Rethinking under-skilling: evidence from the first Cedefop European Skills and Jobs Survey[1]

Ilias Livanos **Imanol Nunez**[2]

Abstract.

This paper investigates the prevalence of and the factors explaining the under-skilling of the European workforce. Three main causes are theoretically discussed; (a) Inefficient signaling, (b) Skills shortages and (c) On-the-job training substitution. To test the posited hypotheses, we use the CEDEFOP ESJ Survey to assess whether workers' skills were lower than required at the point when they started their job. Our results are rather mixed. First, we find that under-skilling is related to some academic fields such as Health & Medicine, and Engineering. Second, the labour market position of workers is clearly linked to under-skilling, being much more likely for the long-term unemployed. Finally, after controlling for endogeneity, we find limited support for the on-the-job training substitution hypothesis.

[2] Universidad Publica de Navarra. Pamplona (Spain).

[1] The views expressed in the paper are solely the authors' and do not necessarily represent those of the European Centre for the Development of Vocational Training (CEDEFOP). *The present paper or any parts thereof, as well as any information and data included in the paper shall not be used, published and/or divulged to third parties, without explicit permission from Cedefop, before the 1st of April 2016, that is the date at which Cedefop will make the microdata related to the European Skills Survey available to the wider public*. The usual disclaimer applies.

1. Introduction.

Skills matching (and mismatching) is one of the long-standing preoccupations for policy makers and public administrations. Governmental design of the educational system, for example, will determine the success of the transitions to the labour market. Furthermore, some key indicators of their governmental action, such as unemployment rates or labour productivity will be the result of policies devoted to improve the matching between skills. The public and government interest of the skill development and matching explain the intense political agenda regarding this issue. In particular, as highlighted by the EU Commission (2014), the deteriorating labour market prospects of younger and lower-skilled individuals in recent years require European policies that continue to invest in lifelong (mainly work-based) learning and active labour market policies, to overcome skill mismatches and ensure they find jobs.

The academic interest for the match between skills and job requirements has also been notable. It is in the seventies when some authors started to measure and discuss the returns to education and training (Berg, 1970; Freeman, 1976). More recently, the field on skill matching has been largely focused on the problem of over-skilling defined as the situation where workers report that their skills are not fully utilized (Mavromaras & McGuinness, 2012). This problem chiefly affects young graduates, who may be pushed to accept under-graduate jobs due to scarcity of job matching their skills (McGuinness& Sloane, 2011). The negative consequences of over-skilling are well-documented in previous empirical research, affecting both firms (lower productivity), and workers, who are paid lower salaries and enjoy less job satisfaction (Green & Zhu, 2010).

This paper examines a different type of skill mismatch, namely under-skilling that, using a conceptual parallelism, may be defined as the situation where workers skills are lower than required by their job and, therefore, require to be further developed. The problems arising from under-skilling may match those arising from over-skilling, concretely lower productivity (due to the insufficient skills) and consequently lower salaries or higher risk of being fired (due to the poor performance). Furthermore, firms may find more problematic to act against under-skilling than over-skilling. In cases of over-skilling, firms may arrange the problem by redefining (upgrading) tasks or changing jobs, and therefore, in some cases, it could be even used as an internal opportunity to develop the human resource function. In cases of under-skilling, instead, firms will be forced to invest in training in order to cover the skills gap, making, for example, their contribution to the educational systems (via taxes) less attractive for them.

Briefly, we argue that firms may hire insufficiently skilled workers for three chief reasons. First, firms may need some skills that are not available in the labour market. Due to these skills shortages, firms may be pushed to hire under-skilled workers. Second, firms may mistakenly hire under-skilled workers, as they might trust some imperfect labour market signals, such as academic degrees. If educational attainment is not correlated with skills, firms may find that their expectations regarding skills and productivity are not fulfilled. Third, firms may choose to complete and develop workers skills by means of on the job training. They may therefore prefer to hire under-skilled workers (and pay lower wages) and latter invest in developing and customizing workers' skills.

The European Skills and Jobs Survey (Cedefop ESJ survey) conducted by the European Centre for the Development of Vocational Training (Cedefop) provides an

unique database to empirically identify the factors affecting under-skilling. In particular, *Block D: Situation since Start Current Job* includes very valuable information regarding the development and demand for skills since the time workers started to work in the current job. Particularly, it gives a direct (subjective) measure of under-skilling by asking if skills were lower than required, and a qualitative measure of the magnitude of this deficit. We use responses to this question to assert the factors explaining under-skilling across 28 European Countries.

2. The factors explaining the under-skilling problem.

2.1.Inefficient signaling.

The signaling theory states that educational degrees could be an effective method to reduce the informational asymmetries affecting labour markets (Spence, 1973). Employers evaluate candidates (whose potential productivity or skills are unknown) using some observable characteristics such as educational credentials or working experience. In this context, high education degrees, for example, should signal high skills and capabilities, while lower educational attainments may be associated to lower skills. However, if this association fails, for example, in cases where the higher education system is accessible and easy to pass for low skilled students, firms may mistakenly hire some workers, as they might expect that their skills are higher than actual. Following the example of graduates, employers may find that hiring graduates is not worthy, as their skills are not sufficient for their assigned jobs or, in other words, they are under-skilled.

There is some evidence on the effect of the imperfect correlation between skills and education. Cuadras-Morato & Mateos-Planas (2006) find that graduates'

employment prospects are negatevely affected when the association between education and skills is not clear. Livanos & Nuñez (2014) also find that labour market outcomes of graduates are strongly affected by the quality of the degree or, in other words, by the signalling power of the academic certifications. Arkes (1999) find that college attendance is the most powerful signal of ability, while educational credentials appear to be imperfect signals. Furthemore, Arkes observed that some specific degrees (i.e bachelor ‘s degrees) are good signals for some skills (maths) while irrelevant for the rest. Ishida, Spilerman, & Suh (1997) focusing on post-secundary education, find limited support for the signalling effect of credentials, particularly in terms of promotion opportunities. However, they observe that graduates from top quality institutions are more skilled, particularly in terms of coginitive skills.

In general, there is a consensus regarding the relevance and usefulnes of educational signals in the labour market. However, empirical research demostrates that the signals (degrees, credentials, experience) are far from being perfect and therefore labour market is still affected by informational asymetries. In this sense, employers persistently report difficulties in hiring workers they need, particulaly because the achievement of school leavers is not adecquate or it is not properly focus to firms’ needs (Capelli, 2015). In this context, the hiring of the workforce becomes a decision making process distressed by uncertainty, where firms may fail in finding the desired candidate.

