Institute for Employment Research

The Research Institute of the Federal Employment Agency

IAB

IAB-Discussion Paper 35/2016

Articles on labour market issues

Overeducation – New Evidence for 25 European Countries

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ISSN 2195-2663

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Abstract

This study investigates the incidence of overeducation among workers in the EU and its underlying factors based on the most recent wave of the European Labor Force Survey (EU-LFS 2013). Its main purpose is to shed light on the interplay of so far neglected explanatory factors such as household characteristics and field of study as well as to reveal country differences in the impact of these factors. Therefore, our innovative features are the large number of determinants as well as the considerable amount of European countries simultaneously analyzed. Moreover, we differentiate in our analysis between high- and medium-skilled workers. Our findings point to a considerable variation in the potential determinants of overeducation across countries as well as across skill levels. This variation is not restricted to job-related characteristics, but interestingly also concerns household variables. Among those determinants showing a largely uniform influence are nationality, job tenure, temporary employment and presence of unemployed household members.

Zusammenfassung

Basierend auf der jüngsten Welle der Europäischen Arbeitskräfteerhebung (EU-LFS 2013) untersuchen wir in dieser Studie das Ausmaß und die Determinanten von formaler Überqualifikation unter Beschäftigten in EU-Staaten. Hierbei werden bislang vernachlässigte Erklärungsfaktoren wie zum Beispiel das Studienfach oder der Haushaltskontext berücksichtigt. Darüber hinaus differenzieren wir in unserer Analyse zwischen Personen mittlerer und hoher Bildung. Unsere Ergebnisse deuten auf eine beträchtliche Variation der Effekte zwischen einzelnen Ländern sowie zwischen den Qualifikationsniveaus hin. Diese Variation findet sich nicht nur bei den arbeitsplatzbezogenen Charakteristika, sondern auch bei den Haushaltsvariablen. Zu denjenigen Variablen, die einen weitgehend einheitlichen Einfluss auf das Risiko, überqualifiziert zu sein, haben, gehören Nationalität, Betriebszugehörigkeitsdauer, befristete Beschäftigung und die Anwesenheit von arbeitslosen Haushaltsmitgliedern.

JEL classification: J24, J21, J22

Keywords: Overeducation, Realized Matches, European Labour Force, Economics of the Household

1 Introduction

In general, the term overeducation refers to a job match in which the educational level of the worker clearly exceeds the educational requirements of the job. In the terminology of labour economics, this is often considered a vertical skill mismatch, as opposed to horizontal mismatches (workers choosing jobs with requirements outside the scope of their field of study/apprenticeship). A widespread occurrence of this phenomenon can seriously impair the competitiveness of an economy. From a macroeconomic perspective, an overeducation status of qualified workers reflects a waste of scarce human capital. From a microeconomic perspective, it can affect a worker's job satisfaction. In turn, a skill mismatch can reduce overall work motivation, expressing itself in more frequent absenteeism and higher turnover of the workforce (Tsang and Levin, 1985; Sicherman, 1991; Sloane et al., 1999). Moreover, overeducation is associated with earnings losses (e.g. Daly et al., 2000; Bauer, 2002; Boll and Leppin, 2016).

However, before being able to tackle the problem successfully, it is essential to under-stand the driving forces of overeducation at the individual level. In international comparison, the relevance of these driving forces might vary between countries and regions. Against this background, the aim of this paper is to identify possible determinants of overeducation for EU-28 countries. We make use of the 2013 wave of the European Labour Force Survey (EU-LFS), a quarterly household sample survey that covers approximately 1.8 million individuals aged 15 years or older. This data set provides rich in-formation on the respondent's demographic background, labour status, employment characteristics and educational attainment. It allows us to assess and compare the impact of a large variety of potential determinants, both separately for single countries and in a cross-country estimation. Furthermore, we carry out separate estimations for high- and medium-skilled workers to account for potential differences in the channels leading to overeducation.

In this way, we make several contributions to the existing empirical literature on the determinants of overeducation. First, we include a range of new candidates for explanatory factors into our framework, including a person's field of study and household characteristics such as the presence of inactive and unemployed household members. Second, our results allow for a comprehensive country comparison of the associations between overeducation and distinct micro level characteristics within the EU area. This helps to identify differences in the seriousness of the phenomenon between countries and to develop tailor-made policy recipes. Finally, by undertaking estimations differentiated by skill level, we are able to analyze in how far certain channels affect the over-education risk of workers at different educational levels differently.

Our findings indeed point to a considerable variation in the potential determinants across countries as well as across skill levels. This variation is not restricted to job-related characteristics, but interestingly also concerns household variables. Among those determinants showing a largely uniform influence are nationality, job tenure,

temporary employment and presence of unemployed household members. The outline of the paper is as follows. The next section provides a brief overview of the theories and empirical results regarding the determinants of overeducation. Section 3 describes measurement method, data and our model setup. The results are discussed in section 4 and section 5 concludes.

2 Literature Findings

2.1 Theories

In principle, a vertical skill mismatch can result from characteristics of the worker, characteristics of the job or characteristics of the worker-job matching procedure. The first case is emphasized by supply-side theories of labour productivity. According to the neoclassical Human Capital Theory (HCT), a worker's productivity on-the-job is foremost determined by her past investments into human capital through formal education or training. These investments are under normal circumstances rewarded by the market, as workers get paid according to their marginal product. The HCT therefore regards job mismatch as a negligible and temporary phenomenon, which is naturally corrected by the market (Becker, 1967). This kind of reasoning rests on the assumption that skills gathered through schooling and skills gathered through practical experience (or inherited talents) are highly substitutable in shaping a worker's productivity. This clearly not fits reality for those occupations where a certain level of experience is indispensable for promotion. Against this backdrop, the Career Mobility Theory was developed as another attempt of a supply-side explanation (Sicherman and Galor, 1990; Sicherman, 1991). It views the entering of workers into a skill mismatch as a deliberate decision made to improve their long-term earnings prospects. By gathering experience at low entry levels, labour market entrants can enhance their skills and raise their chances of occupational upgrading. In contrast, the Theory of Job Competition first formulated by Thurow (1975) assumes that such an adaptation is at least in the short-run excluded due to wage rigidity. Workers therefore compete for jobs in certain occupations, not for wages. The set of jobs, in turn, is the result of firms' production requirements. The higher an individual's formal level of education, the lower is its expected cost of training. As a consequence, more educated persons will have a higher chance of receiving a job in a certain occupation. Unsuccessful applicants will switch to less demanding jobs. If there is a shortage of jobs for professionals, some high-skilled workers will have to be satisfied with low-skill jobs.

