Diploma Thesis

The Spanish Production System: An Input-Output Approach

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Abstract

Amidst what appears to be the final stages of the economic crisis for Spain, this work gives a closer look into the Spanish productive system and the Spanish economy. During the first part of this thesis three works dealing with the topic of the Spanish productive system are analyzed. They are thoroughly explored and explained with the idea of giving a sample of what researchers are working regarding this topic.

In the second part, chapters 2 through 10, the actual analysis of the Spanish production system is given. This part starts by describing general institutions and determinants and how they work in order to later describe the evolution of an aggregate of main sectors through the last 20 to 25 years and to point out the most influencing factors in each of them, mostly in the form of regulation. In many cases these descriptions give ideas of some underlying problems with particular sectors. Next, some aspects of Spain's economy in the international context, like exports of goods and services for example, are described leading toward the end of this part where several macroeconomic indicators are described.

For the last part of this work, input-output tables are introduced. With data from the World Input-Output tables a model is made in order to be able to obtain these tables out of given intermediate inputs. With this model, a forecast is given for 2014 to 2018 along with the application of scenarios dealing with the effects of variations of exports and tourism.

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1. Related Studies

1.1. Introduction

The following section presents a series of studies done by researchers concerning the Spanish production system. The goal is to take a look at a sample of what researchers have done while proving abilities to summarize and outline that which is most important.

1.2. Sunk Exporting Costs Analysis

The following is a summary and critique of the paper "Do sunk exporting costs differ among markets? Evidence from Spanish manufacturing firms" by José V. Blanes-Cristóbal, Marion Dovis, Juliette Milgram-Baleix, Ana I. Moro-Egido.

1.2.1. Introduction

When a company decides to export their products they have to, among other things, overcome the existence of imperfect information and barriers regarding the entry in another country's market. The latter may include having problems with the control of resources since a few firms may have control of needed resources. Companies already established in the target country may already have captured an important user base which at the same time might display customer loyalty to said company or brand. Other examples might be the need to find a distribution network, which might simply take some time to develop or may be even harder if contracts have the distributors locked in with other companies, or government regulations in the form of industry regulations or tax benefits to existing firms for example. All of this, among other barriers conform the sunk costs of exporting (defining sunk costs as costs in which one has incurred in and cannot be recovered).

The work that this paper presents aims to provide an insight into the role that sunk exporting costs play for manufacturing firms. In this context they look, among other things, whether Spanish firms that engage in exporting activities are more likely to have exported in the past and, if they have, how this past experience or sunk costs influences actual decisions to export. Furthermore, this study looks at the sunk costs distinguishing from destination market. Additionally, the researchers look for other characteristics that might be found in these exporting firms.

1.2.2. Data and Model

The data for this study was obtained from a survey of Spanish manufacturing firms ending with a balanced panel of 756 firms who either don't export or export among three different regions (OECD, EU, and the rest of the world, defined as ROW). Simply looking at the data available, interesting information can be seen.

One of the most interesting aspects in relation to the presence of foreign capital in the exporting firms is the difference that can be seen between firms that export exclusively to the EU and those firms that export to the EU as well as the ROW and/or OECD which have on average more than 10% more foreign capital. It would be interesting to take a closer look into the products that these firms export since it appears as though this big difference would not be explained, as the researchers suggest, by investors only participating in firms that export to developed markets, since the EU contains these and yet the presence of foreign capital in these exclusively EU-exporting countries is quite smaller.

An important characteristic of the data is that, as the paper points out, "the share of exports, advertisement, R&D on sales and the presence of foreign capital are larger for those firms that export to the EU non exclusively and to the OECD. Firms that export to the EU have larger labor productivity than other exporters and than non-exporters."

The model is built on the assumption that a firm decides when there is a positive expected gross profit increment associated with the exporting activity, like Roberts and Tybout (1997) did. The researchers assume that this depends on firm characteristics, macro conditions, and past decisions to export.

- ***Firm Characteristics:*** Age of the firm, size of the firm, dummy depending on whether or not the firm has more than 25% of foreign capital, R&D intensity, a dummy depending on whether R&D subventions are received by the firm, and dummies that depend on the year and sector.

- **Macro Conditions**: Although the study presents a set of macro conditions considered for the analysis, they don't present this information later on in their results so I don't consider it should be included here.

1.2.1. Results and Critique

In the following section the results regarding the influence of firm characteristics on the decision to export are presented:

- **Previous exporting experience:** It produces an increase in the probability of exporting. In this case the increase in probability of exporting somewhere is even greater when the firm has previous experience exporting to that precise place.
- **Age:** Results show that the firm's age is non-significant regarding the probability of exporting.
- **Size:** Firm size does produce an increase in the probability to export although this is not the case for those firms that export to ROW where it is not significant.
- **R&D intensity:** This produces an increase in the probability of exporting however it only does so for those firms that export to all categories (EU, OECD and ROW) and for those who export to ROW.
- **R&D subvention:** Doesn't present a significant effect on the probability to export except for those firms that export to all categories where it does have a positive effect.
- **Labor productivity:** Presents a significant and positive effect for those firms that export to all categories and those that export to the EU.
- **Foreign capital:** Significant and positive effect for all categories and EU. Non-significant for OECD countries. Negative effect for firms that export to ROW.

Regarding the aim of the paper one can conclude that sunk costs or previous experience in foreign markets do actually have an influence in the probability to export and that they do, in fact, present differences depending on the target market. One could as well argue from the results that in more developed markets, like the EU, the costs of entering are higher than for those less developed.

Apart from what is mentioned in the previous paragraph the paper provides some insight into the characteristics of exporting firms that somewhat helps to characterize the self-selection phenomenon that the paper mentions a couple of times.

One could say that the way this paper is focused provides an indication that the experience of having exported to countries with homogeneous norms similar to those of the home country (like countries in the EU), facilitates the exporting activity between them. However I believe that more important aspects could be looked at regarding the target countries as well as the disparities between these and the home country of the firm. For instance, distance between countries, difference in GDP, difference in human and technological capital endowments, per-capita income, and so on. I think this would provide a more specific insight to the role of previous experience in the decision to export.

1.3. Intra-Industry Trade

The following is a summary and critique of the paper "The Nature and Causes of Intra-Industry Trade: Back to the Comparative Advantage Explanation? The case of Spain" by Carmela Martín and José V. Blanes.

1.3.1. Introduction

This research paper, in a broad sense, aims to look into the sources of intra-industry trade while assessing claims or contradictions found on other studies regarding the subject. In this context, the researchers developed an empirical model of IIT in order to carry out the task at hand.

Before moving on, it would be important to clarify a set of concepts that ought to be clear. Intra-Industry Trade (IIT) can be defined as a trade between two countries of similar products from the same industry. Taking this into consideration, IIT can be disaggregated into two different components, Vertical IIT (VIIT) and Horizontal IIT (HIIT), which refer to the differentiation of the products traded. Vertical differentiation is a differentiation based on the quality of the product while horizontal differentiation is based on characteristics that don't define quality.

1.3.2. Aim of the Research Paper

With this paper, the authors look to answer a few questions regarding IIT, the first of which is whether the IIT is mainly composed of HIIT or whether on the other hand; components of VIIT are also relevant. This question arises out of the predominant viewpoint in literature in which IIT is mainly composed of HIIT, although recent empirical work and results of econometric studies cast a doubt over this claim. Furthermore, this study looks to find the determinants of IIT, and specifically whether the disentanglement of IIT into VIIT and HIIT allows identifying the determinants of both types of IIT if they are, in fact, different.

The role that factor endowments play in IIT also comes into focus in this study, specifically for VIIT and in the context of comparative advantage. Finally, a look towards a possible influence of Foreign Direct Investment (FDI) in IIT is also taken.

1.3.3. Measuring IIT/HIIT/VIIT

The first step in the process of answering these questions is to get a measure of IIT as well as VIIT and HIIT. This is done by presenting IIT as follows (Greenaway and Milner, 1983):

$$A_{ikt} = \frac{\sum_{j=1}^{n}(X_{ijkt} - M_{ijkt}) - \sum_{j=1}^{n}|X_{ijkt} - M_{ijkt}|}{\sum_{j=1}^{n}(X_{ijkt} - M_{ijkt})} \times 100 \qquad (1)$$

Where A_{ikt} is the IIT given in percentage of total trade for an industry "i", a country "k", and a year "t", while X_{ijkt} and M_{ijkt} are the exports and imports of the variety "k", for and industry "i", a country "k" and a year "t". Regarding the type of goods used to calculate this it must be clarified that the paper uses a six digit level of the Combined Nomenclature, which is a classification for all goods imported or exported from the EU. This nomenclature specifies rules regarding the classification of goods to adapt them to an 8 digit code and allows an aggregation, disaggregation to the desired extent (in this case they are aggregated to a six digit level, as said before). For example, "Cheese and curd" is associated to the 0406 code. This is later disaggregated into more specific types, for example "Grated or powdered cheese" which is code 0406 20, "Processed cheese, not grated or powdered" which is code 0406 30, etc. One more disaggregation is done with each of these types giving 8 digit codes.

Now that a measure of IIT can be calculated by means of equation (1), the focus turns on finding a way to be able to distinguish between its vertical and horizontal components. This is done by making use of relative unit values per ton of exports and imports (also at the 6 digit level).

In order to calculate HIIT, equation (1) is applied to those items that who comply with the following:

$$0{,}85 \leq \frac{VU^{x}_{ijkt}}{VU^{m}_{ijkt}} \leq 1{,}15 \quad (2)$$

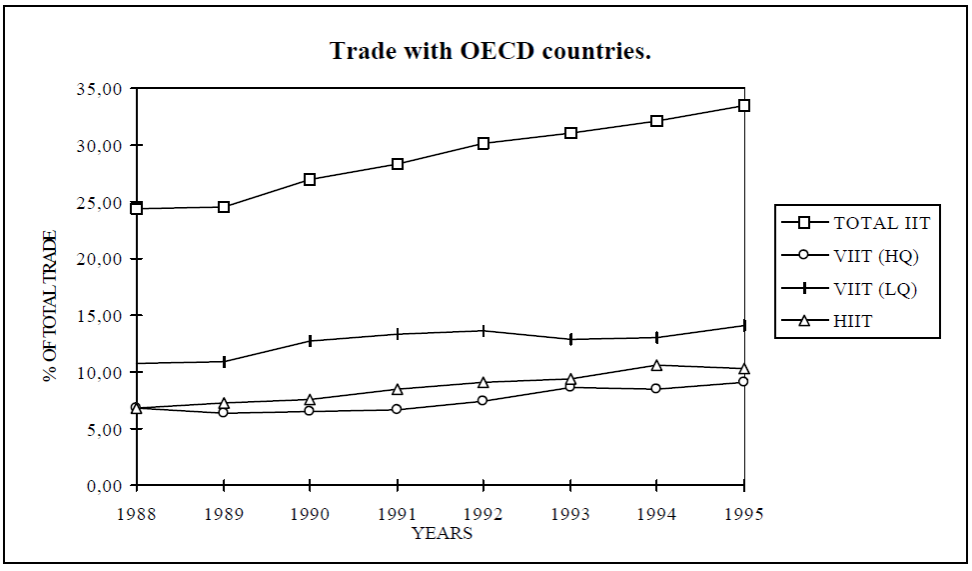
This is the unit value of exports relative to the unit value of imports of a six digit item.

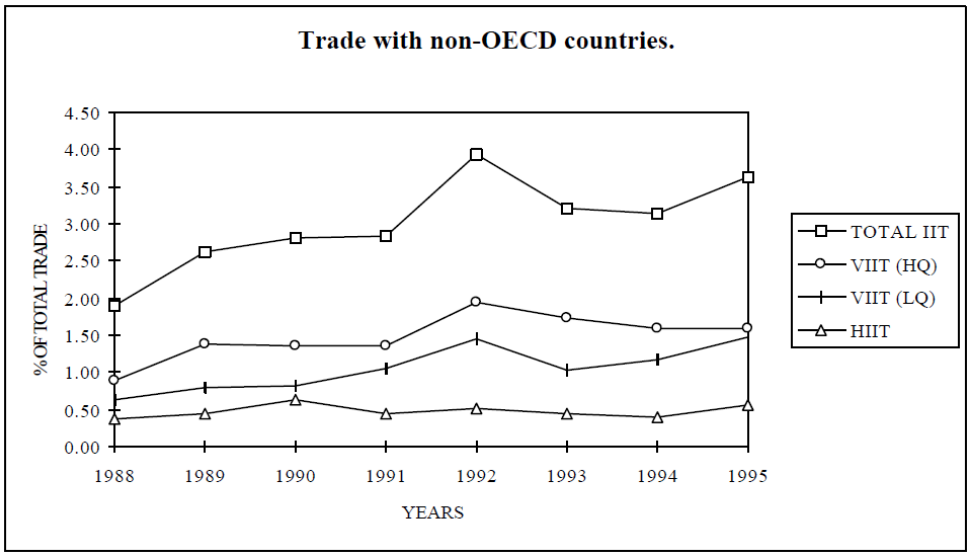
IIT is considered vertical when either one of the following conditions is satisfied:

$$\frac{VU^{x}_{ijkt}}{VU^{m}_{ijkt}} < 0{,}85 \quad (3) \quad \text{or} \quad 1{,}15 \leq \frac{VU^{x}_{ijkt}}{VU^{m}_{ijkt}} \quad (4)$$

When condition (3) is satisfied this is considered low-quality VIIT, or VIIT(LQ), and when condition (4) is satisfied this is considered high-quality VIIT, or VIIT(HQ).

The results are shown in the following graphs taken from Blanes, José V., and Carmela Martín, 2000:





These results show a growth of IIT during the period analyzed, with exception of the decrease in 1993 regarding non-OECD countries due to a large spike in IIT in 1992. This growth seems attributable to growth in both VIIT and HIIT regarding trade with OECD countries and only to VIIT regarding trade with non-OECD countries where HIIT remains at mostly the same level.

It's also worth pointing out that VIIT consistently at least doubles HIIT with OECD countries and non-OECD countries. However, regarding OECD countries there is a greater share of low-quality VIIT while with non-OECD countries, with which IIT trade is much smaller, high-quality VIIT is the dominant one of the two. This is an important observation because it can be taken as a justification for the assumption that comparative advantage is the source of VIIT, which was one of the questions that the paper aimed to answer.

The results provided shed some light on the extent of intra-industry trade in different Spanish industries (concerning the last year of the data provided, which is 1995):

- Regarding trade with OECD countries those industries in which IIT is most predominant are rubber and plastic products, automobiles and parts, and electrical goods. Rubber and plastic products and metal products are the industries with the highest percentage of high-quality VIIT.

- Regarding trade with non-OECD countries, those industries in which IIT is most predominant are other transport equipment (notably high in comparison to the other industries), office and data processing machines, and rubber and plastic products. Those with the highest percentage of high-quality VIIT are other transport equipment and rubber and plastic products.

1.3.4. Model building, motivation, and expectations

Considering all said before, it seems reasonably understandable that the authors want to develop a model that follows these points:

- Presents IIT as a combination of two components: VIIT and HIIT.
- Considering the nature of this type of trade → The model looks for a relation of these components with national and industry specific variables as their determinants while also considering differences in human and technological capital endowments between partner countries.
- The model examines the role of foreign direct investment (FDI)

Industry-specific variables

- Horizontal product differentiation **(HPD)**: A measure obtained with the value of exports and with the unit values of the same varieties. It varies between 0 and 1 where the number approaches 1 as the unit values of the same variety of products are more similar.
    - Expected Effect:
        - Positive effect on HIIT
        - Negative effect on VIIT
- Technological Intensity **(TI)**: Measured by "the proportion of R&D staff in total employment."
    - Expected Effects:
        - Negative for HIIT
        - Positive for VIIT
- Scale Economies **(DSE)**: This paper presents scale economies as something needed in order for IIT to be able to happen. However it also states that really big scale

economies can stifle IIT because it can cause the "standardization of the product." In order to represent this, they use a dummy variable (DSE) which "equals 1 for sectors with a middle range value of SE".

- Expected Effects:
  - Positive for HIIT
  - Unknown for VIIT

- Interaction between HPD and DSE **(HPDSE)**: HPD*DSE is to test the interaction between HPD and DSE. This will be used in a different specification.
  - Expected Effects:
    - Positive for HIIT
    - Unknown for VIIT
- Interaction between TI and DSE **(TIDSE)**: TI*DSE is to test the interaction between TI and DSE. As said above for HPDSE this will be used in a different specification.
  - Expected Effects:
    - Negative for HIIT
    - Unknown for VIIT
- Foreign Capital **(FK)**: "Proportion of foreign share holdings in the sector's total share capital." This will be tested in order to try and give evidence for the positive relation between IIT and FDI linked by other authors.
  - Expected Effects:
    - Positive for HIIT
    - Positive for VIIT

Country-specific variables

- Dissimilarity Between Per Capita Income **(DPCI)**: This is used to test whether or not countries with similar per capita income have a similar consumption pattern, assuming that a similar PCI implies a greater similarity in the consumption pattern. Here they assume that DPCI also explains the effect of factor endowments on HIIT, because a difference in factor endowments has the same effect as a difference in PCI regarding HIIT (decreasing it). However, regarding the effect of factor endowments ion VIIT, they assume that VIIT is mainly affected by the difference in relative technological and human capital endowments which will be tested with a specific variable for each.

- Expected Effects:
  - Negative for HIIT
  - Negative for VIIT

- Difference in Human Capital Endowments **(DHK)**:
  - Expected Effects:
    - Negative for HIIT
    - Positive for VIIT

- Difference in Technological Capital Endowments **(DTK)**:
  - Expected Effects:
    - Negative for HIIT
    - Positive for VIIT

- Distance Between Spain and Each Partner Country (**DIST**): This variable is used to test whether the distance between countries leads to an expected decrease in IIT as costs increase with distance.
  - Expected Effects:
    - Negative for HIIT
    - Negative for VIIT

- Difference Between the GDP of Spain and Each of its Partner Countries (**DGDP**): Assuming GDP is an adequate measurement of the size of a country's economy, this variable is used to test whether this is related to the extent of IIT or not.
  - Expected Effects:
    - Negative for HIIT
    - Negative for VIIT

1.3.5. Results

The researchers estimated 4 different specifications:

(1) – DSE and HPD and TI don't interact.

(2) – DSE interacts with both HPD and TI in the form of HPDSE and HPTI.

(3) – Includes DTK instead of DHK. – Only OECD sample

(4) – Includes both DTK and DHK. – Only OECD sample

At a glance several things can be seen from the results. Making a comparison between TIIT and its components, it can be noticed that results for TIIT and VIIT are very

similar. This can be accounted for because as was explained in the analysis of the evolution of IIT and its components, TIIT is mainly composed of VIIT, and this result is thus understandable.

Additionally, one of the main questions of this study can apparently be answered. This is because most of the determinants for both components of IIT seem to differ.

In the following table, the analyzed variables have been places along with the expectation before the study in accordance to what was explained before as well as the results from the regression. It is apparent that the results go pretty much hand in hand with the researcher's predictions.

	Expected		***Result***	
	HIIT	VIIT	HIIT	VIIT
Industry-specific Variables				
HPD	+	-	+	-
TI	-	+	-	+
DSE	+	n.s.	+	-
HPDSE	+	n.s.	+	-
TIDSE	-	n.s.	-	+
FK	+	+	+	+
Country-specific Variables				
DPCI	-	-	-	-
DHK	-	+	-	+
DTK	-	+	-	+
DIST	-	-	-	-
DGDP	-	-	-	-

1.3.6. Conclusion from the Study

Many conclusions can be derived from these results; the first of which is that VIIT is very present in IIT, contrary to what traditional approaches/viewpoints might argue. In fact, at least in the case of Spain, VIIT plays an important role, taking up much of the countries IIT.

It would seem that since there are big differences in the components of IIT in Spain that the determinants would not be the same for both types of IIT and this study shows that it is in fact true. This can be seen with determinants like scale economies, technological intensity, and human and technological capital while the other variables do play a similar role for both (either positive or negative).

Taking a specific look at factor endowments it can also be said that the initial claim of the researches is appropriate since both variables (differences in technological and human capital) produce the expected result by increasing VIIT while the HIIT component tends to decrease, thus providing evidence to the idea that VIIT arises from the comparative advantage of different countries.

To address the last of the main queries that the researchers looked to answer, it appears as though foreign capital does indeed have positive effects on both components of IIT.

1.3.7. Critique

Along the paper there are several assumptions to be found which I believe more light should be shed upon. First of all, the calculation of the components VIIT and HIIT are made considering that "prices properly reflect quality." This is of essence to the separation of IIT in its components because the researches make use of unit value indexes that they consider for a proxy for prices while at the same time they assume that prices properly reflect quality. However, studies can be found that provide insight on the subject Eitan Gerstner (1985) and David M. Gardner (1971) among others argue that in reality the link between a products price and it's quality is really actually something product dependant, thus being the price a weak signal of quality in the case of many products. This is a very important perspective to keep in mind considering that the distinction of horizontal and vertical differentiation is based around quality.

Another interesting aspect regarding one of the variables considered in this study is that of the technological intensity, in this case measured by "the proportion of R&D staff in total employment". As pointed out by OECD (2011), although it may or may not

necessarily happen in a lot of industries, manufacturing activities that could be considered "high-tech" might not be considered so by looking only at the proportion of R&D at a given moment. Adding to this, industries that can be considered high-tech by this standard might as well be producing low-tech products.

As a conclusion one could say that, aside from the important consideration that prices might not be indicative of quality in a great deal of products (as suggested before), this paper provides an interesting insight regarding that which it set out to do. It offers a picture of Spain's intra-industry trade and offers an explanation for it while reviewing/testing previously established theories and looking to find new results like they provided with the foreign capital. However this research paper was done in 1999, and taking a look at the evolution of data presented in this study one can expect that there has been a big variation up until the present day, especially taking into account the big impact of the economic crisis in Spain and the repercussions in might have had in the different industries.

1.4. Productivity, Welfare, and Reallocation

The following is a summary and critique of the paper "Productivity, Welfare and Reallocation: Theory and Firm-Level Evidence" by Susanto Basu, Luigi Pascali, Fabio Schiantarelli, and Luis Serven.

1.4.1. Introduction

This research paper, looks to present total factor productivity as a measurement of welfare. Furthermore, it will present this welfare is several disaggregated aspects. Those being the different industries or firms that contribute to such welfare and the different components that make up welfare.

1.4.2. Aim of the Research Paper

The paper will be divided in three parts as said before, each with its own aim. The first part shows that there is dependency between welfare and the present value of total factor productivity (TFP) and the initial level of capital stock. In second part, and making use of the first part, a decomposition of the welfare is made into different contributions of different sectors/industries which then is used to compare productivities between

countries and reach conclusions on its effect on welfare. The final part will disaggregate welfare into technical change, aggregate distortions, and allocative efficiency in order to be able to analyze this composition and the effect of each component on welfare.

1.4.3. Total factor productivity and the Solow residual

Having already mentioned TFP and indicating that this will be an important concept that will appear frequently, it seems worthy of an explanation. It can be defined as the part of the output that cannot be explained by the inputs used (labor and capital). So one can say that TFP is determined by how efficiently inputs are used and that as the paper says, it "accounts for the bulk of long-term growth". TFP can be measured by use of the Solow residual which is the rate of growth of TFP.

1.4.4. Linking Welfare to Productivity

In order to establish this link between welfare and the Solow residual, the assumption of existence of a representative consumer needs to be made. For the development of this part, researchers assume that the inputs to economic welfare for a representative household are leisure and consumption and that this household maximizes it's utility based on an intertemporal budget.

- **Intertemporal utility equation:** The first task they undertake here is to arrive at the following normalized intertemporal utility equation of a representative household:

$$v_t = \frac{V_t}{N_t X_t^{1-\sigma}} = E_t \sum_{s=0}^{\infty} \beta^s U(c_{1,t+s}, \dots, c_{Z,t+s}; \bar{L} - L_{t+s})$$

  where N_t is population at a time t, X_t is the Harrod neutral technological progress, $c_{i,t} = \frac{C_{i,t}}{X_t}$ is capita consumption of good i at time t divided by the Harrod neutral technological progress at time t, and $\bar{L} - L_t$ is leisure which is time endowment subtracted by hours of work per capita at time t. $\beta = \frac{(1+n)(1+g)^{1-\sigma}}{1+\rho}$ contains the the growth rates of population and Harrod neutral technological progress as well as the term for discounting the utility values.
- **Budget constraint:** then comes the budget constraint which is shown in the following equation:

$$k_t + b_t = \frac{1-\delta}{(1+g)(1+n)} k_{t-1} + \frac{1+r_t}{(1+g)(1+n)} b_{t-1} + p_t^L L_t + p_t^K k_t + \pi_t - \sum_{i=1}^{Z} p_{i,t}^C c_{i,t}$$

Where k_t is capital per unit of effective labor ($N_t X_t$) with rate of depreciation δ, b_t are real bonds with interest r_t, p_t^L is wage per hour of effective labor, p_t^K is the user cost of capital, π_t is profits, and $p_{i,t}^C$ is the price of goods.

Log linearizing the lagrangean for the optimization problem (and the budget constraint), and applying the optimality conditions around the steady state, they arrive at the following result:

$$v_t - v = E_t \sum_{s=0}^{\infty} \beta^s \lambda \left[\sum_{i=1}^{Z} p_i^C c_i \hat{c}_{i,t+s} + i\hat{\imath}_{t+s} - p^L L \hat{L}_{t+s} - p^K k \hat{k}_{t+s} \right] + \lambda \frac{(1-\delta)}{(1+g)(1+n)} k \hat{k}_{t-1}$$

Where $i\hat{\imath}_t = k\hat{k}_t - \frac{(1-\delta)}{(1+g)(1+n)} k\hat{k}_{t-1}$ from the law of motion of capital.

