Do skills protect graduates against a slack labour market?

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Abstract

The effect of field-specific skills and general skills on labour market entrants' probability of being unemployed or overeducated has been well documented. However, thus far it has not been explored whether the effects of field-specific and general skills interact with business cycle fluctuations or excess supply or demand in the occupational domain of a particular field of study. In this paper, we find that the effect of general skills on the probability of graduates being overeducated is larger when the country-level unemployment rate is higher whereas the effect of field-specific skills on the probability of graduates being overeducated is larger when the unemployment in the occupational domain of the field of study is higher. Moreover, we find that field-specific skills protect graduates against both unemployment and overeducation, whereas general skills protect against overeducation but appear to be unrelated to the risk of being unemployed.

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1. Introduction

Field-specific and general skills have been shown to affect labour market outcomes of young workers entering the labour market. Skills are significantly related to young workers' earnings (Bishop, 1995; Campbell & Laughlin, 1991; Kang & Bishop, 1989; Mane, 1999), probability of employment (Goux & Maurin, 1994; Mane, 1999; Payne, 1995; Ryan, 2001), job allocation (Heijke, Meng, & Ris, 2003) and probability of being overeducated for their job (Chevalier & Lindley, 2009; Verhaest & van der Velden, 2010). However, thus far it has not been explored whether the impact of field-specific and general skills interacts with business cycle fluctuations or excess supply or demand in the occupational domain of a particular field of study.

Naturally, employers can better select their workers when there is an oversupply, and they will do so partly on the basis of workers' skill levels. Therefore, we may expect that the value of field-specific and general skills will increase when unemployment rises. However, one can expect that the value of field-specific skills is particularly affected by the unemployment rate in the relevant occupational domain, whereas the value of general skills will be affected by the overall unemployment rate. In this paper, we will focus on two major labour market risks for graduates entering the labour market: the risk of being unemployed and the risk of finding a job below their educational level. We find that the effect of general skills on the probability of being overeducated is larger when the country-level unemployment rate is higher whereas the effect of field-specific skills on the probability of being overeducated is larger when the field-specific unemployment rate is higher. Moreover, we find that field-specific skills protect graduates against both unemployment and overeducation, whereas general skills protect against overeducation but appear to be unrelated to the risk of being unemployed.

The paper is structured as follows: Section 2 reviews the literature on the effect of field-specific skills, general skills as well as the business cycle on labour market outcomes of labour market entrants. In section 3 we discuss our data and in section 4 we present our estimation results. Section 5 concludes.

2. Literature Review and Hypotheses

Economic literature usually distinguishes between firm-specific and general skills. While the former only augment productivity in a specific firm, the latter are productive in multiple firms. When issues of labour reallocation are examined in the context of business cycles, studies often refer to industry-specific instead of firm-specific human capital because their unit of analysis is the industry (for example, see Keane & Prasad, 1993; Lilien, 1982). In our analysis of labour market outcomes of graduates, our unit of analysis is the field of study. We therefore deviate from the standard dichotomy by referring to field-specific instead of industry or firm-specific skills. We define field-specific skills as skills which are productive in jobs related to a graduate's field of study and which are only transferable to other fields with considerable value depreciation, if at all. General skills, on the other hand, are productive in all fields and do not depreciate when transferred from one field to another.

Different sets of field-specific and general skills have been found to influence labour market outcomes in various ways. As shown by Bishop and Kang (1989), Bishop (1995), Campbell and Laughlin (1991) and Mane (1999), it pays off for non-college bound high school students to invest in specific vocational[2] instead of general academic skills. Non-college bound high school students with field-specific skills have a smoother transition into work and earn more. The authors of these studies suggest that field-specific skills are more productive, are better observable and therefore reduce the risk of employers to find a good match for their vacancies. Goux and Maurin (1994) and Payne (1995) for France and the US respectively find that school leavers from vocational secondary education usually have a lower incidence of unemployment than school leavers from general secondary education. Ryan (2001) therefore concludes that the big payoff of acquiring field-specific skills is finding employment.

Does this mean that we can expect general skills to have no effect on the probability of being unemployed or overeducated in our study? Not necessarily. We have to keep in mind that the studies cited earlier focus on non-college bound high school students. For this group, the dominance of field-specific skills is evident. High school students cannot compete with higher educated on the basis of general skills, as the latter will always have higher levels of these general skills. Their comparative advantage in the labour market lies in occupation-specific, vocational skills. For graduates, however, it is by no means self-evident that general skills matter less for success in the labour market. The studies that have been carried out show effects both for field-specific skills as for general skills.

