DISCUSSION PAPER SERIES

IZA DP No. 4453

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September 2009

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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IZA Discussion Paper No. 4453
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ABSTRACT

Regional Economic Growth and Human Capital: The Role of Overeducation*

The paper analyses the link between human capital and regional economic growth in the European Union. Using various indicators of human capital calculated from census microdata, we conclude that the recent economic performance of European regions is associated with an increase in overeducation. In fact, measures of educational mismatch seem to be more strongly connected to regional economic performance than do other traditional measures of human capital stock.

JEL Classification: O18, O47, R23

Keywords: regional economic growth, human capital, educational mismatch, overeducation

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* This research is based on the IPUMS-International database (Minnesota Population Center. Integrated Public Use Microdata Series - International: Version 5.0. Minneapolis: University of Minnesota, 2009). The authors wish to thank the following statistics offices for providing the underlying data that made this research possible: the National Bureau of Statistics, Austria; the National Institute of Statistics and Economic Studies, France; The National Institute of Statistics, Italy; The National Statistics Office, Greece, The National Institute of Statistics, Portugal; The National Institute of Statistics, Romania; The National Institute of Statistics, Slovenia; The National Institute of Statistics, Spain; and the Office of National Statistics, United Kingdom.
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 importance of human capital accumulation has been stressed by endogenous growth theory (Lucas, 1988 and Romer, 1990). Countries and regions with higher levels of human capital, it is argued, can expect higher growth rates than territories with lower levels. However, despite the theoretical predictions of these models, empirical evidence is inconclusive. Various explanations for this have been forwarded in the literature, but the main shortcoming seems to be that most studies have tended to rely on education as their variable for human capital, and this has usually been proxied by the average number of years of schooling or the percentage of population completing secondary or tertiary studies[4].

However, an alternative explanation might also be offered: if the supply of highly educated workers is not matched by demand, then the impact of education on economic growth is not necessarily positive, especially if geographical labour mobility is limited. Yet, even if highly educated workers do not find a suitable job, the fact that they choose to stay in the region as unemployed or over-educated workers 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. To date, the impact of labour market mismatch on regional economic growth has not received very much attention in the literature owing to the difficulties encountered in obtaining appropriate data to undertake such research.[5] However, the availability of census microdata for a number of countries and for various time periods which also include regional detail provides the perfect framework for conducting this research.

The objective of this paper is twofold: first, to assess quantitatively the relevance of overeducation in the EU regions and to determine whether there are significant differences between these regions; and, second, to analyse the impact of human capital, including overeducation indicators, on regional economic growth.

[4] The quality of these data has also been called into question (De la Fuente and Doménech, 2006).
[5] A notable exception to this is Rodríguez-Pose and Vilalta-Bufí (2005).

The rest of the paper is structured as follows. First, in the section that follows, the database is described and a measure of overeducation is calculated for a broad sample of European regions. Second, the link between overeducation and regional economic growth is analysed. Finally, the paper concludes by offering a summary of our main findings.

2. MEASURING OVEREDUCATION

Educational mismatch occurs when the number of years of schooling received by a worker is higher or lower than that required to carry out his or her job. In order to measure educational mismatch, three methods employing microdata have been developed: objective, subjective and statistical methods.

The objective method involves comparing a worker's level of education with the level required to successfully perform the functions associated with a particular post, according to a panel of experts. Workers with the same levels as those identified by this panel are classified as being "properly educated", while the rest are classified as being "mismatched".

The subjective method is based on surveys in which individuals self-classify themselves directly into either of the aforementioned categories, or alternatively surveys are conducted that enquire about the nature of workers' jobs and on the basis of these findings individuals can be classified indirectly.

The statistical method considers jobs in terms of the average number of years of education presented by workers undertaking the task and then classifies workers according to the number of years of study above or below this average plus or minus a standard deviation, or alternatively below the mode (or the corrected mode).

Unfortunately, these methods even when applied to the same database have been found to provide quite different results (Groot and Maassen van den Brink, 2000) and, in general, empirical evidence shows that the statistical method tends to underestimate the educational mismatch, particularly when working with the average number of years of

education (Groot and Maassen van den Brink, 2002). In fact, when adopting this approach, it is the outcome of the actual matching process that is measured. Typically, the choice of one method or another tends to be determined not by theoretical arguments but rather by the availability of statistical information.

