EMPLOYMENT BY SECTOR, PRODUCTIVITY AND WAGES IN 5 EUROPEAN COUNTRIES, 1965-2015: FIFTY YEARS OF EVOLUTION IN GERMANY, SPAIN, FRANCE, ITALY AND UK

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Abstract: We analyze the evolution of employment by sector, production and wages in 5 European countries for a period of fifty years (1965-2015). We have estimated the elasticities Employment/Output with a model in levels (by LS and GLS) and a mixed dynamic model (by LS). The elasticity estimated in the model in levels by GLS and in the mixed dynamic model by LS show values around 0.37 for Agriculture, 0.21 for Industry, around 0.41 for Building and higher than 0.70 for Services. The main effect of industrial development has been the creation of millions of employments on Services, as well as the increase on labour productivity and average real wage of these economies. The results are a strong support to Kaldor´s views. Regarding wages the evolution has been positive, but less than expected by workers due to the effects of some economic policies, without enough support to industry. There was a diminution of the ratio Wage/Productivity from nearly 0.70 in year 1975 to approximately 0.60 in year 2012. We strongly recommend economic changes in European industrial policies addressed to foster economic development and increasing levels of real wages. The comparison of average real wages of these European countries with the United States show a gap, favourable to the U.S. if the comparison is made with Exchange Rates and that both average values are very alike if the comparison is made with Purchasing Power Parities (PPPs).

Keywords: Employment by sector, Econometric Models, Estimation of Elasticity Labor/Output, Kaldor, Productivity, Wages, Europe, Germany, Spain, France, Italy, UK, European Economic Policy, Industry
JEL Codes: C51, E20, E24, J2, J3, L6, L7, L8, N34, O52

1. Introduction.

We present an analysis of the evolution of employment by sector, productivity and wages in the 5 major European Union countries for a period of fifty years, 1965-2015.. We have devoted a lot of time to the preparation of the data base. Data at constant prices in a common currency have been elaborated by authors from several statistical sources of OECD and Eurostat, through several years, looking for the more precise and accurate estimations. In the case of Germany before 1990 we have estimated data for the joint country.

Section 2 presents a short revision of the literature that relates employment with output, wages and other variables. Section 3 analyzes the evolution of employment and production by sector, and wages, in Germany, Spain, France, Italy and the United Kingdom for the period 1965-2015. Section 4 presents an estimation of elasticities labour/output with 3 equations for each sector. Section 5 presents the main conclusions and the Annex includes tables of data and some supplementary estimation results.

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2. Revision of the literature

In the context of macro-econometric models the total level of employment is mainly related with Gross Domestic Product, as it is shown in the interesting studies by Waelbroek(1976), Uebe(1995), Klein, Welfe and Welfe(1999), Welfe(2013), Fair(2013), and other ones. A similar approach holds for sectoral employment which is usually related to sectoral real-value-added.

Barro and Grossman(1971) provided a model of disequilibrium where GDP is explained as the minimum of both approaches (demand side and supply of primary inputs). Guisan(1980) and (2013) presented a disequilibrium model that, besides the two approaches suggested by Barro and Grossman(1971) included a third component that is the function of intermediate inputs, with intersectoral relationships, where GDP depends on domestic production of raw materials and imports of goods. Welfe(2013) devotes an interesting chapter to macroeconometric models of disequilibrium indicating that foreign trade plays a role in the provision of raw materials. Under this approach, Guisan(2011) analyzes the effects of industry, trade and unfair competition on employment by sector and wages, in 6 OECD countries, and Guisan(2016) estimates equations of labour with a pool of 17 Spanish regions.

In Guisan(2005a) we present a reference to some representative studies of the main variables which explain the differences in employment and wages among countries, particularly among European Union and the United States. Guisan and Aguayo(2006) present a comparison of the evolution of employment by sector in the European Union in comparison with NAFTA countries for the period 1985-2005 and Guisan and Aguayo(2013) analyse employment by sector in European regions.

Other interesting studies, regarding the comparison between Europe and the United States, are the following ones: Krueger and Psichke(1997) present an interesting analysis of the advantages of US´s policies regarding the labour market in an international perspective, and conclude that several bureaucratic rigidities of European countries explain their lower performance in comparison with the US, while the lower wages in Europe do not show an important role to increase the rates of employment. In Guisan(2013) we analyze the role of production, investment, wages, and active population in the evolution of employment from a disequilibrium approach, given great support to Kaldor´s view of the important role of industrial development.

Nickell, Nunziata, Ochel and Quintini(2001) also analyzes unemployment and wage in OECD countries from 1960s to the 1990s, and Peeters and Reijer(2002) analyzed wage and unemployment in Germany, Spain, France, the Netherlands and the US. Other studies as those of Riphahn and Bauer(1998) and Daveri and Tabellini(1997) analyze the effects of taxes on labour. That is an interesting question regarding the role of economic policies to favour employment, well with diminution of taxes for the private sector employment or with increase of funding for public sector employment.

Freeman(2001) analyses Okun´s law for a panel of ten industrial countries, founding an estimation of one percent reduction in the unemployment rate per two points of real Gdp growth. The article finds that the ommission of capital and labour inputs may have biased previous estimates of three points of real Gdp growth related with one percent point of diminution in unemployment.

Regarding the relation between employment and human capital, there are some interesting studies, as that by Tondl(1999) and Guisan and Aguayo(2005), trying to explain the uneven growth of Europe´s poorer 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.

El Hamadi et al(2017) analyze sectoral employment in Morocco and present an interesting summary of international studies of estimation of the elasticity labour/output at sectoral level.

Employment and production by sector in 5 European countries.
Employment by sector 1965-2015

The following show the evolution of population, employment by sector and rate of employment per one thousand inhabitants, through the period 1965-2015. Data source are OECD statistics (mainly Labour Force Statistics and National Accounts Statistics).

Table 1. Population and Employment in 5 European countries, 1965, 1995 and 2015

	Population (thousand people)			Employment (thousand people)		
	1965	**1995**	**2015**	**1965**	**1995**	**2015**
Germany	75647	81661	80646	36032	36900	39887
Spain	31767	39345	46600	11321	12313	17825
France	48758	57844	64338	20129	22656	25799
Italy	52112	56844	61710	19963	21967	22103
UK	54350	58025	64062	25199	27869	30606
EU5	262634	293719	317356	112644	121704	136220

Source: Elaborated by Guisan and Exposito(2017(from OECD statistics.

Table 2. Employment and rates of employment by sector: Agriculture, 1965. 1995 and 2015

	Employment in Agriculture (thousand people)			Rate of Employment in Agriculture (employed people per th population)		
	1965	**1995**	**2015**	**1965**	**1995**	**2015**
Germany	4217	1169	560	56	14	7
Spain	3586	1107	737	113	28	16
France	3473	1013	716	71	18	11
Italy	5103	1316	843	98	23	14
UK	1014	532	353	19	9	6
EU5	17393	5137	3209	56	14	7

Source: Elaborated by Guisan and Exposito(2017(from OECD statistics.

Table 3. Employment and rates of employment by sector: Industry, 1965. 1995 and 2015

	Employment in Industry (thousand people)			Rate of Employment in Industry (employed per th population)		
	1965	**1995**	**2015**	**1965**	**1995**	**2015**
Germany	13769	9647	8087	182	118	100
Spain	3072	2485	2441	97	63	52
France	5803	3937	2996	119	68	47
Italy	6114	5273	4146	117	93	67
UK	10062	4681	2948	185	81	46
EU5	38819	26023	20618	148	89	65

Source: Elaborated by Guisan and Exposito(2017(from OECD statistics.

Table 4. Employment and rates of employment by sector: Building, 1965, 1995, 2015

	Employment in Building (thousand people)			Rate of Employment in Building (employed people per th population)		
	1965	**1995**	**2015**	**1965**	**1995**	**2015**
Germany	2955	3356	2724	39	41	34
Spain	920	1135	1074	29	29	23
France	1837	1467	1697	38	25	26
Italy	1600	1606	1468	31	28	24
UK	1833	1828	2236	34	32	35
EU5	9145	9392	9199	35	32	29

Source: Elaborated by Guisan and Exposito(2017(from OECD statistics.