Now the question lies in linking this equation with productivity. For this some assumptions are made while also making use of the following equations:

$$\hat{y}_t = \sum_{i=1}^{Z} s_{c_i} \hat{c}_{it} + s_i \hat{\imath}_t$$

$$\log pr_t = \log Y_t - s_L \log N_t L_t - s_K \log K_t$$

Where the first one is the log linearization of normalized value added (s_{c_i} and s_i are the shares for consumption and investment) and the second one is the log level of productivity (s_L and s_K are the shares of capital and labor).

Through some more operating they reach the final equation they were looking for:

$$\begin{aligned} \Delta v_t = v_t - v_{t-1} \\ &= \lambda p^y y E_t \sum_{s=0}^{\infty} \beta^s \Delta \log pr_{t+s} + f_1 + \lambda p^y y \sum_{s=0}^{\infty} \beta^s [E_t \log pr_{t+s} - E_{t-1} \log pr_{t+s}] \\ &+ \lambda p^y y \frac{(1-\delta)k}{(1+g)(1+n)} \frac{k}{p^y y} \Delta \log K_{t-1} \end{aligned}$$

Where $\Delta \log pr_t$ is a modified Solow productivity residual and f_1 is a constant. Finally with this they show that the present discounted values of productivity residuals is reflected in utility to a first order approximation along with a revision of expectations of this residual while capturing the change in initial capital endowment and thus showing that the TFP index can be used to measure the welfare.

The researches then go on to show how this result can accommodate for different economic environments, including different types of capital and labor, taxes, and government expenditure.

1.4.5. Obtaining Firm and Sector Contributions to Productivity

After obtaining the link of welfare to the Solow residual, the researchers now look towards decomposing this residual into the different sectors or industries. The aim in this part, as said before, is to be able to have some insight on the productivity growth with sectors or firms in the spotlight with the intent of making some analysis with the results obtained. In this sense they present the Solow productivity as a weighted sum of Solow productivities at a firm level, as shown by the equations below:

$$\begin{cases} \Delta \log pr_t = \sum_i \omega_i \, \Delta \log pr_{it} \\ \Delta \log pr_{it} = \Delta \log Y_{i,t} - s_{K,i} \Delta \log K_{i,t} - s_{L,i} \Delta \log N_t L_{i,t} \end{cases}$$

where *i* is a sector or a firm.

Results:

Calculated for each country, the mean of TFP growth amounts to less than 1% each year. Then they proceed to show results regarding important industries for a set of countries. However it is important to have in mind that the results given are just the TFP growth for that industry ($\Delta \log pr_{it}$) and not how that industry itself contributes to the total TFP, which would require for the contribution share of that industry (ω_i) to be given, resulting in $\omega_i \Delta \log pr_{it}$. The results are shown in the following table:

Average sectoral TFP growth rates					
	Manufacturing	**Electricity, Gas, Water supply**	**Construction**	**Wholesale and Retail**	**Finance, Insurance, Real estate**
Belgium	0,0068	0,0159	0,0100	-0,0203	0,0007
Spain	0,0048	0,0327	-0,0091	-0,0069	-0,0009
France	0,0112	0,0287	-0,0034	0,0065	-0,0103
Italy	0,0041	-0,0071	-0,0120	0,0051	-0,0030
Great Britain	0,0103	0,0149	0,0000	0,0058	-0,0132

Manufacturing has a positive growth rate in all countries and utilities also tends to have big positive growth rates. On the other hand finance, insurance and real estate have generally negative growth rates. Construction only has positive growth rate for Belgium. In the case of Spain, it can be seen that utilities have the highest TFP growth rates for the sectors compared while construction, which has been tremendously important in recent years, show the most negative growth rates among the sectors studied.

Another question asked by the researchers is whether or not the size of firms has an influence on aggregate productivity change. No definite answer is reached for this question since the results that were reached vary across countries. However large firms do consistently account for a larger share of the total productivity change. Particularly in the case of Spain large firms do have a higher productivity change than smaller firms, although they are small rates in both cases.

The researchers then go to answer whether differences in the productivity growth rates between two different countries is accounted more by the growth rates of each sector than by the composition of each country's sectors. To do this they compare each country (C) with the UK with the following equation:

$$\sum_i \omega_i^C \, \Delta \log pr_{it}^C - \sum_i \omega_i^{UK} \, \Delta \log pr_{it}^{UK}$$

$$= \sum_i \frac{(\omega_i^C + \omega_i^{UK})}{2} (\Delta \log pr_{it}^C - \Delta \log pr_{it}^{UK})$$

$$+ \sum_i \frac{(\Delta \log pr_{it}^C + \Delta \log pr_{it}^{UK})}{2} (\omega_i^C - \omega_i^{UK})$$

Results of this part of the study show that the differences in aggregate productivity change comes mostly from the differences in each sector's productivity change instead of

the composition of the sectors, with exception of France which does indeed have a better productivity change in sector by sector comparison in both countries but however loses this advantage when taking their industrial composition into account.

For the last part of this section the productivity pattern of each country is examined. In order to do this they use the following methodology: They calculate each firm's TFP and then divide it by the countries aggregate TFP. Then they divide these numbers into ten brackets to which they fall into and then they calculate the share of value added by the firms in each of these brackets. What they do next is to compare what aggregate productivity change would be obtained if the shares of each bracket would be those of the UK, thus in a sense, substituting each countries productivity pattern with that of the UK. What is shown by the data is that France's and Italy's aggregate productivity would increase with the UK's productivity patter while it would diminish for Belgium and for Spain.

1.4.6. Decomposing Welfare Change Into its Components

As it's been said previously welfare can be decomposed into several components that depend on reallocative efficiency, technical change and aggregate distortions. A first decomposition is found in the following equation:

$$d\log pr = (\bar{\mu}-1)d\log X + (\bar{\mu}-1)\,d\log\frac{M}{Q} + R_{\mu} + R_{M} + d\log T$$

$\bar{\mu}$ is the weighted average markup by the firms; $d\log X$ is the primary input growth; $d\log\frac{M}{Q}$ is the growth of the division of materials input by gross output.

In this equation the first two terms $(\bar{\mu}-1)d\log X$ and $(\bar{\mu}-1)d\log\frac{M}{Q}$ are aggregate distortions. R_{μ} is the term that reflect reallocation of primary inputs toward firms with different markups. R_M is the term that reflects reallocation of materials across firms with different markups. $d\log T$ is the component of productivity that comes from technology change. Even though the researchers finally don't use it, they show that both R_{μ} and R_M can be decomposed to see whether the reallocation happened between different industries or within a same industry.

Results are shown on the following table:

Decomposition of aggregate productivity

	$d \log pr$	$(\bar{\mu}-1)\mathrm{d}\log \mathrm{X} + (\bar{\mu}-1)\mathrm{d}\log \frac{\mathrm{M}}{\mathrm{Q}}$	$\mathrm{R}_{\mu} + \mathrm{R}_{\mathrm{M}}$	$\mathrm{d}\log \mathrm{T}$	Residual
Belgium	0,0352278	0,01446	0,00048	0,0114122	0,00888
Spain	0,0311934	0,02011	-0,00132	0,0048491	0,00755
France	0,0478567	-0,00055	0,00169	0,0405101	0,00621
Great Britain	0,0601621	-0,00084	0,00083	0,0490316	0,01114
Italy	0,0280874	0,00695	0,00025	0,0141505	0,00674

Where the residual is the difference between productivity and all the other terms of the equation. This residual appears as a result of several assumptions and values that were estimated instead of observed. What the researchers do is to allocate this residual in proportion to each component. Then they present each component of a normalized productivity change in the following table:

	Productivity growth	**Aggregate distortions**	**Reallocation**	**Technological change**
Belgium	1	0,5488	0,0182	0,4331
Spain	1	0,8505	-0,0558	0,2051
France	1	-0,0132	0,0406	0,9727
Great Britain	1	-0,0171	0,0169	1,0002
Italy	1	0,3256	0,0117	0,6629

This study was done for data from 1998 to 2005. In the first table it can be seen that during this time there was a considerable and positive productivity change as well as technological change, except for Spain for which this technological change was below than the 1% which all other countries are above of.

However, the second table lets us take a clearer look towards where this productivity is coming from. Something quite notable at first site is that reallocation, as it turns out, is not an important component of productivity growth. Looking at the data one can see that all countries show a reallocation below 6%. Hence, the researchers don't

present the disaggregated data for reallocation (between industries or within them). The researchers argue that this is due to the low number of smaller firms present in the study, which allegedly have a higher productivity. In the final part of this section, the researchers state that, although in this case the reallocation component of productivity growth is small, this doesn't mean that a central planner could not achieve an important productivity growth by reallocation. Regarding aggregate distortion, it can be seen that they are quite important for Belgium, Spain, and Italy while in the case of France and Great Britain this does not happen. For these two countries the opposite happens. They, in fact, have a small negative component of aggregate distortions while the technological change makes up more than 95% of the productivity growth, although this number is not small for any of the other countries and should not be ignored at all, which are all mostly above 40% in the technological change component (except for Spain).

1.4.7. Conclusions from the Study

As the researchers set out to do, they were able to establish a link between welfare and productivity growth or TFP. As said before, with a given initial capital, present discounted values of productivity residuals along with a revision of expectations of this residual the TFP index can be used to measure the welfare. Following this, they provide an insight into the sectoral composition of welfare, which is a useful tool to find the sources of welfare, as well as different components that make up this welfare thus providing useful ways of showing how features of the economy promote growth or not.

In general terms, findings show that Manufacturing is a sector that promotes TFP growth while construction and finance, insurance, and real estate generally produce a decrease of TFP. Testing whether applying the productivity pattern of the UK (with highest TFP change) to other countries helps or not produced mixed results. Finally as explained in the last section, TFP growth has a high component of technological change in all cases as well of aggregate distortions in only some of them while showing a relatively low importance of reallocation.

Regarding the results concerning Spain, it's worth mentioning that the highest TFP growth is present in utilities while the lowest (which is in fact a negative growth) is in

construction which probably is a good reason as to why the results show that Spain has a low productivity change in total in comparison with other countries since construction has traditionally been a big part of Spain's economy. Also, regarding the components of productivity growth, Spain is the country, out of those compared, with the smallest share of technological change.

1.4.8. Critique

This work is based around the existence of a representative consumer. As discussed in the paper itself, this causes for them to ignore issues of distribution. Although they say that this data cannot be incorporated in this framework, it is something worth mentioning. Also as Slesnick (1998) argues, additional problems are present because aggregate demands are inconsistent with the behavior of a single representative agent. Kirkman (1992) also argues that reducing a group of heterogeneous agent to a single representative consumer leads to models that often provide wrong or misleading conclusions.

In the final decomposition of productivity components, there is a large residual to be found, which is the difference between the productivity change and the aggregate distortions, technological change, and reallocation. This seems like a problem because its size seems quite significant. As we can see in the case of Belgium it accounts for no less than 25% percent of the productivity change. Although they explain the reasons regarding why this residual exists (markups are estimated, assumptions made regarding profits, and so on..) they really don't asses the reason for which they decide to allocate this residual to each growth component in proportion to their size. It would seem that without a well reasoned distribution of this residual that these results could be quite imprecise.

Additionally, it is claimed that there is a possibility that reallocation effects are small due to the natures of the firms in the sample. The idea is that most of the firms in the sample are quite large during all the period studied when, in order for the reallocation effects to be more present, firms growing in size should be present since they have higher productivity. In my opinion this goes doesn't fit in with the data calculated beforehand that doesn't show a clear result regarding whether big firms or small firms have a higher productivity change. In this sense maybe it would be helpful to calculate the productivity.

2. Institutional Setting

2.1. Introduction

Economics can be seen as the interaction between a set of agents, which in a broad sense are usually considered to be households, governments, firms, and banks. However, whatever these agents are defined as, institutions, or at least economic institutions, are whatever incentivizes these agents to act as they do. In this sense it is also important to mention that these agents act according not only to present incentives but also to expectations regarding the future state of these incentives or in another sense, the security that this institutional setting creates, as expressed by Gascón et al. (2008). Hence the importance of analyzing the most important institutions for the Spanish economy.

2.2. The Public Administration and The General Courts

The first agent to come to mind regarding the influence in the economy and in the production system of any country are its public administration. In the case of Spain they are divided into the national, autonomic, and local levels which have suffered a heavy decentralization process since the end of Franco's regime, where around 50% of spending was attributable to the general administration, 40% to Social Security, and 10% to local administrations. While local spending has remained more or less the same, spending by autonomic administrations is now on par with central administrations around 30% each, the rest attributed to Social Security. Apart from territorial administrations there are instrumental administrations and corporative administrations, of which the latter are of a lesser importance.

In terms of legislation as said by Delgado et al. (2013), around two thirds of economic norms have their origin in the EU. In this sense, legislating in Spain goes hand in hand with competences, which are shared or totally transferred to either the EU or to autonomic governments. Some of these competences are established in the constitution but can also be transferred by legislative mechanisms. This fragmentation of competences (and, consequently, legislative power) between the Spanish autonomic and central governments has caused for the European Commission to issue a warning that this represents a barrier for competitiveness and for the functioning of firms.

The Congress and the Senate which are not part of the public administration, along with the Government, which can approve Royal-Decree Laws, are in charge of legislation at the topmost level. Congress also carries out an important function regarding the economy which is the approval of the State Budget where funds are allocated to fund different entities and to carry out competences and planned policies. It is imperative to point out that that the Stability and Growth Pact (SGP), now replaced by European Fiscal Compact, has an important impact on the State Budget which aims a deficit lower than 3% of the GDP as well as a debt level lower than 60% of the GDP along with other aims so as to prevent the negative economic effects from passing on to other Eurozone countries. However these limits are more or less flexible depending on the situation of the country's economy.

Regarding the general administration the three most important institutions are the Government and the Ministries along with the Cabinet. Composed of the president, vice presidents, and ministers, the Government carries out several functions among which the most relevant to this work are the legislative function and the elaboration of the State Budget along with the ministries and other organisms. The ministries are determined by the president and their main function is to prepare, conduct and execute the Government's policy regarding a determined set of activities. This model transposes well to the autonomic administration level although different terminology is used.

In addition to territorial administrations there are also institutional administrations, or public organisms, which are dependent on or linked to the General Administration through a ministry or through an Autonomous Organism. They perform activities reserved for the General Administration in a way which justifies its functional decentralization. They have their own legal personality, wealth and treasury and they operate with managerial autonomy. These are

- Autonomous Organisms: They are governed by administrative law (a part of public law) and they carry out activities of promotion, provisioning, and management of public services. They are dependent on a Ministry which is in charge of its strategic direction, and the evaluation and control of the organism's results. Examples are the Public State Employment Service (SEPES), the Wages Guarantee Fund (FGD), The Spanish Agency of Food Security and Nutrition (AESAN), or the Spanish Patent and Trademark Office among others (OEPM).

- Public Business Entities: These organisms are mainly driven by private law and they can carry out activities of provisioning or management of services as well as production of good in the public's interest susceptible to payment. Although they could do it in an exceptional manner, these entities cannot finance themselves through the State's Budget of through public administrations or entities as well as donations from private entities or people, as opposed to the Autonomous Organisms. They are dependent on a Ministry or an Autonomous Organism which is in charge of its strategic direction, and the evaluation and control of the organism's results. There are analogous entities at different territorial levels. In any case, there are many important orgasms that take this form like the Spanish Administrator of Rail Infrastructure (ADIF), the Official Credit Institute (ICO), or the Public Land Management Company (SEPES), among many others.
- State Agencies: These organisms are driven by Public Law and are ascribed to the ministry that creates them for the fulfillment of the programs corresponding to the public policies developed by the General Administration. However the strategic direction, evaluation and control of results and activities of these agencies are determined by a management contract. Notable examples are the Spanish Agency for International Development Cooperation (AECID), the State Meteorological Agency (AEMET), or the State Tax Administration Agency (AEAT).

2.3. European Union

Simply put, it's a supranational organism to which the national governments of the countries integrating it have relinquished certain economic and political powers, which are now exerted by the EU's institutions, in favor of the many benefits that this union provides. In the process a single market and single currency has been created.

The EU's institutions are playing an increasingly important role for Spain as a whole, let alone its economy and production system. It has heavy influence on regulatory aspects as well as budgetary aspects.

- **Decision-Making Institutions**

  European Parliament: It's elected by citizens and it has the power to legislate. It supervises all EU institutions and elects the President of the Commission and Commissioners

proposed by member states. Also, it shares power over the EU's annual budget along with the Council.

European Council: Composed of the heads of member state's governments which meet at least four times a year to define the general political direction and priorities of the EU. These meetings serve as a guideline to the Council.

Council (of Ministers): Represents the governments of the member states by means of their ministers. The Council coordinates member state policies, defines the EU's foreign policy based on the European Council's guidelines, concludes international agreements, and has have the power to legislate along with the Parliament. Additionally it decides the budget jointly with the Parliament. There are 10 different council, including the well known ECOFIN.

European Commission: Represents the interest of the EU as a whole. It proposes legislation, policies and programs of action and implements EU policies and the budget mostly by means of supervision since it's the within the Members States that the spending is done. The Commission answers to the Parliament to whom it must clarify and justify its policies. It is divided into Directorates-General which are each in charge of a different policy area.

- **Legislation**

The areas to which European legislation can be passed depends on competences. Exclusive EU competences are customs, competition rules, monetary policy for the euro area and the conservation of fish and trade. If a competence is shared, as is the case of the internal market, agriculture, the environment, consumer protection and transport among others, then EU laws have priority and if there is no EU legislation then national legislation may be passed.

Regulations: Directly binding in all member states. Doesn't need to become national law.

Directives: Law that binds some or all members states to an objective which is up to the states to determine how it's done. It is generally transposed into national law.

Decisions: Only deals with a particular issue and specifically mentions persons or organizations.

Regarding the passing of legislation there are a few procedures:

The Ordinary Legislative Procedure where the Commission makes a proposal to which the European Parliament and the Council amend and form an agreement, after one or more readings, or not (in which case the law is not adopted).

Consultation Procedures, which apply only to a few areas like competition and internal market exemptions, where the Parliament only serves as a consultation organism to the Council.

Consent Procedures, are where the Parliament can either consent or not but they can't amend.

- **Monetary Policy**

Monetary policy in the EU is carried out by the ECB with the aim of price stabilization. However, it also carries out tasks to ensure financial stability and credit flow. Policy carried out with independence of political powers and which is based around influencing short run interests in money markets, influence which rapidly spreads through the economy. To exert influence over the interbank interest the ECB works through three main instruments:

Open market operations: Consists of repo operations or short term loans to banks.

Standing facilities: These are one day operations where banks can obtain all the liquidity they want or deposit all they want. This is to control the days interbank interest rate.

Minimum reserves: This is a percentage of the banks' deposits that are required by the ECB to be placed as deposits in the respective national banks. With this it can heavily influence liquidity, forcing banks to depend on the ECB for financing.

The economic crisis has forced the ECB to take unconventional measures which have consisted in injecting unlimited liquidity at a fixed interest rate and in buying government debt to lower risk premiums and long term interest rates.

- **Other institutions and entities:**

European Court of Auditors: One of the seven institutions of the EU. Checks whether the EU budget is well implemented.

The Court of Justice: One of the seven institutions of the EU. Among its many important functions it can fine member states if it doesn't comply with EU law.

Agencies: They are separate legal entities set up to perform tasks under EU law.

Decentralized Agencies: They have their own legal personality and are governed by public law. They carry out technical, scientific or managerial tasks that help the EU institutions make and implement policies as well as support cooperation between EU and member states. Good examples are the European Banking Authority, the European Insurance and Occupational Pensions Authority and the European Securities and Markets Regulator.

Executive Agencies: These agencies help the European Commission manage EU programs.

EURATOM agencies and bodies: These bodies are created to coordinate research in the EU countries on the use of nuclear energy.

The European Economic and Social Committee: It's an advisory body for the Commission, the Council, and the Parliament made up of representatives of organizations of employers and of the employed as well as other civil representatives in order to serve as a bridge between the EU and its citizens.

The European Investment Bank: Lends money for investments that support the Union's objectives. It finances itself by issuing bonds. It works in heavy cooperation with the European Commission, the Parliament and the Council of Ministers. Its board of ministers is composed of the finance ministers from member states and it defines the bank's policy. The Board of Directors, which approves lending and borrowing operations is appointed by member states and the European Commission.

Others: There are a wide array of entities in the EU that are not relevant enough for this work.

- **Fiscal Policy**

As stated before, although fiscal policy remains competence of the states, they are bound to the EU. The Council can make recommendations to EU states as well as sanction them for not achieving their commitments.

- **Funds**

The spending of the EU is mainly covered by several funds which serve to enact many of the EU's policies. These are the Structural Fund made up of the ***European Regional Development Fund (ERDF)*** and the ***European Social Fund (ESF)***, the ***Cohesion Fund***,

the CAP Funds composed of the ***European Agricultural Guarantee Fund (EAGF)*** and the ***European Agricultural Fund for Rural Development (EAFRD)***, and the ***European Maritime and Fisheries Fund (EMFF)***.

ERDF: It focuses on trying to create sustainable jobs, investing in infrastructures, supporting small and medium-sized enterprises, as well as providing technical assistance.
ESF: It's mainly focused on developing the labor market by means of promoting training, providing access to start-up capital, combating poverty, among many others.
Cohesion Fund: Allocated to infrastructure projects in the EU's interest as well as trans-European transport networks, and energy and transport related projects.
EAGF: It funds several measures regarding agricultural policy as well as direct payments to farmers.
EAFRD: Under the Common Agricultural Policy it finances rural development projects.
EMFF: Fund that co-finances projects in the field of fisheries and maritime affairs as well as to provide financial support for fishermen, fish farmers, and coastal communities.

- **Financial aid mechanisms to member states in economic difficulties**

These are given in the form of loans. Initially created in 2010, the ***European Financial Stability Facility (EFSF)*** as a temporary mechanism to provide financial assistance to Member States. As of July 2013 this mechanism can't create new programs or loan agreements and the ***European Stability Mechanism (ESM)***, created in 2012 is the only working mechanism, which has actually been used by Spain to recapitalize its banks.

2.4. Labor Market

One of the ways in which institutions affect production systems in through the their effects on the labor market. What these institutions mainly do is setting norms and laws as well as participating in bargaining processes and taking measures to promote employment.

It seems worthwhile, before describing these determinants, to give a snapshot of the Spanish labor market (which can be seen in the following table). In the midst of the economic crisis unemployment has soared, especially among those with less studies, leaving a particularly high unemployment rate among the younger population which also presents a staggeringly high temporary employment. In any case the differences of these figures, except for activity rate, are considerable when compared to the EU.

	2010	2011	2012	2013
Activity rate				
Total	60%	60%	60%	60%
Unemployment rate				
Total	20%	22%	25%	26%
Under 25 years old	42%	46%	53%	56%
25 years old and above	18%	19%	23%	24%
Temporary employment(%)				
Total	25%	25%	23%	23%
Under 25 years old	58%	61%	62%	65%
25 years old and above	22%	23%	21%	21%

Source: INE

Looking in a closer fashion, one can distinguish that the effects of institutions affect the labor market in different aspects:

- **Contracts**

  Types of contracts are determined by the national government. Although this process might be done in negotiation with trade unions and employers' organizations, the decisions ultimately rely on the government which can decide unilaterally. This legislation (called labor legislation reform) regarding contracts, among others, is critical for wages, severance pay, etc.

- **Wages**

  Wages are determined by a mix of competitiveness and institutional influence. The former is done between the labor force themselves and firms by means of supply and demand. The latter is composed of the government, trade unions and employers' organizations, out of which the most important are the last two which engage in collective

bargaining at different levels (national, provincial, and firm-specific). In any case these collective agreements envelope all workers in the area on which the collective agreement is concerned on even if said workers are not affiliated with a trade union. After a reform in 2012, if a collective agreement can't be reached then the previous one will be extended for one, and only one year, then being derogated and coming into play an agreement reached in a higher level. In these agreements everything pertaining employment and the workforce can be included. In this case, wages are agreed upon by which an employer can't negotiate a wage with an employee in an inferior quantity to that which was agreed upon in the collective agreement. Under these agreed upon base wages is the guaranteed minimum wage established by law. Some exceptions to this are in the case of public wages, determined by the Government, as well as payments to agricultures which are heavily determined by the CAP of the EU.

- **Severance conditions and pay**

To a great extent the government is the most important institution regarding severance. This is for two reasons, the first of which is that severance is dependent on the type of contract, which the government establishes. Also, the government establishes the requisites for collective dismissals as well as for unfair dismissal, and dismissals in general.

- **Unemployment benefits**

Unemployment benefits are considered a passive employment policy aimed at protecting those who lose their job or see their working day reduced. These benefits are managed through SEPE (Public State Employment Service) which is an autonomous public organism linked to a the General Administration and, in this case, to the Ministry of Employment and Social Security. They are funded mainly by social security contributions as well as through the general state budget. In any case, the conditions for the reception of these benefits as well as the quantities are set by the national government in the form of labor legislation reforms mentioned before.

- **Active employment policy and intermediation**

  Active employment policy is mainly directed towards promoting employment. This can be done through education of the unemployed, aid in job finding, orientation, as well as economic stimuli. These policies are mostly transferred to Autonomic Public Employment services. The SEPE distributes funds to these organisms for the development of these active policies. The EU also takes part in these policies with the Structural Funds.

