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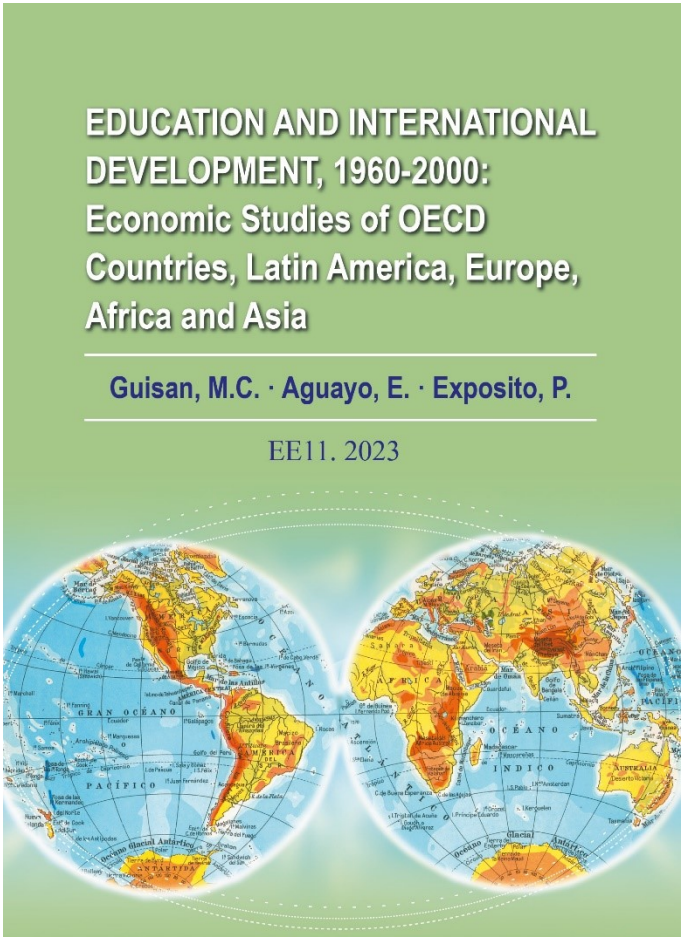

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EDUCATION AND INTERNATIONAL DEVELOPMENT, 1960-2000: ECONOMIC STUDIES OF OECD COUNTRIES, LATIN AMERICA, EUROPE, AFRICA AND ASIA

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Abstract: This book, EE11, presents a summary of several international studies published by the authors on international development for the period 1960-2000.. EE11 includes 5 chapters: 1) Evolution of Gross Domestic Product and Population in the World for the 20th century and indicators of Education and Production per capita by sector in 21 areas of America, Europe, Eurasia, Africa, Asia and Pacific. in years 1980 and 1999. The chapter slso includes a summary of several international models of World development estimated by our research team for the period 1960-2000. 2) International panel models f OECD countries for the 20th century: Production, Employment, Wage and Consumption. 3) Production by sector in OECD countries: Agriculture, Industry, Building and Services. 4) Studies related with economic development of Latin American countries (Education, Trade and Production per capita) for the period 1960-2000. The analyzes highlight the positive impact of Education on international development. 5) A comparison of regional development in Europe and the United States for 1960-2000. This book is scheduled to be followed by another book, EE12, with contents of our research on international development for the period 2001-2023

JEL codes: C51, O5, O51, O52, O57
Keywords: Growth and Development, OECD countries in the 20th century, European Regions, Production and Employment by Sector, Latin America in the 20th century, Africa, Asia, Studies of the period 1960-2000.

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Website: https://www.usc.gal/econo met/ahg11.htm

Prologue

EE11 is a book of the Series EE, published by the AHG with the cooperation of the Euro-American Association of Economic Development Studies (EAAEDS). It includes references to econometric studies, published by our research team for 1975-2005, with samples of the period 1960-2000.

Chapter 1 analyses the evolution of World Production, Population and Production per capita for the 20th century and indicators of Education and Production by sector in 21 areas of the World in years 1980 and 1999. It also cites several international models, published by our research team, relating Education and Development for the second half of that century.

Chapter 2 presents the estimation of several equation for Gross Domestic Product per capita, real Wage and Employment with a panel of 6 OECD countries (France, Germany, Italy, Spain, UK and USA) for the period 1960-2000, and the analysis of causality between Consumption and Production per capita, with a sample of 625 observatios of 25 OECD countries in 25 years.

Chapter 3 includes references to studies of production and employment by sector in OECD countries: Agriculture, Industry, Building and Services.

Chapter 4 analyzes the results of several studies of Education and Development in Latin American countries: model by Guisan(1984), presented at the EADI Conference at Madrid, the study by Guisan, Aguayo and Neira(1997), at the EADI Conference at Paris, the model by Guisand et al(1997) on Centroamerica, and the studies by Neira et al(1997) and (1998). We also cite 3 studies on regional development in Latin American countries.

Chapter 5 includes contents related with regional development in Europe and the USA for the period 1960-2000.

Since year 2001 we have published many electronic and printed journals, books, reports and documents, on international development, which are available at Ideas.Repec and at: https://www.usc.gal/economet/eaat.htm

EE12 is a book scheduled to appear in year 2023 including international studies, of econometric models of develelopment, published by our research team with samples of the period 2001-2023.

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Santiago de Compostela. 15h May of 2023.
https://www.usc.gal/economet/ahg.htm
https://www.usc.gal/economet/guisan2.htm

CHAPTER 1
WORLD DEVELOPMENT IN THE 20TH CENTURY: EVOLUTION AND ECONOMETRIC MODELS

GUISAN, Maria-Carmen

1.1. World development 1900-2000: GDP, Population and GDP per capita

Tables 1.1 and 1.2 show the exponential annual rates of real Gross Domestic Product (GDP), Population (Pop) and real GDP per capita (PH), for the first and second half of the 20th century. Table 1.3 presents the average annual rates for the period 1913-1998.

Sources of data are Maddison(2001), Liesner(1985) and other historical statistics for the first half of the century and the World Bank and other sources for the second half. Data of GDP are expressed in Dollars at constant prices and purchasing power parities of year 1990.

The areas, accordingly to Maddison classification are Western Europe, United States and other countries (Canada, Australia and New Zealand), Japan, Asia excluding Japan, Latin America, Eastern Europe and Eurasia (including Easter Europe, Turkey, Russia and countries of the forme USSR belonging to the Commonwealth of Independent States or CIS), and Africa.

For the first half the highest rates of annual increase of GDPH corresponded to the United States (and other countries of that group), Eastern Europe and Eurasia, and Latin America. Western Europe experienced a low rate of annual growth of GDPH mainly due to the effects of the first and the second world wars and other wars of that period.

The World average rate of annual growth of Production per capita (GDPH) was higher in the second half (2.07%) than in the first half (0.90%) and the average annual rate for all the century was 1.56%.

The World average rate of GDP amounte to 1.83% for the first half, 3.84% for the second half and 1.97% for the 20th century.

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The World average rate of Population growth was 0.93% for the first half of the century, 1.77% for the second half, and 1.40% for the 20th century.

Table 1.1. Exponential rates (%) of GDP, Population and GDPH, 1913-1950

Area	GDP	POP	GDPH
Western Europe	1.18	0.42	0.76
USA and other countries	2.77	1.24	1.53
Japan	2.19	1.30	0.89
Asia excl. Japan	0.90	0.92	-0.02
Latin America	3.37	1.95	1.42
Eastern Europe and Eurasia	1.82	0.34	1.48
Africa	2.65	1.64	1.01
World	1.83	0.93	0.90

Source: Elaborated by Guisan, Aguayo and Exposito (2001) from data by Maddison(2001). The group "USA and other countries", by Maddison. includes USA, Canada, Australia and New Zealand.

Table 1.2. Exponential rates (%), of GDP, Population and GDPH, 1950-1998

Area	GDP	POP	GDPH
Western Europe	3.34	0.50	2.84
USA and other countries	3.42	1.26	2.16
Japan	5.78	0.86	4.92
Asia excl. Japan	5.19	2.00	3.19
Latin America	4.04	2.33	1.71
Eastern Europe and Eurasia	1.97	0.90	1.07
Africa	3.49	2.50	0.99
World	3.84	1.77	2.07

Source: See footnote of table 1.1.

Foe the second half the highest rates of annual increase of GDPH correspondd to Japan, Asia excluding Japan and Western Europe

For all the century, the average higher rates of annual growth of GDPH corresponded to Japan, Western Europe and the group of the United States and other countries, most of them belonging to the OECD (Organization for Economic Cooperation and Development).

Table 1.3. Exponential rates of real GDP, Population and GDPH for 1913-1998

Area	GDP	POP	GDPH
Western Europe	2.40	0.47	1.93
USA and other countries	3.14	1.25	1.89
Japan	4.22	1.05	3.16
Asia excl. Japan	3.32	1.53	1.79
Latin America	3.75	2.16	1.59
Eastern Europe and Eurasia	1.91	0.66	1.25
Africa	3.12	2.12	1.0
World	2.97	1.40	1.56

Source: See footnote of table 1.1. Note: Column (3) is the difference between the values of columns(1) and (2).

For the 20th century, the most moderate rates of population growth corresponded to Western Europe and to the group of Eastern Europe and Eurasia. The areas with the highest rates of population growth were Latin America and Africa.

The exponential rate of annual Growth of GDPH is exactly the differencie between the rate of increase of GDP and the rate of increase of Population.

Countries with high levels of Education usually experience moderate increase of population growth, which favors the increase of savings per capita, investiment per capita and economic development.

Education usually contributes to increase industrialization, and the increase of real production per capita usually have a positive impact on the development of other sectors, particularly in many activities of Services sectors. The following table shows great differences in the Educational level of different areas of the World, outstanding the OECD countries.

Table 1.4. Average Years of Education of the adult population.1970-1990

AREA	**1970**	**1990**
Developing Countries	2.66	4.43
Middle East and North Afr.	2.05	4.47
Sub-Saharian Africa	2.06	2.93
Latin America	3.82	5.24
East Asia and South Pacific	3.80	6.08
South Asia	2.03	3.85
OECD	7.58	9.02

Source: Elaborated from Barro and Lee data.

1.2. Education and Production by sector in 21 areas of the World, 1980-1999.

The lists of the countries by area is includes in Figures 1.1 to 1.4.

Figure 1.1. Areas of America

Am1. USA and Canada

Am2. Mexico and Central America: Costa Rica, Dominican R., El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua and Panama

Am3. West South America (Andean America): Bolivia, Chile, Colombia, Ecuador, Peru, Venezuela.

Am4. East South America: Argentina, Brazil, Paraguay and Uruguay

Figure 1.2. Areas of Europe and Eurasia

Eu1. *Nordic and British Europe*: Denmark, Finland, Ireland, Norway, Sweden, United Kingdom

Eu2. *Central-Western Europe*: Austria, Belgium, Germany, Netherlands and Switzerland.

Eu3. *Latin Europe*: France, Italy, Portugal and Spain

Eu4. *Central-Eastern Europe, Baltic and East Mediterranean*. Includes East Central Europe: Czech Republic, Hungary, Poland, and Slovak. Baltic countries: Estonia, Latvia, and Lithuania. East Mediterranean: Albania, Bulgaria, Croatia, Greece, Macedonia, Romania and Slovenia. In this area we also include Turkey, an Eurasian country that belongs to the Council of Europe.

Eu5. *Russia and CIS*: Includes *3 East European Countries*: Belarus, Moldova and Ukraine, *4 Eurasian countries*, which belong to the Council of Europe: Russia and the 3 Caucasus countries (Armenia, Azerbaijan, and Georgia), and *5 Central Asian countries* which belong to the Community of Independent States (CIS): Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan.

Figure 1.3. Areas of Africa.

Af1. *Northern Africa*: Algeria, Egypt, Mauritania, Morocco and Tunisia.

Af2. *North Western Africa*: Cote d´Ivoire, Ghana, Guinea, Nigeria, Senegal, Sierra Leone, Togo

Af3. *Sahel and Central Africa*: Burkina-Faso, Burundi, Cameroon, Central African R., Chad, Congo D.R. , Congo R., Mali, Niger, Rwanda.

Af4. *North Eastern Africa*: Eritrea and Ethiopia.

Af5. *Eastern Africa*: Kenya, Madagascar, Tanzania, Uganda

Af6. *Southern Africa*: Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe.

Figure 1.4. Areas of Asia and Pacific

As1. *Western Asia*: Israel, Jordan, Kuwait, Lebanon, Saudi Arabia, Syria and Yemen.

As2. *South Central Asia*: Afghanistan, Iran and Pakistan.

As3. India and South: Bangladesh, India, Nepal and Sri Lanka.

As4. *China and North East*: China, Hong-Kong, Japan, South Korea and Mongolia.

As5.. *Indochina or South East*: Cambodia, Lao, Myanmar, Thailand and Vietnam.

As6. *South Pacific*: Australia, Indonesia, Malaysia, New Zealand, Papua-New Guinea, Philippines and Singapore.

In table 1.5 we may notice that the most outstanding areas by Public Expenditure per capita in Education (Eduh) in the period 1990-1999, were: Am1 (USA and Canada with 1396) and Eu1 (Nordic and British Europe with 1192). In table 1.6 we may notice that those areas, with the highest indicators of Education are also those with the highest levels of Industry and Development.

Table 1.5. Indicators of Education and Population, 1999

Area	Name	pop 80	pop 99	eduh 95	tyr 99	fer 99
Am1	USA & Canada	251.8	303.5	1396	12.1	1.9
Am2	Mexico & Central Am.	103.0	151.1	307	5.9	3.1
Am3	Andean America	85.3	125.9	204	6.1	3.0
Am4	South America West	155.8	213.4	260	5.3	2.4
Eu1	Nordic &British Europe	82.3	87.0	1122	9.7	1.7
Eu2	Germanic and Benelux	116.6	123.7	942	9.5	1.4
Eu3	Latin Europe	157.6	166.2	969	7.4	1.4
Eu4	Central+Baltic+East Med	179.9	205.2	234	7.0	1.8
Eu5	Russia and 11 CIS	258.4	283.8	212	6.9	1.0
Af1	North Africa	90.0	138.4	237	4.8	3.3
Af2	NW Africa	112.8	195.5	29	2.8	5.7
Af3	Sahel&C.Africa	73.7	127.6	21	2.5	6.6
Af4	NE Africa	61.8	103.5	36	2.1	6.4
Af5	Eastern Africa	58.7	101.9	44	3.1	5.7
Af6	Southern Africa	69.3	110.8	152	4.9	5.0
As1	Western Asia	53	102	245	4.6	5.3
As2	South Central Asia	137	223	128	3.3	4.7
As3	India + South	804	1169	46	4.5	3.4
As4	China and N.E.	1143	1433	149	6.2	1.7
As5	Indochina	179	245	99	4.7	2.8
As6	South Pacific	236	341	157	6.0	2.8
Total	World	4429	5970	258	5.8	2.8

Notes: Source of data and definitions in table 1.1. Notes: Pop is Population in thousand people, Tyr is the average total years of schooling of adult population, Eduh is average annaul expenditure per capita on public education of the previous decade, and Fer is the Fertility rate or average numbers of children per woman.

Tables 1.6 and 1.7 present data of real Production per capita in the 21 areas and the World, in the sectors of Agriculture, Industry (including Building), Services and Total, with data from the World Bank.

Table 1.6. Production per capita by sector in 21 areas, 1980-1999: Agricultura and Total (Dollars per inhabitant at 1999 prices and PPPs)

Nb	Name	Agri 80	Agri 99.	Total 80	Total 99
Am1	USA&Canada	443	653	22062	31319
Am2	México&C. Am.	573	481	6716	6717
Am3	Andean America	629	569	5052	5726
Am4	America South E.	575	694	6901	8203
Eu1	Nordic&Britigsh	300	353	14306	22677
Eu2	German&Benelux	272	360	18387	24723
Eu3	Latin Europe	521	561	15142	21132
Eu4	Europe East & E.Med.	821	808	6659	8372
Eu5	Russia & 11 CIS	527	563	9229	5501
Af1	Africa North	537	636	3252	4102
Af2	Africa NW	410	401	1448	1273
Af3	Af Central .& Sahel	526	481	1925	997
Af4	Africa North East	406	311	673	672
Af5	Africa East	335	317	822	865
Af6	Africa South	322	324	4958	4614
As1	Western Asia	610	541	9463	7020
As2	South C. Asia	372	628	2375	2988
As3	India and South	489	628	1169	2285
As4	China and NE	348	630	2539	6209
As5	Indochina	461	645	1399	3022
As6	Pacific South	592	645	3295	5061
Total	World	462	591	5434	7031

Source: Elaborated by M.C. Guisan from World Bank statistics.

In the period 1980-1999 there was an increase of real Value-Added per capita of Agriculture in the World, from 462 to 591 Dollars at constant prices, with an increase of almost 28%. There was also an increase in total production per inhabitant, measured by real GDP per capita, which evolved from 5434 to 7031 Dollars at constant prices, with an increase amounting to 29%.

Table 1.7. Production per capita by sector in 21 areas, 1980-1999:
Industry and Services (Dollars per inhabitant at 1999 prices and PPPs)

Nb	Name	Ind 80	Ind 99	Serv 80	Serv 99
Am1	USA & Canada	5180	8300	16439	22366
Am2	México & Central Am.	1692	1797	4451	4439
Am3	Andean America	1353	1661	3069	3496
Am4	America South East	2203	2435	4122	5074
Eu1	Nordic&Britigsh Europe	4456	6849	9549	15475
Eu2	Germanic Eur. & Benelux	6383	7298	11732	17065
Eu3	Latin Europe	4966	6256	9655	14315
Eu4	Europe East & E.Med.	2342	2647	3496	4917
Eu5	Russia& CIS	4241	1899	4461	3098
Af1	Africa North	1423	1565	1291	1901
Af2	Africa NW	605	434	434	438
Af3	Af Central .& Sahel	464	190	935	326
Af4	Africa North East	52	58	215	303
Af5	Africa East	118	141	370	407
Af6	Africa South	1920	1542	2716	2748
As1	Western Asia	4600	2940	4252	3538
As2	South C. Asia	1006	880	998	1480
As3	India and South	248	575	431	1082
As4	China and NE	917	2736	1273	2843
As5	Indochina	310	999	628	1378
As6	Pacific South	1091	1819	2605	2597
Af1	Africa North	1423	1565	1291	1901
Total	World	1732	2285	3240	4154

Source: Elaborated by M.C. Guisan from World Bank statistics.

The World average of Industrial production per capita evolved from 1732 to 2285 Dollars at constant prices for the period 1980-1999, with an increase of almost 32%, and Services production per capita evolved, for the same period, from 3240 to 4154 Dollars at constant prices with an increase of 28%.

There are important differences between the countries that have experience low levels of the indicators of Education in comparison with the highest levels. Areas with highest levels of industrialization, with 6000 or more Dollars per capita, usually have high educational levels and high values of GDP per capita.

1.3. World models of Education and Development, 1960-2000.

We have analyzed international contributions to the empirical estimation of international econometric models of the impact of Education on economic development corresponding to samples of the second half of the 20th century, in several studies, like the following ones: pioneer books on international models of OECD countries, by Guisan(1975) and Guisan(1983). Book by Neira and Guisan(2000) on Education and World Development. Books by Guisan et al (2001), OECD1, and Guisan et al(2004), OECD2, on economic development of OECD countries for 1960-2000. and in several articles published in the journal AEID and in other journals.

Here we cite some studies of our research team developed with World samples, while, in section 1.4, and in chapter 2 and 3 of this book, we refer to several econometric models of specific groups of countries (OECD, Latin America or other ones), with samples of the period 1960-2000. Models including samples of the 21st century will be analyzed by Guisan(2023) in the book EE12 of this series.

Econometric model by Guisan(1997), 22nd SID Congress: *37 countries*

This was a pioneer econometric model on the impact of Education on International Development, presented at the 22nd Congress of the Society for Intrnational Development, held in Santiago de Compostela (Spain) in 1997, and published in electronic version as Working Paper 18 in the series Economic Development by Guisan(1997), available at Ideas.Repec.

Figure 1.5. Society for International Development World Conference 1997

SID Society for International Development World Conference 1997 Congresses Palace Santiago de Compostela,Spain	**Economic Growth and Education: A New International Policy** Maria-Carmen GUISAN *22nd Congress of the Society for International Development* Electronic edition: Guisan(1997). Economic Development 18 at Ideas.Repec

The study by Guisan(1997) includes the estimation of a model with a sample of 37 countries in year 1994, relating the variables GDP94H (Gross Domestic product per head in year 1994) with SK94H (Stock of Capital per

head) and the Educational level measured by the variable PS2 (proportion of adult Population with upper secondary level of studies or more).

Data of GDP94H were elaborated from the publication of Cordelier and Didiot, based on United Nations Statistics, data from Summers and Heston(1997) for SK94H and data from Barro and Lee(1993) and OECD(1995) for PS2.

This was a pioneer international study with a model linking the Education level of many areas of the World, the Stock of Capital per capita and Production per capita. The estimated equation including dummy variables for some particular countries was the following one:

$$\widehat{GDP94H}_i = 627 + 0.0800\ SK94H + 184 * PS2 + \text{effect of dummy variables}$$
$$(1.08)\quad (4.63)\qquad\qquad (7.79)$$

where the terms in brackets are the t of Student statistics. This means that the coefficients of the the 2 explanatory bariables are positive and significant, for Capital per head (SK94H) and the educational level (PS2=proportion of adult people with at least upper secondary education)

The coefficients of the dummy variables where positive and significant for countries 19, 26, 29 and 30. There was a coefficient negative but not significant for country 37. The goodness of fit was high with a determination coefficient of 0.9088.