Table 5. Employment and rates of employment by sec tor: Services, 1965, 1995, 2015

	1965	**1995**	**2015**	**1965**	**1995**	**2015**
Germany	15091	22728	28516	199	278	354
Spain	3742	7586	13573	118	193	291
France	9016	16239	20390	185	281	317
Italy	7146	13771	15646	137	242	254
UK	12290	20828	25069	226	359	391
EU5	47286	81153	103194	180	276	325

Source: Elaborated by Guisan and Exposito(2017(from OECD statistics.

Tables 2 to 5 show that employment in Agriculture has diminished in 14184 employed people, for the period 1965-2015, while employment in Industry has diminished in 18201 thousand. Employment in Building has not changed with around 9000 thousand both in year 1965 and year 2015. Employment in Services has increased in 55908 thousand. In table 1 we may notice that total employment has increased in 23556 thousand in 50 years, from 112644 in 1965 to 136220 in 2015, and population has increased in 54722 thousand. The rate of total employment per one thousand inhabitant has been 429 in year 1965, 414 in 1995 and 429 in 2015.

Some outstanding features of the evolution of employment are the following ones:
1) Employment has decreased in Agriculture, mainly due to the stagnation of real income and the increase of capital/labour ratio. With more machinery the consequence has been to increase productivity and real income per worker, or at least avoid the diminution of real income per worker.
2) Employment has decreased in Industry, for the period 1965-2007, in spite of the increase of real production, due to the increase of capital/lab our ratio. With more modern machinery the consequence has been an increase of labor productivity and an increase of industrial income per capita, with positive impacts on other sectors. For the period 2008-2015 the levels of industrial production per capita have been lower than in year 2007, due to problems with the economic policies of the European Union after the crisis of year 2008.
3) Employment in Building is very alike in years 1965 and 2015. The increases of productivity have usually been compensated with the increases of production, and the level of employment is rather stable, with exceptions during the bubble crisis, with excess of supply, or during restrictions to credit for dwellings.
4) Employment has increased in Services for several reasons:

a) The increase in real income of other sectors, particularly in Industry, foster the consumers demand of services.

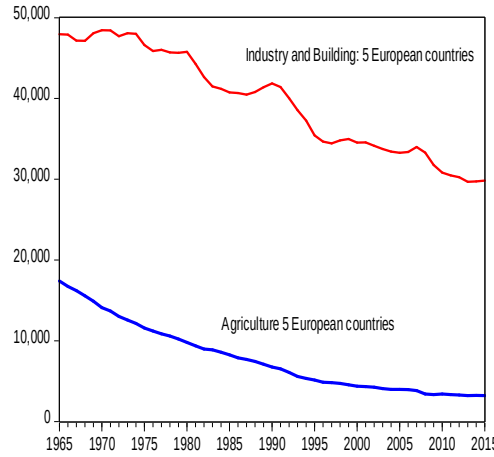
b) The increase of the stock of capital of families in rich countries also has a positive effect on the demand of services because property needs services (repairs, refurbishments, insurance, etc.).

c) In many countries there has been a trend to outsourcing services previously included in the industrial firms (marketing, fiscal services, and other ones) and the development of industry also generates and increase of demand on those services.

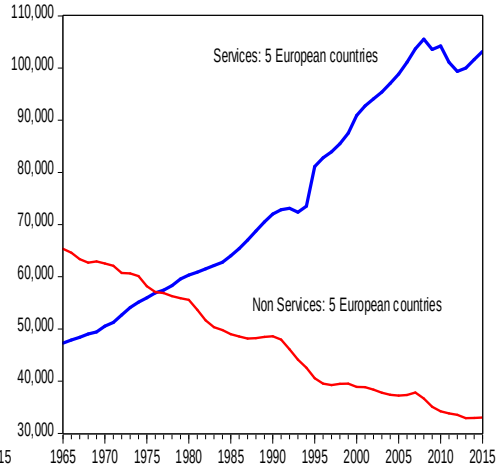
d) the development of social services like education and health assistance generates a great demand of employment in services, well public, private or both.

Graphs 1 and 2 show the evolution of employment by sector in 5 European countries.

Graph 1. Employment by sector in EU5: Agriculture, Industry and Building (th people)



Graph 2. Employment by sector in EU5: Services and Non Services (th people)



Elaborated by Guisan and Exposito(2017) from OECD Statistics (Labor Force and National Accounts). EU5=group of 5 European countries (Germany, Spain, France, Italy and the United Kingdom)

Countries with high levels of industrialization, high level of outsourcing and high development of social services usually have high rates of employment in Services. In table 5 we may notice that the highest rate of employment in services in year 2015 corresponded to the United Kingdom (391) and Germany (354). France occupied an intermediate position (317) while Spain (291) and Italy (254) presented the lowest number of employments in Services per one thousand inhabitants.

Production by sector, productivity and wages in this group of 5 European countries.

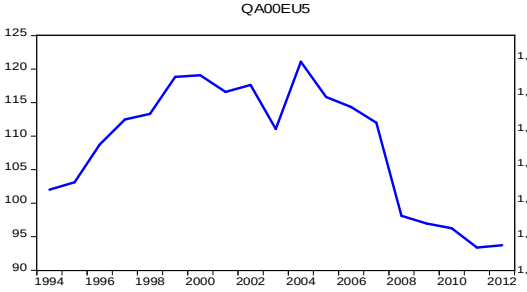
The empirical evidence shows in Europe, and in other areas of the World, a strong support to the ideas of Kaldor, who stated that industry was an important source of increase of productivity and development.

Graphs 3 to 6 present the evolution of real value-added in the group of 5 major European Union countries, including Germany, Spain, France, Italy and the United Kingdom. Data have been elaborate from OECD national accounts statistics and are

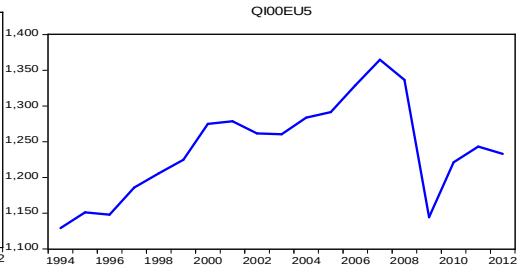
expressed in Billion (thousand million) Dollars at 2000 prices and exchange rates. We may express the values in Euros of year 2000 having into account that the exchange rate in year 2000 was 1.0854 Euros per Dollar.

Between the years 1994 and 2012, the sector of Agriculture (including Agriculture, Fishing and Forestry) did not increase and even experienced a diminution of 8 Bn. We may notice an increase until year 2003 and a diminution afterwards. The sector of industry has experienced an increase of 104 Bn, and the Building sector an increase of 7 Bn while the Services sector has experienced the highest increase with 1604 Bn. We may notice that in the last years of the period, mainly due to the diminution of industry, real value-added of Services experienced stagnation.

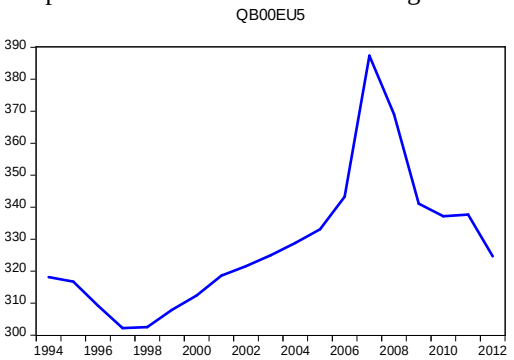
Graph 3. Real Value-Added of Agriculture



