WAGES, PRODUCTIVITY AND HUMAN CAPITAL IN THE EUROPEAN UNION: ECONOMETRIC MODELS AND COMPARISON WITH THE USA 1985-2005,

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Abstract
The European Union lags behind the United States both in rates of employment and real wages. This study analyzes the relationship between wages, productivity and human capital in 5 European Union countries: France, Germany, Italy, Spain and the United Kingdom, in comparison with the USA. Firstly we analyze the role of productivity in the explanation of real wages, secondly we present a comparative study of the evolution of wages and productivity during the period 1985-2005, and thirdly we estimate an econometric model which relates real wages with productivity and productivity with human capital. As measures of human capital we have included the average total years of schooling, based on Barro and Lee estimations and lagged Research expenditure per inhabitant. The main conclusion is that the European Union should develop economic policies in order to increase the support to human capital, fostering education and RD expenditure in order to achieve higher levels of real wages and higher rates of employment and to converge towards to the levels of the United States.
JEL classification: C51, E61, J31, O51, O52
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1. Introduction

European society is preoccupied by the slow evolution of the rates of employment and wages, and there is a social demand for improvement of economic policies in this regard, as it is clearly shown in the Euro Barometer and other public opinion surveys and reports.

The article by Guisan and Cancelo(2006) showed that the European Union (EU) evolves clearly behind the United States (USA) in average rates of employment and in average real wages, and focused on the important role of real value-added of industry per inhabitant, together with other variables, to explain the higher rates of employment in services and other non-industrial sectors in the USA.

In the present study we present an econometric model to explain the evolution of average real wages in the EU and the USA. Our econometric model has into account the gap between the average European Union variables of human capital and the level of the USA. The lower expenditure on human capital in Europe is one of the main explanations for the lower levels of productivity per worker and real wages in comparison with the

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United States. As measures of support to human capital we consider the educational level of population and the expenditure on Research and Development (RD).

Human capital has a positive impact both on the rates of employment and on the productivity and wage levels. Regarding the relation between employment and human capital, some interesting studies, as those by Tondl(1999) and Guisan and Aguayo(2005), try to explain the uneven growth of European poorest regions, having into account the low levels of human capital expenditure, and recommending higher support to human capital from EU and national institutions to those regions.

Although some European countries and regions have reached a very high position in development of human capital, the EU average is yet rather low due to the lack of support to education and research in several European countries. It is advisable to foster EU policies to improve the situation, but this is very difficult to achieve having into account the lack of dialogue between the European institutions and the European citizens, and the excessive bureaucratic rigidities and slowness of many European institutions. Some changes are unavoidable to improve the situation regarding social accountability of EU institutions. We will comment on this issue in section 5 in order to get more social capital that could help to develop better economic and labor policies in the European Union.

In section 2 we present a summary of some selected approaches to real wages determination and economic policies in the labor market, which are based on the empirical evidence of many econometric models. In section 3 we present a comparative analysis of the evolution of real wages, productivity and human capital for the period 1985-2005 in Europe and the United States. In section 4 we estimate an econometric model to explain the evolution of real wages in the EU and the USA related with labor productivity, as well as the positive effects of human capital on productivity and real wages. Finally in section 5 we present the main conclusions and suggestions for economic policies in the European Union in order to achieve higher real wages compatible with higher employment rates.

2. Macro-econometric models and policies on real wages.

Macro-econometric models usually relate wages and productivity in both directions, from a neoclassical, Keynesian or other approaches, and with or without lags between both variables, as seen in Guisan(2006). Here we point to the main relationships that have shown better results in econometric modeling and which, in one or another way, are usually considered in econometric equations of real wages determination.