Figure 1.6. List of countries in the econometric model by Guisan(1997)

1.-Egypt	11.-Bangladesh	21.-Finland	31.-Sweden
2.-Ethiopia	12.-China	22.-France	32.-Switzerland
3.-Nigeria	13.-India	23.-Germany	33.-Turkey
4.-South Africa	14.-Iran	24.-Hungary	34.-United
5.-Canada	15.-Japan	25.-Ireland	Kingdom
6.-Mexico	16.-South Korea	26.-Italy	35.-Australia
7.-USA	17.-Thailand	27.-Netherlands	36.-New
8.-Argentina	18.-Austria	28.-Poland	Zealand
9.-Brasil	19.-Belgium	29.-Portugal	37.-Russia
10.-Colombia	20.-Denmark	30.-Spain	

The study shows the differences of Education expenditure and development in 40 aras of the World, regarding the values of Gross Domestic Product per capita (GDPH) and public expenditure on Education per capita (EDUH). The value of GDPH in year 2004 varied the lowest values below 1000 and areas

over 20000, with a World average of 5620. Eduh varied from a minimum lower than 100 and more than 1000 Dollars per capita and year in the most outstanding area, with a World average of 257.
Econometric Model by Neira&Guisan (1997),AEDE Congress: 117 countries.

We summarize the studiy by Guisan and Neira (1997), published in EcoDev 18, related with education and development in 117 countries in years 1960 and 1990 and Neira and Guisan(2000) with the estimation of an econometric model of Education and Development in 19 OECD countries, with quinquennial data for the period 1960-1990.

Figure 1.7. Guisan and Neira(1997). AEDE.

AEDE ASOCIACIÓN DE ECONOMÍA DE LA EDUCACIÓN *VI Congress of the Assocation of Economics of Education/Asociación de la Economía de la Educación* Vigo (Spain), 1997	**Education and growth: a World Perspective, 1960-1990** Guisan, Maria-Carmen Neira, Isabel. Spanish version: Educación y crecimiento una perspectiva mundial, 1960-1990, in EcoDev 18

Iin the contribution to the AEDE Congress and in the working paper nº 15 of the series Economic Development, analyze the educational level of 119 countries of the World, based on the statistical data published by Barro and Lee and OECD(1995).

The study includes a wide summary of international sources of data by Barro and Lee (1996), OECD(1995) and CORDELLIER and DIDIOT (1996), and analyzes interesting contributions to the role of Education on economic growth and development, by Solow, Denison, Romer and LucaS, as well as other outstanding contributions by Barro and Sala-i-Martin, by Mankiew, Romer and Weill , Guisan(1997) and Arranz, Freire and Guisan(1997).

Neira and Guisan(1997), in EcoDev 18, estimated a logarithmic production function where GDPH is a function of SK94 and indicators of Education (PS2 and Eduh), with a sample of 110 countries in 1960 and 1990. They found positive effects of the indicators of Education on GDPH.

Guisan and Neira (1997) state: *"In Arranz, Freire And Guisan (1997) the percentage of the active population with completed secondary studies is used, as an indicator of the educational level, in the estimation of an international*

production function with data from 37 industrialized and non-industrialized countries, with good results and In GUISÁN (1997) this approach is complemented by incorporating the variable "educational expenditure per inhabitant" as an indicator of quality, since a higher value of this variable generally means more material resources, less massification and higher quality of education. The estimates made show the significance of the coefficient of this variable in a model that largely explains the world differences in per capita production as a function of physical and human capital. Educational spending also shows its influence in the combination of time and time series of 7 OECD countries in the period 1964-92.

Guisan and Neira(1997) estimate a joint regression for 117 countries in the years 1960 and 1990 and tested the homogeneity of coefficients. They accepted the homogenity of the intercept and the coefficient of the stock of capital per head, and an increase in the positive coefficiente of the indicator of education in year 1990.

The estimated equation, in the study by Guisan and Neira(1997), for the natural logarith of GDPH, with a panel of 217 observation (after adjustment due to missing data) is:

$$\widehat{\text{Log GDPH}} = 3.2707 + 0.3626\ \text{Log SKH} + 0.1700\ \text{PS2*EDUH} + 0.0603\ \text{DX2};$$

t student (18.52) (10.12) (6.83) (9.25)

$R^2 = 0.9006$

where

GDPH is the real value of Gross Domestic Product per head,

SKH the real value of the Stock of Capital per head,

PS2*EDUH is an indicator of human capital, given by the product of PS2 (percentaje of active population with at least second cycle of secondary education complet) and Eduh that is an indicator of expenditure on education per inhabitant in the past years.

DX2 is a multiplicative variable given by the product of a dummay with value 1 for observations of year 1990 and cero por year 1960) multiplied by the regressor PS2*EDUH.

The estimation shows a positive and significant impact of the explanatory variables on GDPH. The effect of Education is also transmited to the value of SKH because education contributes to increase investment per capita.

Model by Guisan et al (2001). Development in 132 countries, 1990-1999

Guisan, Aguayo and Exposito(2001) published in Volume 1-1 of journal AEID, several equations of intersectoral relationships between production in Agriculture and Industry on Services, and the impact of indicators of Education on industrial development, with a sample of 132 countries,with data from World Bank and other sources. Data of Industry, from World Bank Indicators, includes "Industry and Building".

In the issues of journal AEID for the period 2001-2004 (Vol.1-1 to Vol.1-4) we have included data of Education and Development of 132 countries os the World for the period 1980-2000.

With this sample we find high correlations coefficients of the indicators of Education (Tyr99 and Eduh) with other variables of the model: negative with Fer99 and positive with the indicators of Education and Production per capita in Industry and Services.

Table 1.8 correlation coefficients of Eduh and Tyr99 with other variables.

Variables	eduh	tyr 90	tyr 99	qhi 90	qhi 99	qhs 90	qhs 99	fer
eduh	1.00	0.80	0.80	0.91	0.92	0.93	0.91	-0.64
tyr99	0.80	0.98	1.00	0.77	0.82	0.82	0.84	-0.81

Source: Elaborated by Guisan for this book EE11.

This correlations, and other indicators, suggest that Education has a negative impact on the average fertility rate, because it contributes to help family decisions taking, regarding the desired number of children, and to avoid excessive average values of children per woman.

Usually. the moderation of excessively high fertility rates cointributes to increase Investment per capita and thus to foster higher values of Industrial Production per capita (qhi) with its positive impact on (qhs), eduh and other variables that contribute to foster economic development.

Equation 1.1 relates Production per capita in Services (PH99SPP) in year 1999 with its lagged value in year 1990 (PH90SPP), and with the increase of Production per capita in Agriculture and Industry (DPHAI) for the period 1990-1999 (from the supply side), and the with the Exports of goods per capita (from the demand side). Variables of Production per capita are expressed at constant prices.

Equation 1.1. Production in Services and inter-sector relations

Dependent Variable: PH99SPP. Method Leas Squares
Cross-section sample of 132 observations. Included obs. 132.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PH90SPP	1.038951	0.018544	56.02532	0.0000
DPHAI	0.818439	0.075997	10.76931	0.0000
DEXPSH	1.739862	0.379749	4.581616	0.0000

R-squared	0.976162	Mean dependent var	4.745967
Adjusted R-squared	0.975793	S.D. dependent var	5.736249
S.E. of regression	0.892488	Akaike info criterion	2.632858
Sum squared resid	102.7530	Schwarz criterion	2.698376
Log likelihood	-170.7686	Durbin-Watson stat	1.770278

Source: Guisan, Aguayo and Exposito (2001), with data from World Bank.

The goodness of fit was high and the coefficients of the explanatory variables were positive and significant, with t de Student higher than 2.

Equation 1.2 estimates del relationship Industrial Production per capita (PH99PP) with its lagged value, increase of Exports of goods and 2 indicators of Education.

Equation 1.2. Industrial Production and Education in 88 countries

Dependent Variable: PH99IPP
Method: Least Squares
Sample(adjusted): 2 132. Included observations: 88

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTYR9	0.198247	0.099494	1.992554	0.0496
EDUH	1.461668	0.373564	3.912764	0.0002
PH90IPP	0.788769	0.067147	11.74697	0.0000
DEXPGH	0.152307	0.034122	4.463646	0.0000
R-squared	0.949910	Mean dependent var		2.965379
Adjusted R-squared	0.948122	S.D. dependent var		3.030887
S.E. of regression	0.690340	Akaike info criterion		2.141124
Sum squared resid	40.03183	Schwarz criterion		2.253731
Log likelihood	-90.20947	Durbin-Watson stat		2.638452

Source: Guisan, Aguayo and Exposito, (2001) with data from World Bank

Equation 1.2 relates Industrial production with Education, by means of a model that relates Industrial Production in year 1999 (PHI99PP) with its lagged value in year 1990 (PHI90PP) and two indicators of Education: the increase of average numbers of years of schooling received by the adult population (DTYR), the value of public expenditure per capita on Education (average per year in the decade 1990-1999) and the increase of Exports of Goods (DEXPG) in the period 1990-1999.

The equation was estimated with 88 observations of the sample due to data unavailability for some variables. All the coefficients are positive and significant.

Equation 1.3 present the estimation of the negative relationship between Education and average Fertility rate. Fertility in year 2000 is related with its lagged value in 1995 and with the increase of TYr for the period 1995-1999

Equation 1.3. Fertility and Total Years of Schooling. Mixed Dynamic Model

Dependent Variable: FER00
Method: Least Squares
Included observations: 94

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FER95	0.939152	0.012916	72.71504	0.0000
DTYR4	-0.474521	0.153352	-3.094325	0.0026

R-squared	0.958057	Mean dependent var	3.447660
Adjusted R-squared	0.957601	S.D. dependent var	1.797347
S.E. of regression	0.370092	Akaike info criterion	0.870919
Sum squared resid	12.60109	Schwarz criterion	0.925031
Log likelihood	-38.93318	Durbin-Watson stat	2.041497

Source: Elaborated by Guisan, Aguayo and Exposito (2001).

The estimated value of the coefficient of DTYR4 is very similar to the coefficient of TYR99 in Model 4 and, besides that, the model results indicate that the coefficient of FER95 is lower than one, implying that there is also a small trend in reduction of fertility due to other causes besides education, that could have relation with age structure of population and/or cultural changes not exclusively linked to the educative level.

Guisan, Aguayo and Exposito(2001) finished this pioneer article with the following recommendation international cooperation to development:

"*Education is the main factor of development and international cooperation should be fostered to contribute to improve education in many areas of the world, as that is very important for improving real production per inhabitant and for getting real solutions to poverty and stagnation*."

Since year 2001 to year 2023, the educational level of population has increased in many countries but not enough in the poorest ones. Many problems of low economic development and low quality of life should be solved with more international cooperation to education and development.

Many of the positive effects of Education on international development for the first quarter of the 21st century, including sustainable growth and better quality of physical environment, are analyze in the book EE12 of this series, by Guisan(2023) which is scheduled to be published in the 2nd semester of year 2023. More information at: https://www.usc.gal/economet/ebooks.htm

1.4. Other international models, 1960-2000: Europe, America, Africa and Asia

Besides the World models of section 1.3, we have estimated several international models to analyze the positive impact of Education on Development, in particular groups of countries, for the period 1960-2000.

We distinguish 5 groups of international studies, of our research team, with data for 1960-2000.

1) Econometric models of Europe and OECD countries
2) Econometric models of Latin America countries
3) Econometric models of Asia
4) Econometric models of Africa
5) Interregional models of development of Europe and OECD countries

1) Econometric models of Europe and OECD countries

Models of the European Union, Japan and the United States

We have estimated many models of OECD countries for several reasons: a) OECD statistics are available for many important variables for several decades. b) OECD countries have experienced an important process of development during the second half of the 20th century.

The variability of several explanatory variables in a panel sample, both cross-section and time series, is important in order to diminish multicollinearity and increase the precision of the estimators.

More information in section 2.2 and 2.3 of this book:

Section 2.2 includes pioneer models estimated by Guisan (1975) with a sample of 14 OECD countries for 1952-1964 and by Guisan (1980) with a sample of 7 OECD countries: (France, West Germany, Italy, Spain, the United Kingdom, Japan and the United States) for the period 1960-1976, and other studies published before 1985.

Section 2.3 includes studies of our research team published after 1985, with samples of several OECD countries. We present a summary in English of models included in the books, in Spanish, by Guisan et al(2001) and (2004), and some estimations presented in this book for the period 1960-2000 with a panel of 6 OECD ountries: France, Germany, Italy, Spain, UK, and USA.

Models of Central Europe

In Guisan, Aguayo and Carballas(2004) we analyze the evolution of 5 Central European Countries (CC5): Czec R, Hungary, Poland, Slovakia and Slovenia for the second half of the 20th century. The study was presented at Conference of 2004 at Warsaw organized by CIRET. Table 1.9 shows the evolution of GDP per capita in CC5 and other countries.

Table 1.9. Real GDP per capita in Central Europe, Western Europe and the USA (thousands Dollars at 1990 prices and PPPs)

Country	1950	1960	1970	1980	1990	2000
Czech R.	3.561	5.199	6.585	8.137	8.689	8.837
Hungary	2.480	3.649	5.028	6.307	6.471	7.131
Poland	2.447	3.218	4.428	5.740	5.115	7.228
Slovakia	3.347	4.887	6.190	7.649	8.168	8.736
Slovenia	2.410	3.742	5.700	9.158	8.848	10.456
Central Europe	2.723	3.781	5.064	6.476	6.226	7.679
Spain	2.397	3.437	7.291	9.524	12.210	15.367
Austria	3.706	6.864	10.246	13.746	17.459	21.030
Ireland	3.446	4.279	6.200	8.541	11.825	21.981
Western Europe	4.594	6.930	10.297	13.226	15.988	18.910
USA	9.597	11.328	15.030	18.575	23.221	29.403

Source: Guisan, Aguayo and Carballas(2004) from Maddison(2001) (2004).

Values are expressd in thousand Dollars of year 1990 at Purchasing Power Parities PPPs).

We may notice that CC5 countries experienced lower development than Austria and Spain due to several factors, mainly due to more restrictions to freedom of trade and less incentive to increase industrial production per capita. We estimated a panel model for the period 1991-2002 that show the important impact of manufacturing production and trade on economic development.

We may distinguish several periods in the evolution:

Period 1950-1980: There was an increase of production per capita in CC5 countries, from 2.7 to 6.5 thousand Dollars at constant prices of 1990. The increase was lower than in Western Europe, where GDP per capita evolved from 4.6 to 13.2, lower than the USA, where GDP per capita evolved from 9.6 to 18.6. In the group of CC5 countries, Czec R and Slovakia and Slovenia got the highest levels of the group. It is outstanding the important increase of Slovenia for the period 1970-1980.

Period 1980-1990: There was stagnation, and an slight diminution, of production per capita in CC5 countries.

Perido 1990-2000. There was a and increase in CC5 production per capita, from 6.2 to 7.7, particularly outstanding in Poland and Slovakia.

2) Econometric models of Development in Latin American countries

Neira(2000), in EcoDev 47, suggest international cooperation for Education and Development. She cites some authors that have highlighte the negative correlation between Education and Fertility for the period 1990-1999, like the studies by Barro(1991) and Becker, Murphy and Tamuña(1990). This author estimates an equation with a panel of quinquennial data for the period 1960-1990 in several Latin Amreican countries.

The dependent variable (FER) is related with Production per head (PH), and indicator of low educational level (Female Active Populaltion without schooling, with level below primary school) and an indicator of medium or high educational level (PS2, percentage of adult population with upper secondary schooling or more). The effect of low education level is positive on FER and the effect of medium or high education level is negative on FER.

In Chapter 4 we cite other studies that analyse the evolution of the educational level, and other variables, in Latin American countries and its positive effect on economic development for the period 1960-2000.

3) International model of Development in Asia: China, India, Japan

Guisan(2004 b), in AEID, presents an econometric model of real production per capita in Industry (QHI) and Services (QHS) in 3 Asian countries (China, India and Japan) for the period 1960-2000. We have estimated a model for each country and a model with a panel of the 3 countries with annual data for 1961-1999. The results of this panel where the following ones:

Equation 1.4 relates real Value of Services at 95 prices (QS95) with its lagged value in year t-1 (QS95(-1)) and with the increases of real value of Agriculture (DQA95) and Industry(DQI95) and with the increases of Imports and Exports. We have included a trend for each country.

Equation 1.4. Pool of China, India and Japan for Services

Dependent Variable: QS95?. Method: Pooled Least Squares.				
Sample(adjusted): 1961 1999. 3 cross-sections. Total panel 89 obs.				
White Heteroskedasticity-Consistent Standard Errors & Covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(QA95?)	-0.086285	0.431971	-0.199748	0.8422
D(QI95?)	0.406592	0.092266	4.406753	0.0000
D(IMP95?)	0.264888	0.149633	1.770258	0.0804
D(EXP95?)	-0.319578	0.260244	-1.227996	0.2230
QS95?(-1)	1.000608	0.008595	116.4172	0.0000
IN--TI	56.76817	14.84583	3.823846	0.0003
CN--TI	53.84026	37.24609	1.445528	0.1522
JP--TI	798.9667	201.9398	3.956459	0.0002
R-squared	0.999788	Mean dependent var		947433.1
Adjusted R-squared	0.999769	S.D. dependent var		1156859.
S.E. of regression	17577.30	Sum squared resid		2.50E+10
Log likelihood	-992.0125	F-statistic		54443.90
Durbin-Watson stat	1.518501	Prob(F-statistic)		0.000000

Source: Guisan(2004 b). Dummies for Time trends in India (IN), China (Cn) and Japan (JP)

In equation 1.4, the coefficient of real value added of Agricultura does not have the expected positive sign an it is not significant. It is likely due to some degree of multicollinearity that causes uncertainty. Other coefficients have the expected sign and are significant, but the coefficient of Exports is not significant, also due to multicollinearity. Both Imports and Exports have several positive and negative effects, and, usually the total effect is positive.

Equation 1.5 relates real Value-Added in Industry (QI95) with its lagged value (QI(-1)), and the increases of Imports (DQIMP) and increases of the lagged values of Exports, D(EXP(-1), and Value-Added of Services (D(QS(-1)).

Equation 1.5. Pool of India, China and Japan for Industry

Dependent Variable: QI95?. Method: Pooled Least Squares				
Sample(adjusted): 1962 2000. 3 cross-sections. Total panel 89 obs.				
White Heteroskedasticity-Consistent Standard Errors & Covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IMP95?)	1.360019	0.291060	4.6726	0.0000
D(EXP95?(-1))	0.310810	0.345079	0.9006	0.3703
D(QS95?(-1))	0.581473	0.180961	3.2132	0.0019
QI95?(-1)	0.976115	0.013831	70.573	0.0000
R-squared	0.998424	Mean dependent var		614357.2
Adjusted R-squared	0.998368	S.D. dependent var		658341.8
S.E. of regression	26592.48	Sum squared resid		6.01E+10
Log likelihood	-1031.005	F-statistic		17949.88
Durbin-Watson stat	1.460544	Prob(F-statistic)		0.000000

Source: Guisan(2004 b)

In equation 1.5, the coefficient of DIMP95 indicates that the positive effect of the increase of availability of intermediate inputs from foreign origin. The positive coefficients of the lagges values of DEXP95 and DQS95 indicates the positive effects of good perspectives of the increase of demanda, domestic and foreign, on industrial production.

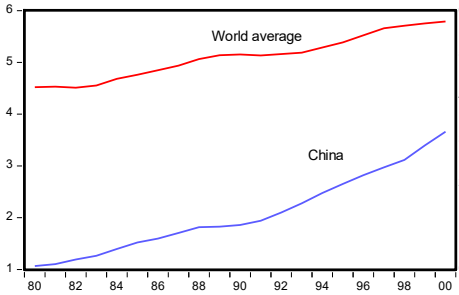
The highest position of development, in this group of 3 Asian countries, corresponds to Japan, due to a highest educational level of Population. By year 2000, the indicator Tyr of Education level was 9.7 in Japan, 5.7 in China and 4.7 in India, as seen in Guisan and Exposito(2004).

There was a higher increase of real Production per capita in China, in comparison with India, for the period 1990-2000.

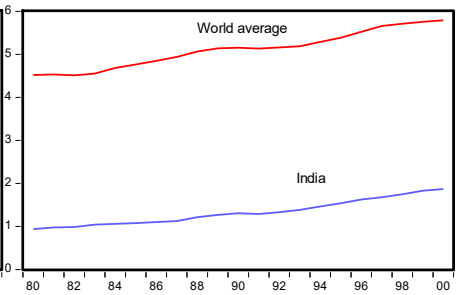
Graphs 1.1 to 1.3 show the evolution of Gross Domestic Product per capita (PH) in China, India and Japan, in comparison with the World average.

Graph 1.4 shows the evolution of the indicator of the average educational level of Population, outstanding the high value of Japan, with its positive impact on industrial production per capita and on economic development.