In order to conduct our research, we use microdata from the Integrated Public Use Microdata Series International (IPUMSI) housed at the Minnesota Population Center. This provides an integrated series of census microdata samples from 1960 to the present day. As of August 2009, the series includes 130 samples drawn from 44 countries, 11 of which are European Union (EU) member states. Table 1 summarises the availability of information from the IPUMSI project for these EU countries indicating those samples for which regional detail (a key aspect in our study) is available.

TABLE 1

In order to take into consideration the sizes of the Europeans regions (both economically and in terms of their population), we combine information at different levels of NUTS aggregation. Specifically, we use the NUTS-3 level for five countries (Austria, Greece, Portugal, Slovenia and Spain), the NUTS-2 level for France, Italy and Romania and the NUTS-1 level for the United Kingdom. Although IPUMSI project data are available for Hungary and the Netherlands, no regional information is provided, so they are excluded from any further analysis.

Table 2 shows the size of the country samples during the two most recent censuses conducted in European countries: 1990-1991-1992 and 1999-2001-2002. The total number of individuals considered in the analysis totals more than 9.2 million.

TABLE 2

The obvious advantage of using the IPUMSI samples as opposed to those supplied directly by the National Institute of Statistics lies in the fact that a number of key variables such as educational level[6] and occupations[7] are recoded using a homogenous

[6] 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,

classification. Drawing on this information, it is first possible to calculate statistical measures of educational mismatch at the individual level and, subsequently, to obtain regional indicators of the incidence and intensity of overeducation.

The first step in calculating a measure of educational mismatch involves transforming educational levels into the corresponding number of years of schooling[8]. The average number of schooling years for the working population in the countries and time periods considered are shown in Table 3. Our results are quite similar to those obtained elsewhere (see, for example, Barro and Lee, 2000): the number of schooling years increased substantially between the eighties and nineties in all European countries, but the greatest increase was recorded in countries with the lowest initial levels, which included Spain and Portugal. We also drew on the census information to calculate the percentage number of workers that had completed secondary and tertiary studies. The results are shown in Tables 4 and 5, respectively. An analysis of these tables shows that the increase in the number of schooling years reflected a higher rate of enrolment at both levels of education. Here again, our findings are similar to those when drawing on information contained in other databases, including that of the Eurostat Regio or the World Bank's World Development Indicators[9].

TABLES 3, 4 and 5

Having transformed the information regarding levels of education attained into number of schooling years, we then compared an individual's number of schooling years with the number required to undertake his or her job. Specifically, individual *i* working in occupation *j* and living in region *y* of country *z* at time *t* is considered to be properly educated if his number of years of schooling is equal to the most frequent value (the mode) for the number of schooling years for workers in occupation *j* in sector *k* of country *z*[10]. If the number of schooling years is higher/lower than the mode, then the

general track completed / Some college completed / Secondary, technical track completed / Post-secondary technical education / University completed.

[7] At a 3-digit level of detail (more than 400).

[8] As schooling levels in each country have been homogenised as part of the IPUMSI project, the equivalence between educational levels and number of schooling years is quite straightforward and is shown in annex 1.

[9] The results of the robustness check conducted on the database are available from the authors on request.

[10] Note, we assume that the educational requirements of a certain workplace are identical across regions in the same country, but that they can vary over time.

individual is classified as being over-/under-educated. This, therefore, constitutes our statistical measure of overeducation. Information at the regional and country level is obtained by aggregating the individual data. Country level results are shown in Table 6.

TABLE 6

As the table shows, approximately half the workers can be considered to be properly educated while the rest present a mismatch. The incidence of overeducation is greatest in Spain, Italy and Greece and markedly lower in Austria and Romania, while intermediate levels are recorded in the United Kingdom, Portugal, France and Slovenia. The percentage of over-educated workers has increased over time in some countries - this is the case of Greece, Romania, Spain and the United Kingdom, while in Austria, France and Portugal the figure has fallen. Here again, this picture is not unlike that described elsewhere (see, for example, Budría and Moro, 2006).

A somewhat different perspective on this educational mismatch is obtained if we focus on the intensity of under- and overeducation rather than on its incidence. This is achieved by breaking the number of schooling years down into three components: the number of years of overeducation, the number of years required for a particular post and the number of years of undereducation[11]. The results at the national level are shown in Table 7.