In the case of neoclassical theory price level of Output multiplied by the real marginal productivity of labor is a function of monetary wage, what imply that real marginal productivity at moment t is a function of real wage:

$$P_t . F_L = f(WM_t) \quad \text{and thus } F_L = f(W_t); \quad \text{with } W_t = WM_t/P_t \qquad (1)$$

where WM_t is monetary wage, W_t is real wage, p_t is the index of price of Value-Added and F_L is the marginal productivity of labor in real terms ($\delta Q_t/\delta L_t$, bein Q_t real Output,

given by Gross Domestic Product at constant prices). Mean productivity per worker is related to the marginal productivity and thus also to the real wage, being the relation in the case of the Cobb-Douglas production function as follows:

$$F_L = \alpha\, Q/L \qquad \text{and thus } MP = \alpha\, F_L = \alpha\, W \tag{2}$$

being MP=Q/L the mean real productivity per worker.

Real wage on other hand is usually the result of supply and demand of labor forces in a market where the real value added of real Output per worker, and the cost of physical capital, are restrictions which limit the capacity of the production units (firms or institutions) which demand laborers. The general approach to the explanation of real wage has been a two equations system. where the explained variables are *monetary wage*, given by average wage at current prices, and *a general price index.* This approach derived from the Phillips¨ curve (equation to analyze the negative effect of unemployment on monetary wages), and the Lipsey-Parkin(1970) model of two equations where the rate of growth of monetary wages depends on the inverse value of the average unemployment rate in periods t and t-1, the rate of growth of the unemployment rate in t, and the rate of increase of a general price index. In this system the rate of growth of real productivity in t-1 is expected to have a negative impact on the price index, and to affect positively to the real wage for a given level of the other explanatory variables. Other authors have included more explanatory variables in the monetary wages equation, and among them are particularly interesting the contributions by Kuh(1967) and other authors who include productivity in monetary terms as an important variables in the explanation of monetary wage. In our model we explain directly real wage relating it with real productivity, having into account the role of demand and supply in the determination of wages and employment accordingly to the studies by Guisan(2005) and Guisan(2006).

Average real wage agreed at the beginning of the period t+1 should usually have an upper limit, for a given level of available capital and the minimum rate of return considered by firms necessary per unit of capital (r*). The upper limit is given by W^*_{t+1} in (3):

$$W^*_{t+1} = f(\,(Q^*_{t+1} - r^*_{t+1}\, KA_t)/L_t\,) \tag{3}$$

where Q^*_{t+1} is expected output produced in year t+1 by the L_t workers with the available physical capital KA_t at constant prices, and r^*_{t+1} is the minimum rate of return accepted by the firm per unit of physical capital KA_t. The expected value of the mean real productivity per worker $MP^*_{t+1} = Q^*_{t+1}/L_t$ has an important role to explain the upper limit of real average wage W^*_{t+1}.

Finally the real wage W is a function of a lower limit (usually its lagged value), the upper limit W^*, one or more variables related with demand and supply of laborers (as unemployment) and other factors which may have influence, so the increase in real wage may be expressed as:

$$W_t - W_{t-1} = \delta_1\,(W^*_t - W^*_{t-1}) + \delta_2\,(UR_{t-1} - UR_{t-2}) + \text{other factors} \tag{4}$$

where UR is unemployment rate: UR= (LS-L)*100/LS, being LS labor supply (measured by the active population which is influenced by the natural growth of population in working age and migration movements), and L is the level of employment. Trade Unions ability to reach wages agreements has effects on the parameters of equation (4). The sign of the first parameter of equation (4) is positive and expected to be within 0.5 and 1 while the second one is expected to be negative.

One of the most analyzed relations of wages changes with other factors has been with unemployment or other variables related with disequilibrium between supply and demand of laborers in the market. Bell, Nickell and Quintini(2000) analyzed this effect with regional and individual data of the UK and found a negative impact of unemployment on wages. They also analyze the impact of inflation, the housing market and other variables.

Usually the main explanatory variable for real wages is Mean Productivity (MP=Q), because this variable is highly related with the upper limit of wages W^*. Wage in year t is determined in a narrow range, between the lower value desired by workers and trade unions, usually the lagged value W_{t-1}, and the top value desired by firms which is W^*_t. Both limits are very much related with the value of real Mean Productivity (MP).

