

**MACRO-ECONOMETRIC MODELS OF SUPPLY AND DEMAND:  
INDUSTRY, TRADE AND WAGES IN 6 COUNTRIES, 1960-2012**  
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**Abstract.** We analyse the impact of industry on non industrial production, as well as its effect on wages and employment in 6 OECD countries: France, Germany, Italy, Spain, the United Kingdom and the United States for the period 1960-2012. Our approach to macro-econometric modelling have into account both demand and supply sides, including not only the effects of primary inputs but also those of intermediate inputs (domestic and imported). We present some estimated equations, and analysis of causality, with a panel of those countries. We show that excessive delocalization of industry, for 2003-2012, and austerity policies, for 2009-2012, have had a negative effect on wages and development. The main conclusion is that industrialized countries should make compatible their foreign trade policy with domestic development, avoiding strong and unsustainable trade deficits.

JEL Codes: C5, E6, F1, F4, F62, J2, J3, O11, O51, O52

Keywords: Supply and Demand, Macro-econometric Models, Industry, Fair Trade, Wages, Employment, Europe, United States, Industrial Delocalization, Austerity Policies

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## 1. Introduction

Foreign trade of goods has direct and indirect effects on economic growth and development. Macro-econometric models show that, when there is an even evolution of exports and imports, usually the effect of an increase of one unity in both types of trade of goods, has a positive effect on economic development. But there are problems with uneven evolution: a highly negative value of trade balance may have negative impact on development, particularly in countries with highly negative net values of their Net International Investment Position (NIIP). Foreign trade deficits may be unsustainable if they imply strong financial restrictions. When it happens, then high interest rates and credit rationing has negative effects on economic development, as it has happen in several European Union countries for the period 2008-2013.

As seen in Guisan(2006) and in other studies, it is important to have into account demand and supply factors to get a clear view of the main factors which explain economic development. From the supply side, it is important to include not only the role of the production function, but also the role of industry, trade and inters-sector relationships. Many economic studies have emphasized the demand side, and also the supply of primary inputs in the production function, but very few have had into account the important role of industry and inter-sector relationships. In Guisan, Aguayo and Exposito(2001), Guisan (2006), and in other studies, the econometric evidence shows that the Kaldor's approach is very important explaining the positive impact of industry on economic development

There have been several variables explaining the economic crisis of years 2008-2012, not only the financial crisis but also oil prices evolution, as seen in Frias(2013),

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and trade deficits derived from unfair policies for delocalization of industries in several OECD countries and from other factors. EU austerity policies have been excessive and unsuccessful because they did not lead to economic recovery and even they have provoked industrial decline in some countries.

In section 2 we analyze the evolution of Trade Deficit and relationship of the Net International Investment Position (NIIP) with the economic crisis of several OECD countries. In section 3 we present a list of some selected models of supply and demand, as well our disequilibrium macro-econometric model which has into account the effects of industry and on economic development and wages. Accordingly to Guisan(1980) and (2006) we have into account the supply of intermediate inputs, besides the primary inputs. In Section 4 we present some estimated equations from this approach with a panel of 6 OECD countries. Finally Section 5 presents the conclusions.

## 2. Foreign Trade Deficits, International Investment Position and Economic Crisis

Table 1 presents the difference between export and imports of goods and services per head for the period 1992-2012 in 6 OECD countries, and table 2 shows the Net International Investment Position (NIIP). We may notice high values of trade deficits for the years 2004-2006 in Spain, France, UK and the USA, even before the financial crisis, due to lack of support to industrial development and to unfair rules of trade.

Table1. Foreign Trade balance per head (goods and services)  
(Dollars at 2000 prices and exchange rates)