Heijke et al. (2003) show that field-specific skills are especially important for the allocation of graduates to the first job. High field-specific skills increase the chance of getting a job in occupations related to the own field which is on average associated with higher wages. General skills, on the other hand, increase the probability of receiving training during the first years in the labour market, which is also associated with higher wages. Both skill-types, the authors conclude, therefore positively impact wages: field-specific skills by securing a job related to the field of study and the general skills by increasing the incidence of training.

Verhaest and Van der Velden (2010) find that graduation from a study programme which is more focused on general skills significantly increases the probability of being overeducated in the first job, But graduating from such general programmes also increase the probability to 'escape' from a situation of overeducation and finding a job that matches their level of education. In a study on graduates in the UK, Chevalier and Lindley (2009) find that vocational courses protect graduates against 'genuine' overeducation.[3] But they also find that a general skill like mathematics protects the graduates against overeducation.

It is the combination of high levels of field-specific skills and general skills that distinguishes graduates from medium and low skilled workers. This is most probably accounted for in employers'

[2] Studies referring to non-college bound high school students usually use the term vocational skills to indicate that skills are field or occupation-specific. However, vocational skills generally refer to a skill level below the level of skills produced by higher education. In our view, the term vocational is therefore very appropriate for skills of individuals at a lower or intermediate level of education but not for our sample of higher education graduates.

[3] Chevalier and Lindley (2009) define individuals as being genuinely overeducated when they do not work in a traditional graduate occupation and are unsatisfied with the match between their job and their education.

expectations and hiring practices. Both skill-types have specific roles with regard to the allocation of graduates to jobs, both leading to better labour market outcomes through different routes. Concluding, we have good reason to expect that, in contrast to non-college bound high school students, graduates benefit from both skill-types.

Hypothesis 1:

Both field-specific and general skills decrease graduates' probability of being overeducated as well as graduates' probability of being unemployed 5 years after graduation.

Several studies have examined the effect of the business cycle on labour market outcomes of labour market entrants. Ryan (2001), for example, concludes that labour market entrants react supercyclical to changes in labour market conditions. As an adjustment of wages during an economic recession is mostly not possible due to legislation or union agreements, it is the new labour market entrants with the lowest tenure who find themselves most affected (Devereux, 2000; Jovanovic, 1979). In line with these arguments, Wolbers (2007), analyzing labour market entry patterns across 11 European countries, finds that a higher unemployment rate at the time of entering the labour market increases individuals' risk of subsequent job loss. Findings with regard to the effect of the business cycle on overeducation are less straight forward. Looking at the entire working population, Di Pietro (2002), Groot and Maassen van den Brink (2000) and Büchel and Van Ham (2003) find little or no evidence that the unemployment rate affects overeducation. We expect this to be different for labour market entrants whose labour market position is most vulnerable to labour market fluctuations. High unemployment could push graduates to accept jobs for which they are overeducated. Verhaest and Van der Velden (2010) show that the output gap, the difference between actual and potential GDP and thus an indicator for excess demand for labour, has a positive effect on the probability of a good match.

To our knowledge, no study has thus far explored if and in what way field-specific and general skills interact with labour market conditions. In this paper, we hypothesise that employers will exploit bad labour market conditions to select their workers more according to the skill sets they need in their firms. Therefore, the value of field-specific and general skills should increase when labour market conditions turn bad. Moreover, we expect that the effect of field-specific and general skills differs with regard to their dependency on field-specific and country-level labour market conditions. As indicated above, field-specific skills cannot easily be transferred to other fields and are most useful in occupational domains of the field of study. Field-specific skills are thus less productive, less rewarded and not relevant for job allocation outside one's own field. As field-specific skills are mainly relevant for success in jobs related to the field of study, their value will be affected by field-specific labour market conditions. When the field-specific labour market conditions turn bad, specific skills will become more important to avoid unemployment and overeducation. General skills, on the other hand, are transferable to jobs outside one's own field and are therefore also relevant for success in these jobs. The value of general skills is thus dependent on labour market conditions not only within but also outside the own field of study. We therefore expect the effect of general skills not to interact with field-specific labour market conditions but

with the overall, country-wide labour market conditions. General skills will become more important when general, country-level labour market conditions worsen. This leads us to our second and third hypothesis.