Fair(2006) about his interesting ROW (rest of the world) model, states:

"Equation 12 explains the wage rate. It is similar to equation 16 for the US model. It includes as explanatory variables the lagged wage rate, the current price level, the lagged price level, a demand pressure variable, and a time trend. Equation 16 of the US model included three further lags of the wage rate and price level, which equation 12 does not. Also, equation 16 of the US model does not include any demand pressure variables because none were significant. The same restriction imposed on the price and wage equations in the US model is also imposed here. Given the coefficient estimates of equation 5, the restriction is imposed on the coefficients in equation 12 so that the implied real wage equation does not have the real wage depend on either the nominal wage rate or the price level separately…)".

Peeters and Reijer(2003) estimated the relation between wages, labor productivity and other variables with data from Germany, Spain, France, the Netherlands and the US by means of an Error Correction Model and the method of 3-SLS to obtain consistent estimates, accounting for endogeneity and common shocks. The results indicate that the dominant role of prices in the formation of wages in the seventies and eighties was taken over by labor productivity in the US and unemployment in Spain and – almost- in the Netherlands at the end of the nineties. Evidence for a stronger real wage flexibility of the US in comparison with the four European countries is not found. Lower labor productivity is the main variable explaining the gap between real average wages in the EU in comparison with the US. In section 4 we will analyze the differences in labor productivity having into account the differences in support to human capital.

Nayman and Ünal-Kesenci (2001) analyze the differences of productivity between France and Germany, and several authors as Fabiani and Pellegrini (1997), Tondl(1999) and Guisan and Aguayo(2004) analyze the role of human capital to explain differences in production per inhabitant and productivity in European regions.

3. Evolution of Wages, Productivity and Human Capital, 1985-2005

Table 1 and table A1 in the Annex show the evolution of real wages in the 5 major EU economies for the period 1985-2005. In year 1985 the average wage, measured by the ratio between Compensation of Employees (CE) of National Accounts and the number of Employees (OECD Labor Force Statistics). According to this information the average wage of this group of countries was 26 thousand constant dollars, at prices and exchange rates of year 2000, lower than the 38 dollars of the USA, with a different of 12 thousand dollars per year. In year 2003 this variable reached 31 thousand dollars in the EU5 countries and 47 in the USA, with a difference of 16 thousand dollars.

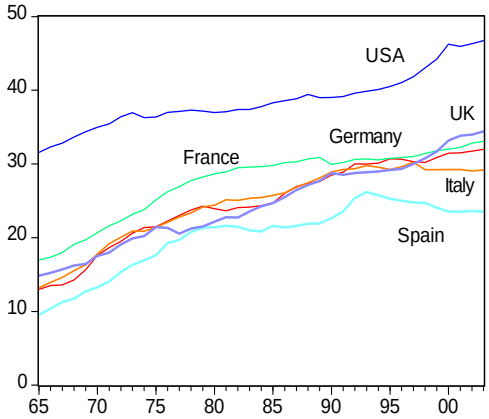
Table 1. Wages in 5 EU countries and the USA (thousand dollars of 2000)

obs	Germany	France	Italy	Spain	UK	UE5	USA
1985	25	30	26	22	25	26	38
1990	28	30	29	23	29	28	39
1995	31	31	29	25	29	30	41
2000	31	32	29	24	33	31	46
2003	32	33	29	24	34	31	47
Total Change	7	3	3	2	9	5	9
%Δ per year	1.37	0.53	0.61	0.48	1.71	0.98	1.18

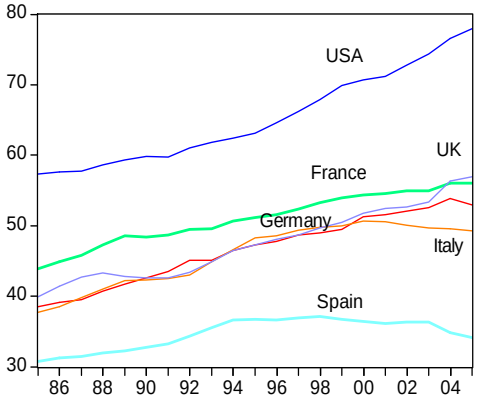
Source: Elaboration from OECD statistics. Total change is the difference between wage in years 2003 and 1985. UE5 is the weighted average of these 5 EU countries.The last row is the exponential annual rate of increase in %.