obs	Spain	Germany	France	Italy	UK	UE5	USA
1992	-349	-82	71	-353	-146	-131	-60
1993	-81	-79	208	336	-101	77	-196
1994	18	-73	201	423	33	138	-297
1995	-19	-70	201	578	202	200	-263
1996	-89	31	286	617	254	222	-291
1997	-34	193	528	516	184	289	-383
1998	-248	85	421	305	-167	99	-737
1999	-479	-99	389	57	-437	-91	-1059
2000	-521	90	276	184	-462	-48	-1344
2001	-521	447	300	243	-604	38	-1398
2002	-577	900	241	71	-908	49	-1639
2003	-679	758	88	-98	-947	-77	-1784
2004	-939	1051	-137	-71	-1153	-116	-1993
2005	-1196	1228	-303	-123	-1145	-150	-2080
2006	-1429	1454	-415	-115	-1134	-147	-2242
2007	-1513	937	-639	-80	228	-72	-2963
2008	-1251	1698	-715	-81	461	195	-1905
2009	-690	972	-755	-279	562	59	-1045
2010	-577	1311	-843	-355	541	127	-1352
2011	372	1554	-973	-95	886	422	-1304
2012	1586	1721	-695	376	744	764	-1259

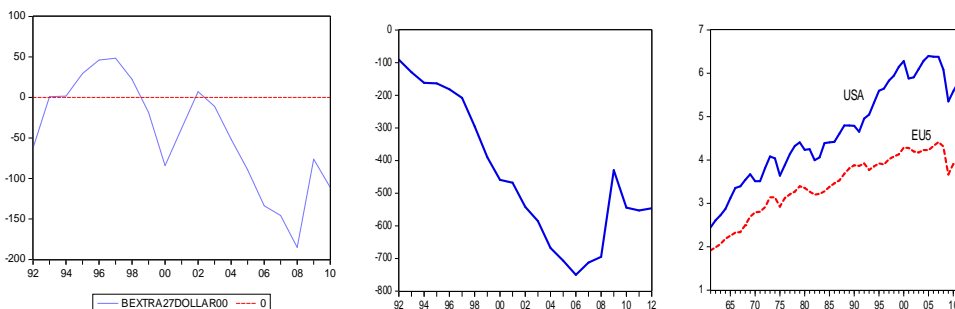
Source: Elaborated by M.C. Guisan(2013) from OECD National Accounts Statistics

Table A1, in the Annex, shows the evolution of the extra-EU27 balance of goods trade with the World, for the period 2000-2009, in million Dollars at current prices, We

notice that for the period 2002-2008 there was an increase in deficit of EU trade with the rest of the world, evolving from -45.1 Billion Euros in year 2002 to -255.1 in year 2008. European policies should be, in our view, more careful in order to avoid strong imbalances in EU trade, because it may have negative consequences for development.

Graphs 1 and 2 show the evolution of the balance of goods in the European Union and the USA, and graph 3 shows a comparison of real Value-Added of Industry per head in the 5 major European Union countries of this study (EU5) and the USA. We may notice that globalization has had negative consequences on industry and trade balance.

Graph 1. Europe: Balance Extra-EU Graph 2. USA: Balance Graph 3: QHI in UE5 and USA (th \$ 2000)



Sources: Graph 1 elaborated by Guisan(2011c) from Eurostat statistics. Bextra27Dollar00 is the balance of extra EU trade of goods in Bn Dollars at 2000 prices and exchange rates, from Eurostat (2010) page 18 for years 1992-2009 and EU Website for year 2010. Data refer to EU-evolutive: EU15(1995-2003), EU25(2004-2006) and EU27(2007-2010). Graph 2 elaborated and 3 elaborated from OECD statistics.

Table 2 presents the evolution of Euro Area and 6 OECD countries of the Net International Investment Position, and table A2, in the Annex, presents a classification of 51 countries accordingly to NIIP as percentage of Gross Domestic Product (GDP).

Table 2. International Investment Position (NIIP): Percentage of GDP, 2007-2013

Time	2007	2008	2009	2010	2011	2012	2013.Q3
Euro Area	-13.6	-17.1	-16.6	-14.0	-15.4	-13.3	...
France	-1.5	-12.9	-9.4	-12.5	-18.8	-21.1	...
Germany	26.5	25.5	34.0	35.5	33.7	41.5	45.8
Italy	-24.5	-24.1	-25.4	-23.9	-21.7	-26.4	...
Spain	-78.1	-79.3	-93.8	-89.1	-90.3	-91.4	-97.9
United Kingdom	-22.6	-6.9	-20.8	-23.5	-16.8	-9.8	6.0
United States	-12.4	-22.1	-15.8	-15.0	-24.0	-23.8	-24.7

Source: From <http://elibrary-daata.imf.org/public/FrameReport.aspx?v=3&c=20840396>

It is important to have into account the Net International Investment position (NIIP) of the country and the sustainability of foreign debt in order to avoid financial restrictions. A country with strong foreign trade deficits and negative NIIP may experience high interest rates and credit rationing and a diminution of wages, real income per capita and rates of employment, as it happens in the case of Spain for the period 2009-2012. Unfair competition happens when a strong trade deficit is provoked by uneven massive flow of goods coming from countries where the firms are not

subject to similar levels of domestic market, regarding taxes, social security contributions, environmental rules, wages and social wellbeing. This kind of unfair competition is negative for development.

