Regional economic growth and human capital: the role of overeducation[A,B]

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Abstract: The paper analyses the link between human capital and regional economic growth in the European Union. Using different indicators of human capital calculated from census microdata, we conclude that the recent economic performance of European regions is associated to an increase in overeducation. In fact, measures of educational mismatch seem to have a stronger connection to regional economic performance than other traditional measures of human capital stocks.

Key words: Regional economic growth, human capital, educational mismatch, overeducation.

JEL codes: O18, O47, R23.

March 2009

[A] This research is based on the IPUMS-International database (Minnesota Population Center. Integrated Public Use Microdata Series - International: Version 4.0. Minneapolis: University of Minnesota, 2008). The authors wish to acknowledge the statistical offices that provided the underlying data making this research possible: the National Bureau of Statistics, Austria; the National Institute of Statistics and Economic Studies, France; The National Statistics Office, Greece, The National Institute of Statistics, Portugal; The National Institute of Statistics, Romania; The National Institute of Statistics, Spain; and the Office of National Statistics, United Kingdom.

[B] The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 216813.

1. INTRODUCTION AND OBJECTIVES

The role of human capital has been highlighted by endogenous growth theory (Lucas, 1988 and Romer, 1990). Countries and regions with higher levels of human capital are supposed to expect higher growth rates than territories with lower levels. However, despite the theoretical predictions of these models, empirical evidence has not been conclusive. Different explanations have been provided by the literature, but the main criticism is that most works basically rely on education, which is usually proxied by the average number schooling of years or the percentage of population with secondary or tertiary studies[c]. The results by Dreger *et al.* (2008) in the context of the IAREG project also confirm the impact of construction techniques on the quality of human capital indicators.

A different explanation can also be provided: if the supply of highly educated workers is not matched by the demand, then the impact of education on economic growth does not necessarily have to be positive, especially if geographical labour mobility is reduced. However, even if highly educated workers do not find a suitable job but stay in the region as unemployed or over-educated workers, they can represent a potentiality for economic growth. This is the central hypothesis of our research.

Taking this hypothesis as the starting point, our objective in this paper is to analyse the effect of over-educated workers on regional economic growth in the European Union. In fact, the impact of labour market mismatch on regional economic growth has not received very much attention in the literature due to the difficulties to obtain appropriate data to carry out this kind of research.[d] The availability of census microdata for different countries and time periods with regional detail provide the perfect framework to carry out the research.

The rest of the paper is structured as follows. First, in the next section, the database is described and a measure of overeducation is calculated for a wide sample of European

[c] The quality of data has also been questioned (De la Fuente and Doménech, 2006).
[d] A remarkable exception is the work by Rodríguez-Pose and Vilalta-Bufí (2005).

regions. Second, the link between overeducation and regional economic growth is analysed. Last, the paper concludes summarising the main results.

2. MEASURING OVEREDUCATION

Educational mismatch occurs when the schooling years of the worker are higher or lower than the one required in their job. In order to measure educational mismatch, the literature has developed three procedures based on microdata: the objective method, the subjective method and the statistical method.

The objective method involves comparing workers' level of education with the levels needed to carry out the functions associated with their work position, according to a panel of experts. Workers with the same levels as the ones identified by the experts are classified as properly educated, while the rest are classified as mismatched.

The subjective method is based on surveys in which individuals self-classify themselves directly into one of the aforementioned categories, or surveys enquiring about the nature of their job, which allows them to be classified indirectly.

The statistical method considers workers who have a number of years of study above or below the average number of years of their job plus or minus a standard deviation, or alternatively below the mode (or the corrected mode).

Unfortunately, these methods provide quite different results when applied to the same database (Groot and Maassen van den Brink, 2000) and, in general, the available empirical evidence permits to affirm that the statistical method underestimates the educational mismatch, particularly in its average version (Groot and Maassen van den Brink, 2002). In fact, when using this approach, the outcome of the actual matching process is measured. Usually, the choice of one method or another tends to be determined by the availability of statistical information rather than for theoretical reasons.