TABLE 7

As can be seen, the number of required schooling years has clearly increased in all the countries considered (with the sole exception of Spain). This implies that educational requirements have increased over time in the job markets considered here in parallel with the population's educational attainment (see Figure 1). However, the latter increase has been insufficient and so the intensity of the educational mismatch is greater in those countries with a higher incidence of educational requirements.

FIGURE 1

[11] In a similar way to the ORU specification of the Mincer equation commonly used in the economics of education literature (Duncan and Hoffman, 1981).

Yet, the main contribution made by our study as regards educational mismatch is provided by our analysis of the regional dimension[12]. Figure 2 shows the kernel density estimation for the percentage of over-educated workers in the regions considered in our study based on data from the two censuses. If we compare this figure with Figure 1, we can see that unlike the number of schooling years, regional differences in over-education have clearly increased in the period studied here. In fact, a twin-peak distribution emerges indicating that regional differences increased between 1991 and 2001.[13]

FIGURE 2

Taking into account these results, the main conclusion to be drawn from the descriptive analysis conducted in this section is that there has been a marked increase in levels of schooling in the EU regions and that this has reduced differences in the levels of human capital across the regions. However, this increase in human capital has not been accompanied by a similar increase in the number of qualified jobs. Thus, both the incidence and intensity of overeducation have increased across regions, but this increase has not been the same throughout the continent. The next section analyses the effects of these two complementary trends on regional economic growth.

3. OVEREDUCATION AND REGIONAL ECONOMIC GROWTH

This section examines the link between educational mismatch and regional economic growth in the EU. In order to disentangle the effect of this mismatch on growth, we first consider the effects of traditional indicators of human capital stock (number of schooling years, percentage of workers with secondary and tertiary studies) and, then, turn our attention to the effects of overeducation taking into account both its incidence and intensity at the regional level.

[12] An aspect that has been largely ignored in the literature on overeducation is the latter's relationship with territory. The link between the two is related to the differential overqualification theory which suggests that overeducation basically affects married women since their job search is restricted to the local labour market in which they live, while the husband is able to search for a job more in keeping with his level of education in a wider labour market (Frank, 1978).
[13] Full details of the results at the regional level are available from the authors on request.

In order to determine which human capital measures have the greatest impact on regional economic growth and to analyse the effects of educational mismatch, we estimated cross-section and panel data analyses 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 cross-section analysis enables us to consider Italian, Romanian and Slovenian regions while the lack of census and GDP data means they cannot be included in the panel analysis. However, it should be borne in mind that the main advantage of adopting a panel data approach is that it allows us to control for unobservable heterogeneity through the inclusion of regional and time fixed effects.

TABLE 8

Specifically, we estimate cross-section regressions of GDP per capita growth between 2000 and 2005 on the initial level of GDP per capita and the human capital variables calculated from the IPUMSI microdata for 229 regions as described in the previous section. The model adopts the following form:

$$(\ln y_{i,2005} - \ln y_{i,2000})/5 = \alpha + \beta \cdot \ln y_{i,2000} + \gamma \cdot x_{i,2000} + \mu_j + \varepsilon_i \qquad (1)$$

where *ln* y_i is the logarithm of GDP in region *i*, *xi* represents the various human capital indicators[14], μ_j is a country specific effect, and ε_i a random error term that varies across regions. The coefficient β is related to the convergence rate across economies, while the coefficient γ allows us to assess the impact of the various human capital indicators on growth.

In the case of the panel data models, GDP per capita growth between 1995 and 2000 and 2000 and 2005 is regressed on the initial level of GDP per capita and the human

[14] 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 the use of panel data) makes it more unlikely that reverse causation could explain the positive and significant effects of human capital and growth (de la Fuente and Domenech, 2006).

capital indicators for the 190 regions for which both GDP and human capital data are available for both periods. In particular:

$$\left(\ln y_{i,t} - \ln y_{i,t-\tau}\right)/x = \alpha + \beta \cdot \ln y_{i,t-\tau} + \gamma \cdot x_{i,t-\tau} + \lambda \cdot z_{i,t-\tau} + \eta_t + \mu_i + \varepsilon_{i,t} \qquad (2)$$

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, $z_{i,t-\tau}$ is a set of additional control variables that have been calculated from the IPUMSI census sample, η_t is a time specific effect, μ_t a region specific effect, and $\varepsilon_{i,t}$ a random error term that varies across regions and time periods. The additional control variables include regional demographic structure (percentage of population over the age of 50), labour market characteristics (inactivity rate and unemployment rate) and employment composition (agriculture, manufacturing, building)[15].

