

Higher education and efficiency in Europe: a comparative analysis

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Resume:

- The aim of this paper is to analyse the efficiency of transforming higher education into wages in the following European countries: Denmark, France, Italy, Spain and United Kingdom.
 - We use the stochastic frontier approach to measure the wage premium associated to education in the six European countries analyzed.
 - The data set is the ECHP (European Community Household Panel Data) from 1995 to 2001
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Related literature

- **Daneshvary et al. (1992)** focus on labour market assimilation by measuring the information utilized by immigrants during job search. Assimilation is assumed to occur whenever such information increases with the length of residence in USA.
 - **Lang (2005)** estimates an earning frontier to search for systematic differences and discrimination between native and immigrants in Germany
 - **Hunt-McCool and Warren (1993)** considered the differences in potential earnings between black and white workers associated with labour market discrimination when analysing the extent of inefficiency in the transformation of human capital into earnings
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The method of estimation

- The earnings frontier describes the highest potential income associated with a given stock of human capital.
- We adopt a standard semi-logarithmic earnings equation (Mincer (1974)) of the type:

$$\ln W^*_{it} = \alpha + \beta' X_{it} + v_{it}$$

The method of estimation

- It is estimated a parametric and stochastic frontier (SFA) with the LIMDEP econometric programme.
- This approach estimates a wage function assuming that the error term has two independent components (**Aigner et al, 1977**; and **Meeusen and Van Broeck, 1977**)

$$W_{it} = W^*_{it} - u_{it} = \alpha + \beta' X_{it} + v_{it} - u_{it}$$

The method of estimation

- The stochastic earnings frontier represents an upper bound to the earnings.
- The observer wage (W) could be lower because of measurement errors or inefficiency in the transformation of human capital into earnings.

$$u_{it} = \delta_0 + \sum_{i=1}^n \delta_i Z_{it} + \Psi_{it}$$

The method of estimation

- Then, I estimate the earnings function for the whole sample, adding a term of inefficiency, whose mean is a function of a set of inefficiency determinants:

$$\ln W_{it} = \alpha + \beta' X_{it} + v_{it} - u_{it}$$

$$u_{it} = \delta_0 + \sum_{i=1}^n \delta_i Z_{it} + \Psi_{it}$$

Data

- We use data from the ECHP (European Community Household Panel Data) for Denmark, France, Italy, Spain and United Kingdom.
 - I estimate a stochastic frontier for each country from the corresponding unbalanced panel of wage earners from 1995 to 2001.
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DESCRIPTIVE STATISTICS (MEAN)

	Denmark	France	Germany	Italy	Spain	UK
Women	0.37	0.23	0.30	0.28	0.18	0.41
Age	43.75	41.90	42.46	41.69	42.85	41.83
Number of children	0.68	0.74	0.64	0.62	0.66	0.62
Higher education	0.37	0.30	0.29	0.13	0.32	0.50
Formal training	0.77	0.55	0.76	0.36	0.58	0.84
Seniority	13.63	18.01	12.99	17.99	17.32	8.43
Services	0.72	0.66	0.54	0.67	0.60	0.71
Mobility	0.37	0.37	0.22	0.27	0.29	0.37
Permanent contract	0.95	0.96	0.95	0.93	0.81	0.96
Private sector	0.58	0.64	0.70	0.58	0.71	0.70

The Wage Premium Result

- The dependent variable is the logarithm of gross hourly wage.
 - Two equations:
 1. Here I estimate the efficiency of having education inside each group of workers (male and females). This efficiency is defined as the transformation of education into earnings in the labour market.
 2. The second equation measures the efficiency of education between females and males.
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Results: wage equation(1)

- The **human capital** variables are significant and they have the expected sign.

Variables	Denmark	France	Germany	Italy	Spain	UK
Women lower education	-0.1219 (-6.828)	-0.1259 (-7.809)	-0.0118 (-0.633)	0.0137 (0.602)	-0.1043 (-3.820)	0.0541 (3.95)
Women higher education	0.0049 (0.421)	0.0285 (2.738)	0.0938 (5.94)	0.2530 (8.74)	0.1509 (5.124)	-0.0777 (-5.49)
Men lower education	-0.0576 (-3.583)	-0.0188 (-2.015)	-0.0112 (-0.73)	-0.0638 (-5.05)	-0.0887 (-7.373)	0.0513 (3.71)
Men higher education	0.1238 (14.21)	0.1759 (17.33)	0.0817 (8.82)	0.3126 (17.41)	0.0529 (3.587)	-0.0566 (-3.39)

Results: wage equation

- The **indirect value of experience:**
age

	Denmark	France	Germany	Italy	Spain	UK
Age (Category of reference: 46 to 55 years old)						
25 to 35 years old	-0.1032 (-9.04)	-0.2791 (-19.77)	-0.1809 (-20.01)	0.0024 (0.332)	-0.1073 (-6.96)	-0.2008 (-15.03)
36 to 45 years old	-0.0378 (-4.178)	-0.1214 (-12.73)	-0.0804 (-11.31)	-0.0016 (-0.225)	-0.0226 (-1.78)	-0.0643 (-6.09)
More than 56	0.0491 (3.817)	0.1119 (7.79)	0.0519 (5.74)	0.0793 (5.12)	-0.0609 (-3.83)	0.0590 (4.50)

Results: wage equation (1)

- We include **type of contracts** as another source of wage premium
- To have **formal training** increase the potential wage for Danish workers while reduce the potential wage for French, Italian, Spanish and British employees.
- With the **occupational variables**, we have controlled the wages differentials due to the differences in occupations.