The higher wage increases have been experienced by the USA, the United Kingdom and Germany. The highest average wages in year 2003 correspond to the USA, with 47 thousand dollars per year, the United Kingdom with 34, France with 33 and Germany with 32. Spain presents the lowest value and the lowest increase of average wage during the period 1985-2003. There is a clear relationship between average wage and labor productivity as it is shown in graphs 1, 2 and 3.

Graph 1. Real wages, 1985-2003
(thousand $ 2000 at exchange rates)



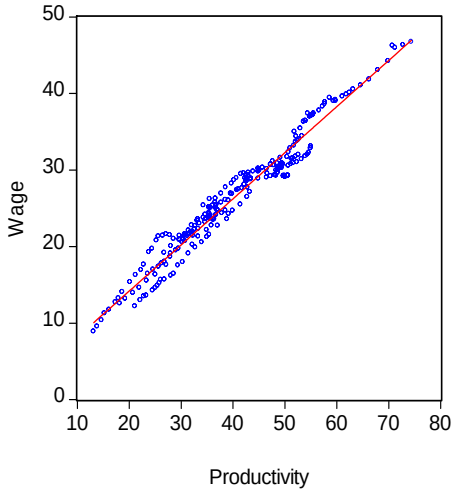
Graph 2. Labor productivity, 1985-2005
(thousand $ at 2000 at exchange rates)



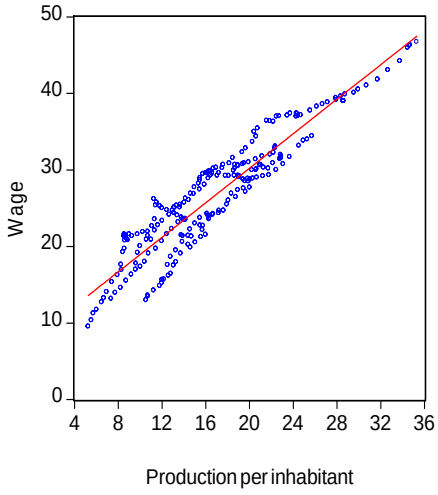
Graphs 1 and 2 show, respectively, the evolution of real wages and labor productivity. Real wages data correspond to average labor cost, calculated from OECD National Accounts and Labor Force Statistics, and labor productivity is given by the ratio between real Gross Domestic Product (Gdp) and total employment. Both variables show outstanding values in the USA in comparison with EU5 countries. The United Kingdom shows the higher increases among the EU5 countries both in wages and labor productivity during the period 1965-85. Italy shows a slight decrease in both variables at the end of the period while Spain shows a clear diminution of wages since year 1994 ad stagnation followed by decline in labor productivity for 1994-2005. The case of Spain is analyzed in Guisan(2005a): the diminution in real wages and average productivity has been led by wrong economic policies addressed to diminish labor costs instead to increase production per inhabitant and provide more support to human capital.

Graph 3 shows the positive relationship between real wage and real labor productivity in the EU5 countries and the USA. The highest values correspond to the United States, and the lowest to Spain. Graph 4 shows the positive relationship between real wage and real Gdp per inhabitant. Gdp per inhabitant may be expressed as the product of labor productivity and the ratio Employment/Population, and thus it will increase when the product of both variables arises.

