



## Explaining International Differences in Rates of Overeducation in Europe

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*Abstract:* This paper examines the factors determining variations in international rates of overeducation. We find significant effects for a range of factors including labour market structural imbalances, risk, trade-union density and the structure of academic funding. The results suggest that international levels of overeducation are particularly sensitive to variations in higher education funding arrangements.

*Keywords:* overeducation, international variation, mismatch

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## Introduction

Recent years have seen a surge in the literature on overeducation (see McGuinness (2006) and Sloane (2003) for reviews). However, the overwhelming majority of existing work tends to be specific to individual countries and concentrated on either measuring the wage effects or determinants of country level mismatch. To date, little or no work has been undertaken to identify the key determinants of international differences in rates of overeducation. With respect to the very limited work that does exist, Groot and van den Brink (2000), in a meta-analysis, found evidence of a relationship between overeducation and the rate of labour force growth. Verheest and van der Velden (2010), estimating a multi-level model for a sample of European graduates, found some evidence of a role for structural imbalances in both the quantity of skilled workers and their composition in terms of field of study. Given the lack of existing knowledge, this letter provides a unique assessment of the determinants of European differences in overeducation rates and, in addition to structural factors, assesses the potential contribution of labour market risk, labour market institutions, education funding mechanisms and migration as determining factors.

## Data

The data for this study come from the 2004, 2005 and 2006 waves of the EU Survey on Income and Living Conditions (EU-SILC). A clear advantage of the EU-SILC dataset is its regional geographical component (NUTS1) which provides us with multiple observations for some countries, thus generating a workable sample. For each year we have data on a maximum of 27 countries,<sup>1</sup> of which regional information is available for nine,<sup>2</sup> giving us a total of 161 observations over three

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<sup>1</sup> Austria, Belgium, Cyprus, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Greece, Hungary, Ireland, Iceland, Italy, Lithuania, Luxembourg, Latvia, Netherlands, Norway, Portugal, Poland, Sweden, Slovakia, Slovenia and UK.

<sup>2</sup> Austria, Belgium, Germany, Spain, France, Greece, Hungary, Italy and Poland.

years<sup>3</sup>. Individuals are defined as being overeducated if their level of attained schooling is at least one level above the mode of their occupation<sup>4</sup>. The data are in line with expectations showing overeducation rates to be generally higher in Portugal, Ireland, Greece and Spain, and lower in Belgium and Finland (Table 1). Overeducation also appears to be less of a problem in Eastern European countries with Poland, Slovenia and Slovakia all exhibiting rates of below 10 per cent. Gender differences were less marked, however, Greece and Italy exhibited relatively high levels of regional variation.

Our explanatory variables include key indicators of labour market and industrial structure, a unique measure of labour market risk, migration, tuition fees and an estimate of excess graduate supply. Risk is measured by estimating a Mincer regression for each region / country and then taking the regression standard error as a measure of dispersion around the expected wage controlling for the experience, education and sectoral profile of the labour market. The regression standard error is, therefore, a relative measure of labour market uncertainty after controlling for key measures of accumulated human capital<sup>5</sup>. Excess educated labour supply is measured as the ratio of ISCED 5 graduates to regional / country employment in professional or managerial positions. While the majority of our variables are derived using the EUSILC data this was not the case for the data on trade union density<sup>6</sup> and tuition fees<sup>7</sup> and, as a consequence, regional and gender breakdowns were not available for these measures.

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<sup>3</sup> The 2004 wave does not contain information of Cyprus, Czech Republic, Germany, Hungary, Lithuania, Latvia, Netherlands, Poland Slovenia, Slovakia and the UK and consequently has 39 observations. The 2005 and 2006 waves each have 61 observations.

<sup>4</sup> This is measured at the 2 digit ISIC level.

<sup>5</sup> See x for a similar application in the industrial relations literature.

<sup>6</sup> TU density figures were sourced from both the OECD and AIAS.