### 3. A Disequilibrium Macro-econometric Model with intermediate inputs

Table 3 shows a summary of some of main macro-econometric approaches from demand and supply, in order to explain real GDP

Table 3. Macro-econometric models: some selected approaches from supply and demand

Approaches and authors	Main features of model
<i>Demand Side</i> , from Keynesian approach: Klein, Fair and several models of the Link Project	Domestic and foreign demand and its effects on economic growth with emphasis on cycles and short-term variations.
<i>Supply Side of Primary Inputs</i> : Neoclassical model with residual factor: Tinbergen, Denison, Griliches and Solow.	Production Function. The Role of investment and analysis of residual factor (effects of human capital, through education and research and development expenditure (RD), with emphasis on long-term.
<i>Supply Side of Intermediate Inputs</i> : Effects of inter-sector relationships from Input-Output.	Wharton, Inter-sector supply side effects on prices. Guisan(1980), (2006) effect on industry and imports on growth and development
<i>Disequilibrium Model of Demand and Supply of primary inputs with neoclassical approach</i> : Barro and Grossman (1971)	$GDP = \min(Q^d, Q^s)$ , being $Q^d$ real GDP from a Keynesian modelo of demand, and $Q^s$ supply side explained by a neoclassical production function.
<i>Disequilibrium Model of Demand and Supply of primary inputs with Harrod-Domar's approach</i> : Sneesens and Drèze	Disequilibrium model with $GDP = \min(Q^d, Q^s)$ , being $Q^s$ a Harrod-Domar production function, with complementary relationship between the stock of capital and labour measured in units of efficiency.
<i>Disequilibrium model of Demand and Supply of primary and intermediate inputs</i> : Guisán(1980), (2001 a,b), (2010)	$GDP = \min(Q^d, Q^{s1}, Q^{s2})$ being $Q^d$ explained by demand, $Q^{s1}$ by production function and $Q^{s2}$ by a model of inter-sector relationships, based on Kaldor and Input-Output supply analysis, that have into account the role of industry and foreign trade.

Source: Guisan(2013).

The disequilibrium approach followed by Guisan(1980) and (2006), is a mix of the approaches by Barro and Grossman(1971) and the approaches by Kaldor, Leontief, Klein, and other authors who have expressed the importance of inter-sectoral relationships and the impact of industry and foreign trade on economic growth.

Real Gross Domestic Product (GDP) may be expressed as:

$$\text{Model 4: } GDP = Q = \min(Q^d, Q^{s1}, Q^{s2})$$

Model 4 is synthesis of models (1), (2) and (3):

Model 1:  $Q^d$  is the demand side expressed by a *Keynesian model* (equation (1 a),

Model 2:  $Q^{s1}$  is the supply side of primary inputs (equation (1b)

Model 3:  $Q^{s2}$  is the supply side of *intermediate inputs* (equation 1c):

The names of the variables are listed in table 4. The estimation of some of the main equations from demand and supply sides are presented in tables 5 to 7.

Table 4. Variables of Models 1 to 3: Macro-econometric demand and supply models

Group	Name	Explanation
Consumption, Investment, Production	C	Private Consumption
	G	Public Consumption (Government)
	I	Investment. Gross Fixed Capital Formation (GFCF)
	IS	Gross Capital Formation=GFCF+VS (variation stocks)
	Q	Gross Domestic Product (by sector: QA, QI, QB, QS)
Trade, Financial facilities	Cimp <sub>g</sub>	Capacity to finance Imports of goods
	Imp	Imports= Imp <sub>g</sub> (goods)+ Imp <sub>s</sub> (services)
	Exp	Exports=Exp <sub>g</sub> (goods) +Exp <sub>s</sub> (services)
	CFin	Credit Financing families (CFin1), firms (CFin2), both(Cfin3)
Labour, Capital, Productivity, Wages	L, L*	Labour (actual and desired level by firms and institutions)
	KA	Stock of physical capital (available)
	PA	Population with Activity
	PM	Productivity of Labour, mean
	W	Wage: average compensation of employees per employee

