

# Overeducation: New Evidence for 25 European Countries

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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.

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

**JEL Classification:** J24, J21, J22

# 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, 2014a).

However, before being able to tackle the problem successfully, it is essential to understand 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 information 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 overeducation 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.

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 over-

education 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.

## 2.2 | Empirical results

Recently, the role of sex 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 biological sex 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 his or 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 oppor-

tunity 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. Only in absence of a control for self-selection, they find for female workers a significant positive impact of the number of children on the risk of overeducation. Moreover, 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.

### 3 | Data and Measurement

We use data from the European Labour Force Survey (EU-LFS)<sup>1</sup> to identify possible determinants of overeducation. The EU-LFS covers approximately 1.8 Mio. individuals aged 15 years or older<sup>2</sup> 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 educa-

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<sup>1</sup> For more detailed information on the European Labour Force Survey, see, for example, European Union (2014).

<sup>2</sup> Norway and Sweden only cover persons between 15 and 74 years and Iceland and Switzerland only provide data on people aged 15 and more.

tional 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<sup>3</sup> and job characteristics. Moreover, we consider interaction terms between sex and different household characteristics.

Personal characteristics include sex, 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 children (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 sex 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.

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<sup>3</sup> Household characteristics are not available for the Nordic countries (see European Union, 2014).

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.

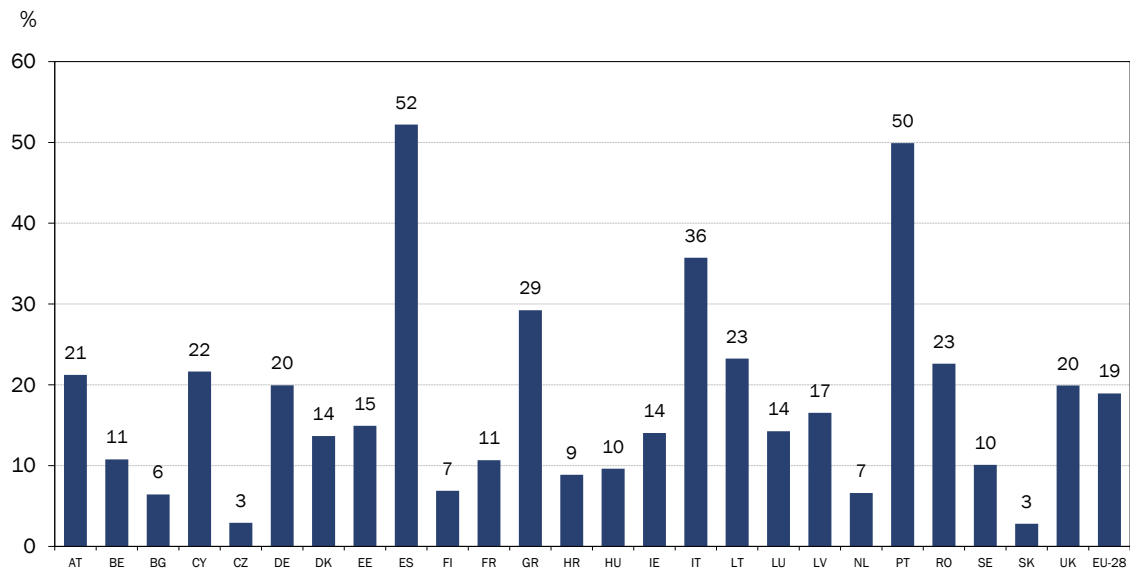
## 4 | Results

### 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 % 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 %. 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

