PRODUCTION BY SECTOR IN CHINA, INDIA AND OECD COUNTRIES, 1985-2005,

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Abstract
We analyse the evolution of production by sector in Agriculture, Industry and Services in China and India in comparison with the European Union, United States, Japan and other OECD countries, during the period 1985-2005, with particular focus on the important positive role of manufacturing, trade and other factors on the development of services, at country level in OECD countries and at country and regional level in China and India. We present an international cross-section model to estimate the impact of industry on services with a sample of 32 countries for the period 1985-2005. The main conclusion is the convenience to foster industrial development in India in order to reach a higher degree of convergence with China and to evolve towards the average level of OECD countries. To achieve this goal domestic policies and international cooperation should include as one of the main priorities to increase the educational level of population.
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Keywords: Agriculture, Industry, Services, China, India, European Union, OECD countries, World Development, Production by Sector

1. Introduction

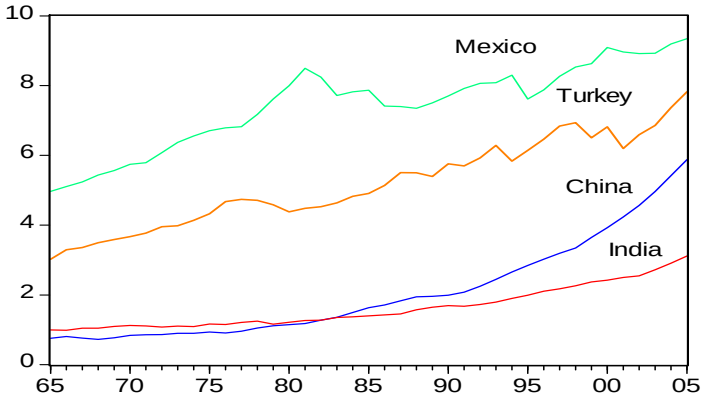
Although China has experienced an important take off during the period 1986-2006, and India has improved economic policies in order to experience a similar take off, not already fully reached but expected to follow in the first two decades of the 21st century, both countries will likely show a higher capacity to converge with OECD average and to have an outstanding role in the world economy during the next decades. We think that is very important, both at country and international level, to improve international cooperation in this regard in order to get smooth and sustained development in all the regions of these two big countries.

With this purpose we analyze the evolution of China and India in comparison with OECD countries during the period 1985-2005: Section 2 presents a comparative analysis of real Gdp per capita for 1965-2005 and points to the important role of education in order to favor investment per inhabitant with the positive impact on industry and economic development. Section 3 analyses the evolution of production by sector in Agriculture, Industry and Services in China, India and 30 OECD countries. Section 4 presents an international cross-section model for year 2004 relating the development of Services with Industry. Finally section 5 presents the main conclusions.

2. Evolution of real Gdp per capita 1965-2005

Graph 1 shows the evolution of real Gross Domestic Product (Gdp) per inhabitant in China and India, in comparison with Mexico and Turkey, during the period 1965-2005. We may notice a trend of China to reach and overtake in a few years the levels of Gdp per inhabitant of Turkey and Mexico, while India, at a lower pace for the moment, will very likely follow the steps of China towards a higher degree of convergence with those middle income countries.

Graph 1. Gdp per inhabitant at price levels and PPPs of year 2000
(thousand dollars per inhabitant)

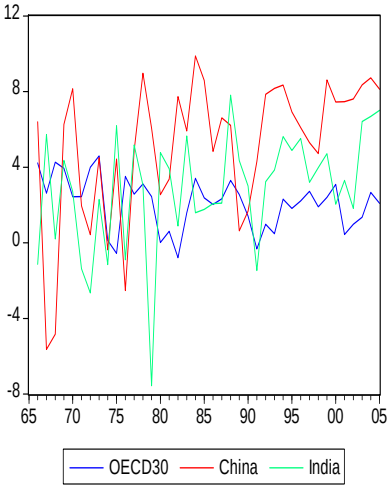


Although the average levels of Gdp per inhabitant in China and India are yet clearly below the OECD average, they soon will reach the levels of the less developed OECD countries, and even at regional level we can find that the most developed Chinese and Indian regions have already reached and surpassed the income levels per inhabitant of the most lagged OECD regions. This question will be analyzed in future studies, as in Guisan and Exposito(2007).

