RETURNS TO EDUCATION IN EUROPE. SAME OR NOT?

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Abstract

The main aim of the paper is estimation of the Mincer equation parameters for European countries. The Mincer equation describes the impact of years of schooling and the work experience to the wages. The estimates of that equation were obtained using cross-section data for selected European in 2002 and 2010. Obtained results show huge differences returns to education in European countries. It seems that countries with better labor market outcomes can be characterized by lower rates to education. The variation of estimated rates stayed unchanged in analyzed period.

Keywords: Mincer equation, returns to education, labor market

Introduction

Although the analyses of the impact of skills on earnings receive attention since Adam Smith's "Wealth of Nations", published in 1776, the pioneer in measurement of human capital and estimation its impact on wages was Mincer (Mincer, 1958) .

Mincer identifies two kinds of investments in human capital: the investments in formal education (measured by years of schooling completed) and investments during the working life (measured by years of work experience). Mincer (1974) estimated rates of returns from on-the-job training and their impact on the wage distribution for several different occupations. He showed that earnings profiles imply a decline in on-the-job training investments with age. Mincer also showed that on-the-job training investments increase with the level of schooling. Mincer concept prompted new studies, however the necessity of some modification of the model was crucial. For example the non-linear relationship between wages and schooling received particular attention (Lemieux, 2006).

Starting from Mincer (1974) the issues of wage and human capital distribution has been studied by many authors. The empirical analyses indicate that the return rate on education is no greater than 10% of initial income per additional year of education or 30-35% for achieving higher level. Several reviews of the empirical results can be found in the literature; see Psacharopoulos (1994), Psacharopoulos and Patrinos (2004), Hanushek and Woessmann (2010) and Strauss, de La Maisonneuve (2007).

Parameters of the Mincer regression are usually estimated using individual data observed for a particular country by labor force surveys. On the macro level, Mincerian equation is estimated on the basis of regressions for both cross-section data and time series; see Hausman, Taylor (1981), Moretti (2004), Krueger and Lindahl (2001). The main assumption for the cross sectional analysis in the homogeneity of regression parameters. Consequently, the impact of education and the experience on the observed wages does not vary across countries.

In this paper I estimate the Mincer equation for European countries and relax the assumption of constancy of parameters across countries. The variability of parameters was obtained by estimation of parameters for particular countries. The differences between parameters were tried to be explained by labor market features.

Data

The empirical analysis presented in the paper is based on the cross-section series taken from the European Union Structure of Earnings Survey (SES), a large representative enterprise sample survey. The SES provides comparable information on the level of remuneration and individual characteristics of employees such as sex, age, occupation.

Also, the International Standard Classifications (ISCO-08, 2012) is used. According to ISCO-08 four major levels of skills can be separate. Skill levels are defined by considering the level of education and qualifications gained by on-the-job training or practice. According to ISC08 methodology there are four levels of skills. The first level requires elementary qualifications and primary or the first stage of basic education. The second level involves individuals with secondary levels of education (basic vocational, general and vocational comprehensive) and post- or non-tertiary levels. The third level is related to education accomplished in the first stage tertiary education. The forth level captures individuals with tertiary level of education accomplished.

Table 1 presents basic descriptive statistics of wages in selected European countries in 2002 and 2010. The highest average hourly remunerations (ca. 16-18 PPS in 2002 and 18-19 PPS in 2010) can be observed in case of Denmark, Luxembourg, Norway, Ireland and Belgium. The lowest are reported in case of Bulgaria, Romania and Baltic States. Differences between lowest and highest wages declined in analyzed period. We can observed a kind of convergence process in that case. In general, in old EU15 countries (except of Portugal) wages were higher than mean in our sample. The similar pattern one can find when studying the diversity of wages. Country statistics show highest variation of wages in southern European countries (Portugal, Italy, Romania, Bulgaria and Slovenia). The lowest coefficients (below 0.3) of variation were noticed in Denmark, Norway and Sweden.

The preliminary, qualitative analyses, indicate that the existing diversification of wages in Europe with respect to the level of skills and labor market experience is strong. The empirical strategy takes into account those empirical effects.