Hypothesis 2:

The effect of field-specific skills is dependent on the field specific labour market situation.

Hypothesis 3:

The effect of general skills is dependent on the overall, country-wide labour market situation.

3. Data

Our analysis is based on original and representative data from the REFLEX and HEGESCO surveys among graduates from 17 European countries.[4] The questionnaire was sent to higher education graduates five years after graduation. Our sample contains 11552 individuals for the estimation of the probability of being unemployed and 11129 individuals for the estimation of the probability of being overeducated.

In the questionnaire, respondents were asked to rate their level of 19 different skills on a scale from 1 (very low) to 7 (very high). Two of these skills, "mastery of own field or discipline" and "analytical thinking" are assumed to indicate field-specific and general skills respectively. "Mastery of own field or discipline" refers to graduates' level of theoretical and practical knowledge in their own field and to the ability to apply this knowledge in practice. Analytical thinking, on the other hand, refers to the ability to generalize from a concrete problem to abstract ideas, and to manipulate these ideas in one's mind in order to arrive at a solution, not only to the original problem, but to a whole class of similar problems. These skills match our definition of field-specific and general skills quite well.

Our definition of the dependent variables is straight forward. We code anybody as unemployed who had been actively trying to obtain paid work in the four weeks preceding the survey but who was not in paid work at the time of the survey. With regard to overeducation, we asked respondents to indicate the type of education most appropriate for the job they are doing.[5] We consider higher education graduates overeducated if the appropriate type of education for their job is below tertiary level.

We use the unemployment rate at the time of the surveys as a proxy for labour market conditions. We include the country unemployment rate as well as the field-specific unemployment rate within a

[4] REFLEX was conducted in 2005 among 15 European countries and Japan. HEGESCO is the extension of REFLEX to four new EU member states and Turkey conducted in 2009. In our analysis we only focus on European countries to ensure comparability. We excluded Sweden and Portugal because their survey design substantially deviated from the rest of the survey. For the remaining countries, we only include individuals who were less than 36 years old at the time of the survey to avoid unobserved pre-university labour market experience to be influencing the results. Moreover, we exclude all individuals who were not living or working in their home country at the time of the survey or who enrolled in further education after the initial education they reported on. The number of observations per country varies between 382 and 995.

[5] For a short discussion of this technique versus other techniques such as external methods see Dolton and Vignoles (2000) and Hartog (2000). Van Smoorenburg and Van der Velden (1997) compare self-reporting methods with job-analyst methods for deriving overeducation and conclude that the former yields better estimates.

country. Both unemployment rates are calculated on the basis of the combined REFLEX and HEGESCO data as posterior means. Their values per country and field of study are displayed in table 1. When using posterior means instead of simple means the mean country unemployment and the mean field-specific unemployment is corrected for its reliability by shifting it towards the Grand Mean depending on the number of observations within each country and field of study. Note that in the regressions, we include the field-specific unemployment rate within a country as the deviation from the country-level unemployment rate, and we include the country unemployment rate as the deviation from the overall sample unemployment rate. This ensures that both unemployment rates are uncorrelated and has advantages concerning the interpretation of the regression results as pointed out in the next section.

Table 1: Country-level and field-specific unemployment rates per country

	Mean	ED	HU	SJI	BL	SMC	EMC	AV	HW	SE
Austria	4,3	2,4	6,1	4,4	4,5	3,6	3,2	5,8	4,8	3,7
Belgium	2,2	1,9	3,3	2,2	1,1	3,0	2,0	2,1	1,2	1,9
Czech Republic	2,6	3,1	3,9	1,6	1,9	2,6	2,1	2,5	2,6	2,1
Estonia	1,9	1,0	2,3	1,7	1,2	1,2	1,1	2,3	2,4	2,5
Finland	4,4	4,4	4,9	3,3	4,0	4,1	3,1	3,5	5,8	6,5
France	7,6	6,6	10,5	8,7	8,2	9,7	5,7	7,2	5,9	7,5
Germany	4,8	4,7	5,9	4,7	4,1	7,3	4,6	4,1	3,8	4,0
Hungary	5,0	6,7	4,2	5,3	4,9	4,6	4,5	4,9	4,1	5,9
Italy	7,6	9,0	10,2	9,1	7,4	8,4	3,6	8,1	6,6	7,4
Lithuania	3,2	3,8	4,4	2,7	2,7	2,8	2,7	-	2,9	3,0
Netherlands	4,2	2,6	6,0	4,0	3,6	6,1	3,5	4,7	2,8	4,1
Norway	2,7	2,4	3,3	3,0	2,1	2,5	2,2	2,6	2,1	3,1
Poland	2,2	3,3	2,0	1,5	2,1	2,3	1,7	2,0	1,8	1,8
Spain	8,9	9,8	12,5	9,9	7,8	10,3	5,1	11,3	7,5	8,0
Slovenia	3,8	3,9	4,1	3,3	3,6	3,5	2,4	5,1	1,6	5,4
Switzerland	4,4	3,6	5,2	5,3	4,2	6,4	3,2	4,3	3,1	-
United Kingdom	3,6	2,7	5,6	3,5	3,3	2,6	3,8	4,0	2,5	3,8