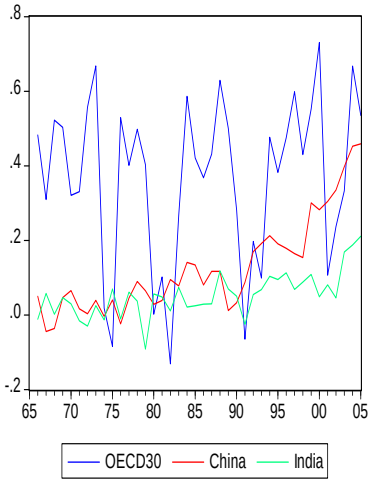
The exponential rate of growth of Gdp per inhabitant is the difference between the rate of growth of Gdp and the rate of growth of population. China has shown a higher rate of Gdp and a lower rate of population growth than India,

Graph 2 shows the exponential rates of annual growth of real Gdp per inhabitant in China, India and OECD (30 countries), in percentage, while graph 3 shows the increase of Gdp per inhabitant in thousand dollars. We may notice that the annual increase in thousand dollars per inhabitant is usually higher in OECD countries, although this increase implies a moderate percentage on their already high level of average income.

Graph 2. Annual rates of growth of real Gdp per inhabitant (%)



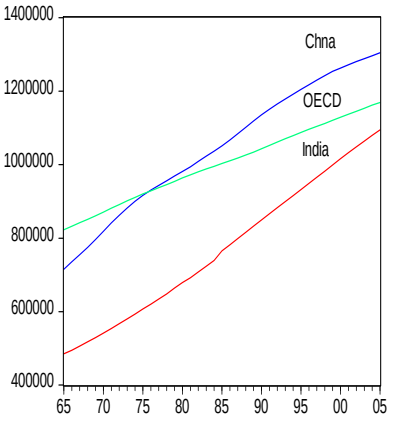
Graph 3. Annual increase of real Gdp per inhabitant (th $2000 at ppp)



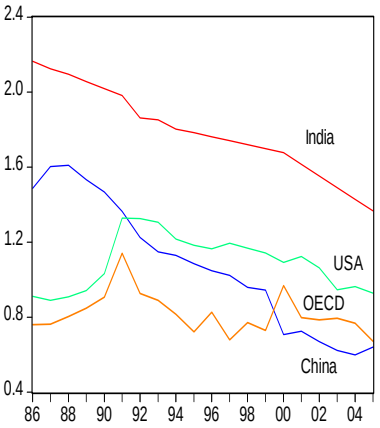
Notes for graphs 1 to 6: OECD 30 countries: 3 countries of Nafta (USA, Canada, Mexico); plus 22 European countries (15 belonging to EU15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom; 4 new EU member countries of year 2004 Enlargement: Czech Republic, Hungary, Poland, and Slovakia; and 3 European countries non belonging to EU25: Iceland, Norway and Switzerland); plus 1 Eurasian country (Turkey); and plus 4 Asia-Pacific countries (Japan, South Korea, Australia and New Zealand). Exponential rates of growth of any variable X has been calculated, in percentage: d(ln(X))*100. Annual increase of real Gdp per inhabitant in dollars at 2000 prices and Purchasing Power Parities (PPPs). Source: Elaboration from WB(2006) and OECD several years.

Graphs 4 and 5 shows that the population of China and India has experienced impressive increase during the period 1965-2005. China has surpassed the population of OECD countries since 1976 and India will reach the level of population of OECD very soon after 2005. Fortunately for their economic development, both China and India have moderated the rates of population growth as seen in graph 2, and the trend is to convergence with OECD rates.

Graph 4. Population (thousand people)



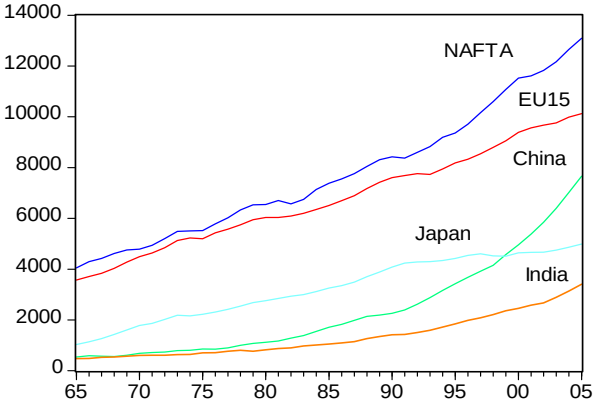
Graph 5 . Rates of population growth (annual percentage)



In countries with high educational level, like the majority of OECD countries, fertility rates are low and the rates of population growth are generally below 1% per year, although immigration may increase this percentage, what leads to higher increases in real Gdp per inhabitant for a given increase of production as seen in Guisan, Aguayo and Exposito(2001) and other studies.