3. Agriculture

Productive activities are base of economic development. In a global vision these activities can be aggregated in three different sectors, of which the primary, secondary, and tertiary sectors can be distinguished. The primary sector primarily contains agriculture and fishing as well as mining, but not always. The secondary sector contains industrial activities, along with energy and construction, while the tertiary sector groups all other activities and is mainly identified as the service sector. These activities draw a picture of an economy that changes with demand as growth occurs. During the last 50 years Spain's economy has shifted towards the tertiary sector while facing an opening to a more competitive world economy.

3.1. Introduction

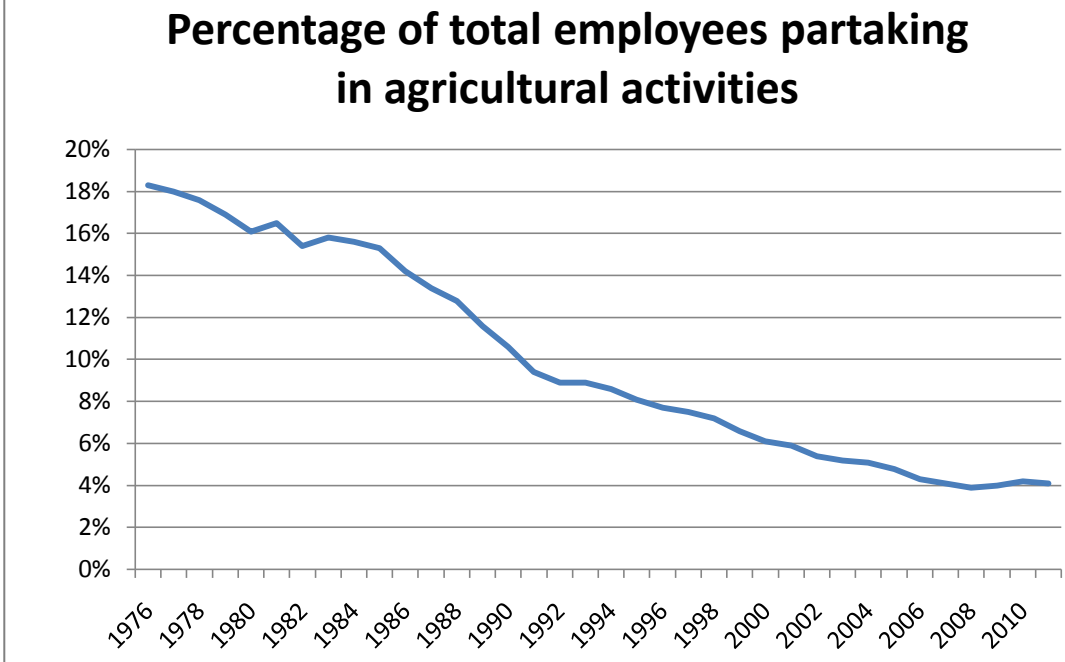
As it is found in literature and as the actual study of the development of different countries has shown, economic development goes hand in hand with a notable decrease of importance of the primary sector and specifically in agrarian related activities. In this sense, Spain's case has been no different.

This shift for Spain has come, as a companion to the expected economic development, with a process of opening to the world economy. Although it seems to follow a common trend of transition from agrarian activities to activities pertaining to the secondary and tertiary sector there are motives for which it can be in the interest of national and supranational governments to maintain agrarian activities in their territories, whatever the high competiveness brought on by market openness and trade liberalization may be. This can require many things. From development of new and more efficient technologies to the introduction of subsidies, a wide array of possibilities exist.

Although the sector of agriculture, forestry, and fisheries is generally considered as a whole, in this case due to the relevance of agriculture for Spain and Europe, and since fishing activities have historically had little relevance, the focus on this sector will totally lie on agricultural activities.

3.2. Sector Evolution

After the introduction of the Stability Plan by the Spanish government and thus ending the era of autarky, the openness based growth during the 60's brought new techniques of production in the form of technology and techniques that could be imported. The second is a change in the profile of agricultural demand that is also generally brought on by wealth increase. In any case the relevance of agriculture in macroeconomic figures has decreased steadily, as was expected. This can partially be explained because as rent grows the proportion of this rent destined to agrarian products decreases.



Source: Garrido Medina and Gonzalez (2005) and INE

As expected, during the opening process of the Spanish economy mentioned before, Spanish agriculture walked into the international playing field, and to a much greater extent during the last 30 years, after joining the European Economic Community. As Myro Sánchez (2013) points out, the sum of exports and imports in relation to total production has more than doubled itself in the last 20 years, most of the trade (70%) being with EU members. The agricultural sector is one of the few that has shown a coverage rate that indicated a trade surplus. This last figure is considerably higher when considering trade with EU partners and considerably lower when outside of these.

Regarding the structure of the agrarian sector, for the most recent years, the agrarian census carried out by the INE which gives a snapshot of the structural composition of agriculture in Spain. As it turns out, about 50% of farms are small farms with low production that in total make up about 16% of production while on the other side of the spectrum, about 13% are larger farms (which produce more than 50.000 €) which make up almost 50% of production.

Regarding productivity, as suggested by Myro Sánchez (2013) an overview of its change can be done with partial measures of it. In this case relevant measures for agriculture would be output per labor input as well as output per land input where land productivity (or yield) can be a factor of labor productivity. Considering labor productivity as a factor of output per land use and land use per labor input, the most important factor for the notable increase in labor productivity since joining the EEC is the latter. This can be explained by the rise of employee compensation as opposed to investment goods (machinery) which points towards a substitution of labor.

Another interesting aspect regarding productivity is its relation with farm size, where the biggest farms show yields and labor productivities more than 10 times higher than the smallest ones. In any case, labor productivity is on par with most developed EU countries and well above the EU average.

3.3. Institutional Setting and Agrarian Policy

Protectionism in the EU has prevented agricultural sectors of member states of facing extremely heavy competition with countries that can provide cheaper labor than in the EU. World pressures along with the EU's efforts to strengthen commerce ties with extra-communitarian countries pose a "threat" in this sense.

Agrarian policy in developed countries is based around transferring money from consumers or taxpayers into the sector. Regarding Spain's agriculture this is mainly done by the EU in a way that it basically stands as the single most important institutional influence. This is the Common Agricultural Policy (CAP).

The CAP emerged in the post World War II period to achieve the goals of preventing food shortages while maintaining reasonable prices, increasing productivity, while maintaining a reasonable standard of living for workers of the sector.

This policy follows the principles of market unity, community preference and financial solidarity. A single market was created removing the barriers between member states, in which there were common prices controlled by a supranational government. These goods were also to be protected from nonmember competitors and the financing of this policy is done through all the member states using mechanisms determined by the European Union.

Under the CAP, the Common Market Organizations (CMO) were created in 1962. These are organizations that set a legal framework for different agricultural sectors. A few years after their creation, these organizations covered more than 90% of agricultural products. This regulation is centered around protectionism based around fixing prices while preventing access to extra-communitarian products, (with current regulation additionally providing aid for different sectors and storage as well as setting production quotas, as explained by Council Regulation (EC) No 1234/2007) . Additionally, in order to finance and implement the CAP, budget allocations were made to the newly created European Agricultural Guidance and Guarantee Fund (EAGGF).

In the mid 70's and 80's this system proved problematic due to constant surpluses that took a big toll on the budget since the way this worked was by using the EAGGF to guarantee a certain base price by buying at a certain price whatever the farmer could sell in the market, thus maintaining prices and assuring income to farmers, as sustained by Wilkinson (1980). Since then measures like quotas and levies on overproduction (co-responsibility levy) were introduced, the first of which were to be seen in 1984 and 1979 respectively in dairy products.

In 1992 a PAC reform was put in place in order to take a more definite step towards solving the grave problems caused by the operating mechanism of this policy. With this reform there was a shift from supporting farmers through prices to supporting them through direct income support (European Commission (1991)). In this sense, the shift was not complete, since guaranteed prices were lowered when production exceeded a given threshold to better reflect market demand instead being of completely eliminated. To substitute price guarantees as a source

of income for the farmers, direct payments were made based on a wide array of factors like farm area, income, livestock, among others. Another important aspect was the introduced rural development policy that looked to compensate positive externalities such as maintaining habitats and biodiversity among others and of which Spain was the biggest beneficiary up to 2006.

After some light reform in 1999, which introduced a second pillar in the form of new rural development policy (in addition to pillar one which basically included direct payments but also export refunds, storage aid, among others) , in 2003 another PAC reform occurred where the main feature was a the new single payment scheme where the direct payment aid to farmers is given in a decoupled fashion, meaning that the same aid is allocated independent of their production. The sought out consequences are, more stability for the farmers as well as obtaining a better match between supply and demand. During this time price support mechanisms have been removed in most products.

In 2005 policy was put in place to change the CAP spending mechanism my setting up the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development (EAFRD).

The 2014-2020 CAP reform will bring a new single payment system that aims to homogenize farmer payment across Europe and will be determined by hectare quantity. Furthermore, there will be a shift of these payments towards farmers who make a better use of natural resources and there will also be payment capping per farm. The concept of "active farmer" will also be introduced to prevent leakage of funds towards non-active farmers or to beneficiaries who really don't carry out farming activities (European Commission (2011)).

As a final note, the management of CAP funds in Spain is done by Spanish Agricultural Guarantee Fund, an autonomous organism, that makes sure that this aid is applied correctly in regard to the CAP's objectives.

4. Industry

4.1. Introduction

As opposed to what happens with the agricultural sector, where the sector's economic importance decrease as the economy grows, in the industrial sector, its growth does go hand in hand with economic development. At least up until the point where the economy becomes more service oriented, as is the case of Spain.

In a general characterization of a generic industrial sector, there are a few things worthy of mention. First of all it a sector that tends to be more productive than the primary or tertiary sector since the nature of industry makes it very susceptible to scientific and technical development. However, these sectors are heavily interconnected between themselves having an important role in the development of each other.

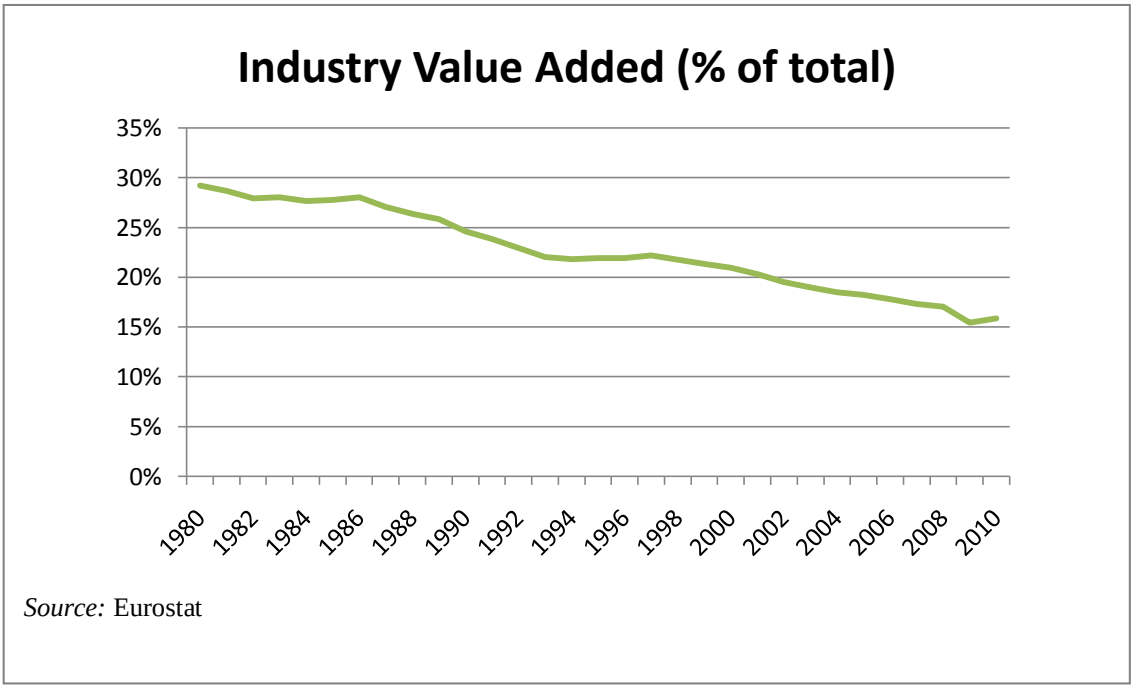
The International Standard Industrial Classification (UN) defines industry, in its Revision 3, as the combination of mining, quarrying, manufacturing, and electricity, gas, and water. However, for this work, and due to the importance in several aspects of the energy sector in Spain, industry will just be considered as mining, quarrying, and manufacturing, leaving the energy sector separately for a posterior analysis.

Within the activities mentioned above there is another frequent classification regarding their technical nature. In this sense, they are usually divided into three different groups. The first group would be those with heavy innovation or development which have room for market expansion like electronics, or aerospace related activities. Based on this there are other activities that show a more intermediate profile in this sense, like chemistry related or machinery related activities, and those more traditional activities which have low technological intensity and whose demand doesn't vary a great deal like mining industries, textile, and foods.

4.2. Sector Evolution

During the last 30 years, in line with what has occurred in many EU countries, the weight of the industrial sector in Spain's economy has waned. Various explanations can be found for this "deindustrialization" phenomenon. It's often argued that a big part is due to the externalization of services which basically means that activities performed by the industrial sector were transferred

to production oriented service activities. In more recent years, outsourcing of production and these service activities has occurred. Increase in productivity can also provide an explanation for the employment-wise deindustrialization as can the slow rise of prices as opposed to the faster rise of other sectors, which also in part explains the change in terms of value added in relation to the whole economy. Additionally, the importance of developing countries and the integration of Spain in Europe has drawn a more competitive setting giving rise to some of the previously mentioned determinants, as pointed out by Baró Tomás (2013).



Source: Eurostat

Keeping this context in mind, since the joining of the EU the more traditional activities have maintained their share of value added around 60%, while the same thing happens with those activities with a more intermediate and advanced profiles, the latter having very little weight in the industry with around 5% of the industry's value added. In this sense it can be concluded that the industrial sector's production profile has changed very little over time. The same thing can be said about exports, where traditional and intermediate activities make up more than 90% of exports and are the only ones that have achieved positive net exports as opposed to the more advanced activities.

Regarding the reasoning behind why Spanish industrial profile is like it is, a reason that could provide an explanation, as argued by Goñi et al. (2012), is that Spain's competitive

advantage relies less on capital than labor, which favors more intermediate and traditional activities as does the small size of businesses. Additionally, since Spain's industrial firms have a small dimension this also conditions R&D activities as well as exporting activities. It also appears that a big part of the more advanced and intermediate activities are those with foreign capital thus a push for increase in advanced industry could go in this direction.

It's also important to mention that after the year 2000, the growth of the manufacturing industry didn't follow the economic cycle at the time as it was expected from previous experience. This is argued, again by Goñi et al. (2012), to be the consequence of high international competitivity as well as the development of a growth model that was based around construction. Anyhow the increase in industrial production experimented in the last 20 years hasn't been a productivity based production growth, as it occurred before. Instead it relied on an increase of cheaper labor, which along with other factors caused the decrease in productivity.

4.3. Industrial Determinants

During the crisis in the 70's inflation severely grew in Spain and labor costs went up, penalizing their main advantage which was lower wages, especially in mature sectors. Rigidity of labor laws forced firms to close instead of letting people go and investing in reconverting. At the same time new developing countries offered other alternatives for low cost labor. In this context the government introduced, in 1984 a Reconversion and Reindustrialization Law in order to help the industry in a financial, fiscal, and labor related manner. However, as pointed out by Sancho and Velilla (2005), the plan is considered somewhat of a failure since, among other effects, heavily benefited sectors were ones with little innovative capacity and small and medium firms didn't have much access to this aid.

Spain's joining of the EEC not only brought access to new markets but also a new form of political economy that greatly limited state intervention and aid as well as subsidies and that revolved more around increasing competitiveness. The Treaty of Maastricht, was in line with this competitiveness objective, especially for small and medium-sized businesses (SMBs). Towards the achievement of these goals the Industry Law was established in 1992 that regulated industrial activity as well as governmental interaction with these activities (de los Monteros and Álvarez (2005)). Among other things, this law regulated, in a general sense how programs for promotion

and modernization that deliver aid and incentives should be carried out by regional or national governments. In the same sense it regulates in relation to quality and safety as well as applicable sanctions (Law 21/1992).

As de los Monteros and Álvarez (2005) explain, five different aspects of the industrial sector have been most regulated since the 90's and these amount to R&D, internationalization, quality, human resources, and SMB aid.

- R&D promotion is spread among several public plans but mostly relies on the Nation Plan for R&D and Innovation introduced shortly after joining of the EEC up until the latest one approved in 2013 which has basically relied on aid mechanisms, such as subsidies and favorable financial conditions, as well as different actions to promote R&D activities in Spain. The Centre for the Development of Industrial Technology (CDTI) is a public business entity that, among other things, manages R&D aid set up by different plans.
- In 1982 the National Institute for Exporting Promotion (INFE) was created with the purpose of its creation stated in its name which changed its name to Spanish Institute for Foreign Trade (ICEX) in 1987. This institute, which is a public business entity, supports and subsidizes activities related with exporting, as is explained by Ruiz Ligero (2007). Additionally it serves as an advisor to firms as well as working as a provider of information and education regarding exports. Also subsequent governments have created Plans for the Promotion of Exports to try to "incentivize exterior investment plans, creation of international commercial networks, brand image promotion" among many other support mechanisms. Other institutions like COFIDES created in 1988 and FOCOEX were created to finance international projects.
- Quality regulation is mostly found in the 1992 Industry Law while human resource related legislation is found in the Enterprise Technical and Industrial Qualification Plan.
- Several governmental plans have been carried out in support of the SMBs in terms of financial aid, cooperation in technological advancement, as well innovation support. Examples of this are the SMB Consolidation and Competitiveness Plan in 2001 or the SMB Plan from 2001 to 2006.

5. Energy

5.1. Introduction

The energy sector is key in a country's economy. It goes hand in hand with industrialization and it has direct and indirect effects on all other sectors in the economy. Not only this is important though, as energy also has a great influence on politics, more specifically in the case of non self-sustainable countries like Spain.

5.2. Sector Evolution

Until around the 90's Spain's energy consumption was mostly based on petroleum and coal, the former taking up around than three fourths of the energy consumption. From back then until today petroleum's weight has gone down to about 40% due to its replacement by other primary sources like coal, nuclear energy, and finally natural gas and renewable energy (Isbell, (2006)).

Throughout this period, energy intensity, measured as energy used divided by GDP, which pretends to measure energy efficiency, has not varied much although taking a disaggregate look shows that the industrial sector has shown a decrease in energy intensity mainly due to changes in the sector's activities and in energy sources (Mendiluce & Linares, (2011)). However this lowering of energy intensity has been compensated with an increase in transports.

In terms of external dependency Spain has a severe disadvantage since during the last decade, imports of energy in relation to total imports has almost multiplied by three reaching close to a fourth of imports. In this sense it's also interesting to look at the generation and consumption aspects of energy. Out of all the generated energy, more than 90% is attributable to renewable and nuclear energy, the rest mostly attributable to coal. However, when comparing demand and production, there is a great mismatch, since national production only accounts for about a fourth of total consumption (Martín & Gonzalez (2008)).

5.3. Sector Structure

- **Coal**

Since the 1990's the energy sector has been target of many restructuring plans that along with liberalization policies and regulations have produced a notable advancement in the sector's efficiency and productivity, in part attributable to the decrease in labor in the mining sector. In line with the European Union's position, coal mining, which has traditionally had a high relevance in Spain, is to become none existent since by 2018 these mining activities can no longer receive national aid, as established by the "Plan de Minería del Carbón 2006-2012" and the "Plan de Carbón 2013-2018", thus becoming mostly unsustainable.

- **Petroleum and Gas**

Regarding the petroleum sector, in Spain it has historically shown to be made up of very few firms that have all related activities vertically integrated within them, which inevitably has an effect on prices. The alternative for Spain regarding this dominance of petroleum has been natural gas which has brought along the benefit of diversification of primary energy sources and even among gas sources themselves. However this market isn't very diversified either with a small number of companies that are heavily vertically integrated in procurement and supply activities while transport and storage is also mostly controlled by a single company. In regard to both of these subsectors there was a really important law. This was the "Ley de Hidrocarburos" (1998) that liberalized the commerce of petroleum products and the supply of liquefied petroleum gas as well as natural gas. With this law the National Energy Commission, now integrated into National Commission for Markets and Competitiveness, was created to act as a supervisor of the energy sector.

In any case, the gas industry regarding consumers and liberalization has progressed in an almost identical way as has the electricity sector which will be explained.

- **Electricity**

Moving along, regarding the electricity market, once again, there is heavy control by a small number of firms controlling most of the electricity as well as clients. There is heavy vertical integration regarding generation, distribution and commercialization however in transport and system operation there is one company (Red Eléctrica de Española), which is partly state-owned that has a monopoly. Electricity has been offered at low prices from the 90's to around 2005 only to then quickly rise. The reason behind this is lies in 1997.

Up until 1997 electricity price was set by the government, which also compensated firms for all costs. Then as a transposition of a European directive, the "Ley del Sector Electrico" (1997) recognized the freedom of establishment on the generation and supply side, and the freedom of choice on the demand side. This led to the creation of a wholesale market where the electricity price is determined each hour. However, transport and distribution is still heavily regulated and controlled. Concentration in electricity generation has been gradually reducing thanks to newcomers as a consequence of the introduction of bilateral contracts and the implementation of forward markets, or energy auctions, as well as the introduction of the Iberian Electricity Market in 2006. In any case, the retail market seems underdeveloped in part due to the existence of last resource tariffs introduced in 2009. This law has been recently replaced in 2013 by another law which hasn't introduced substantial changes.

In any case, as a result of the 1997 consumers have been paying two tariffs. The first of which was an integral tariff, set by the government in its entirety. In 2007 a law was passed (Law 17/2007) in transposition of EU Directive (2003/54/CE) where integral tariffs were replaced by last resource tariffs to protect small consumers. These last resource tariffs are obtained forcefully through a marketer and are only applicable to consumers of low electrical power (less than 10kW). The EU has warned Spain that these regulated tariffs should cease to exist. The second tariff has an unregulated component. This electricity is acquired through a marketer, which takes care of commercialization, which in turn acquire this electricity from the wholesale markets. In the end this tariff is composed of two parts:

Cost of energy: Which includes the cost of the energy itself along with other lesser costs.

Regulated costs (access tariff): Which includes transport and distribution costs, subsidies for renewable energies, payment of the tariff deficit, along with other costs. The method for determining the costs of transport and distribution is laid out by the National Commission of Markets and Competitiveness (CNMC) which is a public organism. Some of the other costs inside this tariff are determined by the Ministry of Industry.

An important issue in Spain is the so called tariff deficit, which basically consist of the government recognizing transport and distribution costs by part of the firms which aren't fully covered by the tariff, thus creating a deficit and debt which has gone through a process of securitization endorsed by the state.

On the other side there is a wholesale market where producers offer electricity which marketers and distributors demand, thus arriving at a price. There are a wide variety of markets. There are those where sales are done with a half-year's time to those done a few hours of difference to the supply. Additionally, these markets can even be bilateral or organized.

As a general outline of recent policy one could say that it revolves around the creation of a European Internal Energy Market which looks to secure energy supply while removing strong dependencies, improve competitiveness with aim of reducing costs and prices, and bettering environmentally friendly economic development. This is where policy comes into play:

- European directives about norms regarding the internal electricity (1996) and gas (1998) markets which were transposed into the important "Ley de Hidrocarburos" and "Ley del Sector Electrico" explained previously.
- In 2003 there were two new directives about electricity and gas (passed into law in 2007 in Spain) looking for further liberalization.
- In 2009 two new directives and three regulations that aim to achieve an efficient European gas and electricity market that guarantees supply.
- In 2012 a Directive entered into force for the promotion of Energy efficiency.

The energy sector has also seen general regulation. Taking off from the "Plan Energetico Nacional 1991-2000" there has been a scarcity of important reforms except for the different versions of the "Planificación de los Sectores de Electricidad y Gas" that had special influence on network infrastructure and on the liberalized nature of the gas and electricity sectors. In this sense, policy has indicated a bet on renewable energies and gas, which allows for diversification, supply guaranty, and environmental protection in line with European goals.

6. Construction

6.1. Introduction

Construction has been a central economic topic during, at least, the past decade in Spain. Soaring prices of households fueled by a housing bubble have constituted a fundamental part of Spain's economic growth. It's also important to understand another important function carried out by this sector apart from housing, also defined as residential construction, which is non-residential construction as well as the construction of infrastructures, also called civil engineering, which plays a supporting role for most other economic activities.

It is important as well to clarify that real estate goods are not only acquired for their use. In fact the recent economic history of Spain has show a frequent acquisition of these goods as an investment, which is a factor that came into play in the creation of the housing bubble.