Graph 3. Wages and labor productivity



Graph 4. Wages and production per capita

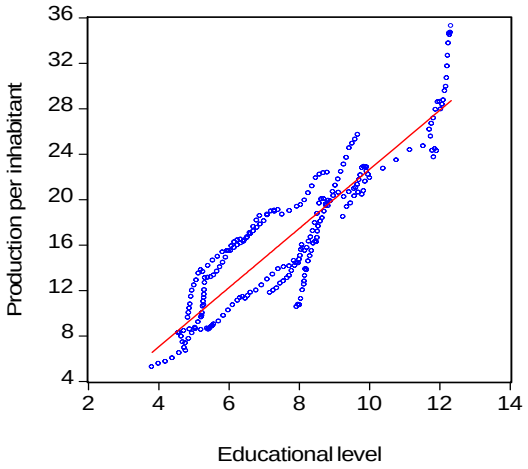


Note: Data for France, Germany, Italy, Spain, the United Kingdom and the United States in thousand dollars at 2000 prices and exchange rates for 1965-2005. Source: Elaborated by Guisan and Aguayo from OECD National Accounts and Labour Force Statistics.

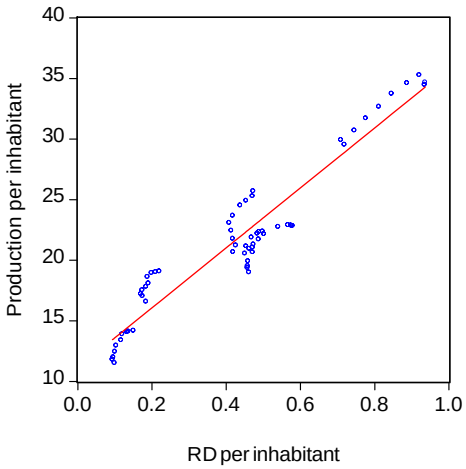
Graphs 5 and 6 relate human capital with economic development in the European Union and the USA. Graph 5 shows the positive relationship that exists between real Gdp per inhabitant and the educational level of population, measured by the average years of schooling per adult accordingly to data estimated by Barro and Lee, and Graph 6 the relationships between Gdp per inhabitant and RD expenditure per inhabitant accordingly to our calculations based on Eurostat statistics. Both the rates of employment and average real wages are highly dependent on the evolution of real Gdp per inhabitant, and

thus the positive impact of human capital on real Gdp per inhabitant makes education and RD expenditure to be selected instruments to reach high rates of employment and real income per inhabitant.

Graph 5. Education and Gdp per inhabitant



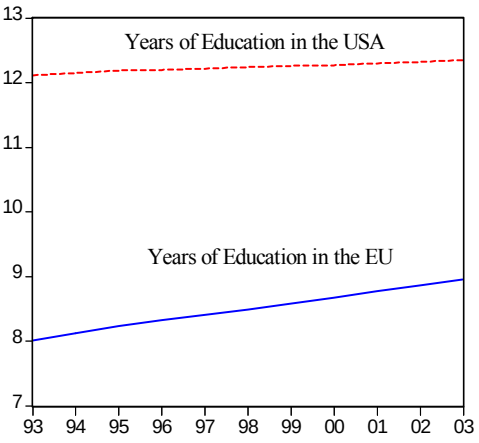
Graph 6. RD and Gdp per inhabitant



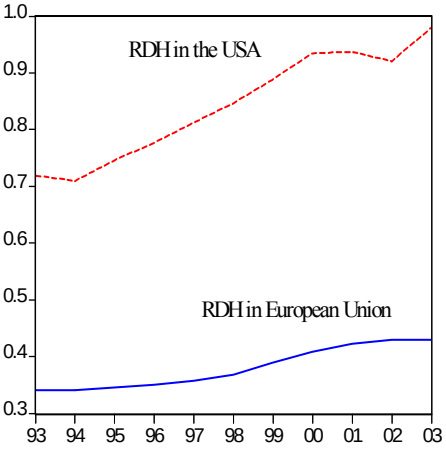
Note: Data in thousand dollars at 2000 prices for 1993-2003 in the USA and 5 EU countries: France, Germany, Italy, Spain and the United Kingdom, for real Gdp and RD expenditure per inhabitant. Educational level: total years of schooling per adult. Sources: Elaborated from OECD, Eurostat statistics and Barro and Lee(2002).

Finally graphs 7 to 9 show that the average of EU15 countries lags behind the USA both in the educational level of population and the RD expenditure per inhabitant.