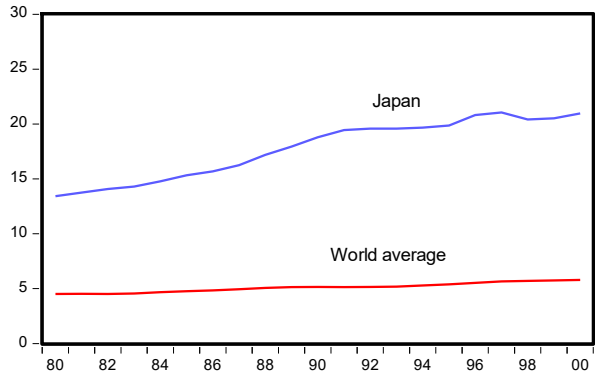
Graph 1.1. PH in China (th$90 PPPs)



Graph 1.2. PH in India (th$90 PPPs)

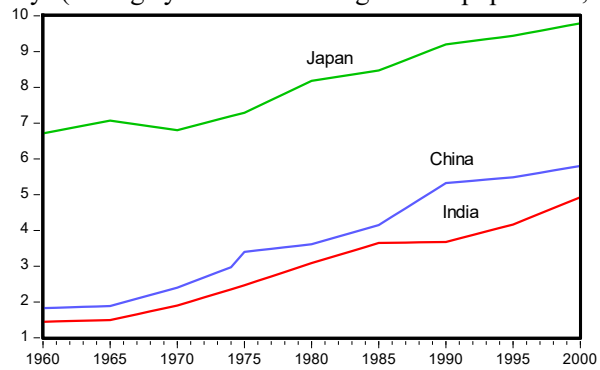


Graph 1.3. PH in Japan(th$90 at PPPs)



Source: Elaborated by author from Maddison(2001) (2004), and World Bank statistics.Note: Thousand Dollars at 1990 prices and Parities for 1980-2000.

Graph 1.4. Tyr (average years of schooling of adut population, 1960-2000

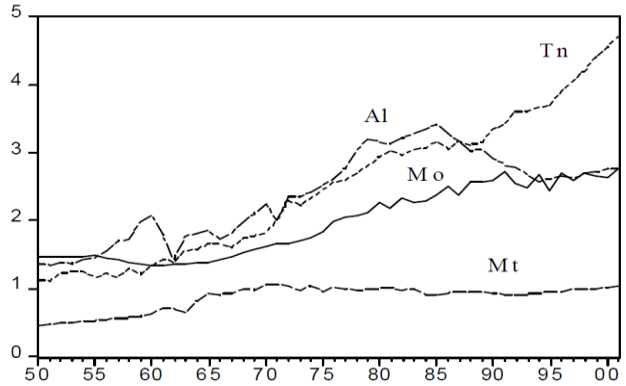


Source: Elaborated by Guisan, in this book EE11 from Barro and Lee and World Bank statistics

4) Model of development of 4 African countries by Guisan and Exposito

Guisan and Exposito(2004) analyzed the evolution of real Gross Domestic Product per head (PH) in 4 African countries (Algeria, Morocco, Mauritania and Tunisia) for 1950-2000. Graph 1.5 shows the evolution and Equation 1.6 a panel model for non manufacturing production (QNM).

Graph 1.5. Real GDP per capita in 4 countries of Magreb
(thousand Dollars at 1990 prices and PPPs)



Source: Elaborated by Guisan and Exposito(2004) from World Bank statistics.

Equation 1.6. Mixed dynamic model of QNM=f (QNM(-1), D(QM))

GLS: Dependent Variable: QNM90?				
Sample(adjusted): 1981 2001				
Number of cross-sections: 4. Total panel (unbalanced) 75 observations				
White Heteroskedasticity-Consistent Standard Errors & Covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(QM90?)	1.612278	0.820651	1.964633	0.0535
QNM90?(-1)	1.018575	0.006598	154.3856	0.0000
TN--AR(1)	-0.024415	0.167946	-0.145374	0.8848
MT--AR(1)	0.141445	0.058122	2.433604	0.0175
MO--AR(1)	-0.737946	0.161023	-4.582862	0.0000
AL--AR(1)	-0.021673	0.260750	-0.083117	0.9340
R-squared	0.996281	Mean dependent var		39415.65
Adjusted R-squared	0.996012	S.D. dependent var		25690.22
S.E. of regression	1622.403	Sum squared resid		1.82E+08
Log likelihood	-657.6684	F-statistic		3697.105
Durbin-Watson stat	2.381840	Prob(F-statistic)		0.000000

Source: Guisan and Exposito(2004).

We estimated by Generalized Least Squares due to the existence of autocorrelation (likely due to the effects of some missing explanatory variables). We estimated a different autocorrelation coefficient (AR(1)) for each country.

The goodness of fit was high and the coefficient of D(QM) was significant at 6% level of significance. The average impact of an increase of 1 unity of Manufacturing was 1.61 on Non-Manufacturing.

We also applied causality tests. The results of the estimations and tests show evidence of the important positive impact of manufacturing on non-manufacturing production.

5) Interregional Models of Development in Europe and America, 1960-2000

European regions, 1960-2000: We have analyzed interregional disparities in growth and development of several countries with availability of data for the main variables of the models.

We have published 3 printed books in English on interregional econometric models of European regions for the period 1990-1999 as in by Guisan and Frias(1995) and (1997) and Guisan and Cancelo (1997) and other ones. In the bibliography we include links to the electronic version of those studies. Besides we have published articles in English, on regional studies of Europe for the period 2000-2023,cited by Guisan and Aguayo(2022) in the book EE9.

Guisan(2004 a) presents the estimation of the equations of QHI and QHNI (value-added of Industrial and non industrial production per inhabitant in 151 European regions. QHNI is explained as a function of its lagged value, the increase of QHI, Tourism activity and the Educational level of Population.

Regions of the United States of America, 1960-2000: The analysis of the evolution of real Income per capita and Population in the large areas of the USA (Census Divisions and BEA regions), and at state level, show smaller disparities, in income per capita and educational level of population, in comparison with the regional disparities in the European Union and other European areas. It is outstanding the important changes in Population of some regions of the USA, well by domestic migration or by capacity to offer employment to inmigrant population.

In section 3.4. we include some comparisons of Europe and the USA.

Regions of Latin American countries, 1960-2000: In section 4 4 of this book EE11, we include references to studies of our research team on regional

development in several Latin American countries, Mexico, Brazil, Argentina, Chile and other ones.

The book EE12 by Guisan(2023) is scheduled to include the analysis of the evolution of Education, Development and Quality of Life in 164 countries of the World for the period 2001-2022, and of regional development in more than 300 regions of OECD countries.

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CHAPTER 2
DEVELOPMENT IN THE OECD, 1960-2000: ECONOMETRIC MODELS AND INDICATORS

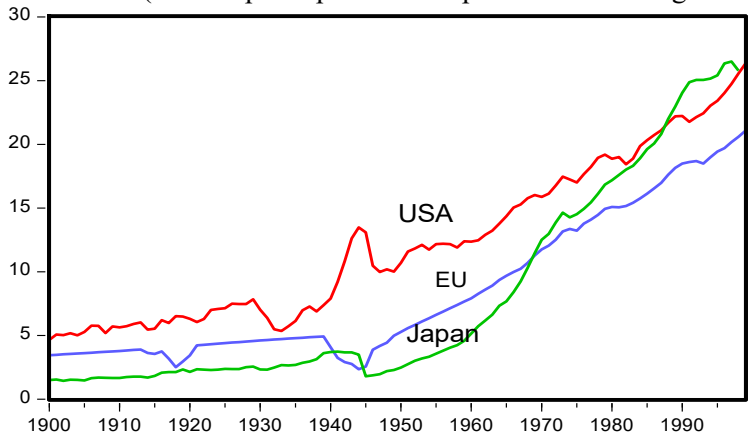
GUISAN, Maria-Carmen*

2.1. Evolution of OECD countries, 1900-1997: Production and Employment

This section is a supplement to the Economic Development paper nº 44, by Guisan, Exposito and Cancelo (2000), and includes references to DEA12 by Cancelo and Guisan (1998).

Th evolution of roduction per head in 15 countries of the European Union, Japan and the United States is shown in graph 2.1 and table 2.1.

Graph 2.1. Production per capita in the European Unione (EU15), USA and Japan, 1900-1997 (Dollars per capita at 1990 prices and exchange rates)



Sources: Elaborated by Guisan, in this book EE11 from the following sources: For the second half of the century, several statistics of the OECD (National Accounts, Labour Force and other ones) and for the first century from several historical statistics, published by Liesner(1985), Madrison(1989).A Nadal et al (1989), Landes(1998), and additional information from historical publications by Cipolla, Kendrick, Kuznets, Mitchell, Barioch, Paretti and other authors. Note: For the EU we have made some interpolations following the trend, with special effect of decay due to the 1st and the 2nd world words). applying the percentage of France to the UE average in those years.

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We have analyzed the evolution of OECD countries for the 20th century. Thanks to improvements in education, health, sanitation, and scientific and technological advances, the more educated countries experienced a great advance in economic development, particularly during the second half of the century, after the second World war (ww2).

Tables 2.1 and 2.2 present a comparison of Production per capita, Productivity of Labour and Employment in the United States (USA), European Union (EU15). Besides, table 2.1 includes data of 4 European countries (France, Germany, Spain and the United Kingdom).

Table 2.1. Production per capita of France, Germany, Spain, UK, Japan, USA and EU15 (thousand Dollars at 1990 prices and exchange rates)

	USA	EU15	France	Germany	Spain	UK	Japan
1900	4.646	3.446	3.643	2.306	2.330	4.383	1.502
1910	5.639	3.779	3.743	2.595	2.709	4.499	1.662
1920	6.306	3.423	3.886	2.356	3.076	4.753	2.141
1930	7.010	4.607	5.506	3.466	3.587	5.309	2.333
1940	7.896	4.073	4.875	5.149	2.628	6.690	3.691
1950	10.687	5.279	6.318	4.849	3.119	6.970	2.476
1960	12.359	7.916	8.949	9.008	4.141	8.928	5.146
1970	15.871	11.751	13.842	13.001	7.634	11.120	12.505
1980	18.856	15.084	17.971	16.878	9.789	13.355	17.183
1990	22.224	18.495	21.199	20.665	12.662	16.947	24.042
1997	24.733	20.173	22.549	22.341	14.179	18.648	26.503

Source: Guisan, Exposito and Cancelo (2000) from historical statistics, cited in footnote of graph 2.1, for the first half of the 20th century and from OECD statistics for the second half. Note: Data of Germany include data of both West and East Germany, based on the sources of data and other indicators.

Productivity, Employment and Educational level, 1900-1997

Industrial development has had an important role in the increase of productivity, accordingly to Kaldor and to the empirical evidence. Thanks to industrial development the non agrarian sectors (Industry, Building and Services experienced a great increase of Production, Employment and Productivity per worker. The technological modernization of Agriculture had the effects of diminution of Agrarian Employment but a positive effect of real production per worker.

Tables 2.2.1 to 2.2.2, show Mean Productivity of Labour (PM), Total Employment (LT) and Rate of Employment per one thousand inhabitants (LHT) in the USA, the European Union and Japan, for the period 1900-1997.

Table 2.2 1. Mean Productivity of Labour (PM) in USA, EU15 and Japan (thosand Dollars of 1990 prices and exchange rates),

Year	Mean Productivy of labor (PM)		
	USA	EU15	Japan
1900	13.094	7.657	2.658
1910	15.056	8.433	3.123
1920	17.127	7.672	4.395
1930	18.975	10.369	5.077
1940	21.959	9.208	8.173
1950	27.527	11.984	6.446
1960	33.936	17.996	10.867
1970	40.279	28.533	25.461
1980	42.559	37.094	36.253
1990	46.119	43.867	47.529
1997	50.784	49.674	50.998

Source: Guisan, Cancelo and Exposito(2000) from historical statistics, cited in footnote of graph 2.1, for the first half of the 20th century and from OECD statistics for the second half. Note: Data of Germany are estimations for the whole West and East Germany.

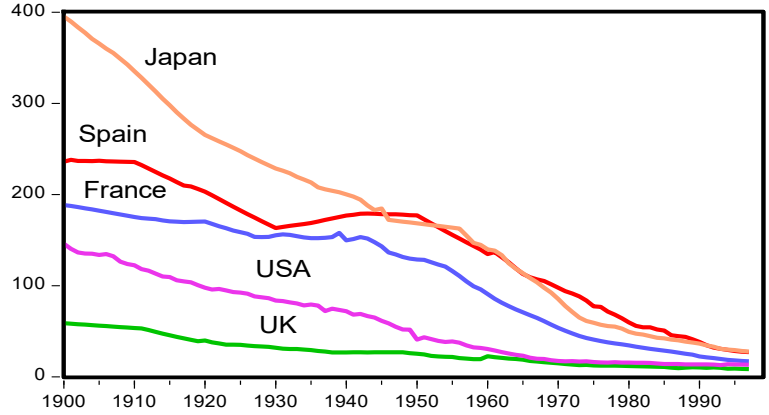
Table 2.2.2. Total Employment (thousand people) and Rate of Employment (per one thousand people), 1900-1997)

Year	Total Employment			Rate of Employment		
	USA	EU15	Japan	USA	EU15	Japan
1900	27000	105179	24770	355	450	565
1910	34600	113968	26170	374	448	532
1920	39200	114319	27260	368	446	487
1930	45500	120438	29620	370	444	460
1940	47500	125349	32480	360	442	452
1950	58900	126848	31954	388	440	382
1960	65800	138914	44165	364	440	470
1970	80796	140168	50940	394	412	488
1980	100907	144447	55360	443	407	474
1990	120430	153694	62490	481	422	506
1997	130543	151532	65566	478	406	520

Source: Elaborated by Guisan, Expostio and Cancelo(2000) from historical statistics, cited in footnote of graph 2.1, and table 2.2.1, and OECD statistics for the second half. Note: Data of Germany are estimations for the whole West and East Germany.

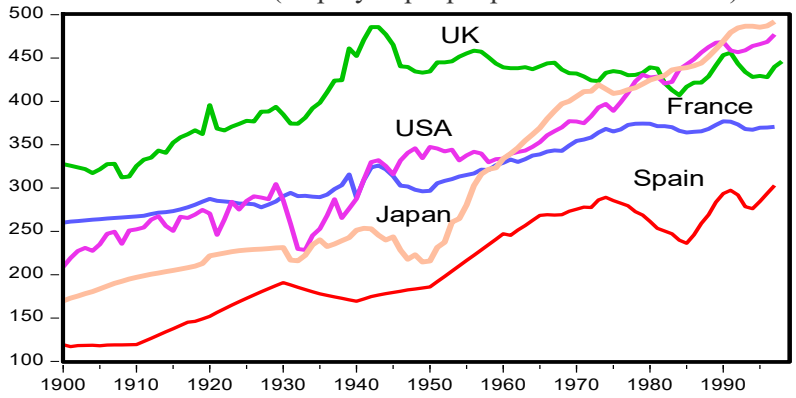
Graphs 2.2 and 2.3 show the evolution of the rate of Employment per 1000 inhabitantes, in Agriculture and in Non-Agrarian sectors, and in section 1.3 we analyze the evolution of production and employment by sector in OECD countries.

Graph 2.2. Rate of Agrarian Employment in 5 OECD countries, 900-1997 (employed people per 1000 inhabitants)



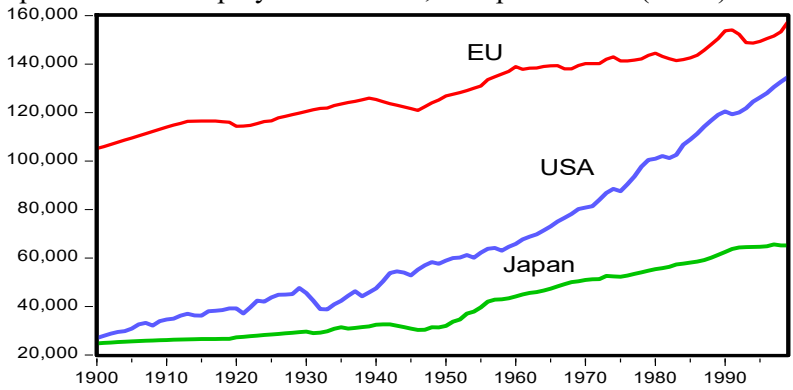
Source: Elaborated by M.C. Guisan, from OECD statistics and the historical sources cited in the footnote of graph 2.1. Note: Agrarian employment includes Agriculture and Fishing.

Graph 2.3. Rate of Non-Agrarian Employment in 5 OECD countries, 1900-1997 (employed people per 1000 inhabitants)



Source: Elaborated by M.C. Guisan from OECD statistics and the historical sources cited in the footnote of graph 2.1.

Graph 2.4. Total Employment in USA, European Union (EU15) and Japan



Source: Elaborated by M.C. Guisan, from OECD Labour Force statistics and the historical statistics cited in the footnote to graph 2.1.

OECD countries experienced a higher increase in real Gross Domestic Product per capita than the many areas of the World, thanks to a higher level of Education, with its positive effects on productivity, investment per capita and real production per capita. Table 2.3 shows a comparison of OECD with other eras of the World in the indicator o Education Attainment: Total years of Schooling (Tyr).

Table 2.3. Average School Years of Education od adult population

	BARRO and LEE		NERUH et al.
AREA	**1970**	**1990**	**1987**
Developing Countries	2.66	4.43	4.48
Middle East and North Afr.	2.05	4.47	4.79
Sub-Saharian Africa	2.06	2.93	2.54
Latin America	3.82	5.24	5.52
East Asia and South Pacific	3.80	6.08	5.13
South Asia	2.03	3.85	3.39
OECD	7.58	9.02	10.0

Source: Elaborated by Guisan(1997) from BARRO and LEE(1996), population over age 25. NERUH et al. (1995), population between the ages 15-64.

Table 2.4. shows real Gross Domestic Product and Population of USA, European Union and Japan in years 1900, 1925, 1950, 1975 and 1999, and table 2.4. the evolution of real GDP per capita.

Table 2.4. Real GDP (Billion dollars at 1990 prices and exchange rates

	GDP at constant prices (Bn)			Population (thousand)		
	USA	**EU15**	**Japan**	**USA**	**EU15**	**Japan**
1900	353506	805377	65845	76094	233731	43850
1925	826561	1150271	142029	115829	261853	59740
1950	1621339	1520118	206868	151708	287965	83563
1975	3671500	4618390	1619510	215973	349247	111520
1999	7365056	7946800	3345011	279328	377067	126686

Source: Elaborated M.C. Guisan, from OECD and historical statistics. as cited in the foot note at graph 2.1.

Table 2.5. Real Production per capita (Dollar at 1990 prices and exchange rates) in the USA, EU15 and Japan, 1900-1999

	USA	**EU15**	**Japan**
1900	4646	3446	1502
1925	7136	4393	2377
1950	10687	5279	2476
1975	17000	13224	14522
1999	26367	21075	26404

Note: Elaborated by M.C. Guisan from table 2.4.

The rate of growth of real GDP was higher than the rate of growth of Population, and the rate of growth of real GDP per capita was positive and important in all the periods. The average rate of growth of the period 1900-1999 was 1.75% in the USA, 1.83% in the European countries of EU15, and 2.90% in Japan.

For the first half of the 20th century, the average annual rate of Population growth was 1.38% in the United States, 0.42% in the European Union and 1.29% in Japan.

For the second half, the annual rate of Population growth was 1.25% in the United States, 0.55% in the European Union and 0.85% in Japan. All of them were below the high value of World average of the annual rate for the period 1950-2000 (1.76%).

Expenditure on education and scientific research have also had a great impact on economic and social development, increasing life expectancy, productivity and production per inhabitant.

2.2. International Models of OECD countries: Pioneer studies until 1985.

For the period 1975-1985 our research team developed several pioneer empirical research with international samples in order to test and analyze demand side and supply side and its role in economic growth and development. There were also several interesting studies, published by other authors, calling attention to the great importance of Education to foster economic development in the World.

Studies with OECD countries where particularly interesting due to the availability of data and indicators for many important variables. The publications National Accounts and Labour Force Statistics by the OECD have been very useful in this regard.

Some of the pioneers approaches to the explanation from the supply side included not only the analysis of the effects of Primary Inputs (mainly Capital and Labour) but also the effects of the availability of Intermediate Inputs. The intermediate inputs include raw materials and more elaborated goods that are used as inputs in the production of other goods of services. It is important to have into account both the domestic production of Intermediate Inputs and the capacity to Import those inputs from the rest of the World.

Here we cite some pioneering research in this regard, developed by our research team in the period 1975-1985.

1) Guisan(1975):Dissertation on International Production Funcions

Title: Econometric Study of Aggregate Production Functions (with applications to 14 OECD countries)

This Doctoral dissertation was an empirical study of the role of the Production Function on economic growth of OECD countries and relationship between Imports and real Gross Domestic Product (GDP), and human capital and development.

The dissertations was prepared under the superivison of Professor Jesus-Bernardo Pena-Trapero, who was Professor and Dean of the Spanish Faculties of Santiago de Compostela (USC) and Alcala de Henares (UAH) at Madrid and Deputy Director of Demographic Statistics at the National Statistical Institute (INE).

The study was pioneer in the estimation of the relationships between GDP with primary inputs and intermediate inputs with an international panel, from

the Supply Side, and in the estimation of ecuations relating the Educational level of employed people with the Capital/labour ratio.

The summary of the dissertation was published in Spanish by the the University of Santiago de Composteloa in Spanish (Guisan(1975))

The index of the summary is as follows:

Section 1. A revision of the literature on aggregate production:

Specification forms: Approaches by Cobb and Douglas, Bridge, Valavanis, Klein and Goldberger, Bakony and other authors.