Table 9 summarises the results of estimating equations 1 and 2. The first four columns of the table show the results for cross-sectional regressions, while the remaining six columns show the results for panel data models. In the case of the cross-sectional analysis, the columns in the first part of the table show the results obtained when estimating models with the different explanatory variables: in models 1 and 2, growth was regressed on initial GDP per capita and traditional human capital indicators: number of schooling years and the percentage of working population with secondary studies. Indicators of educational mismatch are included in models 3 and 4. The percentage of properly educated workers and the percentage of over-educated workers are included in model 3, while in model 4 the number of schooling years is broken down in terms of required, over and under. The second part of the table (panel data results) has a similar structure: models 5 and 6 provide results for the traditional human capital indicators, while models 7 to 10 include educational mismatch indicators. The difference between models 7 and 8, on the one hand, and models 9 and 10, on the other, is that the latter include regional time-varying control variables. In particular, stepwise

[15] It would have been interesting to have included controls related to regional innovation capacity, but information from Eurostat is not available for all NUTS-2 regions.

regressions were carried out in order to avoid collinearity and to include the most relevant control variables[16].

TABLE 9

The results in Table 9 reveal a number of interesting results. First, the coefficient of initial GDP per capita is always negative and significant at the usual levels, indicating that a process of regional convergence has occurred during the period under review. This process is still apparent when the various human capital indicators are included.

The introduction of the traditional indicators of human capital in models 1, 2, 5 and 6 reveals their positive impact on economic growth. The coefficients are positive and statistically significant with the sole exception of the percentage of workers with tertiary studies in the panel data regression (model 6).

In models 3, 7 and 9 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 with the percentage of over-educated workers is greater than that associated with the percentage of properly educated workers for all specifications. This result lends some support to the hypothesis that at the regional level (albeit not necessarily at the individual level) overeducation might be seen more as an investment than as a cost[17]. The result is robust to the inclusion of additional regional time-varying control variables (model 9).

Finally, models 4, 8 and 10 confirm the results of previous models and provide an additional interesting finding: there is a positive and significant effect of the average number of required years and the average number of years of overeducation, while the average number of years of undereducation has a negative and significant effect.

[16] Full results are available from the authors on request.

[17] This result is robust to the inclusion of the average schooling levels in the region as an additional control variable. The reason for including this control is that it might be thought that the positive and significant sign of the percentage of overeducated workers could be related to the greater presence of educated workers.

4. FINAL REMARKS

While the limited time frame and the nature of the analysis mean that any conclusions drawn here should be considered with caution, the study does seem to indicate the presence of a significant correlation between overeducation and regional economic performance in recent years. The impact of overeducation on an individual's earnings is well known: he will tend to earn less than his "properly educated" counterparts. However, at the regional level, our results indicate a more favourable picture: overeducated workers represent an opportunity to take advantage of the generation of more qualified jobs. This finding does not differ greatly from those reported in studies analysing the differences between private and social returns to schooling (see, for example, Moretti, 2004). In a recent study comparing various EU countries, Middendorf (2008) also found that returns to schooling are significantly and negatively related to the educational attainment of the population, a result which is in line with the findings reported herein.

From a policy perspective, our results indicate that even when qualified workers are unable to find a suitable job, they are still more productive at the aggregate level than their unqualified counterparts. This implies that there is a good case for public investment in education, even though a number of recent studies fail to provide favourable evidence regarding the link between human capital and growth. However, in a context of high geographical mobility, regions will not benefit directly 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 certainly constitutes a potential line for future research and one that needs to be considered from a policy perspective. Finally, we should stress (as Rodriguez-Pose and Vilalta-Bufí, 2005, have done so before) that the use of microeconomic data in constructing regional indicators of educational mismatch represents a step forward with respect to the traditional indicators of human capital, but in this area a considerable amount of work has still to be done.