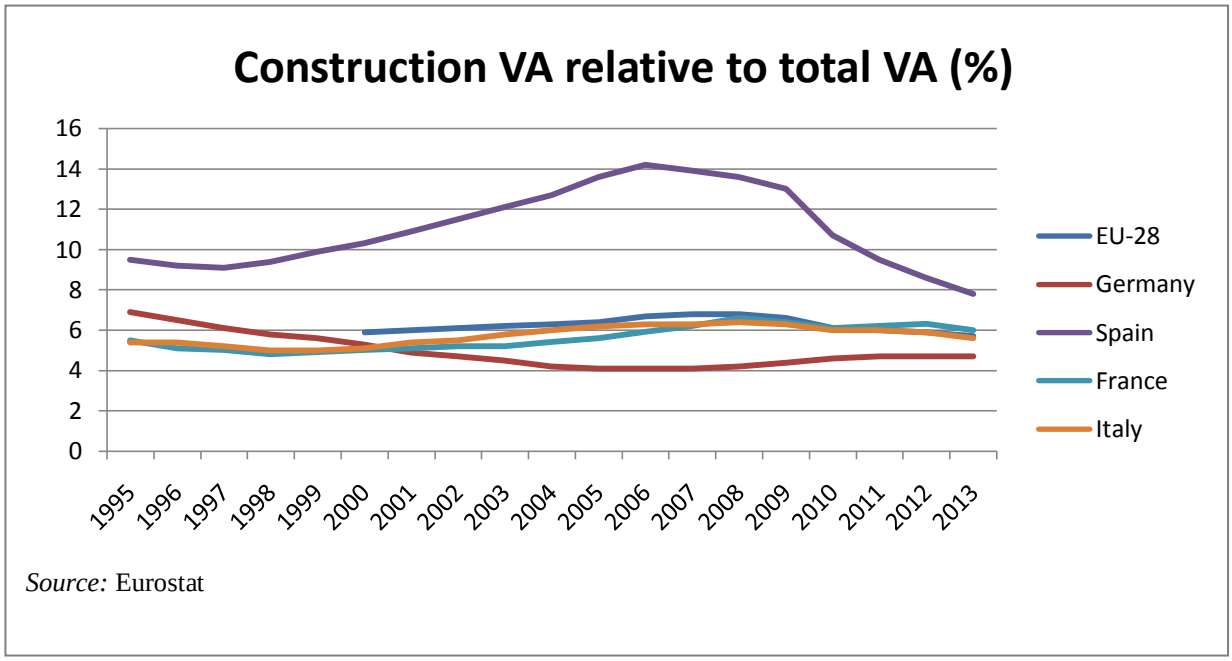
In any case, most activities in the construction sector have certain aspects in common due to the nature of said activities and, more specifically, due to the nature of their products. They are immobile, labor intensive, complex, durable, and costly products. Combination of which make it harder for exporting activities, creation of stocks, as well as international competition (Ofori, 1991).

6.2. Sector Evolution

Since the joining of the EEC the weight of construction activities in relation to total value added has been increasing and as can be seen in the graph below, and it has done so in much higher values than for the rest of the European Union.

In terms of jobs, in 2007 jobs in the construction industry represented 12,8% of all employment while value added in construction in relation to total value added reached its peak in 2006 with a 14,2%. In 2006 started the decline, along with Spain's whole economy, where employment in the construction sector the decreased at a rate up to seventeen times higher (in 2008) than it did for the whole economy, adding up to a decrease of about 68% of jobs in the sector in 2013 when compared to 2007.

During the pre-crisis growth period, a look at the breakdown of construction activities gives telling information since it show that a big part of the increase in construction was in residential constructions, while the proportion of non-residential and infrastructure constructions decreased up until the crisis.



Source: Eurostat

An explanation for the initiation of the bubble can be given. During the 90's and the early 2000's Spain's economy went through an expansive phase which generally is associated with a rise in household prices since construction is a lengthy process compared to other products. The response to this is determined by the availability of construction land as well as restrictions on awarding construction permits (Delgado et al. (2013)). Investment comes in when these two factors go on for an extended period of time, thus causing a bubble. Additional pushes can be given by low interest rates.

Regarding the last decade in infrastructure, special emphasis has been made in transports, especially in airports and railroads while maintaining regular spending regarding public buildings like schools, hospitals, and so on.

6.3. Construction Policy

Regarding policy, regulation is much more present in construction and in real-estate related activities than in the case of other products or activities. The clearest example is that Spain's constitution states that each Spaniard has a right to a decent and suitable household.

Following Sancho and Velilla (2002), state intervention can be separated into two parts; economic regulation and budgetary measures.

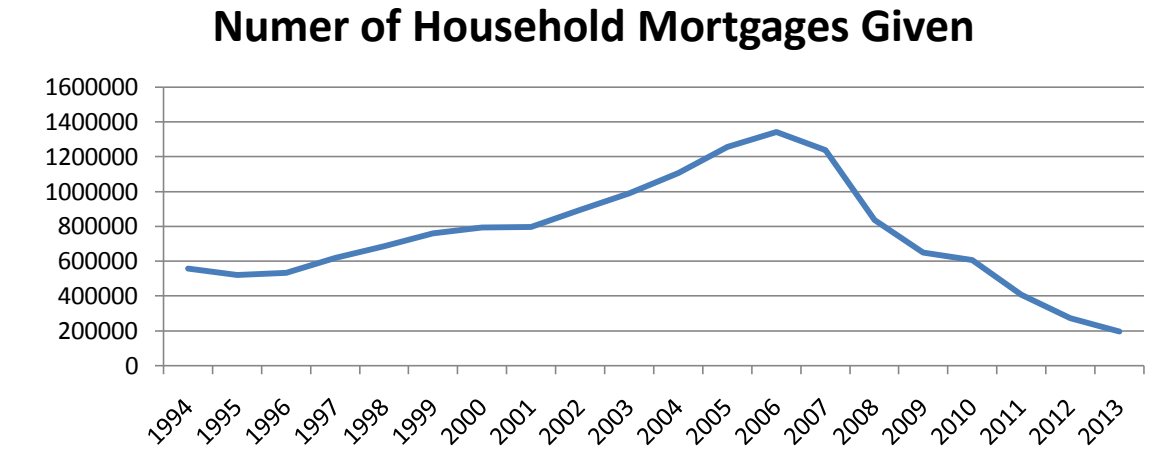
In terms of economic regulation, in the midst of many different aspects there are three heavily influencing regulations. These are Household Plans, the Lease Law, and the Building Code.

- Household Plans basically try to facilitate access to households to those with lower rents by means of direct aid, financial support, credits with favorable conditions, among others as explained by Montalvo (2003). This type of regulation has existed much previously to the joining of the EEC but they have maintained this constant theme throughout time. The main objective of the implementation of the Household Plans has been to maintain reasonable prices for real estate products (task which is contained in article 47 of the Spanish constitution) but it has, as it seems, failed. In any case, these plans have other time-sustained objectives among which are the boosting of protected households presence, rehabilitation of urban areas in need, promotion of renting, among many others. A worthy mention regarding these plans is the Household Plan of 1998 which classified land as developable if it didn't fall under developed or non-developable land, having to justify the state of the latter. This reasoning behind this measure was that if more developable land was available then household prices would go down. This basically default state of developable land was reverted in the 2007 Household Plan.
- Lease Law has been around since 1964 and it sets at framework for the interaction between landlords and tenants. In this sense it is related to construction activities as it has an effect on the purchasing decision and thus also, in part, on construction. The 1994 Lease Law tried to shift the purchasing will into increase in renting by benefiting tenants however this didn't overcome the incentives to buy households. Since then multiple reforms of this law have tried in the same direction.
- As Montalvo (2003) puts it, Construction Code can be divided into four basic aspects*:*

- *"Urban law, which defines the use (residential, industrial) and the types of land (urban, developable, rustic, etc.)*
- *Urban planning, which indicates by means of urban planning, the use and classification of municipal land, metropolitan land, etc.*
- *Land valuation defines how each type of land is valued: market value, initial value, etc.*
- *Urban management refers to the administrative aspect of promotion and construction."*

Budgetary measures basically enclose the budget side related to Household Plans and its aid, credit, and so on, as well as taxes related to the household market which are much less relevant than the previously explained.

Other determinants apart from construction policy have heavy influence on the development of this sector, and more specifically, household construction first of which is a demographic boom led by immigration, which produced a further increase in household demand. The monetary union and the political economy of the Central Bank allowed for ample finance through low interest rates at the time not only to finance household purchases (which can be seen in the graph) but also to finance construction activities as well (Montalvo (2003)). Additionally, Salazar and Aguilar (2012) explain that low yield of financial goods reoriented some of the investment towards housing goods. Note that a common mortgage modality was one with variable interest rates which, although positive at a time with low interest rates, has helped along with unemployment to lower consumption even more. The 2007 financial crisis naturally brought financial activity to a halt, thus swiftly removing one of the main determinants of the housing bubble in Spain.



Source: INE

As a final note in relation to infrastructure, the main determinant in infrastructure related activities is the government. Activities which have been mostly contained in different infrastructure plans constantly changed by different ruling political parties. Most recent ones are the Director Plan of Infrastructure (PDI) that was aimed at the 1993-2007 period. After this came the Transport Infrastructure Plan, meant to go from 2000 to 2007. Since the year 2005 there was the Strategic Plan for Infrastructure and Transport (PEIT), that had a planned spending of 241.392 million Euros up until 2020 and in the most recent Strategic Plan for Infrastructure, Transport and Households (PITVI) in 2012 with a planned investment of 77.400 million Euros up to 2024, most of which is assigned to roads and railroad (around 70%) while the rest is almost entirely assigned to other transport related accounts and only around 2.000 million Euros are assigned most of which are to satisfy past compromises.

Regarding the funding of infrastructure construction the government budget has been the single most important source. However in recent years other financial sources have been looked for like contributions by the users, or public-private collaboration as a way to transform the public administration's role as a direct provider into a buyer and regulator of service for services that could prove attractive and profitable for the private sector. Anyhow, public funding is done through public business entities who are financed through the government budget or through their own income. In addition to this, Spain has traditionally received funding for infrastructure through the EU's Structural and Cohesion funds but the assumption is that Spain's reception of

these funds will decrease even more than they have. These funds will be given through said funds as well as through the European Investment Bank.

7. Service Sector

7.1. Introduction

The evolution of the service activities, as it occurs with all the other sectors mentioned, is an indicator of a country's economic development. After heavy industrial growth there is generally a tendency towards "tertiarization". In most developed countries wealth is no longer created through agriculture or industry, but rather by services. In the case of Spain there has been a notable shift since joining the EEC going from 52% of employment residing in the service sector in 1986 to 76% in 2013 pointing towards a service based economy.

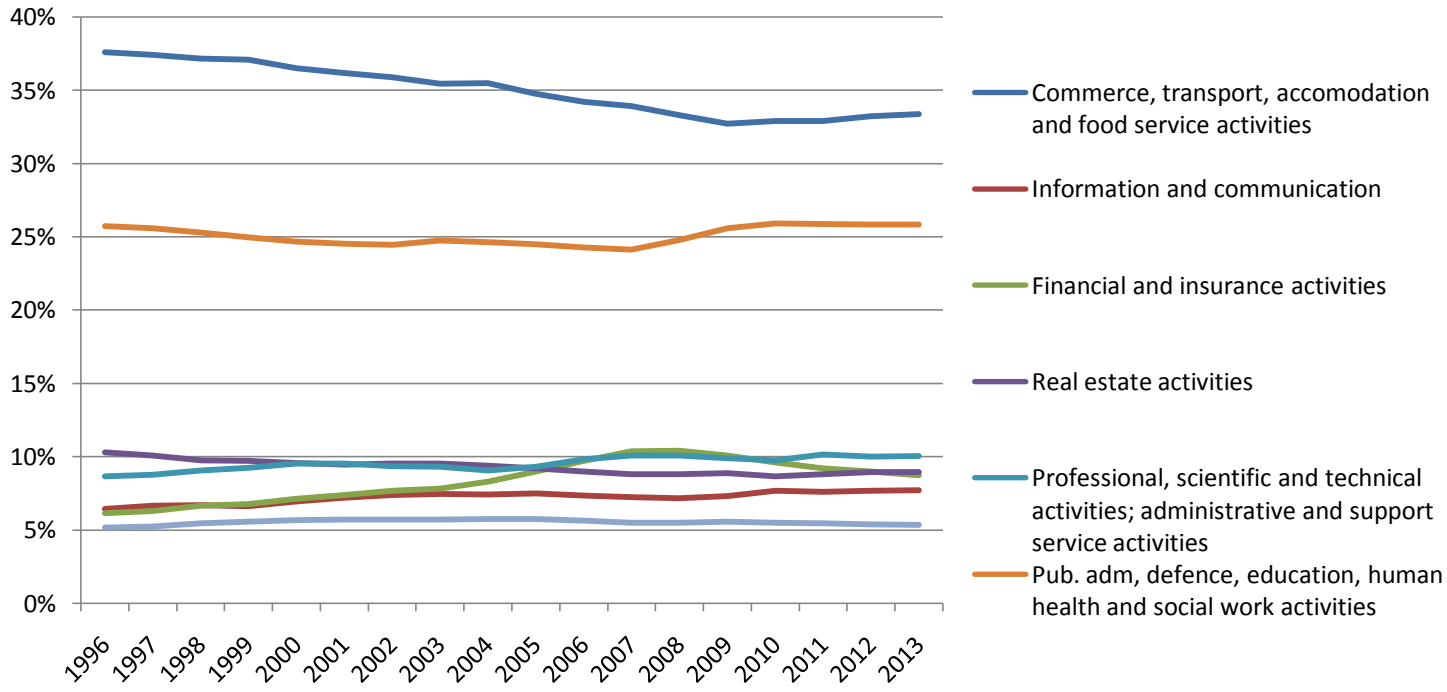
7.2. Sector Evolution

This growth in the tertiary sector is explained by a great amount of factors of which a few can be named. Mainly, the increase in rent fueled increase in demand of services. Additionally, there is a tendency to externalize (as said in previous chapters) certain activities in the industrial sector that now fall into the service sector. A couple more are the aging of the population as well as the increase of activity regarding the welfare state.

Up until 2008, when the crisis reached the service sector, value added growth in real terms regarding tertiary activities maintained itself approximately around 4% of total value added, only to reduce itself to around 0% up until 2013 (according to Eurostat). Looking at the role of this sector with respect to the total value added, during the last twenty years Spain's service sector has represented around 66% of total value added up until the crisis where the sectors weight has gone up to 72%, again until 2013, by not having suffered as much as construction and industrial sectors.

A relevant characteristic regarding services is that the geographical distribution of these has been very irregular. Business services as well as public administrations are most present in Madrid and Barcelona while other services aimed at consumption are most present along the coast according to Luengo (2011).

Looking the composition of value added, commerce has been the most important service activity with an unchanging value of around 18% of the total service value added. The evolution of the composition of the value added by service activities (attending to the NACE 10 classification) can be seen in the following graph.



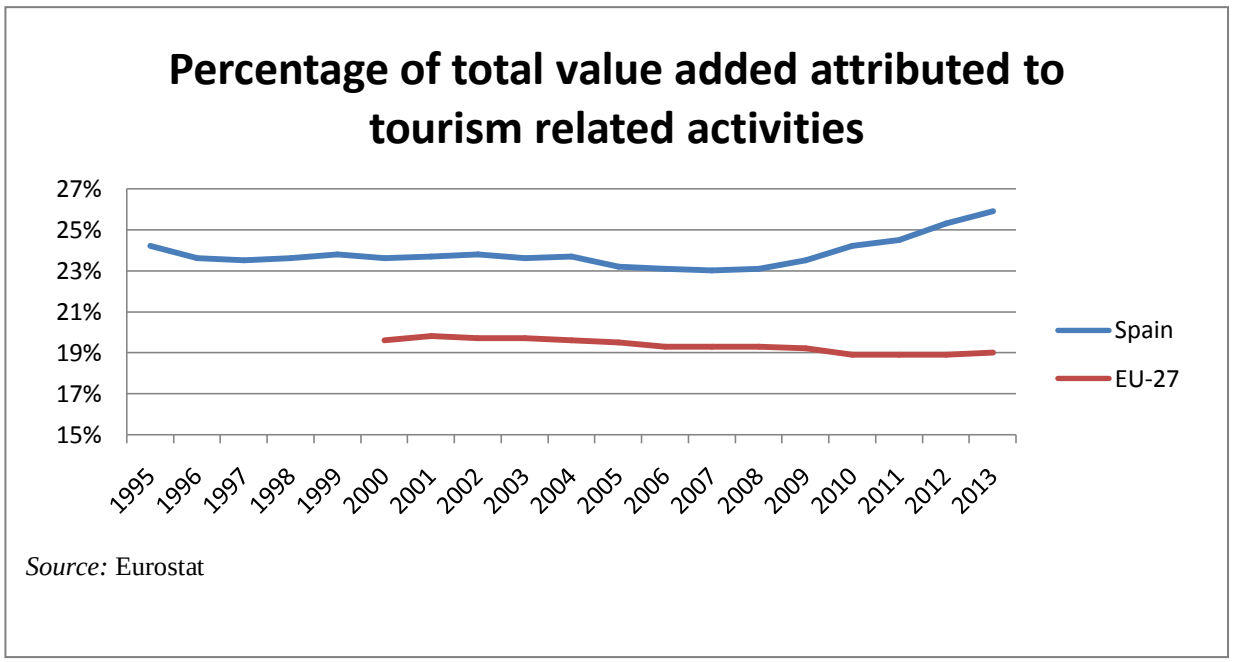
Source: Eurostat

As it can be seen, commerce (along with transport, accommodation and food services) and public spending has traditionally taken up most of the service sector's value added while the others take up between 5% and 10% each.

Regarding commerce, although retail trade is still dominant, it has decreased at the expense of wholesale trade, heavily benefitted by economies of scale. Transports has been already addressed in terms of infrastructures while financial services will be looked at in the following chapter.

Specifically looking at tourism, already from the 90's it has played an important role in Spain's service sector, with the activities surrounding it being much more relevant than in the rest

of the EU as it can be seen in the following graph with the available data from Eurostat. On the other hand, business services are less important than in the rest of the EU.



Source: Eurostat

In terms of foreign trade in services excluding commerce, tourism, whose importance in this sense has decreased in the last 20 years from taking up almost two thirds of non-commerce service exports to 42% in 2013 is still the most important activity showing export that amount to up to 3,7 times more than imports. Up next are services for businesses with around 24% of service exports in 2013 whose share has almost tripled, as well as transports which have constantly maintained a share of around 16%.

Looking at productivity one can see that productivity growth from 1985 to 2012 has shown little to no progress in the service sector. In this sense, production growth has been mostly based on increased employment rather than productivity (responsible for around 12% of production growth from 2001 to 2010) , especially when compared to the EU where productivity was responsible for 40% of production growth from 2001 to 2010 according to Delgado et al. (2013). They give some motives for this which are the heavy reliance of this sector on unqualified hand labor, lower propensity towards modernization by integration with IT, low competitiveness within the sector, or small firm sizes. Anyhow, increasing factor costs along with no productivity growth to absorb these costs has produced an increase in princes greater than in

the primary and secondary sectors, which explains the great difference in increase between value added growth in nominal and real terms.

7.3. Public Sector

As seen earlier in this work the public sector in Spain has shifted from a completely centralized structure to a decentralized one. In this setting, as an addition to what was seen in the earlier stage of this work regarding public administration, spending as well as income will be briefly characterized as they are important factors of the sector. These are determined both by decisions (for example with the elaboration of the yearly state budget) and by automatic mechanisms like unemployment benefits or decrease in tax revenue due to decrease in economic activity. This can be an explanation for the increase in spending, measured as a percentage of the GDP, during recent years.

Regarding spending, most of it has traditionally gone towards welfare, inside of which pensions, healthcare, and education are the most important according to Ministry of Finance data. This generally amounts to between 60 and 65 percent of spending. Next up, is basic public services which has traditionally taken around 20%. The rest usually goes to infrastructure investment, which takes around 10%, and to environment protection and community services.

Regarding income there are three main sources, the biggest of which are social contributions which amount to about 35% of income. Next come taxes on production and imports which takes up about 25%, out of which around half is VAT. Another 25% of income comes from income tax, taxes on wealth, and capital taxes out of which more than 90% comes personal income tax (80%) and corporate income tax (10%).

7.4. Determinants

The service sector has been traditionally very regulated. In the early 90's came deregulation, as in the rest of Europe, that basically aimed at facilitating the entrance of new firms, freedom of price setting and freedom of performing tertiary activities. Along with this process came the privatization of many state owned firms as well as new policy to defend competitiveness. In 1998 came the greater push for this liberalization which more specifically targeted network services like communications and electricity. From then on liberalization

legislation reached fossil fuels, postal service and in 2005 came the liberalization of railroad firms.

The EU has also played an important role in this sector in accordance with its goal to create a single market. Specifically with the "Services" Directive (Directive 2006/123/EC) which mainly looks to enhance the freedom of establishment and the freedom to provide services. Additionally "less important" regulation, in the sense that it doesn't apply to the whole sector, has been passed for different sectors like the financial sector, different transport sectors, IT sector, and so on.

Attending to the fact that commerce is without a doubt the most important service subsector, along with public administrations and the financial sector which will be looked at separately, an explanation of the regulatory framework will be provided in detail only for this subsector.

- According to Matea and Mora (2009), since the joining of the EEC commerce started being regulated by autonomic governments instead of just relying on the Commercial Code. With the 7/1996 Law that sets a framework for retail activities, and more importantly regulation the establishment of large retailers by means of a license given out by autonomic governments. Anyhow this law only provides a framework for retail activities since autonomic governments maintain regulatory power over them. Due to this, several models have evolved in Spain among which liberal and more protectionist ones can be found, which has caused for Spain's commercial system to be considered difficult for entry since this picture complicates global strategies (Blázquez and Navarro (2010)). These regulations affect opening hours, sale seasons, specific taxes for large retailers, requisites for the acquisition of a license, among others (Matea and Mora (2009)). The regulatory power over opening hours is not complete though, since state laws define minimum weekly opening hours while autonomic governments establish the maximum limit.

- More recent and relevant legislation has been created in order to adapt current law to the EU Services Directive in the form of several laws like Law 17/2009, Law 25/2009, and Law 1/2010 (the Reform of Law 7/1996). Autonomic Laws must also be adapted to this

directive. Further national legislation, like Royal Decree-law 19/2012 and 20/2012, has been passed to go against the hindrances in commerce by means of decreasing administrative proceedings and by making opening hours more flexible among others.

8. Financial Sector

8.1. Introduction

Its the institutions, intermediaries and markets that channel the savings of agents towards those agents who need them. This is done through financial markets, where the lenders assume the risks, or through financial intermediaries, where the intermediaries assume the risks.

In Spain the financial system has become increasingly important during the last decades, especially regarding financial markets and non-banking financial intermediaries like investment funds, pension funds, and insurance firms. However, banking still remains a key part of this sector and due to this importance the greatest part of this look at the financial sector will be directed at the banking system.

8.2. Evolution of the banking system

Made up by banks, saving banks (cajas), and credit unions. In a setting of deregulation, where financial markets offered a solid alternative to intermediation, along with technical development, the banking sector has posed itself as an intermediary between lenders and financial markets thus taking a role in the financial market business. According to Delgado et al. (2011) these banking entities have enlarged themselves (not in number but in size), either by operations like merging, opting for internationalization, as well as by expanding their territorial scope in the case of the savings banks that were before 1990 confined to their territory. In the case of savings banks they started tending less towards risk averse strategies like interbank lending and public debt towards other more risk prone like credit lending. Anyhow, in this new competitive setting, banks decreased in size in terms of employees and branch offices while saving banks did just the contrary in line with their territorial expansion (Alegre & Komilova (2013)).

As explained by Dominguez (2009; 2010a) after 2008 there was a restriction of funds, a lower tendency to get in debt by families and businesses, increasing risk aversion, increasing defaults, and so on. In any case the financial crisis most importantly brought wholesale funding mechanisms to a halt. It is also important to keep in mind that banking entities, savings banks in particular, were the main providers of credit for the housing bubble. As a consequence, the increase of defaults among construction entities as well as the loss of value of real-estate assets put Spanish banking entities at great risk, which along with the other effects previously

mentioned, have caused for intervention by the authorities, especially in savings banks, as well as the application of other measures which some of which will now be explained.

Regarding the cutback in liquidity by the halting of interbank lending, along with the European Central Bank's increase in liquidity injections (Pateiro et al. (2010)), among other measures, Spanish authorities created in 2008 the now extinct Financial Asset Acquisition Fund (FAAF), attached Ministry of the Finance and Public Administrations and managed by the Bank of Spain, in order to buy assets from banks and savings banks in order to inject them liquidity. Along with this the state backed bank issuances as explained by Alegre & Komilova (2013).

Along with the increased liquidity, the government looked for lesser exposure to risk by promoting restructuring processes and diluting this exposure by integration processes between entities. For this purpose, the public entity Fund for Orderly Bank Restructuring (FOBR) was formed in 2009, which in many cases took control of entities. Along with this capital requirements were increased later on.

Regarding the capitalization of savings banks the reform of their legal framework in 2010 allowed for the obtaining of capital through other resources other than their own benefits, among other things, essentially turning them into banks (except for two of the entities), as explained by Díaz (2010).

In 2012 Spain asked the EU for financial help for the sanitation of the banking sector. By fulfilling the condition imposed by the EC of presenting restructuring plans by fund-requesting entities, these did receive these funds from the European Stability Mechanism. Among other things, one of the conditions in exchange for the EC's was the creation of a so called bad bank. This is the Company for the Management of Assets proceeding from Restructuring of the Banking System (SAREB) which is actually not a bank and which is mostly financed by government sanctioned debt. It's goal is to acquire toxic real-estate assets from nationalized entities with the objective of selling these assets during a period of 15 years.

In this setting, there has been a great reduction of banking firms in the last years and, more specifically, in savings banks where more than half of them are publicly controlled by the

FROB and which are now operating under the forms of banks. The economic downturn, the mergers, and government impositions have all pointed to a cutback in the size of these firms in terms of employees and branches.

