathematical tools,' 'carry out work-related calculations,' 'display intercultural competence,' and 'interact electronically.' They may be independent of the general tendencies in vacancy market. Such classes of competences are unique in the sense that employers change demand for

them in specific periods. These periods may be connected to large inflow of investments in unique sectors of the economy that is due to a particular large initiative, such as building a specific subsidiary of an international company; in turn, such inflows, because of sectoral specificity, may be uncorrelated with any general economic tendencies.

We also analysed pairs and triplets of competences that occurred together in the same job offer. Among the most often co-occurring pairs were 'English' and 'German' languages and combination of English with other competences, the most popular being 'work out time line,' 'meet commitments,' and 'troubleshoot.' Another set of commonly co-occurring competences was 'work independently' in connection with 'work out time line' and 'meet commitments.' Also a few classes of certain competences were connected with the above and with themselves. Among them were 'working as part of a team,' 'spoken production,' 'demonstrate commitment,' 'manage time,' and 'generate new ideas.' All these competences also combined into triplets of competences that co-occurred most often in job offers.

5. Conclusion

For job seekers, the up-to-date information about employers' detailed demands might be helpful. That is why we decided to propose a method of the analysis of demand for competences at a macroeconomic scope. Based on collecting and analysing Internet job offers throughout a long period of time, the method makes it possible to analyse the demand for competences with a relatively low cost. During November 2012–December 2015, we gathered Internet job offers from the most important web sites with vacancies in Poland. Then we searched this data base for competences listed in the European Commission (2015) classification of individual transversal competences.

We found evidence for upskilling during economic contraction and downskilling afterwards. This suggests that the number of competences companies require from future workers is counter–cyclical. Such counter-cyclicality may lead to an increase in labour market mismatch during economic contractions. It may help explain jobless recoveries (Jaimovich and Siu 2012). Even if wages decrease and a pool of the unemployed increases during economic contraction, job creation may slowly speed up—as a result of competence mismatch.

During the analysed period, employers expected about three transversal competences in an average job offer; this number was increasing throughout the period. The structure of competences according to their category and class was relatively stable. Employers mostly valued 'language and communication' skills as well as 'attitudes and values at work.' 'English' language skills were the most popular competence, but 'German' language was also very popular; they often co-occurred in job offers. Among competences concerning individual traits, employers most often looked for workers who can work independently, are committed and have strong self-discipline. From social skills, employers highly needed competences connected to cooperation, working in a team and efficiently contacting with contractors. These competences are universal, which means that the transversal requirements probably have not been changing much despite rapid technological development. To some extent, it is against what Docherty and Marking (1997) claim—that competences constantly change, especially in manufacturing, where technological change is fast. Their remark may not be true for transversal competences, although likely being true for job-specific competences. Among handling new technologies or application of knowledge types of skills, the most important were 'use operating systems' and 'use electronic databases.' The above competences also most often occurred in pairs and triplets in the same job offer. We believe that companies require some competences (such as 'use mobile phone' or 'use printers') without even pointing them in a job offer.

Measuring demand for individual competences may help shape the OECD Skills Strategy. Likely due to methodological difficulties (methods for collecting and analysing data are lacking, and data sources are rarely public), studies aimed to do so have been scarce. The Ministry of

National Education in Poland publishes and updates Program Bases, containing competences and qualifications for primary and secondary education as well as for particular subjects within these stages of education. Similarly, the Ministry of Science and Higher Education in Poland publishes National Qualifications Framework. Both documents list competences and qualifications a student should get, but do not recommend which competences should be stressed in curriculum. On the one hand, to maximize structural matching between job seekers and employers' demand for workers, students should learn mainly competences that are useful according to labour market needs. On the other hand, transversal competences may *not* be easily taught and may *not* be transferable between activities (Hendrick 2017 and citations therein). Thus, a transversal competence (such as those concerned with critical thinking) applied to a particular activity or job usually is not applicable in another. This makes transversal skills even more unique—but not as transversal as it is usually thought. In other words, transversal competences are job-specific too. In this context, thus, job-specific rather than transversal competences should be taught and teaching the latter should focus on the field's specificity. In the next stage of research, we plan to analyse job-specific competences and focus on competences connected to particular occupations and fields of education.

The proposed method can be helpful for job seekers, though only indirectly. They will not be able to use it directly, but various institutions will, whether academic, governmental, or non-profit. These can be research institutes and statistical offices; training institutions; educational policymakers, such as boards of education; career advice centres, such as employment offices; university career services; and the European jobs network. Using the method continuously, such institutions can analyse and publish up-to-date information on the current demand for competences as well as tendencies in this demand.

References

Abraham, K. (1987). Help-Wanted Advertising, Job Vacancies, and Unemployment. Brookings Papers on Economic Activity, 1, 207–248.

Act on promotion of employment and labour market institutions (2004) Dz. U. 2004, No. 99, Pos. 1001, Art. 36 (20 April 2004).