In order to carry out our research, we use microdata from the Integrated Public Use Microdata Series International (IPUMSI) from the Minessota Population Center. It is an

integrated series of census microdata samples from 1960 to the present. At October 2008, the series includes 111 samples drawn from 35 countries, 9 of them are European Union (EU) countries. Table 1 summarises the availability of information from the IPUMSI project for EU countries indicating those samples where regional detail (a key aspect for our study) is available.

TABLE 1

The level of regional detail is, however, different. Information is only available at the NUTS-3 level for four countries (Austria, Greece, Portugal and Spain), while the sample can be expanded to France and Romania if the NUTS-2 level is considered and the United Kingdom if working at the NUTS-1 level. For Hungary and the Netherlands, no regional information is provided.

Table 2 shows the size of the country samples for the three most recent census in the European countries: 1981-1982; 1990-1991-1992 and 2001-2002. The total number of individuals considered in the analysis is near 9,5 millions of records.

TABLE 2

It is worth mentioning that there is one clear advantage of using the IPUMSI samples instead of the ones directly provided by the National Institute of Statistics. In particular, some key variables for our study such as educational level[e] and occupations[f] have been recoded using a homogenous classification. Using this information, it is possible to calculate, first, statistical measures of the educational mismatch at the individual level and, in a second stage, to obtain regional indicators of the incidence and intensity of over-education.

[e] That can be easily obtained from the nine homogenous categories that are considered: Less than primary completed / Some primary completed / Primary (6 yrs) completed / Lower secondary general completed / Secondary, general track completed / Some college completed / Secondary, technical track completed / Post-secondary technical education / University completed.
[f] At a 3-digit level of detail (more than 400).

The first step to calculate the measure of educational mismatch consists in transforming educational levels into schooling years[g]. The average schooling years for the working population in the different countries and time periods considered are shown in table 3. The results are quite similar to the ones obtained in other studies such as Barro and Lee (2000): schooling years have increased substantially between the eighties and nineties in all European countries, but the highest change is observed in countries with lower initial levels such as Portugal and Spain. The census information is also exploited to calculate the percentage of workers with secondary and tertiary studies. The results are shown in tables 4 and 5, respectively. The analysis of these tables shows that the increase in schooling years is related to a higher enrolment in both levels of studies. Again, the evidence is similar to the one found when using similar information in other databases such as the Eurostat Regio or the World Bank World Development Indicators[h].

TABLES 3, 4 and 5

Once the information of educational levels is transformed in schooling years, the next step consists in comparing the schooling years of the individual with the ones required in his workplace. In particular, individual *i* working in occupation *j* and living in region *y* of country *z* at time *t* is considered as properly educated if his schooling years are equal to the most usual value (mode) of schooling years of workers in occupation *j* in sector *k* of country z^i. If the schooling years are higher/lower than the mode, the individual is classified as over / under-educated. This is the statistical measure of overeducation. The information at the region and country level is obtained from the aggregation of the individual data. The results at the country level are shown in table 6.

TABLE 6

As we can see from the table, approximately half of the workers are classified as properly educated while the rest are mismatched. The incidence of over-education is higher in Spain and Greece, at an intermediate level in France, Portugal and the United

[g] As the different schooling levels in each country have been homogeneised in the context of the IPUMS project, the equivalence between educational levels and schooling years is quite straightforward and it is shown in annex 1.

[h] The results of this robustness check of the database is available from the authors on request.

[i] It is worth mentioning that we are assuming that the educational requirements of a certain workplace are identical across regions in the same countries, but can vary along time.

Kingdom, and clearly lower in Austria and Romania. The percentage of overeducated workers has increased in some countries such as Greece, Romania, Spain and the United Kingdom while in Austria, France and Portugal (in the most recent period) has decreased. Again, this picture is similar to the one found in other studies such as Budría and Moro (2006).

A different perspective of educational mismatch can be obtained if we focus on the intensity of under and overeducation instead of their incidence. This can be achieved if schooling years are broken down into three components: the years of over-education, the years required and the years of under-education[j]. The results at the national level are shown in table 7.