*Model 1: Demand side model for Q<sup>d</sup>*

(1a) $Q_t^d = C_t + G_t + IS_t + EXP_t - IMP_t$	(6) $W_t = f(W_{t-1}, D(PM_t))$
(2a) $L_t = f(L_{t-1}, D(L^*_{t-1}), D(PA_t)); L^*_{t-1} = f(Q, KA, t)$	(7) $D(W_t) = W_t - W_{t-1}$
(3) $C_t = f(D(Q_t), D(CFIN1) C_{t-1})$	(8) $D(PM_t) = PM_t - PM_{t-1}$
(4) $IS_t = f(D(Q_t), D(CFIN2), IS_{t-1})$	(9) $PM_t = Qt/L_t$
(5) $D(Q_t) = Q_t - Q_{t-1}$	

*Model 2. Supply of primary inputs (labour and stock of capital):  $Q_t = Q_t^{s1}$*

(1 b) $Q_t^{s1} = f(KA_t, L_t, t)$	(7) $D(W_t) = W_t - W_{t-1}$
(2 b) $L_t = f(L_{t-1}, D(L^*_{t-1}), D(PA_t)); L^*_{t-1} = f(Q_t/W_t)$	(8) $D(PM_t) = PM_t - PM_{t-1}$
(3) $C_t = f(D(Q_t), D(CFIN1) C_{t-1})$	(9) $PM_t = Qt/L_t$
(4) $IS_t = f(D(Q_t), D(CFIN2), IS_{t-1})$	(10) $KA_t = KA_{t-1} + I_{t-1} - A_{t-1}$
(5) $D(Q_t) = Q_t - Q_{t-1}$	(11) $I_t = IS_t - VS_t$
(6) $W_t = f(W_{t-1}, D(PM_t))$	

*Model 3. Supply of intermediate inputs and foreign trade (Guisán(1980) y (2001)*

(1 c) $Q_t^{s2} = QA_t + QI_t + QB_t + QS_t$	(10) $KA_t = KA_{t-1} + I_{t-1} - A_{t-1}$
(2 c) $L_t = f(L_{t-1}, D(L^*_{t-1}), D(PA_t)); L^*_{t-1} = f(Q_t/W_t, KA_t/W_t)$	(11) $I_t = IS_t - VS_t$
(3) $C_t = f(D(Q_t), D(CFIN1) C_{t-1})$	(12) $QB_t = f(QB_{t-1}, D(QS_t), D(IMP_{G_t}), D(EXP_{G_t}))$
(4) $IS_t = f(D(Q_t), D(CFIN2), IS_{t-1})$	(13) $QS_t = f(QS_{t-1}, D(QI), D(IMP_{G_t}), D(EXP_{G_t}))$
(5) $D(Q_t) = Q_t - Q_{t-1}$	(14) $IMP_{G_t} = f(IMP_{G_{t-1}}, D(CIMP_{G_t}), D(C_t))$
(6) $W_t = f(W_{t-1}, D(PM_t))$	(15) $CIMP_{G_t} = EXP_{G_t} + EXPS_t - IMPS_t + CFIN3$
(7) $D(W_t) = W_t - W_{t-1}$	(16) $EXP_{G_t} = F(EXP_{G_{t-1}}, D(QI_t), Otros Factores)$
(8) $D(PM_t) = PM_t - PM_{t-1}$	(17) a 21): Identities for
(9) $PM_t = Qt/L_t$	$D(QS), D(IMP_{G_t}), D(EXP_{G_t}), D(QI), D(CIMP_{G_t}).$

Note: in equation (13) it is, usually, convenient to include the current value of  $D(QI_t)$ , although in order to simplify the model, avoiding interdependence, sometimes it is substituted by its lagged value:  $D(QI_{t-1})$ .