8.3. Institutions

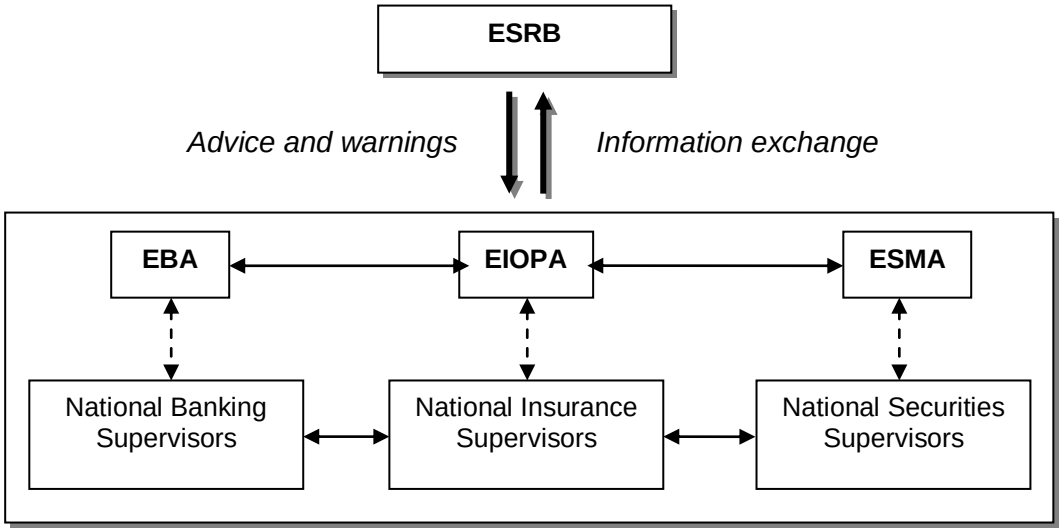
As opposed to most of the other activities which compose the Spanish productive system where not many specific institutions come into play, the financial sector is indeed heavily affected and controlled by these. The government, through the Ministry of Economy and Finance, exerts its functions over the financial sector through three main entities which control and supervise three different subsectors.

- The Bank of Spain is in charge of the credit sector and is in charge of executing monetary policy. That is, that policy that is not performed by the ECB. Additionally it supervises the solvency of some financial entities, it performs treasury services for the state as well as serving as a financing agent for state debt, among many others. A great number of entities are dependent on the Bank of Spain
    - Credit Entities like banks, savings banks, credit unions, and the ICO
    - Financial Credit Establishments which are institutions that can perform a wide array of financial operations but can't offer deposits.
    - Mutual guarantee societies
    - Some financial markets like the interbank, exchange, and some of the public debt market.
- The Spanish Securities & Exchange Commission (CNMV) which is in charge of supervising and inspecting the stock market more specifically by protecting investors, assuring the correct forming of prices as well as the markets transparency. Entities dependent on the CNMV are:
    - Stock market.
    - Stock companies and agencies.
    - Collective investment entities.
    - Venture capital entities.
    - Companies managing securitization funds.

- The General Insurance and Pension Funds Directorate is in charge of the insurance sector, where it exerts its competences over all insurance companies as well as pension fund management entities.

Regarding the EU there are three relevant institutions that have a great influence in the European financial system and as a consequence, for Spain's financial system.

- **The European Central Bank** is tasked with designing and executing monetary policy for the EU as well as maintaining price stability. More specific tasks include the "control of key interest rates, control of the money supply, managing the Eurozone's foreign-currency reserves and buying or selling currencies when necessary to keep exchange rates in balance, helping to ensure financial markets and institutions are adequately supervised by national authorities, and that payment systems function smoothly." It's control basically lies under three bodies (The Executive Board, The Governing Council, and The General Council) which are all appointed either directly by the states on recommendation of the European Council, or indirectly in the case of the Governing Council which includes the governors of National Central Banks.
- The **European System of Financial Supervisors**, created in 2010 is composed of three European Supervisor Authorities, which are the European Banking Authority (EBA), the European Insurance and Occupational Pensions Authority (EIOPA) and the European Securities and Markets Authority (ESMA), along with the European Systemic Risk Board (ESRB). The three authorities can issue standards that are directly binding on Member States. The objective of the authorities is to improve the functioning of the internal market by ensuring appropriate, efficient and harmonized European supervision as well as by establishing norms for all European financial entities.
    - In the midst of the economic crisis it is important to point out **The European Systemic Risk Board**, part of the European System of Financial Supervisors. However it works more in a complementary fashion to the three supervisory authorities. It's dependent on the ECB and it's tasked mainly with preventing financial risks from spreading to through the system and to make sure that the financial sector contributes to sustainable economic growth. This entity definitely takes more of a supervising role by doing analysis's and issuing warnings to different entities .



- **Colleges of Supervisors** enclose those states authorities that have supervising responsibility over the EU member state's cross-border banking systems. EU banking regulation requires these entities to be established for cross-border banking groups in order to facilitate their supervision and to facilitate home-host dialogue, prepare and handle emergency situations, among others.

8.4. Legislative Framework

Since the joining of the EEC there has been a process of liberalization and homologation of EU regulation. A short description will be given with the major changes up to the economic crisis.

In 1994 the EU directive 89/646/CEE was transposed to law in an effort to be in line with the European banking system. That year the Law of Autonomy of Spain's Central Bank was approved thus regulating its activities.

In 2002 the Law on Reform Measures for The Financial System was approved to accommodate Spanish firms for competition with other European firms, ensure clients' safety, as well as channeling savings towards the real economy.

From then on the major reforms have already been outlined previously while explaining the banking sector crisis. The FROB was create, regulation was passed regarding savings banks, minimum capital requirements were risen, and the SAREB was created.

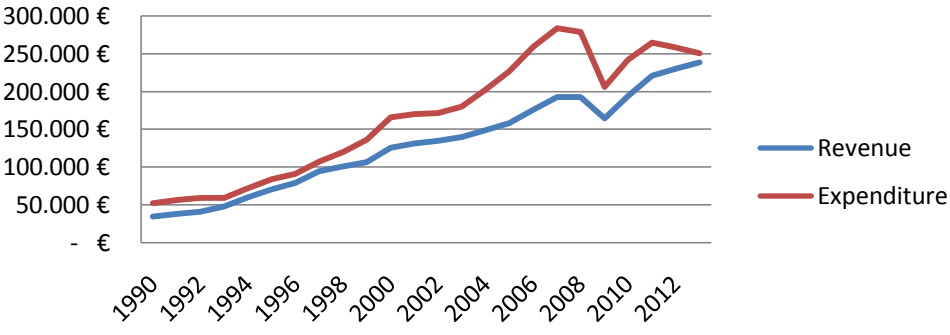
9. Embeddedness of Spain in the World

9.1. Introduction

Spain has come a long way from the autarky era, that ended during the late 1950's, until today. During this time important checkpoints were passed that had effects on Spain's relation with the world economy. Starting with the National Stabilization Plan in 1959, the next important points were the integration with the EEC and the introduction of the Euro in the Spanish economy taking the Peseta's place. Many of this information is reflected in the Spanish current accounts.

9.2. Commercial Trade Balance and Service Balance

Spain's commercial trade balance has always been negative. During the 90's devaluation of currencies were used, thus making Spanish products more competitive and therefore having an effect on the trade balance (Belda (2005)). However, since the adoption of the Euro the devaluation mechanism was not a mechanism that could be used. In its absence Spain hasn't managed to reduce this trade deficit through competitiveness while inflation hasn't helped either. With the economic crisis unleashed in 2007 this gap has closed mainly because of the greater decrease in demand which has greatly decreased the expenditure on foreign goods. Exports were also hit by the economic prices but as other economies resumed their growth exports quickly got back on the growth track. It's also relevant to clarify that a big part of this trade is generally attributable to energy imports which include oil whose prices have soared. In fact, since 2012 there is actually a trade surplus if energy trade is discounted.



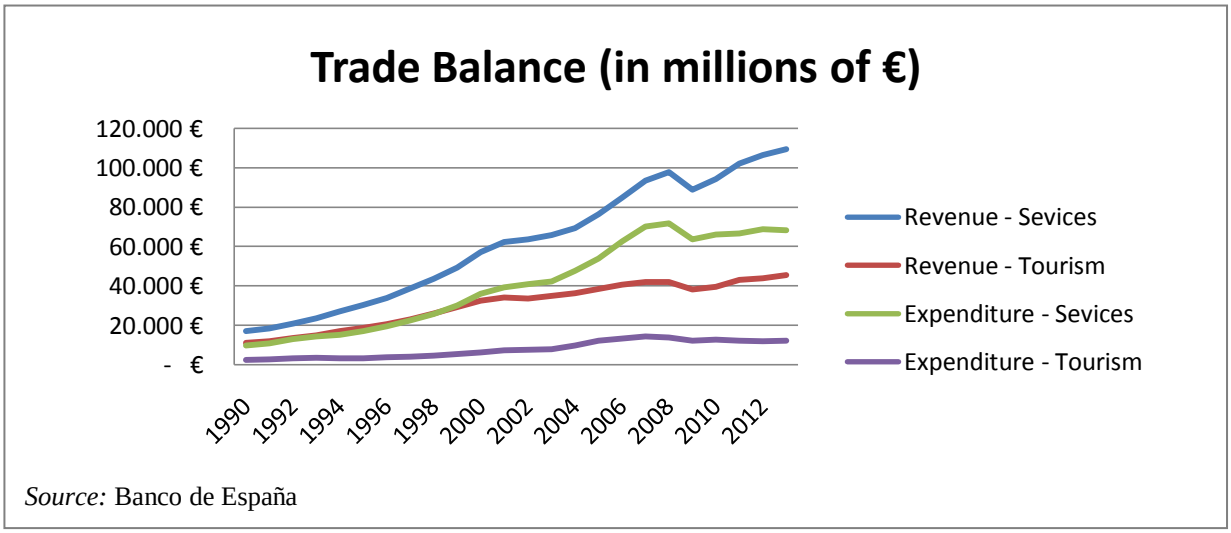
Source: Banco de España

Out of data from Banco de España one can take a look at the countries that are involved in importing and exporting activities as well as the type of goods.

- **Exports**
  - *Geography*
    - 75% goes to OECD countries, most of which is to EU-28 countries.
    - The United States has historically represented around 3-4% of exports which is about the same amount the both OPEP countries get as well as other American countries.
  - *Products*
    - Around half of the exports are intermediate goods, which almost in their totality consist of industrial goods.
    - Consumer goods represent around 30-40% of exports. Out of these food products, non-durable goods, and durable goods (mostly represented by vehicles) each roughly take up the same share.
    - Energy goods represent around 7% while capital goods are around 10% of exports.
- **Imports**
  - *Geography*
    - Two-thirds comes from OECD countries, most of which is attributable to EU-28 countries.
    - The United States, again, has historically represented around 3-4% of imports, while imports from other American countries has slowly crept up to around 5%.
    - During the last five years the OPEP has typically taken around 10% of Spain's imports due to energy imports.
  - *Products*
    - The most important thing to mention here is the importance of energy products which represent around 25% of imports during the last 3 years (2011-2013).
    - Around half of the imports are intermediate goods, which almost in their totality consist of industrial goods once again.

- Consumer goods represent around 20-30% of imports. Out of these food products, non-durable goods, and durable goods (mostly represented by vehicles) each roughly take up the same share.
- Capital goods represent around 5-10%.

Regarding the service balance, one could say that it is one of Spain's international strengths. In the graph below the services trade balance can be seen as well as its tourism component. One can see that tourism is indeed the service's trade balance's main component. Regarding tourism, the view is sometimes held that for the future, lower spending per tourist as well as new destinations may hurt this balance.



Source: Banco de España

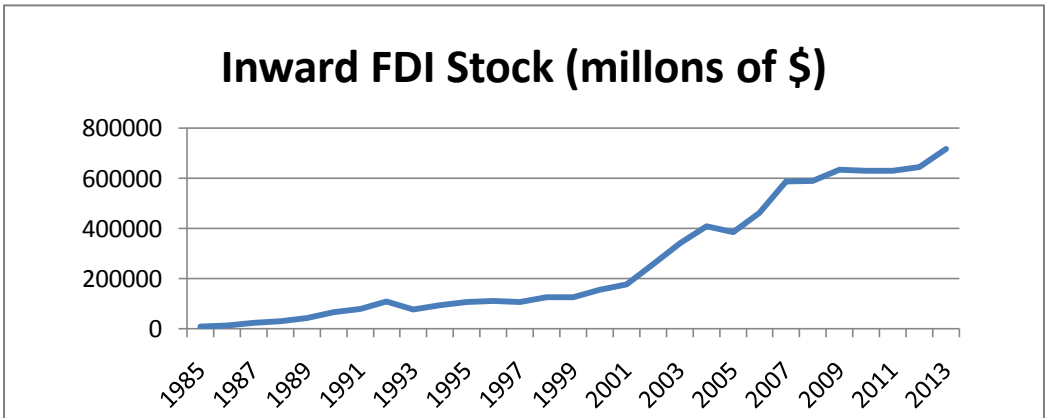
9.3. Income Balance, Current Transfers, and Capital Account

Income balance in Spain is mostly composed of rents on capital rather than rents on labor. During the last 15 years this balance has always been negative. This negative gap was greatly increased by the economic crisis due to the rapid decrease of income produced by Spanish rents while expenditure maintained itself.

Current transfers, those transfers which are not capital, have been in deficit during the whole last decade due to a big rise in expenditure. Among these, payments for the CAP and the European Social Fund are made. In the capital account, which amounts to capital transfers, there has always been a small positive balance. In this account funds by the European Regional Development Fund and Cohesion Fund and included.

9.4. Foreign Direct Investment

During the last fifteen years foreign direct investment (FDI), defined by the OECD as "cross-border investment by a resident entity in one economy with the objective of obtaining a lasting interest in an enterprise resident in another economy", has seen its stocks multiplied by ten, with a notably high growth since the introduction of the Euro but more or less flat-lining since the beginning of the crisis.



Source: Unctad

This growth really commenced in 1985 joining the EEC due to a liberalization process, growth potential, and the availability of the country as a platform for exporting as pointed out by Chislett (2013). He puts turnover of foreign affiliates of around 38% of the GDP representing around 7% of employment.

As seen in the Bank of Spain's data, seen in Rodríguez & Tello (2014), from 1995 to 2000 FDI was more or less evenly distributed among sectors, being transport and communications most predominant along with the manufacturing and real estate sectors. During the next five years, up until 2005, the great surge of investment went to the real estate and manufacturing sectors but more specifically in the financial sector, whose reception of foreign investment grew around 500%. In the next years, financial FDI was reduced to a third of what it previously was, while FDI in the manufacturing sector continued to grow, almost doubling. Also, previously insignificant investments in the energy sector skyrocketed taking up, in just a couple of years, the same FDI as manufacturing. From 2009 onwards, there was a general reduction of FDI that hit all sectors more or less proportionally.

9.5. Energy

A really important factor in Spain's international setting is energy. Taking a look at data from INE one can see that out of all primary energy sources oil takes up 45-50% while natural gas takes up 20-25% and all of these have to be imported. Additionally, in comparison with other OECD countries Spain dependence on oil is around 10 points higher according to Casillas et al. (2012).

In this sense oil prices, and as an extension the dollar exchange rate, have noticeable effects on the Spanish economy. Casillas et al. (2012) demonstrate that, although in expansive cycles of the economy oil prices don't have an effect on employment, during recessive cycles the productive systems tend to substitute oil with cheapened labor.

Furthermore, rising oil prices have been shown to channel to rising inflation as well as to a decrease in economic agent's demand. Estrada y Hernández de Cos (2008) also show that, in addition to its effects on labor, oil prices have an effect on the productivity of production factors.

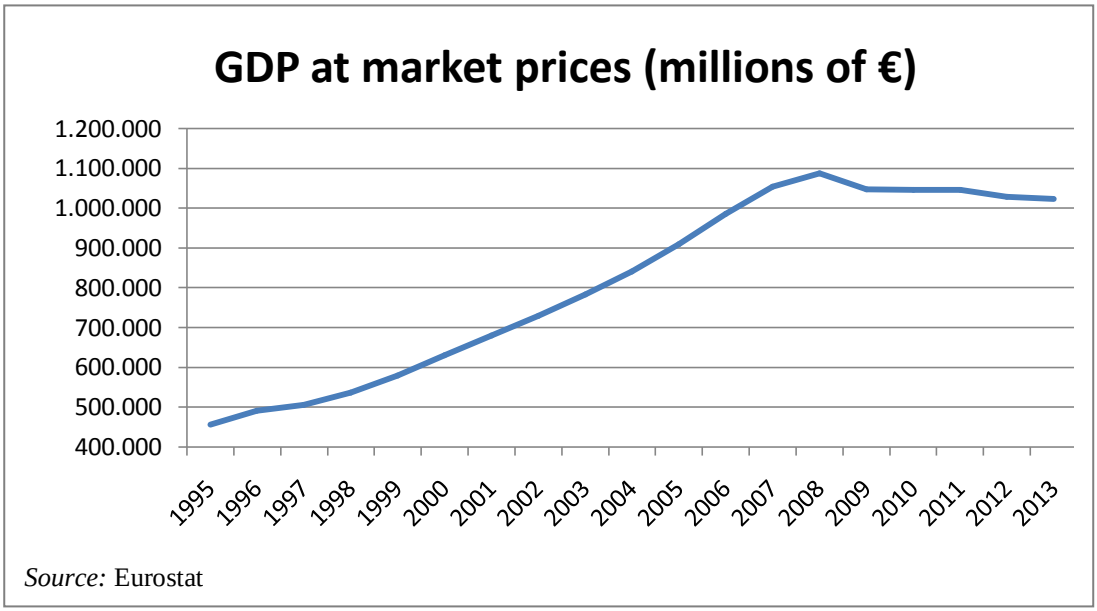
10. Economic Indicators

10.1. Introduction

In this section, an overview several indicators of the Spanish economy will be given in order to give a more global perspective of what was explained in the previous chapters. Since this work revolves around the Spanish production system, some indicators that could be considered important are not considered. Good examples of this are the unemployment issue amongst young people in Spain or the breakdown of transfer payments. Some other indicators like foreign direct investment and exports have already been described previously.

10.2. Gross Domestic Product

The GDP of Spain, taken as the value of all final goods and services produced by a country in a period of time, can be used to provide a quick snapshot of the evolution of production in Spain. In the following figure we can see the evolution of the GDP since 1990 until 2013.



Source: Eurostat

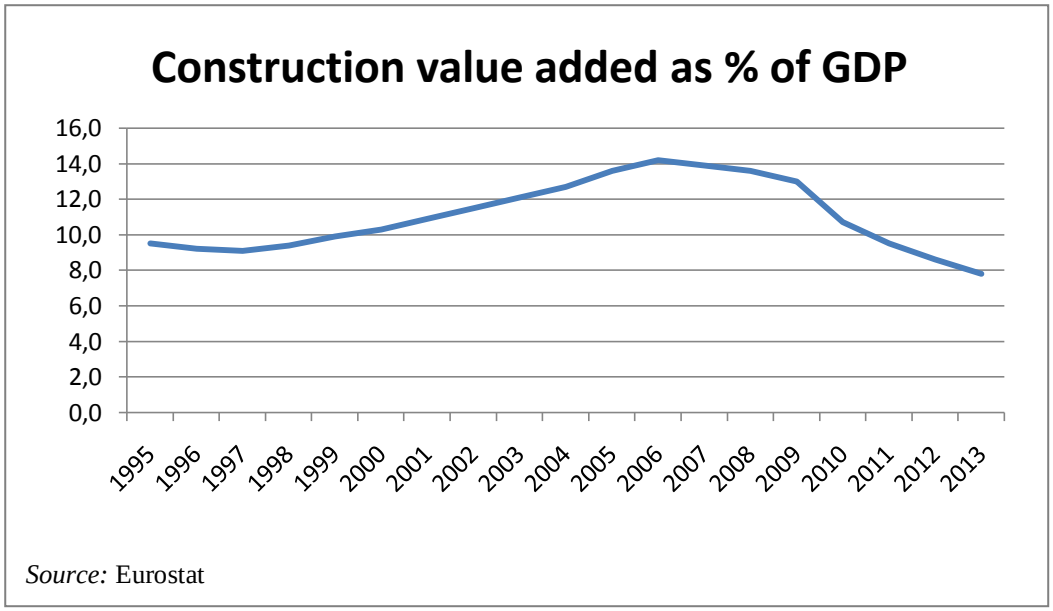
The data shown above commences amidst the growth produced by the joining of Spain to the European Economic Community in 1986 as well as the heavy government spending in preparation for the Expo and the Olympic Games among other things. This prevented the full blown effects of the 1990's recession that hit a large part of the world in part due to the rise of oil prices in response to the invasion of Kuwait in 1990 (Roubini, N.; Setser, B. (2004)). That lasted

until 1993, when Spain was hit by a large recession that lasted until 1995, during which unemployment reached 24,55% during 1994 (data: INE). From 1992 to 1994 four devaluations were made, which could be later no longer made due to the introduction of the Euro.

After this recession came a large expansionary period of the Spanish economy that lasted until 2007. It is argued that his period is sustained on mainly three things: the housing bubble and the privatization of a large number of government controlled companies (Etxezarreta et al., 2011), and the massive arrival of immigrants to Spain (Bentolia et al. 2008) in part to take up those jobs in construction.

During these years several imbalances were created. Spain showed a low productivity, a growing trade deficit, an overspecialization in construction, loss in competitiveness, and housing prices continuously climbing (Suarez 2010) amidst increasingly easy credit obtention. In this context Spain suffered an economic and financial crisis. Due to the subprime crisis originating in the US and the burst of the housing bubble (which transferred to the banking system) Spain delved into an economic crisis from which it has still not recovered and during which unemployment soared. A decrease of 6,3 % of the GDP occurred during the first quarter of 2009 when around 800.000 people went to unemployment as well (Carballo-Cruz, 2011).

If one breaks down the GDP into the contribution of the different sectoral activities since the year 2000 then one can see that, in general, there hasn't been a great change in the composition of these contributions. However there is one variation that stands out the most and which can be seen in a clearer fashion in the graph below. This is the evolution of the contribution of the construction activities to the GDP.



Source: Eurostat

From the late 90's to 2006 this figure shows a great increase in its importance in the economy with a growth of 5% in its contribution to the GDP while later on it concedes 6% up to 2013. This evolution, which is even more staggering when looking at figures in nominal terms, is a consequence of the growth and then burst of a bubble in the housing market (Arellano & Bentolila, 2009). Housing prices during the bubble were much higher than could have been justified just by economic reasons, and this is because houses were being bought as a secure investment. When the bubble burst job loss in the construction sector was higher than 36% (Carlos Alvarez Aledo, 2011).

10.2.1. Consumption

As explained by Señan (2010), consumption has logically gone hand in hand with economic development. He argues that not only consumption as a whole but also consumption per individual. During this time, the consumption profile has changed up until the 90's where a stable consumption profile has remained at least up until the economic crisis where the profile changes but not in a disproportionate way at least until 2009, point in which, as provided by Cetelem's analysis, consumption growth rate stops following the employment growth rate, remaining higher the former than the latter but decreasing nonetheless. During the last four years household consumption has grown in 2010, 2011, and 2013 arguably due to an increase in economic expectations (which were shattered in 2011) which can be clearly observed which the increase in demand for

consumption credit which increased in the last quarter of 2013 for the first time since the beginning of the crisis.

10.2.2. Investment

Taking gross fixed capital formation as a proxy for investment, this indicator goes in line with what all others show. This is, that the joining of the EEC provoked a great increase in investment, that took a hit during the crisis in the early 1990's and whose growth resumed again up until 2008 where the effects of the global financial crisis (with its national determinants as well) came into play.

Mas et al. (2013) explain that investment has been mainly based on household construction and other constructions which together have generally made up about 70% of investment. Regarding the evolution of the different components of nominal investment, they show that investment in construction has sharply fallen since 2007, especially in household construction which halved in four years as a consequence of the bursting of the housing bubble. Nominal investment in ICT assets, which during the last 20 years has taken up about 10% of investment, started to fall a year later and started to timidly grow in 2008 in a similar fashion to what happened to machinery and non-ICT assets which have roughly generally taken up about 15% of investment.

Further important information is found when looking at real investment for each component, and thus, at prices. One can see that during the last 20 years the prices of non-construction investments have either gone down or have reduced like in the case of ICT assets. Regarding construction, the deflators show the prices in household investment approximately doubled until 2008 (base year 1995) while in non-household constructions it increased around 50%.

Mas et al. (2013) also give an insight on non-residential investment. They point out that most of it pertains to the service sector (excluding public services) which grew more than 200% in nominal terms up to 2007 only to decrease a little bit in the two following years and then returning to the growth path again.

All in all, decrease in investment appeared as a consequence, in the case of private investment, of lowered expectations, financial restrictions, as well as over-installment of capacity. Regarding public investment, during the first two years of the crisis (2008 and 2009) important efforts were made in order to compensate for lower private investment, however these policies were unsustainable in the long run thus leading to an inevitable decrease in public investment in 2010.

10.2.3. Compensation of Employees, Gross Operating Surplus and Employment

Up until the recent economic crisis, employment has followed the growth path set by the GDP, as explained by Cruces (2010), both showing similar growth rates that were around 1-3% and supported by the joining of women joining the labor force, that began in the 80's, to the more recent influx of immigrants looking for work.