Armstrong, M. (2012). Armstrong's Handbook of Human Resource Management Practice. London: Kogan Page.

Becker, G. (1964). Human Capital. Chicago: The University of Chicago Press.

Boudarbat, B., & Chernoff, V. (2012). Education–job match among recent Canadian university graduates. Applied Economics Letters ,19(18), 1923–1926, doi:10.1080/13504851.2012.676730.

Boyatzis, R. (1982). The Competent Manager: A Model for Effective Performance. New York: John Wiley & Sons.

Central Statistical Office (2016). Information society in Poland. Results of statistical surveys in the years 2012-2016. http://stat.gov.pl/en/topics/science-and-technology/information-society/information-society-in-poland-results-of-statistical-surveys-in-the-years-20122016,1,3.html. Accessed 20 June 2018.

Chevalier, A. (2011). Subject Choice and Earnings of UK Graduates. Economics of Education Review, 30(6), 1187–1201.

Deming, D. (2017). The Growing Importance of Social Skills on the Labor Market. Quaterly Journal of Economics, 132(4), 1593–1640.

Deming, D., & Kahn, L. (2017). Skill requirements across firms and labor markets: evidence from job postings for professionals. NBER Working Paper 23328. http://www.nber.org/papers/w23328. Accessed 20 June 2018.

Docherty, P., & Marking, C. (1997). Understanding Changing Competence Demand. In: P. Docherty, & B. Nyhan (Eds.), Human Competence and Business Development (pp. 19–42). London: Springer.

Drozdowicz-Bieć, M., Pater, R., & Wargacki, M. (2006). Barometr Ofert Pracy a rynek pracy w Polsce [The Help-Wanted Index for Poland and the labour market]. In: M. Mocek (Ed.), Diagnozowanie i prognozowanie koniunktury gospodarczej w Polsce (pp. 73–87). Poznań: Poznań University of Economics and Business.

European Commission (2015). ESCO. European Skills, Competences, Qualifications and Occupations. https://ec.europa.eu/esco/web/guest/hierarchybrowser/-/browser/Qualification. Accessed 20 June 2018.

Hershbein, B., & Kahn, L. (2017). Do recessions accelerate routine-biased technological change? Evidence from vacancy posting. Employment Research, 24(4), 1-4.

Hendrick, K. (2017). Why students should not be taught general critical-thinking skills. The impact blog, 26 January. http://blogs.lse.ac.uk/impactofsocialsciences/2017/01/26/why-students-should-not-be-taught-general-critical-thinking-skills/. Accessed 20 June 2018.

International Labour Office (2012). International Standard Classification of Occupations. Volume I. Structure, group definitions and correspondence tables.

http://www.ilo.org/global/publications/ilo-bookstore/order-online/books/WCMS_172572/lang--en/index.htm. Accessed 20 June 2018.

Jaimovich, N., & Siu, H. (2012). The trend is the cycle: job polarization and jobless recoveries. NBER Working Paper 18334. http://www.nber.org/papers/w18334. Accessed 20 June 2018.

Kuhn, P., & Mansour, H. (2011). Is Internet Job Search Still Ineffective? IZA Discussion Paper 5955. http://ftp.iza.org/dp5955.pdf. Accessed 20 June 2018.

Kuhn, P., & Skuterud. M. (2004). Internet job search and unemployment durations. American Economic Review, 94(1), 218–232.

Marinescu, I., & Wolthoff, R. (2016). Opening the Black Box of the Matching Function: the Power of Words. NBER Working Paper 22508. http://www.nber.org/papers/w22508.pdf. Accessed 20 June 2018.

McClelland, D. C. (1973). Testing for Competence Rather Than for Intelligence. American Psychologist, 28, 1–14.

McGowan, A., & Andrews, M. D. (2015). Skill Mismatch and Public Policy in OECD Countries. OECD Economics Department Working Papers 1210. Paris: OECD Publishing, http://dx.doi.org/10.1787/5js1pzw9lnwk-en.

Mitrani, A., Dalziel, M., & Fitt, D. (1992). Competency Based Human Resource Management: value-driven strategies for recruitment, development and reward. London: Kogan Page.

Modestino, A., Shoag, D., & Ballance, J. (2016). Downskilling: Changes in Employer Skill Requirements Over the Business Cycle. Labour Economics, 41, 333–347.

National Bank of Poland (2012). Badanie Ankietowe Rynku Pracy. Raport 2012 [Labour market survey]. Warsaw: Economic Institute of the National Bank of Poland.

Nordin, M., Persson, I., & Rooth, D. (2010). Education–occupation mismatch: Is there an income penalty? Economics of Education Review, 29(6), 1047–1059, doi:10.1016/j.econedurev.2010.05.005.

OECD (2011). Towards an OECD Skills Strategy. OECD. http://www.oecd.org/education/47769000.pdf. Accessed 20 June 2018.