TABLE 7

As we can see from this table, the number of required schooling years has clearly increased in all the considered countries. This implies that educational requirements have increased along time in the considered job markets in a parallel way to the educational attainment of the population. However, the increase has not been enough and the intensity of the educational mismatch is higher in those countries with a higher incidence of educational requirements.

But, the main contribution of our study in this context is the analysis of the regional dimension[k]. As previously mentioned, the census microdata is not provided with the same level of regional detail for the considered EU countries. The information for the United Kingdom is only available at the NUTS I level, for France and Romania at NUTS I and NUTS II and for Austria, Greece, Portugal and Spain at the two previous levels and also at the NUTS-III.[l]. Figure 1 shows the value of the coefficient of variation for the average years of schooling and the percentage of over-educated workers in the NUTS I regions of the considered countries. As we can see, while regional differences

[j] In a similar way to the one used in ORU Mincer equations in the economics of education literature (Duncan and Hoffman, 1981).

[k] One aspect that has been scarcely considered in the literature on overeducation is its relationship with the territory. The link between both is related with the hypothesis of the differential overeducation. The idea is that overeducation will basically affect married women as their job search is restricted to the local labour market where they live, while the husband could search for a more adequate job according to his schooling in a wider labour market (Frank, 1978).

[l] Full details of the results at the regional level are available from the authors on request.

in schooling years has clearly decreased, differences in over-education have shown exactly the opposite trend.

FIGURE 1

Figure 2 provides additional descriptive evidence by looking at the temporal evolution of differences in schooling levels and overeducation in NUTS III regions of Austria, Greece, Portugal and Spain. As we can see in figure 2, in 1981 two regional clusters were clearly identified: on one hand, regions with low values of schooling years and high levels of overeducation, and, on the other, regions with high values of schooling years and low levels of overeducation. In 1991 the situation changed and overeducation increased for groups of regions although the most relevant change was the strong increase in the number of schooling years for the first group of regions. In the last year considered, a clear positive relationship between the two variables for the different regions is observed: the correlation coefficient has changed from -0.6 when using 1981 data and 0.07 for 1991 data to 0.71 for 2001 data.

FIGURE 2

Taking into account these results, the main conclusion from the descriptive analysis in this section is that there has been a strong increase in schooling levels in EU regions that has reduced the differences in human capital levels across regions. However, this increase in human capital has not been accompanied by the same increase in qualified jobs. As a result, the incidence and intensity of overeducation has increased across regions but in an unequal way. The next section will focus on the analysis of the effects on regional economic growth of these two complementary trends.

3. OVEREDUCATION AND REGIONAL ECONOMIC GROWTH

This section looks at the link between educational mismatch and regional economic growth in the EU. In order to disentangle the effect of educational mismatch on growth, we will first look at the effects of traditional indicators of the stock of human capital (schooling years, percentage of workers with secondary and tertiary studies) and, next,

we will consider the effects of overeducation taking into account both its incidence and intensity at the regional level.

In order to test which human capital measures have a higher impact in regional economic growth and the effects of educational mismatch, panel data models are estimated using Gross Domestic Product (GDP) per capita data adjusted for Purchasing Power Parities (PPP) provided by Eurostat. Table 8 summarises this information for 1995, 2000 and 2005. The availability of information for more than 1 year makes possible to estimate panel data models instead of cross-section regressions. The main advantage of this approach is that it permits to control for unobservable heterogeneity by the inclusion of region and time fixed effects.

In particular, panel regressions of GDP per capita growth between 1995 and 2000 and 2000 and 2005 are conducted on the initial level of GDP per capita and the human capital variables calculated from the IPUMSI microdata for the 41 NUTS-I regions, the 78 NUTS-II regions and the 156 NUTS-III regions described in the previous section. The model adopts the following form:

$$\ln y_{i,t} - \ln y_{i,t-\tau} = \alpha + \beta \cdot \ln y_{i,t-\tau} + \gamma \cdot x_{i,t-\tau} + \eta_t + \mu_i + \varepsilon_{i,t} \qquad (1)$$

where $ln\ y_{i,t}$ is the logarithm of GDP in region i at time t, $x_{i,t-\tau}$ represents the different human capital indicators[m], η_t a time specific effect, μ_t a region specific effect, and $\varepsilon_{i,t}$ a random error term that varies across regions and periods. The coefficient β is related to the convergence rate across economies while the coefficient γ will permit to assess the impact of human capital on growth.