As a result of the financial crisis and the bursting of the construction bubble consumption and investment took a big hit leading to a reduction in economic activity. As a logic result, Cruces says, unemployment grew. From 2008 to 2010 50% of this job destruction was attributed to the construction sector, accompanied by the industrial sector which added up to 35% of total job destruction.

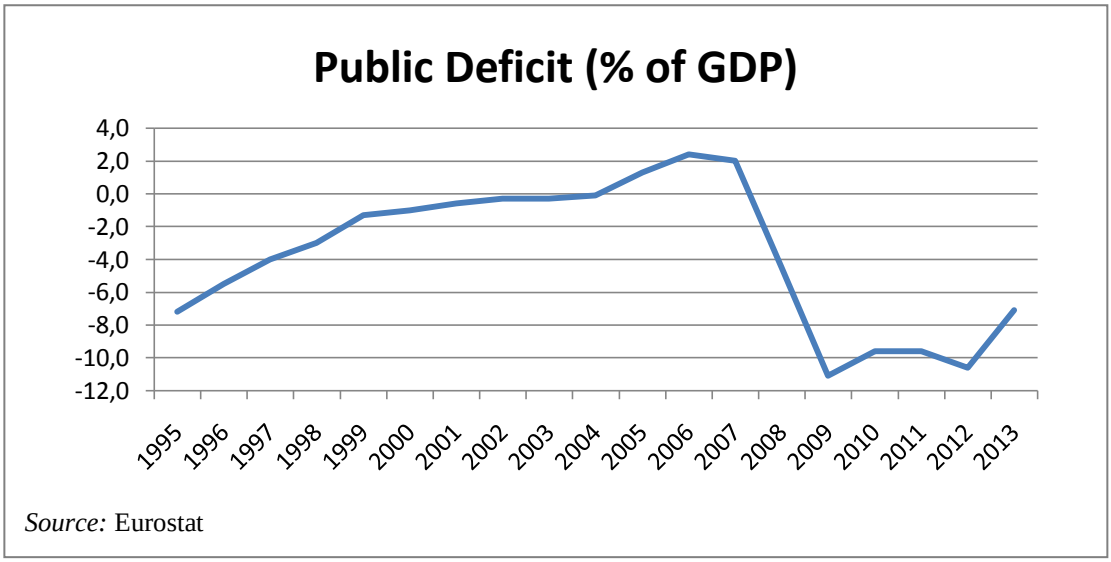
Anyway, as a result of the economic crisis, several labor reforms were put in place which pushed the Spanish labor market to a further duality between temporary employment and fixed or steady employment. As a consequence, although the nominal compensation of employees has gone down with the crisis, nominal compensation of employees per worker has actually gone up, since those who are sent to unemployment first are those with low pay less productive temporary jobs.

The evolution of profits, or gross operating surplus has generally closely followed salaries as well as employment (seeing as to how Spain's economy has been traditionally labor intensive) even in the beginning of the crisis. However in 2010 this trend stopped as profits started to rise while employment and salaries went down showing clearly where the greater adjustments were made. Also, labor productivity has been increasing at a

higher rate than the average compensation of employee thus the difference going to profits.

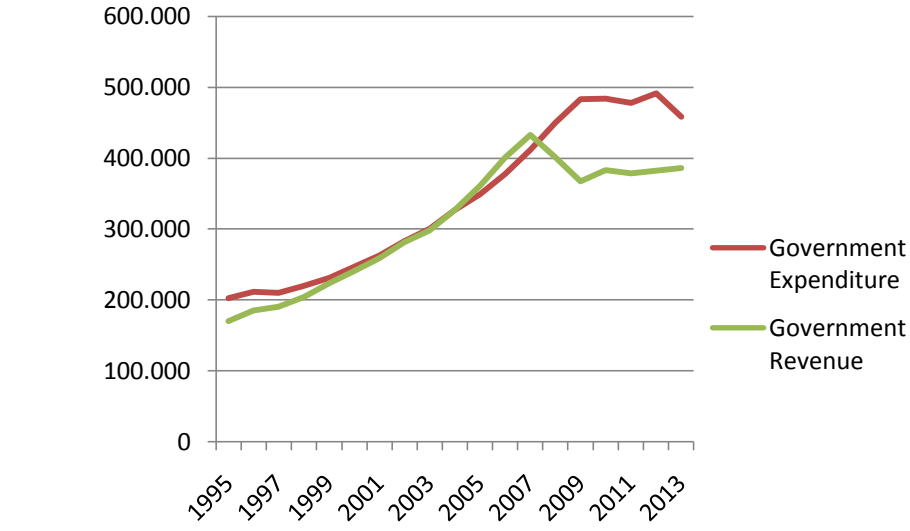
10.3. Government Deficit

The concept of government deficit refers to the difference between government revenue and government expenditure which essentially must be financed by debt in the case that there actually is a deficit. This deficit is given in percentage of the GDP in order to give a sense of the importance of the debt acquired.



Source: Eurostat

Spain's economy has always been characterized by having public deficit with the recent exception of 2005 trough 2007. Coming from the crisis in the early 90's the Spanish deficit took almost ten years to real an almost non-existence during a sustained period of growth up until the economic crisis hit in 2007-2008. The sharp rise in deficit makes sense if one looks at its components. First, there is a rise in government expenditure. This is not only due to the government trying to reactivate the economy but also to transfers that the government has to do (for example, with unemployment benefits). Additionally, Spain has had to pay more interests on its debt, thus adding to its expenditure. Next, government revenue decreases, since there is greater unemployment and less consumption which causes less income and value added taxes to be collected. Finally, the GDP (the denominator) contracts this increasing this percentage of deficit. The evolution of government income and expenditure can be seen in the following graph.



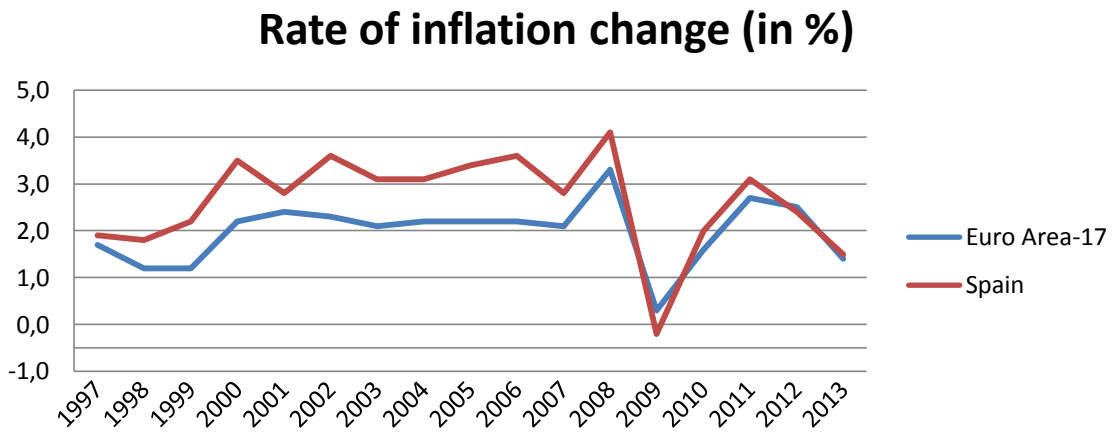
Units: Millions of €
Source: Eurostat

10.4. Inflation

Coming from a great inflationary period in the 70's, since the mid 90's Spain's inflation rate has held itself below 5%. As Maluquer (2013) explains, during that time the Bank of Spain was given autonomy in order to perform a better stabilization of prices. Additionally, as a push towards the joining of the EEC, efforts were made to contain public spending which fueled inflation in the past in order to be able to join the EEC.

Maluquer (2013) argues that from that point onwards, the difference of inflation with other important UE economies have not been totally eliminated. He goes on to explain that his difference has its origin in the service sector and more specifically in the low increase of labor productivity within it. This growth of prices, even if it's more localized in the service sector, hurts the competitively.

The adoption of the Euro took monetary policy out of Spain's hands, leaving it to the EU. In this context high internal demand and unlimited credit made prices rise over the rest of important Eurozone area, thus increasing imports and decreasing exports. After 2007 Maluquer (2013) explains that this difference with other Euro countries has subsided quite a bit, as can be seen in the graph below.



Source: Eurostat

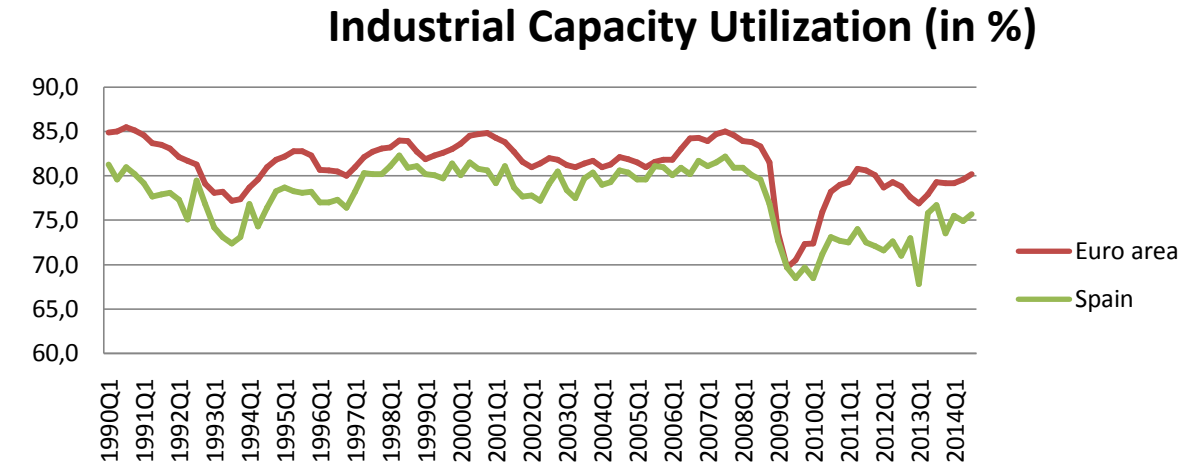
10.5. Productivity

During the last 20 years Spain has been considered a low productivity country in comparison to other important EU countries. During the expansionary period from 1995 to 2007 Spanish productivity maintained itself notably below the EU-15 average and the USA. The main reason for this is the intensive use of labor of the Spanish economic activities.

Sanchez & Roura (2012) show that the evolution of labor productivity growth is countercyclical and has specifically opposite evolution of employment growth rate, thus justifying the evolution of productivity up to and during the economic crisis. The explanation lies in that, as said before, the growth experimented in the expansionary period since 1995 was basically fueled by employment and not by increase in productivity. In fact, this becomes more evident if one considers that most of the job destruction during the firsts years of the crisis were mostly construction and manufacturing related.

10.6. Industrial Capacity Utilization

Defining capacity as the amount of manufacturing capability then capacity utilization, as it name implies is a measurement of the use out of all the capacity that is installed. As seen in the graph below Spanish industrial capacity utilization seems to follow the same trend as the Euro Area countries.



Source: Eurostat

One can clearly see how during the last 25 years there has been a gap between the utilization of Euro Area countries and Spain. All of this poses two main problems. First of all, if there is an underuse of capacity the costs involved in production, if measured per unit of production, are higher thus translating into higher costs and lower profit. Additionally if other EU countries produce with a higher capacity utilization this potentially leaves Spanish products at a disadvantage since that can discourage exports due to price difference. To top it all of it also indicates a lower performance of investment or resource allocation since that which was invested in capacity installation at one point might have been more efficient elsewhere in the economy.

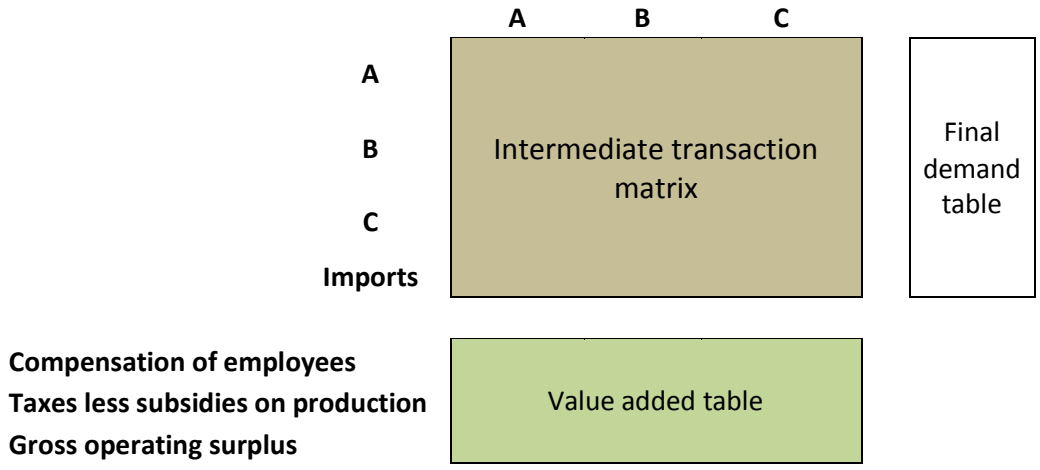
11. Theoretical Explanation of Empirically Observed Dynamics

11.1. Introduction

For the final part of this work a model of part of the Spanish economy was made in order to reflect the production system and its interaction with the rest of the agents, which in this case are the national population, the government and finally external economies by means of exports. Specifically, the model deals with input-output tables, which will be explained in the following sections. Once the model is explained as well as the pertinent explanations preceding it are given, then the model will be used to test the result of certain scenarios pertaining the Spanish economy.

11.2. What is an input-output table?

The following figure is a scheme of what a Symmetrical Input-Output (IO) table is. In the following paragraphs an explanation will be given on what each of this parts is. Although the format between sources varies somewhat this scheme gives a general good idea and follows WIOD table's format, which are the ones used for this part.



11.2.1. Technical coefficients matrix - intermediate transaction matrix

Assume an economy with *n* sectors, each of which produces a commodity output of x_j (measured in currency and thus representing the gross output of that sector). In order to produce this output, apart from capital and labor, this sector receives inputs from other sectors. Each of these relations can be expressed by the coefficient a_{ij} which represented

the input of commodity I that sector j needs to produce each unit of their commodity. So, in order to produce x_j then sector j would need $a_{1j}x_j, \dots, a_{nj}x_j$. These coefficients are all contained in an input-output coefficient matrix, as follows:

$$A = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{pmatrix}$$

However what is generally given in input-output tables is the actual values of inputs between sectors which is also called the ***intermediate transaction matrix***:

$$\begin{pmatrix} a_{11} \cdot x_1 & \cdots & a_{1n} \cdot x_n \\ \vdots & \ddots & \vdots \\ a_{n1} \cdot x_1 & \cdots & a_{nn} \cdot x_n \end{pmatrix}$$

When adding up a column like column 1, for example, this would give the total intermediate inputs that the other sectors and sector 1 (or sector A in the scheme above) itself provide sector 1 in order to produce the x_1 total output. Adding up rows like row 1, for example, gives the amount of intermediate output that sector 1 produces for other sectors and for itself. Thus $A \cdot x$ gives the intermediate outputs produced for all sectors. If one adds final demand y then the following equation is obtained:

$$x = A \cdot x + y$$

Which can also conveniently be expressed in the following fashion:

$$\begin{cases} y = (I - A) \cdot x \\ x = (I - A)^{-1} \cdot y \end{cases}$$

These expressions are convenient because they allow, if one considers that in a short time frame the technical coefficients are more or less unchanging, then intermediate outputs can be know with final demand values and vice versa. Additionally, when intermediate outputs are known so are intermediate inputs. In the case WIOD imported intermediate inputs are counted as a standalone sector.

11.2.2. Value added table

This table, as shown in the scheme above generally includes at least three things:

- Compensation of employees, which is the remuneration paid by the employer in exchange for the work done by employees. This includes both salaries and social contributions.
- Other taxes less subsidies on production, which, as Eurostat puts it, consists of all taxes that enterprises incur as a result of engaging in

production, independently of the quantity or value of the goods and services produced or sold. Other subsidies on production consist of subsidies which resident producer units may receive as a consequence of engaging in production including in particular subsidies on payroll or work force, subsidies to reduce pollution and grants for interest relief.

- Gross operating surplus (and mixed income), which again looking at Eurostat definitions, is the surplus generated by operating activities after the labor factor input has been recompensed. It is the balance available to the unit which allows it to recompense the providers of own funds and debt, to pay taxes and eventually to finance all or a part of its investment.

11.2.3. Final demand table

This table includes final consumption by three agents, which are households, nonprofits and government. In addition to this there are investment and exports.

11.2.4. Other considerations

In addition to what was mentioned above, these tables include rows for taxes on products and for imports both in the cases of intermediate transaction matrix and final consumption.

11.3. Multipliers

The term multiplier refers to the multiplier effect produced by variations in this economy that initially may apparently only affect one sector but actually spread to other sectors. These may be of interest to decision makers as it can be a useful tool as to where to invest resources. A few examples will be given, as explained by Raa (2006). and one of them, the demand-pull multiplier, will be used later on.

11.3.1. Demand-pull multiplier

If one takes the equation $x = (I - A)^{-1} \cdot y$ seen before and simply turns it into incremental values then one could obtain the variation of output for the whole economy given a variation of final demand. Thus column j of $(I - A)^{-1}$ are the effects on total

output out every sector caused by a unitary increase in final demand of commodity *j*, which are also called *demand-pull multipliers for commodity j*.

11.3.2. Production-income multiplier

If v is a vector of value added per unit of output, and this is considered to remain constant for any level of output, then extending what was seen in with demand-pull multipliers the production-income multipliers can be obtained. These represent the increase in value added for all sectors produced by a unitary increase of final demand of commodity *j*. *Production-income multipliers* for commodity *j* are found in the *j*th column of matrix $v \cdot (\mathrm{I} - \mathrm{A})^{-1}$.

Additionally, if one has data on propensity to consume, which can be defined as how much of final demand goes towards consumption, then one can also add in the effect of the extra consumption produced by the new value added increase.

11.3.3. Employment multiplier

Making use of the already seen multipliers, employment multipliers come trivially when employment comes into focus. For this it will be convenient to remember that l is defined as labor cost per unit of output. It must be said that this only makes sense if l is assumed constant.

One example of this are *production employment multipliers* are defined as the employment, measured in currency, created in the whole economy as a consequence of an increase in demand. The production employment multiplier of sector *j* is found in the *j*th position of row vector $\mathrm{l} \sum_{\mathrm{k}=0}^{\infty} \mathrm{A}^{\mathrm{k}}$.

11.4. Model

11.4.1. Data

The data used to work on the model has mostly been taken out of the World Input-Output Database (WIOD) which contains tables going from 1995 to 2011. However, additional data was required for government revenue and expenditure, employment, the decomposition of value added into compensation of employees, gross operating surplus and other taxes less subsidies on production.

- Government revenue and expenditure from 1995 to 2011 was obtained through Eurostat data.

- Employment data from 1995 to 2009 was taken from the WIOD Socio Economic Accounts. For the two following years, the values were estimated from INE data by taking sectoral employment growth rates and applying them to the WIOD employment data.

- Compensation of employees data from 1995 to 2009 was once again taken from WIOD Socio Economic Accounts. For the two following years, the values were estimated from INE data by taking sectoral employment growth rates and applying them to the WIOD employment data.

- Other taxes less subsidies on production could be found in the Eurostat use tables from 1995 to 2007. For the following years INE data was used.

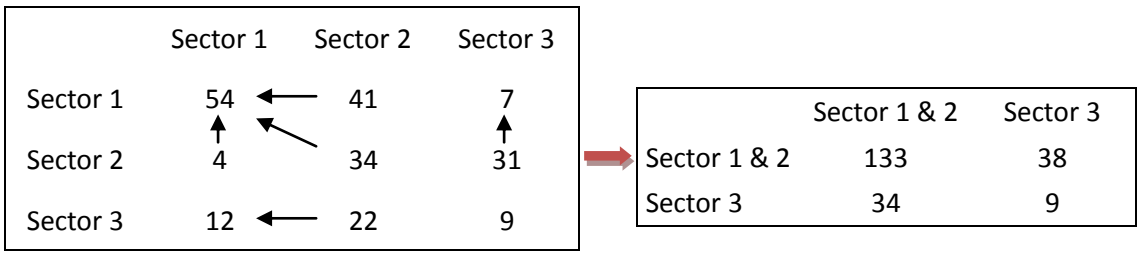
- Gross operating surplus data was unavailable in the Eurostat tables up until 2000 so it was calculated for each sector as value added minus compensation of employees and minus other taxes less subsidies on production. From 2000 to 2007 the data could be found in Eurostat tables. For the following years INE data was used.

11.4.2. Transforming WIOD tables

Original WIOD input output tables contain 35 sectors. With the aim of making the modeling process more manageable the number of sectors were reduced to seven which I initially did following ISIC Revision 2, by the UN. The result was the following seven sectors which are each assigned to a letter.

A	*Agriculture, Hunting, Forestry and Fishing*
B	*Manufacturing, Mining and Quarrying*
C	*Electricity, Gas and Water*
D	*Construction*
E	*Wholesale and Retail Trade, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services*
F	*Financing, Insurance, Real Estate and Business Services*
G	*Public Admin, Defense , Social Security, Education, Health and Social Work*

The process for this is trivially shown as follows with a intermediate input matrix of three example sectors.



11.4.3. Purpose of the Model and Exogenous variables

The purpose of this model is to be able to generate the complete input output tables out of the values of intermediate inputs for each sector. This is convenient because national accounting tends to give these values much before they publish any input output tables. Additionally, under certain assumptions, one can translate a variation in final demand to a variation of intermediate inputs, also making this model useful for policy making or measuring impacts on the economy. Thus the intermediate inputs for each sector are the models exogenous variables. Additionally, to model exports and tourism several European GDP's will also be taken as exogenous.

11.4.4. Employment

Employment seems to be well predicted by three explanatory variables, last periods employment and total intermediate inputs as well as the current periods intermediate inputs.

$$Emp_t = \alpha + \beta_1 \cdot Emp_t + \beta_2 \cdot (IntInp_t - IntInp_{t-1})$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is not autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	1475,695	536,350	2,751	0,022
Emp1	0,893	0,033	27,132	0,000
IntInp-IntInp1	0,010	0,001	9,826	0,000

R	0,994	SS Resid.	218393,581
R Square	0,988	F	368,094
Adj. R Square	0,985	Sig.	0,000
Regression S. E.	155,775	Durbin-Watson	2,673

11.4.5. Compensation of Employees

Compensation of employees was modeled for each sector. As a general comment they tend to depend on sector specific variables, like past compensation of employees or past intermediate inputs, and on the same variables but in a global scope like total compensation of employees the previous period.

A - Agricultural Sector

$$COE\_A_t = \alpha + \beta_1 \cdot IntInp\_A_t + \beta_2 \cdot COE_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	594,976	643,840	0,924	0,380
IntInp_A	0,140	0,052	2,660	0,026
COE1	0,006	0,001	5,545	0,000

R	0,976	**SS Resid.**	269060,363
R Square	0,953	**F**	91,995
Adj. R Square	0,943	**Sig.**	0,000
Regression S. E.	172,903	**Durbin-Watson**	1,538

B - Manufacturing/Industrial Sector

$$COE\_B_t = \alpha + \beta_1 \cdot IntInp\_B_t + \beta_2 \cdot COE\_B_{t-1} + \beta_3 \cdot (COE_{t-1} - COE\_B_{t-1})$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-3254,344	5426,784	-0,600	0,565
IntInp_B	0,141	0,017	8,213	0,000
COE_B1	0,894	0,108	8,261	0,000
COE1mCOE_B1	-0,104	0,015	-7,128	0,000

R	0,988	**SS Resid.**	12206882,392
R Square	0,976	**F**	106,289
Adj. R Square	0,966	**Sig.**	0,000
Regression S. E.	1235,257	**Durbin-Watson**	3,114

C - Energy & Water Sector

$$COE\_C_t = \alpha + \beta_1 \cdot IntInp\_C_t + \beta_2 \cdot COE\_C_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	1205,192	381,592	3,158	0,012
IntInp_C	0,041	0,010	4,115	0,003
COE_C1	0,369	0,187	1,970	0,080

R	0,996	**SS Resid.**	65211,302
R Square	0,991	**F**	523,576
Adj. R Square	0,990	**Sig.**	0,000
Regression S. E.	85,122	**Durbin-Watson**	2,512

D - Construction Sector

$$COE\_D_t = \alpha + \beta_1 \cdot IntInp\_D_t + \beta_2 \cdot (IntInp_t - IntInp\_D_t) + \\ + \beta_3 \cdot COE\_D_{t-1} + \beta_4 \cdot (COE_{t-1} - COE\_D_{t-1})$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	15067,941	2322,346	6,488	0,000
IntInp_D	0,117	0,023	5,172	0,001
IntInpmIntInp_D	0,081	0,011	7,293	0,000
COE_D1	0,508	0,135	3,770	0,007
COE1mCOE_D1	-0,184	0,026	-6,982	0,000

R	0,998	**SS Resid.**	7259969,639
R Square	0,995	**F**	358,742
Adj. R Square	0,992	**Sig.**	0,000
Regression S. E.	1018,400	**Durbin-Watson**	2,768

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$COE\_E_t = \alpha + \beta_1 \cdot IntInp\_E_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	31217,366	1820,641	17,146	0,000
IntImp_E	0,442	0,009	51,210	0,000
R	0,998	SS Resid.	18551164,408	
R Square	0,996	F	2622,498	
Adj. R Square	0,996	Sig.	0,000	
Regression S. E.	1362,027	Durbin-Watson	1,638	

F - Financial, Real Estate and Business Services

$$COE\_F_t = \alpha + \beta_1 \cdot COE\_F_{t-1} + \beta_2 \cdot IntInp_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	344,306	1110,703	0,310	0,764
COE_F1	0,488	0,041	12,015	0,000
IntInp	0,039	0,003	11,405	0,000
R	0,999	SS Resid.	4489906,455	
R Square	0,998	F	2358,878	
Adj. R Square	0,998	Sig.	0,000	
Regression S. E.	706,313	Durbin-Watson	1,338	

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$COE\_G_t = \alpha + \beta_1 \cdot IntInp\_G_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	23746,420	1118,657	21,228	0,000
IntInp_G	1,737	0,021	83,344	0,000

R	0,999	SS Resid.	11442862,516
R Square	0,999	F	6946,206
Adj. R Square	0,998	Sig.	0,000
Regression S. E.	1069,713	Durbin-Watson	1,876

11.4.6. Gross Operating Surplus

Gross operating surplus was also modeled for each sector. Once again, they tend to depend on sector specific variables and global variables, this time also including present compensation of employees and past gross operating surplus.