<sup>7</sup> This information is sourced from CESifo see

<http://www.ifo.de/pls/guestci/download/CESifo%20DICE%20Report%202007/CESifo%20DICE%20Report%204/2007/dicereport407-db5.pdf>. We have banded tuition fees into zero, low (250 to 700

Euros per year) and medium / high categories (above 750 Euros).

## Methodology

Given the fractional nature of our data, we estimate the fractional logit model developed by Papke and Wooldridge (1996) on the grounds that it overcomes many of the flaws that arise when Tobit and OLS models are applied to such data.

Papke and Wooldridge (1996) propose a non-linear function for estimating the expected values of dependent variables  $y_i$  conditional on a vector of covariates  $x_i$

$$E(y_i|X_i) = G(x_i\beta)$$

where  $G$  is the cumulative distribution function and  $\beta$  denotes the true population parameters. They chose a logistic distribution

$$E(y_i | x_i) = \exp(x_i\beta) / [1 + \exp(x_i \beta)]$$

and suggest the use of the Bernoulli log-likelihood function

$$l_i(\beta) = Y_i \log[G(x_i \beta)] + (1-y_i) \log[1-G(x_i\beta)]$$

to obtain the quasi-maximum likelihood estimator,  $\hat{\beta}$ . We estimate models to include country level fixed effects and dummy variables for the year the survey was conducted. In order to ensure that our estimates were not effected by colinearity bias we systematically omit each significant variable from our model to ensure that the remaining coefficients remain stable and, therefore, represent independent effects. The models are estimated separately for both males and females.

## Results

Our results are presented in table 2. The models are estimated separately for males and females, with the first column representing the complete specification and, subsequent columns representing robustness checks for the stability of the model coefficients when significant variables are consecutively excluded from the model. These robustness checks confirm that colinearity bias is not a concern. The results

reveal a variety of significant effects that vary somewhat by gender. We find that for both genders the incidence of overeducation was positively related to an excess supply of graduates over professional level jobs and negatively related to higher education fees. Within female labour markets overeducation was higher in countries where labour market risk was more pronounced and, lower in countries with high levels of trade-union density. For males, overeducation was positively related to the rate of in-migration and the employment share of micro-businesses. In terms of marginal effects<sup>8</sup>, the model suggests that high university fees lower the predicted incidence of over-education by between 17 and 29 percentage points among males. The marginal effects of structural factors were lower: a 0.1 increase in ratio of graduates to professional employment result in a 0.5 percentage point increase in the rate of overeducation. For females, a one percent increase in trade-union density generates a 2.4 percentage point reduction in the rate of overeducation. The magnitude of labour market risk was more difficult to assess given the non-standardised nature of the regression standard error. For males a 1% increase in migration generated a 1.4 percentage point increase in the rate of overeducation.

## **Conclusions**

We find that the differences in the funding structure of education to be a major driver of international variations in the incidence of overeducation. The misalignment of labour market demand and supply was also found to be a strong predictor of the rate of overeducation. Variations in the strength of labour market institutions are an important factor within female labour markets while the rate of migration plays a role in explaining variations in the incidence of male overeducation.

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<sup>8</sup> These were evaluated at the predicted means which were 0.171 for males and 0.189 for females.

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**Table 1: European Average Overeducation Rates 2004 - 2006**