Accordingly, we argue that the likelihood of underskilling will depend on the quality and number of signals. In this sense, we posit that the expected performance and skills of workers adequately signalled by educational credentials should be more accurate than the expectancy regarding workers that lack these credentials. Hence, if

signals are effective (and this is the key question to be tested empirically), more signaling (educational level) will be associated with lower probability of under-skilling.

Hypothesis 1. The likelihood of under-skilling is negatively associated to the level of individual education.

Besides the amount of skills, firms are also interested in the type of skills they are hiring. In order to signal the field of expertise, the higher education system classifies grades in academic fields. Shavit, Muller, & Tame (1998) stress that the specificity of the education systems could influence the transition to the labour market. Specificity applies to the emphasis on specific training rather than on general knowledge. This is the case, for example, of fields such as Health, Education or Engineering. On the opposite, we should expect less specificity for fields where the variety of task and occupations is higher. This may be the case of fields such as Social Sciences, Humanities and Arts or Services. We could therefore expect that signals coming from more specific academic fields will more accurately signal the skills and capabilities, reducing the likelihood of under-skilling.

Hypothesis 2. The likelihood of under-skilling is lower for graduates from specific academic fields.

2.2.Skills shortages.

Under-skilling may also arise when firms are unable to find adequate and capable candidates in the labour market, situation which is usually known as skill shortages. In practice, skills shortages have been measured by (several forms of) difficulties in filling vacancies of skilled labour (Haskel & Martin, 1993). This approach leads to a conceptual divergence bewteen skills shortages and underskilling. As defined,

underskilling may only occur when firms facing a skill shortage may hire a (second best) canditate with lower or different skills. These situations are also known as "skills gap" or "lacking qualities" and are interpreted as a particular manifestation of the skills shortages (Green, Machin, & Wilkinson, 1998). Hence, under-skilling may be interpreted as a particular form of skill shortage, where the existing workforce may lack some capabilites or qualities, but are still able to do the job.

There is a growing literature on skills shortages, usually linked to the analysis of the consequences of the IT revolution. Skills shortages and mismatches, for example, are often seen as the cause of wage inequality (scarce skills are rewarded with high salaries) and unemployment (Osterman & Weaver, 2014). Several studies have also analyzed the changes and growth of the skills demands, and therefore the increased risk of skills shortages. In particular, the fast development of new technologies, in a context of an ageing workforce, are seen as the main causes of recent skills shortages (Burke & Ng, 2006). Autor, Levy, & Murnane (2003), for example,conclude that new technologies tend to polarize the skills needs, segmenting the demand betwenn high-skilled workers and low-skilled workers. Autor (2014) points that, in advanced economies, the demand for high skilled workers is rapidely increasing, at a faster pace than the supply. As a consequence, returns to skills, or the so-called skill premium, has rocketed in the last decade in the US (Goldin & Katz, 2007).

However, as we pointed above, skills shortages leading to underskilling should not affect fundamental or essential capabilities. Hospitals for example can not cover the skills of a heart surgeon with the skills provided by a nurse or a dentist. In other words, underskilling, as we define it, can only occur when the lack of a desirable skills can be covered by a workers providing some different (non optimal) skills.

For example, firms may be looking for sales assistant fluent in German, but in case they can not find it, the sales person may try to sell the product using English. Brenčič (2010) provides some empirical evidence on how firms adapt their skills requirements to the availabilties of the labour market. In particular, firms raise their requirements when high skilled candidates are abundant and lower them when they are scarce.

According to several studies, most of the skills shortages affect these non-essential skills, or in other words, affect to some desirable (but lacking) skills of the actual workforce. For example, Green, Machin, & Wilkinson (1998) show that, for employers in the UK, the most lacking skills are social, such as "good self-representation" and the "ability to get on with others in a team". From another approach, Capelli (2015) stresses that American employers indetify a clear lack of academic skills in science, technology, engeneering and maths.

Lazear (2009) stresses that the negative effect of skills shortages on employment and wages may depend on the idiosincracy of the skills mix, and on the thickness of the labour market. He distinguighes thick labour markets, where workers are able to easyly find new jobs suitable for their skills, and thin labour markets, where the opposite happens. From this perspective, underskilling problems may arise when workers belong to thin labour market, and have have problems finding jobs that match their skills. In this situation, and in order to avoid unemployment, they may be pushed to apply for jobs that do not suit their skills mix. An real life example of this situation is the recent burst of the contruction bublle in some countries, that pushed a great number of former construction workers to looking for jobs in other industries such as agriculture of basic services. These workers belonged to a very thin labour market segment and therefore tried to find jobs in new segments where

their skill mix was not optimal, but sufficient to perform their (likely basic) tasks. Accordingly, we posit:

Hypothesis 3. The likelihood of underskilling will be lower (higher) for workers in thick (thin) labour markets.

2.3.On-the-job training substitution.

The human capital theory distinguishes the general human capital, that includes all the skills and capabilities applicable in various firms, from the firm-specific human capital, that includes the skills that may raise the productivity in the firm, but are less useful in other firms (Becker, 1962). Since the scope of applicability is different, Lazear & Gibbs (2009) stress that education may be associated with general human capital, being goverments and individuals responsible of the learning process. On-the-job trainign, instead, is linked to the creation of both general human capital or firm-specific human capital, and usually firms are seen as the designers of the trainign strategy.

Within this framework, it can be argued that firms where the productive process requires specific skills, the relevance of generic education may be lower. Since the skill mistmach happens at the begining of the employment relationship, for firms where skills development relies on training, the cost of hiring under-skilled workers may be also lower. Furthermore, since education is usually rewarded with higher salaries, firms investing on training may prefer to hire cheaper (lower skilled) workers, in order to invest these resources on intesifying training. Hatch & Dyer (2004), for example, show that firms using selection systems based on screening mechanisms (instead of signals) combine this practice with the development of specific human capital trough learning by doing. For example, some firms may

prefer to hire underskilled apprendices in order to screen their potential and later invest in their training.

Transaction cost theory can also provide a supporting argument for the on the job training susbtitution argument. Williamson (1985) stresses that the decision to produce (on the job training) or buy (education) any good or service (skills) depends on contractual hazards. These hazards are higher when the required good or service are complex or very specific, as may be the case of the firm-specific human capital needs. In such cases, using the market (buying skills) may be risky and expensive, as the transfereability of these skills are low. External candidates investing in specific skills may demand higher salaries and more contractual guarantees (Lazear & Gibbs, 2009). Alternatively, firms may find it more eficient to hire candidates with lower skills than required in order to develop their specific skills by investing in training programmes. Hence, we argue that, for firms that intensively invest in on the job training (or more informal learning by doing systems) the cost of hiring an underskilled worker may be lower, and therefore its occurrence more likely.

Hypothesis 4. The likelihood of underskilling will be higher for workers that participate in learning by doing systems.