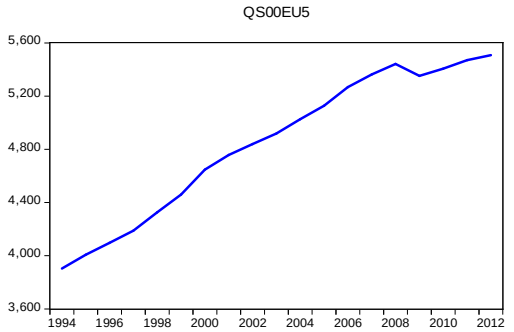
Graph 4. Real Value-Added of Industry



Graph 5. Real value-added of Building



Graph 6. Real value-added of Services



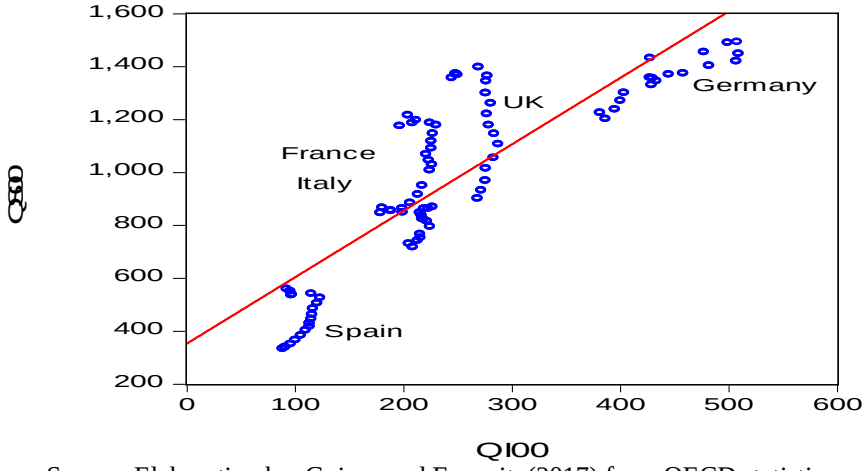
Note: Graphs 1 to 4 elaborated by Guisan and Exposito(2017) from OECD(2017). Real value-added by sector in Bn Dollars at 2000 prices and exchange rates (1.0854 € per Dollar in year 2000)

It is important to have into account that industry usually is important for the development of other sectors, particularly many Services sectors.

Besides we may notice, as seen in previous studies cited in the bibliography, that there are several factors that favour the expansion of Services, even with no too high level of industrialization. It may happen due to tourism and to the political support to Services, for example with low taxes or other incentives, applied to private services or with development of public services. There are also other features like the degree of outsourcing of services in the industrial sector. Countries with a high degree of outsourcing compute many services related with industrial production to the Services sector, while countries with a low degree of outsourcing in industry provide those services inside the own firms and the activities compute statistically in the Industry sector.

Graph 7 shows the important relationship between QI (real value added of industry) and QS (real value-added of Services). The lowest level of industrial production correspond to Spain. Italy and France have levels very alike. The United Kingdom has a higher level and Germany is at the top of industrial production in this group of five European countries.

Graph 7. Real Value-added of Industry and Services in 5 European countries, 1995-2012



Source: Elaboration by Guisan and Exposito(2017) from OECD statistics.

Industry is important for economic development of many services, both in the domestic market or through investment that increasea income from abroad. In table 6 we may notice that since year 2007 the European economic policies have not offered enough support to industry and there has been a diminution of industrial real value-added per capita in this group of 5 European countries.

Table 6 shows the evolution of real-valued added of Industry per inhabitant. The highest values in year 1965 corresponded to UK with 3270 and Germany with 2656, while France and Italy occupied intermediate positions, with 1990 and 1689, and the lowest level of industrialization corresponded to Spain with only 893. In year 2015 the highest value corresponded to Germany with 6565, followed by the United Kingdom with 3942. The lowest value in 2015 corresponde to Spain with 1975, while France (3251) and Italy (2820) occupied intermediate positions. For the period 1965-2007, the 5 countries showed a positive evolution of QHI, multiplying the initial values by the following factors: 2.32 in Germany, 3.03 in Spain, 1.87 in France, 2.28 in Italy, 1.40 in the United Kingdom, and 1.96 in this group of 5 EU countries.

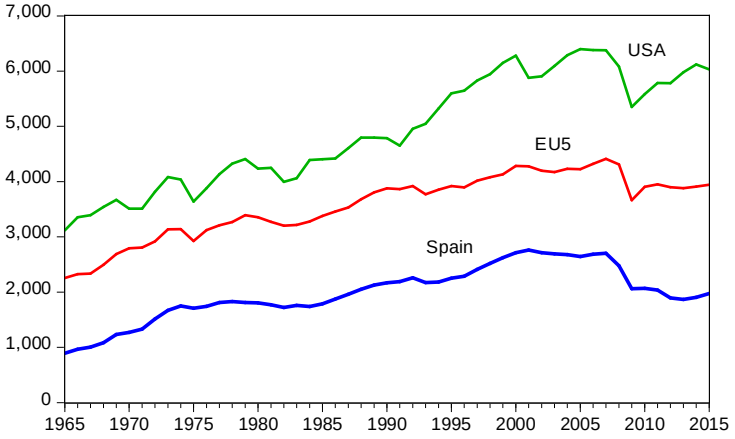
For the period 2007-2012, there was a slight increase in Germany and a diminution of QHI in Spain, France, Italy, UK. The increase of Germany was not enough to compensate the diminution of the other countries and the overall value of QHI in this group of 5 European countries diminish from 4413 in year 2007 to 3897 in year 2012. Graph 8 shows the evolution of real value-added of Industry per capita in EU5, Spain and the United States. For 2012-2015 there was an slight recovery in the average of the group.

Table 6. Real-valued added of industry per capita (USD 2000)

	Germany	Spain	France	Italy	UK	EU5
1965	**2656**	**893**	**1990**	**1689**	**3270**	**2255**
1975	3507	1708	2754	2411	3545	2925
1985	4293	1789	3103	2940	3909	3378
1995	4732	2252	3445	3669	4623	3919
2005	5551	2644	3716	3703	4583	4225
2006	5851	2684	3701	3816	4565	4321
2007	**6163**	**2702**	**3731**	**3853**	**4563**	**4413**
2008	6196	2476	3618	3689	4377	4310
2009	5210	2061	3151	2994	3958	3663
2010	5818	2067	3321	3130	4029	3904
2011	6106	2036	3359	3125	3974	3949
2012	**6205**	**1894**	**3219**	**2965**	**3950**	**3897**
2013	6435	1868	3246	2835	3794	3883
2014	6541	1906	3203	2808	3828	3911
2015	**6565**	**1975**	**3251**	**2820**	**3850**	**3943**

Source: Elaborated from OECD statistics. The last column is the average of EU5.

Graph 8. Industrial real value-added per capita in USA, EU5 and Spain (the lowest values of the EU5 group) (Dollar at 2000 prices and Exchange Rates)



Source: Elaborated by authors from OECD and Eurostat statistics.

Evolution of average real Wage per year

Average wage depends on the level of productivity per worker and the general labor productivity of a country depends, at a great extent, on industrial production per inhabitant. The increase of industrial production per inhabitant in the period 1965-2005 has favoured the increase of average real wage in the 5 countries, but the diminution of industrialization for the period 2005-2015 in 4 of those countries has implied.

Period 1965-1975: The 5 countries experienced an important increase of real wage for the decade 1965-1975, with increase higher than 7 thousand Germany, Spain, France and Italy, and higher than 6 thousand in UK.

Period 1975-1985: The increase of real wage was lower than in the previous decade, with more than 3 thousand, and less than 5 in the 6 countries.

Period 1985-2005: Increase higher than 6 thousand in Germany and the UK, increase higher than 3 thousand in France, almost 3 thousand in Spain and higher than 2 thousand in Italy.

Period 2005-2015: Diminution in Spain, Italy and the UK, small increase in Germany (higher than 3 thousand), France (lower than 2 thousand).

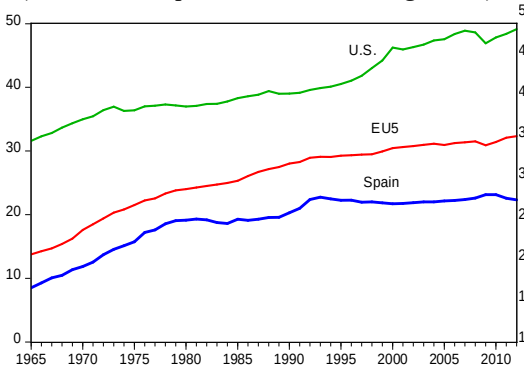
Graph 8 presents a comparison of real average wage of Spain, the group of 5 European countries and the United States, in Dollars at 2000 prices and Exchange Rates. Graph 9 presents these variables at 2000 prices and Purchasing Power Parities (PPPs).