*Industry and Trade:* In this approach it is of uppermost importance the role of real value of industry (QI) on equation (13), with a positive effect on real value of services (QS). Regarding foreign trade, there are direct and indirect effects of Exports and Imports. The total impact of foreign trade (exports and imports) may be positive, provided that they do not lead to important trade deficits, financial restrictions to development, and strong delocalization of industry. Strong trade deficits may lead to negative value of the Net International Investment Position (NIIP) and to financial restrictions with effects of stagnation or diminution of real income and wages.

*Wages, Productivity and Employment:* Wages depend strongly on the evolution of productivity, although disequilibrium in the domestic labour market (supply of labourers increasing more than market demand of labourers), austerity policies and the effects of excesses of industrial delocalization, may have negative impacts on real wages. Excessive Austerity policies have had negative effects on development of Spain and other European countries for the period 2009-2012. Diminution of W has provoked also diminution of real GDP and of  $L^* = f(Q/W)$ .

*Domestic Demand: Consumption and Investment:* In model 4 equations (3) and (4) are equal, or similar, to those of models 1, 2 and 3. A proper evolution of supply is of uppermost importance to reach a sustained development of demand and quality of life. Excessive austerity policies addressed to diminish wages and domestic demand may cause danger to industrial and non industrial production as seen in the Annex.

*The role of Public Expenditure:* General Government Expenditure has different effects on economic growth and development, as seen in the Annex.

**4. Econometric estimations of real GDP and Wages.**

The estimated equations, with a panel of 6 OECD countries, show the positive impact of industry on non industrial sectors and wages. Equation (13 b) is a simplified mix of equation 12 and 13 of Model 3. Equation (6) relates Wage with Productivity.

$$(13 b) \quad QHNI_t = F(QHNI_{t-1}, D(QHI_t), D(IMP_{GH}_t), D(EXP_{GH}_t))$$

Where the variables are measured by head (inhabitant): QHI is real value-added of Industry per head, QHNI is real value-added of non industrial sectors, while IMPGH and EXPGH are, respectively Imports and Exports of Goods per head (th USD 2000)

Table 5. Equation 13b. Real GDP= $Q^2$ , with a pool of 6 OECD countries, 1993-2010

Dependent Variable: QHNI00? Pooled Least Squares, Sample 1993-2010				
Cross-sections included: 6. Total pool (unbalanced) observations: 86				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
QHNI00?(-1)	1.015261	0.001539	659.6649	0.0000
D(QHI00?)	0.388669	0.210720	1.844478	0.0687
D(IMP_{GH}00?)	0.670343	0.160444	4.178048	0.0001
D(EXP_{GH}00?)	-0.405141	0.155843	-2.599669	0.0111
R-squared	0.998371	Mean dependent var		17.64640
Adjusted R-squared	0.998312	S.D. dependent var		5.198703
S.E. of regression	0.213596	Akaike info criterion		-0.204067
Sum squared resid	3.741100	Schwarz criterion		-0.089911
Log likelihood	12.77489	Hannan-Quinn criter.		-0.158125
Durbin-Watson stat	1.252632			

Industrial production per head (QHI) and non industrial production per head (QHNI) appear, in the Annex, in tables A1 and A2. Imports of Goods per head (MHG), and Exports of Goods per head, XHG, appear in tables A3 and A4.

The explanatory variables of equation 3c show an important and significant effect on QHNI. Other variables may have impact on QHNI, and we expect to include some of them in future studies.

Causality between QHI and QHNI has been analyzed in Guisan(2011) and other studies. Table A5 shows a summary in the Annex. The results are more favourable to the important impact of QHI on QHNI than to the reverse relationship, although both directions of causality are usually present in many countries.

Table 6. Equation (6). Wage as a function of its lagged value and increase of productivity, 1993-2012

Dependent Variable: W00?. Method: Pooled Least Squares. Sample: 1993 2012				
Included observations: 20. Cross-sections included: 6. Total pool (balanced) observations: 120				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
W00?(-1)	1.003814	0.003277	306.3673	0.0000
D(PM00?)	0.183525	0.102428	1.791746	0.0757
R-squared	0.995339	Mean dependent var		32.33072
Adjusted R-squared	0.995299	S.D. dependent var		7.233231
S.E. of regression	0.495913	Akaike info criterion		1.451692
Sum squared resid	29.01966	Schwarz criterion		1.498150
Log likelihood	-85.10153	Hannan-Quinn criter.		1.470559
Durbin-Watson stat	1.675276			

We have found, for the period 1961-2012, a higher coefficient for D(PM00). The difference is due to a diminution of the effect of labour productivity on wages in the last decades of the period (1993-2012).