Note: Values are posterior means derived from REFLEX/HEGESCO data. ED=Education, HU=Humanities and Arts, SJI=Social Sciences, Journalism and Information, BL=Business, Law, SMC=Science, Mathematics and Computing, EMC=Engineering, Manufacturing and Construction, AV=Agriculture and Veterinary, HW=Health and Welfare, SE=Services.

As control variables we only use variables which influence the probability of being overeducated or unemployed because of signalling or network effects but which are not necessarily outcomes of skills. We include gender, age, age squared, a dummy whether the father has higher education, a dummy whether the respondent has a second level higher education degree[6], a dummy whether the respondent had study-related work experience during higher education and a dummy whether the respondent had non study-related work experience during higher education.[7]

[6] A second level higher education degree is a degree at ISCED level 5A allowing direct access to doctoral studies.
[7] Descriptive statistics of all variables used in the multivariate analysis can be found in appendix A.

4. Estimation Results

In this section we present our estimation results using random effects probit models which allow for country-specific unobserved effects[8]. For both dependent variables, the probability of being unemployed as well as the probability of being overeducated, we estimate three models. In model 1, we only include a graduate's standardized general and field-specific skills, the general and the field-specific unemployment rate and our set of control variables. Model 2 is our preferred model that tests our three hypotheses. Here, we additionally include the interaction terms of general skills with the general unemployment rate as well as field-specific skills with the field-specific unemployment rate. Model 3 includes all possible interaction terms between skills and the unemployment rates and can be seen as a robustness check. It tests whether the effect of field-specific skills also interacts with the overall unemployment rate and whether the effect of general skills depends on field-specific labour market conditions.[9]

For the interpretation of the coefficients of the main effects of skills in model 2 it is important to keep in mind that the field-specific unemployment rate is expressed as the deviation of the unemployment rate in the occupational domain of the field of study from the country-level unemployment rate and that the country unemployment rate is expressed as the deviation from the overall sample unemployment rate. This means that the averages of these two variables are zero and therefore their main effects represent average effects in all three models. In other words, in model 2 the main effects of skills express the effect of skills when the unemployment rate (in the occupational domain of the field of study and at the country level respectively) is average. The coefficients of the interaction terms express the change in the effect of skills on the outcome when the unemployment rate changes by one percent.

Unemployment

Table 2 presents the estimation results for the probability of being unemployed five years after graduation. The estimation results in model 1 show that graduates who have high field-specific skills have a lower probability of being unemployed than those who have a lower level of field-specific skills. For the average person in our sample, a one standard deviation increase in field-specific skills lowers the chance of being unemployed by 0.8% to 2.2%.[10] However, no such effect is found for graduates who report to have high general skills. To our surprise, general skills as

[8] Standardizing skills per country and expressing the field-specific unemployment rate as the deviation from the country unemployment rate eliminates any country specific unobserved effects related to these variables. However, we still have to rely on the assumption that the country-specific effect, such as employers' beliefs or institutional differences in ability sorting we do not account for in our analysis, is mean independent of the rest of our variables in the form of $E(c_c|x_{ci}) = 0$, where c_c is the country-specific unobserved effect and x_{ci} is the vector of our regressors of individual i in country c. We therefore test the consistency of the random effects model by calculating a logit random effects and a logit fixed effects model and applying a Hausman test. Naturally, the country-level unemployment rate drops out in the fixed effects model but the variable of interest, the interaction term with skills, does not. We cannot reject the null hypothesis that the random effects model is consistent.