Graph 6 shows the evolution of real Gdp, expressed in billion dollars at 2000 prices and PPPs, in China and India in comparison with NAFTA countries (USA, Canada and Mexico), EU15 (the 15 countries that belonged to the European Union before 2004, listed at the footnote of graph 1) and Japan. This variable has experienced high increases in the two big Asian countries, particularly in China, which surpassed Japan and reached in year 2005 a value very close to the 15 countries of the EU15. India will reach the Japan level of production in a few years and probably will maintain a steady growth for the following decades.

Graph 6. Real Gdp (Bn $ at 2000 prices and PPPs)



As it has been analyzed in Guisan, Aguayo and Exposito(2001), Guisan(2004) and (2005), among other studies, the great importance of industrial take off, and the increase in the educational level of population, are the main economic factors to explain the acceleration in economic growth and development of China and India. In the next

sections we present an analysis of production by sector to remark the great importance of manufacturing and industrialization in the areas of this study.

3. Production by sector in Agriculture, Industry and Services

Table 1 shows the evolution of real Gross Domestic Product (Gdp) by sector in 1999-2005, in dollars at 2000 prices and Purchasing Power Parities (PPPs), and table 2 presents shows the evolution of real Gdp per inhabitant at sector level for the period 1985-2005.

Data have been elaborated from World Bank statistics, with provisional own estimations in case of non available data. The factor of conversion of dollars at exchange rates to dollars at Purchasing Power Parities has been generally taken from WB(2006) but in a few cases data are from OECD statistics, particularly in case of non available data. International comparisons at PPPs may undervalue or overvalue the values of real Gdp in some sectors, likely the value of Agriculture could be overvalued and the value of Services undervalued in the cases of China and India in comparison with OECD, but in spite of these limitations the comparison at PPPs is in this case much better than the comparison with values at Exchange Rates.

Table 1 show an increase of 19% in real Gdp of Agriculture and Fishing in China and India during the period 1999-2005, and increase of 74% in Industry and Building and 70% in Services, all in a short span of only 6 years. Although the main increases have been experienced by China it is expected a similar growth in India for the following years. The sum of Agriculture and Fishing of China and India is higher than this variable in the 30 OECD countries here analyzed. The sum of Industry in China and India is already below the OECD value but has increased from 126% of 15 European Union countries (EU15) in year 1999 to 203% in year 2005. Services in China and India has also experienced an outstanding increase from 54% of EU15 value in year 1999 to 80% in year 2004.

Table 1. Real Gdp by Sector (Bn dollars, 2000 prices and PPPs), 1999-2005

Country	**Agriculture and Fishing**		**Industry and Building**		**Services**	
	1999	**2005**	**1999**	**2005**	**1999**	**2005**
Australia	16.9	17.6	121.1	133.4	319.5	368.6
Austria	4.4	4.5	60.7	68.8	132.2	144.0
Belgium	3.4	3.5	63.6	69.4	163.3	184.9
Canada	18.8	17.7	250.1	273.0	489.0	566.2
Czech R.	5.1	6.6	49.9	59.0	74.3	85.1
Denmark	3.5	3.8	34.4	34.0	87.9	100.0
Finland	4.0	4.2	36.5	42.4	68.4	81.0
France	40.8	40.2	307.7	344.6	1007	1142
Germany	24.0	24.3	547.7	581.7	1252	1390
Greece	12.0	11.7	33.08	42.2	101.7	134.2
Hungary	4.9	6.5	33.06	40.0	63.9	76.1
Iceland	0.6	0.6	1.7	1.7	4.22	4.66
Ireland	3.1	2.9	37.3	45.6	47.5	75.4
Italy	37.9	37.0	363.	378.8	843.9	934.6
Japan	45.1	41.9	1018	1118	2155	2294
Korea R.	32.8	33.0	248.9	352.9	349.8	431.7
Luxembourg	0.1	0.1	3.51	4.3	13.94	17.5
Mexico	33.7	36.9	215.3	232.5	514.9	623.0
Netherlands	10.9	11.0	100.1	103.0	262.9	289.2
New Zealand	6.3	7.1	18.4	20.5	46.9	54.5
Norway	3.1	3.1	58.6	60.6	75.1	86.2
Poland	18.8	21.1	110.2	127.8	221.1	258.2
Portugal	5.7	5.7	44.4	44.4	98.0	109.2
Slovakia	2.3	2.8	17.5	21.6	36.7	44.7
Spain	32.7	33.0	215.0	257.1	489.0	595.7
Sweden	3.9	4.4	57.2	71.9	138.2	155.0
Switzerland	3.1	2.9	57.8	61.0	135.2	142.1
Turkey	58.8	64.9	95.4	122.3	221.5	291.7
UK	14.1	14.2	370.9	378.0	889.4	1084
USA	99.5	109.2	2113	2383	6559	8189
EU15	201	201	2276	2466	5597	6438
China	797	987	2308	4170	1968	3462
India	539	603	562	838	1076	1707
OECD30	552	574	6686	7475	16866	19956