Pater, R. (2006). Analiza przebiegu i wskazań wskaźnika rynku pracy [Analysis of labour market leading index for Poland]. In: M. Drozdowicz-Bieć (Ed.), Wskaźniki wyprzedzające (pp. 209–237). Warsaw: Warsaw School of Economics.

Pavlicek, J., & Kristoufek, L. (2015). Nowcasting Unemployment Rates with Google Searches: Evidence from the Visegrad Group Countries. PLoS ONE, 10(5), e0127084, doi:10.1371/journal.pone.0127084.

R Core Team (2016). R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing. https://www.R-project.org/. Accessed 20 June 2018.

Şahin, A., Song, J., Topa, G., & Violante, G. (2014). Mismatch Unemployment. American Economic Review, 104(11), 3529–3564.

Shippmann, J. S., Ash, R. A., Battista, M. A., Carr, L., Eyde, L. D., Hesketh, B., et al. (2000). A Practice of Competency Modeling. Personnel Psychology, 53, 703–740.

Somers, M. A., Cabus, S. J., Groot, W., & van den Brink, H. M. (2016). Horizontal Mismatch between Employment and Field of Education: Evidence from a Systematic Literature Review. XXV Meeting of the Economics of Education Association, Badajoz, 30 June–1 July.

Spencer, L. M., Spencer, S. M. (1993). Competence at Work. Models for Superior Performance. New York: John Wiley & Sons.

United Nations Industrial Development Organization (2002). Competencies. Part 1.Vienna: United Nations Industrial Development Organization. https://www.unido.org/fileadmin/media/documents/pdf/Employment/UNIDO-CompetencyModel-Part1.pdf. Accessed 20 June 2018.

Winterton, J., Delamare Le Deist, F., & Stringfellow, E. (2006). Typology of knowledge, skills and competences: clarification of the concept and prototype. Cedefop Reference Series 64. Luxembourg: Office for Official Publications of the European Communities. http://www.cedefop.europa.eu/en/publications-and-resources/publications/3048. Accessed 20 June 2018.

Zhu, R. (2014). The impact of major–job mismatch on college graduates' early career earnings: evidence from China. Education Economics, 22(5), 511-528, doi: 10.1080/09645292.2012.659009.

Appendix

Table 2: A list of Polish Internet websites with job offers

http://interkadra.pl
http://jobexplorer.pl
http://jobexpress.pl
http://kariera.pl
http://karierawnieruchomosciach.pl
http://praca.gratka.pl
http://pracawbiurze.pl,
http://pracawsprzedazy.pl
http://pracownicy.it
http://www.dlastudenta.pl
http://www.gazetapraca.pl
http://www.goldenline.pl/praca
http://www.gowork.pl
http://www.hrk.pl
http://www.ibroker.pl
http://www.infopraca.pl
http://www.jober.pl
http://www.jobs.pl
http://www.jobs4.pl
http://www.karierawfinansach.pl
http://www.linguajob.pl
http://www.metropraca.pl
http://www.monsterpolska.pl
http://www.mypraca.pl
http://www.praca.pl
http://www.pracanateraz.pl
http://www.pracuj.pl
http://www.profesja.pl
http://www.przedstawiciele.pl
http://www.strefa-hostess.pl
http://www.szybkopraca.pl

Table 3: Detailed classification of competences, November 2012–December 2015 (number per job offer)