[9] We also ran all six models including field of study dummies. This did not change the results significantly.

[10] For a table with marginal effects see appendix C.

proxied by the ability to think analytically do not improve graduates' chances of getting a job. The estimation results therefore only partially confirm the first hypothesis.

Table 2: The probability of being unemployed five years after graduation

	Model 1	Model 2	Model 3
Mastery of own field	-0.124***	-0.128***	-0.127***
(standardized)	(0.023)	(0.023)	(0.023)
Analytical thinking	0.029	0.027	0.026
(standardized)	(0.024)	(0.024)	(0.025)
Country-level unemployment rate	0.093***	0.094***	0.094***
	(0.017)	(0.017)	(0.017)
Field-specific unemployment rate	0.170***	0.172***	0.171***
	(0.019)	(0.019)	(0.019)
Country-level unemployment rate X		0.014	0.011
Analytical thinking		(0.011)	(0.012)
Field-specific unemployment rate X		0.015	0.012
Mastery of own field		(0.017)	(0.018)
Field-specific unemployment rate X			0.006
Analytical thinking			(0.019)
Country-level unemployment rate X			0.006
Mastery of own field			(0.012)
Controls included:	yes	yes	yes
N	11552	11552	11552

Note: Table reports coefficients, standard errors in parentheses. Controls included are gender, age, age squared, dummy father with higher education, dummy second level degree, dummy study related work experience during higher education, dummy non study related work experience during higher education.

Moreover, model 2 shows that there is no interaction effect between the unemployment rates and the effect of "mastery of own field" or "analytical thinking" on the probability of being unemployed. These results contrast with our second and third hypothesis and are robust to adding all possible interaction terms of unemployment rates and skills in model 3.

Overeducation

Table 3 presents the estimation results of our model with the probability of being overeducated for one's job five years after graduation as the dependent variable. Model 1 shows that, on average, both skill types have a significant negative effect on the probability of being overeducated.[11] For

[11] We also tested if graduates working in jobs that match their level of education have higher skills because they receive more training than those who are overeducated (van Smoorenburg & van der Velden, 2000). We therefore rerun our estimation once with hours of training in the past 4 weeks and once with a dummy indicating the participation in training in the last 12 months to take account of the effect of training on skills. Including these variables did not significantly affect the coefficients of our variables of interest, indicating that our skill variables are not picking up training effects.

the average person in our sample, a one standard deviation increase in field-specific skills reduces the risk of being overeducated by 1% to 6.1%. A one standard deviation increase in general skills reduces the risk of being overeducated by 1.3% to 5.8%. This confirms our first hypothesis with respect to the probability of being overeducated.

Both unemployment rates have a positive effect on the probability of being overeducated for one's job. Moreover, as expected, both the interaction of "analytical thinking" and the country-level unemployment rate as well as the interaction of "mastery of own field" and the field-specific unemployment rate are negative and significant at the 5% level in model 2. This indicates that in a period with high unemployment, having a higher level of general skills protects graduates from being overeducated for the job they have. Only if the overall unemployment rate is zero is there no effect of general skills on the probability of being overeducated as can be seen from the main effect of analytical skills in model 2.

Table 3: The probability of being overeducated five years after graduation

	Model 1	Model 2	Model 3
Mastery of own field	-0.080***	-0.080***	-0.079**
(standardized)	(0.018)	(0.018)	(0.018)
Analytical thinking	-0.103***	-0.104***	-0.105 ***
(standardized)	(0.018)	(0.018)	(0.018)
Country-level unemployment rate	0.118***	0.114***	0.114***
	(0.035)	(0.035)	(0.035)
Field-specific unemployment rate	0.082***	0.079***	0.078***
	(0.015)	(0.015)	(0.015)
Country-level unemployment rate X		-0.020**	-0.022**
Analytical thinking		(0.009)	(0.009)
Field-specific unemployment rate X		-0.032**	-0.030**
Mastery of own field		(0.014)	(0.014)
Field-specific unemployment rate X			-0.010
Analytical thinking			(0.014)
Country-level unemployment rate X			0.007
Mastery of own field			(0.009)
Controls included:	yes	yes	yes
N	11129	11129	11129

Note: Table reports coefficients, standard errors in parentheses. Controls included are gender, age, age squared, dummy father with higher education, dummy second level degree, dummy study related work experience during higher education, dummy non study related work experience during higher education.