Table 2. Real Gdp per inhabitant and by sector, 1985-2005 ($2000 PPPs)

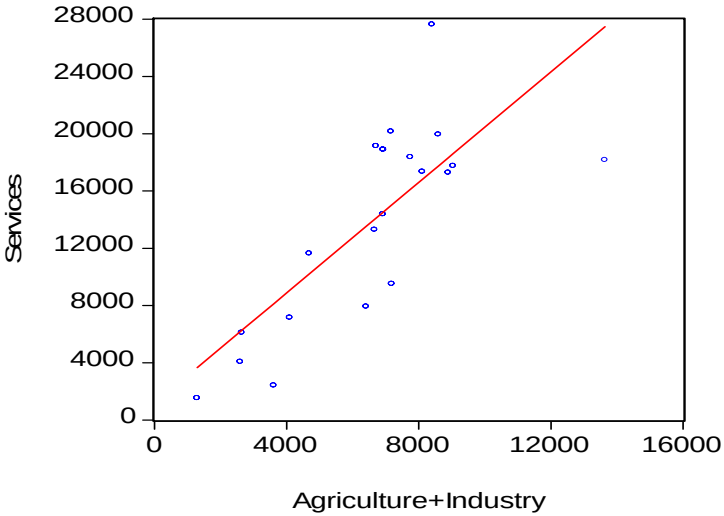
Country	Agriculture and Fishing		Industry and Building		Services	
	1985	2005	1985	2005	1985	2005
Australia	768	933	5469	6817	12033	18366
Austria	461	503	5458	8539	12032	17750
Belgium	245	331	5080	6602	13096	18874
Canada	564	542	6985	8358	12391	17285
Czech R.	418	625	6173	6566	6956	9519
Denmark	396	647	5506	6277	12724	18884
Finland	967	830	5126	8109	10822	15970
France	615	621	4566	5799	12971	18900
Germany	275	310	6334	7203	10052	16682
Greece	1184	952	2776	3669	8388	13011
Hungary	831	877	3068	4351	5873	8493
Iceland	2090	2007	5649	5644	10084	15768
Ireland	945	709	8872	10966	5108	18143
Italy	484	631	5233	6369	11501	16390
Japan	546	413	6706	8663	11600	17536
Korea, R.	677	695	2043	7661	3367	9241
Luxembourg	299	214	4863	8532	17282	42144
Mexico	393	361	1823	2287	4863	6101
Netherlands	487	715	5563	6452	13136	20158
New Zealand	1318	1713	5091	4952	9956	13284
Norway	517	691	8376	12940	11281	18162
Poland	491	557	2385	3546	4938	7151
Portugal	687	528	2542	4167	6727	11638
Slovak Rep	473	783	3276	5634	6185	7925
Spain	551	782	3721	6136	8340	14374
Sweden	485	424	4578	7690	12510	17340
Switzerland	630	415	9029	8180	19978	19938
Turkey	965	904	989	1704	2612	4062
UK	237	244	5335	6476	10756	19147
USA	291	368	6043	8041	17802	27629
China	396	688	399	2926	453	2422
India	441	544	297	752	499	1537
OECD30	474	504	4919	6467	11195	17274

Source: Elaborated by Guisan and Exposito from World Bank Statistics, OECD and own estimations in case of non available data.