The Assignment Theory, in turn, seeks to unify both supply- and demand-side explanations (Sattinger, 1993). Based on the Theory of Job Search (Jovanovic, 1979), it views overeducation as an inefficient outcome of a job matching procedure. Due to the existence of search costs, highly educated jobseekers might be satisfied with finding a position at a level below their formal qualification. At the same time, employers are happy to hire applicants whose skills exceed the current job requirements, as this could allow them to save training costs in the future. In this context, a special application of a job-search framework is the Theory of Differential Overquali-

fication developed by Frank (1978). He attempts to explain the frequent occurrence of overeducation among women, particularly married ones, based on matching problems. In traditional gender role model settings where the couple's priority is on the job match of the husband, the husband acts as a first-mover, i.e. he performs his job search first. After he has accepted a match, the wife will conduct her job search. However, due to the co-location restriction, she can do that merely within a much smaller market area. The likelihood of finding a job adequate to her qualification level is therefore much lower for her than for her husband, explaining a striking incidence of overeducation among married females.

2.2 Empirical results

Recently, the role of gender differences has received a large amount of attention in the empirical literature. This interest primarily arises from the observation made in many countries that the share of overeducated workers among women is higher than among men. A considerable amount of studies examined finds that the effect of gender on overeducation risk is insignificant in a multivariate setup (Büchel and Pollmann-Schult, 2001; Groot and van den Brink, 2003; Frenette, 2004; Green and McIntosh, 2007; Capsada-Munsech, 2015). Alba-Ramirez (1993), Groot (1996) and European Commission (2012) obtain the result that male employees face a slightly higher overeducation risk, an effect which is however in all cases merely weakly significant.

Another potentially relevant individual characteristic is the worker's age. The European Commission (2012) finds a continuously shrinking overeducation probability for categories of workers of increasing age. Büchel and van Ham (2003) estimate a significant effect only after controlling for the selection effect of employment decisions. In this specification, the effect is generally positive, implying a higher overeducation risk for older workers. Ortiz and Kucel (2008) likewise estimate a significant and positive effect both for Spain and Germany, but again not for all specifications. In contrast, Groot and van den Brink (2003) detect no significant impact of age on the incidence of overeducation in any of their model types. Those papers focusing on the impact of work experience establish a more clear-cut picture. The by far dominating outcome is a highly significant negative impact of increased experience on the incidence of overeducation (Alba-Ramirez, 1993; Groot, 1996; Nielsen, 2011; Sloane et al., 1999). In Büchel and Pollmann-Schult (2001), the same effect is only weakly significant. In Boll et al. (2016b), the significance level varies between subsamples differing in region and educational attainment as well as between the chosen measures of overeducation. The most striking exception is McGoldrick and Robst (1996), where the effect is insignificant for all three measures of required schooling.

In addition to a worker's individual background, part of her overeducation risk can also be related to her living situation. The literature so far has focused on the presence of children as a determinant. Childcare requires a perpetual allocation of resources in the form of time and/or money. In this way, a job creates additional op-

portunity costs that can influence a parent's decision on which job match to accept. Büchel and Pollman-Schult (2001) limit their measurement to pre-school children (< 7 years) and consider an interaction of the number of children with female sex. This does not deliver significant coefficients for any specification. In contrast, Büchel and van Ham (2003) include all children up to 16 years and also control for the selection effect of the employment decision. Without controlling for self-selection, they find for female workers a significant positive impact of the number of children on the risk of overeducation. Significance however disappears in the Heckman self-selection specification, indicating that the most relevant effect of kids already concerns the decision to enter the labour market. Several family-related aspects are yet only insufficiently explored. First, the role of a child's age deserves more attention. Sloane et al. (1999) provide at least some insights in this regard. They distinguish between children up to 2 years and children between 3 and 5 years in their model specification. While the number of kids younger than 2 years exerts a significant and positive impact on the overeducation risk of women, the effect for older children remains insignificant. This is in line with the idea that younger children impose tougher restrictions on the employment decisions of their parents.

Furthermore, previous studies have demonstrated that the incidence of overeducation is strongly related both to job type and firm characteristics. Concerning the job type, one relevant distinction relates to contract length. Economic logic would suggest that people with fixed-term contracts are more likely to work in positions for which they are overeducated than people with permanent ones. Due to the transitory nature of fixed-term jobs, workers tend to view these matches as mere temporary solutions on their way to more favorable permanent positions. Green and McIntosh (2007) as well as Ortiz (2010) indeed find some evidence for a significantly lower overeducation risk among workers in permanent positions. A similar argumentation would suggest a lower overeducation risk for full-time compared to part-time workers. Jobs with longer working time can also create better opportunities for training participation and advancement, thereby improving the match quality over time. Green and McIntosh (2007) indeed document a higher overeducation risk for part-time workers in Great Britain. Moreover, Groot and van den Brink (2003) come to the same result for the Netherlands when measuring work extent continuously (in hours of work). The empirically best-documented job-related determinant of overeducation risk is job tenure. A long tenure signals a high level of satisfaction with the match received. As job satisfaction is in turn linked to the incidence of overeducation (e.g. Allen and van der Velden, 2001), one would expect a long tenure to imply a low likelihood of overeducation. This is confirmed by the existing evidence. A wide range of papers detects a significant negative effect of job tenure on overeducation risk in a variety of datasets (Sloane et al., 1999; Büchel and Pollmann-Schult, 2001; Büchel and van Ham, 2003; Büchel and Battu, 2003; Groot and van den Brink, 2003; Ortiz, 2010; European Commission, 2012).

3 Data and Measurement

We use data from the European Labour Force Survey (EU-LFS)[1] to identify possible determinants of overeducation. The EU-LFS covers approximately 1.8 Mio. individuals aged 15 years or older[2] and asks the respondents for their demographic background, labour status, employment characteristics and their previous employment experience/search for person not in employment. Our analysis is based on 2013 data and is restricted to the EU-28 countries. Respondents are assigned to countries based on their place of work. Malta, Poland and Slovenia are excluded from the analysis due to the lack of detailed information regarding occupation groups. Furthermore, the sample is restricted to respondents aged 15 to 74 years. Although we focus on highly-educated workers/graduates, we also estimate our models for medium-skilled workers and compare the results. Highly educated have completed tertiary education (5A, 6), and the medium educated persons have completed upper secondary or post-secondary education (ISCED 3-4, 5B). We use the EU-LFS weighting variable (COEFF) in order to calculate the modal qualification level of each occupation group.

We refer to the above mentioned overeducation as a vertical inadequacy. In the literature, different ways for measuring overeducation are followed, from expert statements and respondents' subjective assessments to statistical approaches (realized matches). For our purposes, we adopt the variant of the realized matches approach proposed by Kiker et al. (1997) and code a person as being overeducated if his or her highest educational attainment level is higher than the modal qualification level of her occupation group at the two-digit level. To investigate the causal factors of overeducation, we use a broad range of explanatory variables. In particular, we differentiate between three categories of covariates, namely personal characteristics, household characteristics[3] and job characteristics. Moreover, we consider interaction terms between sex and different household characteristics.

Personal characteristics include gender, marital status and two dummy variables that are equal to one if the respondent is a foreigner from another EU country or a non-EU country, respectively. Furthermore, we use the following age dummies: 15-24 years, 35-44 years, 45-54 years, 55-64 years and 65-74 years. Persons aged between 25 and 34 years belong to the reference group. To control for a person's educational background, we further distinguish between 8 broad fields of study. As household characteristics, we control for the number of unemployed and inactive adults, the number of persons aged 75 and over (eldercare) and the number of chil-

[1] For more detailed information on the European Labour Force Survey, see, for example, European Union (2014).