Table 7. Real Wage per worker and year (Dollars at 2000 prices and exchange rates)

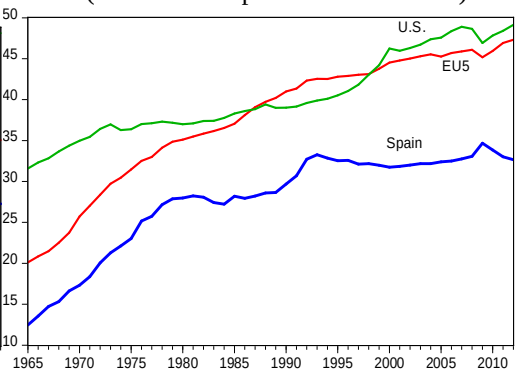
	Germany	Spain	France	Italy	UK	EU5
1965	13.000	8.519	16.988	13.185	14.857	13.619
1975	21.494	15.744	25.104	21.403	21.435	21.414
1985	24.711	19.280	29.792	25.717	24.689	25.161
1995	30.701	22.241	30.771	29.259	29.182	29.002
2005	31.227	22.150	33.507	28.151	35.948	30.715
2007	31.095	22.385	34.466	28.370	38.400	31.400
2012	32.410	22.319	34.385	28.380	35.898	31.215
2015	34.658	21.935	35.198	27.386	35.923	31.717

Source. Elaborated by the authors from OECD statistics.

Graph 8. Wage in EU5, Spain and U.S.
(th USD 2000 per worker at Exchange rates)



Graph 9. Wage in EU5, Spain, and US
(th USD 2000 per worker at PPPs)

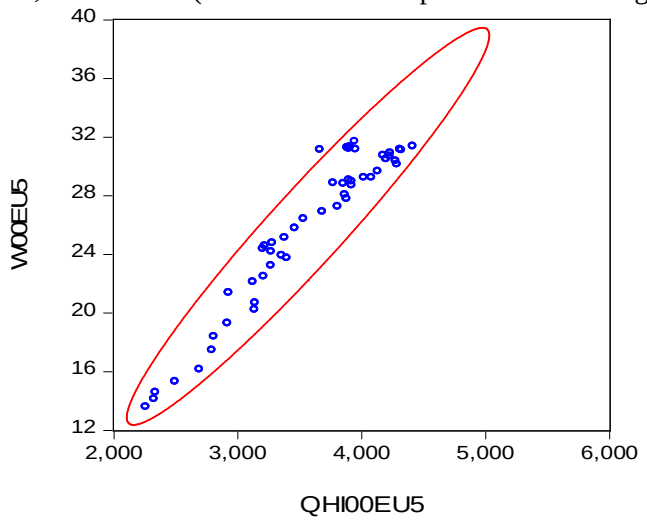


Source: Elaborated by the authors from OECD statistics

The comparison shows a high degree of convergence of average wage of the group of 5 European Union countries with the U.S. if we have into account the Purchasing Power Parities. Spain, with the minimum average wage of the group of EU5 countries, is far from the averages of U.S. and EU5, both using Exchange Rates or PPPs, what is due to the lower level of industrial production per head in Spain.

It is important to avoid diminutions of QHI in the European Union in order to avoid diminutions of general productivity and wages. Graph 10 shows the positive correlation between industrial development (QHI00) and Wages (W00) in the group of 5 European Union countries of this study for the period 1965-2015. In the Annex we include an analysis of cross correlations between industrial and non industrial development.

Graph 10. Industrial development and real Wages EU5 (Germany, Spain, France, Italy, and the UK, 1965-2015 (th Dollars at 2000 prices and Exchange Rates)



Evolution of employment, production and wages in the group of EU5 for 1965-2015

Table 8 presents a selection of data of the Group of 5 European Union countries of this study, including Germany, Spain, France, Italy and the United Kingdom, for the period 1965-2012.

Table 8. Data oof 5 European countries, EU5, for 1965-2015. Employment by sector and Population in thousand, GDP in Bn (th million) ph, pm and w (th Dollars at 2000 prices)

	LA	LI	LB	LS	LT	Pop	GDP00	PH00	PM00	W00
1965	17393	38819	9145	47286	112644	262634	2489.704	9.379	22.102	13.748
1975	11575	37294	9322	55962	114154	278567	3546.277	12.584	31.066	21.515
1985	8251	32131	8614	64030	113026	284551	4446.192	15.472	39.338	25.325
1995	5137	26023	9392	81153	121704	293719	5578.452	18.807	45.836	29.259
2005	3971	23126	10139	98829	136065	305690	6868.236	22.468	50.478	30.943
2007	3828	23146	10841	103665	141480	309246	7227.183	23.370	51.083	31.366
2012	3285	20748	9507	99361	132901	316263	7159.732	22.632	53.873	31.215
2015	3209	20618	9199	103194	136220	317356	7191.398	22.660	52.793	31.717

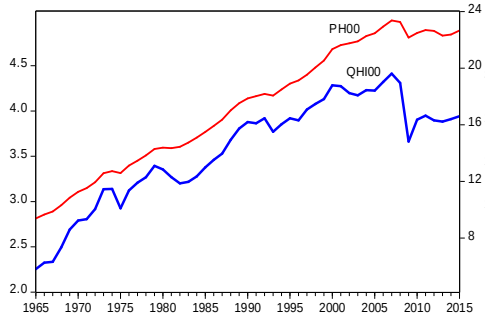
Source: Elaborated by authors from OECD statistics. Employment (L) by sector: A=Agriculture, I=Industry, B=Building, S=Services, T=Total). GDP00, Gross Domestic Product, PH00 real GDP per capita, PM00 mean productivity of workers, W00=average real wage.

We may notice an important increase of real Gross Domestic Product for the period 1965-2007, and stagnation and diminution afterwards. Regarding production per head (PH00EU5) we may notice an important increase for the period 1965-2007 and stagnation or diminution for the period 2007-2012. Real values of Productivity per

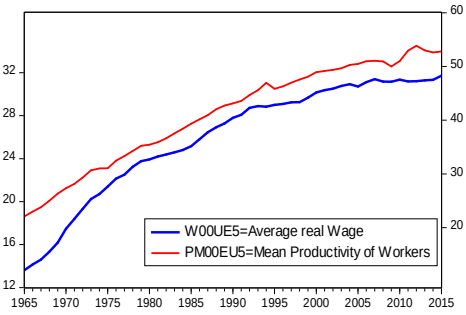
worker (PM) and Wage have increased, particularly for the period 1965-2007 but the ratio Wage/Productivity has decreased for the period 1975-2015, from almost 70% in year 1975 to approximately 60% in year 2015, as it is shown in a graph in the Annex.

Graph 11 shows the evolution of QHI00EU5 (real-valued added of industry per inhabitant in the group of 5 European countries of this study) and PM00EU5 (mean productivity of labor in the same group of countries. Graph 12 show the evolution of PM00EU5 and real Wages (W00EU5).

Graph 11. Industry and Production per capita



Graph 12. Labor productivity and wages



The diminution of industrial production per capita in 2008-2010, and its stagnation afterwards have implied a diminution, followed by staganation of total production per head. The stagnation of PH and low increase of PM have implied a slow evolution of real wages for the period 2007-2015.

4. Econometric models

4.1. Estimation of the elasticity Employment/Output by sector.

Table 9 presents the estimation of labor/output elasticities for each sector, estimated with a pool of Germany, Spain, France, Italy and the United Kingdom for the period 1995-2012. Data and the results of the estimations are included in the Annex.