Empirical results

The standard regression form of the Mincer equation can be written as:

$$\ln wage_t = \alpha_0 + \alpha_1 edu_t + \alpha_2 age_t + \alpha_3 age_t^2 + \varepsilon_t ,$$

where

$\ln wage_t$ is observation number *t* of the logarithm of the hourly wage (in PPS),

age_t denotes observation number *t* measuring the experience (age_t may equal 1…5 depending on the age group, there are 5 intervals for age: 1 – less than 30 years, 2 – from 30 to 39 years, 3 – from 40 to 49 years, 4 – from 50 to 59 years, 5 – 60 years or over);

edu_t is the observation number *t* of the occupational group (edu_t may equal 1…4, according to the standard division with respect to skills).

The parameters α_2 and α_3 describe the impact of the age to the salary, and parameter α_1 shows the relative change of worker's salary caused by skills level increase. The parameters of the above equation were estimated OLS using cross-section data concerning men and women in 2002 and 2010 in European countries.

The results of estimation are presented in Table 2 which contains the point estimates, t-Statistics, adjusted R^2 and number of observations. There is positive and statistically significant impact of skills level on remuneration. Depending on country of region, the improvement of skill level resulted in 17-51% change of salaries. The estimated value of α_1 parameter can be treated as measure of returns to education in particular country. As it was mentioned above, the skills level can be easily mapping to education level.

Additionally, the returns to education (in 2010) are presented on Figure 1. Analysing results presented in Table 2 and on Figure 1 one can find that the highest returns to education have been noticed in Southern European countries, Romania and Poland. These economies can be characterized by relatively low wages level and low labour productivity, high wage dispersion and relatively worse educational attainment in tertiary degree as compared to other countries. The lowest (18-20%) returns to education one can find for Denmark, Norway and Sweden. Relatively low returns can be observed in core EU countries. The labour force in this group of countries is well educated, the wages are relatively high and less diversified (Figure 2). Comparing the results for two separate periods indicate on lack of large changes (Table 2), however some minor can be find (Figure 3).

In most of the analysed countries the work experience plays significant role in wage formation. Extended Mincer equation with nonlinear dependency between wages and work experience is also taken into account. In general, the level of wage can be described by quadratic function of individuals' work seniority. Each additional year of work experience is connected with an increase in the wage. The differences in returns to work experience are also diversified among countries. Although direct economic interpretation of estimated α_2 parameter as return to work experience is not allowed due to nonlinearities, we can see that distribution of these estimates is similar to that for α_1 values. There are some cases in which the impact of work seniority on salary is statistically insignificant. Typically in emerging markets. However, the pattern is that the lowest values are in NMS countries and the highest

Conclusion

The main aim of the paper was to estimate the extended Mincer equation parameters across European countries. The variability of estimated returns to education and work experience was obtained by using particular countries data.

Analysis showed statistical significance of skills level impact on wage level in analyzed countries. The value of estimated returns to education rate vary from 17% in Scandinavian countries to 50% in Southern Europe countries. The changes in returns to education between 2002 and 2010 occurred but was not dramatically.

Analyzing the level of estimated returns we can observed that countries with lower estimated returns to education can be characterized by higher wages and labor productivity, better educated labor force and lower dispersion of wages. In this group of countries the work experience plays more important role as compared to the remaining countries.

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Table 1. Descriptive statistics of hourly wages in selected EU countries in 2002 and 2010 (in PPS)