Hypothesis 5. The likelihood of underskilling will be higher for workers that are given more on the job training.

As we will discuss on the methodological section, the testing of these hypothesis is problematic since the relationship between under-skilling and training variables is clearly endogenous. Firms may hire under-skilled workers because they rely on

training for the development of skills or, alternatively, they may need more intensive training because they hire underskilled workers.

3. Sample and Variables.

Sample and database.

The article draws extensively on data from Cedefop's ESJ survey. The Cedefop European Skills and Jobs Survey (Cedefop ESJ) is a survey of adult employees aged 24-65 across all 28 European Union Member States. The aim of the survey is to enable policymakers and researchers in the EU to compare and analyse:

- the extent of skill development of adult employees over their working life, including their initial and continuing vocational training efforts;
- the changing nature of demand for formal educational qualifications, both for recruitment and optimal job performance;
- the demand for skills in different jobs and industries, including technical skills, foundation skills (literacy, numeracy, ICT, foreign language) and generic skills (communication, customer-handling, team-working, problem solving, learning to learn, organisation and planning skills);
- whether the skills of individuals are matched to their job requirements and the extent to which jobs are designed to make the best possible use of all available skills;
- the changing nature of skill requirements and of skill mismatch over employees' careers;

  the demographic, socioeconomic and contextual factors that may explain skill mismatch.

The dependent variable: Under-skilling rates across Europe and Academic Fields.

The dependent variable (under-skilling) is compiled using Cedefop *ESJ* survey *Question 30. When you started your job with your current employer, overall, how*

would you best describe your skills in relation to what was required to do your job at that time? We coded *Response 3. Some of my skills were lower than what was required by my job and needed to be further developed* as a dummy variable labeled *under-skilling*. In the same question, respondents were given the choice between Response 1. My skills were higher than required by my job (over-skilling) and Response 2. My skills were matched to what was required by my job (skills matching).

As mentioned above, most of the discussion on the proper identification of the skills matching is focused on the over-skilling literature. However, we understand that this discussion is suitable to assert the properties of the under-skilling measure, as the response used to construct the variable is included in the same question, as an alternative to the over-skilling option. The under-skilling dependent variable has some characteristics that should be explained in order to properly understand the analysis and results. First, it is a subjective measure of, in one hand, the individual skills of the worker and, in the other hand, the skills required by the job. Furthermore, the worker, and not the firm, makes this evaluation. This is common in the over-skilling literature, were most of the measures are subjective, rather than technical or objective, and frequently assessed by individual workers (Allen & van der Velden, 2001; Mavromaras & McGuinness, 2012; McGuinness & Sloane, 2011).

The subjective assessment of personal skills is not as problematic as the external (but also subjective) assessment of the skills required by the job. In particular, it is easy to argue that workers may lack the knowledge and information to identify the skills needed to perform certain tasks that, in some cases, are still unknown for them. When skills are measured by *direct self-assessment* techniques, the

assessment is subject to some perception biases and limitations on the understanding that could affect the measurement of the skills matching (Verhaest & Omey, 2006). This is an extended problem in the literature, that also affects our analysis. Capelli (2015), for example, favors the objective skills assessment, but recons that most of the studies are based on individual appraisement of the use of their skills.

However, in this analysis, and this feature is less common, the respondents of the Cedefop ESJ survey are questioned about the skills they required when they started their current job. We understand that this may, in some extent, mitigate (not eliminate) the perception bias and/or lack of knowledge that commonly affect the subjective measures of skill matching. Since they are being questioned retrospectively, workers may use their experience to evaluate if their skills were or not enough for their jobs, improving the accuracy of this evaluation.

In Table 1, we show the distribution of the skill matching by country in Europe.

[Insert Table 1 about here]

Frequencies show that, in Europe, the scale of the under-skilling problem (23.2%) almost equals (the much more analyzed) problem of over-skilling (25.9%). The analysis by country reveals some preliminary but interesting features. First, it shows that the problem of under-skilling is substantially higher than over-skilling in Eastern countries, ruled in the past by Communist economic systems. Under-skilling in Estonia (41.1%), Lithuania (37,8%) Latvia (35.9%) or Czech Republic (32.5%) is substantially higher than over-skilling. Instead, in Western and Mediterranean countries, the problem of over-skilling is stronger than under-skilling, particularly in Greece (37,6%), Spain (31,2%) or United Kingdom (35.8%). This preliminary result may indicate that under-skilling could be more frequent in countries where Higher

Education is adapting from systems based in planned economies. In market economies, both the educational system may choose to provide, and individuals may choose to acquire, the skill mix that the labour market is demanding. This could reduce under-skilling and improve the matching of skills.

Table 2 shows the distribution of mismatch frequencies by academic fields, which can be interpreted as an educational proxy for the types of skills.

[Insert Table 2 about here]

The distribution of under-skilling is quite stable across academic fields. Most of the fields suffer the over-skilling problem more intensely than the under-skilling, as it happens for the whole sample of, in this case, graduates. This circumstance is particularly clear for the Mathematics and Statistics field (+13.7%), which is a minority choice, and for the more popular Economics and Business field (9.1%). Rather worryingly, as society is always sensible regarding health issues, graduates from the Medicine and Health related fields report the highest level of under-skilling difference (-6.7%) even if their percentage for matching is also among the highest (51.1%).

The explanatory variables.

To measure the impact of the signaling mechanisms in the likelihood of under-skilling we use the *education level and fields* as variables. The Cedefop ESJ survey codifies the educational level following the ISCED classification (see Question 15). We create three dummy variables distinguishing Low education (No completed education, ISCED 1), Medium education (ISCED 2-5) and High education (ISCED 6-7). The sample frequencies show that the sample is slightly biased (taking as reference other European based statistics) towards individuals that are more

educated. The 46% of the sample that is high educated is also classified according the academic field of study (Question 17).

The Cedefop ESJ survey does provide some valuable information regarding the previous labour market situation of each individual, which can be used to locate workers in thick or thin labour markets. In particular, we use the variable *time looking for a job* (Question 40) as a measure of the thinness of the labour market. We assume that workers that spend long periods looking for jobs have difficulties in finding jobs that suit their skills mix, and therefore belong to thin labour markets. On the opposite, we use the variable *have turned down and offer* (Question 44) as a measure of the thickness of the labour market. We assume that workers rejecting offers have no difficulty in finding jobs suitable to their skills, and therefore operate in thick labour markets. A relevant 28.7% of the sample had rejected a job offer before accepting the current position. However, the Cedefop ESJ survey does not provide the reason why those offers were turned down.