[2] Norway and Sweden only cover persons between 15 and 74 years and Iceland and Switzerland only provide data on people aged 15 and more.

[3] Household characteristics are not available for the Nordic countries (see European Union, 2014).

dren (between 0 and 5 years, between 6 and 11 years and between 12 and 14 years) in the same household.

Job characteristics include, among others, usual working hours and tenure. Usual working hours are given as the number of hours that a respondent is usually working per week in his or her main job. Tenure is defined as the number of years since a person started to work for his/her current employer or as self-employed. Further job characteristics are considered by means of dummies that are equal to one if the respondent is usually working less than 15 hours per week (indicator for marginal employment), if he or she holds a temporary contract or if he or she has a second job, respectively. Firm size is controlled for by means of three dummy variables, namely 11 to 19 employees, 20 to 49 employees and more than 50 employees. Persons who work for firms whose number of employees varies between 1 and 10 belong to the reference group. Whether a respondent attended any courses, seminars, conferences or received private lessons or instructions outside the regular education system within the last 4 weeks prior to the interview is captured by a lifelong learning dummy.

As a variable reflecting the spatial dimension, the degree of urbanization is included. It ranges from 1(densely populated area) to 3 (thinly populated area) and is available for all countries. We also include economic sector and country dummies in our regressions. Finally, we include interaction terms between gender and age, field of study as well as a number of personal and household characteristics: marital status, the number of children, the number of persons aged 75 years and older and the degree of urbanization. We do this to account for likely discrepancies in the marginal effects of these variables between male and female workers.

In order to estimate the probability of being overeducated we make use of a Probit model (see Judge et al. (1988)). The target variable y_i classifies a respondent either to be overeducated ($y_i = 1$) or not ($y_i = 0$). In the Probit model, the probability of $y_i = 1$ is modelled as follows:

$$p = \Pr(y_i = 1|X) = \Phi(X\beta)$$

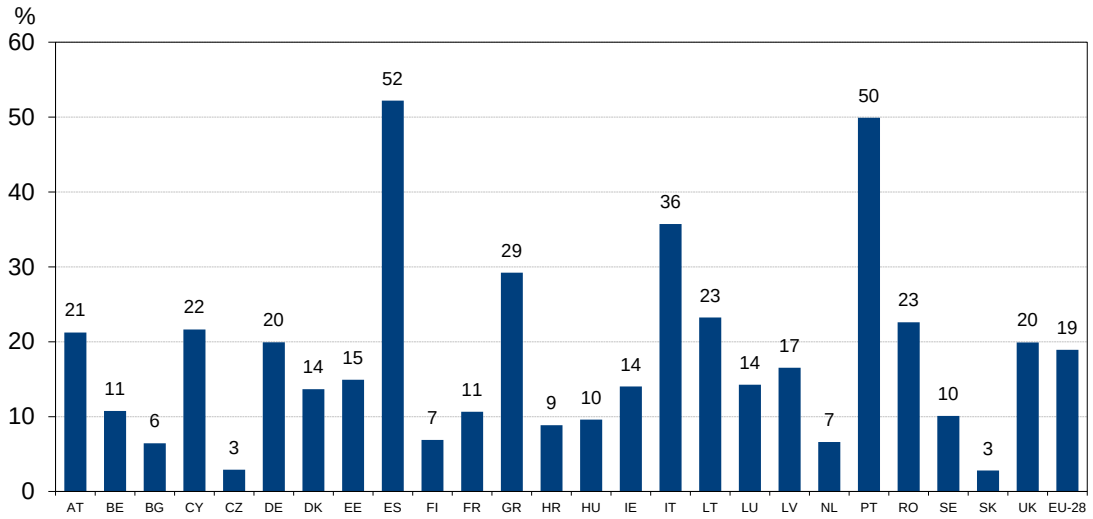
where $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution and X is the set of covariates presented above. We estimate the model with the Maximum-Likelihood-Method, which yields consistent, asymptotically efficient and asymptotically normal distributed estimates. Due to the nonlinearity of the model, marginal effects are not simply given by the estimated coefficients $\hat{\beta}$, but depend on the level of the covariates. In the results section, we report the marginal effects measured at the means of the covariates.

4 Results

4.1 Descriptive results

Figure 1 depicts the incidence of overeducation for medium-skilled workers in 2013. While about half of the medium-skilled workers are overeducated in Spain (ES) and Portugal (PT), this holds for only 3 percent in the Czech Republic (CZ) and Slovakia (SK). Concerning the geographical distribution, it is a striking pattern that the four Southern European countries most severely affected by the current sovereign debt crisis (Greece, Italy, Portugal, Spain) all exhibit rates well above the EU average of 19 percent. Apparently, one reflection of the crisis in these countries is also a high risk of skill mismatches for medium-skilled workers. Potentially, this is an outcome of the general downturn of local labour demand, forcing workers to accept inadequate positions to avoid unemployment. At the same time, overeducation rates for medium-skilled in the Middle and East European countries that joined the EU in 2004 all rank clearly below EU average. This regional particularity is confirmed by a previous report (European Commission, 2012), albeit not differentiating by educational level. The result could be related to the ongoing wave of labour migration from the Eastern to the Western part of the EU. Workers facing a scarcity of job offers adequate to their qualifications on their national labour markets prefer to migrate abroad instead of working in low-qualified jobs at home. This gains support by the fact that overeducation is observed to be especially rare in those countries exhibiting a common border with Germany and/or Austria.

Figure 1
Percentage of overeducated workers on all medium-skilled workers, 2013

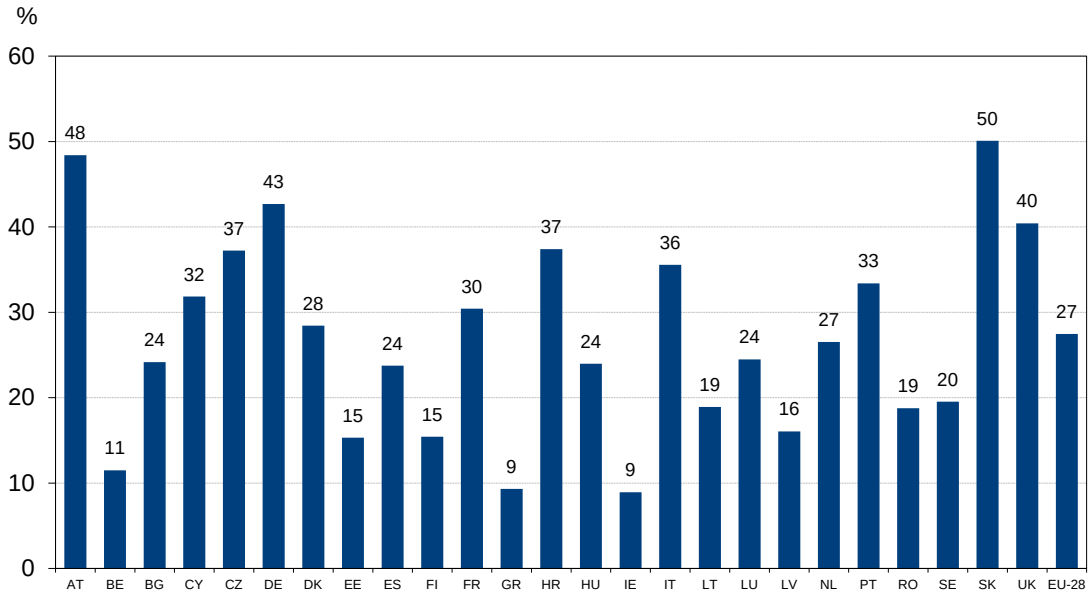


EU-28: without Malta, Poland and Slovenia
Sources: EU-LFS (2013), Boll et al. (2016a)