Country	2010						2002					
	Mean	Median	Min	Max	Std dev	Coef. of Var.	Mean	Median	Min	Max	Std dev	Coef. of Var.
Austria	15.1	13.0	6.2	46.4	7.6	0.502	14.3	12.3	6.5	36.9	6.8	0.473
Belgium	17.6	15.0	10.0	42.1	7.2	0.407	16.8	14.2	8.7	36.9	7.2	0.428
Bulgaria	4.7	4.0	2.1	13.1	2.6	0.547	2.8	2.3	1.3	7.1	1.4	0.519
Czech Republic	7.3	6.3	3.7	20.1	3.4	0.471	6.6	5.6	3.0	17.5	3.1	0.474
Denmark	18.6	17.4	11.5	35.7	4.9	0.265	16.5	15.1	11.0	30.8	4.1	0.251
Estonia	7.1	6.4	3.2	17.8	3.1	0.445	5.1	4.4	2.2	13.5	2.3	0.453
Finland	14.8	12.8	7.8	35.4	5.7	0.382	12.8	11.2	8.1	29.1	4.6	0.357
France	13.7	11.6	6.7	40.3	6.0	0.438	14.7	11.7	6.9	62.7	8.1	0.555
Germany	16.0	13.9	7.5	40.0	7.6	0.471	15.0	12.8	8.3	41.8	6.2	0.410
Greece	12.0	10.0	6.2	43.0	6.2	0.517	12.1	11.0	5.3	27.7	5.2	0.425
Hungary	7.1	6.0	3.8	19.7	3.7	0.519	5.6	4.7	2.7	13.5	2.8	0.504
Iceland	11.5	10.3	7.1	24.5	3.8	0.326	12.9	11.4	7.6	29.7	4.8	0.368
Ireland	17.7	15.3	9.0	40.3	7.1	0.400	16.3	14.0	8.7	40.3	6.7	0.412
Italy	14.1	11.0	7.0	42.6	8.2	0.580	14.9	11.6	7.4	47.5	8.5	0.570
Latvia	5.7	5.2	2.6	13.2	2.3	0.393	4.2	3.6	1.9	9.6	1.8	0.428
Lithuania	5.4	4.8	2.8	12.0	2.2	0.417	4.5	4.1	1.9	10.6	1.9	0.426
Luxembourg	18.5	14.2	8.5	58.5	10.1	0.543	18.1	14.4	9.4	47.0	8.9	0.492
Malta	11.4	10.2	6.5	24.0	3.8	0.338	4.1	3.7	2.3	7.9	1.3	0.321
Netherlands	15.2	13.6	6.8	32.4	5.4	0.358	14.8	13.7	7.0	30.1	4.9	0.334
Norway	18.2	16.7	11.7	34.1	4.7	0.257	16.4	15.2	10.2	30.1	4.2	0.258
Poland	7.8	6.5	3.6	22.6	4.2	0.536	6.3	5.2	3.0	17.3	3.4	0.541
Portugal	9.6	6.7	4.0	31.2	6.9	0.712	8.6	5.9	2.9	30.2	6.3	0.724
Romania	5.2	4.3	2.3	15.3	3.2	0.618	3.3	2.8	1.6	9.9	2.1	0.633
Slovakia	7.0	5.8	3.3	19.0	3.4	0.487	5.4	4.4	2.9	17.2	2.9	0.535
Slovenia	11.5	8.7	5.5	33.9	6.5	0.564	11.0	7.9	4.5	33.9	6.9	0.631
Spain	13.2	10.8	7.2	35.9	6.1	0.463	12.4	9.7	6.6	36.5	6.2	0.503
Sweden	13.9	12.6	9.6	28.1	3.8	0.276	13.1	11.7	9.1	26.9	3.8	0.287
UK	15.0	12.5	7.6	36.4	6.7	0.444	16.6	13.6	8.7	36.3	7.4	0.442

Table 2. Estimates of parameters in Mincer equations in European countries in 2002 and 2010