[m] As Temple (2001) highlights, this specification is preferred to the analysis of the relation between the change in output and the change in education as in this case causality could run from output (or anticipated output) to education, and not vice versa. As long-run changes in average educational attainment are driven by government policy, it seems plausible that as output and tax revenues increase, governments will often allocate more resources to education, and attainment will rise for a transitional period. This critique does not apply to the specification between output growth and the initial level of human capital as considered here. The use of schooling years (instead of enrolment rates) and panel data makes more unlikely that reverse causation could explain a positive and significant effects of human capital and growth (de la Fuente and Domenech, 2006).

Table 9 summarises the results of estimating equation 1 for NUTS-I regions of Austria, France, Greece, Portugal, Romania, Spain and the United Kingdom. The different columns of the table show the results of estimating models with different explanatory variables: in model 1, only initial GDP per capita is regressed on growth. In models 2, 3 and 4 traditional indicators of human capital: schooling years, the percentage of working population with secondary studies. Indicators of educational mismatch are included in models 5 and 6. The percentage of properly educated workers and the percentage of overeducated workers are included in model 5, while in model 6 the number of schooling years is broken down in required, over and infra.

TABLE 9

The results in table 9 permit to obtain some interesting results. First of all, the coefficient of the initial GDP per capita is always negative and significant at the usual levels, indicating that a process or regional convergence has occurred in the considered period. This process occurs even when the different human capital indicators are included.

The introduction of the traditional indicators of human capital in models 2, 3 and 4 does not reveal any positive impact on economic growth[n]. Although the coefficients are positive in the first two cases, they are not statistically significant.

In model 5, the percentage of properly educated workers and the percentage of over-educated workers are included in the regression. For both variables, the two coefficients are positive and statistically significant. The magnitude of the coefficient associated to the percentage of over-educated workers is higher than the one associated to the percentage of properly educated workers. This result will favour the hypothesis that at the regional level (although not necessarily at the individual level) overeducation can be seen more as an investment rather than as a cost[o].

[n] Rodríguez-Posé and Vilalta-Bufí (2005) and Dreger et al. (2008) obtain similar results.

[o] This result is robust to the inclusion of the average schooling levels in the region as an additional control variable. The reason to include this control is that one could think that the positive and significant sign of the percentage of overeducated workers would be related to a higher presence of educated workers.

Last, model 6 confirms the results of model 5 and permits to obtain an additional interesting result: there is a positive and significant effect of the average required years and the average years of overeducation while the average years of infraeducation has a negative and significant effect.

In order to check the robustness of these results to the considered level of regional detail, we have replicated the previous analysis for NUTS II and NUTS III regions with the information available. The results are shown in tables 10 and 11, respectively. The conclusions are similar to the ones obtained before, although there are some remarkable differences. First, the percentage of workers with secondary studies is now positive and significant in both cases while the percentage of workers with tertiary studies has a negative and significant effect in the NUTS-III sample. Second, the percentage of properly educated workers and the required years of schooling do not have any effect on economic growth when analysing the NUTS-II sample. It is worth mentioning, however, that as the sample of countries also varies, it is not clear if the effect is related to level of regional detail or to the inclusion/exclusion of the different countries.

TABLES 10 and 11

4. FINAL REMARKS

Although the limited time frame and the nature of the analysis implies that any conclusions should be considered with caution, the study has identified that there seems to be a significant correlation between overeducation and regional economic performance over the last years. The effect of overeducation on an individual's earnings is well known: he will earn less than his properly educated counterparts. However, from a regional perspective, our results indicate a more favourable picture: overeducated workers represent an opportunity to take advantage from the generation of more qualified jobs. The result is not very different from studies analysing the differences between social and private returns to schooling such as Moretti (2004). In a recent study comparing different European Union countries, Middendorf (2008) has also found that returns to schooling are significantly negtively related to the educational attainment of the population, a result which is in line with the ones found here.