Considering high-skilled workers, the picture looks quite different (see Figure 2). The overall incidence of overeducation is considerably more widespread in the majority of countries. The only exceptions to this are Spain, Greece, Ireland, Lithuania, Latvia, Portugal and Romania, where the overeducation risk of the medium skilled is

still higher. The average percentage of overeducated workers on all the highly-skilled is 27 percent. The geographical pattern also differs decisively. The Southern countries do not stand out with particularly high rates. The rate in Greece is with 9 percent (together with Ireland) even measured to be the lowest. Again, a combination of migration and unemployment could serve as an explanation for these numbers. The exodus of well-trained young graduates from the crisis countries (Ver-wiebe et al., 2014, Boll et al. 2014) has created a scenario where the remaining population of high-skilled is either well matched (and therefore has no emigration incentive) or unemployed, generating the statistical result of a seemingly high matching efficiency.

Figure 2
Percentage of overeducated workers on all high-skilled workers, 2013



EU-28: without Malta, Poland and Slovenia
Sources: EU-LFS (2013), Boll et al. (2016a).

In addition to the distribution by countries, the distribution by worker characteristics offers further insights. Table 1 provides information on the percentage of overeducated and not overeducated high- and medium-skilled workers by sex, age, and field of study in the aggregate cross-country sample (for more comprehensive descriptive statistics see Table 3 and Table 4 in the Appendix). As can be seen, highly-skilled men are slightly more frequently overeducated (29.3 %) than women (25.7 %) at this level of education. In the group of medium skilled-workers, the frequency of being overeducated hardly differs by gender.

Table 1
Percentage of overeducated (yes) and not overeducated (no) workers by sex, age, and educational attainment

Skill level	High-skilled		Medium-skilled	
Overeducation status	Yes	No	Yes	No
Sex (in % on all employees)				
- Male	29.3	70.7	13.2	86.8
- Female	25.7	74.3	13.1	86.9
Age (in % on all employees)				
- 15-24	42.8	57.2	15.7	84.3
- 25-34	28.6	71.4	16.1	83.9
- 35-44	26.9	73.1	13.9	86.1
- 45-54	26.5	73.5	11.6	88.4
- 55-64	25.1	74.9	10.2	89.8
- 65-74	32.4	67.6	15.3	84.7
Field of study (in % on all employees)				
- Teaching, Education	15.4	82.4	20.5	79.5
- Humanities, Languages, Arts	27.2	72.8	11.7	88.3
- Social Sciences, Business and Law	28.7	71.3	12.3	87.7
- Science, Mathematics, Computing	27.3	72.7	14.3	85.7
- Engineering, Manufacturing, Construction	31.2	68.8	12.2	87.8
- Agriculture, Veterinary	46.5	53.5	19.3	80.7
- Health, Welfare	21.4	78.6	8.3	91.7
- Services	40.9	59.1	14	86

Sources: EU-LFS (2013), Boll et al. (2016a).

Moreover, among high-skilled workers the youngest (15-24 years) and the oldest group of (65-74 years) are more frequently overeducated than workers from other age groups. A lack of actual work experience and a missing occupational focus of study programs are potential factors to explain why young high-skilled workers are at a particular risk. For old high-skilled workers, other influences should dominate, potentially related to formally low-ranked but yet redeeming consulting activities executed in retirement. Again, the picture looks quite different if we look at medium-skilled workers. This group of workers is not only less likely to be overeducated in general, but the difference between age groups is also less marked. Intuitively, this could both be ascribed to a stronger occupational focus of educational programs at the medium level, facilitating young workers' access to adequate positions, and to a high relevance of practical work experience, helping older workers to maintain qualified jobs. Again, this result requires a more thorough analysis in the following section. Finally, the comparison by field of study shows that high-skilled workers from the fields Agriculture, Veterinary and Services are much more frequently overeducated than high-skilled workers from the fields Teaching and Education as well as Health and Welfare. This is explicable by the narrow occupational focus of the latter fields, thoroughly preparing graduates to become teaching and health professionals, respectively. Indeed, in our sample, 69 percent of all high-skilled graduates from

Teaching, Education worked as teaching professionals, while 67 percent of high-skilled graduates from Health, Welfare worked as health (or health associate) professionals. Graduation has the role of an entry ticket into these occupations. The result is a high degree of internal educational homogeneity (Abraham et al., 2011).

4.2 Regression results

Table 2 presents estimated coefficients of the aggregate cross-country model for high-skilled and medium-skilled workers separately.[4] The following discussion focuses on results from the cross-country model. Results for single countries are only reported if they clearly deviate from the aggregate ones.

Table 2
Estimation results (cross-country estimation)

	High-skilled		Medium-skilled	
	Coeff	SE	Coeff	SE
Personal characteristics				
Female	-0.008	0.013	-0.004	0.008
Age groups (reference: 25-34 years):				
- 15-24 years	0.140***	0.022	-0.008	0.007
- 35-44 years	0.011	0.009	-0.009**	0.004
- 45-54 years	-0.006	0.009	-0.029***	0.004
- 55-64 years	-0.007	0.010	-0.026***	0.005
- 65-74 years	0.060**	0.024	-0.010	0.012
Married	-0.029***	0.007	-0.004	0.003
Foreigner: EU countries	0.078***	0.014	0.112***	0.010
Foreigner: non EU countries	0.167***	0.016	0.085***	0.008
Field of study (reference: Social Sciences, Business and Law):				
- Teaching, education	-0.102***	0.010	0.089***	0.019
- Humanities, languages, arts	0.012	0.012	-0.018*	0.009
- Science, mathematics, computing	-0.008	0.010	-0.017**	0.008
- Engineering, manufacturing, construction	-0.011	0.007	-0.058***	0.004
- Agriculture, veterinary	0.094***	0.017	-0.024***	0.006
- Health, welfare	-0.096***	0.010	0.038***	0.009
- Services	0.108***	0.015	-0.041***	0.005
Household characteristics				
Number of unemployed adults[1]	0.048***	0.007	0.017***	0.004
Number of inactive persons[1]	0.013***	0.003	0.001	0.002
Persons aged 75 or older[1]	0.057	0.118	-0.036	0.049
Number of children between 0 and 5 years[1]	-0.006	0.005	0.002	0.003
Number of children between 6 and 11 years[1]	-0.008	0.005	0.000	0.003
Number of children between 12 and 14 years[1]	-0.001	0.008	0.001	0.004
Job characteristics				

[4] Regression tables for the single country regressions are provided upon request.