Category	Class	Competences			Mean	Min	Max	First	Last
I			**Attitudes and values at work**		**0.93**	**0.72**	**1.03**	**0.72**	**0.95**
I	*1*		*Values*		*0.12*	*0.07*	*0.24*	*0.08*	*0.10*
I		*1.1*	*Follow ethical work practices*		*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
I			1.1.1	Identify social impact	0.00	0.00	0.00	0.00	0.00
I			1.1.2	*Reflect on own work practices*	0.00	0.00	0.00	0.00	0.00
I			1.1.3	*Identify environmental impact*	0.00	0.00	0.00	0.00	0.00
I			1.1.4	Make ethical choices	0.00	0.00	0.00	0.00	0.00
I			1.1.5	Identify ethical issues	0.00	0.00	0.00	0.00	0.00
I		*1.2*	*Show respect*		*0.12*	*0.07*	*0.23*	*0.07*	*0.10*
I			1.2.1	Treat people fairly	0.02	0.01	0.02	0.01	0.02
I			1.2.2	Work with different viewpoints	0.00	0.00	0.01	0.00	0.01
I			1.2.3	Show consideration	0.02	0.00	0.04	0.00	0.00
I			1.2.4	Demonstrate tolerance	0.01	0.00	0.09	0.00	0.01
I			1.2.5	Show good manners	0.07	0.05	0.10	0.05	0.06
I	*2*		*Attitudes*		*0.81*	*0.64*	*0.92*	*0.64*	*0.85*
I		*2.1*	*Demonstrate commitment*		*0.77*	*0.61*	*0.87*	*0.61*	*0.81*
I			2.1.1	Meet commitments	0.16	0.13	0.17	0.13	0.16
I			2.1.2	Attend to quality	0.00	0.00	0.00	0.00	0.00
I			2.1.3	Make an effort	0.06	0.04	0.07	0.04	0.06
I			2.1.4	Attend to detail	0.10	0.07	0.13	0.08	0.12
I			2.1.5	Show enthusiasm	0.04	0.03	0.05	0.04	0.05
I			2.1.6	Be curious	0.00	0.00	0.00	0.00	0.00
I			2.1.7	Persist	0.03	0.02	0.03	0.02	0.03
I			2.1.8	Work independently	0.12	0.09	0.14	0.10	0.12
I			2.1.9	Work efficiently	0.05	0.04	0.07	0.04	0.05
I		*2.2*	*Handle challenges*		*0.04*	*0.03*	*0.05*	*0.03*	*0.04*
I			2.2.1	Manage frustration	0.03	0.02	0.03	0.02	0.02
I			2.2.2	Cope with pressure	0.00	0.00	0.00	0.00	0.00
I			2.2.3	Deal with uncertainty	0.00	0.00	0.00	0.00	0.00
I			2.2.4	Learn from mistakes	0.00	0.00	0.00	0.00	0.00
I			2.2.5	Adapt to changes	0.00	0.00	0.00	0.00	0.00
I			2.2.6	Build on experience	0.00	0.00	0.00	0.00	0.00
II			**Application of knowledge**		**0.05**	**0.04**	**0.06**	**0.04**	**0.05**
II	*1*		*Information and communications*		*0.03*	*0.02*	*0.03*	*0.02*	*0.03*
II		*1.1*	*Interact electronically*		*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			1.1.1	Communicate on-line	0.00	0.00	0.00	0.00	0.00
II			1.1.2	Use mobile phone	0.00	0.00	0.00	0.00	0.00
II			1.1.3	*Choose method of electronic interaction*	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.1.4	Observe 'netiquette'	0.00	0.00	0.00	0.00	0.00
II			1.1.5	Use on-line services	n.a.	n.a.	n.a.	n.a.	n.a.
II		*1.2*	*Manage hardware*		*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			1.2.1	Use printers	0.00	0.00	0.00	0.00	0.00
II			1.2.2	Use pointing devices	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.2.3	Use image scanners	0.00	0.00	0.00	0.00	0.00
II		*1.3*	*Manage electronic information*		*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
II			1.3.1	Use word processing	0.00	0.00	0.00	0.00	0.00
II			1.3.2	Retrieve files	0.00	0.00	0.00	0.00	0.00
II			1.3.3	Detect bias in electronic information	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.3.4	Evaluate quality of electronic information	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.3.5	Use spreadsheets	0.00	0.00	0.00	0.00	0.00
II			1.3.6	Use electronic databases	0.01	0.00	0.01	0.00	0.01
II			1.3.7	Store files	0.00	0.00	0.00	0.00	0.00
II			1.3.8	Cross-check electronic information	n.a.	n.a.	n.a.	n.a.	n.a.
II		*1.4*	*Manage software*		*0.01*	*0.01*	*0.02*	*0.01*	*0.02*
II			1.4.1	Use office software	0.00	0.00	0.01	0.00	0.00
II			1.4.2	Use operating systems	0.01	0.01	0.02	0.01	0.01
II		*1.5*	*Create electronic content*		*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			1.5.1	Produce electronic images	0.00	0.00	0.00	0.00	0.00
II			1.5.2	Produce tables	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.5.3	Edit electronic content	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.5.4	Type text	0.00	0.00	0.00	0.00	0.00
II			1.5.5	Design spreadsheets	0.00	0.00	0.00	0.00	0.00
II			1.5.6	Produce audio files	0.00	0.00	0.00	0.00	0.00
II			1.5.7	Produce text files	0.00	0.00	0.00	0.00	0.00
II		*1.6*	*Maintain online privacy*		*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			1.6.1	Review online privacy settings	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.6.2	Up-date online security measures	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.6.3	Install anti-virus software	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.6.4	Choose online security measures	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.6.5	Identify online threats	n.a.	n.a.	n.a.	n.a.	n.a.
II			1.6.6	Set up passwords	0.00	0.00	0.00	0.00	0.00