Graph 7. Average years of education

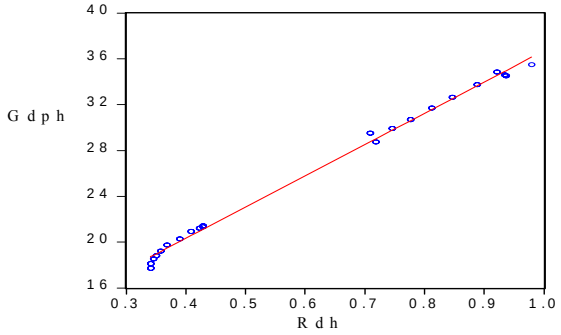


Graph 8. RD expenditure per inhabitant



Note: Data of EU15 countries and the USA. Source: Total years of education per adult inhabitant from Barro and Lee(2002) and own provisional estimations and Research Expenditure (RD) per inhabitant from Eurostat(2005) for 15 EU countries, in dollars at 2000 prices and exchange rates. Elaborated by Guisan and Aguayo(2005) from this sources.

Graph 7. Gdph and Rdh; EU15 and USA, 1993-2003
($ per inhabitant, at 2000 prices)



Note: The points at the bottom of the graph correspond to the European Union while the upper points correspond to the United States. Source: Elaborated by Guisan and Aguayo(2005).

Wages paid by the firms are clearly lower in the European Union in comparison with the USA. The gap between EU15 average and the USA regarding wages received by the workers is even higher because there is a high fiscal pressure on labor costs in the European Union both in the form of labor income taxes and in the form of social security contributions. Those social contributions are in some degree similar to taxes because all the workers contribute accordingly with their registered income but the distribution of social benefits is almost equal for all with very few advantages for high wage payers.

3. Econometric models of wages and productivity.

Model equations: Real wage is explained in equation 1 (eq.1) as a function of its lagged value and the increase in real Mean Productivity (MP). Equation 2 (eq. 2) has into account the effect of human capital on real Gdp per inhabitant, and identity 3 (eq. 3) shows the relationships between mean real productivity per worker and production per inhabitant. The equations are as follows:

$$W = f(W(-1)\ D(MP)) \qquad \text{(eq.1)}$$

$$PH = f(TYR(-1)\ RDH(-1),\ D(PH(-1))) \qquad \text{(eq.2)}$$

$$MP = PH/(L/POP) \qquad \text{(eq.3)}$$

where W is real wage, MP is Mean Productivity (Q/L), PH is production per inhabitant (Q/POP), RDH is expenditure on Research and Development per inhabitant (RD/POP), TYR is the average total years of Education per adult (TYR), POP is population and L is total employment. D(X) means first difference of the variable X ($D(X)=X_t - X_{t-1}$).

Some variables have been omitted for simplification, but this will not have important effects of the goodness of fit nor in the main conclusions of the study accordingly to the

analysis of the effects of missing variables in case of linear relationships among the explanatory variables analyzed in Guisan(2006). PH depends on many variables, from the supply and demand side, as it is considered in Guisan(2005) and the studies related with macro-econometric modeling. Particularly it is very important in our view to have into account the existence of inter sector relationships as it is explained in Guisan, Aguayo and Exposito(2001), Guisan and Cancelo(2006) and other studies. The reason to express this variable as a function of human capital is due to the important direct and indirect effects that human capital has on investment per inhabitant, industrial development and other variables which determine the value of PH, as explained in Guisan and Neira(2006) and other studies.

The following tables show the estimation of equations (1) and (2). More detailed results are presented in the Annex.