	High-skilled		Medium-skilled	
	Coeff	SE	Coeff	SE
Firm size (reference: < 10 persons):				
- 11-19 persons	-0.014**	0.007	0.005	0.004
- 20-49 persons	-0.054***	0.006	-0.005	0.003
- 50 and more persons	-0.053***	0.006	0.015***	0.003
Marginal employment[2]	-0.019	0.015	-0.014*	0.007
Temporary contract	0.038***	0.007	0.027***	0.004
Usual working hours	-0.058***	0.010	-0.001	0.006
Usual working hours squared	0.001	0.001	0.000	0.001
Tenure	-0.002	0.006	-0.006**	0.003
Tenure squared	-0.006***	0.002	-0.004***	0.001
Participation in LLL	-0.036***	0.006	0.021***	0.004
Second job	0.007	0.008	0.013**	0.006
Degree of urbanization	0.009***	0.003	-0.005***	0.002
Interaction terms:				
Sex and married	0.021**	0.009	-0.009*	0.005
Sex and urbanization	0.014***	0.005	-0.002	0.003
Sex and elder household members	0.036	0.131	-0.035	0.061
Sex and children:				
- number of children (0-5 years)	-0.030***	0.007	-0.009**	0.005
- number of children (6-11 years)	0.005	0.007	0.000	0.004
- number of children (12-14 years)	0.010	0.011	0.003	0.006
Sex and age groups (references: 25-34 years):				
- 15-24 years	-0.013	0.024	-0.023***	0.009
- 35-44 years	-0.013	0.011	-0.011*	0.006
- 45-54 years	0.009	0.011	-0.012**	0.006
- 55-64 years	0.018	0.013	-0.024***	0.007
- 65-74 years	-0.008	0.034	-0.049***	0.014
Sex and field of study (reference: Social Sciences, Business and Law):				
- Teaching, education	0.017	0.013	0.044**	0.018
- Humanities, languages, arts	-0.021	0.015	0.017	0.013
- Science, mathematics, computing	-0.014	0.015	0.023	0.015
- Engineering, manufacturing, construction	-0.026**	0.011	0.017***	0.006
- Agriculture, veterinary	-0.036	0.022	0.043***	0.013
- Health, welfare	0.014	0.012	0.012	0.008
- Services	0.010	0.021	0.013*	0.008
Observations	248,230		431,542	

[1]: in same household

[2]: usually working less than 15 hours per week

Notes: Malta, Poland and Slovenia are excluded due to data restrictions. *, **, *** statistically significant at the 10-percent, the 5-percent, the 1-percent level. Robust standard errors. Dummies for industry and country included. LLL: Life Long Learning. Coeff: coefficients, SE: robust standard errors.

Sources: EU-LFS (2013), Boll et al. (2016a).

Individual characteristics

In the cross-country perspective, the base level of gender proves to be insignificant for both medium and high-skilled workers, in line with a large part of the preceding literature (Büchel and Pollmann-Schult, 2001; Groot and van den Brink, 2003; Frenette, 2004; Green and McIntosh, 2007; Capsada-Munsech, 2015). However, this does not imply the general absence of a gender effect on overeducation. This is shown by the interaction terms of gender with other covariates, precisely with household composition variables and degree of agglomeration. For instance, the interaction of gender with marital status is significant for members of both skill groups, albeit with opposite sign. Additionally, the base level of marital status is significantly negative for high-skilled workers and insignificant for medium-skilled workers. Consequently, among high-skilled workers, married men face a significantly lower overeducation probability (about 2.9 % at the means) than unmarried men. At the same time, the probability for married men is also clearly lower than for married women, which is in line with Frank's Theory of Differential Overqualification (1978), but contrasts results of Frenette (2004) and Sloane et al. (1999), who find interaction terms to be insignificant. The pattern is also opposed to the estimates of Groot (1996), who predicts a risk-enhancing effect of marriage for men. Among medium-skilled workers, married and unmarried men do not exhibit significantly different probabilities, but they are significantly higher than those for married women.

With regard to the interplay of gender and urbanization, results likewise tend to differ between high-skilled and medium-skilled workers. Among high-skilled workers, women living in rural areas face a higher overeducation risk than women in urban areas in the cross-country estimations, an outcome again coinciding with the ideas of Frank (1978). For medium-skilled workers, this interaction term is insignificant, thus not pointing at a spatial dimension of the gender effect. At first glance, this outcome seems surprising, as high-skilled workers are commonly observed to be more mobile than workers with lower qualification levels (Greenwood, 1975). Therefore, one could expect their job quality to be less affected by conditions in their area of living. At the same time, however, theories of knowledge spillovers suggest that high-skilled workers benefit to the largest extent from working in urban areas (Duranton and Puga, 2004). In the single-country estimations, the significance of the interaction of urbanization and gender in the high-skilled segment is not observed for all large countries, for instance not for France and the UK. For these two countries, no rural-urban gap in the overeducation probability of women can be proved. This could hint at a higher degree of worker mobility and/or at a stronger influence of the female partner on a couple's co-location decision in these countries.

Moreover, our results for the impact of field of study deserve some attention. In this regard, the comparison to Ortiz and Kucel (2008) is most informative, as they apply the same categorization of fields and discriminate between tertiary and non-tertiary graduates in their estimation. First, among male high-skilled workers, the cross-country estimation yields the highest overeducation risk for graduates from the field Services, which is consistent with the results of Ortiz and Kucel (2008). A deviation from Ortiz and Kucel (2008) emerges with respect to students of Teaching and Edu-

cation, which in our approach enjoy the smallest overeducation probability. This could be rationalized by the phenomenon of social closure: graduates from teaching have overcome the hurdle for working as a teaching professional. They therefore enjoy access to a number of adequate positions with limited competition. For medium-skilled workers, results of our estimation are almost turned upside down: male graduates from Teaching and Education are at the highest risk, graduates from Services at the second lowest (after Engineering and Construction). Here, the interaction with gender reveals a particularly high risk for female medium-skilled workers in the field of Health and Welfare. Occupational segregation is likely to play a major role in this, given the female image of low-qualified jobs in the area of caretaking and medical assistance. At the country level, the single estimations show the highest degree of conformity with respect to the situation of high-skilled graduates from Services. The low probability for high-skilled graduates from Teaching is also remarkably widespread. In the high-skill segment, the strongest diversity of coefficients across countries can be observed for the fields Humanities and Engineering. Regarding Humanities, for instance in Italy and Portugal a significantly positive coefficient for the base term is estimated (again implying a higher overeducation risk than for the reference group), while it is negative in Germany. Results for Engineering are even more equally divided.