A - Agricultural Sector

$$GOS\_A_t = \alpha + \beta_1 \cdot IntInp\_A_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	8535,076	2474,338	3,449	0,006
IntInp_A	0,859	0,137	6,288	0,000

R	0,893	SS Resid.	6022221,404
R Square	0,798	F	39,544
Adj. R Square	0,778	Sig.	0,000
Regression S. E.	776,030	Durbin-Watson	1,969

B - Manufacturing/Industrial Sector

$$GOS\_B_t = \alpha + \beta_1 \cdot IntInp\_B_t + \beta_2 \cdot IntInp\_B_{t-1} + \beta_3 \cdot COE\_B_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	6317,478	3624,648	1,743	0,120
IntInp_B	0,147	0,014	10,416	0,000
IntInp_B1	-0,077	0,012	-6,606	0,000
COE_B	0,265	0,082	3,247	0,012

R	0,991	**SS Resid.**	6405503,379
R Square	0,982	**F**	142,112
Adj. R Square	0,975	**Sig.**	0,000
Regression S. E.	894,812	**Durbin-Watson**	1,723

C - Energy & Water Sector

$$COE\_C_t = \alpha + \beta_1 \cdot IntInp\_C_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	2367,520	482,236	4,909	0,001
IntImp_C	0,381	0,014	26,564	0,000

R	0,993	**SS Resid.**	4328788,933
R Square	0,986	**F**	705,632
Adj. R Square	0,985	**Sig.**	0,000
Regression S. E.	657,935	**Durbin-Watson**	1,685

D - Construction Sector

$$GOS\_D_t = \alpha + \beta_1 \cdot IntInp\_D_t + \beta_2 \cdot (COE_{t-1} - COE\_D_{t-1})$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-15164,595	2181,150	-6,953	0,000
IntInp_D	0,157	0,011	14,286	0,000
COE1mCOE_D1	0,071	0,007	10,204	0,000

R	0,994	**SS Resid.**	17946986,387
R Square	0,987	**F**	347,526
Adj. R Square	0,984	**Sig.**	0,000
Regression S. E.	1412,129	**Durbin-Watson**	2,114

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$GOS\_E_t = \alpha + \beta_1 \cdot IntInp\_E_t + \beta_2 \cdot IntInp\_E_{t-1} + \beta_3 \cdot (COE_t - COE\_E_t)$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	37114,066	5811,548	6,386	0,000
IntImp_E	1,130	0,282	4,012	0,004
IntImp_E1	-0,373	0,159	-2,345	0,047
COEmCOE_E	-0,235	0,108	-2,172	0,032

R	0,997	**SS Resid.**	29314798,859
R Square	0,994	**F**	481,869
Adj. R Square	0,992	**Sig.**	0,000
Regression S. E.	1914,249	**Durbin-Watson**	1,594

F - Financial, Real Estate and Business Services

$$GOS\_F_t = \alpha + \beta_1 \cdot IntInp\_F_t + \beta_2 \cdot COE\_F_t + \beta_3 \cdot (IntInp_{t-1} - IntInp_{F_{t-1}})$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-18540,477	2431,819	-7,624	0,000
IntInp_F	-0,692	0,206	-3,364	0,010
COE_F	0,939	0,300	3,129	0,014
IntImp1mIntInp_F1	0,172	0,038	4,511	0,002

R	0,999	SS Resid.	17563255,150
R Square	0,998	F	1368,859
Adj. R Square	0,997	Sig.	0,000
Regression S. E.	1481,691	Durbin-Watson	2,555

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$GOS\_G_t = \alpha + \beta_1 \cdot IntInp\_G_t + \beta_2 \cdot COE\_G_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	2435,751	791,348	3,078	0,013
IntInp_G	0,176	0,067	2,631	0,027
COE_G1	0,134	0,038	3,581	0,006

R	0,998	SS Resid.	2050537,141
R Square	0,995	F	988,244
Adj. R Square	0,994	Sig.	0,000
Regression S. E.	477,323	Durbin-Watson	1,655

11.4.7. Other Net Taxes and Subsidies on Production

Other net taxes and subsidies on production was modeled after sector specific variables once again since using global variables didn't give any result. These make sense since these taxes and subsidies are not set in general terms for all sectors as opposed to other taxes like VAT.

A - Agricultural Sector

$$OtherTax\_A_t = \alpha + \beta_1 \cdot COE\_A_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	10490,038	1506,773	6,962	0,000
COE_A	-2,443	0,270	-9,065	0,000

R	0,944	**SS Resid.**	4191314,336
R Square	0,892	**F**	82,171
Adj. R Square	0,881	**Sig.**	0,000
Regression S. E.	647,404	**Durbin-Watson**	1,329

B - Manufacturing/Industrial Sector

$$OtherTax\_B_t = \alpha + \beta_1 \cdot IntInp\_B_t + \beta_2 \cdot COE\_B_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	776,227	459,104	1,691	0,125
IntInp_B	0,003	0,001	2,536	0,032
COE_B	-0,032	0,010	-3,115	0,012

R	0,722	**SS Resid.**	120509,064
R Square	0,521	**F**	4,900
Adj. R Square	0,415	**Sig.**	,036
Regression S. E.	115,715	**Durbin-Watson**	1,719

C - Energy & Water Sector

$$OtherTax\_C_t = \alpha + \beta_1 \cdot COE\_C_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-259,713	92,216	-2,816	0,018
COE_C	0,183	0,024	7,707	0,000

R	0,925	**SS Resid.**	43177,602
R Square	0,856	**F**	59,397
Adj. R Square	0,841	**Sig.**	0,000
Regression S. E.	65,710	**Durbin-Watson**	1,041

D - Construction Sector

$$OtherTax\_D_t = \alpha + \beta_1 \cdot IntInp\_D_t + \beta_2 \cdot GOS\_D_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	349,547	117,947	2,964	0,016
IntInp_D	0,009	0,002	4,776	0,001
GOS_D	-0,031	0,008	-4,038	0,003

R	,850	**SS Resid.**	121483,357
R Square	0,723	**F**	11,758
Adj. R Square	0,662	**Sig.**	0,003
Regression S. E.	116,182	**Durbin-Watson**	1,625

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$OtherTax\_E_t = \alpha + \beta_1 \cdot IntInp\_E_t + \beta_2 \cdot IntInp\_E_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	940,389	610,189	1,541	0,158
IntInp_E	-0,059	0,018	-3,220	0,010
IntInp_E1	0,059	0,017	3,400	0,008

R	0,769	**SS Resid.**	1206501,994
R Square	0,592	**F**	6,522
Adj. R Square	0,501	**Sig.**	0,018
Regression S. E.	366,136	**Durbin-Watson**	1,374

F - Financial, Real Estate and Business Services

$$OtherTax\_F_t = \alpha + \beta_1 \cdot IntInp\_F_t + \beta_2 \cdot GOS\_F_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	689,858	951,239	0,725	0,487
IntInp_F	-0,141	0,057	-2,490	0,034
GOS_F	0,163	0,047	3,492	0,007

R	0,914	**SS Resid.**	4782706,287
R Square	0,836	**F**	22,958
Adj. R Square	0,800	**Sig.**	,000
Regression S. E.	728,980	**Durbin-Watson**	1,602

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$OtherTax\_G_t = \alpha + \beta_1 \cdot GOS\_G_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-80,871	83,445	-0,969	0,355
GOS_G	0,012	0,003	3,898	0,003

R	0,777	SS Resid.	44473,987
R Square	0,603	F	15,198
Adj. R Square	0,563	Sig.	0,003
Regression S. E.	66,689	Durbin-Watson	2,033

11.4.8. Taxes Less Subsidies on Products

Taxes less subsidies on products for each sector don't correctly correspond to that of INE data. They appear to include a lot of VAT in them which in INE data is included in taxes less subsidies on products for household consumption. Hence for the explanatory variables I used the same ones as household consumption which are current employment and profits as well as the previous year's employment.

$$TLSOP_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-20007,904	3863,451	-5,179	0,001
GOS	0,149	0,010	15,694	0,000
Emp-Emp1	10,994	1,250	8,796	0,000

R	0,982	**SS Resid.**	31899660,182
R Square	0,965	**F**	124,405
Adj. R Square	0,957	**Sig.**	0,000
Regression S. E.	1882,659	**Durbin-Watson**	1,916

A - Agricultural Sector

$$TLSOP\_A_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-106,307	107,873	-0,985	0,350
GOS	0,002	0,000	7,031	0,000
Emp-Emp1	0,189	0,035	5,411	0,000

R	0,922	**SS Resid.**	24869,292
R Square	0,850	**F**	25,438
Adj. R Square	0,816	**Sig.**	0,000
Regression S. E.	52,567	**Durbin-Watson**	2,649

B - Manufacturing/Industrial Sector

$$TLOP\_B_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-4311,251	1285,027	-3,355	0,008
GOS	0,041	0,003	12,846	0,000
Emp-Emp1	3,813	0,416	9,171	0,000
R	0,974	**SS Resid.**	3529067,143	
R Square	0,949	**F**	83,313	
Adj. R Square	0,937	**Sig.**	0,000	
Regression S. E.	626,194	**Durbin-Watson**	2,056	

C - Energy & Water Sector

$$TLOP\_C_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-1336,067	297,144	-4,496	0,001
GOS	0,008	0,001	10,913	0,000
Emp-Emp1	0,222	0,096	2,307	0,046
R	0,972	**SS Resid.**	188698,209	
R Square	0,945	**F**	77,842	
Adj. R Square	0,933	**Sig.**	0,000	
Regression S. E.	144,798	**Durbin-Watson**	1,551	

D - Construction Sector

$$TLOP\_D_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-5534,603	1183,486	-4,677	0,001
GOS	0,027	0,003	9,376	0,000
Emp-Emp1	1,980	0,383	5,172	0,001

R	0,953	SS Resid.	2993379,344
R Square	0,908	F	44,512
Adj. R Square	0,888	Sig.	0,000
Regression S. E.	576,713	Durbin-Watson	1,564

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$TLOP\_E_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-3439,899	1020,227	-3,372	0,008
GOS	0,038	0,003	15,007	0,000
Emp-Emp1	2,954	0,330	8,949	0,000

R	0,981	SS Resid.	2224481,129
R Square	0,962	F	112,931
Adj. R Square	0,953	Sig.	0,000
Regression S. E.	497,156	Durbin-Watson	1,658

F - Financial, Real Estate and Business Services

$$TLOP\_F_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-3834,067	542,874	-7,063	0,000
GOS	0,022	0,001	16,794	0,000
Emp-Emp1	1,266	0,176	7,209	0,000

R	0,985	**SS Resid.**	629845,343
R Square	0,971	**F**	151,399
Adj. R Square	0,965	**Sig.**	0,000
Regression S. E.	264,543	**Durbin-Watson**	2,018

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$TLOP\_G_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-1445,709	294,937	-4,902	0,001
GOS	0,011	0,001	15,598	0,000
Emp-Emp1	0,571	0,095	5,982	0,000

R	0,984	**SS Resid.**	185906,412
R Square	0,968	**F**	134,959
Adj. R Square	0,961	**Sig.**	0,000
Regression S. E.	143,723	**Durbin-Watson**	1,691

11.4.9. International Transport Margins

International transport margins for each sector were modeled by taking the sector's intermediate inputs as explanatory variables.

A - Agricultural Sector

$$ITM\_A_t = \alpha + \beta_1 \cdot IntInp\_A_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	21,471	24,825	0,865	0,407
IntImp_A	0,005	0,001	3,342	0,007
R	0,726	**SS Resid.**	606,223	
R Square	0,528	**F**	11,171	
Adj. R Square	0,480	**Sig.**	0,007	
Regression S. E.	7,786	**Durbin-Watson**	1,693	

B - Manufacturing/Industrial Sector

$$ITM\_B_t = \alpha + \beta_1 \cdot IntInp\_B_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-243,938	653,091	-0,374	0,717
IntImp_B	0,011	0,002	6,068	0,000
R	0,887	**SS Resid.**	1056814,612	
R Square	0,786	**F**	36,820	
Adj. R Square	0,765	**Sig.**	0,000	
Regression S. E.	325,087	**Durbin-Watson**	1,245	

C - Energy & Water Sector

$$ITM\_C_t = \alpha + \beta_1 \cdot IntInp\_C_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	110,275	37,706	2,925	0,015
IntImp_C	0,007	0,001	6,068	0,000

R	0,887	SS Resid.	26464,745
R Square	0,786	F	36,822
Adj. R Square	0,765	Sig.	0,000
Regression S. E.	51,444	Durbin-Watson	1,438

D - Construction Sector

$$ITM\_D_t = \alpha + \beta_1 \cdot IntInp\_D_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	234,521	65,214	3,596	0,005
IntImp_D	0,002	0,000	4,477	0,001

R	0,817	SS Resid.	41776,410
R Square	0,667	F	20,040
Adj. R Square	0,634	Sig.	0,001
Regression S. E.	64,635	Durbin-Watson	1,615

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$ITM\_E_t = \alpha + \beta_1 \cdot IntInp\_E_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	107,235	92,203	1,163	0,272
IntImp_E	0,003	0,000	7,236	0,000
R	0,916	SS Resid.	47579,055	
R Square	0,840	F	52,355	
Adj. R Square	0,824	Sig.	0,000	
Regression S. E.	68,978	Durbin-Watson	1,606	

F - Financial, Real Estate and Business Services

$$ITM\_F_t = \alpha + \beta_1 \cdot IntInp\_F_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	17,830	21,984	0,811	0,436
IntImp_F	0,001	0,000	5,827	0,000
R	0,879	SS Resid.	3070,905	
R Square	0,773	F	33,957	
Adj. R Square	0,750	Sig.	0,000	
Regression S. E.	17,524	Durbin-Watson	1,608	

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$ITM\_G_t = \alpha + \beta_1 \cdot IntInp\_G_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	62,360	23,046	2,706	0,022
IntImp_G	0,005	0,000	11,755	0,000

R	0,966	SS Resid.	4856,783
R Square	0,933	F	138,192
Adj. R Square	0,926	Sig.	0,000
Regression S. E.	22,038	Durbin-Watson	1,342

11.4.10. Household Consumption

In order to explain household consumption employment seems to be a better explanatory variable than compensation of employees. The other explanatory variable is gross operating surplus.

$$ConsHH_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	41102,349	7230,444	5,685	0,000
Emp-Emp1	15,979	2,339	6,831	0,000
GOS	1,229	0,018	69,092	0,000

R	0,999	SS Resid.	111728812,272
R Square	0,999	F	3557,889
Adj. R Square	0,998	Sig.	0,000
Regression S. E.	3523,395	Durbin-Watson	1,721

For the different sectors I considered two possibilities. These were either to consider that the household consumption profile is unchanging or to simply use these variables for each sector removing the non-relevant ones. I finally opted for the latter.

A - Agricultural Sector

$$ConsHH\_A_t = \alpha + \beta_1 \cdot Emp_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	4979,608	1957,249	2,544	0,029
Emp	0,405	0,122	3,307	0,008
R	0,723	**SS Resid.**	2709926,357	
R Square	0,522	**F**	10,935	
Adj. R Square	0,475	**Sig.**	0,008	
Regression S. E.	520,570	**Durbin-Watson**	1,588	

B - Manufacturing/Industrial Sector

$$ConsHH\_B_t = \alpha + \beta_1 \cdot Emp_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	25076,045	6776,368	3,701	0,004
Emp	3,643	0,424	8,595	0,000
R	0,938	**SS Resid.**	32483233,154	
R Square	0,881	**F**	73,878	
Adj. R Square	0,869	**Sig.**	0,000	
Regression S. E.	1802,311	**Durbin-Watson**	2,702	

C - Energy & Water Sector

$$ConsHH\_C_t = \alpha + \beta_1 \cdot Emp_t + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	7541,055	1710,400	4,409	0,002
Emp	-0,962	0,153	-6,296	0,000
GOS	0,050	0,003	19,803	0,000

R	0,994	SS Resid.	1121677,696
R Square	0,988	F	376,948
Adj. R Square	0,986	Sig.	0,000
Regression S. E.	353,031	Durbin-Watson	2,265

D - Construction Sector

$$ConsHH\_D_t = \alpha + \beta_1 \cdot GOS_t + \beta_2 \cdot Emp_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-7827,523	1441,704	-5,429	0,000
Emp1	0,814	0,163	5,009	0,001
GOS	0,008	0,003	2,550	0,031

R	0,992	SS Resid.	579121,483
R Square	0,985	F	294,653
Adj. R Square	0,982	Sig.	0,000
Regression S. E.	253,667	Durbin-Watson	1,856

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

It is important to explain that in the input-output table one can find the foreign tourism account in two places. The first one is in household consumption of sector E. The second one is by itself as negative household consumption labeled as "purchases on domestic territory by non-residents". What I did to obtain household consumption was to remove the foreign tourism component from household consumption of sector E, then I modeled it, and finally I re-included it by means of a subtraction, in this case, because as

said before the foreign tourism account is counted as negative consumption. The foreign tourism is modeled later on.

$$ConsHH\_E_t = \alpha + \beta_1 \cdot GOS_t + \beta_2 \cdot Emp_t - ConsHH\_TRSM$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	23245,928	5947,462	3,909	0,004
GOS	0,529	0,009	60,231	0,000
Emp	-2,981	0,531	-5,609	0,000
ConsHH_TRSM	-1,000	0,000	0,000	0,000

R	1,000	**SS Resid.**	13562382,664
R Square	0,999	**F**	5239,836
Adj. R Square	0,999	**Sig.**	0,000
Regression S. E.	1227,571	**Durbin-Watson**	1,970

F - Financial, Real Estate and Business Services

In this case, autocorrelation appeared and was solved by introducing a the variable lagged by one period.

$$ConsHH\_F_t = \alpha + \beta_1 \cdot GOS_t + \beta_2 \cdot ConsHH\_F_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-2577,024	3822,139	-0,674	0,517
GOS	0,175	0,035	5,045	0,001
ConsHH_F1	0,290	0,124	2,327	0,045

R	0,996	**SS Resid.**	30609654,346
R Square	0,993	**F**	628,327
Adj. R Square	0,991	**Sig.**	0,000
Regression S. E.	1844,200	**Durbin-Watson**	1,458

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$ConsHH\_G_t = \alpha + \beta_1 \cdot GOS_t + \beta_2 \cdot (Emp_t - Emp_{t-1})$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	2249,216	612,800	3,670	0,005
GOS	0,069	0,002	46,053	0,000
Emp-Emp1	-0,921	0,198	-4,647	0,001

R	0,999	**SS Resid.**	802552,021
R Square	0,998	**F**	2037,618
Adj. R Square	0,997	**Sig.**	0,000
Regression S. E.	298,618	**Durbin-Watson**	1,896

Impts - Imports

$$ConsHH\_Impts_t = \alpha + \beta_1 \cdot (Emp_t + Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-15511,154	2621,770	-5,916	0,000
GOS	0,194	0,006	30,047	0,000
Emp-Emp1	9,032	0,848	10,649	0,000

R	0,996	**SS Resid.**	14690086,167
R Square	0,991	**F**	512,736
Adj. R Square	0,989	**Sig.**	0,000
Regression S. E.	1277,588	**Durbin-Watson**	1,356

TLS - Taxes Less Subsidies on Consumption

$$ConsHH\_TLS_t = \alpha + \beta_1 \cdot (Emp_t + Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	3277,353	3382,431	0,969	0,358
GOS	0,071	0,008	8,581	0,000
Emp-Emp1	8,787	1,094	8,031	0,000

R	0,951	**SS Resid.**	24450801,775
R Square	0,904	**F**	42,323
Adj. R Square	0,883	**Sig.**	0,000
Regression S. E.	1648,258	**Durbin-Watson**	2,346

ITM - International Trade Margins

$$ConsHH\_ITM_t = \alpha + \beta_1 \cdot (Emp_t + Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-739,687	213,527	-3,464	0,007
GOS	0,010	0,001	18,977	0,000
Emp-Emp1	0,556	0,069	8,054	0,000

R	0,989	**SS Resid.**	97440,791
R Square	0,977	**F**	193,937
Adj. R Square	0,972	**Sig.**	0,000
Regression S. E.	104,052	**Durbin-Watson**	1,232

DPA - Direct Purchases Abroad

$$ConsHH\_DPA_t = \alpha + \beta_1 \cdot (Emp_t + Emp_{t-1}) + \beta_2 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-4468,146	996,315	-4,485	0,002
GOS	0,034	0,002	13,946	0,000
Emp-Emp1	1,549	0,322	4,805	0,001

R	0,980	**SS Resid.**	2121430,757
R Square	0,961	**F**	111,386
Adj. R Square	0,953	**Sig.**	0,000
Regression S. E.	485,504	**Durbin-Watson**	1,296

TRSM - Purchases on the Domestic Territory by Non-Residents

Foreign tourism was found to be dependent on the GDP of the Euro Area (excluding Spain) and the previous period's compensation of employees.

$$ConsHH\_TRSM_t = \alpha + \beta_1 \cdot COE_{t-1} + \beta_2 \cdot (GDP\_EA17_t - GDP\_Spain_t)$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	12293,908	5052,288	2,433	0,038
EA17-Spain	-0,010	0,001	-7,280	0,000
COE1	0,047	0,012	4,062	0,003

R Square	0,959	**F**	106,292
Adj. R Square	0,950	**Sig.**	0,000
Regression S. E.	788,452	**Durbin-Watson**	1,503

11.4.11. Non-Profit Organization Consumption

The best explanatory variables for consumption carried out by non-profit organizations are employment for the current and previous year as well as gross operating

surplus for the previous years. In this case, assuming that the sectoral consumption is proportional to the total value gives a good result, since most of this consumption in localized in two sectors (E and G) and they evolve in a similar fashion.

$$ConsNP_t = \alpha + \beta_1 \cdot (Emp_t - Emp_{t-1}) + \beta_2 \cdot GOS_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	71,249	274,690	0,259	0,801
Emp-Emp1	0,250	0,099	2,512	0,033
GOS1	0,022	0,001	31,490	0,000

R	0,998	**SS Resid.**	162824,605
R Square	0,995	**F**	924,270
Adj. R Square	0,994	**Sig.**	0,000
Regression S. E.	134,505	**Durbin-Watson**	1,901

A - Agricultural Sector

$$ConsNP\_A_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	15,188
ConsNP	1,38E-03

B - Manufacturing/Industrial Sector

$$ConsNP\_B_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	11,281
ConsNP	1,54E-05

C - Energy & Water Sector

$$ConsNP\_C_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	-1,654
ConsNP	3,17E-04

D - Construction Sector

$$ConsNP\_D_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	0
ConsNP	0

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$ConsNP\_E_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	91,758
ConsNP	0,526

F - Financial, Real Estate and Business Services

$$ConsNP\_F_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	-17,437
ConsNP	9,20E-03

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$ConsNP\_G_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	-190,762
ConsNP	0,460

Impts - Imports

$$ConsNP\_Impts_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	20,834
ConsNP	2,85E-03

TLS - Taxes Less Subsidies on Consumption

In this case, proportionality didn't provide a reasonable result. Instead the explanatory variables employment, compensation of employees and gross operating surplus were used.

$$ConsHH\_TLS_t = \alpha + \beta_1 \cdot Emp_t + \beta_2 \cdot COE_t + \beta_3 \cdot GOS_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-158,384	22,463	-7,051	0,000
COE	-0,002	0,000	-6,495	0,000
GOS	0,001	0,000	5,417	0,001
Emp	0,029	0,003	11,263	0,000

R	0,971	**SS Resid.**	164,823
R Square	0,942	**F**	43,505
Adj. R Square	0,921	**Sig.**	0,000
Regression S. E.	4,539	**Durbin-Watson**	1,827

11.4.12. Government Consumption

The best explanatory variables for government consumption, which is not the same as government expenditure, are compensation of employees for sector G (public administration, defense, education, etc.), which is actually proportional to intermediate inputs of said sector, as well as employment. Once again, like I did for non-profits, I assumed that the sectoral consumption is proportional to the total value since it once again gives good results.

$$ConsGV_t = \alpha + \beta_1 \cdot Emp_t + \beta_2 \cdot COE\_G_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-31789,590	3883,279	-8,186	0,000
Emp	1,560	0,309	5,051	0,001
COE_G	1,569	0,015	106,563	0,000

R	1,000	**SS Resid.**	7231058,043
R Square	1,000	**F**	13058,641
Adj. R Square	1,000	**Sig.**	0,000
Regression S. E.	896,354	**Durbin-Watson**	1,867

A - Agricultural Sector

$$ConsGV\_A_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	33,499
ConsGV	,001

B - Manufacturing/Industrial Sector

$$ConsGV\_B_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	2373,788
ConsGV	,010

C - Energy & Water Sector

$$ConsGV\_C_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	-137,177
ConsGV	,002

D - Construction Sector

$$ConsGV\_D_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	-4,651
ConsGV	3,85E-04

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$ConsGV\_E_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	-1700,742
ConsGV	,097

F - Financial, Real Estate and Business Services

$$ConsGV\_F_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	-879,812
ConsGV	,012

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$ConsNP\_G_t = \alpha + \beta_1 \cdot ConsNP_t$$

	Coeff
(Constant)	489,417
ConsGV	,844

Impts - Imports

$$ConsGV\_Impts_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	-494,815
ConsGV	,032

TLS - Taxes Less Subsidies on Consumption

In this case, just like in non-profit consumption, proportionality didn't provide a reasonable result. Instead the explanatory variables employment (actual and previous year's), and previous year's gross operating surplus were used.

$$ConsHH\_TLS_t = \alpha + \beta_1 \cdot Emp_t + \beta_2 \cdot Emp_{t-1} + \beta_3 \cdot GOS_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-240,256	289,131	-0,831	0,430
Emp	0,230	0,044	5,239	0,001
Emp1	-0,225	0,063	-3,582	0,007
GOS1	0,002	0,001	2,907	0,020

R	0,932	SS Resid.	24254,013
R Square	0,868	F	17,550
Adj. R Square	0,819	Sig.	0,001
Regression S. E.	55,061	Durbin-Watson	2,292

ITM - International Transport Margins

$$ConsGV\_ITM_t = \alpha + \beta_1 \cdot ConsGV_t$$

	Coeff
(Constant)	-7,394
ConsGV	,001

11.4.13.Government Expenditure and Revenue

Government expenditure, which includes government consumption, can be well explained by the past period's compensation of employees and employment.

$$GovExpend_t = \alpha + \beta_1 \cdot Emp_{t-1} + \beta_2 \cdot COE_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	59898,232	14466,163	4,141	0,003
Emp1	-13,804	1,575	-8,763	0,000
COE1	1,263	0,028	45,006	0,000

R	1,000	**SS Resid.**	74813650,792
R Square	0,999	**F**	5234,464
Adj. R Square	0,999	**Sig.**	0,000
Regression S. E.	2883,163	**Durbin-Watson**	1,294

With the addition of current years employment to the explanatory variables then one can model government revenue.

$$GovRev_t = \alpha + \beta_1 \cdot Emp_t + \beta_2 \cdot Emp_{t-1} + \beta_3 \cdot COE_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-199897,624	39519,340	-5,058	0,001
Emp	66,957	7,024	9,533	0,000
Emp1	-52,751	10,493	-5,027	0,001
COE1	0,731	0,109	6,680	0,000

R	0,994	**SS Resid.**	485811768,646
R Square	0,988	**F**	229,216
Adj. R Square	0,984	**Sig.**	0,000
Regression S. E.	7792,719	**Durbin-Watson**	2,631

11.4.14. Gross Fixed Capital Formation

Gross fixed capital is good proxy for investment, which can be modeled by taking capital stock of the previous period and profits for the current and previous period as explanatory variables. In this case the explanatory variable used instead of gross operating surplus has been the total intermediate inputs variable. In order to model sectoral investment I simply applied these variables as the explanatory variables for the different sectors since I didn't have the capital stock for each sector.