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6. FIGURES AND TABLES

Figure 1

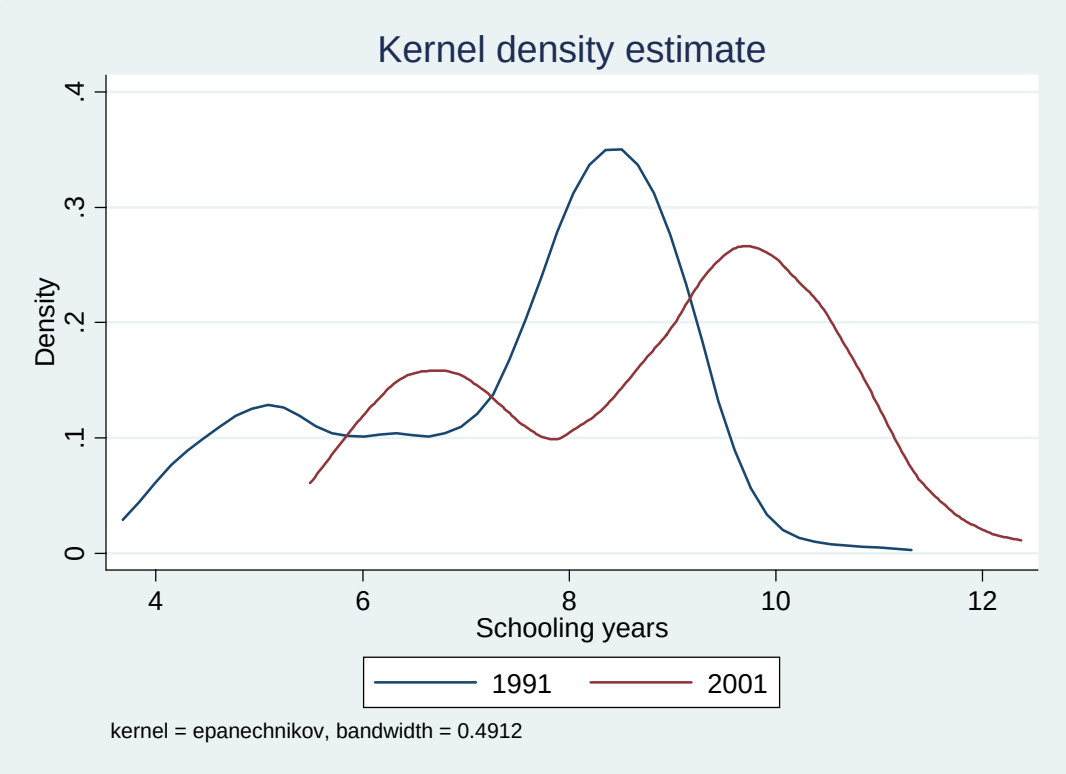

Figure 2

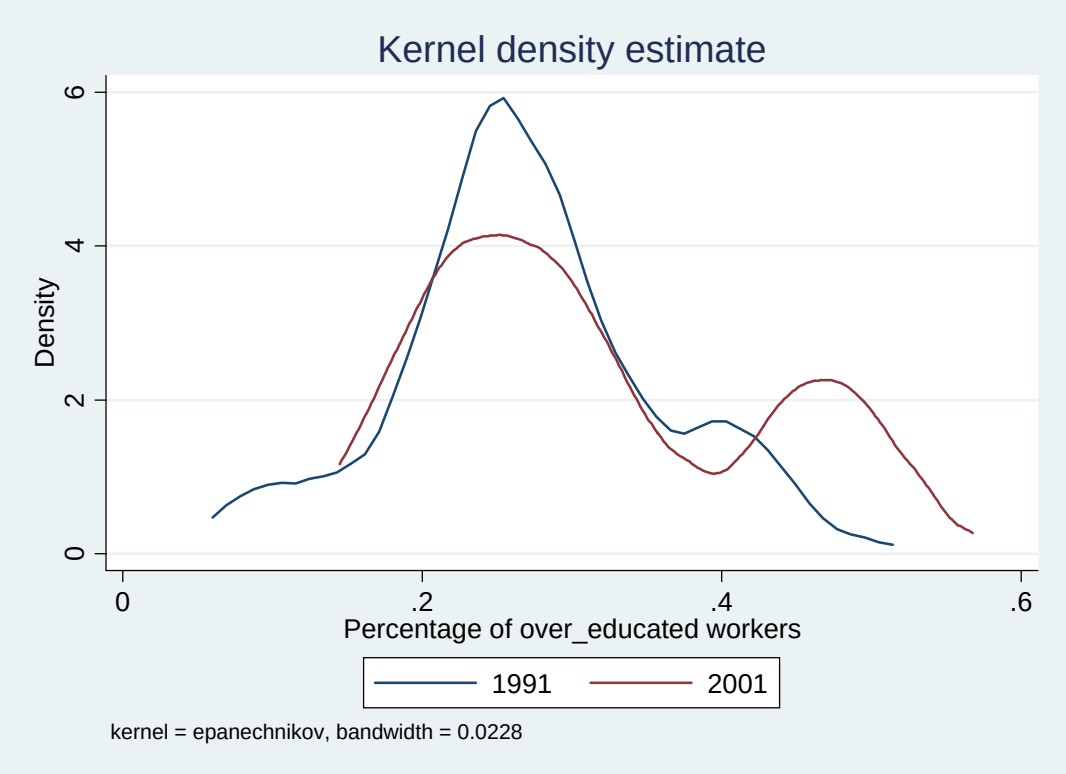
Kernel density estimate
Density
0
2
4
6
0
.2
.4
.6
Percentage of over_educated workers
1991
2001
kernel = epanechnikov, bandwidth = 0.0228