### 5. Conclusions

We include a disequilibrium approach with supply of intermediate inputs that accounts for the role of industry and trade.

The model shows that domestic industry has a direct positive effect on non domestic production and on economic development. Besides domestic industry has other positive effects from the supply side, through domestic inter-sector relationships and through foreign trade, as it may contribute to increase exports, to finance imports of intermediate inputs and to avoid trade deficits and financial restrictions.

An increase of both imports and exports has a net positive effect on QHNI. An increase in imports has a direct positive impact but that increase may have negative impact if it leads to strong and unsustainable deficit of trade balance, particularly in countries with negative position in the Net International Investment Position.

Wages depend on labour productivity and other factors. Industry has an important role to explain labour productivity differences among countries.

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- Annex on line at the journal Website: <http://www.usc.es/economet/eaat.htm>



## Annex

Table A1. Extra-EU-27 trade of goods, 2000-2009 (Billion Euros)

Year	Exports to China	Imports from China	Balance With China	Exports to the World	Imports from the World	Balance with the World
2000	32.920	41.467	-8.547	849.7	992.7	-143.0
2001	39.945	45.797	-5.852	884.7	979.1	-94.4
2002	40.810	51.000	-10.190	891.9	937.0	-45.1
2003	46.911	63.855	-16.944	869.2	935.3	-66.0
2004	56.380	86.233	-29.853	953.0	1027.5	-74.6
2005	59.127	115.627	-56.500	1052.7	1179.6	-126.9
2006	71.716	144.491	-72.775	1160.1	1352.8	-192.7
2007	81.060	179.146	-98.086	1240.5	1433.4	-192.9
2008	90.358	199.331	-108.973	1309.8	1564.9	-255.1
2009	91.250	180.540	-89.290	1094.4	1199.2	-104.8

Source: Elaborated by Guisan(2011c) from Eurostat Statistics: Extra-EU-27 Trade with the World from Eurostat (2010b), p.476, for years 2000-2004 and Eurostat(2010a), pages 33, 37 and 41, for years 2005-2009. EU-27 with China from Eurostat(2010a) pages 20, 22 and difference. It does not include trade with Hong-Kong. that evolved from 20.3 Exports, 33.5 Imports and -13.2 Balance in year 2000 to 19.3 Exports, 28.5 Imports and -9.2 Balance in year 2009.

Table A2. Net International Investment Position: Classification of 51 countries accordingly to NIIP as percentage of Gross Domestic Product (GDP), around year 2014.

NIIP percentage of GDP	Countries and territories
1. Higher than 100	<i>Hong-Kong(China), Singapore, Norway, Taiwan, Switzerland, Saudi Arabia</i>
2. Between 50 and 100	<i>Netherlands, Japan, Denmark, Germany</i>
3. Between 25 and 50	<i>Belgium, Malta, Israel, Venezuela,</i>
4. Between 0 and 25	<i>United Kingdom, Luxembourg, South Korea, Russia, Sweden, China, Argentina, Finland, Canada, Austria,</i>
5. Between -25 and 0	<i>Nigeria, Chile, Philippines, Italy, Kazakhstan, France, India, Czech R.,</i>
6. Between -50 and -25	<i>Brazil, Mexico, Slovenia, Estonia, Lituania, United States, Indonesia, Romania</i>
7. Between -100 and -50	<i>Bulgaria, Turkey, Australia, Slovakia, Latvia, Hungary, Poland, New Zealand, Croatia, Spain</i>
8. Between -100 and -200	<i>Portugal, Cyprus, Greece, Ireland</i>
9. Below -200	<i>Iceland</i>

Source elaborated from [https://en.wikipedia.org/wiki/Net\\_international\\_investment\\_position](https://en.wikipedia.org/wiki/Net_international_investment_position)

US Net International Investment Position. Note: "A positive NIIP value indicates a nation a creditor nation, while a negative value indicates it is a *debtor nation*. The USA, as recently as 1960 the world's largest creditor, has now become the world's largest debtor, and since the 1980s, Japan has replaced USA as the world's largest creditor nation".