COUNTRY	REGION	males	females	COUNTRY	REGION	males	females
Austria	AT1	0.225	0.304	Greece	GR1	0.300	0.272
	AT2	0.182	0.257		GR2	0.307	0.208
	AT3	0.224	0.249		GR3	0.314	0.263
	<i>average</i>	<i>0.210</i>	<i>0.270</i>		GR4	0.239	0.210
Belgium	BE1	0.089	0.206	<i>average</i>	<i>GR</i>	<i>0.290</i>	<i>0.238</i>
	BE2	0.098	0.186	Hungary	HU1	0.117	0.220
	BE3	0.092	0.150		HU2	0.091	0.168
	<i>average</i>	<i>0.093</i>	<i>0.181</i>		HU3	0.097	0.175
Cyprus	CY0	0.245	0.280	<i>average</i>	<i>HU</i>	<i>0.102</i>	<i>0.188</i>
Czech Republic	CZ0	0.077	0.127	Ireland	IE0	0.379	0.283
Germany	DE1	0.129	0.169	Iceland	IS	0.198	0.235
	DE2	0.164	0.145	Italy	ITC	0.269	0.278
	DEA	0.168	0.215		ITD	0.284	0.318
	DEC	0.163	0.211		ITE	0.296	0.308
	DEN	0.174	0.249		ITF	0.220	0.315
	<i>average</i>	<i>0.160</i>	<i>0.198</i>		ITG	0.201	0.311
Denmark	DK0	0.155	0.118		<i>average</i>	<i>IT</i>	<i>0.254</i>
Estonia	EE0	0.184	0.277	Lithuania	LT0	0.253	0.216
Spain	ES1	0.369	0.283	Luxembourg	LU0	0.229	0.118
	ES2	0.413	0.284	Latvia	LV0	0.151	0.209
	ES3	0.319	0.242	The Netherlands	NL	0.160	0.182
	ES4	0.390	0.280	Norway	NO	0.118	0.102
	ES5	0.336	0.250	Portugal	PT	0.273	0.243
	ES6	0.324	0.275	Poland	PL1	0.091	0.175
	ES7	0.355	0.263		PL2	0.071	0.160
	<i>Average</i>	<i>0.358</i>	<i>0.268</i>		PL3	0.081	0.151
Finland	FI1	0.057	0.070		PL4	0.071	0.154
France	FR1	0.135	0.101		PL5	0.070	0.190
	FR2	0.084	0.079		PL6	0.072	0.147
	FR3	0.093	0.093	<i>Average</i>	<i>PL</i>	<i>0.076</i>	<i>0.163</i>
	FR4	0.124	0.090	Sweden	SE0	0.141	0.117
	FR5	0.098	0.093	Slovakia	SK0	0.083	0.126
	FR6	0.099	0.102	Slovenia	SI	0.061	0.166
	FR7	0.086	0.084	United Kingdom	UK	0.195	0.248
	FR8	0.118	0.137				
	<i>average</i>	<i>0.105</i>	<i>0.097</i>				