II		*1.7*			*Seek electronic information*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			1.7.1		Use internet browsers	0.00	0.00	0.00	0.00	0.00
II			1.7.2		Retrieve information from the Internet	0.00	0.00	0.00	0.00	0.00
II	*2*				***Numeracy and mathematics***	***0.02***	***0.01***	***0.03***	***0.02***	***0.02***
II		*2.1*			*Process mathematical information for work*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
II			2.1.1		Organise data	0.00	0.00	0.00	0.00	0.00
II			2.1.2		Interpret data	0.00	0.00	0.00	0.00	0.00
II			2.1.3		Gather data	0.00	0.00	0.00	0.00	0.00
II		*2.2*			*Apply mathematical concepts to work tasks*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			2.2.1		Identify mathematical problem	n.a.	n.a.	n.a.	n.a.	n.a.
II			2.2.2		Apply mathematical method	0.00	0.00	0.00	0.00	0.00
II			2.2.3	concepts	Choose relevant mathematical	n.a.	n.a.	n.a.	n.a.	n.a.
II		*2.3*			*Use mathematical tools*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			2.3.1		Use measuring equipment	0.00	0.00	0.00	0.00	0.00
II			2.3.2		Use calculators	n.a.	n.a.	n.a.	n.a.	n.a.
II			2.3.3		Use ICT	n.a.	n.a.	n.a.	n.a.	n.a.
II		*2.4*		processes	*Communicate mathematical work*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			2.4.1		Record data	0.00	0.00	0.00	0.00	0.00
II			2.4.2		Explain mathematical findings	n.a.	n.a.	n.a.	n.a.	n.a.
II			2.4.3		Illustrate mathematical findings	n.a.	n.a.	n.a.	n.a.	n.a.
II			2.4.4	language	Use appropriate mathematical	n.a.	n.a.	n.a.	n.a.	n.a.
II		*2.5*			*Carry out work-related calculations*	*0.01*	*0.00*	*0.02*	*0.00*	*0.00*
II			2.5.1		Measure	0.00	0.00	0.02	0.00	0.00
II			2.5.2		Work with shape	0.00	0.00	0.00	0.00	0.00
II			2.5.3		Use numbers	n.a.	n.a.	n.a.	n.a.	n.a.
II	*3*				***Health in working environment***	***0.00***	***0.00***	***0.01***	***0.00***	***0.00***
II		*3.1*			*Implement organisational policies*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			3.1.1		Support company plan	0.00	0.00	0.00	0.00	0.00
II			3.1.2		Support company mission	0.00	0.00	0.00	0.00	0.00
II			3.1.3		Monitor policy implementation	0.00	0.00	0.00	0.00	0.00
II			3.1.4		Apply quality standards	0.00	0.00	0.00	0.00	0.00
II		*3.2*		work practices	*Implement environmentally-sustainable*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			3.2.1		Minimise environmental risks	n.a.	n.a.	n.a.	n.a.	n.a.
II			3.2.2		Preserve environmental heritage	n.a.	n.a.	n.a.	n.a.	n.a.
II			3.2.3		Assess environmental impact	0.00	0.00	0.00	0.00	0.00
II			3.2.4	practices	Reduce environmentally harmful work	n.a.	n.a.	n.a.	n.a.	n.a.
II		*3.3*			*Implement equality policies*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			3.3.1	backgrounds	Consider different cultural	n.a.	n.a.	n.a.	n.a.	n.a.
II			3.3.2		Support gender equality	0.00	0.00	0.00	0.00	0.00
II			3.3.3		Foster cultural diversity	n.a.	n.a.	n.a.	n.a.	n.a.
II		*3.4*			*Implement safety policies*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
II			3.4.1		Store equipment safely	0.00	0.00	0.00	0.00	0.00
II			3.4.2		Identify risks	0.00	0.00	0.00	0.00	0.00
II			3.4.3		Use safe working methods	0.00	0.00	0.00	0.00	0.00
II			3.4.4		Take precautions	n.a.	n.a.	n.a.	n.a.	n.a.
II			3.4.5		Use correct equipment	0.00	0.00	0.00	0.00	0.00
III					**Social skills and competences**	**0.30**	**0.21**	**0.35**	**0.21**	**0.32**
III	*1*				***Working with others***	***0.20***	***0.14***	***0.24***	***0.14***	***0.22***
III		*1.1*			*Work as part of a team*	*0.19*	*0.13*	*0.23*	*0.13*	*0.21*
III			1.1.1		Accept constructive criticism	0.00	0.00	0.00	0.00	0.00
III			1.1.2		Share information	0.00	0.00	0.01	0.00	0.01
III			1.1.3		Give constructive criticism	0.00	0.00	0.00	0.00	0.00
III			1.1.4		Foster social networks	0.00	0.00	0.00	0.00	0.00
III			1.1.5		Share opinions	0.00	0.00	0.01	0.00	0.00
III			1.1.6		Collaborate on tasks	0.00	0.00	0.00	0.00	0.00
III			1.1.7		Share resources	0.00	0.00	0.00	0.00	0.00
III		*1.2*			*Negotiate, resolve conflict*	*0.01*	*0.00*	*0.01*	*0.01*	*0.01*
III			1.2.1		Influence on others	0.00	0.00	0.01	0.00	0.00
III			1.2.2		Persuade others	0.00	0.00	0.00	0.00	0.00
III			1.2.3		Argue cases	0.00	0.00	0.00	0.00	0.00
III			1.2.4		Seek consensus	0.00	0.00	0.00	0.00	0.00
III			1.2.5		Seek compromise	0.00	0.00	0.00	0.00	0.00
III			1.2.6		Propose options	0.00	0.00	0.00	0.00	0.00
III		*1.3*			*Display intercultural competence*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
III			1.3.1		Use culturally appropriate gesture	n.a.	n.a.	n.a.	n.a.	n.a.
III			1.3.2		Use culturally appropriate language	n.a.	n.a.	n.a.	n.a.	n.a.
III	*2*				***Leading others***	***0.11***	***0.07***	***0.13***	***0.08***	***0.10***
III		*2.1*			*Exercise responsibility*	*0.04*	*0.02*	*0.06*	*0.02*	*0.03*
III			2.1.1		Foster quality	0.00	0.00	0.00	0.00	0.00