Table 2. Results of estimations Eq.1: Explained variable W=real Wage

Explanatory variables	Pool of 6 countries	United States
W_{t-1}	1.0038 (520.73)*	1.0039 (410.94)*
D(MP)	0.2714 (3.89)*	0.3585 (3.76)*
R^2	0.9945	0.9883

Table 3. Results of estimations of Eq. 2: Explained variable real PH=Gdp per inhabitant

Explanatory variables	Pool of 6 countries with country trends	United States
TYR(-1)	0.8332 (3.32)*	1.0432 (9.32)*
RDH(-1)	2.9362 (0.74)	23.7620 (15.34)*
D(PH(-1))	0.3697 (3.94)*	0.5486 (1.37)
R^2	0.9990	0.9718

The lack of significance of two coefficients in table 3 (RDH(-1) in the pool of 6 countries and D(PH(-1)) in the USA, may be due to multicollinearity and to the effects of other missing variables, but it is expected that their coefficients will be significant with a wider sample. Tables 2 and 3 show a high goodness of fit and important positive effects of human capital on real wages. For a given rate of employment MP depends on the increase of PH and this positive effect will be transmitted to W.

5. Conclusions and suggestions.

Accordingly to the economic literature and our own results here shown, the main variable to have into account in EU policies to reach the rates of employment, wages and real Gdp per inhabitant of the US, is real Gdp per inhabitant, and thus European policies should be addressed that way. Economic policies should not be addressed to the diminution of real wages but to foster human capital and increase production per inhabitant, real wages and the rates of employment at the same time. It is really outstanding the higher support of the USA to RD and Education in comparison with the low values of European Union, and EU should address their policies to reach a fast convergence with the levels of the USA.

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Annex

Table A1. Evolution of real wages in 5 EU countries and the USA, 1985-2003
(thousand dollars at 2000 prices and exchange rates)

obs	Alemania	España	Francia	G.Bretaña	Italia	UE5	USA
1985	25	22	30	25	26	26	38
1986	26	21	30	26	26	26	39
1987	27	22	30	26	27	27	39
1988	27	22	31	27	27	27	39
1989	28	22	31	28	28	28	39
1990	28	23	30	29	29	28	39
1991	29	24	30	29	29	29	39
1992	30	25	31	29	29	29	40
1993	30	26	31	29	30	29	40
1994	30	26	31	29	30	29	40
1995	31	25	31	29	29	30	41
1996	31	25	31	29	30	30	41
1997	30	25	31	30	30	30	42
1998	30	25	31	31	29	30	43
1999	31	24	32	32	29	30	44
2000	31	24	32	33	29	31	46
2001	32	24	32	34	29	31	46
2002	32	24	33	34	29	31	46
2003	32	24	33	34	29	31	47

Table A2. Wages and Empoyment in five EU countries and the USA

Variable and year	Germany	Spain	France	Uk	Italy	EU5	USA
Real Wage							
1985	25	22	30	25	26	26	38
1995	31	25	31	29	29	30	41
2003	32	24	33	34	29	31	47
Employment rate							
1985	457	284	388	431	373	400	456
1995	443	317	387	449	353	400	474
2005	441	430	412	468	393	434	482
Total Employment							
1985	35.5	11.2	21.4	24.3	21.1	113.7	108.8
1995	36.1	12.6	22.4	26.0	20.2	117.5	126.2
2005	36.3	18.9	25.0	29.5	22.5	132.4	142.9

Source: Elaboration from OECD statistics. Real Wage is the ratio between Compensation of Employees and number of Employees, in dollars at 2000 prices and exchange rates. Total employment in millions. Employment Rate: employments per one thousand inhabitants.

Wage equations:

Equation 1.1. Wage equation: Pool of 6 countries

Dependent Variable: W00?
Method: Pooled Least Squares
Sample: 1980 2003
Included observations: 24
Number of cross-sections used: 6
Total panel (balanced) observations: 144
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
W00?(-1)	1.003869	0.001928	520.7376	0.0000
D(GDP00?*1000/LT?)	0.271479	0.069685	3.895816	0.0002

R-squared	0.994580	Mean dependent var	29.82445
Adjusted R-squared	0.994542	S.D. dependent var	5.896533
S.E. of regression	0.435626	Sum squared resid	26.94730
Log likelihood	-83.66017	F-statistic	26058.08
Durbin-Watson stat	1.388205	Prob(F-statistic)	0.000000