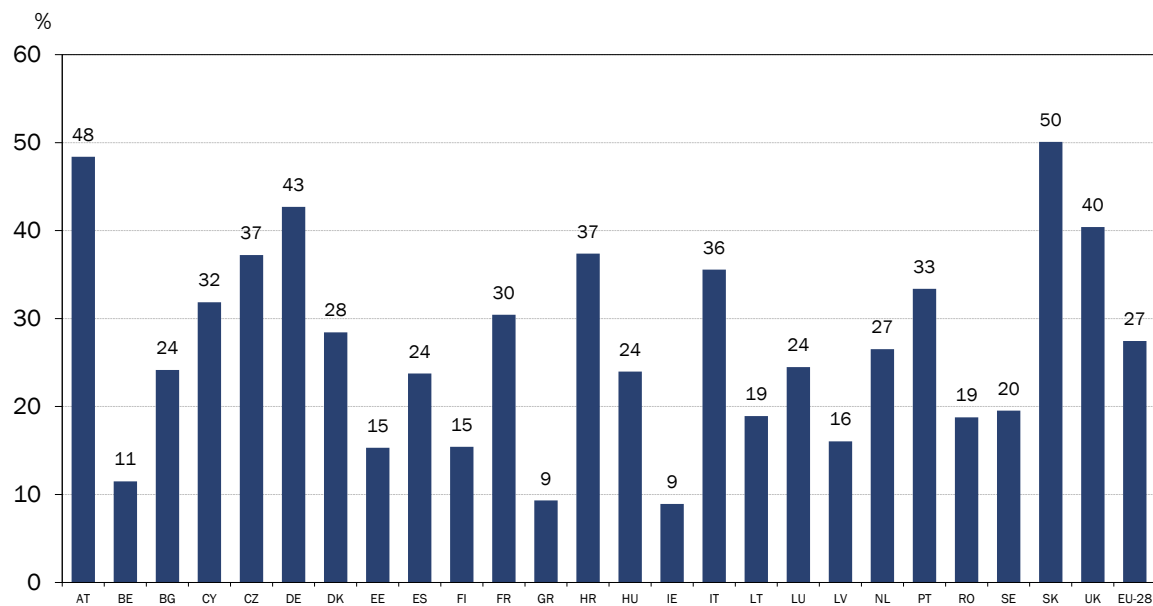


EU-28: without Malta, Poland and Slovenia  
Sources: EU-LFS (2013).

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 %. The geographical pattern also differs decisively. The Southern countries do not stand out with particularly high rates. The rate in Greece is with 9 % (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 (Verwiebe et al., 2014, Boll et al. 2014b) 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.<sup>4</sup>

<sup>4</sup> The distribution by workers' individual characteristics like sex, age, or field of study may be provided by the authors upon request.

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



EU-28: without Malta, Poland and Slovenia  
Sources: EU-LFS (2013).

## 4.2 | Regression results

Table 1 presents estimated coefficients of the aggregate cross-country model for high-skilled and medium-skilled workers separately.<sup>5</sup> 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.

<sup>5</sup> Regression tables for the single country regressions are provided upon request.

Table 1: Estimation results (cross-country estimation)

	High-skilled		Medium-skilled	
	Coeff	SE	Coeff	SE
<b>Personal characteristics</b>				
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
<b>Household characteristics</b>				
Number of unemployed adults <sup>1</sup>	0.048***	0.007	0.017***	0.004
Number of inactive persons <sup>1</sup>	0.013***	0.003	0.001	0.002
Persons aged 75 or older <sup>1</sup>	0.057	0.118	-0.036	0.049
Number of children between 0 and 5 years <sup>1</sup>	-0.006	0.005	0.002	0.003
Number of children between 6 and 11 years <sup>1</sup>	-0.008	0.005	0.000	0.003
Number of children between 12 and 14 years <sup>1</sup>	-0.001	0.008	0.001	0.004
<b>Job characteristics</b>				
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 <sup>2</sup>	-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
<b>Interaction terms:</b>				
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	

Sources: EU-LFS (2013).

<sup>1</sup>: in same household<sup>2</sup>: 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.

### *Individual characteristics*

In the cross-country perspective, the base level of sex 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 that a worker's sex does not impact on the risk of being overeducated. This is shown by the interaction terms of sex with other covariates, precisely with household composition variables and degree of agglomeration. For instance, the interaction of sex 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.

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 Education, 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 sex 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.

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.<sup>6</sup> 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 Joonas et al. (2012). As the interaction terms of sex 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. 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.

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<sup>6</sup> 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.

### *Household characteristics*

A salient feature of our estimates for the household-specific determinants is the dichotomy by the workers' sex. 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 sex 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 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 lifelong learning 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.

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 Pollmann-Schult, 2001; Büchel and Battu, 2003; Büchel and van Ham, 2003; Groot and van den Brink, 2003; Ortiz, 2010; European Commission, 2012). Work-

ers 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. 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. 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 % in our dataset, which clearly exceeds their share across occupations of 34.7 %.

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. 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.

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.

## 6 | References

- Alba-Ramirez, A. (1993): Mismatch in the Spanish labor market: overeducation?. *The Journal of Human Resources* 28(2), 259-278.
- Bauer, T. (2002): Educational mismatch and wages: a panel analysis. *Economics of Education Review* 21(3), 221-229.
- Becker, G.S. (1967): Human capital and the personal distribution of income: an analytical approach. University of Michigan, Ann Arbor, MI.
- Boll, C., Leppin, J., Rossen, A., Wolf, A. (2016a): Magnitude and impact factors of the gender pay gap in EU countries. Report prepared for and financed by the European Commission.
- Boll, C., Leppin, J., Schömann, K. (2016b): Who is overeducated and why? Probit and dynamic mixed multinomial logit analyses of vertical mismatch in East and West Germany. *Education Economics* (Online First, DOI: 10.1080/09645292.2016.1158787).
- Boll, C., Leppin, J. (2014a): Overeducation among graduates: An overlooked facet of the gender pay gap? Evidence from East and West Germany. SOEPpapers on Multidisciplinary Panel Data Research No. 627.
- Boll, C., Leppin, J., Quitzau, J. (2014b): Is the Euro boosting mobility? Labour mobility in Europe during the crisis years. Study Prepared Jointly by Berenberg and HWWI, Hamburg.
- Büchel, F., Battu, H. (2003): The theory of differential overqualification: does it work?. *Scottish Journal of Political Economy* 50(2), 1-16.
- Büchel, F., Van Ham, M. (2003): Overeducation, regional labor markets, and spatial flexibility. *Journal of Urban Economics*, 53(3), 482-493.
- Büchel, F., Pollmann-Schult, M. (2001): Overeducation and skill endowments: the role of school achievement and vocational training quality. IZA Discussion paper series No. 337, 1-28.
- Capsada-Munsech, Q. (2015): The role of social origin and field of study on graduates overeducation: the case of Italy. *Higher Education* 69(5), 779-807.
- Daly, M. C., Büchel, F., Duncan, G. J. (2000): Premiums and penalties of surplus and deficit education. Evidence from the United States and Germany. *Economics of Education Review* 19(2), 169-178.
- European Commission, Directorate-General for Employment, Social Affairs and Inclusion (2012): *Employment and Social Developments in Europe 2012*, Brussels.