The Cedefop ESJ survey includes a great variety of training and learning by doing variables. We construct three variables obtained from Question 33 that ask "Since you started your job, have you undergone any of the following types of training for your current job? The possible responses distinguish between a) Training attended during work hours (42.1%), that generally is paid by the employer, b) Training attended outside work hours (21.7%), where costs are usually shared between employer and employee, and c) Training performed whilst your regular job (34.7%), which is a magnitude similar to the learning by doing.

Finally, as suggested by Hatch & Dyer (2004), there may be some differences regarding the development of skill between formal training and more informal

learning by doing. Nevertheless, both human resource practices are designed to create and sustain competitive advantage by developing firm-specific skills, and therefore may akinly respond to the posited relationship. Two variables have been included to measure the learning by doing practices. In particular, Question 28 ask for practices "to improve or accquire new skills" and offers the response (among others) a) Your supervisor taught you on-the-job (41.1%) and b) You learned by interacting with colleagues at work (67.7%).

The model specification is completed with the inclusion of some control variables. In particular, we control for age and gender, as demographic controls, and country. The inclusion of country variables is important since the unit of the Cedefop ESJ survey are individuals and therefore macroeconomic conditions are not available. General economic conditions may particularly affect to the thickness of the labour markets, since economic downturns may complicate jobs searching, and therefore the labour market may become thiner. As a proxy, we include country level dummies, which will be associated to key figures such as GDP and unemployment rates. Since our data is a one sport cross-section, changes in labour market conditions that might not be captured by fixed country dummies will no affect our estimates. Finally, we include a control variable regarding the occupational matching provided by previous experience. In particular, we include responses to Question 41 that ask if they were "working in the same occupation in your previous job as in your current job".

4. Results.

The estimation of the likelihood and magnitude of underskilling.

Table 4 shows the results for the basic Logit and Ordered Logit models. In the third and fourth columns we estimate Ordered Logit using Question 31 where the magnitude of under-skilling is measured using a Likert scale, being 1 "little lower" and 5 "a lot lower". All the respondents reporting over-skilling or skill matching are coded with 0 in this variable.

[Insert Table 4 about here]

Regarding the testing of hypothesis, we find some support for *hypothesis 1* since the likelihood of under-skilling is higher for the medium education category in all models and specifications. In particular, using the Logit estimation, we find that the probability of under-skilling for graduates is 7% lower than for medium educated. The non-significant coefficient obtained for low education should be interpreted with care, since low education is a marginal category as we coded. No Education and ISCED 1 Elementary Education account only for the 1.5% of the sample, and therefore the significance of the coefficients may be affected. In the light of the theoretical definition of the model, these results may be used as proof of the effectiveness of higher education as skill signaling mechanism.

As posited in *hypothesis 2*, results indicate that the effect of higher education on under-skilling is not equal for all academic degrees. However, the results obtained only partially support the relationship between specific academic fields and the likelihood of under-skilling. Taking Economics and Business as reference category, we find very positive results for (the specific field of) Mathematics and Statistics, which reduces the probability of under-skilling in 31%. However, we find opposite

results for the also specific fields of Medicine and Health related (+23%) and Engineering sciences (9%) that increase the likelihood of under-skilling. The remaining (more generic) academic fields reduce the likelihood of under-skilling in the same magnitude as the reference category, Economics and Business.

Hypothesis 3 is also supported by the analysis. In particular, we find that the variable measuring the labour market thickness (turned down an offer) does reduce the likelihood of under-skilling in -12%. Results suggest that workers that are able to choose their job take advantage of this opportunity to improve the job/skill matching. Furthermore, variables measuring the labour market thinness do also behave as hypothesized. Specifically, our results show that workers that enter the labour market from unemployment have a higher probability of under-skilling. However, the analysis also reveals that the period of labour market search should be quite long in order to affect the likelihood of under-skilling. Concretely, only workers previously looking for a job during 2 years or more do increase their likelihood of under-skilling by 20%. In other words, job-searches shorter than 2 years have a non-significant impact on under-skilling.

Hypothesis 4 is also supported by results in the four different specifications. In particular, result show that firms where learning from the supervisor is more common (+34%) and learning from colleagues is an extended practice (+55%) have a higher probability of under-skilling. In this sense, the results may suggest that the cost of under-skilling is lower for firms where informal mechanisms to learn are implemented. In any case, as we will further explain in the next subsection, both learning by doing practices, and particularly, training investments may be affected by endogeneity.

Solving the endogeneity problem for training variables.

The (ordered) logit models proposed above may not be appropriate to test hypothesis 5. The inadequacy arises from the potential endogenous relationship between under-skilling (dependent variable) and training investment (explanatory variables). Concretely, it is quite clear that training may be the response to the under-skilling problem, as firms may need to invest in training programs to compensate the skills deficits of their employees. In effect, previous literature adopts, in general, this perspective of the relationship, where training performance and efficiency are dependent on skill related variables (Blume *et al*., 2010).

In the relationship posited in hypothesis 5, we argue that under-skilling is a consequence of the strategy of the firm; hire cheap under-skilled to invest in training. To test this assertion the model should consider the endogeneity. To resolve endogeneity problems, the usual econometric solution is the use of Instrumental Variables (IV) in two-stage least square models (2SLS). This methodology requires the definition of a set of instruments that are related to the endogenous variable while unrelated to the dependent variable (Cameron & Trivedi, 2009). In our case, instruments should be related with training investments and unrelated with the likelihood of under-skilling. In the analysis, we used firm characteristics (*size*, *sites* and *governance*) as IV of the training variables. We expect to be positively related with training, as the financial and human resources may determine the training strategy of the firm. Small firms, for example, may find difficult to find the financial and technical resources to provide training to workers, and therefore the level of and quality may be lower. We also expect that firm characteristics will (reasonably) be unrelated to the likelihood of under-skilling. In particular, the hypotheses above are referred to individuals (educational credential

or previous labour market position) and therefore may be exogenous to the firm characteristics.

Table 5 shows the results for the IV variables in the first-stage regressions, one for each endogenous training variable. In these equations, the remaining exogenous variables are also included, but results have only computational value and therefore are not included in the Table.

[Insert Table 5 about here]

Results confirm the relevancy of instruments as they are strongly related to the endogenous variables, particularly for the training programs sponsored by the firm. Only for the case of training outside of work hours, we find a weaker relationship. Moreover, this relationship is (against our initial expectations) negative with the size of the firm (-.012) and private governance (-.076). The estimated inverse relationship may just indicate that outside training is a substitute of training during work hours, which is characteristic of private and big firms, and therefore is negatively related to these firm characteristics. In any case, the direction of the relationship is not relevant in terms of ensuring the robustness of the IV model and therefore, as parameters are significant, we can conclude that they are good instruments of training outside working hours (endogenous covariate).