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

Country	Availability	Years	Regional dimension			Number of regions		
			NUTS I	NUTS II	NUTS III	NUTS I	NUTS II	NUTS III
Austria	X	1971, 1981, 1991, 2001	X	X	X	3	9	31
France	X	1962, 1968, 1975, 1982, 1990, 1999	X	X		8	22	
Greece	X	1971, 1981, 1991, 2001	X	X	X	4	13	51
Hungary	X	1970, 1980, 1990, 2001						
Italy	X	2001	X	X		5	19	
Netherlands	X	1960, 1971, 2001						
Portugal	X	1981, 1991, 2001	X	X	X	3	7	22
Romania	X	1977, 1992, 2002	X	X		4	8	
Slovenia	X	2002	X	X	X	1	2	12
Spain	X	1981, 1991, 2001	X	X	X	7	19	52
United Kingdom	X	1991, 2001	X			12		
Number of countries/regions	11		9	8	5	47	99	168

Source: Authors' own calculations based on IPUMSI microdata.

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

Sample	1990-1991-1992	1999-2001-2002
Austria	345,004	370,179
France	932,384	1,156,454
Greece	327,529	381,334
Italy	-------	1,084,806
Portugal	199,685	227,712
Romania	928,752	756,535
Slovenia	-------	73,044
Spain	626,202	742,777
United Kingdom	234,757	812,989
Total	3,594,313	5,605,308

Source: Authors' own calculations based on IPUMSI microdata.

Table 3. Average number of schooling years of working population

Schooling years	1990-1991-1992	1999-2001-2002
Austria	8.2	8.3
France	8.7	10.3
Greece	9.4	11.2
Italy	-------	7.4
Portugal	5.2	7.3
Romania	10.9	12.1
Slovenia	-------	11.6
Spain	9.2	11.0
United Kingdom	8.4	10.3
Simple Average	8.6	10.0

Source: Source: Authors' own calculations based on IPUMSI microdata.

Table 4. Percentage of workers with secondary studies

Secondary education	1990-1991-1992	1999-2001-2002
Austria	65%	67%
France	49%	54%
Greece	31%	39%
Italy	-------	42%
Portugal	12%	16%
Romania	50%	58%
Slovenia	-------	72%
Spain	22%	34%
United Kingdom	47%	47%

Source: Authors' own calculations based on IPUMSI microdata.

Table 5. Percentage of workers with tertiary studies

Tertiary education	1990-1991-1992	1999-2001-2002
Austria	7%	11%
France	16%	25%
Greece	14%	22%
Italy	-------	11%
Portugal	6%	12%
Romania	8%	12%
Slovenia	-------	12%
Spain	12%	10%
United Kingdom	21%	33%

Source: Authors' own calculations based on IPUMSI microdata.