Values per inhabitant in China and India have reached levels similar or higher than OECD countries in Agriculture and Fishing, and have shown an important take off in industry, particularly in China, although they are clearly below than OECD average. Development in Services has experienced and increase of more than 400% in China and 200% in India during the period 1985-2005 and it is expected to experience an outstanding increase in the following years if industrial development increases as expected.

Graph 7 shows the important positive relationship that exists between Services by one side and Agriculture and Industry by the other one, with the sample of 32 countries included in table 2 (excluding Luxembourg due to the particular circumstances of development of international services in this small country).

Graph 7. Inter-sector relationships of real Gdp per inhabitant
Cross-section sample of 32 countries in year 2005



Services depends positively on the evolution of the sum of "Agriculture and Fishing" and "Industry" both from the supply side (they provide goods necessary as intermediate outputs for the development of services) and from the demand side (they provide income to families, enterprises and institutions which they use to

increase their demand for services and/or building). As production in Agriculture and Fishing has usually a limited capacity to increase for several reasons (both from supply and demand sides) it follows that usually industrial development is essential to foster services.

Tables A1 and A2 in the Annex present more detailed data of production by sector in industry of China and India, and the following tables refer to regional development in India and China.

Table 3 regional development in China

		Nb (units Enterprises	Gross Industrial Value Bn	Emplo yed thousand	Population million	Ph Yuan unit
1	Beijing	31670	597	1580.3	14.930	37058
2	Tianjin	25650	611	1689.3	10.240	31550
3	Hebei	64630	1019	4409.9	68.090	12918
4	Shanxi	28883	417	2781.3	33.350	9150
5	Inner Mongolia	11849	232	1101.4	23.840	11305
6	Liaoning	54607	914	3542.0	42.170	16297
7	Jilin	16363	355	1382.9	27.090	10932
8	Heilongjiang	20303	395	1874.8	38.170	13897
9	Shanghai	55806	1459	3409.3	17.420	55307
10	Jiangsu	188841	2947	10189.1	74.330	20705
11	Zhejiang	188919	2122	8615.9	47.200	23942
12	Anhui	39265	423	2358.1	64.610	7768
13	Fujian	49838	751	3645.3	35.110	17218
14	Jiangxi	29467	273	1791.7	42.840	8189
15	Shandong	120672	2467	9359.3	91.800	16925
16	Henan	76895	923	5302.5	97.170	9470
17	Hubei	29262	532	2354.8	60.160	10500
18	Hunan	43925	434	2624.0	66.980	9117
19	Guangdong	137650	3151	13381.3	83.040	19707
20	Guangxi	19081	224	1266.7	48.890	7196

21	Hainan	2066	43	147.7	8.180	9450
22	Chongqing	20509	259	1446.2	31.220	9608
23	Sichuan	43759	530	2973.1	87.250	8113
24	Guizhou	11121	154	938.9	39.040	4215
25	Yunnan	14403	234	1035.3	44.150	6733
26	Tibet (Xizang)	356	2.5	23.1	2.740	7779
27	Shaanxi	25785	315	1754.3	37.050	7757
28	Gansu	11663	169	980.9	26.190	5970
29	Qinghai	2199	39	181.0	5.390	8606
30	Ningxia	4019	60	331.1	5.880	7880
31	Xinjiang	5807	165	568.1	19.630	11199
	Total	1375263	22231	93039.4	1301.5	13033

Source: Elaborated from Government of China Statistics: Indicators of Industry by region 2004 and other tables. Ph is Gdp per inhabitant.

Table 4. Regional development in India.

		Ph 1993-94	Ph 2004-05	Population 2001
1.	Andhra Pradesh	7416	12352	76.210
2.	Arunachal Pradesh	8733	10348	1.098
3.	Assam	5715	6721	26.656
4.	Bihar	3037	3773	82.998
5.	Jharkhand	5897	8025	26.946
6.	Goa	16558	24797	1.348
7.	Gujarat	9796	16878	50.671
8.	Haryana	11079	16872	21.145
9.	Himachal Pradesh	7870	13471	6.078
10.	Jammu and Kashmir	6543	8075	10.144
11.	Karnataka	7838	13820	52.850
12.	Kerala	7983	13321	31.841
13.	Madhya Pradesh	6584	8238	60.348
14.	Chattisgarh	6539	8266	20.834