In Table 6, results for the structural equation of the IV model are shown.

[Insert Table 6 about here]

According to the results for the three endogenous variables (training variables) hypothesis 5 is clearly rejected. Once the endogeneity is controlled, the effect of training mechanisms in the likelihood of under-skilling disappears. The combined

result obtained in Table 4 (without controlling for endogeneity) and Table 6 (where instruments are used), indicate that firms do not purposely hire under-skilled workers to be trained. Instead, and this assertion should be confirmed by alternative models beyond the scope of this paper, results suggest that training (particularly during work hours or regular work) is the response (outcome variable) to the undesired under-skilling problem in some firm.

5. Discussion and conclusions.

The present study identifies the factors explaining the under-skilling problem in Europe. First, confirming our hypotheses, we find that educational attainments (particularly higher education) are an effective system to reduce under-skilling. However, against our hypotheses, we find that specific academic degrees are not particularly effective on that purpose. Even more, some paradigmatic fields such as Medicine and Health studies or Engineering are positively associated to under-skilling. Second, we confirm that the labour market position of workers, measured by the thinness and thickness of their segment, is a strong predictor of under-skilling. Finally, we find support for hypothesis 4 that associates on the job learning with under-skilling and we reject (after controlling for endogeneity) hypothesis 5 that associated training with under-skilling.

Several interesting implications are derived from the analysis. First, recent literature on skills mismatch has taken for granted that the problem of over-skilling is much more widespread than the problem of under-skilling (Capelli, 2015). Furthermore, the latest studies point to the idea that skills gaps or shortages do not exist or are not crucial in developed countries (Osterman & Weaver, 2014). However, starting from the descriptive results, the new wave of the Cedefop ESJ survey data reveals that the

magnitude of the under-skilling problem (23.2%) is (almost) as big as the problem of over-skilling in Europe (25.9%). Nevertheless, it is also true the prevalence of over/under-skilling problems is not equal across Europe. In fact, in countries such as United Kingdom or Germany, where most of previous studies are based, over-skilling is clearly more frequent than under-skilling. On the contrary, the problem of under-skilling is clearly more prevalent than over-skilling in countries that have not traditionally been studied, such as Estonia or the Czech Republic.

Second, results reveal that higher education (in average) is an effective mechanism to reduce labour market asymmetries and therefore improve skills matching. However, the analysis by academic fields, and some results from recent studies based in Europe, may shade this allegedly positive result. We found some worrying results for the case of Medicine and Health that notably increases the likelihood of under-skilling. However, some studies stress the skills deficits that doctor and nurses do usually report are related to general skills rather than to technical or professional skills. In particular, Maguire & Heaven (1997) observe that health professionals lack some basic skills, such as communicating with patients and self-control, while technical skills, usually obtained in higher education, are reported to be sufficient. Furthermore, other studies also suggest that the under-skilling problem detected in the analysis may not affect to key skills associated the professional exercise. In particular, estimates of the economic returns for Medicine and Health or/and Engineering reveal that graduates from these fields are rewarded with the highest skill premiums (Kelly, O'Connell, & Smyth, 2010), and therefore the under-skilling problem spotted in our analysis may not be penalized with lower wages. In sum, these studies stress that the solution to the under-skilling problem identified in

our analysis may be associated to vocational education and long-life learning, rather than substantial reforms in the design of the higher education curricula.

Furthermore, results from the present analysis are in line with some studies that identify some handicaps regarding the effectiveness of Higher Educationin the European area. Hanushek *et al*. (2015), for example, show that returns to skills are notably lower in Europe than in the US, and lower than in Australia or Korea. Furthermore, these changes have some notable social and political consequences for Europe. Hausermann, Kurer, & Schwander (2015), for example, stress that individuals with higher educational attainments are increasingly sensitive to experience labour market risks and, as a result, they are joining low skilled workers on the support for income redistribution and the welfare state.

Third, the finding on the effect of labour market thinness are coherent with the idea of skills deficits associated occupational or industrial changes. These deficits are stronger when occupational changes affect workers belonging to labour markets that are affected by long-term unemployment. Roosaar, Motsmees, & Varblane (2014), for example, also observe that occupational mobilty is contingent to changes in the skill mix as, they state, mobility is strongly favoured by training. In particular,they observe that potential underskilling caused by changes in occupations are corrected by the provision of training, usually offered by the administration. Lamo, Messina, & Wasmer (2011) also point to skills, specific skills concretely, as a barrier to labour market adjustements. They observe that occupational moblity is hindered by disadjustements on the skill mix of workers affected by unemployment. Our analysis confirms the association between unemployment and skill mismatch, and provides some new insights to this relationship, as identifies long-term unemployment (over 2 years) as the fundamental origin of underskilling.

Fourth, the analysis also provides some evidence regarding the relationship between job design, in particular, learning by doing mechanism, and under-skilling. Concretely, hypothesis 4 confirms that firms where jobs design offers opportunities to learn from colleagues or supervisors have higher probabilities of under-skilling. Some previous studies have, indirectly, pointed towards this direction, by drawing a relationship between the HR architecture and firms' strategy regarding the development of skills and capabilities. Lepak & Snell (2002), for example, identify knowledge-based employment as the combination of internal development of skills and organizational commitment. These firms are orientated towards skills-enhancing activities (learning-by-doing), reinforced with strong social interactions (supervisor/colleagues). In these organizations, thus, the cost of under-skilling may be lower as the HR structure is ready to compensate this deficit by providing support for the learning by doing. Within the Lepak & Snell (2002) framework, this type of HR management coexist with other (alternative) types such as job-based employment, where skills are externally acquired, and therefore the cost of under-skilling may be higher, as the HR architecture is not oriented to develop the skills and capabilities of workers.

Finally, regarding results in for training, the IV model shows that firms investing in on the job training do not suffer higher levels of under-skilling. Against our hypothesis, we find no support for the substitution between education (previously acquired skills) and training (firm specific skills). Our results instead suggest (but some further research should be performed to confirm this assessment) that training acts as a response to the under-skilling problem. Firms that suffer from persistent under-skilling problems, likely because their required skills are very specific, or the

educational system is not adequately developed, are obliged to invest more resources in on the job training.

This paper may open some new avenues for research. First, from the policy making perspective, the strong differences in the prevalence of under-skilling across Europe should be carefully analyzed in order to identify deficiencies in the design and development of some education systems. Second, the nature and characteristics of the skills deficit is Health and Medicine and Engineering should be investigated. As we argued above, and according to some other previous studies, these deficits may not be purely academic or technical, but more social or personal, and therefore the design of the response may be contingent to the results of this line of investigation. Finally, and from a managerial perspective, future studies may investigate the different responses that firms are giving to these skill deficits, by identifying benchmarks and effective practices.