Analysis of problems: 1) Aggregation (Klein), 2) specification (Klein, Theil), 3) Identification in a multiequational system (Hoch, Mundlak and Hoch, Zellner, Kmenta and Dreze, Diamond and McFadden and Nerlove)

Estimation Methods of the CES function (Solow, Brown, Fhron, Kmenta)

Measure of technological change (Abramowitz), Tinbergen,

Section 2. Empirical results of several macroeconometric estimations:

Douglas in year 1948 for a cross-section of manufacturing in the United States in year 1919, with estimated elasticities of 0.76 (for Labour) and 0.25 for Capital. The sum of elasticities was slighty higher than unity (1.01).

Walters(1963) presents an interesting suvery of 28 cross-section studies of industries in several countries, including the study by Douglas. The elasticity of Labour varied between 0.43 and 0.76 in those studies, and the elasticity of Capital between 0.13 and 0.58.

Aukrust(1965) compared its study for Norway 1900-1955 with the results of several studies that followed the approach suggested by Tinbergen. The comparison includes the study by Tinbergen, for Netherlands 1870-1915, Solow for USA in the period 1909-1949, Niitamo for Finland (1929-1992) and Gehrigh and Khulo for West Germany 1925-1957.

The main conclusion from Aukrust is that the quantities of the primary factors (Labour and Capital) explain approximately the 50% of the rate of growth of real GDP, while the other 50% should be explained by other factors (tecnological change, education and other qualitative changes).

Section 3. Elaboration of a pool of data of OECD countries and estimations

Guisan(1975) elaborate a pool of data of 14 OECD countries (Belgium, Canada, Denmark, France, Germany West, Greece, Italy, Netherlands,

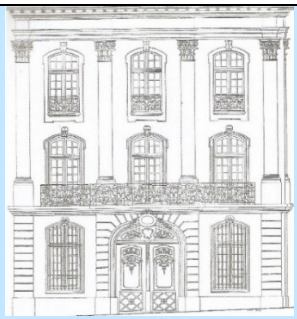
Norway, Portugal, Spain, Sweden, UK and the USA in years 1955 and 1964). and presents estimations for each year and for panel of both yearsta by Denison(1967) for the Stock of Capital in several OECD countries where highly appreciate.

In Guisan(1975), the estimated elasticities, for Labour and Capital, where 0.23 and 0.85 in the sample of 1955; 0.22 and 0.86 for the sample of 1964 and 0.22 and 0.86 for the pool of years 1955 and 1964. There was evidence of increasing returs to scale.

2) Study by Guisan(1980). Panel model of 7 OECD countries, 1962-76.

Guisan(1980) presented ta contribution to the Econometric Society World Congress, ESWC80, on Production Functions of OECD countries Forecasting Employment

Figure 2.1. Study by Guisan(1980) at ESWC80.



AIX-EN-PROVENCE
(FRANCE) 29th August 1980

ESWC80. ECONOMETRIC SOCIETY WORLD CONGRESS 1980

FORECASTING EMPLOYMENT THROUGH AN INTERNATIONAL COBB-DOUGLAS FUNCTION

Maria-Carmen GUISAN

Faculty of Economics

University of Santiago de Compostela (USC,Spain)

Session: Studies in Applied Econometrics II

Chairman: Teun Kloek. Erasmus University, Rotterdam (Netherlands). Papers by: F.D.Arditt (Florida, US), G.S. Maddala (California, USA), James Davies (W.Ontario, Canada), J.Van der Gaar&E. Smolenksy (Wisconsing, USA), M.C. Guisan (USC, Spain)

The study by Guisan(1980) includes an anlysis of macroeconometric approachs from demand and supply and the role of the Production Function, and other equations, in the explanation of Gross Domestic Product and Employment. The study includes the following sections.

Some of the main contributions of the study are the following ones:

The estimation of an international Cobb-Douglas Function to relate real GDP (Q), Stock of Capital (KA=available capital) and Employment (L) in 7 OECD countries for the period 1962-1974 and to present a comparison of the dynamic forecasts of Q and L for year 1976 of 3 models.

The production function, estimated for the period 1962-1973 with a panel of 7 countries, showed increasing returns to scale and a high goodness of fit.. The existence of increasing returs to scale implies that the neoclassical approach must be reformulated as we mention in the book by Guisan(1983)

This is an important function relating Capital, GDP and Employment. but it does not explain Q when there is a high degree of underutilization of the available Capital Stock (KA). In that case, the production function may be utilized to estimate de value of utilized Capital (K).

For that period there were not important restrictions to full capacity utilization of the stock of capital in those countries, and the production function failed to forecast the value of Q for the period 1974-1976 due to other restrictions (diminution of stagnation of the capacity to increase real imports by consequence of the oil crisis of that period).

The explanation of Q corresponds to:

Model 1 from demand approach,

Model 2 fron the supply of primary inputs (production function)

Model 3 as a function of intermediate inputs.

The explanation of L is based in equations that relate actual Employment L with the desired level of employment by enterprises (L*) and supply of workers (LS) and the lagged value of L (L(t-1).

L* is explained as follows:

Equation 1: with the usual estimation in studies based on the demand approach, from the production function,

Equation 2 : with the usual estimation in staduies of the supply of primary inputs, from the marginal productivity function, which usually leads to L*=f(K/W)

Equation 3: we use our own approach for the situations, which holds when there are restrictions to the utilization of full capacity of the stock of capital

under the hypothesis that the enterprises would try to maintain at least aan average return to available capital r*.

In Equation 3 there is a relationship between L* and the rations Q/W (with positive effect) and KA/W (with negative effect). The total effect of the increase of KA on Employment depends on the effect of KA on Q. If there are not restrictions to full capacity the total effect usually will be positive.

The production function is an important function to explain the relationship between Q, L, and utilized capital (K). If there are not restrictions to full capacity K will be close to KA, Q would b explained by the production function and L by Model 2, with L* depending on Q/W).

When there are restrictions to full capacity, K will be not close to KA and the production function may explain the utilized capital (K) given the values of Q (explained by demand or by intermediate inputs) and L (explained by the equation that we have formulated in Model 3 as a function of Q/W and KA/W.

Table 2.6 present dynamic forecasts for Q in 1976: Models 1 (Demand), 2 (Primary Inputs), 3 (Intermediate Inputs) and actual value of Q.

Table 2.6. Dynamic forecasts and actual value of real Production 1976
(Billion Dollars at 1970 prices and exchange rates)

	Q Forecasts			Q
Country	Model 1	Model 2	Model 3	Actual
France	181	195	184	182
Germany W	208	233	229	216
Italy	111	124	108	110
Japan	289	344	287	272
Spain	53	56	50	49
UK	140	147	134	137
USA	1136	1226	1159	1164

Source: Guisan(1980)

In all the countries, the forecasts of Model 2 overestimated the actual value. The best forecasts of Q corresponded to Model 1 in France, Germany West and Italy and to Model 3 in Spain and the USA. In the case of UK both Models. 1 and 3, showed a similar distance to actual value of Q.

Table 2.7 prsents dynamic forecasts for Employment (L) in year 1976, based in equations 1, 2 and 3.

Table 2.7. Dynamic forecasts and Employment in 1976 (million people)

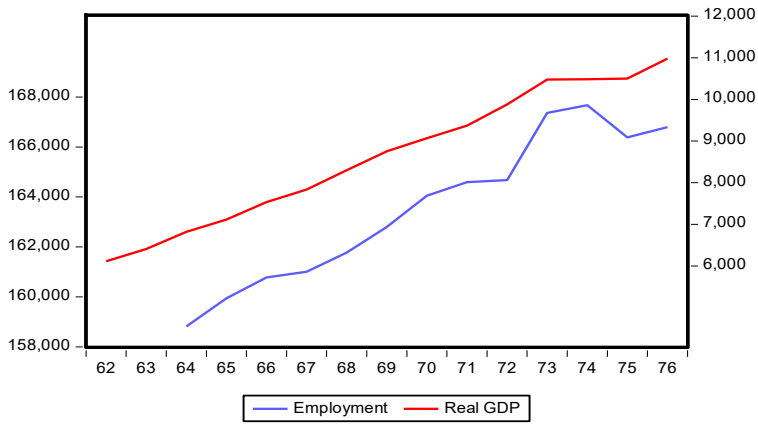
	L Forecasts			L
Country	Equation 1	Equation 2	Equation 3	Actual
France	20.94	21.74	21.57	21.45
Germany W	24.72	25.85	25.24	25.09
Italy	18.57	19.38	19.37	19.29
Japan	53.83	53.21	53.05	52.70
Spain	13.10	13.01	12.99	12.65
UK	24.08	25.53	24.95	24.76
USA	88.46	92.15	89.19	89.63

Source: Guisan(1980).

Equation 3 provided the best forecasts in the 7 countries of this study.

Graph 2.5 presents in the lower line (blue colour) and left scale the total employment of these 7 OECD countries for the period 1962-1976, and in upper line (red colour) and right scale the total value of real GDP per capita (Q) in the 7 countries.

Graph 2.5. Employment (million) and real GDP (Billion Dollars at 1970 prices and exchange rates) in 7 OECD countries, 1962-1976



Sources: Guisan(1980) from OECD statistics.

3) Book by Guisan(1983) Forecasting Income and Employment

In the book by Guisan(1983), published in Spanish by the USC, there is an analysis of macroeconometric models in OECD countries for 1956-1976.

The Index of that book includes the following chapters

1) Evolution of OECD countries for 1956-1975
2) Demand and Supply approaches to economic growth: Harrod-Domar, Keynes, Leontieff, Solow and Disequilibrium approaches.

3) Estimation of macroeconometric models of demand, supply and disequilibrum in 7 OECD countries for the period 1962-73 and forecasting capacity for 1974-76.

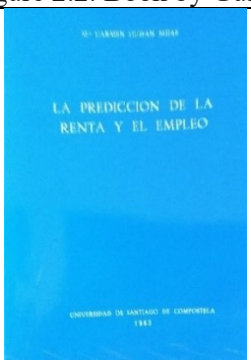
4) Macroeconometric models of Employment.

5) Wages, Prices and Employment

6) Economic development and Income distribution in the World

7) Energy crisis, intermediate inputs restrictions and foreign trade.

Figure 2.2. Book by Guisan(1983).

	FORECASTING INCOME AND EMPLOYMENT. Panel models of OECD countries for 1956-2976 GUISAN, Maria-Carmen BOOK PUBLISHED, IN SPANISH, BY THE UNIVERSITY OF SANTIAGO DE COMPOSTELA (USC), 1983. Spanish printed version 1983. Printed edition available at the Library of the Congress of the USA

The book includes 7 Chapters, with some international estimations of econometric models and selected data of the period 1956-1976.

Table 2.8. shows the evolution of Population and real values of average Wage, Private Consumption per capita and Public Consumption per capita for the period 1956-1976 in the 7 more populated countries of the OECD.

The period 1956-1976 was positive for this group of 7 countries, with high increases of W), CH) and GH. Public Consumption includes individual and collective consumption of public goods, including many goods and services provided from Government to families, like health assistance and other ones

In year 1976 the highest wages corresponded to the United States followed by Germany West and France. Those countries also had the highest levels of Private and Public Consumption per capita.

Table 2.8. Evolution of Population (thousand), Wage, and Consumption per capita (Dollars at 1970 prices) in 7 OECD countries, 1956-1976).

Country	Pop 1956	Pop 1976	Wage 1956	Wage 1976	CH 1956	CH 1976	GH 1956	GH 1976
France	43843	52927	2490	5775	976	2120	271	441
Germany W	53008	61531	2096	5785	860	1956	263	631
Italy	48469	56156	1521	4528	565	1228	142	255
Japan	89980	112768	1133	3986	351	1284	88	208
Spain	29301	36240	835	3137	359	924	64	131
UK	51430	56001	2212	3937	1075	1499	260	474
USA	168903	215118	6751	8988	2208	3541	698	947

Note. Population in thousand people. Wage, Private and Public Private Concumption per capita (CH) and Public Consumption per capita GH), in Dollars at 1970 prices and exchange rates. Source: Elaborated by Guisan(1983) from OECD statistics.

Countries with the highest levels of education and investment per capita usually are those with the highest wages and highest values of concumption per capita (both private and public).

The highest level of Public Consumption per capita corresponded to the United States, with 947 in year 1976, followed by Germany West, the United Kingdom and France.

Tables 2.9 and 2.10 show values of real GDP (Q), real value of the available Stock of Capital (KA), Employment (L), the ratio KA/L the real average Wage (W) and the Mean Productivity of Labour (PM=Q/L).

There was an important increase of the variables for the period 1962-1976, particularly outstanding in the case of the two countries with PM lower than 2000 in year 1962 (Spain and Japan).

Productiviy per worker (PM) is very much related with the ratio Capital/Labour (KA/L) and real Wage (W) is very much related with Productivity of Labour (PM).

Table 2.9. Producción, Stock of Capital, KA/L, PM and Wage in year 1962 (at 1970 prices and exchange rates)

Country	Q	KA	L	KA/L	W	PM=Q/L
Germany West	129	165.85	26690	6220	3110	4834
Spain	22.87	26.74	11767	1933	1117	1859
France	92.91	79.787	19.621	4066	3176	4735
UK	96.37	103.652	24.634	4208	2554	3912
Italy	61.91	53.00	20.261	2616	2179	3056
Japan	87.13	54.172	45.56	1189	1488	1912
USA	726.28	518.028	69.531	7450	7560	10445

Note: Q and KA in Billion $ 1970, L thousand, KA/L, W and PM in $1970.
Source: Tables of Guisan(1983), elaborated from OECD national accounts and labor force for Q, L, W, PM, and from Denison and other sources for KA.

Table 2.10. Producción, Stock of Capital, KA/L, PM and Wage in year 1976 (at 1970 prices and exchange rates)

Country	Q	KA	L	KA/L	W	PM=Q/L
Germany West	216.03	264.09	25088	10527	5785	8610
Spain	49.25	63.975	12650	5057	3137	3893
France	181.84	156.375	21447	7291	5775	8479
UK	136.82	150.218	24761	6067	3937	5530
Italy	109.62	94.548	19289	4902	4528	5683
Japan	272.93	231.665	52700	4396	3986	5179
USA	1164.47	966.130	89629	10779	8988	12992

Source: See footnote of table 2.7.

In the period 1962-1976 there were important increase of KA/L, PM and W in the 7 countries of the study. In year 1962 the lowest values of K/L corresponded to Japan and Spain, clearly below Italy, but both countries experienced an important investment process and an increase of K/L reaching in year 1976 a value close to that of Italy.

The highest values of KA/L corresponded to the USA and Germany (West), with values around 10000 Dollars in 1976.

Japan and Spain had low values of the Stock of Capital per capita in year 1962 (below 2000 Dollars), and both countries experienced a high increase for the period 1962-1976, reaching more than 4000 Dollars in year 1976.

2.3. Wages, Employment and GDP in the OECD, 1960-2000.

For the period 1985-2005, our research team of Econometrics, has contributed to several Congresses and published many articles, related with econometric models of the OECD countries with samples of 1960-2000.

Many of the articles has been published, in English and Spanish, in several academic journals, and we have published two books in Spanish in this series of books EE, on Economic Growth and Development in OECD countries.

In this section, we present: 1) a summary of the book OECD 1. 2) A summry of the book and OECD2. 3) the model by Guisan, in this booke EE11, of year 2023, for GDP, Wages and Employment in 6 OECD countries for the period 1960-2000.

1) Summary of Book OECD 1: https://www.usc.gal/econo met/ahg4.htm

OECD1 is the book EE4 of the series EE, written by Guisan et al (2001) t. It includes the estimation of panel models of the European Union, United States and Japan for the period 1960-1995, relating GDP per capita with the educational level of Population, as well as an analysis of Employment by sector in Germany, Spain, Japan and the USA.

It includes the estimation of a panel model relating Manufacturing and Non Manufacturing Production in 4 OECD countries for 1970-1992. and the impact of Manufacturing on the Employment of Private and Public Services.

It also analyses the evolution of development in France, Ireland and Spain, for the period 1965-1996, related with Non Agraria real Value-Added per capita, Educational level of Population (measured by the percentage of adults with upper secondary education), Rates of Non Agrarian Employment and level of industrialization.

2) Summary of Book OECD2: https://www.usc.gal/econo met/ahg8.htm

OECD 2 is the book EE8 of the series EE, written by Guian et al(2004), including econometric models of OECD countries for the last decades of the 20th century.

Chapter 1, by Guisan, analyses the evolution in 25 OECD countries of the following variables, in per capita terms: Investment, Exports, Imports, GDP, Private and Public Consumption. It also includes an analysis of the evolution of GDP and Population for the periods 1964-1974, 1974-1984 and 1984-1999, as well as data of Education level (indicator Years of Schooling of adult Population) in years 1965 and 1999.

Chapter 2, by Guisan and Exposito, estimates multiecuacional models, with interdependence and recursives, applied to OECD countries, including a model on demand and supply of Agriculure in France, Japan, Spain and the United States, for the period 1964-1999, and an econometric models of demand, and supply of intermediate inputs, for the period 1966-1998 with data of the United States.

Chapter 3, by Guisan, analyses the relationships of causality and cointegration between Private Consumption and Gross Domestic Product and applies a test of Hausman, to test contemporaneous and bilateral causality with samples of Mexico and the United States for the period 1951-1997. Although there is some degree of bilateral relationship, the main address of causality is from Production to Consumption.

This chapter also includes data of Private and Public Expenditure per capita in Health and Education, of 24 OECD countries in year 1996, and highlights the importance of intermediate inputs to foster production from the supply side and the positive impact on Consumption, Health and Education.

Chapter 4, by Guisan and Cancelo, presents a panel model of OECD countries, with a sample of 176 observations, of 11 countries for the period 1975-1990, relating Production of Manufacturing from the demand and supply sides and applying several specification tests: Davidson and McKinnon and the method of the combined model. Both results indicate empirical evidence more favourable to the supply model. This chapter was published by Guisan and Cancelo(2006) in EcoDev89. The equation of supply is a production function that includes, besides Capital and Labour as explanatory variables, an indicator of innovation given by expenditure on research. This chapter also includes the estimation of equation of Exports of Manufacturing products, related positively with domestic industry, educational level and international demand, and negatively related with relative price of the domestic market and foreign markets.

That chapter includes an Annex with data of the main variables in years 1975, 1980, 1985 and 1990, in 11 OECD countries: Germany, Belgium, Denmark, Spain, France, UK, Netherlands, Italy Portugal, Japan and the USA.

Chapter 5, by Aguayo and Guisan, analyses econometric models of regional distribution of Population and Employment. It includes data and econometric models with a panel of Spanish regions for the period 1977-1997 an a summary of studies of the European Union, the United States, and Mexico.

Chapter 6, by Guisan and Neira. includes quinquennial data of the following variables, in 25 OECD countries for the period 1964-2000: Total Employment, Average real Wage in Purchasing Power Parities (PPPs), ratio Wage/Productivity.

It also includes annual data for 7 OECD countries for the period 1963-1976 of the following variables: Real Production, Real value of the Stock of Capital, Employment and real Wage.

The group of 7 OECD countries includes: Germany, Spain, France, Italy, Japan, UK and USA. A Production function was estimated with a panel of the 7 countries for the period 1962-1976, based in Guisan(1980) and (1983). It also includes the estimation of a production function, with a panel of quinquennial data of 19 OECD counrries fo the period 1965-1990.

3) A Panel model by Guisan (2023): 6 OECD countries for 1960-2000

Here, in section 2.3 of book EE11, we include the estimations, with annual data, for the period 1961-2000. We include the estimations as well as some tables of quinquennial data and graph 2.6 relating the values of real Production per capita of non industrial sectors (QHNI) with industrial production per capita (QHI).

Equation 2.1, by Gusian, 2023, for QHNI, 1960-2000

Table 2.11. Industrial production per head in 6 OECD countries, 1960-2000
(Thousand Dollars per inhabitant at 2000 Prices and Exchange Rates)

	QHI00 Germany	QHI00 Spain	QHI00 France	QHI00 Italy	QHI00 UK	QHI00 USA
1960	2.114	0.551	1.665	1.252	2.920	2.470
1970	3.458	1.270	2.534	2.292	3.503	3.511
1975	3.507	1.708	2.754	2.411	3.545	3.640
1980	4.124	1.803	3.167	3.086	3.759	4.234
1985	4.293	1.789	3.103	2.940	3.909	4.405
1990	4.909	2.167	3.522	3.423	4.412	4.787
1995	4.732	2.252	3.445	3.669	4.623	5.596
2000	5.218	2.712	3.809	3.926	4.884	6.282

Source: Elaborated by M.C. Guisan, from OECD National Accounts Statistics.
Note: Data of Germany for 1960-1990 has been calculated by adding to the West Germany data from the OECD statistics our estimations for East Germany.

Table 2.12. Non-Industrial Production per head in 6 OECD countries, 1960-2000
(Thosuand Dollars per inhabitant at 2000 Prices and Exchange Rates)

	QHNI00 Germany	QHNI00 Spain	QHNI00 France	QHI00 Italy	QHI00 U K	QHI00 USA
1960	6.566	3.150	6.089	4.684	7.583	13.438
1965	7.894	4.479	7.624	5.678	8.536	15.357
1970	9.069	5.552	9.460	7.355	9.578	16.916
1975	10.269	6.722	10.883	8.308	10.848	18.241
1980	12.139	7.023	12.318	10.009	11.951	20.035
1985	13.345	7.415	13.295	11.238	13.368	21.746
1990	15.003	9.175	15.025	13.108	15.688	23.787
1995	16.215	9.817	15.936	13.900	16.883	24.311
2000	17.535	11.626	18.738	15.262	20.207	28.325

Source: Elaborated by M.C. Guisan, from OECD statistics.Note: Data of Germany for 1960-1990 calculated from OECD for West and own estimations for East.