Of less complex nature is apparently the link to nationality. For both high- and medium-skilled workers, the overeducation risk is measurably higher for foreigners.[5] To the extent that foreigners include immigrants, this is in line with general economic reasoning. It would predict a higher risk for immigrants due to the non-transferability of human capital accumulated abroad and the role of cultural and language barriers. However, some interesting discrepancy emerges in the comparison of EU- and non-EU foreigners. Among high-skilled workers, the overeducation probability is clearly lower for EU- than for non-EU-foreigners, which seems consistent with a notion of cultural distance. Among medium-skilled workers, however, this is not observed. An explanation might be the existence of general legal or social barriers non-Europeans face in accessing high-skilled jobs in the EU. This fact would obviously be of less relevance for the overeducation risk of medium-skilled workers. Results at country level mostly fit this overall picture, apart from a few outliers. For instance, no significant differences between native and foreign medium educated workers are identified in the Netherlands.

For high-skilled workers, cross-country results on the role of worker's age seem to support the U-shaped relationship found by Green and McIntosh (2007) as well as Joona et al. (2012). Compared to the reference category 25-34 years, both the youngest group of 15-24 years old and the oldest group of 65-74 years old workers

[5] We also tested an alternative model in which nationality is also interacted with gender. However, results proved insignificant for both skill levels, suggesting that the impact of nationality is similar for male and female workers.

are predicted to be at a significantly higher risk. As the interaction terms of gender and age remain insignificant, this pattern holds for male and female high-skilled workers alike. Given that we control for marginal employment, it cannot simply be dismissed as reflecting age-specific spare-time work like student jobs or jobs for retirees. Rather, the high risk faced by the youngest group points at the existence of significant entry barriers that young high-skilled workers face when accessing the labour market immediately after graduation. At the medium skill level, male workers within the youngest group are not exposed to a particular high risk, which might be explained by the shorter training period and the stronger occupational focus compared to higher educational levels. At the same time, results for the oldest cohorts point at a beneficial role of work experience. Coefficients of the interaction terms of age and gender are throughout negative and significant. This implies that the risk-reducing effect of age (starting from the group of 35-44 years old) is not only maintained for women, its magnitude is even larger than in case of men. This result should be interpreted against the background of selection effects in the context of labour market exit, which are likely to be stronger and to occur earlier in life for female workers. As to be expected, results at country level show some degree of heterogeneity. For the high-skilled workers, Italy constitutes an outlier among the large countries. Here, overeducation risk is continuously declining with increasing age for the high-skilled. Among medium-skilled workers, Greece is a special case with a particularly high overeducation probability for the youngest group of 15-24 years old workers.

Household characteristics

A salient feature of our estimates for the household-specific determinants is the gender dichotomy. Starting with the role of children in the household, the coefficients of the base terms are generally insignificant. This means in our setup that the overeducation risk of male workers is not affected by children of any number and age composition. For female workers, the interaction terms with gender are relevant. Here, the result seems to hinge upon the age of children as well as the worker's educational level. For high-skilled female workers, having an additional child below the age of six is predicted to reduce the overeducation probability significantly. This is at odds with Sloane et al. (1999), who detect a risk-enhancing effect of small children. However, it matches the reservation wage argument laid out above: the reward should be high enough to cover the (monetary and emotional) costs of giving the child into external care. In turn, high rewards are typically associated with high skill requirements. For older children, the association remains insignificant, which is also in line with intuition, given that school-age children require less intensive care. For medium-skilled workers, the risk-reducing effect of small children is of lower magnitude and only weakly significant. This does not need to imply that medium-skilled females face lower costs of childcare. It could also result from the generally lower overeducation risk for medium-skilled workers. Another reason might be that medium-skilled workers are on average expected to be less wealthy than the high-skilled, which could force them to accept also barely adequate jobs when living with

children. In the estimations undertaken at country level, having children below the age of six cannot be proven to raise the overeducation risk of high-skilled workers for the majority of countries.

Furthermore, the presence of unemployed persons in the same household is estimated to increase the likelihood of overeducation for both skill classes. This is interesting, not least because it is a so far a new result in the overeducation literature. One interpretation could be that the need to financially support unemployed household members induces workers to avoid own unemployment by accepting even comparatively bad matches. This result is confirmed for many, if not for all countries in the separate estimations. Exceptions for which the coefficients show a reverse sign are only found at the medium-skill level and comprise two countries, Germany and Lithuania.

When comparing the role of unemployed with those of inactive household members, the influence of the inactive is measurably smaller in the cross-country estimations, as expected. For medium-skilled workers, the influence is insignificant. This seems to point at a linkage between household composition and job-related productivity: workers living together with unemployed might on average be less productive themselves, a fact that reduces their chances to find a match adequate to their formal education. In other words, for the medium educated the correlation points rather to selection than to causality. At the country level, this distinction is largely confirmed. In a clear majority of countries, the effect of unemployed household members exceeds the effect of the inactive. A notable exception is marked by high-skilled workers in Italy, for whom only inactive household members significantly contribute to a higher overeducation risk.

Job-related characteristics

Concerning job characteristics, results are partially surprising. Foremost, this concerns the role of marginal employment. While being insignificant for high-skilled workers, the coefficient is weakly significant and negative for medium-skilled workers. This means that marginally employed workers are at a lower risk of becoming overeducated, which contradicts the intuition outlined above. Even more surprising, in the estimations at country level, this result is confirmed for a clear majority of countries both in the segments of high- and medium-skilled workers. Descriptive analysis reveals that this difference results from the fact that marginally employed workers tend to select into different occupational groups in these countries. For instance, Managers and Professionals make up a considerably larger share among marginally employed workers in the UK (48.4 %) than in Germany (39.3 %). This might reflect country differences in the social perception of certain jobs. However, we need to be cautious with our interpretation, given that we only define marginal employment based on information on working hours.

In contrast, the coefficients for working in a temporary position are clearly positive for high- and medium-skilled workers, which is both in line with expectation and the

results of Green and McIntosh (2007) and Ortiz (2010). Again, one explanation could be that the transitory nature of fixed-time jobs could convince people to accept less ideal matches. The role of training activities exhibits contrary signs for the high- and the medium-skilled in the cross-country estimations. For high-skilled workers, recent participation in lifelonglearning activities (LLL) is associated with significantly lower overeducation risk for high-skilled, but significantly higher overeducation risk for medium-skilled workers. Among the highly educated, training foremost takes place within already favorable matches. By contrast, training incentives for the medium educated are predicted to be higher under unfavorable matches. Here, the upgrading argument seems to apply, i.e. workers seek to escape inadequate positions by improving their human capital through training. While the negative coefficient of LLL participation for the highly skilled proves to be negative for the majority of countries, there exists considerable country variation in the coefficients for the medium-skilled. For instance, in Greece and Italy it is positive and thus opposed to the aggregate effect. In all, the outcome documents the ambiguous relationship between training participation and the incidence of skill mismatches outlined above.