Allen, J., & van der Velden, R. (2001). Educational mismatches versus skills mismatches: effects on wages, job satisfaction, and on the job search. *Oxford Economic Papers, 53*(3), 434-452.

Arkes, J. (1999). What do educational credentials signal and why do employers value credentials? *Economics of Education Review, 18*, 133-141.

Autor, D. (2014). Skills, education, and the rise of earnings inequality among the "other 99 percent". *Science, 344*(6186), 843-851.

Autor, D., Levy, F., & Murnane, R. (2003). The skills content of recent technological change: An empirical exploration. *Quaterly Journal of Economics, 118*(4), 1279-1333.

Becker, G. (1962). Investment in human capital: A theoretical analysis. *Journal of Political Economy, 70*(5), 9-49.

Berg, I. (1970). *Education and Jobs: The Great Training Robbery.* Wesport: Praeger.

Blume, B., Ford, J., Baldwin, T., & Huang, J. (2010). Transfer of training: A meta-analytic review. *Journal of Management, 36*(4), 1065-1105.

Brencic, V. (2010). Do employers respond to the cost of continued search? *Oxford Bulletin of Economics and Statistics, 72*(2), 221-245.

Burke, R., & Ng, E. (2006). The changing nature of work and organizations: Implications for human resource management. *Human Resource Management Review, 16*(2), 86-94.

Cameron, A., & Trivedi, P. (2009). *Microeconometrics Using Stata.* College Station: Stata Press.

Capelli, P. (2015). Skills gaps, skills shortages, and skills mismatches: evidence and arguments for the United States. *Industrial and Labour Relations Review., 68*(2), 251-290.

Cuadras-Morato, X., & Mateos-Planas, X. (2006). Skill bias and employment frictions in the US labour market 1970-1990. *Internationa Economic Review, 47*, 129-160.

European Commission (2014) *Employment and Social Developments in Europe 2014,* Luxembourg: Publications Office of the European Union.

Freeman, R. (1976). *The Overeducated American.* New York: Academic Press.

Goldin, C., & Katz, L. (2007). Long-run changes in the wage structure: Narrowing, widening, polarizing. *Brookings Papers on Economic Activity., 2*, 135-165.

Green, F., & Zhu, Y. (2010). Overqualification, job satisfaction, and increasing dispersion in the returns to graduate education. *Oxford Economic Papers, 62*(4), 740-763.

Green, F., Machin, S., & Wilkinson, D. (1998). The meaning and determinants of skills shortages. *Oxford Bulletin of Economics and Statistics., 60*(2), 165-184.

Hanushek, E., Schwerdt, G., Wiederhold, S., & Woessmann, L. (2015). Returns to skills around the world: Evidence from PIACC. *European Economic Review, 73*(1), 103-130.

Haskel, J., & Martin, C. (1993). The causes of skills shortages in Britain. *Oxford Economic Papers., 45*, 573-588.

Hatch, N., & Dyer, J. (2004). Human capital and learning as a source of sustainable competitive advantage. *Strategic Management Journal, 25*, 1155-1178.

Hausermann, S., Kurer, T., & Schwander, H. (2015). High-skilled outsiders?Labour market vulnerability, education and welfare state preferences. *Socip-Economic Review, 13*(1), 235-258.

Ishida, H., Spilerman, S., & Suh, K. (1997). Educational credentials and promotion chances in Japanese and American organizations. *American Sociological Review, 62*, 866-882.

Kelly, E., O'Connell, P., & Smyth, E. (2010). The economic returns to field of study and competencies among higher education graduates in Ireland. *Economics of Education Review, 29*(4), 650-667.

Lamo, A., Messina, J., & Wasmer, E. (2011). Are specific skills an obstacle to labour market adjustment? *Labour Economics, 18*(2), 240-256.

Lazear, E. (2009). Firm-specific human capotal: A skill-weights approach. *Journal of Political Economy, 117*(5), 914-940.

Lazear, E., & Gibbs, M. (2009). *Personnel Economics in Practice.* Hoboken: John Wiley and Sons, Inc.

Lepak, D., & Snell, S. (2002). Examining the human resource architecture: The relationship among human capital, employment, and human resource configurations. *Journal of Management, 28*(4), 517-543.

Livanos, I., & Nuñez, I. (2014). Better safe than sorry? The role of stratification and quality of higher education in the labour market outcomes of graduates across Europe. *Economic and Industrial Democracy*, on line first.

Maguire, P., & Heaven, C. (1997). The development of training model to improve health professionals' skills, self-efficacy and outcome expectancies whn

communicating with cancer patients. *Social Science and Medicine, 44*(2), 231-240.

Mavromaras, K., & McGuinness, S. (2012). Overskilling dymamics and education pathways. *Economics of Education Review., 31*, 619-628.

McGuinness, S., & Sloane, P. (2011). Labour market mismatch among UK graduates: An analysis using REFLEX data. *Economics of Education Review, 30*(1), 130-145.

Osterman, P., & Weaver, A. (2014). Why claims of skills shortages in manufacturing are overblown. *Economic Policy Insitute, 376*, 1-14.

Roosaar, L., Motsmees, P., & Varblane, U. (2014). Occupational mobilty over the business cycle. *International Journal of Manpower, 35*(6), 873-897.

Shavit, Y., Muller, W., & Tame, C. (1998). *From School to Work: A Comparative Study of Educational Qualifications and Occupational Destinations.* Oxford: Claredon Press.

Spence, M. (1973). Job market signaling. *Quaterly Journal of Economics, 87*, 355-374.

Verhaest, D., & Omey, E. (2006). The impact of overeducation and its measurement. *Social Indicators Research, 77*(3), 419-448.

Williamson, O. (1985). *The Economic Institutions of Capitalism.* New York: Free Press.

Table 1 Skills Matching by Country.

	Skills Higher than Required	Skills Matched	Skills Lower than Required
Germany	30,3	50,11	18,32
France	25,8	49,57	23,15
United Kingdom	35,85	40,7	22,55
Sweden	24,67	54,13	19,98
Italy	25,54	53,04	20,56
Greece	37,64	41,67	20,29
Czech Republic	18,93	48,07	32,47
Poland	27,25	50,31	21,32
Netherlands	25,1	53,56	19,66
Denmark	24,13	49,9	24,74
Hungary	24,47	54,01	21,12
Spain	31,17	49,56	17,26
Austria	34,34	43,03	21,62
Belgium	27,07	51,8	18,98
Ireland	29,67	41,96	27,47
Slovakia	22,19	42,41	34,91
Finland	27,52	43,51	28,07
Portugal	18,48	57,84	23,08
Estonia	10,71	47,35	41,14
Romania	15,00	58,87	25,8
Lithuania	11,02	50,45	37,84
Cyprus	26,2	43,6	30,00
Slovenia	22,12	59,62	17,96
Bulgaria	17,52	54,65	26,93
Latvia	10,00	53,4	35,9
Luxembourg	15,80	71,80	12,00
Malta	13,45	60,04	26,1
Croatia	20,94	56,73	21,64
TOTAL	**25,9**	**49,8**	**23,2**

Source: Compiled by authors from CEDEFOP ESJ SURVEY data.