Country	2010						2002					
	edu	age	age^2	_cons	Adj. R^2	obs	edu	age	age^2	_cons	Adj. R^2	obs
Whole sample	0.347 (36.82)	0.238 (7.16)	-0.030 (-5.56)	1.071 (21.64)	0.336	2889	0.339 (24.38)	0.285 (5.60)	-0.041 (-4.95)	0.833 (11.10)	0.218	2261
Austria	0.345 (14.69)	0.364 (4.24)	-0.046 (-3.25)	1.163 (9.16)	0.762	80	0.358 (14.53)	0.411 (4.56)	-0.051 (-3.45)	1.037 (7.78)	0.765	80
Belgium	0.296 (20.30)	0.252 (4.74)	-0.028 (-3.24)	1.619 (20.55)	0.860	80	0.277 (12.20)	0.361 (4.87)	-0.044 (-3.62)	1.360 (11.46)	0.807	50
Bulgaria	0.439 (17.96)	0.113 (1.33)	-0.021 (-1.51)	0.248 (1.96)	0.784	90	0.357 (16.22)	0.238 (2.95)	-0.032 (-2.47)	-0.619 (-5.20)	0.776	80
Czech	0.363 (16.71)	0.194 (2.56)	-0.029 (-2.33)	0.744 (6.60)	0.761	90	0.326 (15.91)	0.161 (2.15)	-0.027 (-2.24)	0.623 (5.62)	0.764	80
Denmark	0.180 (14.04)	0.320 (7.17)	-0.042 (-5.81)	1.960 (29.49)	0.763	90	0.184 (14.50)	0.319 (6.88)	-0.045 (-5.92)	1.851 (27.00)	0.775	80
Estonia	0.351 (15.51)	0.162 (1.99)	-0.033 (-2.52)	0.884 (7.19)	0.745	86	0.334 (15.54)	0.051 (0.65)	-0.020 (-1.57)	0.572 (4.92)	0.768	80
Finland	0.272 (15.21)	0.226 (3.61)	-0.030 (-2.90)	1.624 (17.47)	0.739	90	0.253 (17.89)	0.178 (3.44)	-0.024 (-2.86)	1.554 (20.32)	0.810	80
France	0.312 (19.00)	0.181 (3.16)	-0.016 (-1.68)	1.415 (16.57)	0.826	90	0.330 (20.48)	0.210 (2.57)	-0.026 (-1.60)	1.457 (14.82)	0.877	64
Germany	0.357 (19.08)	0.440 (6.73)	-0.058 (-5.46)	1.132 (11.66)	0.832	90	0.327 (11.56	0.357 (3.45)	-0.048 (-2.82)	1.331 (8.69)	0.657	80
Greece	0.292 (13.44)	0.378 (4.90)	-0.040 (-3.21)	0.984 (8.54)	0.758	87	0.309 (13.91)	0.439 (5.41)	-0.051 (-3.85)	0.660 (5.50)	0.778	80
Hungary	0.402 (19.29)	0.059 (0.81)	-0.003 (-0.28)	0.736 (6.80)	0.809	90	0.353 (18.42)	0.057 (0.82)	-0.004 (-0.36)	0.467 (4.50)	0.812	80
Iceland	0.231 (12.57)	0.197 (2.94)	-0.031 (-2.82)	1.571 (15.82)	0.674	80	0.318 (13.88)	0.195 (2.36)	-0.034 (-2.48)	1.394 (11.44)	0.718	79
Ireland	0.280 (14.70)	0.459 (6.90)	-0.065 (-5.95)	1.461 (14.78)	0.758	90	0.315 (14.36)	0.358 (4.48)	-0.051 (-3.91)	1.339 (11.30)	0.744	80
Italy	0.370 (14.46)	0.296 (3.30)	-0.033 (-2.26)	1.102 (8.28)	0.732	90	0.435 (13.64)	0.471 (4.04)	-0.058 (-3.05)	0.684 (3.96)	0.737	80
Latvia	0.330 (17.12)	0.077 (1.15)	-0.014 (-1.32)	0.800 (8.00)	0.767	90	0.260 (11.50)	0.041 (0.50)	-0.012 (-0.90)	0.443 (3.62)	0.629	80
Lithuania	0.351 (17.78)	0.023 (0.33)	-0.005 (-0.45)	0.728 (6.97)	0.787	86	0.351 (21.23)	0.124 (2.05)	-0.022 (-2.27)	0.181 (2.02)	0.852	80
Luxembourg	0.382 (15.57)	0.362 (4.20)	-0.046 (-3.26)	1.294 (10.10)	0.761	88	0.359 (14.76)	0.286 (3.23)	-0.034 (-2.34)	1.382 (10.64)	0.758	78
Malta	0.278 (22.62)	0.204 (4.56)	-0.032 (-4.29)	1.426 (21.71)	0.869	81	0.225 (10.17)	0.241 (2.94)	-0.038 (-2.77)	1.282 (10.77)	0.598	75
Netherlands	0.264 (17.39)	0.423 (7.98)	-0.055 (-6.37)	1.357 (17.21)	0.825	90	0.224 (12.31)	0.363 (5.42)	-0.049 (-4.46)	1.513 (15.30)	0.717	79
Norway	0.191 (15.98)	0.265 (6.35)	-0.037 (-5.37)	2.012 (32.41)	0.778	90	0.216 (19.42)	0.255 (6.26)	-0.038 (-5.70)	1.781 (29.58)	0.841	80
Poland	0.408 (17.53)	0.219 (2.70)	-0.030 (-2.27)	0.619 (5.12)	0.780	90	0.455 (19.15)	0.240 (2.76)	-0.033 (-2.30)	0.136 (1.06)	0.826	80
Portugal	0.508 (17.22)	0.338 (3.28)	-0.041 (-2.45)	0.279 (1.83)	0.782	90	0.509 (16.27)	0.414 (3.62)	-0.062 (-3.30)	0.222 (1.32)	0.778	80
Romania	0.471 (17.92)	0.120 (1.30)	-0.017 (-1.13)	0.180 (1.32)	0.783	90	0.473 (17.03)	0.280 (2.76)	-0.040 (-2.41)	-0.699 (-4.65)	0.790	80
Slovakia	0.360 (15.53)	0.144 (1.76)	-0.021 (-1.57)	0.765 (6.32)	0.736	88	0.327 (13.81)	0.230 (2.66)	-0.040 (-2.84)	0.355 (2.78)	0.713	80
Slovenia	0.402 (20.98)	0.139 (2.05)	-0.007 (-0.58)	0.993 (9.88)	0.862	84	0.396 (19.48)	0.149 (1.97)	-0.007 (-0.59)	0.745 (6.72)	0.851	77
Spain	0.335 (17.83)	0.138 (2.10)	-0.005 (-0.44)	1.313 (13.43)	0.816	89	0.381 (18.63)	0.346 (4.62)	-0.042 (-3.47)	0.821 (7.43)	0.834	80
Sweden	0.197 (14.56)	0.212 (4.49)	-0.029 (-3.78)	1.805 (25.71)	0.729	90	0.251 (21.56)	0.208 (4.89)	-0.030 (-4.33)	1.517 (24.09)	0.862	80
UK	0.346 (19.09)	0.362 (5.68)	-0.054 (-5.21)	1.295 (13.70)	0.818	89	0.342 (17.59)	0.332 (4.67)	-0.054 (-4.64)	1.370 (13.01)	0.806	80