Table 9. Employment/Output elasticity by sector: pool of 5 countries, 1995-2012

Functional Form	Method	Agriculture	Industry	Building	Services
Model in levels : *log($L_{i,t}$) f(log($Q_{i,t}$) c)*	LS	0.9499	0.6874	0.7041	0.7891
	GLS: AR(1)	**0.3604**	**0.2023**	**0.4219**	**0.7060**
Mixed dynamic Model with trend: log($L_{i,t}$)=f(log(($L_{i,t-1}$)D(log($Q_{i,t}$) time)	LS	**0.3716**	**0.2169**	**0.4111**	**0.7780**

Note: Elaborated by authors. The pool includes: Germany, Spain, France, Italy and the UK

The estimation results show that the least squares (LS) estimation with the variables in levels, presented autocorrelation and we have corrected the problem by two means:

1) Estimating the equation in levels by generalized least Squares (GLS) without modification of the specification.

2) Modifying the specification of the relation by including a missing variable (the lagged value of employment), in order to avoid autocorrelation and specifying the

model as a mixed dynamic model with the increase of output as exogenous variables. The mixed dynamic model was estimated by LS because there was not autocorrelation.

Both solutions to autocorrelation led to better estimates of elasticity than least squares apply to the equation in levels estimated by LS.

As seen in the Annex, the best results correspond to the mixed dynamic model with trend and to the GLS estimation of the model in levels. Model in levels estimated by LS present a problem of high degree of autocorrelation. Results of the model in levels, without correction of the autocorrelation, do not provide accurate estimations of the elasticity in the cases of Agriculture, Industry and Building

In the estimations by GLS of the model in levels and LS of the mixed dynamic model, we may notice that the elasticity labor/output is close to 0.37 in Agriculture and to 0.21 in Industry, while it reaches a value close to 0.41 in Building sector and higher than 0.70 in Services. The increase of industrial production creates few employments in Industry but many on other sectors, particularly in Services.

In the Annex we include data, the results of the estimation of elasticity by sector, with the 3 methods, and comments on good properties of the mixed dynamic model regarding the cointegration of variables and goodness of fit.

5. Conclusions

1) The most outstanding feature of economic development of the five countries of this study for the period 1965-2007 has been the increase of industrial production and real-value-added of Industry per capita, which has had positive impact on employment in Services, on productivity of labor, real average wage and income per capita. This implies strong support to Kaldor´s theories related with the positive impact of industry.

2) Total employment has increased in 23.55 million people in 50 years, from 112.64 in 1965 to 136.22 in 2015, and population has increased in 54.7 million. The rate of total employment per thousand inhabitants has been 429 in years 1965 and 2015.

3) Employment in Agriculture has diminished in 14.18 million of employed people, for the period 1965-2015. In Industry it has diminished in 18.20 million. Employment in Building has not changed with around 9 million employed people both in year 1965 and year 2015. Employment in Services has increased in 55.91 million in fifty years.

4) Regarding real wages the evolution has been positive for the period 1965-2007, from 13.7 thousand Dollars at 2000 prices, in year 1965 to 31.4 thousand in year 2007. Stagnation has occurred for the period 2007-2015, due to some wrong economic policies in Europe. The ratio Wage/Productivity, in this group of five countries, has diminished from nearly 0.70 in year 1975 to approximately 0.57 in 2012 and 0.60 in year 2015. This diminution may imply a reduction on average family income if there is not compensation from other sources (returns to investments, subsidies, grants, etc.).

5) We strongly recommend economic changes in European policies addressed to foster industrial development, with high rates of employment and increasing levels of production per inhabitant and increasing levels of wages. Delocalization of industries usually has a negative impact on Services or other sectors, unless the income from investments abroad should be used to foster the domestic market and family income.

6) The comparison of real wages of these European countries with the United States show a gap, favourable to the U.S. if the comparison is made with Exchange Rates and that both average values of EU5 and the U.S. are very alike if the comparison is in PPPs.

7) In the estimations by GLS of the model in levels and LS of the mixed dynamic model, we may notice that the elasticity labor/output is close to 0.37 in Agriculture and to 0.21 in Industry, while it reaches a value close to 0.41 in Building sector and higher than 0.70 in Services. The impact of industrial development is important to increase income and employment in other sectors, particularly in Services.

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Annex 1. Data: Elaborated by authors from OECD and Eurostat Statistics.

Table A1. Data of real value-added by sector: Agriculture (bn $2000)

	Germany	Spain	France	Italy	UK	EU5
1994	18.108	17.339	29.278	24.428	12.864	102.017
1995	19.042	16.277	30.325	24.783	12.696	103.123
1996	19.811	19.622	31.872	25.158	12.280	108.743
1997	20.477	21.013	32.430	25.860	12.692	112.472
1998	19.249	21.666	32.970	26.472	12.972	113.329
1999	21.703	21.446	34.221	28.073	13.403	118.846
2000	21.614	23.018	33.730	27.416	13.297	119.075
2001	22.453	22.568	32.792	26.741	12.052	116.606
2002	21.085	22.663	34.428	25.917	13.532	117.625
2003	21.487	22.510	29.172	24.649	13.253	111.071
2004	22.021	22.945	35.146	27.873	13.117	121.102
2005	22.021	20.647	33.109	26.640	13.427	115.844
2006	22.256	20.698	32.392	25.803	13.194	114.343
2007	23.177	21.342	30.572	23.502	13.405	111.998
2008	18.636	21.224	24.749	22.780	10.738	98.127
2009	17.528	21.441	26.205	20.878	10.913	96.965
2010	17.085	20.369	26.043	20.764	12.001	96.262
2011	17.085	20.369	25.815	22.229	11.239	96.737
2012	17.085	20.369	25.460	22.480	11.133	96.527

Table A2. Data of real value-added by sector: Industry (Bn $ 2000)

	Germany	Spain	France	Italy	UK	EU5
1994	387.569	85.644	195.228	197.169	263.580	1129.190
1995	386.454	88.593	199.290	208.577	268.272	1151.186
1996	381.352	90.779	198.839	205.133	271.860	1147.963
1997	395.114	95.851	206.061	213.098	275.724	1185.848
1998	400.131	100.389	213.509	215.681	276.000	1205.710
1999	403.432	105.391	217.346	215.465	283.176	1224.810
2000	428.727	109.837	224.343	224.506	287.592	1275.005
2001	433.400	113.488	226.374	221.708	283.728	1278.698
2002	427.312	113.471	223.440	218.694	278.760	1261.677
2003	430.013	115.031	221.183	217.187	277.104	1260.518
2004	444.761	115.749	225.697	216.757	280.692	1283.656
2005	457.880	116.616	225.697	215.250	276.000	1291.443
2006	482.018	120.237	227.051	222.999	276.552	1328.857
2007	507.018	123.216	230.211	226.874	277.380	1364.699
2008	509.048	114.995	224.569	218.909	269.100	1336.621
2009	427.817	96.348	196.582	178.873	244.742	1144.362
2010	477.373	97.211	208.318	188.344	249.881	1221.127
2011	499.196	95.439	211.862	188.537	248.132	1243.166
2012	507.834	92.267	204.053	180.616	248.207	1232.977

Table A3. Data of real value-added by sector: Building (Bn $ 2000)

	Germany	Spain	France	Italy	UK	EU5
1994	106.696	33.169	67.575	46.386	64.305	318.131
1995	102.725	35.222	67.035	46.961	64.775	316.718
1996	95.891	34.986	64.009	47.752	66.618	309.256
1997	93.595	35.791	57.348	47.055	68.405	302.194
1998	90.971	38.244	57.127	46.943	69.200	302.485
1999	91.671	41.405	58.409	47.114	69.312	307.911
2000	88.640	43.840	61.323	49.036	69.564	312.403
2001	83.632	47.595	63.442	52.769	71.144	318.582
2002	80.618	50.585	62.617	54.024	73.696	321.540
2003	77.037	53.155	62.083	55.521	77.161	324.957
2004	73.554	55.890	63.077	56.028	80.256	328.805
2005	71.027	58.903	65.247	56.439	81.466	333.082
2006	74.440	62.006	67.095	57.350	82.380	343.271
2007	80.300	63.563	69.016	66.733	107.751	387.363
2008	80.357	62.540	75.617	66.318	84.212	369.044
2009	82.095	58.670	73.857	63.084	63.386	341.092
2010	81.514	54.856	74.777	59.337	66.690	337.174
2011	84.808	40.772	85.483	59.078	67.529	337.670
2012	87.400	28.037	82.513	55.237	71.465	324.652