Table 2 Skills Matching by Academic Fields.

	Skills Higher than Required	Skills Matched	Skills Lower	Upper/Lower difference
Economics and Business	30,9	47,1	21,5	9,4
Education	24,0	52,5	23,3	0,7
Humanities and Languages	31,1	45,0	23,3	7,8
Other Social Sciences	31,3	44,2	24,0	7,3
Natural Sciences	29,9	44,6	24,8	5,1
Mathematics and Statistics	32,7	47,8	19,0	13,7
Computing Sciences	30,4	46,6	22,4	8,0
Engineering Sciences	27,2	47,1	25,0	2,2
Agriculture and Veterinary	25,7	45,3	28,2	-2,5
Medicine and Health related	20,7	51,1	27,4	-6,8
Security & Transport	27,2	45,9	26,3	0,9
Other Subject	28,6	48,2	22,1	6,6
TOTAL	**28,3**	**47,1**	**24,0**	**4,4**

Table 3 The distribution of the explanatory variables.

Signaling variables.	
Level	
Low education	1,50%
Medium Education	53,0%
High education	46,0%
Fields	
Economics and Business	13,8%
Education	5,9%
Humanities and Languages	5,8%
Other Social Sciences	3,7%
Natural Sciences	4,1%
Mathematics and Statistics	2,2%
Computing Sciences	5,8%
Engineering Sciences	8,1%
Agriculture and Veterinary	1,1%
Medicine and Health related	5,0%
Security & Transport	2,3%
Other Subject	6,9%
Labour market thickness.	
Thickness	
Have Turned Down offer	28,7%
Thinness	
Looking for a Job: Max 6	5,6%
Looking for a Job: 6 to 12	3,3%
Looking for a Job: 1 to 2 years	3,5%
Looking for a Job: more than 2 years	3,8%
Training variables	
Learning by doing	
My Supervisor tought me on the job	41,1%
I learned by my Colleagues	67,7%
On the job training	
Attended training during work	42,1%
Attended training outside work	21,7%
Attended training regular work	34,7%
Control variables	
Demographic	
Age40_54	44,1%
Age55_65	13,3%
Female	44,0%
Occupational match	
I am in the same occupation as before	12,9%
Country	
Germany	8,2%
France	8,2%

UK	8,2%
Sweden	2,0%
Italy	6,2%
Czech	3,1%
Poland	8,3%
Netherlands	3,1%
Denmark	2,0%
Hungary	3,1%
Spain	8,2%
Austria	2,0%
Belgium	3,1%
Ireland	2,1%
Slovakia	2,1%
Finland	4,1%
Portugal	3,1%
Estonia	2,1%
Romania	3,1%
Lithuania	2,1%
Greece	4,2%
Cyprus	1,0%
Slovenia	2,1%
Bulgaria	2,1%
Latvia	2,1%
Luxembourg	1,0%
Malta	1,0%
Croatia	2,1%

Table 4 The likelihood of underskilling.

Variables	Logit Model [education]	Logit Model [fields]	O -Logit [education]	O-Logit [fields]
Signalling variables.				
Level				
Low education	,09	0,12	0,12	0,14
	(0,107)	(0,109)	(0,106)	(0,107)
Medium Education	0.07**	0.09**	0.09***	0.11***
	(0,025)	(0,028)	(0,024)	-0,028
High education	§	NA	§	NA
Fields				
Economics and Business	NA	§	NA	§
Education	NA	0,05	NA	0,01
		(0,051)		(0,051)
Humanities and Languages	NA	-0,02	NA	-0,02
		-0,051		-0,05
Other Social Sciences	NA	-0,04	NA	-0,06
		-0,062		-0,061
Natural Sciences	NA	0,04	NA	0,03
		-0,058		-0,057
Mathematics and Statistics	NA	-0.31***	NA	-0.31***
		-0,086		-0,085
Computing Sciences	NA	-0,03	NA	-0,01
		-0,052		-0,051
Engineering Sciences	NA	0.09*	NA	0.10*
		-0,044		-0,043
Agriculture and Vetinery	NA	0,19	NA	0,14
		-0,105		-0,102
Medicine and Health related	NA	0.23***	NA	0.22***
		-0,053		-0,052
Security & Transport	NA	0.17*	NA	0.16*
		-0,073		-0,072
Other Subject	NA	-0,04	NA	-0,03
		-0,048		-0,047
Labour market thikness.				
Thiksness				
Have Turned Down offer	-0.12***	-0.12***	-0.13***	-0.13***
	-0,026	-0,026	-0,026	-0,026
Thinness				
Looking for a Job: Max 6	*REFERENCE*	*REFERENCE*	*REFERENCE*	*REFERENCE*
Looking for a Job: 6 to 12	0,12	0.13*	0,12	0,12
	-0,064	-0,064	-0,063	-0,063
Looking for a Job: 1 to 2 years	0	0,01	0,02	0,02
	-0,065	-0,065	-0,064	-0,064
Looking for a Job: more than 2 years	0.20***	0.20***	0.17**	0.17**
	-0,06	-0,06	-0,059	-0,059
Trainining variables				
learning by doing				
My Supervisor tought me on the job	0.34***	0.34***	0.34***	0.34***