Results for the remaining job-related characteristics show a slightly more uniform picture. Longer job tenure is associated with a shrinking risk of overeducation for members of both skill segments, which is consistent with the general literature (Sloane et al., 1999; Büchel and van Ham, 2003). Workers in a skill mismatch are unlikely to achieve high levels of job satisfaction and are therefore not expected to remain in the current match for a long time. As the quadratic term is negative and highly significant, the risk reduction associated with any additional year is predicted to become even stronger with increasing tenure. Moreover, while the negative association with overeducation risk cannot be statistically proven for all single countries, it is nowhere estimated to be positive except for medium-skilled workers in Romania. This can be interpreted as a high degree of stability, especially compared to the outcomes for other covariates. Less straightforward are the results for hours of work. In the aggregate approach, the expected negative coefficient can only be confirmed for the high-skilled. This might be related to better promotion opportunities for high-skilled workers. These could create incentives to show high levels of engagement, i.e. to spend much time at the workplace, which is in turn rewarded through advancement into better positions. For medium-skilled workers, the corresponding incentives are lower, diluting a relationship between hours of work and overeducation risk. Moreover, the quadratic terms remain insignificant for both skill classes. Variation of the estimates among countries mostly concerns the quadratic term, reaching from a clearly positive to a clearly negative influence.

In addition, the estimated coefficients for firm size also show conflicting patterns. For the high-skilled, the overeducation risk is predicted to decline with increasing firm size. This result seems to fit the notion that larger firms can achieve a more precise matching of applicants and positions. Moreover, they offer more internal opportunities for advancement. For the medium-skilled, however, this is not observed. Workers in firms with more than 50 employees are here even at a significantly higher risk

than those in very small firms. This observation is presumably technology-related, in the sense that it reflects a relationship between occupation and firm organization: manual jobs in industrial mass production are typically executed within large organizations. For instance, for medium-skilled workers within the occupational group of plant and machine operators and assemblers, the share of workers employed in firms which are measured to have more than 50 employers is equal to 49.6 percent in our dataset, which clearly exceeds their share across occupations of 34.7 percent.

Finally, we also undertook additional estimations including further explanatory factors at the regional level (NUTS 2), such as the regional unemployment rate and employment-to-population ratio. However, due to the large share of missing values, models including this regional information did not yield reliable results for the population as a whole.

5 Conclusion

The purpose of this paper was to conduct a comprehensive econometric analysis of potential determinants of overeducation for the EU-28 countries in a unified framework. Based on data from the European Labour Force Survey (EU-LFS), a series of individual, household, job-related and regional characteristics were used as explanatory factors in a Probit model explaining the probability that a worker can be considered overeducated. Estimations were undertaken both for a cross-country sample and a set of 25 EU countries, selected based upon data availability. At each regional level, the sample was further split into two subsamples of high- and medium-skilled workers.

For most potential determinants, sign and magnitude of the estimated impact exhibits considerable variation both among countries and skill segments, justifying our disaggregated analysis. Results that are less scenario-sensitive are the higher overeducation risk of foreigners compared to native workers, the lower risk for persons with longer job tenure, the higher risk for persons in temporary compared to persons in permanent positions and the risk-increasing effect of the presence of unemployed and inactive household members. Others apparently specific to high-skilled workers are a U-shaped relationship between age and overeducation risk and the significant risk increase for female workers arising from a child below the age of six. Moreover, the risk was shown to vary significantly with the chosen field of study even when controlling for all other measurable characteristics. Among high-skilled workers, graduates from the field of Services exhibit the highest, teaching graduates the lowest EU-wide probability of overeducation. For medium-skilled workers, almost the inverse outcome was obtained, with graduates from Teaching facing the highest and graduates from Engineering facing the lowest overeducation probability.

Our results provide a stimulus for future research with respect to several aspects. First, the striking discrepancies observed in the role of many determinants between highly and medium educated workers clearly deserve some attention. It would be

interesting to know to which extent these results reflect a genuine treatment of persons at certain educational levels and to which extent they merely disguise the selection effect of educational programs. Second, concerning the effects of household composition, a further differentiation could yield additional insights. For instance, among the inactive household members, it would be beneficial to distinguish between permanently inactive ones (e.g. due to physical disability) and those who would be willing to work under changed conditions (hidden reserve). Under the assumption of rational behavior, the search pressure imposed by inactive household members on their active housemates can be expected to be lower in the case of voluntary inactivity, implying a different relation to overeducation. Finally, our cross-sectional setup could be extended to a Panel dataset in order to study the dynamics of overeducation. This would allow us to analyze the impact of previous employment histories, thereby gaining insights into the persistence of the phenomenon over the lifecycle.

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Appendix

Table 3
Descriptive statistics: high-skilled workers, EU-28

Variable	obs.	mean	std.	min.	max.
Overeducation	415197	0.3212	0.4669	0	1
Personal characteristics					
Female	416275	0.4985	0.5000	0	1
Age Group:					
- 15-24 years	416275	0.0325	0.1773	0	1
- 25-34 years	416275	0.2657	0.4417	0	1
- 35-44 years	416275	0.2983	0.4575	0	1
- 45-54 years	416275	0.2450	0.4301	0	1
- 55-64 years	416275	0.1400	0.3469	0	1
- 65-74 years	416275	0.0185	0.1348	0	1
Married	416275	0.5706	0.4950	0	1
Foreigner EU countries	416195	0.0366	0.1879	0	1
Foreigner non EU countries	416195	0.0307	0.1725	0	1
Field of study:					
- Teaching, education	407486	0.0927	0.2900	0	1
- Humanities, languages, arts	407486	0.1003	0.3004	0	1
- Social sciences, business and law	407486	0.3112	0.4630	0	1
- Science, mathematics, computing	407486	0.0939	0.2917	0	1
- Engineering, manufacturing, construction	407486	0.1917	0.3937	0	1
- Agriculture, veterinary	407486	0.0215	0.1451	0	1
- Health, welfare	407486	0.1455	0.3526	0	1
- Services	407486	0.0431	0.2031	0	1
Household characteristics					
Number of unemployed adults in same household	337097	0.0563	0.2467	0	4
Number of inactive adults in same household	337097	0.2103	0.4907	0	6
Persons aged 75 or older in same household	416275	0.0006	0.0236	0	1
Number of children between 0 and 5 years in same household	337097	0.2579	0.5598	0	4
Number of children between 6 and 11 years in same household	337097	0.2316	0.5413	0	5
Number of children between 12 and 14 years in same household	337097	0.1053	0.3365	0	4
Job characteristics					
Firm size:					
- 0-10 persons	356010	0.2065	0.4048	0	1
- 11-19 persons	356010	0.0973	0.2964	0	1
- 20-49 persons	356010	0.1654	0.3715	0	1
- 50 and more persons	356010	0.5309	0.499	0	1
Industry:					
- Agriculture, forestry and fishing	414990	0.0118	0.1078	0	1