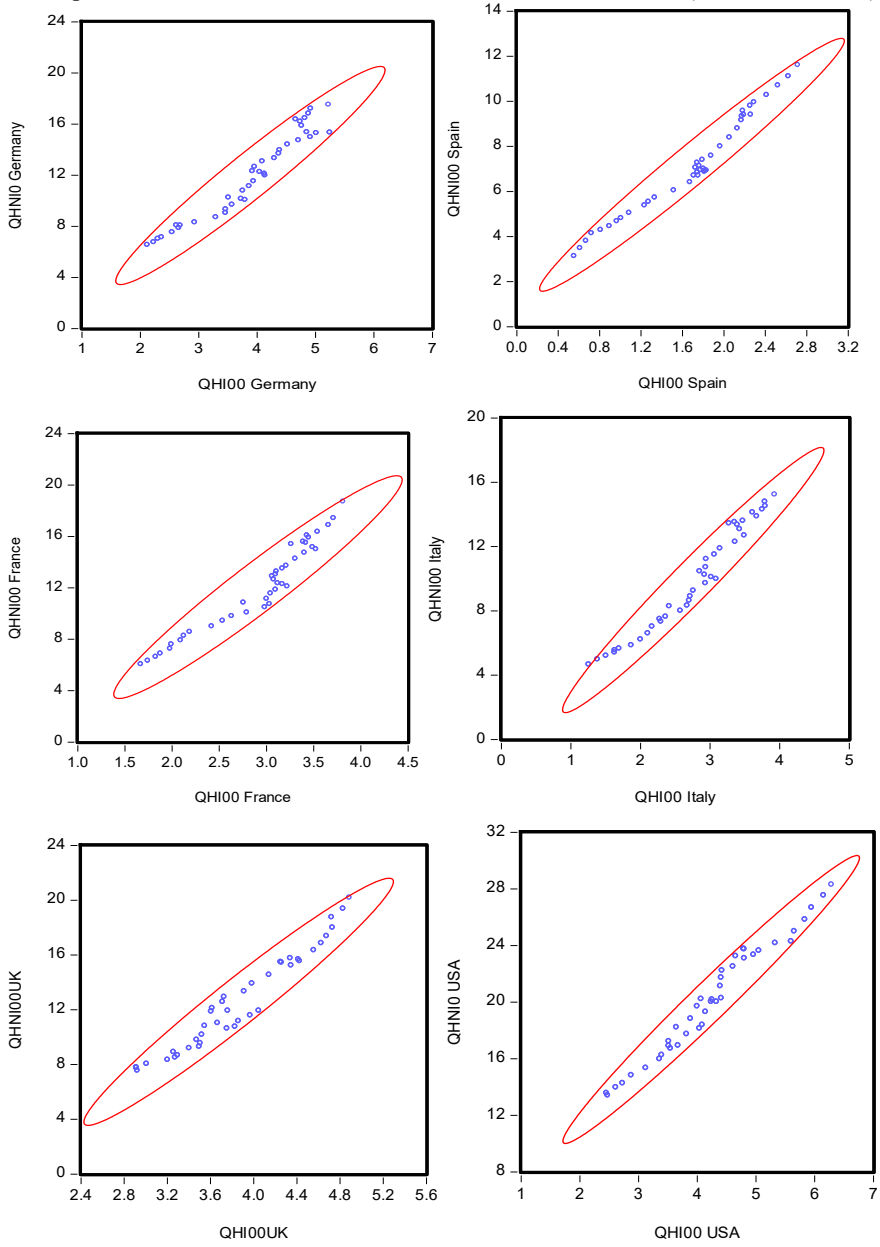
Equation 2.1 is a function of *supply of intermediate inputs* from domestic and foreign arkets.

Equation 2.1. QHNI =f(QHI(-1) and increase of QHI, MHG andXHGA.
Panel model of 6 OECD countries for the period 1965-2000

Dependent variable QHNI. Method: Pooled Least Squares				
Sample: 1965 2000. 36 obs. Cross-sections: 6. Total pool: 120				
White diagonal standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
QHNI00?(-1)	1.011842	0.002432	416.0210	0.0000
D(QHI00?)	0.565950	0.222643	2.541959	0.0123
D(MHG00?)	1.040119	0.175164	5.937978	0.0000
D(XHG00?)	-0.422826	0.162931	-2.595128	0.0107
R-squared	0.998988	Mean dependent var		14.41407
Adjusted R-squared	0.998961	S.D. dependent var		5.875765
S.E. of regression	0.189363	Akaike info criterion		-0.457539
Sum squared resid	4.159560	Schwarz criterion		-0.364622
Log likelihood	31.45232	Hannan-Quinn criter.		-0.419805
Durbin-Watson stat	1.405708			

Source: Estimated by Guisan, in this book EE11. Note: QHI and QHNI are Industrial and Non Industrial production per head. MHG and XHG are Imports and Exports of Goods per head. Thousand Dollars at 2000 Prices and Exchange Rates.

Graph 2.6. QHNI and QHI in 6 OECD countries, 1960-2000 (Th Dollars 2000):



Source: Elaborated by Guisan, in this book EE11, from OECD statistics

Equation 2.1. is the supply *equation of intermediate intpus,* which shows the average positive impact of Industry (QHI) on Non-Industrial sectors (QHNI), particularly in Services and Building, but also in Agriculture. It includes the direct effects of foreign trade. Imports of Goods per capita (MHG) has an average positive impact on QHNI, due to the increase of intermediate inputs from foreign origin available for domestic production of Services, and other other activites. Exports may have a direct negative effect on the availabily of intermediate inputs but it usually has a total positive effect having into account its positive effect on the increase of inputs from abroad..

A simulteanous increase of 1 unity of MGH and XGH has a positive impact on QHNI (1.0401-0.4228=0.6173). Direct and Indirect effects of Foreing trad eon economic development are analyzes in articles published by Guisan in journal IJAEQS

Guisan(2022), in chapter 3 of the book EE9 (in Spanish), includes intereting estimations of the period 1965-2019. and we are going to present an English version of that study in the book EE12 by Guisan(2023 b).

Equation 2.2 by Guisan, 2023, for real Wages 1960-2000

Table 2.13 includes quinquennial data of real Wage (W00) in 6 OECD countries for the period 1960-2000, and table 2.14. includes quinquennial data of the real value of the Mean Productivity of Labour (PM00).

Table 2.13. Real Wage in 6 OECD countries, 1960-2000
(Thousand Dollars at 2000 prices and exchange rates)

Year	W00 Germany	W00 Spain	W00 France	W00 Italy	W00 UK	W00 USA
1960	10.269	5.253	13.279	10.165	13.218	29.970
1965	13.000	8.519	16.988	13.185	14.857	31.586
1970	17.593	13.264	20.693	17.784	16.110	34.977
1975	21.494	17.634	25.104	21.403	19.702	36.383
1980	23.914	21.427	28.663	24.415	20.364	36.984
1985	24.711	21.595	29.792	25.717	22.694	38.292
1990	28.498	22.658	29.944	28.910	26.411	39.022
1995	31.514	24.019	30.771	27.685	27.267	40.044
2000	32.757	23.953	32.014	29.121	31.129	45.991

Note: Elaboratéd by Guisan, in this book EE11, from OECD statistics: National Accounts (for Compensations of Employees) and Labour Force Statistics (for number of Employees)

Table 2.14. Mean Productivity of Labour (PM00) in 6 OECD countries, 1960-2000
(Real value, in thousand Dollars at 2000 Prices and Exchange Rates)

Year	PM00 Germany	PM00 Spain	PM00 France	PM00 Italy	PM00 UK	PM00 USA
1960	10.269	5.253	13.279	10.165	13.218	29.970
1965	13.000	8.519	16.988	13.185	14.857	31.586
1970	17.593	13.264	20.693	17.784	16.110	34.977
1975	21.494	17.634	25.104	21.403	19.702	36.383
1980	23.914	21.427	28.663	24.415	20.364	36.984
1985	24.711	21.595	29.792	25.717	22.694	38.292
1990	28.498	22.658	29.944	28.910	26.411	39.022
1995	31.514	24.019	30.771	27.685	27.267	40.044
2000	32.757	23.953	32.014	29.121	31.129	45.991

Note: Elaboratéd by Guisan, in this book EE11, from OECD National Statistics.

Equation 2.2. relates real Wage, in Dollars at constant prices of year 2000, with a panel of 6 OECD countries of table 11, with a sample of annual data of the period 1962-2000, and a total of 226 obseervations.

Equation 2.2. W00)=f(W00(-1), D(PM00), D(Unemployment), D(PH00(-1))

Dependent Variable: W00?. Method: Pooled Least Squares				
Sample (adjusted): 1962 2000				
Included observations: 39 after adjustments. Cross-sections included: 6				
Total pool (unbalanced) observations: 226				
White diagonal standard errors & covariance (d.f. corrected)				
Convergence achieved after 11 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
W00?(-1)	1.004372	0.002939	341.7766	0.0000
D(PM00?)	0.271045	0.053833	5.034891	0.0000
D((UR?)	-1.592835	3.165439	-0.503195	0.6153
D(PH00?(-1))	0.273829	0.105743	2.589580	0.0102
AR(1)	0.407660	0.068720	5.932207	0.0000
R-squared	0.997239	Mean dependent var		25.4585
Adjusted R-squared	0.997189	S.D. dependent var		7.8125
S.E. of regression	0.414198	Akaike info criterion		1.0969
Sum squared resid	37.91471	Schwarz criterion		1.1726
Log likelihood	-118.9530	Hannan-Quinn criter.		1.1274
Durbin-Watson stat	2.027456			

Source: Elaborated by M.C.Guisan for this book EE11. Note: We have included and autocorrelation term (AR(1)) to correct the possible effect of missing variables.

The equation relates W with its lageed value, PM, UR and PH(-1).

PM00= Mean Productivity of Labour

UR Unemployment Rate. Ratio Unemployment/Active Population

PH00(-1): Lagged value of Production per head

The goodness of fit is very high, not only because the R-squared is close to unity, but also because the percentage of the Stantard Error to the Mean of the dependent variable is very low (0.414198*100/25.4585=1.63%).

The model shows that the increase of Productivy (PM) and the increase of the lagged value of production per capita (PH) have a positive impact on real Wage, and that the increase of the Unemployment Rate may have a negative impact.

The coefficient of the Unemployment Rate is negative but not significantly different from zero, because there is some degree of uncertainty due to some degree of multicollinearity in the sample. Usually that coefficient is negative for each sector of Employment.

Equations 2.3 and 2.4, by Guisan, for Employment 1960-2000

Table 2.15 shows the quinquennial data of the Rate of Employment per 1000 inhabiantes. in 6 OECD countries for 1960-2000.

Table 2.15. Rate of Employment LHT) in 6 OECD countries, 1960-2000 (number of employed persons per one thousand inhabitants)

	LHT	LHTE	LHTF	LHTIT	LHTUK	LHTU
1960	NA	382	430	419	464	368
1965	476	356	413	383	464	376
1970	461	350	412	367	445	394
1975	447	351	407	361	446	405
1980	460	309	407	370	450	436
1985	457	276	388	373	431	449
1990	468	324	399	384	471	475
1995	452	306	387	349	449	469
2000	459	378	390	370	465	485

Note: Elaboratéd by Guisan, in the book EE11, from OECD Labour Force Statistics (for total Employment).

Equation 2.3 relates Total Employment (LT with the ratios GDP/W and KD/W. and equation 2.4 relates the Rate of Total Employment (LHT) with the ratios of PH/W and KDH/W.

Equation 2.3. Total Employment (LT) related with its lagge value and the increasea fo GDP/W and KD/W

Dependent Variable: LT? Method: Pooled Least Squares				
Sample:1962 2000. Cross section: 4. Total pool observations 145				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Stat	Prob.
LT?(-1)	1.010795	0.002250	449.2998	0.0000
D(GDP00?/W00?)	359.6609	45.37004	7.927279	0.0000
D(KD00?/W00?)	-67.73817	16.90861	-4.006135	0.0001
AR(1)	0.357820	0.114462	3.126112	0.0022
R-squared	0.999844	Mean dependent var		42519.26
Adjusted R-squared	0.999840	S.D. dependent var		37096.11
S.E. of regression	468.8956	Akaike info criterion		15.16584
Sum squared resid	31000691	Schwarz criterion		15.24795
Log likelihood	-1095.523	Hannan-Quinn criter.		15.19920
Durbin-Watson stat	2.029313			

Source: Guisán in this book EE11, with OECD statistics

Equation 2.4. Rate of Employment per thousand people (LHT)

Dependent Variable: LHT?. Method: Pooled Least Squares					
Sample: 1962 2000. Included obs: 39. Cross-section: 4. Total 145					
White cross-section standard errors & covariance (d.f. corrected)					
	Convergence achieved after 7 iterations				
Variable	Coefficient	Std. Error	t-Statistic		Prob.
LHT?(-1)	1.000916	0.001573	636.1295		0.0000
D(PH00?/W00?)	0.313658	0.054830	5.720585		0.0000
D((KDH00?/W00?)	-0.050105	0.010728	-4.670549		0.0000
AR(1)	0.338836	0.104392	3.245815		0.0015
R-squared	0.991456	Mean dependent var			0.403819
Adjusted R-squared	0.991274	S.D. dependent var			0.054812
S.E. of regression	0.005120	Akaike info criterion			-7.684067
Sum squared resid	0.003696	Schwarz criterion			-7.601950
Log likelihood	561.0948	Hannan-Quinn criter.			-7.650700
Durbin-Watson stat	2.091257				

Source:M.C. Guisán in this book EE11, with OECD statistics

Economic policies should be addressed to increase PH, without diminution of W, increasing the ratio PH/. The increase of PH allows simultaneous increases of W and the rate of Employment (LHT9. Increases of KDH are useful when they contribute to increase PH, but not in case of infrautilization.

2.4. Consumption and Production in the OECD, 1960-2000

Causality tests by Guisan(2001) in 25 OECD countries, 1960-1995

Table 2.16 shows the evolution of Production per head (PH) and Private Consumption per head (CH).

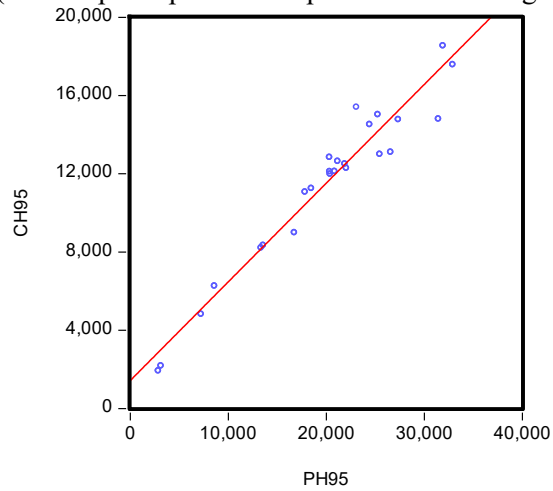
Table 2.16. Production and Private Consumption per capita in 25 OECD countries 1960-95. (Dollars per inhabitant at 1990 prices and Exchange Rates)

		PH60	PH75	PH95	CH60	CH75	CH95
1	Austria	8022	14334	22028	4495	7943	12294
2	Belgium	7844	14050	20316	5428	9038	12848
3	Denmark	11934	18445	27348	7407	10903	14784
4	Finland	9986	18336	25442	5086	9711	13011
5	France	8949	15738	21168	5341	9315	12645
6	Germany	9008	14297	21883	4427	7935	12510
7	Greece	2571	6311	8583	1909	4351	6270
8	Netherlands	9108	14685	20373	4884	8938	11996
9	Ireland	4700	8036	16740	3680	5477	9000
10	Italy	7047	12725	20345	3597	7258	12117
11	Luxembourg	11688	16657	32902	6497	11281	17585
12	Portugal	1992	4340	7214	1482	3464	4829
13	Spain	4141	9433	13351	2675	6115	8219
14	Sweden	13180	21519	26553	8044	11981	13118
15	UK	8928	12235	17818	5281	7058	11080
16	Australia	8785	13380	18463	5459	8123	11262
17	Canada	9244	15189	20857	5661	9043	12128
18	Iceland	9318	16147	24419	5284	9771	14532
19	Japan	5146	14522	25253	3425	8837	15036
20	Mexico	1741	2759	3132	1291	1963	2188
21	New Zealand	8742	11675	13561	6079	7875	8348
22	Norway	10485	17741	31425	6466	10070	14813
23	Switzerland	19099	26407	31905	10670	15468	18554
24	Turkey	1263	2015	2863	1039	1365	1932
25	USA	12259	16606	23068	7467	10811	15411
26	EU15	7908	13211	19397	4433	7713	11463
27	OECD25	8240	13181	18757	4903	8083	11613

Source: Elaborated by M.C. Guisan(2000) and (2002) in EcoDev67, from OECD National Accounts. Note: Countries 1 to 15 belonged to European Union (EU15). The Countries 16 to 25 include non European countries and some European countries that not belonged to EU15. The last two rows are total EU15 and total OECD25.

Graphs 2.7 presents the scatter diagram of the data oc CH95 and PH95 in 25 OECD countriesin year 1995, with data from table 2.16.

Gaph 2.7. CH95 and PH95 in 25 OECD countries, 1995
(Dollars per capita a 1990 prices and Exchange Rates)



Source: Elaborated from data of table 2.16.

Guisan(2001), in AEID, presents an interesting analysis of causality and cointegration between real value of Private Consumption per Capita (CH) and real value of Gross Domestic Product per capita (PH)., with a sample of 625 observations of 25 OECD countries in the 25 years of the period 1961-1995. Although it may be some degree of contemporaneous bilateral relation, we find that the main direction of causality is from Production to Consumption.

The main conclusion was to find empirical support to the importance of the supply side of macroeconomics to explain economic development. The supply side includes not only the availabitliy of primary inputs but also the analysis of the impact of intermediate inputs.

Studies by Guisan and Arranz (2001) (2003) on Public Consumption

The studies by Guisan and Arranz (2001) and (2003) analyze the evolution of Consumption of Medical Care and Education for the period 1970-1996 in OECD countries, and present econometric models that have into account the difference between public and private consumption.

Table 2.17 presents data of Private and Public Consumption of 24 OECD countries on *Medical Care* and *Education and Culture* in year 1996.

Table 2.17. Private and Public Expenditure on Medical Care and Education in 1996 (dollars per inhabitant at 1996 prices and PPPs)

Country	Medical Care			Education and Culture		
	Total	Private	Public	Total	Private	Public
1. Austria	1895	418	1477	2352	1473	879
2. Belgium	2043	467	1576	2342	983	1359
3. Finland	1543	346	1197	2438	1159	1279
4. France	2674	434	2240	2211	1053	1158
5. Germany	2227	474	1753	2193	1216	977
6. Ireland	1611	279	1332	2322	881	1441
7. Italy	1779	400	1379	2063	1056	1007
8. Luxembourg[1]	1738	1734	34	2755	1473	1282
9. Netherlands	2055	439	1616	2525	1214	1311
10. Portugal	921	648	273	2117	679	1438
11. Spain	1013	327	686	1266	1016	250
12. Denmark	1552	288	1264	3758	1367	2391
13. Greece	1112	564	548	1136	672	464
14. Sweden	1470	219	1251	2371	1037	1334
15. UK	1627	155	1472	2487	1458	1029
16. Iceland	3213	323	2890	3046	1604	1442
17. Norway	1674	314	1360	2671	1336	1335
18. Switzerland[1]	2234	2144	90	2357	1460	897
19. Turkey[1]	179	125	54	462	137	325
20. Australia	2058	446	1612	3204	1642	1562
21. New Zealand	1491	819	672	2204	1066	1138
22. Japan	3747	386	3361	3093	1607	1486
23. Canada	2480	451	2029	3113	1413	1700
24. USA	3402	3298	104	3453	2190	1263

Source: Elaboration by Guisan and Arranz(2001), from OECD National Accounts, for Private Consumption, and from OECD Purchasing Power Parities and Real Expenditure, for Total Individual.Consumption on Medical Care.

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CHAPTER 3
PRODUCTION AND EMPLOYMENT BY SECTOR IN OECD COUNTRIES. 1960-2000,

GUISAN, Maria-Carmen*
EXPOSITO, Pilar

3.1. Production by sector in 23 OECD countries in year 1999.

Table 3.1 presents the Production per capita in the sectors of Agriculture (A), Industry and Building (I&B) and Services (S) in 23 OECD countries.