*Causality between QHI and QHNI*

Table A5 presents the results of the Granger’s test of causality between real value-added per inhabitant of industrial (QHI) and non industrial sectors (QHNI).

Table A5. Pairwise Granger Causality Test with one lag: 1992-2010

Country	QHNI does not cause QHI	QHI does not cause QHNI
France	<i>Non rejected</i>	Rejected (10% signif.)
Italy	<i>Non rejected</i>	Rejected (10% signif.)
Germany	<i>Rejected (10% signif.)</i>	Non rejected
Spain	<i>Rejected (10% signif.)</i>	Rejected (5% signif.)
UK	<i>Rejected (5% signif.)</i>	Rejected (10% signif.)
USA	Non rejected	Rejected (10% signif.)

Source: Elaborated from table A7 of Guisan(2011c).

The hypothesis that Non-Industry causes Industry was rejected in 3 out of the 6 countries and non rejected in the other 3 countries. The hypothesis that Industry does not cause Non-Industry as rejected in 5 out of the 6 countries.

Thus there is more clear evidence in favour of the important impact of Industry on Non-Industrial development. Non rejection is an indicator of the existence of causality relationships but non rejection not always implies the lack of causality, because in the Granger’s test there are many situations of uncertainty.

As seen in Guisan(2015), due to multicollinearity: *“Thus we should not interpret the lack of significance of some parameters always as a proof of non causal relationships. In order to diminish multicollinearity the modified version of Granger test suggested by Guisan usually improves the results, as in the relationships between Consumption and GDP per head in Mexico that appears in Guisan(2004)”*.

The modified Granger’s causality test, suggested by Guisan(2004), allows to show causal impact of QHI on QHNI in Germany: with a sample of the period 1962-2010, as seen in table A6. The modification consists in diminution of multicollinearity, due to a high correlation between the lagged values of both variables, by including two lags for one regressor (QHNI<sub>t-2</sub>) and one lag for the other one (QHI<sub>t-1</sub>)

Table A6. Modified test of causality suggested by Guisan: Germany

Dependent Variable: QHNI00AX				
Method: Least Squares				
Sample (adjusted): 1962 2010				
Included observations: 49 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
QHNI00AX(-2)	0.873206	0.033061	26.41212	0.0000
QHI00AX(-1)	0.500132	0.102627	4.873304	0.0000
R-squared	0.995468	Mean dependent var		13.45437
Adjusted R-squared	0.995371	S.D. dependent var		3.744709
S.E. of regression	0.254771	Akaike info criterion		0.143058
Sum squared resid	3.050693	Schwarz criterion		0.220275
Log likelihood	-1.504924	Hannan-Quinn criter.		0.172354
Durbin-Watson stat	0.979789			

*General Government Expenditure in our Disequilibrium Model*

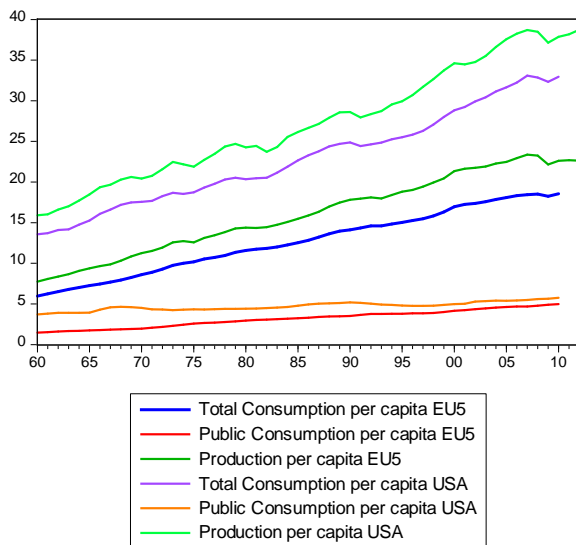
There are many Economics studies concerned about the positive, or negative, effects of General Government Expenditure on economic growth and development.

In our view, it is advisable to analyze the effects of different components of public expenditure (Consumption, Investment, Transfers, or Public Debt payments). The effects of these variables may be incorporated in the macro-econometric model by adding some supplementary relationships.