Unfortunately, the data did not allow us to test this alternative explanation with regard to unemployment as we did not have training measures for respondents who were unemployed at the time of the survey.

Similar results are found for graduates' mastery of their own field. The effect of field-specific skills on the probability of being overeducated increases when the unemployment rate in the occupational domain of the field of study rises. Keeping in mind that the field-specific unemployment rate is expressed as a deviation from the overall unemployment rate and is zero for occupational domains with average unemployment, we see from the main effect of field-specific skills in model 2 that only in occupational domains with an unemployment rate well below the overall unemployment rate is the effect of field-specific skills almost zero. For the average person in our sample, the effect of a one standard deviation change of field-specific (general) skills on the predicted probability of being overeducated increases by about half a percent for every percent increase of the field-specific (general) unemployment rate. Our estimation results therefore support hypotheses 2 and 3 with respect to the probability of being overeducated 5 years after graduation. Model 3 shows that these results are robust to the specification of the model and that the other two possible interaction effects are not significant. Having high field-specific skills does not reduce the risk of being overeducated when the overall unemployment is high and that having a high level of general skills does not reduce the risk of overeducation when field-specific unemployment is high.

5. Conclusion

In this paper we explored the relationship between graduates' field-specific and general skills and the risk to become unemployed or employed in a job for which they are overeducated. Moreover, we analysed the interaction between these skills and the business cycle with regard to the risk to become unemployed or overeducated. We found that both field-specific and general skills are important for avoiding overeducation. As expected, field-specific skills become more important when unemployment within the occupational domain of the field of study increases, while general skills become more important when the overall unemployment rate increases.

Our results with regard to the probability of being unemployed are less in line with our hypotheses. To begin with, contrary to what we expected, the probability of being unemployed is only related to graduates' level of field-specific skills and not to their level of general skills. General skills only appear to play a role with respect to the allocation of workers to jobs requiring their level of education. In addition, we did not find any evidence that the effect of graduates' level of general skills or field-specific skills varies with labour market conditions.

Our findings complement the findings of earlier studies on the value of field-specific and general skills for labour market success in two important ways. First, we showed that with regard to the probability of being overeducated the importance of field-specific skills depends on field-specific labour market conditions and the importance of general skills depends on general labour market conditions. Second, we further explored the average effects of field-specific and general skills on graduates' labour market outcomes. Our study showed that the importance of field-specific skills for avoiding unemployment for medium educated labour market entrants (Bishop, 1995; Mane, 1999) also applies to the higher educated. In addition, we showed that field-specific skills help graduates to get a job at an adequate level. Chevalier and Lindley (2009) found similar results using

fields of study rather than a direct measure of mastery of one's field of study as an indicator of skill specificity.

Besides finding evidence for the importance of field-specific skills, we were able to show that employers expect graduates to possess a fair amount of general skills when applying for a job matching their level of education. General skills had already been shown to affect the amount of training graduates receive during the first years in the labour market (Heijke, et al., 2003) but had not yet been linked to the probability of being unemployed or overeducated directly.

With respect to the debate whether initial education should produce field-specific or general skills to meet the demands of employers and to ensure a smooth transition from school to work of the young, we do not find that one of the two skill-types is unimportant for labour market success of graduates. However, for risk-averse students in higher education whose primary aim is to find employment it might nevertheless be advisable to invest primarily in field-specific skills as field-specific skills protect graduates against unemployment while general skills do not.

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Appendix A

Descriptives of variables used in multivariate analysis (overeducation model)