From a policy perspective, the results indicate that even in the case that qualified workers do not find a suitable job, they are still more productive at the aggregate level than the unqualified ones. This implies that, although some recent studies have failed to provide favourable evidence on the link between human capital and growth, there is the case for public investment in education. However, in a context of high geographical mobility, regions will not directly benefit from their "over-investment" in the education of their population. In this sense, one aspect that has not been considered in this paper is the probable existence of spatial spillovers of human capital (Tselios, 2008; Olejnick, 2008). This is one of the potential future research lines derived from the study and that has to be considered from a policy perspective. In this sense, we would also like to highlight that (in a similar way to Rodriguez-Pose and Vilalta-Bufí, 2005) the use of microeconomic data to construct regional indicators of educational mismatch represents a step forward with respect to the traditional indicators of human capital, but in this area too much work has still to be done.

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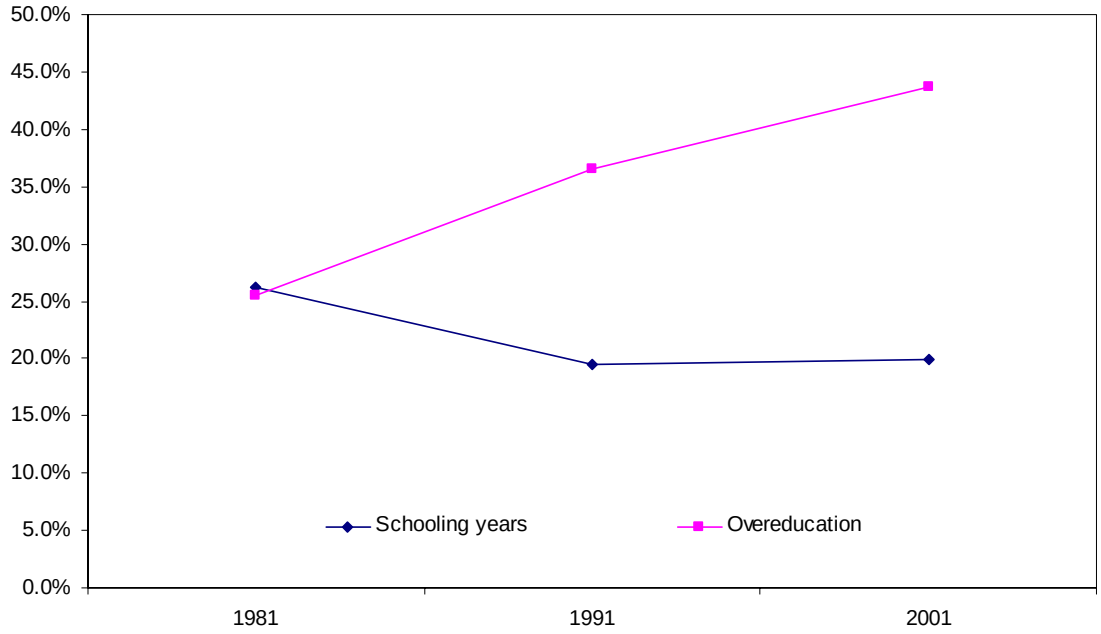
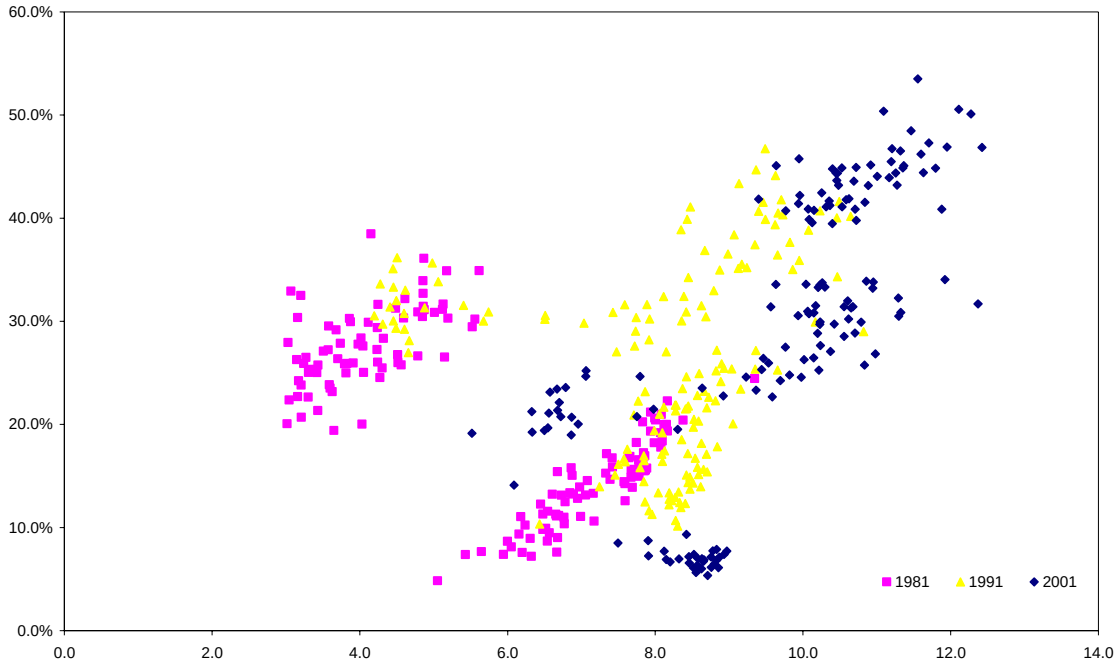
6. FIGURES AND TABLES