Table 6. Incidence of the educational mismatch

Percentage of workers		1990-1991-1992	1999-2001-2002
Austria	Under-educated	30.3%	37.3%
	Properly educated	56.0%	55.4%
	Over-educated	13.8%	7.3%
France	Under-educated	31.2%	35.0%
	Properly educated	42.8%	46.6%
	Over-educated	25.9%	18.4%
Greece	Under-educated	16.3%	17.9%
	Properly educated	59.0%	51.6%
	Over-educated	24.7%	30.5%
Italy	Under-educated	-------	11.6%
	Properly educated	-------	57.0%
	Over-educated	-------	31.4%
Portugal	Under-educated	18.3%	27.0%
	Properly educated	50.7%	51.5%
	Over-educated	31.0%	21.5%
Romania	Under-educated	31.8%	25.2%
	Properly educated	58.4%	61.9%
	Over-educated	9.8%	12.9%
Slovenia	Under-educated	-------	27.0%
	Properly educated	-------	56.5%
	Over-educated	-------	16.5%
Spain	Under-educated	18.9%	8.2%
	Properly educated	46.3%	48.6%
	Over-educated	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: Authors' own calculations based on IPUMSI microdata.

Table 7. Intensity of the educational mismatch

Schooling years		1990-1991-1992	1999-2001-2002
Austria	Under-education	1.25	1.57
	Required	9.05	9.54
	Over-education	0.45	0.32
France	Under-education	2.10	2.23
	Required	9.52	11.65
	Over-education	1.29	0.87
Greece	Under-education	0.72	0.75
	Required	8.79	10.29
	Over-education	1.33	1.64
Italy	Under-education	-------	1.09
	Required	-------	5.88
	Over-education	-------	2.59
Portugal	Under-education	0.91	1.00
	Required	4.65	7.35
	Over-education	1.47	0.91
Romania	Under-education	1.90	1.47
	Required	12.23	12.84
	Over-education	0.55	0.78
Slovenia	Under-education	-------	2.13
	Required	-------	12.55
	Over-education	-------	1.21
Spain	Under-education	1.17	0.63
	Required	4.77	4.07
	Over-education	2.85	3.86
United Kingdom	Under-education	0.06	1.61
	Required	8.26	11.15
	Over-education	0.22	0.79

Source: Authors' own calculations based on 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%
Italy	17740.7	22253.1	23474.3	5.1%	1.1%	3.2%
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%
Slovenia	10620.2	14968.7	19461.8	8.2%	6.0%	8.3%
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. Estimates of beta-convergence equation

	Cross-section regression				Panel data models					
Annualized GDP growth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Initial GDP	-0.00928**	-0.0119***	-0.00605*	-0.00886**	-0.138***	-0.171***	-0.148***	-0.170***	-0.169***	-0.176***
	[0.00414]	[0.00445]	[0.00354]	[0.00418]	[0.0147]	[0.0112]	[0.0123]	[0.0105]	[0.0137]	[0.0122]
Schooling years	0.0212**				0.0429***					
	[0.01000]				[0.0151]					
% Secondary studies		0.0121**				0.215***				
		[0.00578]				[0.0223]				
% Tertiary studies		0.0329**				-0.0144				
		[0.0146]				[0.0202]				
% Properly educated			0.0587				0.0407***		0.0329***	
			[0.0357]				[0.00708]		[0.0108]	
% Overeducated			0.0669*				0.147***		0.122***	
			[0.0399]				[0.0146]		[0.0159]	
Required schooling years				0.00523***				0.00899***		0.00971***
				[0.000696]				[0.00168]		[0.00202]
Overeducation years				0.0107***				0.0220***		0.0215***
				[0.00104]				[0.00212]		[0.00275]
Infraeducation years				-0.00905***				-0.0150***		-0.0162***
				[0.00209]				[0.00273]		[0.00415]
Country dummies	Yes				No				No	
Region and time period dummies	No				Yes				Yes	
Regional time-varying controls	No				No				Yes	
Observations	229	229	229	229	380	380	380	380	380	380
Number of regions	229	229	229	229	190	190	190	190	190	190
R-squared	0.629	0.64	0.628	0.638	0.599	0.752	0.700	0.755	0.730	0.759

Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

Annex 1. Equivalence between educational levels and number of schooling years

Educational levels (edattand in IPUMSI)	Number of 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