Table 3.1. Production per capita by sector, year 1999. (Dollars at 1999 PPPs)

Country	Agriculture	Industry and Building	Services	Total
Australia	733	6349	17338	24419
Austria	519	8049	17396	25964
Belgium	260	7291	16695	26040
Canada	781	8328	16916	26025
Denmark	537	9663	16642	26843
Finland	921	7371	14743	23036
France	462	6000	16616	23078
Germany	242	7253	16682	24176
Greece	1266	3638	10915	15819
Ireland	986	8871	14786	24642
Italy	675	6972	14844	22490
Japan	519	9611	15845	25975
Mexico	417	2251	5670	8338
Netherlands	733	6353	17347	24433
New Zealand	1358	5238	12803	19399
Norway	553	8851	18255	27659
Portugal	627	4706	10354	15687
Spain	528	5987	11094	17609
Sweden	441	6395	15216	22053
Switzerland	851	9080	18444	28375
Turkey	1002	1870	3807	6678
UK	219	6340	15305	21864
USA	638	8297	22977	31912

Source: Elaborated by Guisan and Exposito, from OECD statistics

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Maria-Carmen Guisan and Pilar Exposito. Econometrics. USC, Spain

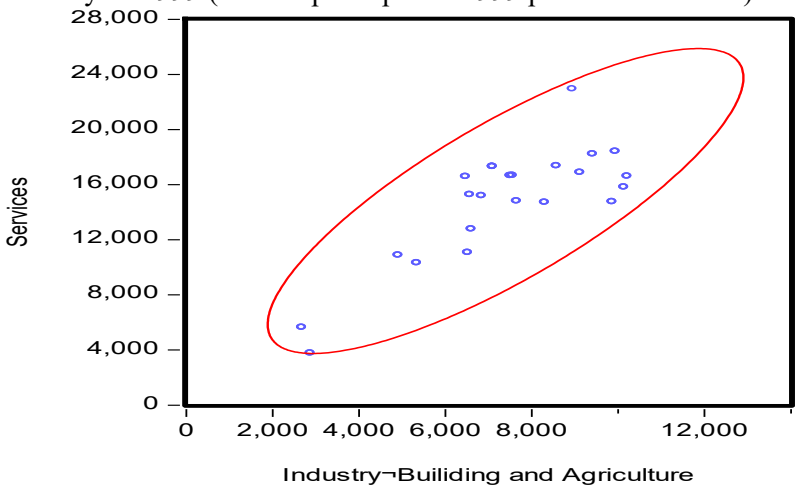
Agriculture: The lowest values correspond to the United Kingdom (219), Germany (242) and Belgium (260) while the highest values, in table 3.1, correspond to New Zealand (1358), Greece (1266) and Turkey (1002). The difference between the maximum and the minimum was 1139.

Industry&Building: The lowest values correspond to Turkey (1870), Mexico (2251) and Greece (3638), while the highest values correspond to Denmark (9663), Japan (9611) and Switzerland (9080). The difference between the maximum and the minimum was 7793.

Services: The lowest values, in table 3.1, correspond to Turkey (3807), Mexico (5670) and the highest ones to the United States (22977), Switzerland (18444) and Norway (18255). The difference between the maximum and the minimum was 19170.

Graphs 3.1 shows the positive relationship between production of Services and the sum of production in Agriculture, Industry and Building.

Graph 3.1. Relationship of Services with other sectors (Agricultur+Industry&Building) in 23 OECD countries in year 1999 (Dollars per capita at 1999 prices and Parities)



Source: Elaborated by authors from table 3.1.

The correlation coefficient of Production per capita in Services with the sum of the Sectors Industry&Building and Agriculture, is as high as 80.98%.

3.2. Agriculture in 4 OECD countries, 1965-1999

Tables 3.2 to 3.5 show the evolution of the following variables in the sector of Agriculture (which includes Agriculture and Fishing), for the period 1965-1999 in 4 OECD countries:

It is important to differenciate between *real value of production* and *real value of income,* when the sectoral index of prices is very different of the general index of prices of private consumption.

Real Value-Added in *production approach* represents the produced quantity and real Value-Added in *income approach* represents the purchasing capacity of the incomes generated in each sector.

For each country, we have calculatd real values of Producción of Agriculture (QA) in local currency, at constant prices of year 1990, by dividing VA (Value-Added of Agriculture at current prices in local currency) by IPA (Index of Prices of Agriculture in the country, being IPA equal to 1 in year 1990

We also have calculated Real Income of Agriculture (RA) by dividing VA by the Index of Prices of Private Consumption (IPC=1 in year 1990)

The increase of QA indicates a higher production, while and increase in RIA indicates a higher power to purchase general goods and services.

The real values of QA and RA in local currencies at 1990 pricres are:

Real production of Agriculture in local currency: QA(local) = VA /IPA

Real Income of Agriculture in local currency: RA(local)=VA/IPC

Relative Price Indexo f Agriculture: IPRA = IPA/IPC

Relation between Real Production and Real Income: RA = QA . IPRA

Finally we have divided the values of QA(local) and RA(local) by the Purchasing Power Parity (PPP) of local currency to Dollar in year 1990, and get the values QA90 and RA90, expressed in Dollars at 1990 prices and PPPs.

Table 3.2. Agriculture in France, 1965-1999: QA90 and RA90 (Dollars at 1990 prices and PPPs), Employment (th), Indexes of prices

Year	QA90	RA90	LA	IPA	IPC	IPRA
1965	20.851	44.196	3473	0.285	0.163	1.746
1970	22.497	45.279	2753	0.340	0.205	1.658
1975	22.467	41.647	2156	0.493	0.323	1.527
1980	25.444	38.771	1854	0.672	0.535	1.255
1985	31.188	39.298	1582	0.884	0.852	1.038
1990	33.565	40.746	1262	1.000	1.000	1.000
1995	33.097	29.698	1039	0.832	1.125	0.739
1999	37.543	29.623	959	0.764	1.175	0.650

Source: Calculated by authors from OECD National Accounts. Real Value Added (production and income approaches), Employment and Prices. Published in Guisan and Exposito(2004).

Table 3.3. Agriculture in Spain, 1965-1999: QA90 and RA90 (Dollars at 1990 prices and PPPs), Employment (thousand), Indexes of prices

Year	QA90	RA	LA	IPA	IPC	IPRA
1965	13.216	26.108	3586	0.152	0.077	1.975
1970	14.598	25.340	3310	0.175	0.101	1.736
1975	17.817	29.495	2745	0.293	0.177	1.655
1980	19.752	24.021	2228	0.497	0.409	1.216
1985	20.948	20.735	1950	0.718	0.725	0.990
1990	21.120	21.120	1486	1.000	1.000	1.000
1995	16.566	14.387	1107	1.140	1.313	0.868
1999	19.698	13.853	1015	1.024	1.456	0.703

Source: Calculated by authors from OECD National Accounts. Real Value Added (production and income approaches), Employment and Prices.Puhblished in Guisan and Exposito(2004).

We may notice that real Value-Added *income approach* (RA) increased less thant real Value-Added *production approach* (QA), due to the diminution of the relative prices of Agriculture (IPRA).

Table 3.4. Agriculture in Japan, 1965-1999 QA90 and RA90
(Dollars at 1990 prices and PPPs), Employment (th), Indexes of prices

Year	QA90	RA90	LA	IP	IPCU	IPRA
1965	56.462	84.596	4476	0.394	0.263	1.498
1970	59.209	85.330	3567	0.454	0.315	1.441
1975	63.880	116.965	3507	0.785	0.429	1.831
1980	68.688	107.393	3529	0.980	0.627	1.563
1985	91.307	105.140	3338	0.941	0.817	1.152
1990	110.300	110.300	3394	1.000	1.000	1.000
1995	120.799	98.524	3592	0.940	1.152	0.816
1999	142.004	87.896	3416	0.761	1.230	0.619

Source: Source: Calculated by authors from Guisan and Expotio(2001) and OECD National Accounts. Real Value Added (production and income approaches), Employment and Prices. Published by Guisan and Exposito(2004).

Table 3.5. Agriculture in the United States, 1965-1999: QA90 and RA90 (Dollars at 1990 prices and PPPs), Employment (thousand), Indexes of prices: IPA (Agriculture), IPC (Consumption), IPRA=IPA/IPC

Year	QA90	RA90	LA	IPA	IPC	IPRA
1965	47.037	55.608	11130	0.325	0.275	1.182
1970	51.236	65.205	8860	0.447	0.351	1.273
1975	57.950	70.189	6610	0.719	0.594	1.211
1980	52.369	55.713	5770	0.869	0.817	1.064
1985	53.774	55.722	5090	0.974	0.940	1.036
1990	56.005	55.979	4510	1.000	1.000	1.000
1995	49.184	45.300	3670	0.974	1.058	0.921
1999	46.341	38.806	3350	0.896	1.071	0.837

Source: Source: Calculated by authors from Guisan and Exposito(2001) and OECD National Accounts. Note: Real Value Added (production and income approaches), Employment and Prices.

We have caulculated the mean values per worker of QA90 and RA90:

Mean productivity per worker: PMA90=QA90/LA

Mean real income per worker: RMA90 = RA90/LA.

We may notice an increase of real production and a diminution of real income, due to the diminution of the relative price of Agriculture (IPRA). The price of Agriculture has experienced low increase in comparison with the general price of Private Consumption.

Table 3.6 shows the evolution of PMA90 and RIM90, for 1965-1999.

Table 3.6. Real Mean Productivity (PM) and Real Mean Income per worker (RM) of Agriculture, 1965-1999 (th Dollars at 1990 prices and Parities)

Country	Mean Productivity (PMA)		Mean Real Income (RMA)	
	1965	1999	1965	1999
France	6.0	39.1	12.7	30.9
Spain	3.7	19.4	7.3	13.6
Japan	4.2	13.8	5.0	11.6
USA	12.6	41.6	18.9	25.7

Source: Elaborated from tables 3.2 to 3.5.

The increase of productivity per worker (PMA=QA/LA) has compensated the diminution of the relative price index (IPRA) and the mean real income per worker (RMA=RA/LA) has increased for the period 1965-1999, from 12.7 to 30.9 in France, from 12.7 to 13.6 in Spain, from 5.0 to 11.6 in Japan and from 18.9 to 25.7 in the United States.

3.3. Industry in 4 OECD countries, 1960-2000

Evolution for the period 1965-1990 in 4 OECD countries

Table 3.7 shows the evolution of real Value-Added per capita in Manufacturing for the period 1965-1990 in Germany West, Spain, Japan and the United States.

We may notice an important increase in the 4 countries, particularly in Japan. This country had the lowest value of this group of countries in year 1965 (768) and got the highest one in 1990, with an increase of almost 4000 Dollars per capita. The USA had an increase of more than 1300 Dollars per capita, Germany of almost 2000 and Spain of almost 1400.

Table 3.7. Manufacturing Production per capita
($ per inhabitant at 1985 prices)

Country	1965	1970	1975	1980	1985	1990
USA	2347	2461	2570	2956	3332	3695
Japan	768	1572	1841	2795	3580	4638
Germany West	2687	3362	3467	4109	4292	4647
Spain	1048	1498	2023	2070	2028	2440

Source: Elaborated by Guisam(1995) from OECD statistics.

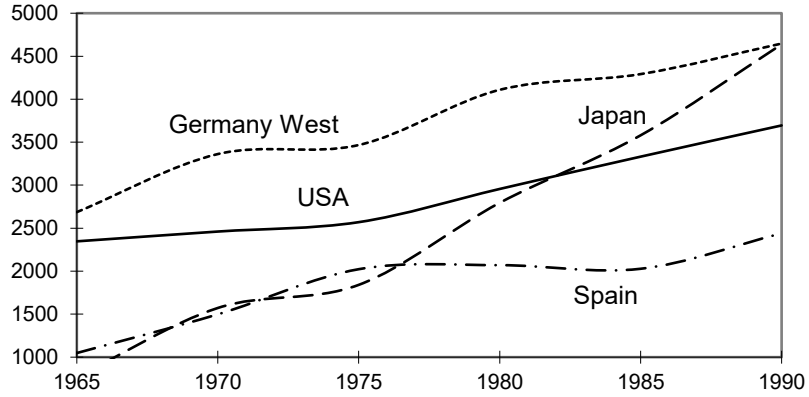
Table 3.8 shows the evolution of the Stock of Industrial Capital per capita in 11 OECD countries for the period 1975-1990

Table 3.8. Stock of Capital per capita in Industry
(thousand Dollars at 1990 prices)

Country	1975	1980	1985	1990
Germany West	8.13	8.18	9.04	10.35
Belgium&L (*)	4.27	4.99	5.90	7.66
Denmark	6.41	7.20	7.56	8.65
Span	3.35	3.97	3.90	3.82
France	6.36	7.56	8.18	8.77
UK	5.01	5.51	5.47	5.68
Netherlands	7.40	7.95	8.20	8.60
Italy	6.16	6.60	7.87	9.10
Portugal	2.45	2.83	3.47	4.24
Japan	6.90	7.94	9.51	11.30
USA	5.05	5.39	5.85	6.15

Source: Published in Cancelo and Guisan(1998), DEA12, and elaborated by Cancelo (1996) from OECD, Eurostat and Mas et al.
Note: (*) Data of Belgium&L includes Belgium and Luxembourg.

Graph 3.2. Manufacturing real Value-Added per capita (Dollars of 1985 prices per inhabitant)

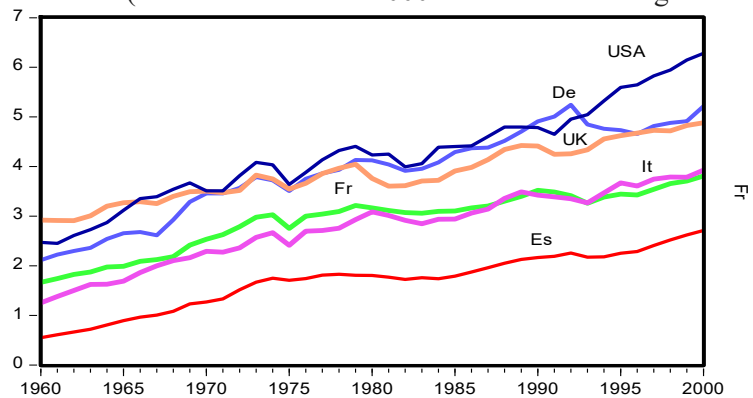


Source: Elaborated by authors from OECD statistics

The high increase of the Stock of Capital per capita in industrial sectors has been very important not only to increase industrial production per capita but also to foster development of production, and productivity in other sectors.

Industrial development 1960-2000 in 7 OECD countries

Graph 3.2. Eevolution of QHI in these 6 OECD countries, 1960-2000 (thousand Dollars at 2000 Prices and Exchange Rates)



Source: Elaborated by M.C.Guisan in this book EE11, from OECD National Accounts. Thousand Dollars per capita at 2000 prices and exchange rates

3.4. Building and Services in 4 OECD countries, 1965-1999

In several studies we have estimated econometric models of Employment by sector and have analyzed the evolution of the rates of Employment per one thousand people.

Here we present selected data from those studies, elaborated from OECD Labour Force Statistics, based in Guisan(1995), EcoDev1 and Asepelt Congress held at Valladlid, for the period 1965-1990 and have added new data for 1999.

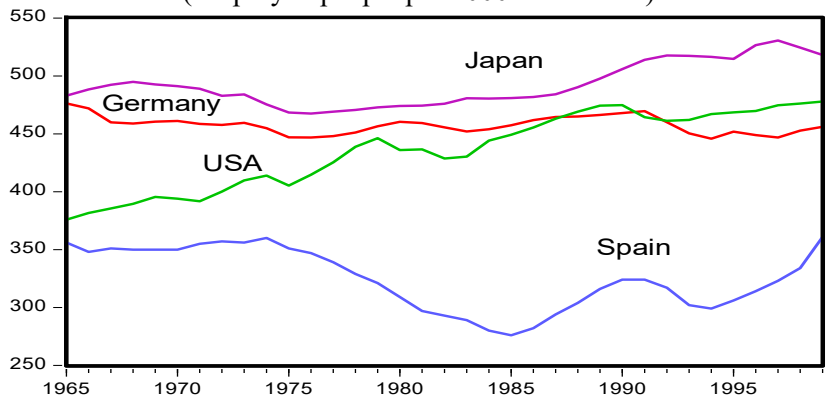
Table 3.9. Rates of Total Employment in 4 OECD countries, 1965-1999
(Employed people per 1000 inhabitants)

Country	1965	1970	1975	1980	1985	1990	1999
USA	366	383	386	422	433	461	478
Japan	483	515	493	502	505	532	518
Germany	469	450	428	438	434	450	456
Spain	375	361	350	309	276	323	361

Source: Elaborated from Guisan(1995) and OECD Labour Force Statistics.
Note: Data of Germany correspond to West Germany, for the period 1965-1990, and to the united Germany (former West and East) in year 1999.

Graph 3.3 shows the evolution of the rate of Employment in countries of table 3.9, with annual data for the period 1985-1999.

Graph 3.3. Rate of Total Employment in 4 OECD countries, 1965-1999
(Employed people per 1000 inhabitants)



Source: Elaborated by Guisan, in this book EE11, from OECD statistics.

In Spain, for 1975-1999, the rate of Non-Agrarian Employment increased 72 points (from 263 to 365 employments per thousand populaltion), while the rate of Agrarian Employment diminished by 106 points. These changes where accompanied by an increase of income per worker, both in Agriculture and in the other sectors of the economy.

Table 3.10. Rates of Employment in Agriculture :4 OECD countries
(Employed people per 1000 inhabitants)

Country	1965	1970	1975	1980	1985	1990	1999
USA	23	20	18	14	12	12	8
Japan	114	103	77	65	55	49	26
Germany	49	37	29	23	20	16	13
Spain	132	109	77	59	50	38	26

Source: Elaborated by authors from Guisan(1995) from OECD Labour Force Statistics. Note: Data for Germany: only West Germany for 1965-1990.

Table 3.11. Rates of Employment in Industry: 4 OECD countries
(Employed people per 1000 inhabitants)

Country	1965	1970	1975	1980	1985	1990	1999
USA	116	119	105	114	106	103	87
Japan	123	137	125	121	124	125	110
Germany	177	173	155	154	145	147	115
Spain	97	99	96	83	67	77	69

Source: Elaborated by authors, from Guisan(1995) and OECD Labour Force Statistics. Note: Data for Germany: Only West Germany until 1990

Table 3.12. Rates of Employmen in Building: 4 OECD countries
(Employed people per 1000 inhabitants)

Country	1965	1970	1975	1980	1985	1990	1999
USA	24	21	21	24	25	26	23
Japan	33	42	48	51	45	49	52
Germany	42	38	32	35	31	30	35
Spain	29	32	35	28	20	31	39

Source: Elaborated by authors from Guisan(1995) and OECD Labour Force Statistics. Note: Data for Germany: Only West Germany until 1990.

Table 3.13 shows the evolution of the rates of Employment in Services for the perior 1965-1999. There was an important increase for 1965-1999. The highest rates in 1999 corresponded to the United States (364) and Japan (330).

Table 3.13. Rates of Employment in Services
(Employed people per 1000 inhabitants)

Country	1965	1970	1975	1980	1985	1990	1999
USA	213	234	260	287	309	337	364
Japan	213	230	241	257	271	297	330
Germany W	191	196	208	228	238	272	-
Germany	199	203	216	235	246	260	294
Spain	118	122	142	136	138	176	227

Source: Elaborated by authors from OECD Labour Force Statistics. Note: There are 2 rows for Germany for 1965-1990: Germany W, provided by OECD , and our estimation for united Germany.

Table 3.14. Rates of Employment in Commercial Services and Hostelty

Country	1970	1975	1980	1985	1990
USA	77	81	91	98	105
Japan	85	84	89	91	95
Germany W.	67	66	69	69	73
Spain	51	60	54	51	65

Source: Elaborated from Guisan(1995) and OECD Labour Force Statistics. Note Germany for 1970-1990, only West Germany.

Table 3.15. Rates of Employment in Social Services: Private and Public

	1970			1980			1990		
Country	Priv.	Pub.	Total	Priv.	Pub.	Total	Priv.	Pub.	Total
USA	46	64	110	58	65	123	73	67	140
Japan	66	30	96	81	33	114	112	32	144
Germany W	34	49	83	40	64	104	55	68	123
Spain	23	30	53	20	36	56	25	50	75

Source: Elaborated from Guisan(1995) and OECD Labour Force Statistics.
Note: Data of Germany for the prido 1970-1990: Only West Germany.

Table 3.14 shows an increase in the rates of Employments in Commercial Services, for the period 1970-90, from 77 to 105 in the USA, 85 to 95 in Japan, 67 to 73 in West Germany and 51 to 65 in Spain. Table 3.14 shows increase in the rates of Employment in Social Services (both public and private), with an evolution from 110 to 140 in the USA, 96 to 144 in Japan, 83 to 123 in West Germany and 53 to 75 in Spain

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CHAPTER 4
ECONOMETRIC MODELS OF LATIN AMERICA: STUDIES OF THE PERIOD 1984-2004

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In this chapter we include references to several studies, on economic Latin America, published by our research team, for the period 1984-2004, related with development in the last decades of the 20th century. Other studies on Latin America in the 21st century has been includes in Guisan(2020), EcoDev 123, articles in AEID,, and in other studies. The book EE12, by Guisan(2023 b) is scheduled to include a survey in this regard.

4.1. Production and Trade in Latin America: 1979-1995.

Section 4.1 includes references to two models: the study by Guisan(1984) on Trade and Development in 17 Latin American countries in year 1979, and the study by Guisan, Cis and Neira (1999) Trade in Central America, 1980-1995

Guisan(1984): Trade constraints to development in Latin America in year 1979. EADI84.

The study by Guisan(1984), presented to the Congress EADI 1984, held in Madrid, analyzes the challenges of Latin American countries to increase its capacity to imports goods necessary for the formation of stock of capital and intermediate goods. The author published an article on this topic in the Scandinavian Journal of Development Altrnatives in year 1985.