Figure 1. Regional coefficient of variation of schooling years and the percentage of overeducated workers at the NUTS I level (Austria, France, Greece, Portugal, Romania, Spain, United Kingdom)



Source: Own elaboration from IPUMSI microdata.

Figure 2. Schooling years (horizontal axis) and percentage of overeducated workers (vertical axis) in NUTS-III regions (Austria, Greece, Portugal, Spain)



Source: Own elaboration from IPUMSI microdata.

Table 1. Availability of microdata samples for EU countries from the IPUMSI project

Country	Availability	Regional dimension			Number of regions		
		NUTS I	NUTS II	NUTS III	NUTS I	NUTS II	NUTS III
Austria	X	X	X	X	3	9	31
France	X	X	X		8	22	
Greece	X	X	X	X	4	13	50
Hungary	X						
Netherlands	X						
Portugal	X	X	X	X	3	7	22
Romania	X	X	X		4	8	
Spain	X	X	X	X	7	19	52
United Kingdom	X	X			12		
Number of countries/regions	9	7	6	4	41	78	155

Source: Own elaboration from IPUMSI microdata.

Table 2. Description of the microdata samples for EU countries from the IPUMSI project

Sample	1981-1982	1990-1991-1992	2001-2002
Austria	326,681	345,004	370,179
France	1,046,628	932,384	---
Greece	310,825	327,529	381,334
Portugal	186,312	199,685	227,712
Romania	---	928,752	756,535
Spain	607,997	626,202	742,777
United Kingdom	---	234,757	812,989
Total	2,478,443	3,594,313	3,291,526

Source: Own elaboration from IPUMSI microdata.

Table 3. Average schooling years of working population

Schooling years	1981-1982	1990-1991-1992	2001-2002
Austria	7.9	8.2	8.3
France	7.2	8.7	
Greece	7.7	9.4	11.2
Portugal	4.0	5.2	7.3
Romania		10.9	12.1
Spain	4.6	9.2	11.0
United Kingdom		8.4	10.3
Simple Average	6.3	8.6	10.0

Source: Own elaboration from IPUMSI microdata.