Table A4. Data of real value-added by sector: Services (Bn $ 2000)

	Germany	Spain	France	Italy	UK	EU5
1994	1169.127	325.957	835.519	703.317	870.351	3904.271
1995	1202.379	334.760	849.750	718.379	902.157	4007.425
1996	1226.646	340.942	864.380	731.657	933.042	4096.667
1997	1238.514	352.489	885.361	742.587	969.479	4188.430
1998	1271.549	367.416	917.694	753.904	1015.928	4326.491
1999	1301.494	384.518	950.624	767.648	1055.909	4460.193
2000	1331.319	403.978	1008.568	796.386	1107.047	4647.298
2001	1346.415	418.205	1029.982	816.078	1146.976	4757.656
2002	1358.485	431.413	1045.990	823.734	1179.612	4839.234
2003	1356.663	446.575	1068.896	824.822	1221.682	4918.638
2004	1371.154	463.506	1091.536	838.711	1261.858	5026.765
2005	1374.829	485.709	1118.240	848.513	1300.576	5127.867
2006	1404.051	506.336	1147.728	864.040	1345.941	5268.096
2007	1421.054	526.508	1179.473	870.428	1365.660	5363.123
2008	1449.068	542.187	1187.612	863.816	1398.995	5441.678
2009	1432.985	536.905	1176.144	847.849	1358.060	5351.943
2010	1455.028	538.788	1186.830	856.632	1369.510	5406.788
2011	1490.841	551.799	1198.240	855.233	1374.534	5470.647
2012	1494.254	560.622	1216.679	866.744	1370.078	5508.377

Table A5. Employment by sector: Agriculture (thousand people employed)

	Germany	Spain	France	Italy	UK	EU5
1994	1200	1151	1047	1411	532	5341
1995	1169	1107	1013	1316	532	5137
1996	1056	1074	987	1252	510	4878
1997	1052	1070	972	1229	495	4818
1998	1030	1074	962	1175	465	4706
1999	1035	1040	943	1113	425	4556
2000	967	951	922	1103	426	4369
2001	971	943	905	1110	390	4319
2002	925	952	887	1080	393	4236
2003	877	951	870	1009	357	4064
2004	841	932	810	1023	369	3974
2005	880	916	775	1019	381	3971
2006	858	870	801	1055	376	3960
2007	842	855	756	993	382	3828
2008	698	836	612	962	306	3414
2009	647	786	648	940	311	3332
2010	633	835	644	958	342	3412
2011	648	760	644	958	342	3352
2012	620	743	644	958	342	3307

Table A6. Employment by sector: Industry (thousand people employed)

	Germany	Spain	France	Italy	UK	EU5
1994	10337	2474	4323	5626	5348	28108
1995	9647	2485	3937	5273	4681	26023
1996	9201	2500	3899	5210	4723	25533
1997	9056	2580	3852	5183	4741	25412
1998	9233	2705	3841	5265	4758	25802
1999	9406	2782	3825	5222	4580	25816
2000	8534	3035	3863	5190	4444	25065
2001	8544	3077	3884	5174	4274	24953
2002	8355	3064	3805	5217	4065	24506
2003	8140	3037	3716	5248	3870	24011
2004	8020	3017	3591	5197	3691	23516
2005	7884	3029	3523	5163	3527	23126
2006	7986	3050	3509	5163	3228	22936
2007	8223	3044	3442	5183	3254	23146
2008	8022	3025	3357	5121	3055	22580
2009	7844	2775	3227	4899	2877	21622
2010	7705	2610	3135	4703	2836	20989
2011	7854	2555	3086	4440	2849	20784
2012	7994	2431	3071	4370	2882	20748

Table A6. Employment by sector: Building (thousand people employed)

	Germany	Spain	France	Italy	UK	EU5
1994	3131	1059	1459	1635	1864	9148
1995	3356	1135	1467	1606	1828	9392
1996	3135	1175	1426	1591	1801	9129
1997	3009	1243	1388	1585	1806	9030
1998	2912	1307	1379	1553	1844	8995
1999	2859	1464	1405	1575	1851	9154
2000	2769	1749	1463	1618	1876	9475
2001	2598	1914	1503	1656	1926	9597
2002	2439	2006	1528	1698	1957	9628
2003	2322	2113	1533	1749	2008	9725
2004	2254	2233	1556	1787	2071	9901
2005	2165	2357	1612	1866	2138	10139
2006	2208	2516	1677	1853	2191	10445
2007	2280	2697	1725	1907	2232	10841
2008	2319	2404	1890	1922	2442	10977
2009	2566	1888	1846	1896	2206	10402
2010	2586	1651	1869	1883	2065	10054
2011	2645	1393	1866	1868	1921	9693
2012	2691	1148	1858	1778	1908	9383

Table A8. Employment by sector: Services (thousand people employed)

	Germany	Spain	France	Italy	UK	EU5
1994	21624	7329	14916	12939	17973	74781
1995	22728	7586	16239	13799	20828	81180
1996	23374	7884	16428	14035	21059	82780
1997	23541	8144	16628	14137	21513	83962
1998	23969	8444	17008	14343	21745	85509
1999	24131	8948	17485	14651	22300	87515
2000	25495	9487	18046	15084	22828	90939
2001	25784	9818	18429	15453	23277	92761
2002	25857	10138	18656	15799	23661	94110
2003	25785	10556	18789	16143	24115	95388
2004	26049	11299	18922	16250	24523	97043
2005	26311	12096	19083	16348	24992	98829
2006	26863	12722	19216	17018	25267	101086
2007	27494	13771	19770	17264	25367	103665
2008	28247	13786	20266	17558	25692	105549
2009	26554	13439	20209	17427	25942	103571
2010	26926	13402	20342	17460	26092	104222
2011	27662	13396	20394	15701	23965	101118
2012	27947	12950	20417	15792	24288	101394

Annex 2 . Estimation of elasticity Labor/Output by sector, 1995-2012.
Pool of 5 countries (Germany, Spain, France, Italy and the United Kingdom), 1995-2012.
Equations 1.1 to 3.3 show the results of the estimation of elasticity. L is Labor (Employment), Q is real value-added. The letters indicate the sector: A (Agriculture), I (Industry), B (Building) and S (Services). Employment is measured in thousand people and Values of Q are measured in Billion Dollars at 2000 prices and exchange rates.

In the case of Agriculture the best adjustment, accordingly to the lowest value of S.E., corresponds to 1.3, followed by 1.2. The equation 1.1 has lower goodness of fit and presents high degree of autocorrelation.

Equation 1.1. Agriculture. Model in levels. LS estimation

Dependent Variable: LOG(LA?)				
Method: Pooled Least Squares				
Sample: 1995 2012				
Included observations: 18 Cross-sections included: 5 Total pool (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.756284	0.252064	14.90213	0.0000
LOG(QA00?)	0.949961	0.082493	11.51572	0.0000
R-squared	0.601109	Mean dependent var		6.643971
Adjusted R-squared	0.596576	S.D. dependent var		0.382335
S.E. of regression	0.242843	Akaike info criterion		0.029167
Sum squared resid	5.189591	Schwarz criterion		0.084718
Log likelihood	0.687500	Hannan-Quinn criter.		0.051568
F-statistic	132.6118	Durbin-Watson stat		0.074463
Prob(F-statistic)	0.000000			

Equation 1.2. Agriculture. Model in levels, GLS estimation

Dependent Variable: LOG(LA?)				
Method: Pooled Least Squares				
Sample (adjusted): 1995 2012				
Included observations: 18 after adjustments. Cross-sections included: 5 Total pool (balanced) observations: 90. Convergence achieved after 6 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.701797	0.479811	9.799262	0.0000
LOG(QA00?)	0.360414	0.070274	5.128676	0.0000
AR(1)	0.970480	0.015471	62.72958	0.0000
R-squared	0.987149	Mean dependent var		6.643971
Adjusted R-squared	0.986854	S.D. dependent var		0.382335
S.E. of regression	0.043838	Akaike info criterion		-3.383878
Sum squared resid	0.167192	Schwarz criterion		-3.300551
Log likelihood	155.2745	Hannan-Quinn criter.		-3.350275
F-statistic	3341.452	Durbin-Watson stat		2.244018
Prob(F-statistic)	0.000000			