	obs	% overeducated	Mastery of own field or discipline*		Analytical thinking*		age	
			mean	std. dev	mean	std. dev	mean	std. dev
Austria	520	10,9	5,8	0,9	5,8	1,2	31,6	0,09
Belgium	457	3,0	5,2	0,9	5,4	1,1	28,2	0,06
Czech Republic	943	2,9	5,6	1,0	5,5	1,1	28,6	0,05
Estonia	392	1,8	5,0	0,9	5,3	1,1	30,0	0,10
Finland	794	6,7	5,0	1,0	4,9	1,2	30,5	0,07
France	552	5,2	5,1	1,0	5,2	1,0	28,2	0,07
Germany	687	5,9	5,8	0,9	5,6	1,2	31,7	0,07
Hungary	648	16,1	5,0	1,1	5,0	1,3	29,0	0,07
Italy	843	14,7	5,2	1,1	5,5	1,2	31,5	0,06
Lithuania	382	5,2	5,1	1,1	5,2	1,1	28,7	0,10
Netherlands	842	6,4	5,3	0,9	5,4	1,1	29,1	0,06
Norway	804	4,4	5,3	0,9	4,7	1.4	31,4	0,07
Poland	697	4,0	4,9	1,2	5,2	1,3	29,6	0,05
Spain	622	18,5	5,2	1,1	4,9	1,3	29,8	0,09
Slovenia	995	10,7	5,2	1,2	5,2	1,2	30,8	0,06
Switzerland	778	10,3	5,4	0,9	5,6	1,1	31,0	0,07
United Kingdom	568	17,2	5,1	1,1	5,3	1,2	27,6	0,07
Total	11524	8,6	5,3	1	5,3	1,2	30,0	0,02

* z-scores used in the regressions

Descriptives of variables used in multivariate analysis (overeducation model), concluded

	% female	% with higher educated father	% with study relevant work experience during higher education	% with non study relevant work experience during higher education	% second level degree
Austria	49,1	21,8	71,1	63,3	89,5
Belgium	51,7	46,6	19,8	58,0	58,6
Czech Republic	49,3	34,0	45,9	66,6	88,0
Estonia	67,6	58,1	55,0	38,2	11,1
Finland	56,4	21,1	67,2	52,3	47,3
France	69,8	39,0	57,9	55,9	36,8
Germany	46,7	59,6	58,6	46,9	59,5
Hungary	62,0	24,8	29,3	37,7	35,5
Italy	53,2	16,6	17,9	37,4	92,2
Lithuania	63,6	42,1	37,3	43,1	34,3
Netherlands	60,6	38,1	37,4	71,9	27,5
Norway	57,0	46,9	55,5	54,4	37,5
Poland	56,8	27,8	24,5	36,7	67,6
Spain	64,5	21,0	19,6	32,0	58,8
Slovenia	69,0	24,1	58,2	67,0	4,2
Switzerland	37,0	46,9	50,2	45,1	61,0
United Kingdom	56,6	34,5	18,7	43,2	5,9
Total	56,7	34,1	43,2	51,1	49,3

Appendix B

Marginal effects evaluated at sample means

	Probit, RE	Probit	Marginal effect
Unemployment model 1			
Mastery of own field	-0.122***	-0.122***	-0.008***
(standardized)	(0.023)	(0.025)	(0.002)
Analytical thinking	0.032	0.033	0.002
	(0.024)	(0.024)	(0.002)
Overeducation model 1			
Mastery of own field	-0.077***	-0.074***	-0.010***
(standardized)	(0.018)	(0.019)	(0.002)
Analytical thinking	-0.096***	-0.095***	-0.013***
(standardized)	(0.018)	(0.019)	(0.002)
Overeducation model 2			
Mastery of own field	-0.078***	-0.074***	-0.010***
(standardized)	(0.018)	(0.020)	(0.003)
Analytical thinking	-0.003	-0.001	0.000
(standardized)	(0.046)	(0.044)	(0.001)
Country-level unemployment rate X	-0.020**	-0.020**	-0.004***
Analytical thinking	(0.009)	(0.008)	(0.001)
Field-specific unemployment rate X	-0.032**	-0.030**	-0.005***
Mastery of own field or discipline	(0.014)	(0.014)	(0.002)

Note: Column Probit, RE reports extracts of coefficients and standard errors of the random effects probit model presented in table 2 and table 3. Column Probit reports coefficients and robust standard errors of a pooled probit model using the same variables. This is to show our readers that the estimates of the two methods do not differ much. All marginal effects are calculated on the basis of the pooled probit model. This was necessary as Norton et al.'s inteff stata programme for the calculation of the marginal effects of the interaction terms does only run with pooled probit (Ai & Norton, 2003). Controls included are gender, age, age squared, dummy father with higher education, dummy second level degree, dummy above average grades, dummy study related work experience during higher education, dummy non study related work experience during higher education.

Predicted probability of being unemployed at sample mean (mean of all variables):

$Pr(Unemployed|X) = 0.030$, where X is the vector of sample means of the covariates

Predicted probability of being overeducated at sample mean (mean of all variables):

$Pr(Overeducated|X) = 0.071$, where X is the vector of sample means of the covariates