	-0,024	-0,024	-0,024	-0,024
I learned by my Colleagues	0.55***	0.55***	0.53***	0.53***
	-0,028	-0,028	-0,028	-0,028
On the job training				
Attended training during work	0.07**	0.06**	0.07**	0.06**
	-0,024	-0,024	-0,024	-0,024
Attended training outside work	-0.09**	-0.10***	-0.08**	-0.09**
	-0,029	-0,029	-0,029	-0,029
On the job training	0.21***	0.21***	0.19***	0.19***
	-0,025	-0,025	-0,024	-0,024
control variables				
Demographic				
Age40_54	-0.05*	-0.05*	-0,03	-0,04
	-0,025	-0,025	-0,025	-0,025
Age55_65	-0.19***	-0.19***	-0.17***	-0.18***
	-0,038	-0,038	-0,038	-0,038
Female	0.10***	0.09***	0.07**	0.07**
	-0,023	-0,024	-0,023	-0,024
Occupational match				
I am in the same occupation as before	-0.62***	-0.63***	-0.62***	-0.63***
	-0,041	-0,041	-0,041	-0,041
Country				
Germany	-0.46***	-0.46***	-0.45***	-0.45***
	-0,055	-0,055	-0,054	-0,055
France	-0.10*	-0,1	-0,07	-0,06
	-0,053	-0,053	-0,052	-0,052
UK	*REFERENCE*	*REFERENCE*	*REFERENCE*	*REFERENCE*
Sweden	-0.38***	-0.38***	-0.37***	-0.38***
	-0,09	-0,09	-0,089	-0,089
Italy	-0.29***	-0.30***	-0.25***	-0.27***
	-0,058	-0,058	-0,058	-0,058
Czech	0.34***	0.34***	0.38***	0.38***
	-0,069	-0,07	-0,067	-0,068
Poland	-0.23***	-0.23***	-0.20***	-0.20***
	-0,054	-0,054	-0,053	-0,053
Netherlands	-0.33***	-0.33***	-0.30***	-0.30***
	-0,077	-0,077	-0,076	-0,076
Denmark	0,09	0,08	0,06	0,05
	-0,086	-0,086	-0,085	-0,085
Hungary	-0.23**	-0.24**	-0.24**	-0.24**
	-0,077	-0,078	-0,076	-0,076
Spain	-0.39***	-0.39***	-0.37***	-0.37***
	-0,058	-0,058	-0,057	-0,057
Austria	-0.26**	-0.26**	-0.23**	-0.23**
	-0,088	-0,088	-0,087	-0,087
Belgium	-0.39***	-0.40***	-0.38***	-0.38***
	-0,077	-0,077	-0,076	-0,076
Ireland	0,05	0,05	0,1	0,1
	-0,083	-0,083	-0,081	-0,081
Slovakia	0.48***	0.49***	0.43***	0.45***
	-0,08	-0,08	-0,077	-0,077
Finland	0,06	0,05	0,04	0,02
	-0,063	-0,063	-0,061	-0,062

Portugal	-0.17*	-0.17*	-0.15*	-0.15*
	-0,073	-0,073	-0,072	-0,072
Estonia				
Romania	0,02	0,01	0,08	0,08
	-0,072	-0,072	-0,071	-0,071
Lithuania	0.59***	0.58***	0.54***	0.53***
	-0,077	-0,078	-0,074	-0,074
Greece	-0.18**	-0.18**	-0.13*	-0.13*
	-0,068	-0,068	-0,067	-0,067
Cyprus	0.22*	0,21	0.24*	0.24*
	-0,11	-0,11	-0,106	-0,107
Slovenia	-0.57***	-0.57***	-0.51***	-0.51***
	-0,094	-0,094	-0,093	-0,093
Bulgaria	0,15	0,14	0,15	0,15
	-0,084	-0,084	-0,082	-0,082
Latvia	0.42***	0.41***	0.45***	0.44***
	-0,078	-0,079	-0,076	-0,076
Luxembourg	-0.83***	-0.82***	-0.80***	-0.79***
	-0,149	-0,149	-0,148	-0,148
Malta	-0.22*	-0,22	-0,19	-0,19
	-0,112	-0,112	-0,11	-0,11
Croatia	-0.38***	-0.39***	-0.36***	-0.37***
	-0,088	-0,089	-0,087	-0,087
Constant	-1.52***	-1.53***	NA	NA
	-0,049	-0,052	NA	NA
Constant cut1	NA	NA	1.54***	1.55***
	NA	NA	-0,049	-0,052
Constant cut2	NA	NA	2.00***	2.01***
	NA	NA	-0,049	-0,052
Constant cut3	NA	NA	2.59***	2.60***
	NA	NA	-0,05	-0,053
Constant cut4	NA	NA	3.72***	3.73***
	NA	NA	-0,054	-0,057
Constant cut5	NA	NA	4.81***	4.82***
	NA	NA	-0,064	-0,066

Standard errors below coefficients
*** p<0.001, ** p<0.01, * p<0.05
Source: Authors' estimations based on the CEDEFOP ESJ SURVEY data

Table 5 First-Stage equation: Instruments of training variables.

Instrumented: OnTraining	
Firm size	.112***
	(.005)
Multi site	.096***
	(.005)
Private firm	-.102***
	(.005)
Instrumented: OutTraining	
Firm size	-.012**
	(.004)
Multi site	-.005
	(.004)
Private firm	-.076***
	(.004)
Instrumented: InTraining.	
Firm size	.045***
	(.005)
Multi site	.053***
	(.004)
Private firm	-.026***
	(.004)

Standard errors below coefficients
*** p<0.001, ** p<0.01, * p<0.05
Source: Authors' estimations based on the CEDEFOP ESJ SURVEY data

Table 6 Structural equation results: Endogenous training variables.

VARIABLES	(1) Coefficients
OnTraining	1.48
	(0.958)
OutTraining	-1.07
	(0.634)
InTraining	-3.35
	(2.102)
LowEducation	-0.15
	(0.157)
MediumEducation	-0.03
	(0.056)
Age40_54	-0.11
	(0.067)
Age55_65	-0.20*
	(0.089)
Female	0.12
	(0.067)
Supervisor	0.69*
	(0.319)
Colleagues	0.76*
	(0.343)
Germany	-0.08
	(0.089)
France	-0.14
	(0.087)
Sweden	-0.10
	(0.090)
Italy	-0.17*
	(0.081)
Greece	0.37
	(0.262)
Czech	0.43***
	(0.124)
Poland	0.26
	(0.201)
Netherlands	-0.20*
	(0.091)
Denmark	-0.36
	(0.238)
Hungary	0.14
	(0.190)
Spain	0.13
	(0.184)
Austria	0.05
	(0.122)
Belgium	-0.16*
	(0.066)
Ireland	0.07
	(0.082)
Slovakia	0.15
	(0.097)
Finland	0.05
	(0.066)
Portugal	-0.30
	(0.178)
Romania	0.53

	(0.292)
Lithuania	0.01
	(0.195)
Cyprus	0.36*
	(0.163)
Slovenia	-0.08
	(0.107)
Bulgaria	0.33
	(0.188)
Latvia	0.74**
	(0.288)
Luxembourg	-0.26*
	(0.113)
Malta	0.19
	(0.192)
Croatia	0.22
	(0.239)
LokingBetween6and12	0.05
	(0.059)
LokingBetween1and2	0.09
	(0.082)
LokingForMorethan2	0.15
	(0.083)
HaveTurnedDownOffer	0.01
	(0.052)
SameOccupationAsBefore	-0.25***
	(0.037)
Constant	0.61***
	(0.107)
Observations	41,540
Adj. R-squared	e(r2_a)