Equation 1.3. Agriculture. Mixed dynamic model. LS estimation with trend

Dependent Variable: LOG(LA?)				
Method: Pooled Least Squares. Sample (adjusted): 1995 2012				
Included observations: 18 after adjustments				
Cross-sections included: 5				
Total pool (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(LA?(-1))	0.985216	0.004695	209.8368	0.0000
D(LOG(QA00?))	0.371565	0.069071	5.379499	0.0000
TI	0.001678	0.000718	2.338144	0.0217
R-squared	0.987527	Mean dependent var		6.643971
Adjusted R-squared	0.987240	S.D. dependent var		0.382335
S.E. of regression	0.043188	Akaike info criterion		-3.413726
Sum squared resid	0.162276	Schwarz criterion		-3.330399
Log likelihood	156.6177	Hannan-Quinn criter.		-3.380123
Durbin-Watson stat	2.350986			

Equation 2.1. Industry. Model in levels. LS estimation, 1995-2012

Dependent Variable: LOG(LI?)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(QI00?)	0.687372	0.050471	13.61913	0.0000
C	4.661569	0.274231	16.99867	0.0000
R-squared	0.678222	Mean dependent var		8.382353
Adjusted R-squared	0.674566	S.D. dependent var		0.394615
S.E. of regression	0.225115	Akaike info criterion		-0.122436
Sum squared resid	4.459570	Schwarz criterion		-0.066884
Log likelihood	7.509612	Hannan-Quinn criter.		-0.100034
F-statistic	185.4807	Durbin-Watson stat		0.028413
Prob(F-statistic)	0.000000			

Equation 2.2. Industry. Model in levels. GLS estimation, 1995-2012

Dependent Variable: LOG(LI?)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(QI00?)	0.202270	0.071497	2.829080	0.0058
C	5.816039	1.401886	4.148724	0.0001
AR(1)	0.988533	0.010716	92.24835	0.0000
R-squared	0.993578	Mean dependent var		8.382353
Adjusted R-squared	0.993430	S.D. dependent var		0.394615
S.E. of regression	0.031985	Akaike info criterion		-4.014321
Sum squared resid	0.089006	Schwarz criterion		-3.930994
Log likelihood	183.6444	Hannan-Quinn criter.		-3.980719
F-statistic	6729.929	Durbin-Watson stat		1.390748
Prob(F-statistic)	0.000000			

Equation 2.3. Industry. Mixed dynamic model. LS estimation with trend

Dependent Variable: LOG(LI?)				
Method: Pooled Least Squares. Sample (adjusted): 1995 2012				
Included observations: 18 after adjustments. Cross-sections included: 5				
Total pool (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(LI?(-1))	0.995888	0.003136	317.5652	0.0000
D(LOG(QI00?))	0.216913	0.074430	2.914314	0.0045
TI	0.000398	0.000601	0.662598	0.5093
R-squared	0.993563	Mean dependent var		8.382353
Adjusted R-squared	0.993415	S.D. dependent var		0.394615
S.E. of regression	0.032022	Akaike info criterion		-4.012011
Sum squared resid	0.089212	Schwarz criterion		-3.928684
Log likelihood	183.5405	Hannan-Quinn criter.		-3.978408
Durbin-Watson stat	1.421588			

In Industry, equation 2.1 present the problem of a high degree of autocorrelation and lower goodness of fit than equations 2.2 and 2.3. Equation 2.2 and 2.3 have a high level of goodness of fit. The lower values of S.E. corresponds to 2.2, followed by 2.3.

Equation 3.1. Building. Model in Levels. LS estimation, 1995-2012

Dependent Variable: LOG(LB?)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(QB00?)	0.704108	0.060461	11.64556	0.0000
C	4.625729	0.251692	18.37856	0.0000
R-squared	0.606474	Mean dependent var		7.551288
Adjusted R-squared	0.602002	S.D. dependent var		0.232420
S.E. of regression	0.146627	Akaike info criterion		-0.979879
Sum squared resid	1.891953	Schwarz criterion		-0.924327
Log likelihood	46.09454	Hannan-Quinn criter.		-0.957477
F-statistic	135.6191	Durbin-Watson stat		0.145768
Prob(F-statistic)	0.000000			

Equation 3.2. Building. Model in levels. GLS estimation, 1995-2012

Dependent Variable: LOG(LB?)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(QB00?)	0.421900	0.062752	6.723259	0.0000
C	5.828537	0.271231	21.48921	0.0000
AR(1)	0.921822	0.031037	29.70097	0.0000
R-squared	0.956171	Mean dependent var		7.551288
Adjusted R-squared	0.955163	S.D. dependent var		0.232420
S.E. of regression	0.049214	Akaike info criterion		-3.152499
Sum squared resid	0.210718	Schwarz criterion		-3.069172
Log likelihood	144.8624	Hannan-Quinn criter.		-3.118896
F-statistic	948.9834	Durbin-Watson stat		1.268401
Prob(F-statistic)	0.000000			

Equation 3.3. Building. Mixed dynamic model. LS estimation with trend

Dependent Variable: LOG(LB?)				
Method: Pooled Least Squares. Sample: 1995 2012				
Included observations: 18. Cross-sections included: 5				
Total pool (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(LB?(-1))	1.003335	0.002015	497.8583	0.0000
D(LOG(QB00?))	0.411109	0.064218	6.401806	0.0000
TI	-0.001698	0.001053	-1.612189	0.1105
R-squared	0.954290	Mean dependent var		7.551288
Adjusted R-squared	0.953239	S.D. dependent var		0.232420
S.E. of regression	0.050259	Akaike info criterion		-3.110479
Sum squared resid	0.219761	Schwarz criterion		-3.027152
Log likelihood	142.9716	Hannan-Quinn criter.		-3.076877
Durbin-Watson stat	1.292995			

In Building equation 3.1 presents a problem of high degree of autocorrelation and the goodness of fit is worse than in equations 3.2 and 3.3. The goodness of fit is high both in equation 3.2 and equation 3.3.

Equation 4.1. Services. Models in levels. LS estimation, 1995-2012

Dependent Variable: LOG(LS?)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(QS00?)	0.789068	0.018806	41.95852	0.0000
C	4.425668	0.128370	34.47588	0.0000
R-squared	0.952394	Mean dependent var		9.802138
Adjusted R-squared	0.951853	S.D. dependent var		0.333667
S.E. of regression	0.073214	Akaike info criterion		-2.368879
Sum squared resid	0.471710	Schwarz criterion		-2.313327
Log likelihood	108.5995	Hannan-Quinn criter.		-2.346477
F-statistic	1760.517	Durbin-Watson stat		0.090605
Prob(F-statistic)	0.000000			

Equation 4.2. Services. Model in levels. GLS estimation , 1995-2012

Dependent Variable: LOG(LS?)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(QS00?)	0.706024	0.090446	7.806049	0.0000
C	5.031457	0.644705	7.804281	0.0000
AR(1)	0.911122	0.037418	24.34960	0.0000
R-squared	0.994041	Mean dependent var		9.802138
Adjusted R-squared	0.993904	S.D. dependent var		0.333667
S.E. of regression	0.026051	Akaike info criterion		-4.424781
Sum squared resid	0.059041	Schwarz criterion		-4.341454
Log likelihood	202.1151	Hannan-Quinn criter.		-4.391178
F-statistic	7256.922	Durbin-Watson stat		1.472005
Prob(F-statistic)	0.000000			

Equation 4.3. Services. Mixed dynamic model with trend, 1995-2012

Dependent Variable: LOG(LS?)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(LS?(-1))	1.002592	0.001101	910.3679	0.0000
D(LOG(QS00?))	0.778023	0.187244	4.155138	0.0001
TI	-0.001709	0.000600	-2.846034	0.0055
R-squared	0.994307	Mean dependent var		9.802138
Adjusted R-squared	0.994176	S.D. dependent var		0.333667
S.E. of regression	0.025464	Akaike info criterion		-4.470351
Sum squared resid	0.056411	Schwarz criterion		-4.387024
Log likelihood	204.1658	Hannan-Quinn criter.		-4.436748
Durbin-Watson stat	1.704855			

In Services, equation 4.1 presents a problem of high degree of autocorrelation and worse goodness of fit than equations 4.2 and 4.3. Equation 3 presents the highest level of goodness of fit among the three equations estimated for this sector.