Figure 4.1. EADI Congress, 1984

EADI European Association of Development Research and Training Institutes 4th Congress, Madrid (Spain),1984	External Trade Constraints to Development in Latin America and the Future of its economic relations with Europe Maria-Carmen Guisan, USC (Spain)

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The following tables show the values of GDP (Q), Raw Material (RM), Imports of Goods (IMPG, Imports of Intermediate Inputs IMPII=IMG-Imports of capital goods), Population and values per capita of Q (QH), RM (RMH), IMPG (MGH), IMPII (MIIH), and the Imports per capita of Capital goods (MCGH) in year 1979.

Table 4.1. Presents total values of Q, RM, IMPII, IMPG and Population in year 1979.

Table 4.1. Production, Raw Materials, Imports of Intermediate Inputs (IMPII), Imports of Goods (IMPG) and Population of 17 Latin American countries in 1979

Country	Q	RM	IMPII	IMPG	Pop
Argentina	53.00	7.95	5.18	6.94	26.73
Bolivia	4.98	1.44	0.65	1.01	5.42
Brasil	204.52	24.54	13.77	18.56	118.65
Chile	17.50	2.61	3.37	4.22	10.92
Colombia	25.80	7.32	1.93	3.36	26.36
Costa Rica	3.99	0.91	1.08	1.41	2.19
Dominican R	5.50	1.31	0.92	1.31	5.28
Ecuador	9.17	2.92	0.96	1.95	8.15
El Salvador	3.50	1.03	0.77	1.02	4.66
Honduras	2.17	0.68	0.53	0.83	3.56
Mexico	119.85	19.18	7.88	12.08	69.38
Nicaragua	2.50	0.70	0.48	0.60	2.64
Panama	2.60	0.57	1.01	1.19	1.92
Paraguay	3.30	1.11	0.32	0.52	2.97
Peru	13.62	3.30	1.72	2.19	17.29
Uruguay	6.95	0.86	1.03	1.21	2.88
Venezuela	48.97	12.24	6.19	10.67	13.55
Total	527.92	88.67	47.79	69.07	322.55

Source: Elaborated by the author from several sources: Banco de Bilbao(1991), The Economist (1981) and UN(1980). Notes: Population in million people. Columns (1) to (4) in Billion (thousand million) Dollars. Columns (6) to (10) in Dollars per capita.

Brazil and Mexico are the countries with the highest values of total Production (Q), production of Raw Materials (RM) and Imports of Intermediate Inputs (IMPII) in year 1979.

Table 4.2. presents the values per capita of Production, Raw Materials, Imports of Intermediate Inputs, Imports of Capital Goods and Total Imports of Goods. We use as indicator of Intemediate Inputs the difference between Imports of Goods and Imports of Capital Goods.

Table 4.2. Production (Q), Raw Matrials (RM), Imports of Intermediate Inputs MIIH, Capital Groods (MCGH) and Total Goods (MGH)

(Dollars per capita, at curret prices, in year1979)

Country	QH	RMH	MIIH	MCGH	MGH
Argentina	1983	297	194	66	260
Bolivia	919	266	120	66	186
Brasil	1724	207	116	40	156
Chile	1603	239	309	78	386
Colombia	979	278	73	54	127
Costa Rica	1822	416	493	151	644
Dominican R	1042	248	174	74	248
Ecuador	1125	358	118	121	239
El Salvador	751	221	165	54	219
Honduras	610	191	149	84	233
Mexico	1727	276	114	61	174
Nicaragua	947	265	182	45	227
Panama	1354	297	526	94	620
Paraguay	1111	374	108	67	175
Peru	788	191	99	27	127
Uruguay	2413	299	358	63	420
Venezuela	3614	903	457	331	787
Total	1637	275	148	66	214

Source: Elaborated by the author from several sources: Banco de Bilbao(1991), The Economist (1981) and UN(1980). Notes: Data in Dollars per capita.

The highest values of Production per capita (QH) corresponded to Venezuela (3614), followed by Uruguay (2413), Argentina (1983) and Costa Rica (1822).

The highest velues of Raw Materials production per capita, corresponed to Venezuela (903), followed by Costa Rica (416)

The highest values of Imports per capita were as follows: Intemediate Inputs (MIIH) higher than 300: Chile, Costa Rica, Panama, Uruguay and Venezuela. Capital Goods (MCGH): Venezuela, Costa Rica and Ecuador.

To reach a relevant increase of Production per capita, without disequilibrium in the commercial balance, it is necessary to increase industrialization. The increase of industry generally supposes an increase of domestic production of intermediate inputs for Services and other sectors, and an increase the capacity to export and thus of the capacity to import other intermediate inputs useful for economic development

The equation of intermediate inputs for 17 Latin American countries, estimated with data of year 1979 was:

$$\hat{Q} = \underset{(2.74)}{-9.9061} + \underset{(1.90)}{2.884}\,RM + \underset{(3.02)}{9.1050}\,IMPII; \qquad R^2 = 0.9596$$

where the terms between brackets are the correspondign t-statistics.

The equation shows a positive impact of domestic production of raw materials and the capacity to import intermediate goods, on the increase of real GDP.The goal to double the value of real GDP of this group of 17 Latin American countries, imply a great increase of RM and also a great increase of the capacity to Import not only intermediate inputs (IMPII) but also machinery and equipment necessary to increase the stock of capital necessary for the production function.

A challenge of Latin American countries, in order to sustainable development, is to increase RMH and the capacity to Export per capita, allowing and increase of the values of MHII and MHCG required for development without a strong disequilibrium in the current account balance.

With an external debt of 340 Billion (thousand million) Dollars in year 1983, the future of economic development in Latin America depended on international cooperation to conciliate economic development and a more balanced external trade evolution.

In Guisan(1997), EcoDev 18, we analyze the positive correlation between Education Expenditure per capita (EDUH) and Gross Domestic Product per capita (GDPH), in 20 geographical areas of the World in year 1994. The lowest value of EDUH were below 100 Dollars per capita in several areas de Africa and Asia, and the higest values were higher than 1000 Dollars.

The results for American areas were: North America (including USA, Canada and Mexico) 1157, Central America 104 Andean America (without Venezuela) 137, Venezuela and Guyanas 416, South Cone 259.

Guisan, Cis and Neira (1999) Trade in Central America, 1980-1995

The study by Guisan, Cis and Neira (1999), EcoDev 36, about the economic integration of Central America, we include a table with some historical events, since the independence from Spain in year 1821 to the System of Integration of Central America(SICA) in 1993.

We include a table with foreign trade balance of Guatemala, El Salvador, Honduras, Nicaragua Costa Rica and Panama for the period 1980-1995, with a negative balance for each country. mainly due to the low value-added per capita in industry.

Intrarregional imports and exports supposed approximately 1600 Dollars in each direction. Extrarregional imports and exports generated a great deficit, with 4074 million of exports and 12932 million of imports.

To increase the capacity to import without generating a big trade deficit usually requires to increase the capacity to exports goods (from Agriculture and Industry) or Services (like tourism).

The study also includes a table with the evolution of Population for the period 1960-1999, with the following countries:

Guatemala from 3.83 to 11.24 million;

El Salvador fro 2.45 to 6.1;

Honduras from 1.85 to 6.1,

Nicaragua from 1.41 to 4.5;

Costa Rica fro 1.25 to 3.7

Panama from 1.1 to 2.8.

The total population of these countries of Central America evolved from 11.89 million people in year 1960 to 34 million in year 1999. The increase of Production was not enough to get a high increase of Production per head.

Income per capita was low in those countries. The better positions corresponded to Costa Rica and Panama. To foster economic development, without generating unsustainable foreign debt, it is important to increase the educational expenditure and average years of schooling of population, in order to moderate high fertility rates and contribute to increase the difference between the rate of growth of Production and the rate of Population growth.

4.2. Studies by Neira et al(1997,1998), on Education in Latin America

Study by Neira, Exposito and Aguayo(1998), PS2 for 1960-1990:

That study analyses the evolution of the percentage of adult population with at least upper secondary education). It was a contribution to the VII Meeting of the AEDE Association in year 1998, and published in EcoDev 25.

Table 4.3.. Percentage of Secondary Schooling, PS2, in Latin America and the Caribbean, 1960-1990

	1960	1965	1970	1975	1980	1985	1990
Argentina	14,6	15,8	19,3	20,2	26,5	28,6	37,3
Bolivia	34,9	29,5	25,5	22,9	21,6	21,5	20,4
Brazil	14,1	12,5	11,6	10	11,9	11,4	11,9
Barbados	17,2	18,5	65,1	62,8	35,6	42,4	49,6
Chile	24,5	23	30,4	29,5	34,1	33,9	34,8
Colombia	13,8	12,2	11,8	21,7	20,7	22,1	23,9
Costa Rica	10,4	10,7	10,7	17	18,1	21,8	25,4
Dominican R.	3,5	3,9	14	13,1	13,8	16,7	20,2
Ecuador	8,5	8,1	8,1	14,4	23,6	24,5	27
Guatemala	4,2	4,2	4,5	6,1	9,6	9,7	10,4
Guyana	2,7	5,5	10,2	17,4	19,1	25,9	32,3
Honduras	4,1	3,8	4	6,3	6,6	15,2	15,5
Haiti	4,4	4,2	4,1	4,2	7,9	10	10,4
Jamaica	6	6	8	13,8	17	24,7	31,7
Mexico	5,7	5,4	10,4	10,8	17,2	19	32,6
Nicaragua	7,2	6,2	11,4	10,6	10,4	10,9	13,6
Panama	18	17,9	21,6	22,9	31,5	33	45,5
Peru	12,3	11,5	17,9	18	31,5	30,8	31,6
Paraguay	8,1	7,6	12,4	11,9	19,4	18,6	19,2
Salvador (El)	5,1	4,8	7,9	8,5	9,6	10	10,7
Trinidad&Tobago	13,5	12,8	13,8	16,7	26,6	28,4	32,1
Uruguay	21,9	15,7	22,2	23,7	26,4	37,3	38,3
Venezuela	6,8	6,8	13,7	14,8	29,3	30,5	23,8
Mean	11,3	10,7	15,6	17,3	20,3	22,9	26,01
Standard Deviatio	7.9	6.8	12.7	11.7	8.7	9.3	11.2
Coeff.of Variation	0.69	0.63	0.81	0.67	0.42	0.40	0.43

Source: Elaborated by Neira, Exposito and Aguayo(1998), EocDev 25, from Summers and Heston (1991).

We may notice an important increase of secondary schooling in many Latin American countries, for the period 1960-1990.

A first group, with the highest values of PS2 in year 1990, over 30% corresponded to: Argentina, Barbados, Chile, Guyana, Jamaica, Mexico, Canada, Peru, Trinidad&Tobago and Uruguay.

A second group of countries reached values of PS2, in year 1990, between 20% and 29%: Bolivia, Colombia, Costa Rica, Dominican R., Ecuador and Venezuela.

A third group of countries had values of PS2, in year 1990, below 20%: Brazil, Guatemala, Honduras, Haiti, Nicaragua, Paraguay and El Salvador.

That study includes the estimation, with quinquenia data of the period 1965-1990, of the relationship between the variable "Stock of Physical Capital per capita" with its lagged valueda nd the educational level of Active Population.

The estimation was performed with data of 10 american countries: Argentina, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Mexico, Panama, Peru and Venezuela The coefficients of the explanatory variables were positive and statistically significant.

Study by Neira, Aguayo and Guisan(1997) for 1960-1990

That study, on Education and Development in Latin Amrica, 1960.1997, was presented at the EADI 1997 Congress helt at Paris, and published in EcoDev 35.

Table 4.4. shows the evolution of Gross Domestic Product per Capita (GDPH) and Population for the period 1960-1990, and the rate of annual increase of both variables.

Figure 4.2. Names of countries in tables 4.4 and 4.5.

BRD (Barbads), CAN (Canada), CRI (Costa Rica), DOM (Dominican Republic), SLV (El Salvador), GTM (Guatemala), HTI (Haiti), HND (Honduras), JAM (Jamaica), MEX (Mexico), NIC (Nicaragua), PAN (Panama), TTO (Trinidad&Tobago), USA (United States of America), ARG (Argentina), BOL (Bolivia), BRA (Brazil, CHL (Chile), COL (Colombia), ECU (Ecuador), GUY (Guyana), PRY (Paraguay), PER (Peru), URY (Uruguay), VEN (Venezuela)

Table 4.4. Domestic Product per head (GDPH and Population) in America, 1960-90

	GDPH (Dollars at 1985 prices			**Population (thousand)**		
	1960	**1990**	**Rate**	**1960**	**1990**	**Rate**
BRD	2666	7664	3.35	231	257	0.37
CAN	7258	17173	2.9	17910	26522	1.34
CRI	2096	3499	1.68	1254	2994	2.96
DOM	1195	2166	2.00	3325	7074	2.50
SLV	1427	1824	0.86	2578	5172	2.26
GTM	1660	2127	0.95	3887	9197	2.91
HTI	924	834	-0.32	3857	6346	1.73
HND	1039	1377	0.90	1934	5105	3.27
JAM	1773	2545	1.00	1622	2356	1.2
MEX	2836	5827	2.5	38227	81724	2.53
NIC	1606	1294	-067	1578	3676	2.85
PAN	1575	2888	2.37	1145	2418	2.49
TTO	5627	7764	1.2	776	1236	6.24
USA	9895	18054	2.00	180673	250372	1.0
ARG	4462	4706	0.17	20618	32322	1.41
BOL	1148	1658	1.27	3428	7172	2.49
BRA	1784	4042	2.46	72594	149042	2.38
CHL	2885	4338	1.66	7695	13173	1.8
COL	1684	3300	2.2	15754	32300	2.38
ECU	1461	2755	2.09	4563	10547	2.79
GUY	1596	1094	-1.17	538	798	1.32
PRY	1177	2128	1.94	1825	4277	2.87
PER	2019	2188	0.11	9936	21512	2.49
URY	3968	4602	0.84	2538	3094	0.64
VEN	6338	6055	0.35	7303	19325	3.23

Source: Neira, Aguayo and Guisan(1999), with data from Summer and Heston(1991). Notes: GDP per inhabitant (GDPH) in Dollars at 1985 prices and Purchasing Power Parities (PPPs). Rate = percentage of annual increase.

The annual rates of growth of GDPH varied between a minimum of -1.17 in Guyana to a maximum of 3.35 in Barbados. The annual rates of Population growth varied between the moderate values of 0.37% in Barbados and the highest value of 6.24% in Trinidad&Tobago.

The highest values of GDPH in year 1960 corresponded to the United States, Canada and Venezuela. In year 1990 the United States and Canada were also in first and second position, while the third one corresponded to Trinidad&Tobago

Comparison of GDP per capita at 1994 prices and PPPs

All these countries had a GDPH value in international comparison, both using exchange rates (ER) and purchasing power parities (PPP), much lower than the OECD average. The average of the17 countries was in 1994 a little below orld average. The comparison with GDPH expressed in Dollars at 1994 prices and PPPs is as follows:

The highest levels corresponded to Argentina, with 8920$ per head, Chile with 9060, Mexico with, Panama with 6080 and Venezuela with 7890.

At a lower stage with GDP per head next to the world average (see Guisán (1997) and Cordelier (1997)) are the following countries: Brazil (5630 $), Colombia (5970$) and Costa Rica (5760 $).

The lowest levels, under World average, correspond to Bolivia (2520 $), DominicanRepublic (3790 $), Ecuador (4380 $), El Salvador (2510 $), Honduras (1900$), Nicaragua (1850 $), Paraguay (3540 $) and Peru (3690 $).

Table 4.5 shows the percentage of illiterate population for the period 1960-1990.

We may notice high percentages of illiterate population in many countries. In year 1960 there were 22 countries with percentages of illiterate population higher than 10%, corresponding to all the countries of table 4.5 with the only exceptions of the United States and Canada.

Table 4.5. Percentage of Illiterate population over 25 years old in American countries, 1960-1990

	1960			1990		
	Total xx	**Male**	**Female**	**Total**	**Male**	**Female**
BRD	0.00	0.00	0.00	1.90	1.60	2.20
CAN	1.70	1.70	1.70	1.00	0.90	1.10
CRI	17.40	17.60	17.30	12.80	12.10	13.50
DOM	43.40	40.00	46.90	43.80	41.10	46.50
SLV	61.80	56.80	66.60	34.90	31.70	37.70
GTM	69.70	65.20	74.20	52.70	46.80	58.50
HTI	90.20	83.70	96.10	61.70	42.50	78.80
HND	60.90	55.90	65.90	32.10	31.40	32.80
JAM	18.80	21.60	16.40	4.20	4.30	4.00
MEX	46.00	40.60	51.20	18.80	16.10	21.40
NIC	59.00	58.60	59.50	42.20	38.00	46.30
PAN	28.00	27.50	28.50	12.90	12.00	13.80
TTO	14.70	10.20	19.10	5.60	6.30	5.00
USA	2.30	2.40	2.20	1.20	0.30	2.00
ARG	12.00	10.50	13.60	5.70	5.20	6.20
BOL	44.90	24.90	63.90	40.80	30.60	50.20
BRA	43.10	37.30	48.80	22.40	22.40	22.40
CHL	20.20	18.50	21.80	8.00	7.10	8.90
COL	35.10	31.90	38.00	24.50	27.20	21.90
ECU	37.80	32.00	43.40	24.00	21.10	26.80
GUY	13.30	8.40	18.00	10.80	9.30	12.30
PRY	26.40	18.40	33.80	13.80	10.60	17.00
PER	42.80	29.20	56.30	22.40	13.80	30.80
URY	13.10	11.60	14.60	5.50	6.60	4.60
VEN	49.10	42.20	56.20	21.20	19.50	22.90

Source: Neira, Aguayo and Guisan(1999) , with data from Barro and Lee (1991) and (1996)

In year 1990 the number of countries with percentage of illiterate population higher than 10% were 17 out of 25 American countries. In that year, the countries with percentage of illiterate population lower than 10 were: Barbados, Canada, Jamaica, Trinidad&Tobago, Estados Unidos, Argentina, Chile y Uruguay.

In many countries with high percentage of illiterate population the percentage was higher in the female population. In year 1990 the highest percentage of illiterate population corresponded to Dominican R (43.80), Guatemala (52.70), Haiti (6170), Nicaragua (42.20) and Bolivia (40.80)

In year 1990 12 countries of table 4.5 presented illiterate rates higher than 20% and 5 of them even higher than 40%. International cooperation to foster the average years of schooling in many Latin American countries and to diminish high illiterate rates is very important and we sugges an increase of that cooperation.

We consider important for Latin America in year 1997 to increase the educational level of population given the great positive impact of education on moderation of excessively high fertility rates and on the increase of investment per capita, production per capita, poverty diminution and improvement of quality of life.

With data of the 25 American countries of table 4.5, from Barro and Lee(1991) and (1996), we have calculate correlation coefficients of the Fertility Rate (number of children per woman in her life) with the indicators of education PS2 (percentage of people with upper secondary level) and the percentage of Illiterate Female Population and found the following a positive correlation between Fertility and Illiterate population and a negative correlation between Fertiliby and Upper secondary education.

Table 4.6. Correlation coefficients between Fertility rate (FER) and Education in America

Year 1960:
FER and Illiterate female population = 0,62
FER and Upper secondary level = -0,61
Year 1990:
FER and Illiterate female population = 0,81
FER and Upper secondary level = - 0,79

Source: Neira, Aguayo and Guisan(1999).

Usually, higher levels of education contribute to moderate excessive fertility rates and to increase savings per capita and investment per capita, with positive impact on industrial production and economic development.

The estimated econometric models also showed those effects on Fertility: negative of the percentage of upper secondary education (PS2) and positive of the percentage of illiterate female population. The study suggests to increase European cooperation for development with Latin America.

4.3. Models by Guisan and Aguayo (2002,2005) on America, 1980-2000

Guisan and Aguayo (2002) Education and Development in America, 1999

In that study, published in AEID, we have found that countries with high educational level usually had moderate fertility rates and relatively high savings and investment per capita, increasing production per capita in Industry and other sectors. Countries with a high level of industrial productionr may foster the development of Services without big deficits in the trade balance.

Table 4.7 includes several indicators of education and development of American countries in year 1999.

Table 4.7. Education indicators and Value-Added per capita in 1999 (Dollars)

	Education		Value-Added per capita in year 1999			
Country	eduh	tyr99	Agriculture	Industry &B	Services	Total
Argentina	294	8.49	757	4035	7818	12609
Bolivia	68	5.54	375	774	1349	2498
Brazil	259	4.56	661	2129	4552	7342
Canada	1620	11.43	781	8328	16916	26025
Chile	245	7.89	754	3108	5557	9419
Colombia	209	5.01	851	1458	3767	6075
Costa Rica	265	6.01	933	1466	4266	6665
Dominican R	64	5.17	616	1959	3023	5598
Ecuador	131	6.52	366	1006	1676	3048
El Salvador	40	4.50	480	1222	2662	4365
Guatemala	56	3.12	862	712	2173	3746
Haiti	13	2.67	408	272	680	1361
Honduras	78	4.08	432	720	1248	2401
Jamaica	184	5.22	262	1079	1929	3269
Mexico	423	6.73	417	2251	5670	8338
Nicaragua	72	4.42	623	503	1270	2397
Panama	340	7.90	489	1101	4527	6118
Paraguay	99	5.74	1217	1030	2433	4680
Peru	55	7.33	422	2003	2847	5272
United States	1371	12.25	638	8297	22977	31912
Uruguay	192	7.25	804	2592	5541	8937
Venezuela, RB	418	5.61	288	1384	4094	5757

Note: Eduh in Dollars per capita. Tyr99, average years of school attendance of adult population in 1999. Source: Elaborated by Guisan and Aguayo (2002) from several statistical sources (Barro and Lee, World Bank, Cordelier and Didiot(1996), among other ones). World Bank data for Industry includes Building.