Table 4. Percentage of workers with secondary studies

Secondary education	1981-1982	1990-1991-1992	2001-2002
Austria	55%	65%	67%
France	42%	44%	
Greece	18%	31%	39%
Portugal	6%	12%	16%
Romania		50%	58%
Spain	15%	22%	34%
United Kingdom		47%	47%

Source: Own elaboration from IPUMSI microdata.

Table 5. Percentage of workers with tertiary studies

Tertiary education	1981-1982	1990-1991-1992	2001-2002
Austria	4%	7%	11%
France	10%	16%	
Greece	11%	14%	22%
Portugal	4%	6%	12%
Romania		8%	12%
Spain	5%	12%	10%
United Kingdom		21%	33%

Source: Own elaboration from IPUMSI microdata.

Table 6. Incidence of the educational mismatch

Percentage of workers		1981-1982	1990-1991-1992	2001-2002
Austria	Under-educated	25.0%	30.3%	37.3%
	Properly educated	57.9%	56.0%	55.4%
	Over-educated	17.1%	13.8%	7.3%
France	Under-educated	28.4%	34.0%	
	Properly educated	42.1%	43.7%	
	Over-educated	29.5%	22.3%	
Greece	Under-educated	19.6%	16.3%	17.9%
	Properly educated	63.4%	59.0%	51.6%
	Over-educated	17.0%	24.7%	30.5%
Portugal	Under-educated	16.2%	18.3%	27.0%
	Properly educated	57.2%	50.7%	51.5%
	Over-educated	26.7%	31.0%	21.5%
Romania	Under-educated		31.8%	25.2%
	Properly educated		58.4%	61.9%
	Over-educated		9.8%	12.9%
Spain	Under-educated	23.1%	18.9%	8.2%
	Properly educated	47.5%	46.3%	48.6%
	Over-educated	29.4%	34.8%	43.2%
United Kingdom	Under-educated		32.7%	35.7%
	Properly educated		47.2%	40.5%
	Over-educated		20.1%	23.9%

Source: Own elaboration from IPUMSI microdata.

Table 7. Intensity of the educational mismatch

Schooling years		1981-1982	1990-1991-1992	2001-2002
Austria	Under-education	0.95	1.25	1.57
	Required	8.23	9.05	9.54
	Over-education	0.58	0.45	0.32
France	Under-education	1.75	2.10	
	Required	7.04	9.52	
	Over-education	1.86	1.29	
Greece	Under-education	0.77	0.72	0.75
	Required	7.75	8.79	10.29
	Over-education	0.77	1.33	1.64
Portugal	Under-education	0.69	0.91	1.00
	Required	3.37	4.65	7.35
	Over-education	1.28	1.47	0.91
Romania	Under-education		1.90	1.47
	Required		12.23	12.84
	Over-education		0.55	0.78
Spain	Under-education	1.10	1.17	0.63
	Required	3.71	4.77	4.07
	Over-education	2.02	2.85	3.86
United Kingdom	Under-education		0.06	1.61
	Required		8.26	11.15
	Over-education		0.22	0.79

Source: Own elaboration from IPUMSI microdata.

Table 8. GDP per inhabitant and GDP growth in the European Union

	GDP per inhabitant (PPP)			Annualized GDP growth		
	1995	**2000**	**2005**	**1995-2000**	**2000-2005**	**1995-2005**
Austria	19853	25359	28852	5.5%	2.8%	4.5%
France	16993	21964	25077	5.9%	2.8%	4.8%
Greece	12335	16007	21589	6.0%	7.0%	7.5%
Portugal	10984	14856	16891	7.1%	2.7%	5.4%
Romania	---	4924	7933	---	12.2%	---
Spain	13436	18537	23069	7.6%	4.9%	7.2%
United Kingdom	16338	22259	26715	7.2%	4.0%	6.4%
European Union (27 countries)	14627.8	18995.9	22400.2	6.0%	3.6%	5.3%

Source: Eurostat Regio.