Final comments on the estimation of the elasticity labor/output:

1) We may notice that the estimation by Least Squares (LS) of the equation in levels presents in all the sectors a problem of high degree of autocorrelation. This is mainly due to missing variables, like the lagged value of the dependent variable.
2) We may correct the problem of autocorrelation estimating the model in levels by Generalized Least Squares (GLS) or solving the problem of autocorrelation changing the form of the equation with a mixed dynamic model instead of a model in levels.
3) The advantages of a mixed dynamic model in comparison with models in levels, is that usually it does not present problem of autocorrelation, or at least at a lower degree than the model in levels, and presents higher goodness of fit. Besides the test of cointegration usually allows us to reject the hypothesis of "no cointegration" in the mixed dynamic model where the model in levels does not allow us to reject that hypothesis. For example in the Services sectors:

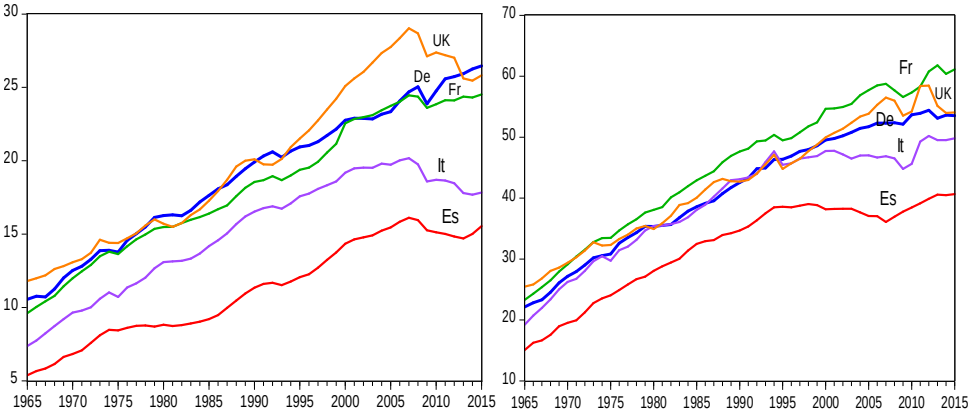
ADF test of cointegration: Services sector

	LS Levels	LS Mixed dynamic model
Germany	-2.4280	-4.1265*
Spain	-2.0851	-3.4805*
France	-3.0663**	-7.4451*
Italy	-2.9625	-2.8911**
UK	-1.1389	-4.1897*
MacKinnon limit 10%	-3.0656	-2.6735
MacKinnon limit 5%	-3.0989	-3.0522

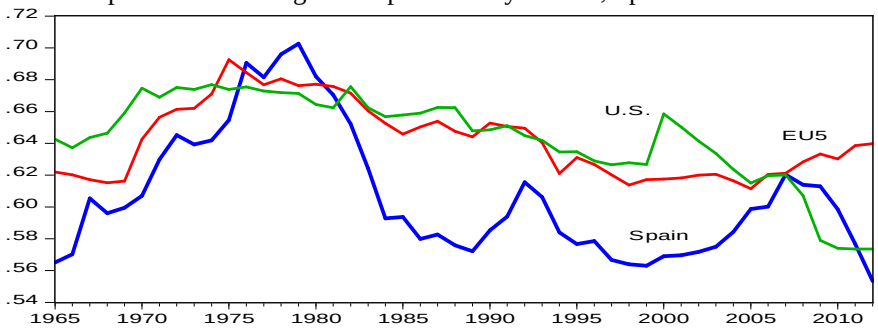
The hypothesis of "no cointegration" is rejected, with ADF lower than the critic al values of MacKinnon, in all the countries with the mixed dynamic and in none of them, at the usual level of 5% of significance, with the model in levels.

Annex 3. Production per head, Productivity and Share of Labor Compensation on GDP.

Graph A1. Real production per head (PH00) Graph A2.Labor Productivity
(thousand Dollars per capita at 2000 prices and Exchange rates)

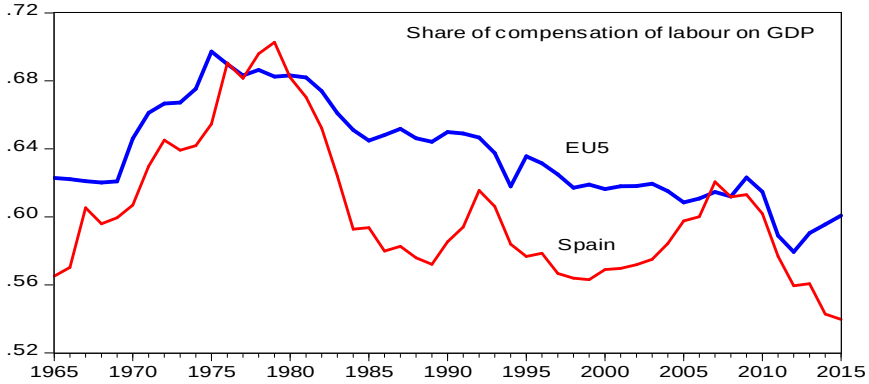


Graphs A3. Ratio wage/labor productivity in EU5, Spain and the U.S.



Source: Elaborated by the authors from OECD statistics and other sources

Graph A4. Share of compensation of labor on GDP. Spain and EU5



Annex 4. Correlations and cross-correlations in Spain and EU5, 1965-2015.

Correlations between Industrial real-value-added per head with non industrial real value-added per head and average wage in Spain and EU5.

	QHI00ES	QNI00ES	W00ES
QHI00ES	1.0000	0.8012	0.8638
QHNI00ES	0.8012	1.0000	0.8521
W00ES	0.8638	0.8521	1.0000

	QHI00EU5	QHNI00EU5	W00EU5
QHI00EU5	1.000	0.929	0.962
QHNI00EU5	0.929	1.000	0.957
W00EU5	0.962	0.957	1.000

Cross correlations between QHI and QHNI in the Group of 5 European countries

Sample: 1965 2015. Included observations: 51				
Correlations are asymptotically consistent approximations				
QHI00EU5,QHNI00EU5(-i)	QHI00EU5,QHNI00EU5(+i)	i	lag	lead
. |********** |	. |********** |	0.0000	0.9286	0.9286
. |********** |	. |********** |	1.0000	0.8495	0.9030
. |********* |	. |********** |	2.0000	0.7706	0.8751
. |******** |	. |********** |	3.0000	0.6908	0.8479
. |******* |	. |********* |	4.0000	0.6162	0.8197
. |******* |	. |********* |	5.0000	0.5498	0.7868
. |****** |	. |********* |	6.0000	0.4884	0.7553
. |**** |	. |******** |	7.0000	0.4249	0.7344
. |**** |	. |******** |	8.0000	0.3639	0.6842
. |*** |	. |******* |	9.0000	0.3145	0.6301
. |*** |	. |******* |	10.0000	0.2665	0.5777
. |**. |	. |****** |	11.0000	0.2049	0.5248
. |* . |	. |****** |	12.0000	0.1537	0.4703
. |* . |	. |**** |	13.0000	0.1061	0.4170
. |* . |	. |**** |	14.0000	0.0614	0.3633
. | . |	. |*** |	15.0000	0.0246	0.3068

Correlation of QHNI with lagged value of QHI is higher than correlation of QHI with lagged value of QHNI for i=1,2…15. Although some degree of bilateral relationship exists, de empirical evidence, in this and in other studies, shows that usually industry is the key for sustainable development of services and other non industrial sectors.

Annex 5. Bibliography by authors related with employment, productivity and wages in European countries and regions. Downloadable at: http://www.usc.es/econo met/eaat.htm

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Participation in Congresses

ERSA: European Regional Science A.: Zurich, Vienna, Rome, Porto and other ones
ASEPELT-Applied Economics: Many years since the first Congress of year 1985
AECR: Spanish Association of Region al Science