Variable	obs.	mean	std.	min.	max.
- Mining and quarrying	414990	0.0022	0.0469	0	1
- Manufacturing	414990	0.1050	0.3065	0	1
- Electricity, gas, steam and air conditioning supply	414990	0.0095	0.0968	0	1
- Water supply, sewerage, waste management and remediation activities	414990	0.0043	0.0654	0	1
- Construction	414990	0.0372	0.1892	0	1
- Wholesale and retail trade; repair of motor vehicles and motorcycles	414990	0.0885	0.2840	0	1
- Transportation and storage	414990	0.0255	0.1578	0	1
- Accommodation and food service activities	414990	0.0196	0.1386	0	1
- Information and communication	414990	0.0547	0.2274	0	1
- Financial and insurance activities	414990	0.0468	0.2112	0	1
- Real estate activities	414990	0.0093	0.0958	0	1
- Professional, scientific and technical activities	414990	0.1093	0.3120	0	1
- Administrative and support service activities	414990	0.0278	0.1643	0	1
- Public administration and defence; compulsory social security	414990	0.0899	0.2860	0	1
- Education	414990	0.1556	0.3625	0	1
- Human health and social work activities	414990	0.1540	0.3610	0	1
- Arts, entertainment and recreation	414990	0.0206	0.1421	0	1
- Other service activities	414990	0.0225	0.1483	0	1
- Activities of households as employers; undifferentiated goods- and service-producing activities of households for own use	414990	0.0041	0.0642	0	1
- Activities of extraterritorial organizations and bodies	414990	0.0019	0.0432	0	1
Marginal employment	406910	0.0303	0.1713	0	1
Temporary contract	351643	0.0971	0.2961	0	1
Usual working hours (in 10h)	406910	3.8347	1.0890	0.1	8
Usual working hours squared (in 10h)	406910	15.891	8.4739	0.01	64
Tenure (in 10y)	412751	1.0440	0.9634	0	6
Tenure squared (in 10 y)	412751	2.0182	3.2534	0	32
Participation in lifelong learning	415687	0.1612	0.3677	0	1
Second job	416237	0.0484	0.2146	0	1
Degree of urbanization	416275	1.6792	0.7756	1	3

Sources: EU-LFS (2013), Boll et al. (2016a).

Table 4
Descriptive statistics: medium-skilled workers, EU-28

Variable	obs.	mean	std.	min.	max.
Overeducation	691106	0.1893	0.3918	0	1
Personal characteristics					
Female	693017	0.4468	0.4972	0	1
Age Group:					
- 15-24 years	693017	0.0705	0.2561	0	1
- 25-34 years	693017	0.2157	0.4113	0	1
- 35-44 years	693017	0.2683	0.4431	0	1
- 45-54 years	693017	0.2836	0.4507	0	1
- 55-64 years	693017	0.1468	0.3539	0	1
- 65-74 years	693017	0.0151	0.1220	0	1
Married	693017	0.5576	0.4967	0	1
Foreigner EU countries	692888	0.0301	0.1707	0	1
Foreigner non EU countries	692888	0.0250	0.1562	0	1
Field of study:					
- Teaching, education	666137	0.0218	0.146	0	1
- Humanities, languages, arts	666137	0.0321	0.1761	0	1
- Social sciences, business and law	666137	0.2651	0.4414	0	1
- Science, mathematics, computing	666137	0.0275	0.1636	0	1
- Engineering, manufacturing, construction	666137	0.3910	0.488	0	1
- Agriculture, veterinary	666137	0.0397	0.1953	0	1
- Health, welfare	666137	0.0999	0.2999	0	1
- Services	666137	0.1229	0.3283	0	1
Household characteristics					
Number of unemployed adults in same household	583596	0.0666	0.2708	0	5
Number of inactive adults in same household	583596	0.2541	0.5371	0	7
Persons aged 75 or older in same household	693017	0.0006	0.0246	0	1
Number of children between 0 and 5 years in same household	583596	0.1999	0.4919	0	5
Number of children between 6 and 11 years in same household	583596	0.2145	0.5086	0	5
Number of children between 12 and 14 years in same household	583596	0.1151	0.3448	0	4
Job characteristics					
Firm size:					
- 0-10 persons	595038	0.2713	0.4446	0	1
- 11-19 persons	595038	0.1193	0.3241	0	1
- 20-49 persons	595038	0.1647	0.3709	0	1
- 50 and more persons	595038	0.4448	0.4969	0	1
Industry:					
- Agriculture, forestry and fishing	691513	0.0345	0.1825	0	1
- Mining and quarrying	691513	0.0034	0.0585	0	1
- Manufacturing	691513	0.1802	0.3844	0	1

Variable	obs.	mean	std.	min.	max.
- Electricity, gas, steam and air conditioning supply	691513	0.0096	0.0974	0	1
- Water supply, sewerage, waste management and remediation activities	691513	0.0078	0.0878	0	1
- Construction	691513	0.0834	0.2764	0	1
- Wholesale and retail trade; repair of motor vehicles and motorcycles	691513	0.1541	0.361	0	1
- Transportation and storage	691513	0.0579	0.2335	0	1
- Accommodation and food service activities	691513	0.0420	0.2006	0	1
- Information and communication	691513	0.0227	0.1488	0	1
- Financial and insurance activities	691513	0.0305	0.172	0	1
- Real estate activities	691513	0.0093	0.0958	0	1
- Professional, scientific and technical activities	691513	0.0400	0.1959	0	1
- Administrative and support service activities	691513	0.0395	0.1948	0	1
- Public administration and defence; compulsory social security	691513	0.0714	0.2575	0	1
- Education	691513	0.0429	0.2025	0	1
- Human health and social work activities	691513	0.1199	0.3249	0	1
- Arts, entertainment and recreation	691513	0.0137	0.1163	0	1
- Other service activities	691513	0.0288	0.1674	0	1
- Activities of households as employers; undifferentiated goods- and service-producing activities of households for own use	691513	0.0078	0.0879	0	1
- Activities of extraterritorial organizations and bodies	691513	0.0007	0.0258	0	1
Marginal employment	675874	0.0395	0.1949	0	1
Temporary contract	589890	0.0862	0.2806	0	1
Usual working hours (in 10h)	675874	3.7331	1.0988	0.1	8
Usual working hours squared (in 10h)	675874	15.1433	8.3185	0.01	64
Tenure (in 10y)	682450	1.0949	1.005	0	6
Tenure squared (in 10 y)	682450	2.2088	3.4956	0	32
Participation in lifelong learning	692262	0.0956	0.294	0	1
Second job	692971	0.0371	0.1891	0	1
Degree of urbanization	693017	1.9497	0.8032	1	3

Sources: EU-LFS (2013), Boll et al. 2016a.

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Imprint

IAB-Discussion Paper 35/2016

24. Oktober 2016

Editorial address
Institute for Employment Research
of the Federal Employment Agency
Regensburger Str. 104
D-90478 Nuremberg

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Technical completion
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Website
http://www.iab.de

Download of this Discussion Paper
http://doku.iab.de/discussionpapers/2016/dp3516.pdf

ISSN 2195-2663

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