We may notice low values of the indicators of Education in many Latin American and Caribbean countries, in comparison with the United States and Canada. Among Latin American countries, the highest values of the indicator Tyr99 corresponded to Argentina (8.49), Panama (7.90), Chile (7.89), Peru (7.33), Uruguay (7.25) and Mexico (6.73).

The highest values of Services per capita of Latin American countries, with more than 5000 Dollars in year 1999, corresponded to Argentina, Chile, Mexico and Uruguay.

Countries with low values of the indicators of Education, usually have low values of real value-added of industry per capita and, as a consequence, also a low value of value-added of services per capita.

Production in Services depends on Manufacturing and Energy and also depends on Tourism, Transport activities and some special features for development of this sector.

Table 4.8 shows the evolution of real Gross Domestic Product per capita in the 8 more populated countries of Latin America and Cuba.

Table 4.8. Real Production per capita in 9 Latin American countries
(Dollars per inhabitant and year at 2017 Prices and Parities)

	1950	1960	1970	1980	1990	2000
Argentina	10407	11602	15238	17205	13590	18525
Brazil	3367	4703	6156	10470	9918	11529
Chile	5904	6675	8178	8865	9891	15416
Colombia	3879	4499	5574	7684	8687	9138
Cuba	6764	6222	5932	5344	5883	4869
Mexico	5680	8226	11160	15696	15181	17943
Peru	3898	5207	6558	7243	5090	6376
Venezuela	15029	19428	21494	20421	16743	19133

Source: Elaborated from World Bank Statistics

In year 1950 the 3 most outstanding positions corresponded to Argentina, Venezuela and Cuba. In year 2000 the top positions corresponded to Venezuela, Argentina and Mexico. Mexico experienced a high increasefor 1950-1980, as pointed out by Moreno-Brid and Sanchez(2022), and most moderate for 1980-2000.

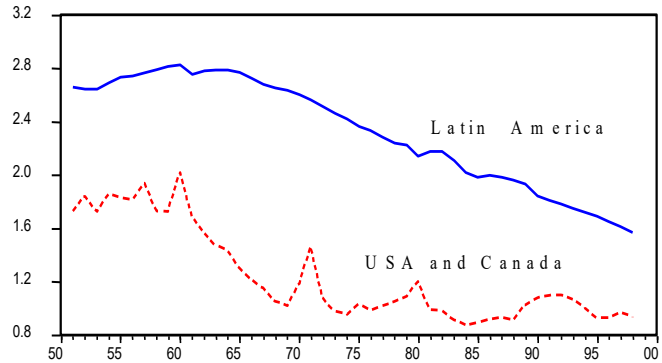
The highest increases corresponed to Mexico, with more tha 12000 Dollars, Chile with more than 9000 Dollars, and Argentina and Brazil, with more than 8000 Dollars. Colombia experiences an increase of more than 5000 and Peru an increase of more tha 2000, but Cuba experienced a decrease.

In Guisan(2023 a), in AEID, it is analyzed the evolution of these 8 Latin American countries for the period 1950-2022. The article highlights the importance of Education and Industry to foster the increase of real income per capita in Latin American countries. It also founds the importance of political stability and economic freedom to foster sustainable development. Countries with political instability and/or loss of economic freedom may usually suffer great damages in their development.

Model by Guisan and Aguayo(2005): American countries 1980-2002

The study shows the moderation of the rates of Population growth. The Educational level of population has contributed to this moderation.

Graph 4.1. Annual rates of population growth in America, 1950-2000



Source: Elaborated by Guisan and Aguayo(2005) from World Bank statistics

Moderation in Population growth has contributed to increase the capacity of savings and investments per capita, but politicas instability and/or lack of economic freedom have restricted the incentives to investment in industry in many countries.

The following table shows the evolution of real value-added of Manufacturing per capita in the 8 most populated countries of Latin America.

Table 4.9. Real Value Added of Manufacturing, 1980-2002
(dollars per inhabitant at 1995 prices and Exchange Rates)

Country	1980	2002	Ratio
Argentina	1561	1055	0.68
Brazil	1144	874	0.76
Chile	526	766	1.46
Colombia	402	311	0.77
Mexico	618	754	1.22
Panama	248	245	0.99
Peru	429	343	0.80
Venezuela1	527	495	0.94

Source: Elaboration by Guisan and Aguayo(2005) from World Bank statistics.
Notes: For Nicaragua and Venezuela in 2002 data are own estimations, based on the evolution during the period 1990-99 analysed by Guisan and Aguayo(2002). Last column is the ratio between figures for year 2002 and 1980.

The highest percentages of increase of real value-added of Manufacturing per capita, among the 8 Latin American countries of tabl 4.9, correspond to Chile (46%) and Mexico (22%). In the other cases there was a diminution for the period 1980-2002. Although the moderation in Population growth might have led to an increase of investment on manufacturing per capita, there are other factors that have restricted the increase of industrial production: unsecurity of investment in some cases, political instability and restrictions to economic freedom or other causes.

Other latin American countries that have experienced an increase of industrialization were in the period 1980-2002 were: Costa Rica (28%). Dominican Republic (70%), El Salvador (16%), and Honduras (12%)

The highest levels of the Manufacturing value-added per capita in Latin America, in year 2002, corresponded to Argentina, Uruguay, Brazil, Costa Rica, Chile and Mexico.

The authors estimated a cross-section model of 20 American countries including not only Latin American countries but also Canada and the United States in year 2002, where QNMH (real value added of Non Manufacturing per capita) dependes on its lagged value in year 1990 and the increase of QMH (real value added of Manufacturing per capita) for the period 1990-2002.

The equation includes 2 dummy variables for special cases: D4 for Chile, with an additional positive increase of 1181 Dollars per capita, and D20 for Venezuela) with an additional negative effec of 884 Dollars per capita.

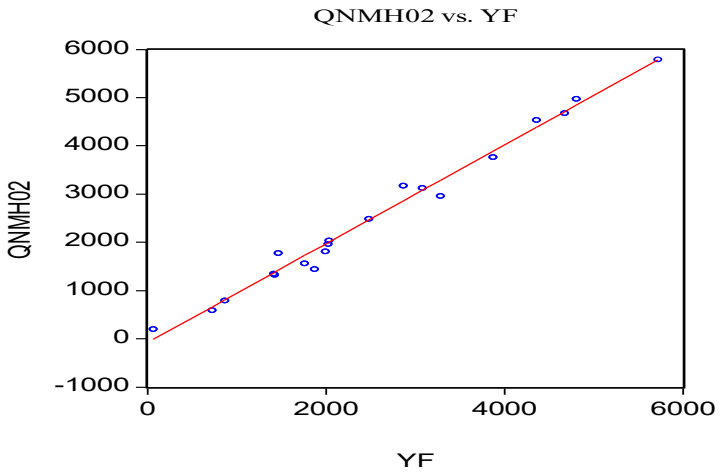
The estimated equation was:

qnmh02 = 1.2323 qnmh90 + 0.8091 (qmh02-qmh90) +Effects of D4 and D20
(58.4) (2.32)

The goodness of fit was high with R-square close to unity (0.9854) and a percentage of the Standard Error on the mean of the dependent variable of 8%. The t de Student statistics, between brackets, indicate that the coefficients are significantly different fron zero.

The average effect of an increase of one unity in QMH (Manufacturing real value-added per capita) was important, with a positive effect of 0.8091 on Non-Manufacturing real value added per capita. The coefficient of the lagged value of qnmh was higher than unity (1.2323) indicating that other factors, like tourism and transport activities, have also contributed to increase QNMH for the period 1990-2002.

Graph 4.2 show the good relationship between actual values of QNMH in year 2002 and the values estimated by the model (YF).



Source: Guisan and Aguayo(2005).

4.4. Studies on Regional Development of Latin America, 1990-2000

Study by Guisan and Martinez (2004): Argentina, Brazil and Chile

We have published some studies including regional econometric studies of Latin American countries for the last decade of the 20th century, as those included in Guisan and Martinez(2004) for regions of 3 South American countries of (Argentina, Brazil and Chile).

The estimated equation, with a panel of 20 regions for the period 1991-2001, and data of PH and SKH in Dollars at constant prices, was:

$$\hat{} \quad \text{Log (PH)} = 0.1052*\log(PS2(-1)) + 0.8603 \log (SKH) + 0.2413 \log(LTH)$$

$$- 0.0138 \text{ Dummy}; \quad R \text{ square} = 0.9911; \quad \%SE \text{ on Mean} = 0.61\%$$

where log means Neperian logarithm. PH is production per capita, SKH is PS" is the indicator of Education (percentage of adult Population with upper secondary education) Stock of Physical Capital per capita, LTH is rate of Total Employment per 1000 inhabitants. and Dummy is a variable included to have into account of macroeconomic crisis of Argentina and Brazil.

The coefficients where positive, with the exception of the Dummy of economic crisis. The coefficients of SKH and LHT where significant, but the coefficient of the log(PS2) was not significant, likely due to a high degree of multicollinearity with log(SKH). The impact of Education, as we have indicate, has a positive impact on SKH, and thus there are two effects of Education of Development in this equation: an indirect effect on the increase of SKH, and a direct effect on the Ecuation of PH.

Study by Alvarez and Aguayo((2003): Mexico 1994-2001

Alvarez and Aguayo(2003) estimated a panel modelo of 32 Mexican regions for the period 1994-2001, with data in Mexican Pesos at constant prices, the related Production per capita of Private Services, with the following explanatory variables:

Regional Production per capita of Manufacturing

Regional Production per capita of Public Services

Foregin Tourism: rate of arrivals per 1000 inhabitants of the region.

All the coefficients where positive and significant and the goodness of fit was high.

Study by Guisan and Cardim-Barata(2004): Brazil

Guisan and Cardim-Barata(2003) and (2004), EcoDev73 published a quantitative analyzis of economic development in Brazil by the end of the 20th century. In the Annex of Cardim-Barata(2004) they include an econometric model relating the educational level of regional Population and regional Development in year 2000, with a sample of 27 observations, and the following variables:

Y = Regional PH in year 2000 – Average PH of Brazil in year 2000.

X1 = Regional percentage of adult population with more than 7 years of schooling – Average value of X1 for Brazil in year 2000.

DP = Dummy for special positive effects in some regions.

DN = Dummy for special negative effects in some regions.

The average value of Brazil was 6473 for Y, in Reais per capita, in year 2000. The average value of X1 of Brazil was 35.

The estimated coefficient of X1 was positive (320) and highly significant (with a t-statistics of 26.92).

The effects of dummy variables where positive for DP (2156) and negative por DN (-2210)

Regions with special effects: Positive effects in. Amazonia and Brasilia. Negative effects in Roraima, Amapa, Tocantins and Goias.

As seen in Guisan and Cardim-Barata(2003) the highest educational level and the highest Production per capita in year 2000 corresponded to Brasilia, Rio de Janeiro and Sao Paulo.

International studies of regional development for the period 2001-2023

In the study by Guisan(2022a,b), with samples of the period 2001-2023 we analyze the effects of Education on Development and Quality of Life in 372 regions of OECD countries in year 2016, including several American countries: Canada, Chile, Mexico and the United States.

Good news is the inclusion of more Latin American countries as OECD members. The total number of OECD members evolved from 20 in year 1960 to 38 as of May 2021, with only 2 American countries at the beginning (Canada and the USA). Mexico joined in 1994, Chile in 2010, Colombia in year 2020 and it is schedulted to include more Latin American countries soon.

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CHAPTER 5
A COMPARISON OF REGIONAL DEVELOPMENT IN THE EUROPEAN UNION AND THE UNITED STATES, 1960-2000,

MARIA-CARMEN GUISAN

5.1. Interregional models of European and OECD countries, 1960-2000

Guisan and Aguayo(2001), in Chapter 1 of the book EE5 of this series, present an overview of 11 Regional Models of the United States, for the period 1960-200, including contributions by Klein, Glickman , Ballard and other authors. Besides we include a list of 9 interregional models with samples of several European countries, and interregional model of only one European country, as well as a list of Doctoral Disserations on Regional Development.

Guisan and Aguayo(2022), in Chapter 2 of the book EE9, cite several interregional models of Europe, and other areas, published by Guisan and Frias, Guisan and Cancelo, Guisan and Aguayo, and other authors many of them corresponding to the period 1980-2000, They include an Annex with links to 24 interregional models of Europe and other areas. Our studies analyze real production, employment, wages, human capital (including Education and Research) and quality of life. The great development of several countries and regions of the OECD is explained by their high levels of education, industrial development and quality of social organization.

Guisan(2023), in RSES, includes an analysis of of development and population in large regions of the United States for 1960-2021 and presents some comparisons with European countries and regions. Here we highlight some of the main conclussions of that comparison, for the period 1960-2000.

Other interesting studies on OECD countries are the study gy Belot and Ederveen(20212) on cultural barriers to migration movements among OECD countries, and the paper by Cavaleri, Luu and Caus(2021), published by the OECD, which present the results of interregional gravity models for each of 14 OECD countries, with different periods for each of them: in the United States for 1997-2018, but in some countries only for years after 2002 or 2008. In Guisan(2023) we expect to include references to other studies of our research team on regional development of European and American countries for the period 2001-2023.

Maria-Carmen Guisan, Professor of Econometrics for 1987-2017 and Honorary Professor for 2017-2022. Website: https://www.usc.gal/economet/guisan.htm

5.2. Population evolution in EU5 and Large US Regions for 1960-2000

Population of a group of 5 major European countries (EU5): France, Germany, Italy, Spain and the United Kingdom) , increased by 46 million for the period 1960-2000, which represents a 18.3% Population growth.

The sum of Net immigration of the EU5 countries, having into account data published by Guisan(2005), amounted approximately to 12.5 for 1960-2000 (including internal migration among countries of UE5), very close to the figure from World Bank of 12.493 million.

The total increase of Population in EU5 was 46 million and the increase due to natural growth of population was around 33.5 million. Net immigration amounted approximately to a 27% of the total increase of Population of EU5.

Table 5.1 shows data of EU5 countries and table 5.2 of Regions of the US.

Table 5.1. Population of EU5, for the period 1960-2000 (thousand people)

	Population 1960	Population 2000	Increase	% of Increase	Net migration	Density 2000
Germany	72674	82212	9538	13	7544	236
Spain	30583	40500	9917	32	1186	95
France	45684	60913	15229	33	3244	111
Italy	50200	56942	6742	13	318	201
UK	52373	58893	6520	12	201	243
EU5	251514	297640	46126	18	12493	152

Source: Elaborated by author from OECD and World Bank statistics.

The highest increase, among EU5 countries for 1960-2000. corresponded to France, Spain and Germany, and the lowest to the UK and Italy. The highest percentages of population growth for the period corresponded in France was 33% and in Spain 22%.

The average percentage of Population growth, in the area EU5, was 18%. Density of Populaltion in EU5 increased from 123 inhabitants per square Km in year 1960 to 145 in year 2000. Population Density per square km in year 2000 was higher in EU5 (151) than in the United States (29) and in the World (46).

Table 5.2 includes data of Population in the 8 Regions of the Bureau of Economic Analysis (BEA) in year 2000, the land surface of each Region and the density of Population per km2 in year 2020.

Table 5.2 Population (thousand), Land Area and Density per km2, year 2000

BEA Regions	Population 1960	Population 2000	% Increase	km2 land area	density per km2 2000
New England	10532	13923	26	162363	86
Mideast	38597	46324	20	629114	74
Great Lakes	36290	45155	24	162363	278
Plains	15424	19238	25	1314730	15
Southeast	38885	69282	78	1364599	51
Southwest	14235	31252	120	1462615	21
Rocky Mountain	4350	9224	112	1323726	7
Far West	21659	47024	117	2603113	18
Total	179972	281422	56	9826675	29

Source: Elaborated by author from Census Data by State and FRED data.

Figure 5.1 includes the lists of states of each BEA Region.

Figure 5.1. States by each of the 8 BEA Regions

BEA Region	States
1.New England	Connecticut, Main, Massachusetts, New Hampshire, Rhode Island, Vermont (CD1)
2. Mideast	New Jersey, New York, Pennsylvania (CD2) Delaware, District of Columbia, Maryland (CD4)
3. Great Lakes	Illionis, Indiana, Michigan, Ohio, Wisconsin (CD3)
4. Plains	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota (CD4)
5. Southeast	Alabama, Kentucky, Mississippi, Tennessee (CD6) Arkansas, Louisiana (CD7); Florida, Georgia, North Carolina, South Carolina, Virginia, West Virginia (CD5)
6. Southwest	Arizona, New Mexico (CD8): Oklahoma, Texas (CD7)
7.Rocky Mountain	Colorado, Idaho, Montana, Utah, Wyoming (CD8)
8. Far West	Alaska, California, Hawaii, Oregon, Washinton (CD9) Nevada (CD8)

Source: Elaborated from US-BEA and Census classification. It includes 50 States and District of Columbia. Note: CD1 to CD9 are the Census Divisions.

Population of the BEA Regions increased by 101 million pepole, for the period 1960-2000, which represents 56 % Population growth. Aproximately 41% of the increase (41 million= came from foreign countries (with figures

of the World Bank for 1961-2000), and the 59% (60 million) corresponded to domestic increase of Population.

Density of Population in the United States evolved from 19 inhabitants per square Km in year 1960 to 29 in year 2000., below World average (47).

The highest % of Population growth corresponded to the Regions with the low Density. Franklin(2003) analyzes the changes of the share of regions on total Population.

5.3. Regional development in EU5 and the United States,1960-2000

Table 5.3 shows the increase of real Production per capita, as an indicator of Income per capita, in EU5 countries in years 1960 and 2000, and table 5.4 the values of real income per capita in BEA regions. Real income per capita might be a value around 80% of real GDP per capita in some cases or even lower in other cases.

Table 5.3. Real GDP per capita in EU5 for 1960-2000
(Dollars at 2000 Prices and Exchange Rates)

	Germany	Spain	France	Italy	UK
1960	8680	3360	7754	5936	10503
2000	22762	14338	22548	19188	25091
Increase	14082	10978	14794	13252	14588
% Increase	62	227	91	124	39

Source: Elaborated by M.C. Guisan from OECD statistics.

Table 5.4. Real Income per capita in BEA Regions (Dollars at 2000 prices)

Code	BEA regions	1960	2000	Increase	% of Increase
91000	New England	13027	37349	24322	187
92000	Mideast	13663	35160	21497	157
93000	Great Lakes	12671	30305	17634	139
94000	Plains	11177	29040	17863	160
95000	Southeast	8897	27337	18440	207
96000	Southwest	10463	27285	16822	161
97000	Rocky Mountain	11668	29120	17452	150
98000	Far West	14625	32775	18150	124
	Total USA	11999	30672	18673	156

Source: Elaborate from BEA statistics, applying to current value of year 1960 the index of Consumption Prices to express the value at constant prices of year 2000.

In the EU5 countries the difference in income per capita at country level was 213% in 1960 and diminished to 75% in year 2000. Real Disposal income per capita would be lower than real Gross Domestic Product per capita.

In the United States there was a difference of 64 % between the highest and the lowest values of real income per capita of the 8 BEA Regions in year 1960 while in year 2000 the difference was only 37 %.

Comparison of 86 regions from Europe and 51 from the United States

Guisan (2004), in RSES analyzes economic development of 151 regions of 15 Europan Union countries in year 2000, with data expressed in Dollars at 2000 prices and purchasing power parities. Among the EU5 countries with Production per head (PH) as an indicator of regional Income per capita, we found a big difference between the lowest value (the minimum of the Spanish regions with 11381) and the highest value (the maximum of France with 36637), what amounts of a 222%.

The mean of production per capita in 86 region of EU5 countries in year 2000 was 20400 Dollars, the standard deviation was 5520 and the coefficient of variation was 28% (5630*100/20400). There was less disparity among the 51 regions of the US, with a mean of 29551, a standard deviation of 5012 and a Coefficient of Variation of 17% ((5012*100/29551).

Table 5.5 indicates 4 groups of EU5 regions by the value of Production per capita, in Dollars at 2000 prices and purchasing power parities.

Table 5.5 Production per capita in 86 European regions, year 2000 (Dollars).

Group 1 (<15)	Spain: 10 regions. Italy: 6 regions
Group 2 (15 to 20)	Germany: 5 regions Spain:7 regions France:9 regions. Italy:
Group 3 (20 to 30)	Germany: 9 regions, France: 12 regions. Italy: 11 regions UK 11 regions
Group 4 (>30)	Germany: 3 regions (Bremen, Hamburg, Hessen). France: 1 region (Ile de France)

Source: Elaborated by author from table by Guisan(2004), based on Eurostat statistics.

The top regions of EU5 in value of Production per capita, corresponded to 3 German regions (Bremen, Hamburg and Hessen) and to the French region of Île de France.

The top regions of the US, by Income per capita (higher tan 50 thousand Dollars) in year 2000 were Connecticut, Masachussets, New Jersey and Washington DC. The lowest values, between 31 and 35 thousand Dollars,

corresponded in year 2000 to Alabama, Arizona, Arkansas, Georgia, Idaho, Kentucky, Mississippi, New Mexico, South Carolina, Utha and West Virginia.

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