Equation 1.2. LS estimation of the wage equation in the United States

Dependent Variable: W00U				
Method: Least Squares				
Sample: 1965 2003				
Included observations: 39				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
W00U(-1)	1.003914	0.002443	410.9411	0.0000
D(GDP00U*1000/LTU)	0.358519	0.095361	3.759610	0.0006
R-squared	0.988382	Mean dependent var		38.57023
Adjusted R-squared	0.988068	S.D. dependent var		3.761361
S.E. of regression	0.410867	Akaike info criterion		1.108825
Sum squared resid	6.246025	Schwarz criterion		1.194136
Log likelihood	-19.62208	Durbin-Watson stat		1.793800

Relationships between Production per inhabitant and human capital:

Equation 2.1. Gdp per inhabitant and human capital: Pool of 6 countries
Dependent Variable: GDP00?H
Method: Pooled Least Squares
Sample(adjusted): 1994 2003
Included observations: 10 after adjusting endpoints
Number of cross-sections used: 6
Total panel (balanced) observations: 54
Convergence achieved after 14 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TYR?(-1)	0.833276	0.250463	3.326943	0.0018
RD00?H(-1)	2.936227	3.922667	0.748528	0.4581
D(GDP00?H(-1))	0.369707	0.093722	3.944722	0.0003
E--TI	0.173556	0.042548	4.079033	0.0002
AX--TI	0.303581	0.068865	4.408362	0.0001
F--TI	0.325274	0.058505	5.559772	0.0000
IT--TI	0.291165	0.043045	6.764228	0.0000
UK--TI	0.377409	0.056213	6.713960	0.0000
U--TI	0.523176	0.086940	6.017651	0.0000
AR(1)	0.751482	0.105762	7.105375	0.0000

R-squared	0.999033	Mean dependent var	21.93654
Adjusted R-squared	0.998836	S.D. dependent var	6.223610
S.E. of regression	0.212358	Sum squared resid	1.984215
Log likelihood	12.57886	F-statistic	5053.148
Durbin-Watson stat	1.634946	Prob(F-statistic)	0.000000

Equation 2.2. Gdp per inhabitant and human capital: USA
Dependent Variable: GDP00UH
Method: Least Squares
Sample(adjusted): 1994 2004
Included observations: 11 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TYRU(-1)	1.043234	0.111843	9.327653	0.0000
RD00UH(-1)	23.76206	1.548184	15.34834	0.0000
D(GDP00UH(-1))	0.548695	0.400382	1.370430	0.2078

R-squared	0.971891	Mean dependent var	33.12708
Adjusted R-squared	0.964864	S.D. dependent var	2.372633
S.E. of regression	0.444740	Akaike info criterion	1.444347
Sum squared resid	1.582350	Schwarz criterion	1.552864
Log likelihood	-4.943911	Durbin-Watson stat	1.796898

Finally equation 6 shows the positive impact of human capital on real Gdp with a small pool of the EU15 and the USA during the period 1995-2000. Similar results have been found with larger samples.

Equation 6. Gdp per capita and human capital in a pool of EU and USA

Dependent Variable: GDP00?H				
Method: Pooled Least Squares. Sample(adjusted): 1995 2000				
Number of cross-sections used: 2. Panel (balanced) observations 12				
White Heteroskedasticity-Consistent Standard Errors & Covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP00?H(-1)	1.016760	0.001456	698.2514	0.0000
D(RD00?H(-1))	10.88644	1.593560	6.831523	0.0001
D(TYR?)	0.620133	0.470738	1.317364	0.2203
R-squared	0.999764	Mean dependent var		25.91126
Adjusted R-squared	0.999711	S.D. dependent var		6.735607
S.E. of regression	0.114470	Sum squared resid		0.117931
Log likelihood	10.70810	F-statistic		19038.27
Durbin-Watson stat	2.535116	Prob(F-statistic)		0.000000

This equation shows autocorrelation due to the effects of missing variables. The non significance of the variable related with education (Tyr=Total years of education per adult inhabitant) is probably due to the high degree of multicollinearity with Research and Development expenditure (RD). Both variables have shown a positive and significant effect in other studies.