Table 9. Panel estimates of beta-convergence equation for NUTS-I regions

Austria, France, Greece, Portugal, Romania, Spain, United Kingdom

GDP growth: 95-00 / 00-05	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Initial GDP	-0.149***	-0.172***	-0.157***	-0.162***	-0.159***	-0.182***
	[0.0275]	[0.0317]	[0.0298]	[0.0301]	[0.0273]	[0.0270]
Schooling years		0.0131				
		[0.0237]				
% Secondary studies			0.0279			
			[0.0216]			
% Tertiary studies				-0.0203		
				[0.0265]		
% Properly educated					0.0319***	
					[0.0113]	
% Overeducated					0.0807**	
					[0.0313]	
Required schooling years						0.00613**
						[0.00285]
Overeducation years						0.0123**
						[0.00476]
Infraeducation years						-0.0126***
						[0.00445]
Intercept	1.474***	1.667***	1.543***	1.600***	1.531***	1.745***
	[0.262]	[0.288]	[0.285]	[0.285]	[0.261]	[0.253]
Observations	78	70	70	70	70	70
R-squared	0.811	0.812	0.821	0.814	0.858	0.872
Number of regions	41	41	41	41	41	41

Additional control variables: region fixed-effects and year fixed-effects. Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 10. Panel estimates of beta-convergence equation for NUTS-II regions

Austria, France, Greece, Portugal, Romania, Spain

GDP growth: 95-00 / 00-05	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Initial GDP	-0.195***	-0.195***	-0.205***	-0.218***	-0.189***	-0.212***
	[0.0197]	[0.0198]	[0.0182]	[0.0213]	[0.0205]	[0.0207]
Schooling years		-0.00351				
		[0.0155]				
% Secondary studies			0.135***			
			[0.0355]			
% Tertiary studies				-0.0636		
				[0.0402]		
% Properly educated					-0.0169	
					[0.0395]	
% Overeducated					0.104***	
					[0.0218]	
Required schooling years						0.00426*
						[0.00220]
Overeducation years						0.0126**
						[0.00618]
Infraeducation years						-0.00942
						[0.00950]
Intercept	1.899***	1.904***	1.952***	2.120***	1.820***	2.012***
	[0.186]	[0.188]	[0.172]	[0.202]	[0.183]	[0.210]
Observations	148	148	126	126	126	126
R-squared	0.76	0.76	0.826	0.782	0.852	0.839
Number of regions	78	78	78	78	78	78

Additional control variables: region fixed-effects and year fixed-effects. Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Table 11. Panel estimates of beta-convergence equation for NUTS-III regions

Austria, Greece, Portugal, Spain

GDP growth: 95-00 / 00-05	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Initial GDP	-0.204***	-0.205***	-0.201***	-0.214***	-0.204***	-0.211***
	[0.0108]	[0.0108]	[0.00975]	[0.0111]	[0.0101]	[0.0100]
Schooling years		0.0194*				
		[0.0116]				
% Secondary studies			0.158***			
			[0.0261]			
% Tertiary studies				-0.0883***		
				[0.0303]		
% Properly educated					0.0552**	
					[0.0254]	
% Overeducated					0.102***	
					[0.0149]	
Required schooling years						0.0012
						[0.00125]
Overeducation years						0.00577*
						[0.00347]
Infraeducation years						-0.0174***
						[0.00630]
Intercept	1.971***	1.941***	1.897***	2.070***	1.910***	2.036***
	[0.101]	[0.102]	[0.0923]	[0.105]	[0.0916]	[0.0991]
Observations	312	312	312	312	312	312
R-squared	0.735	0.74	0.786	0.749	0.798	0.797
Number of regions	156	156	156	156	156	156

Additional control variables: region fixed-effects and year fixed-effects. Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Annex 1. Equivalence between educational levels and schooling years

Educational levels (edattand in IPUMSI)	Schooling years
Less than primary completed (n.s.)	0
No schooling	0
Some primary completed	3
Primary (4 yrs) completed	4
Primary (5 yrs) completed	5
Primary (6 yrs) completed	6
Lower secondary general completed	8
Lower secondary technical completed	10
Secondary, general track completed	12
Some college completed	13
Secondary or post-secondary technical completed	13
Secondary, technical track completed	15
Post-secondary technical education	16
University completed	17