III		2.1.2		Facilitate groups	0.03	0.02	0.05	0.02	0.02
III		2.1.3		Support colleagues	0.00	0.00	0.00	0.00	0.00
III		2.1.4		Support change	0.00	0.00	0.01	0.00	0.00
III		2.1.5		Decide priorities	0.00	0.00	0.01	0.00	0.00
III		*2.2*		*Build relationships*	*0.07*	*0.05*	*0.08*	*0.05*	*0.06*
III		2.2.1		Encourage staff	0.00	0.00	0.00	0.00	0.00
III		2.2.2		Mentor	0.00	0.00	0.00	0.00	0.00
III		2.2.3		Motivate staff	0.00	0.00	0.00	0.00	0.00
IV				**Language and communication**	**0.99**	**0.77**	**1.10**	**0.77**	**1.00**
IV	*1*			***Non-verbal communication***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
IV		*1.1*		*Understand non-verbal cues*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
IV		1.1.1		Understand postures	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.1.2		Understand uses of personal space	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.1.3		Read facial expressions	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.1.4		Read different types of eye contact	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.1.5		Understand gestures	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.1.6		Read different types of touch	n.a.	n.a.	n.a.	n.a.	n.a.
IV		*1.2*		*Respond to cultural differences*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
IV		*1.3*		*Use non-verbal cues*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
IV		1.3.1		Use appropriate facial expressions	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.3.2		Make appropriate use of touch	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.3.3	space	Make appropriate use of personal	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.3.4		Use appropriate gestures	0.00	0.00	0.00	0.00	0.00
IV		1.3.5		Make appropriate use of eye contact	n.a.	n.a.	n.a.	n.a.	n.a.
IV		1.3.6		Use appropriate posture	0.00	0.00	0.00	0.00	0.00
IV	*2*			***Verbal communication***	***0.49***	***0.39***	***0.57***	***0.40***	***0.47***
IV		*2.1*		*Spoken production*	*0.22*	*0.17*	*0.27*	*0.17*	*0.21*
IV		2.1.1		Presentation techniques	0.04	0.03	0.05	0.03	0.03
IV		*2.2*		*Spoken interaction*	*0.27*	*0.22*	*0.32*	*0.23*	*0.26*
IV		2.2.1		Debating techniques	n.a.	n.a.	n.a.	n.a.	n.a.
IV		2.2.2		Interrogating	0.00	0.00	0.00	0.00	0.00
IV		2.2.3		Persuading	0.00	0.00	0.00	0.00	0.00
IV		2.2.4		Negotiating	0.09	0.07	0.12	0.08	0.09
IV	*3*			***Language***	***0.50***	***0.38***	***0.59***	***0.38***	***0.53***
IV		*3.1*		*Language*	*0.50*	*0.38*	*0.59*	*0.38*	*0.53*
IV		3.1.1		Russian	0.01	0.00	0.01	0.01	0.01
IV		3.1.2		Estonian	0.00	0.00	0.00	0.00	0.00
IV		3.1.3		Vietnamese	0.00	0.00	0.00	0.00	0.00
IV		3.1.4		Azerbaijani	0.00	0.00	0.00	0.00	0.00
IV		3.1.5		Bulgarian	0.00	0.00	0.00	0.00	0.00
IV		3.1.6		Czech	0.00	0.00	0.01	0.00	0.00
IV		3.1.7		English	0.30	0.24	0.36	0.24	0.34
IV		3.1.8		Greek	0.00	0.00	0.00	0.00	0.00
IV		3.1.9		Kurdish	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.10		Javanese	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.11		Galician	0.00	0.00	0.00	0.00	0.00
IV		3.1.12		Slovak	0.00	0.00	0.00	0.00	0.00
IV		3.1.13		German	0.11	0.07	0.23	0.07	0.09
IV		3.1.14		Hindi	0.00	0.00	0.00	0.00	0.00
IV		3.1.15		Malayalam language	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.16		Romani	0.00	0.00	0.00	0.00	0.00
IV		3.1.17		Yiddish	0.00	0.00	0.00	0.00	0.00
IV		3.1.18		Finnish	0.00	0.00	0.00	0.00	0.00
IV		3.1.19		Dutch	0.01	0.00	0.01	0.00	0.01
IV		3.1.20		Ukrainian	0.00	0.00	0.00	0.00	0.00
IV		3.1.21		Lithuanian	0.00	0.00	0.00	0.00	0.00
IV		3.1.22		Limburgish	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.23		Serbian	0.00	0.00	0.00	0.00	0.00
IV		3.1.24		Marathi language	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.25		Kazakh	0.00	0.00	0.00	0.00	0.00
IV		3.1.26		Hungarian	0.00	0.00	0.00	0.00	0.00
IV		3.1.27		Belarusian	0.00	0.00	0.00	0.00	0.00
IV		3.1.28		Punjabi	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.29		Gujarati	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.30		Arabic	0.01	0.00	0.01	0.00	0.01
IV		3.1.31		Occitan	0.00	0.00	0.00	0.00	0.00
IV		3.1.32		Persian	0.00	0.00	0.01	0.00	0.00
IV		3.1.33		Portuguese	0.00	0.00	0.00	0.00	0.00
IV		3.1.34		Bihari language	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.35		Tamil	n.a.	n.a.	n.a.	n.a.	n.a.
IV		3.1.36		Macedonian	0.00	0.00	0.00	0.00	0.00
IV		3.1.37		Latvian	0.00	0.00	0.00	0.00	0.00
IV		3.1.38		Spanish	0.01	0.00	0.01	0.00	0.01