15.	Maharashtra	12183	17864	96.879
16.	Manipur	5846	8015	2.167
17.	Meghalaya	6893	11278	2.319
18.	Mizoram	NA	NA	0.889
19.	Nagaland	9129	NA	1.990
20.	Orissa	4896	7176	36.805
21.	Punjab	12710	16756	24.359
22.	Rajasthan	6182	9853	56.507
23.	Sikkim	8402	12637	0.541
24.	Tamil Nadu	8955	13999	62.406
25.	Tripura	5534	NA	3.199
26.	Uttar Pradesh	5066	6138	166.198
27.	Uttaranchal	6896	10584	8.489
28.	West Bengal	6756	12271	80.176
29.	A & N islands	15192	NA	0.356
30.	Chandigarh	19761	35452	0.901
31.	Delhi	18166	31345	13.850
32.	Pondicherry	9781	29893	0.974
	Total	7690	19297	1028.172

Data: Ph: Production in Rupees per inhabitant, base 93-94 for year 93-94 and base 99-00 for year 2004. The sum of population in table 1 is below the value of 1032.473 total population for India in 2001 in WB(2006). Source: Elaborated from Indian Government Statistics.

We may notice that the highest levels of production per inhabitant in Services correspond to regions with more favorable conditions: higher level of industrial development, tourism, trade and other features which increase both the demand and supply of services. The important infrastructures that have been built during the last years and those which will be constructed during the following years are of uppermost importance to benefit the more lagged regions and contribute to their convergence with the most developed ones.

4. Cross-country econometric model of Gdp in Services.

The following model shows the impact of the development of Agriculture and Industry on Services. We relate Gdp per inhabitant of Services in year 2005 with its initial value in year 1985 and the increase in Gdp per inhabitant of Agriculture and Industry during the period 1985-2005. The sample corresponds to the 32 countries included in table 2.

Equation 1. Gdp per inhabitant at $2000 PPPs. Without dummies
Dependent Variable: Services05
Method: Least Squares. Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Services85	1.374631	0.082886	16.58457	0.0000
D(Agri+Industry)	1.231781	0.406901	3.027225	0.0050

R-squared	0.783920	Mean dependent var	15119.51
Adjusted R-squared	0.776717	S.D. dependent var	7715.873
S.E. of regression	3645.967	Akaike info criterion	19.30109
Sum squared resid	3.99E+08	Schwarz criterion	19.39270
Log likelihood	-306.8175	Durbin-Watson stat	2.026155

Equation 2. Gdp per inhabitant at $2000 PPPs. With dummies
Dependent Variable: S05HPP
Method: Least Squares. Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Services85	1.336574	0.041025	32.57965	0.0000
D(Agri+Industry)	0.857299	0.203508	4.212603	0.0002
D13 Ireland	9722.340	1813.242	5.361856	0.0000
D17 Luxembourg	15973.68	1888.597	8.457964	0.0000

R-squared	0.951394	Mean dependent var	15119.51
Adjusted R-squared	0.946186	S.D. dependent var	7715.873
S.E. of regression	1789.921	Akaike info criterion	17.93420
Sum squared resid	89706846	Schwarz criterion	18.11742
Log likelihood	-282.9472	Durbin-Watson stat	1.806599

Development of Services presents a significantly coefficient of its lagged value higher than one, what shows the trend to increase services activities at some degree even when the other sectors do not increase. The coefficient of the increase of real Gdp of Agriculture

and Industry on Services is near unity, a little higher in the equation without dummies and a little lower in the equation with dummies, which takes into account the special circumstances of Ireland and Luxembourg.

5. Conclusions

China and India have experienced an important take off during the last decades, particularly in the case of China, and both are likely to experience a higher degree of convergence with real Gdp per inhabitant of some OECD countries. This evolution may have positive consequences both for their domestic markets, at country and regional level, and at international level. It is important to analyze the main factors that may contribute to higher levels of development in all the regions of those countries.

The econometric model shows that the main factor explaining the increase in real Gdp of Services per inhabitant is generally the increase of real Gdp of Agriculture and Industry. As Agriculture has usually a limited capacity to increase the main policies should be addressed to the development of Industry per inhabitant, which require to be successful important efforts to increase the educational level of population as has been stated in section 2.

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