Figure 1. Estimated returns to education in Europe in 2010 (in pp.)

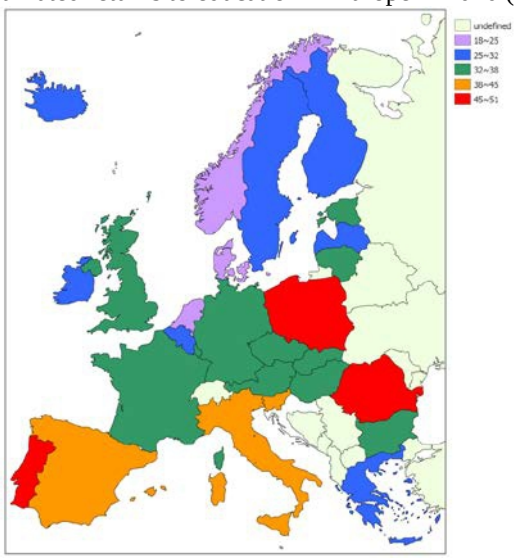

Figure 2. Returns to education vs. labour productivity, wage coefficient of variation and mean wage in European countries in 2010 and 2002

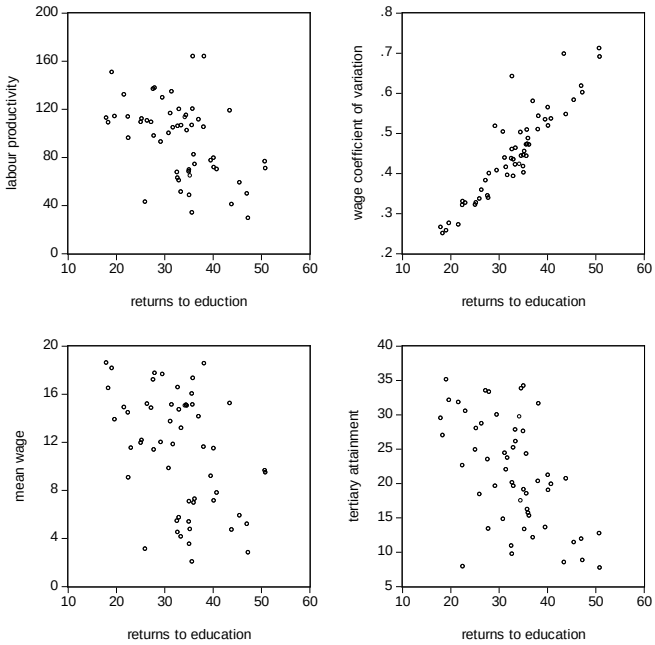

Figure 3. Changes in returns to education between 2002 and 2010