	Denmark	France	Germany	Italy	Spain	UK
Permanent	0.1046 (5.99)	0.1456 (10.52)	0.0323 (4.69)	0.0932 (9.58)	0.1285 (13.99)	0.0457 (4.61)
Formal training	0.0290 (3.15)	0.0674 (9.68)	0.0610 (10.50)	0.0308 (4.52)	0.0308 (4.52)	0.1498 (10.08)

Results: wage equation(2)

- The **human capital** variables are significant and they have the expected sign.

Variables	Denmark	France	Germany	Italy	Spain	UK
Women lower education	-0.2560 (-5.703)	-0.2219 (-5.55)	-0.2242 (-7.24)	-0.1481 (-3.71)	-0.2960 (-8.75)	-0.2416 (-6.48)
Women secondary education	-0.2253 (-5.067)	-0.2837 (-7.23)	-0.2215 (-8.90)	-0.1875 (-4.75)	-0.1869 (-4.14)	-0.2904 (-7.66)
Women higher education	-0.1915 (-4.180)	-0.1842 (-4.60)	-0.1299 (-4.62)	0.0425 (0.975)	-0.0796 (-1.98)	-0.3645 (-9.90)

Results: wage equation(2)

Variables	Denmark	France	Germany	Italy	Spain	UK
Women with permanent contract	0.1051 (2.344)	0.2056 (8.38)	0.0451 (3.84)	0.1253 (7.23)	0.1787 (6.21)	0.0596 (3.72)
Men with permanent contract	0.1130 (4.497)	0.1118 (6.59)	0.0258 (3.02)	0.0786 (6.82)	0.1448 (9.20)	0.0337 (2.67)
Women formal training	0.1007 (4.778)	0.0153 (1.001)	0.0765 (7.33)	0.0340 (2.88)	0.0723 (2.54)	0.1736 (8.34)
Men formal training	0.0422 (3.206)	0.0012 (0.171)	0.0599 (8.69)	0.0381 (4.59)	0.0921 (8.57)	0.1565 (7.55)

the inefficiency model

- We can define wage inefficiency as the distance between the wages that earn a particular group of workers and what they could effectively earn given their observed characteristics.
 - These differences (distance to the frontier) could be explained by the existence of labour market imperfections that makes difficult and expensive for workers the job search process.
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Results: the inefficiency model

- The coefficient of time trend is negative and significant what means that the inefficiency (the individuals have reduced the distance to their potential wage measured in the frontier) has been reduced along these seven years.
- To be woman increases the distance to the potential wage in Germany, Italy, Spain and UK.

	Denmark	France	Germany	Italy	Spain	UK
Time Trend	-1.987 (-2.052)	-0.8575 (-8.53)	-0.1009 (-6.16)	-0.1428 (-4.23)	-0.9076 (-2.67)	-0.0311 (-1.68)
Women	2.112 (1.577)	-0.0098 (-0.059)	0.5572 (10.41)	0.5926 (5.86)	0.6205 (5.56)	0.7439 (10.69)

Results: the inefficiency model

- The presence in the household of dependants **children** affect differently depending on the countries.

	Denmark	France	Germany	Italy	Spain	UK
Number of children under 12 years old in the household (category of reference: no children aged under 12)						
1 child	0.0629 (0.042)	-0.6083 (-3.69)	-0.0712 (-1.136)	0.2096 (2.16)	-0.0050 (-0.062)	-0.2180 (-3.06)
2 children	-0.7911 (-0.596)	-1.0183 (-4.545)	-0.3622 (-4.42)	0.1473 (1.23)	-0.3017 (-2.76)	-0.4075 (-5.09)
3 or more children	-3.037 (-0.811)	-1.9470 (-4.19)	-0.3705 (-2.93)	0.0235 (0.083)	-0.4224 (-1.23)	-0.1529 (-1.28)
Born	-0.4321 (-0.280)	-1.0034 (-2.45)	-0.0627 (-0.363)	0.0944 (3.82)	-0.1510 (-0.560)	-0.2655 (-1.94)

Concluding remarks

- The wage frontier will describe the highest potential earnings associated with a given stock of human capital.
 - This method allows us to consider that there could be differences between the potential and the effective wage due to the existence of inefficiency in the transformation of human capital variables (schooling, experience, and tenure) into earnings.
 - We have obtained that a higher level of education increases the potential wage for Danish, French, German, Italian and Spanish workers while reduce the wage possibilities for British employees.
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Concluding remarks

- Moreover, higher education is an instrument that allows the reduction of wages differentials that experiment the European females with respect to males. It is an efficient mechanism to equalizing differences between men and women in Europe.
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