Source:EU\_SILC, waves 1-2-3 cross-sectional files

**Table 2 : Fractional Logit Models of Overeducation**

	MALES				FEMALES			
	complete	- tuition	- ratio	- RMSE	complete	- tuition	- ratio	- RMSE
<b>% foreign born in active population</b>	0.140*** (0.052)	<b>0.112**</b> <b>(0.051)</b>	<b>0.153***</b> <b>(0.050)</b>	<b>0.114**</b> <b>(0.051)</b>	0.071 (0.104)	0.071 (0.104)	0.048 (0.114)	0.075 (0.100)
% part-time workers	-0.155 (0.190)	-0.182 (0.238)	-0.262 (0.242)	-0.179 (0.236)	-0.134* (0.073)	-0.134* (0.073)	-0.131 (0.080)	-0.095 (0.067)
% temporary workers	-0.028 (0.061)	-0.071 (0.080)	-0.134* (0.078)	-0.068 (0.074)	-0.080 (0.092)	-0.080 (0.092)	-0.117 (0.090)	-0.014 (0.092)
% employed in micro-firms	0.091*** (0.033)	0.069* (0.038)	0.049 (0.035)	0.070* (0.038)	0.043 (0.040)	0.043 (0.040)	0.018 (0.040)	0.047 (0.043)
% employed in Public Administration	0.105 (0.153)	0.059 (0.199)	0.018 (0.208)	0.059 (0.198)	0.198 (0.131)	0.198 (0.131)	0.211 (0.142)	0.159 (0.139)
% employed in Sales and Hostels	-0.010 (0.103)	-0.023 (0.143)	-0.041 (0.142)	-0.027 (0.139)	0.146 (0.091)	0.146 (0.091)	0.088 (0.095)	0.119 (0.094)
% employed in other private sector services	-0.245 (0.204)	-0.218 (0.265)	-0.352 (0.236)	-0.219 (0.264)	0.114 (0.190)	0.114 (0.190)	0.166 (0.193)	0.156 (0.195)
% 25-34 year-olds in labour force	0.035 (0.153)	0.014 (0.175)	-0.055 (0.178)	0.015 (0.173)	-0.206* (0.119)	-0.206* (0.119)	-0.101 (0.130)	-0.185 (0.115)
% work and study	-0.106 (0.325)	-0.104 (0.437)	-0.001 (0.442)	-0.097 (0.425)	-0.094 (0.246)	-0.094 (0.246)	-0.119 (0.291)	0.028 (0.251)
% employed in low occupations	-0.135 (0.115)	-0.121 (0.142)	-0.091 (0.143)	-0.120 (0.142)	0.025 (0.119)	0.025 (0.119)	0.011 (0.126)	0.065 (0.121)
<b>RMSE (risk)</b>	-0.010 (0.047)	0.007 (0.056)	0.001 (0.060)		<b>0.173**</b> <b>(0.067)</b>	<b>0.173**</b> <b>(0.067)</b>	<b>0.166**</b> <b>(0.071)</b>	
<b>Trade Union Density</b>	-0.187 (0.396)	-0.347 (0.451)	-0.240 (0.458)	-0.343 (0.448)	<b>-2.448***</b> <b>(0.872)</b>	<b>-2.448***</b> <b>(0.872)</b>	<b>-2.296**</b> <b>(0.892)</b>	<b>-2.188**</b> <b>(0.861)</b>
<b>low-medium tuition rates</b>	-0.086* (0.045)		<b>-0.121*</b> <b>(0.066)</b>	<b>-0.142**</b> <b>(0.065)</b>	-0.331*** (0.121)		-0.301** (0.125)	-0.343*** (0.125)
<b>medium-high tuition rates</b>	-0.167*** (0.043)		<b>-0.210***</b> <b>(0.041)</b>	<b>-0.291***</b> <b>(0.078)</b>	<b>-0.369***</b> <b>(0.116)</b>		<b>-0.498***</b> <b>(0.185)</b>	<b>-0.346***</b> <b>(0.115)</b>
<b>ISCED5 supply/demand ratio</b>	0.050*** (0.014)	<b>0.063***</b> <b>(0.021)</b>		<b>0.063***</b> <b>(0.021)</b>	<b>0.067***</b> <b>(0.019)</b>	<b>0.067***</b> <b>(0.019)</b>		<b>0.065***</b> <b>(0.019)</b>
ISCED5 unemployment rate	-0.132 (0.104)	-0.153 (0.126)	-0.128 (0.127)	-0.153 (0.125)	-0.041 (0.116)	-0.041 (0.116)	-0.107 (0.124)	-0.017 (0.123)
activity rates	-0.082 (0.130)	-0.066 (0.148)	-0.130 (0.152)	-0.067 (0.148)	-0.038 (0.071)	-0.038 (0.071)	-0.086 (0.075)	-0.037 (0.072)
2004	-0.009 (0.007)	-0.009 (0.009)	-0.014 (0.009)	-0.009 (0.009)	0.024** (0.012)	0.024** (0.012)	0.016 (0.012)	0.022* (0.012)
2005	0.006 (0.005)	0.007 (0.006)	0.005 (0.006)	0.007 (0.006)	0.032*** (0.009)	0.032*** (0.009)	0.029*** (0.009)	0.028*** (0.009)
Observations	161	161	161	161	161	161	161	161
Log Likelihood								
Wald Chi()								

Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source:EU\_SILC, waves 1- 2-3 cross-sectional files



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