IV			3.1.39		Telugu language	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.40		Romanian	0.00	0.00	0.00	0.00	0.00
IV			3.1.41		Turkish	0.00	0.00	0.00	0.00	0.00
IV			3.1.42		Sign language	0.00	0.00	0.00	0.00	0.00
IV			3.1.43		Danish	0.00	0.00	0.01	0.00	0.00
IV			3.1.44		Urdu language	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.45		Bosnian	0.00	0.00	0.00	0.00	0.00
IV			3.1.46		Basque	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.47		Maltese	0.00	0.00	0.00	0.00	0.00
IV			3.1.48		French	0.02	0.02	0.04	0.02	0.03
IV			3.1.49		Icelandic	0.00	0.00	0.00	0.00	0.00
IV			3.1.50		Greek, Ancient (to 1453)	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.51		Catalan	0.00	0.00	0.00	0.00	0.00
IV			3.1.52		Irish	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.53		Norwegian	0.01	0.00	0.02	0.00	0.00
IV			3.1.54		Welsh	0.00	0.00	0.00	0.00	0.00
IV			3.1.55		Walloon	0.00	0.00	0.00	0.00	0.00
IV			3.1.56		Sardinian	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.57		Hebrew	0.00	0.00	0.00	0.00	0.00
IV			3.1.58		Italian	0.00	0.00	0.02	0.00	0.00
IV			3.1.59		Georgian	0.00	0.00	0.00	0.00	0.00
IV			3.1.60		Berber language	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.61		Swedish	0.00	0.00	0.01	0.00	0.01
IV			3.1.62		Chinese	0.00	0.00	0.00	0.00	0.00
IV			3.1.63		Korean	0.00	0.00	0.00	0.00	0.00
IV			3.1.64		Croatian	0.00	0.00	0.00	0.00	0.00
IV			3.1.65		Polish	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.66		Bengali	0.00	0.00	0.00	0.00	0.00
IV			3.1.67		Montenegrin	0.00	0.00	0.00	0.00	0.00
IV			3.1.68		Slovenian	0.00	0.00	0.00	0.00	0.00
IV			3.1.69		Latin	0.00	0.00	0.00	0.00	0.00
IV			3.1.70		Albanian	0.00	0.00	0.00	0.00	0.00
IV			3.1.71		Armenian	n.a.	n.a.	n.a.	n.a.	n.a.
IV			3.1.72		Japanese	0.00	0.00	0.00	0.00	0.00
V					**Thinking skills and competences**	**0.60**	**0.46**	**0.67**	**0.46**	**0.62**
V	*1*				*Learning*	*0.02*	*0.02*	*0.03*	*0.02*	*0.03*
V		*1.1*			*Manage the learning self*	*0.01*	*0.01*	*0.02*	*0.01*	*0.01*
V			1.1.1		Reflect on learning process	0.01	0.01	0.02	0.01	0.01
V			1.1.2		Prioritise learning tasks	n.a.	n.a.	n.a.	n.a.	n.a.
V		*1.2*			*Manage learning process*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
V			1.2.1		Monitor learning process	0.00	0.00	0.00	0.00	0.00
V			1.2.2		Plan learning	0.00	0.00	0.00	0.00	0.00
V			1.2.3		Use different learning strategies	n.a.	n.a.	n.a.	n.a.	n.a.
V	*2*				*Critical thinking*	*0.04*	*0.03*	*0.04*	*0.03*	*0.04*
V		*2.1*			*Examine evidence*	*0.03*	*0.02*	*0.04*	*0.02*	*0.03*
V			2.1.1		Check facts	n.a.	n.a.	n.a.	n.a.	n.a.
V			2.1.2		Consider alternative views	n.a.	n.a.	n.a.	n.a.	n.a.
V			2.1.3		Critique reasoning	n.a.	n.a.	n.a.	n.a.	n.a.
V			2.1.4		Consider impact of judgement	n.a.	n.a.	n.a.	n.a.	n.a.
V			2.1.5		Notice bias	n.a.	n.a.	n.a.	n.a.	n.a.
V		*2.2*			*Explore issues*	*0.01*	*0.00*	*0.01*	*0.00*	*0.01*
V			2.2.1		Make judgements	0.00	0.00	0.00	0.00	0.00
V			2.2.2		Draw conclusions	0.00	0.00	0.00	0.00	0.00
V			2.2.3		Question assumptions	n.a.	n.a.	n.a.	n.a.	n.a.
V			2.2.4		Explain reasoning	n.a.	n.a.	n.a.	n.a.	n.a.
V			2.2.5		Identify live topics	0.00	0.00	0.00	0.00	0.00
V			2.2.6		Recognize connections	0.00	0.00	0.00	0.00	0.00
V			2.2.7		Identify patterns	0.00	0.00	0.00	0.00	0.00
V			2.2.8		Ask key questions	n.a.	n.a.	n.a.	n.a.	n.a.
V	*3*				*Creative thinking*	*0.06*	*0.05*	*0.07*	*0.05*	*0.05*
V		*3.1*			*Generate new ideas*	*0.05*	*0.04*	*0.05*	*0.04*	*0.04*
V			3.1.1		Anticipate needs	0.00	0.00	0.00	0.00	0.00
V			3.1.2		Experiment	0.00	0.00	0.00	0.00	0.00
V			3.1.3		Show originality	0.00	0.00	0.00	0.00	0.00
V			3.1.4		Recognise opportunity	0.00	0.00	0.00	0.00	0.00
V			3.1.5		Visualize completed work	n.a.	n.a.	n.a.	n.a.	n.a.
V		*3.2*			*Turn new ideas into action*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
V			3.2.1		Create implementation strategy	0.00	0.00	0.00	0.00	0.00
V			3.2.2		Adapt implementation strategy	n.a.	n.a.	n.a.	n.a.	n.a.
V			3.2.3		Produce original work	n.a.	n.a.	n.a.	n.a.	n.a.
V	*4*				*Problem-solving*	*0.10*	*0.08*	*0.14*	*0.08*	*0.12*
V		*4.1*			*Analyse the problem*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
V			4.1.1		Explore context of problem	n.a.	n.a.	n.a.	n.a.	n.a.
V			4.1.2		Examine causes of problem	n.a.	n.a.	n.a.	n.a.	n.a.