- European Union (2014): Quality report of the European Union Labour Force Survey 2013 -2014 edition.
- Frank, R. (1978): Why women earn less: the theory and estimation of differential over-qualification. *American Economic Review* 68(3), 360–373.
- Frenette, M. (2004): The overqualified Canadian graduate: the role of the academic program in the incidence, persistence, and economic returns to overqualification. *Economics of Education Review* 23(1), 29-45.
- Green, F., McIntosh, S. (2007): Is there a genuine under-utilization of skills amongst the over-qualified? *Applied Economics* 39(4), 427-439.
- Groot, W., van den Brink, H. (2003): The dynamics of skill mismatches in the Dutch labour market. *Overeducation in Europe. Current Issues in theory and Policy*, 49-63.
- Groot, W. (1996): The incidence of, and returns to overeducation in the UK. *Applied Economics* 28(10), 1345-1350.
- Joona, P.A., Gupta, N.D., Wadensjö, E. (2012): Overeducation among immigrants in Sweden: incidence, wage effects and state-dependence. IZA Discussion paper series No. 6695, 1-39.
- Jovanovic, B. (1979): Job matching and the theory of turnover. *The Journal of Political Economy* 87(5), 972-990.
- Judge, G., Hill, R., Griffiths, W., Lütkepohl, H., Lee, T.-C. (1988): Introduction to the theory and practice of econometrics – 2<sup>nd</sup> edition.
- Kiker, B. F., Santos, M. C., De Oliveira, M. M. (1997): Overeducation and undereducation: Evidence for Portugal. *Economics of Education Review* 16(2), 111-125.
- McGoldrick, K.M., Robst, J. (1996): Gender differences in overeducation: a test of the theory of differential overqualification. *The American Economic Review* 86(2), 280-284.
- Nielsen, C.P. (2011): Immigrant over-education: evidence from Denmark. *Journal of Population Economics* 24, 499-520.
- Ortiz, L. (2010): Not the right job, but a secure one: over-education and temporary employment in France, Italy and Spain. *Work, employment and society*, 24(1), 47-64.
- Ortiz, L., Kucel, A. (2008): Do fields of study matter for over-education? The cases of Spain and Germany. *International Journal of Comparative Sociology* 49(4-5), 305-327.
- Sattinger, M. (1993): Assignment models of the distribution of earnings. *Journal of Economic Literature* 31(2), 831-880.
- Sicherman, N. (1991): “Overeducation” in the labor market. *Journal of Labor Economics* 9(2), 101-122.

Sicherman, N., Galor, O. (1990): A theory of career mobility. *Journal of Political Economy* 98(1), 169-192.

Sloane, P.J., Battu, H., Seaman, P.T. (1999): Overeducation, undereducation and the British Labour market, *Applied Economics* 31(11), 1437-1453.

Thurow, L. C. (1975): *Generating inequality: mechanisms of distribution in the U. S. economy*. New York: Macmillan Interactive Publishing.

Tsang, M. C., Levin, H. M. (1985): The economics of overeducation. *Economics of Education Review* 4 (2), 93-104.

Verwiebe, R., Wiesböck, L., Teitzer, R. (2014): New forms of intra-European migration, labour market dynamics and social inequality in Europe. *Migration Letters*, 11(2), 125-136.

## Appendix

Table A 1: Descriptive statistics: high-skilled workers, EU-28

Variable	obs.	mean	std.	min.	max.
Overeducation	415197	0.3212	0.4669	0	1
<b>Personal characteristics</b>					
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
<b>Household characteristics</b>					
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
<b>Job characteristics</b>					
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
- 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).

Table A 2: Descriptive statistics: medium-skilled workers, EU-28

Variable	obs.	mean	std.	min.	max.
Overeducation	691106	0.1893	0.3918	0	1
<b>Personal characteristics</b>					
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
<b>Household characteristics</b>					
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
<b>Job characteristics</b>					
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
- 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).