For example total real Consumption (Private+Public) may be expressed as a function of its lagged value and the increases of real production and real credit. The increases of Public Consumption, for a given level of real production and real credit, may lead to decreases in Private Consumption. Thus it is important that the increases in Public Consumption would evolve accordingly to the increase of production without diminution of Private Consumption.

Graph A1 shows the evolution of real values (Dollars at 2000 prices and exchange rates) of Total Consumption, Public Consumption and Gross Domestic Product per capita in the set of 5 major European Union countries of this studie (EU5) and the United States (USA) for a period of 50 years: 1960-2010.

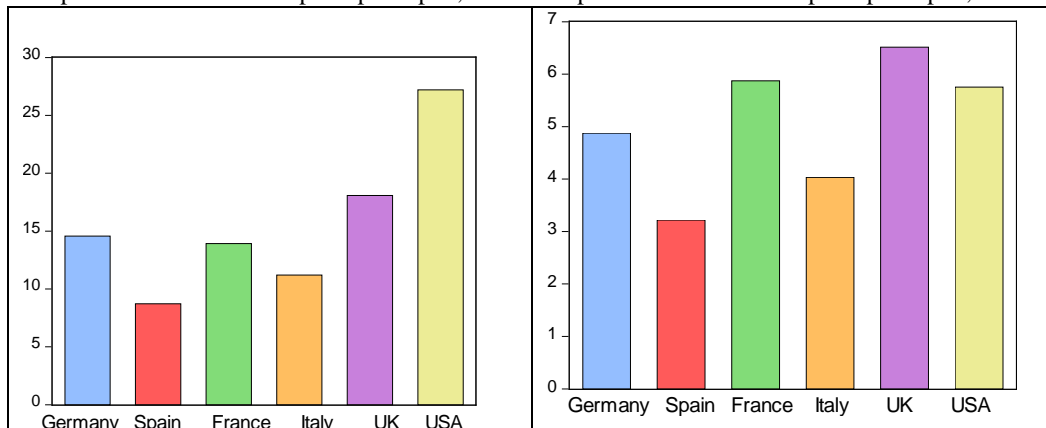
Graph A1. Public Consumption, Total Consumption and Production per capita in 5 European Union countries (EU5) and the United States,(thousand USD at 2000 prices and exchange rates)



We may notice that the increase of real production per capita contributes to increase both Public and Private Consumption and that the increases of Public Consumption are more moderate than the increases of Private Consumption.

Graphs A2 and A3 show the values of CH (Private Consumption per capita) and GH (Public Consumption per capita, provided by Government as collective or individual consumption).

Graph A2. Private Consumption per capita, 2010. Graph A3. Public Consumption per capita, 2010



Source: Elaborated by Guisan(2013) from OECD statistics.

An important question regarding the distribution of consumption as public or private are the services of health, education and other social services. As seen in Guisan and Arranz(2003), and other studies, there are some substitution effects between public and private sectors: when public services have a low value the increase of real production lead to increases of private services. Both types of social services (public and private) are interesting for many citizens and it is desirable to increase both of them with economic development.

The role of Consumption (both private and public) on economic development depends on the regime of the disequilibrium model: if there is lack of demand it is important, but if there is lack of supply the increase of real Consumption and real Investment should be accompanied by other measures addressed to foster supply.

In the case of the austerity policies implemented by the European Union in several countries for the period 2008-2018, we find that they restrict economic development. Although in some countries, like Spain, Greece, Portugal, or other ones, the main restriction to development came from the supply side (from low values of QHI in equation (13)), the restrictions on wages and credit to families has led to decay in domestic demand that has had negative effects on QHI and development.

Regarding Public Investment, suggested by Keynes for regime of low demand, is not convenient for economic development when the problem comes from the supply side of intermediate inputs, and the public investment is not addressed to increase social welfare and development. Crowding out effects often arise when Public investment is not accompanied by an increase of production and leads to diminish financial support to private consumption and investment.

Regarding Public Debt, it is an alternative to taxation, with some advantages and some problems. It is advisable to keep within some limits the percentage of public debt, accordingly to the economic circumstances, the country capacity to pay the interests of the debt, and the domestic of foreign origin of the lenders.

Regarding transfers from Government to the private sector, economic development usually increases the contributions of citizens to social security pensions and services, and thus it increase both income and expenditures of public sector.

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