					Mean	min	max	first	last
V			4.1.3	Identify stakeholders involved in problem	n.a.	n.a.	n.a.	n.a.	n.a.
V		*4.2*		*Take action to solve the problem*	*0.09*	*0.06*	*0.13*	*0.06*	*0.11*
V			4.2.1	Implement strategy	0.00	0.00	0.00	0.00	0.00
V			4.2.2	Coordinate actions	0.00	0.00	0.00	0.00	0.00
V			4.2.3	Multi task	0.00	0.00	0.00	0.00	0.00
V			4.2.4	Evaluate success	0.00	0.00	0.00	0.00	0.00
V			4.2.5	Troubleshoot	0.09	0.06	0.12	0.06	0.10
V		*4.3*		*Plan for action*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
V			4.3.1	Devise strategy	0.01	0.00	0.01	0.01	0.01
V			4.3.2	Set goals	0.00	0.00	0.00	0.00	0.00
V			4.3.3	Prioritise actions	0.00	0.00	0.00	0.00	0.00
V	*5*			***Planning own work***	***0.38***	***0.29***	***0.42***	***0.30***	***0.39***
V		*5.1*		*Manage time*	*0.35*	*0.27*	*0.39*	*0.28*	*0.36*
V			5.1.1	Work out time line	0.21	0.15	0.24	0.17	0.23
V		*5.2*		*Follow plan*	*0.03*	*0.02*	*0.03*	*0.02*	*0.03*
V			5.2.1	Monitor progress	0.00	0.00	0.00	0.00	0.00
V		*5.3*		*Set targets*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
V			5.3.1	Identify tasks	n.a.	n.a.	n.a.	n.a.	n.a.
			Sum		2.88	2.21	3.14	2.21	2.94

Mean: mean no. of competences per job offer throughout the studied period; min, max: minimum and maximum mean no. of competences per job offer in a month; first, last: number of competences per job offer in the first and last months of the analysis. n.a. means that the corresponding competence was not identified in any job offer; 0.00 means that the number of competences per job offer was less than 0.01.