A - Agricultural Sector

$$GFCF\_A_t = \alpha + \beta_1 \cdot CS_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	1301,299	143,076	9,095	0,000
CS1	-2,64E-04	0,000	-5,638	0,000
R	0,872	**SS Resid.**	50322,199	
R Square	0,761	**F**	31,786	
Adj. R Square	0,737	**Sig.**	0,000	
Regression S. E.	70,938	**Durbin-Watson**	2,841	

B - Manufacturing/Industrial Sector

$$GFCF\_B_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot IntInp_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	30461,809	6831,184	4,459	0,002
CS1	-0,02	0,005	-3,269	0,010
IntInp1	0,043	0,012	3,567	0,006
R	0,776	**SS Resid.**	30864547,232	
R Square	0,601	**F**	6,790	
Adj. R Square	0,513	**Sig.**	0,016	
Regression S. E.	1851,862	**Durbin-Watson**	1,559	

C - Energy & Water Sector

$$GFCF\_C_t = \alpha + \beta_1 \cdot CS_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-554,552	62,440	-8,881	0,000
CS1	3,46E-04	0,000	16,941	0,000
R	0,983	**SS Resid.**	9584,069	
R Square	0,966	**F**	287,008	
Adj. R Square	0,963	**Sig.**	0,000	
Regression S. E.	30,958	**Durbin-Watson**	2,382	

D - Construction Sector

$$GFCF\_D_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot IntInp_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	72227,150	9872,716	7,316	0,000
CS1	-0,084	0,008	-10,736	0,000
IntInp	0,351	0,019	18,182	0,000
R	0,993	**SS Resid.**	167842665,377	
R Square	0,986	**F**	307,999	
Adj. R Square	0,982	**Sig.**	0,000	
Regression S. E.	4318,470	**Durbin-Watson**	1,376	

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$GFCF\_E_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot IntInp_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	1280,495	886,461	1,445	0,182
CS1	-0,002	0,001	-3,253	0,010
IntInp	0,022	0,002	12,745	0,000
R	0,994	**SS Resid.**	1353158,283	
R Square	0,988	**F**	357,695	
Adj. R Square	0,985	**Sig.**	0,000	
Regression S. E.	387,751	**Durbin-Watson**	2,362	

F - Financial, Real Estate and Business Services

$$GFCF\_F_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot IntInp_t + \beta_3 \cdot IntInp_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	9825,149	3619,584	2,714	0,026
CS1	-0,012	0,003	-4,697	0,002
IntInp	0,091	0,006	13,967	0,000
IntInp1	-0,026	0,009	-2,751	0,025
R	0,996	**SS Resid.**	4766461,000	
R Square	0,991	**F**	310,872	
Adj. R Square	0,988	**Sig.**	0,000	
Regression S. E.	771,886	**Durbin-Watson**	2,051	

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$GFCF\_G_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot IntInp_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	271,490	35,831	7,577	0,000
CS1	-2,96E-04	0,000	-10,493	0,000
IntInp	0,002	0,000	24,166	0,000

R	0,997	SS Resid.	2210,816
R Square	0,995	F	828,944
Adj. R Square	0,993	Sig.	0,000
Regression S. E.	15,673	Durbin-Watson	2,820

Impts - Imports

$$GFCF\_Impts_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot IntInp_t + \beta_3 \cdot IntInp_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	32774,011	10948,068	2,994	0,017
CS1	-2,15E-02	0,008	-2,824	0,022
IntInp	0,153	0,020	7,782	0,000
IntInp1	-0,084	0,029	-2,915	0,019

R	0,965	SS Resid.	43606750,790
R Square	0,931	F	36,214
Adj. R Square	0,906	Sig.	0,000
Regression S. E.	2334,704	Durbin-Watson	2,995

TLS - Taxes Less Subsidies on Consumption

The explanatory variables chosen for sectoral investment didn't give good results, however employment and compensation of employees did.

$$GFCF\_TLS_t = \alpha + \beta_1 \cdot Emp_t + \beta_2 \cdot Emp_{t-1} + \beta_3 \cdot COE_t + \beta_4 \cdot COE_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-25733,206	2311,575	-11,132	0,000
Emp	6,860	0,479	14,326	0,000
Emp1	-4,537	0,364	-12,480	0,000
COE	-0,088	0,018	-4,812	0,002
COE1	0,088	0,015	5,880	0,001

R	0,997	**SS Resid.**	370922,019
R Square	0,995	**F**	329,639
Adj. R Square	0,992	**Sig.**	0,000
Regression S. E.	230,193	**Durbin-Watson**	2,303

ITM - International Trade Margins

$$GFCF\_ITM_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot IntInp_t + \beta_3 \cdot IntInp_{t-1}$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	2223,601	756,313	2,940	0,019
CS1	-0,001	0,001	-2,593	0,032
IntInp	0,009	0,001	6,505	0,000
IntInp1	-0,005	0,002	-2,374	0,045

R	0,952	**SS Resid.**	208104,472
R Square	0,907	**F**	26,083
Adj. R Square	0,872	**Sig.**	0,000
Regression S. E.	161,286	**Durbin-Watson**	2,809

CS - Capital Stock

Gross fixed capital formation is not actually investment. The two main things missing is the inclusion of financial assets and inventories. For this reason the equation $Capital\ Stock_t = Investment_t + Capital\ Stock_{t-1}$ cannot be used per se. However the following does give a good result:

$$CS_t = \alpha + \beta_1 \cdot CS_{t-1} + \beta_2 \cdot GFCF_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	176521,318	2823,227	62,525	0,000
CS1	0,919	0,001	809,087	0,000
GFCF	0,757	0,010	76,366	0,000

R	1,000	**SS Resid.**	17340644,632
R Square	1,000	**F**	563362,205
Adj. R Square	1,000	**Sig.**	0,000
Regression S. E.	1388,070	**Durbin-Watson**	1,473

11.4.15. Intermediate Transaction Matrix

The intermediate transaction matrix, and consequently the intermediate outputs, can be easily obtained if one considered that the technical coefficients don't change significantly for determined periods of time, which is what I have done in this case.

11.4.16.Exports

If one looks at the main destination of Spanish exports then one can see that the majority of these are European countries. Keeping this in mind it seems reasonable that, as results show, exports can be modeled by the following three explanatory variables. The first two are the GDPs of the Euro Area 17 (excluding Spain) and EU-28 (excluding Spain). The third variable is compensation of employees, which make sense keeping in mind that it's often argued that lower salaries promotes exports.

$$Exp_t = \alpha + \beta_1 \cdot (GDPEU28_t - GDPEA17_t) + \beta_2 \cdot (GDPEA17_t - GDPSpain_t) + \beta_3 \cdot COE_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-333248,397	27295,963	-12,209	0,000
EU28-EA17	0,023	0,010	2,437	0,041
EA17-Spain	0,094	0,009	10,037	0,000
COE	-0,501	0,081	-6,177	0,000

R	0,996	**SS Resid.**	135284820,324
R Square	0,993	**F**	370,380
Adj. R Square	0,990	**Sig.**	0,000
Regression S. E.	4112,250	**Durbin-Watson**	1,745

As I did for household consumption instead of making sectoral exports proportional to total exports I decided to use these three explanatory variables for each of the sectors.

A - Agricultural Sector

$$Exp\_A_t = \alpha + \beta_1 \cdot (GDPEA17_t - GDPSpain_t)$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and the Durbin-Watson statistic was inconclusive although it was scratching the upper limit (1,023).

	Coeff	S.E.	t	Sig.
(Constant)	-982,379	1267,146	-0,775	0,456
EA17-Spain	0,001	0,000	8,615	0,000

R	0,939	**SS Resid.**	1873938,052
R Square	0,881	**F**	74,212
Adj. R Square	0,869	**Sig.**	0,000
Regression S. E.	432,890	**Durbin-Watson**	1,262

B - Manufacturing/Industrial Sector

$$Exp\_B_t = \alpha + \beta_1 \cdot (GDPEU28_t - GDPEA17_t) + \beta_2 \cdot (GDPEA17_t - GDPSpain_t) + \beta_3 \cdot COE_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-253779,950	24131,215	-10,517	0,000
EU28 -EA17	0,026	0,008	3,089	0,015
EA17-Spain	0,071	0,008	8,618	0,000
COE	-0,442	0,072	-6,167	0,000

R	0,995	**SS Resid.**	105733017,164
R Square	0,989	**F**	243,231
Adj. R Square	0,985	**Sig.**	0,000
Regression S. E.	3635,468	**Durbin-Watson**	1,741

C - Energy & Water Sector

$$Exp\_C_t = \alpha + \beta_1 \cdot (GDPEU28_t - GDPEA17_t) + \beta_2 \cdot (GDPEA17_t - GDPSpain_t) + \beta_3 \cdot COE_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-2084,097	255,120	-8,169	0,001
EU28 -EA17	0,000	0,000	-3,758	0,020
EA17-Spain	0,001	0,000	7,008	0,002
COE	-0,002	0,001	-2,780	0,050

R	0,993	**SS Resid.**	5490,488
R Square	0,986	**F**	92,167
Adj. R Square	0,975	**Sig.**	0,000
Regression S. E.	37,049	**Durbin-Watson**	2,063

D - Construction Sector

$$Exp\_D_t = \alpha + \beta_1 \cdot COE_t$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	75,674	43,008	1,760	0,109
COE	0,001	0,000	5,760	0,000
R	0,877	SS Resid.	6307,622	
R Square	0,768	F	33,176	
Adj. R Square	0,745	Sig.	0,000	
Regression S. E.	25,115	Durbin-Watson	1,618	

E - Commerce, Restaurants, Hotels, Transport, Storage and Communication, Other Community, Social and Personal Services

$$Exp\_E_t = \alpha + \beta_1 \cdot (GDPEA17_t - GDPSpain_t)$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-18648,428	2030,054	-9,186	0,000
EA17-Spain	0,005	0,000	19,631	0,000
R	0,987	SS Resid.	4809687,858	
R Square	0,975	F	385,382	
Adj. R Square	0,972	Sig.	0,000	
Regression S. E.	693,519	Durbin-Watson	1,241	

F - Financial, Real Estate and Business Services

In this case, autocorrelation appeared and was solved by introducing a the variable lagged by one period.

$$Exp\_F_t = \alpha + \beta_1 \cdot (GDPEA17_t - GDPSpain_t)$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and the Durbin-Watson statistic was inconclusive.

	Coeff	S.E.	t	Sig.
(Constant)	-38683,736	3672,488	-10,533	0,000
EA-17mSpain	0,008	0,000	16,168	0,000
R	0,981	SS Resid.	15740642,356	
R Square	0,963	F	261,389	
Adj. R Square	0,959	Sig.	0,000	
Regression S. E.	1254,617	Durbin-Watson	1,328	

G - Public Admin, Defense, Social Security, Education, Health and Social Work

$$Exp\_G_t = \alpha + \beta_1 \cdot (GDPEA17_t - GDPSpain_t)$$

Shapiro-Wilk test was used to check for normality and Durbin-Watson for autocorrelation. Results indicated that residuals were normally distributed and that there is no autocorrelation.

	Coeff	S.E.	t	Sig.
(Constant)	-2626,785	128,847	-20,387	0,000
EA17-Spain	0,000	0,000	28,468	0,000
R	0,994	SS Resid.	19375,335	
R Square	0,988	F	810,405	
Adj. R Square	0,987	Sig.	0,000	
Regression S. E.	44,017	Durbin-Watson	2,247	

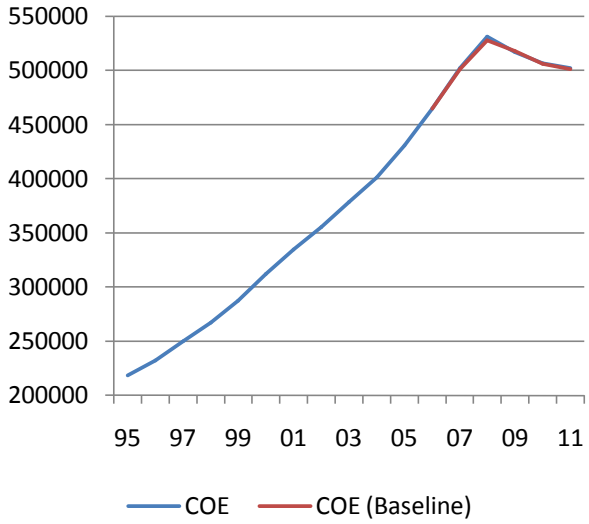
11.4.17. Verification of the Model

The model will now be verified through a re-estimation of the values (Baseline values) for the past 5 years of available data (2007 to 2011) taking the actual values of the exogenous variables which in this case are intermediate inputs for all sectors and the UK's GDP, the EU28 GDP (subtracting the UK's and Spain's GDP), and the Euro Area's GDP (subtracting Spain's GDP).

Since there are a great number of things that are modeled, I made the decision of not supplying graphs for everything in this verification. Only the most important results

will be given. For example, the non-profit consumption is quite irrelevant at a sectoral perspective, so only the aggregate will be shown.

As can be seen below the result are quite accurate, although in several instances like for sectoral international transport margins, sectoral taxes less subsidies on production, as well as sectoral other taxes less subsidies on production this is not the case. However, I would argue that in the big picture that the importance of the accuracy in these cases is not that significant.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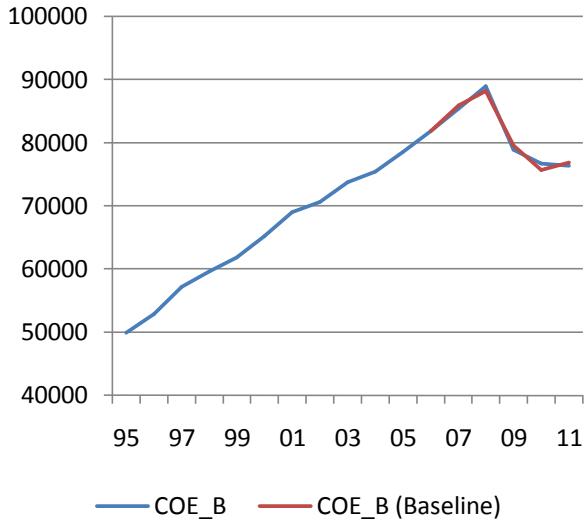
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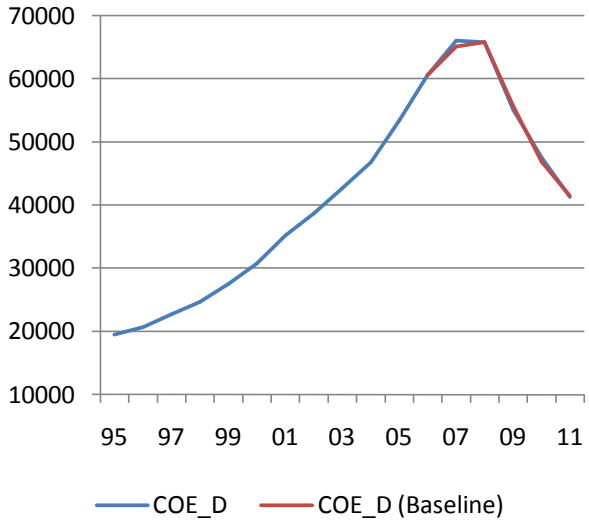
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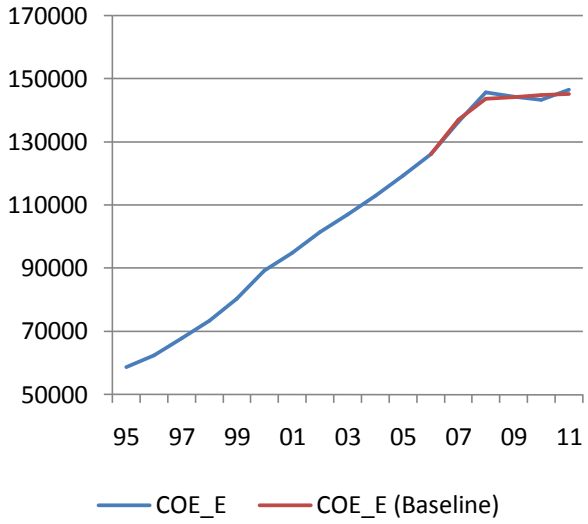
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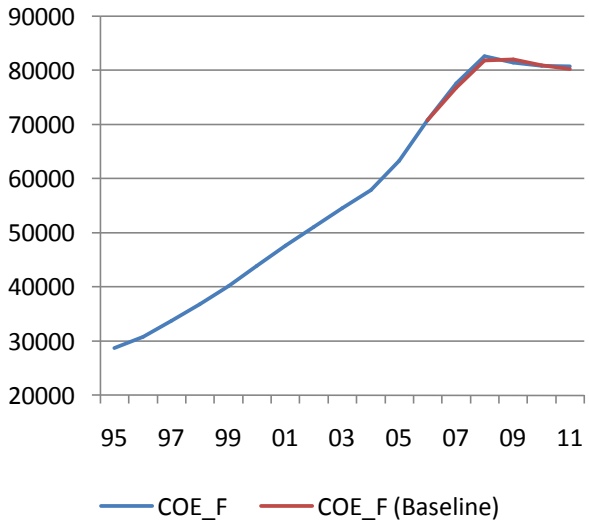
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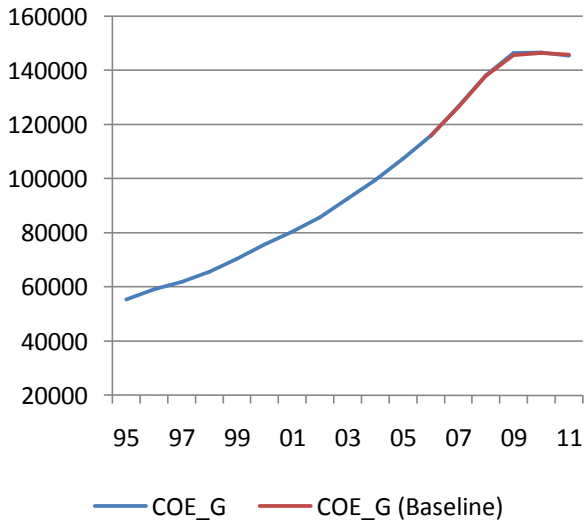
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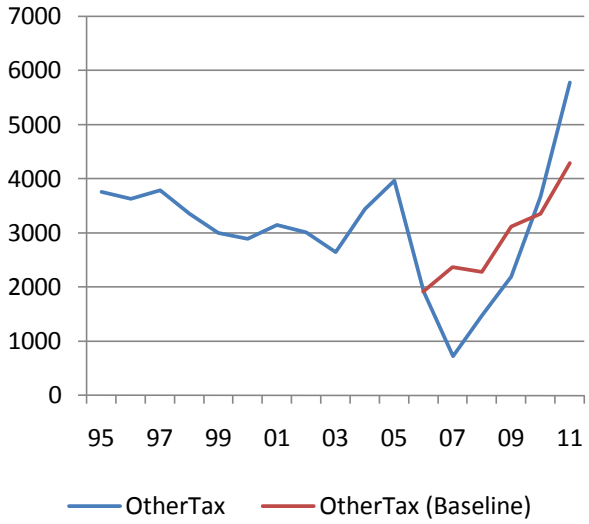
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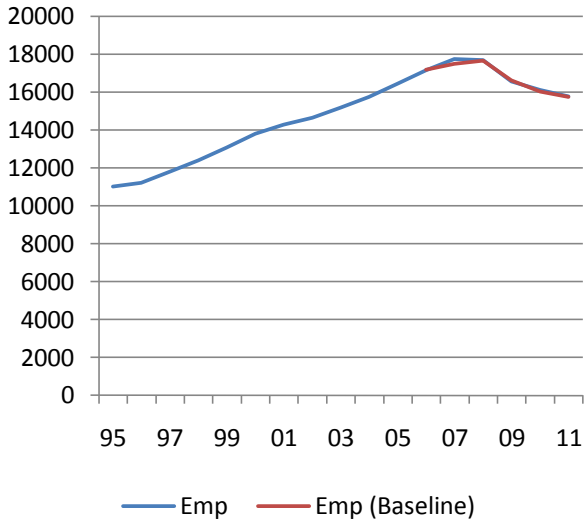
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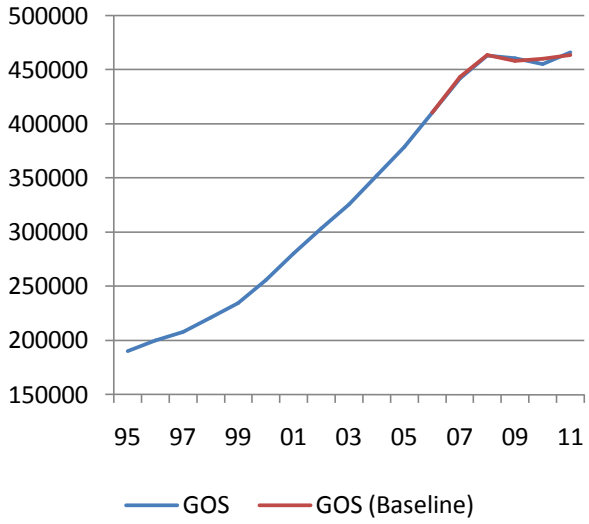
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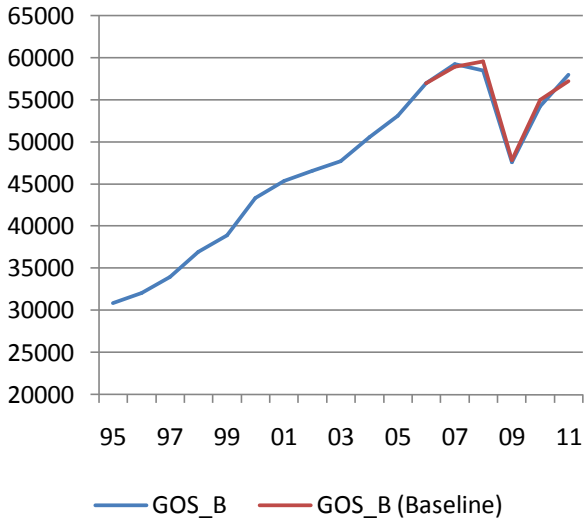
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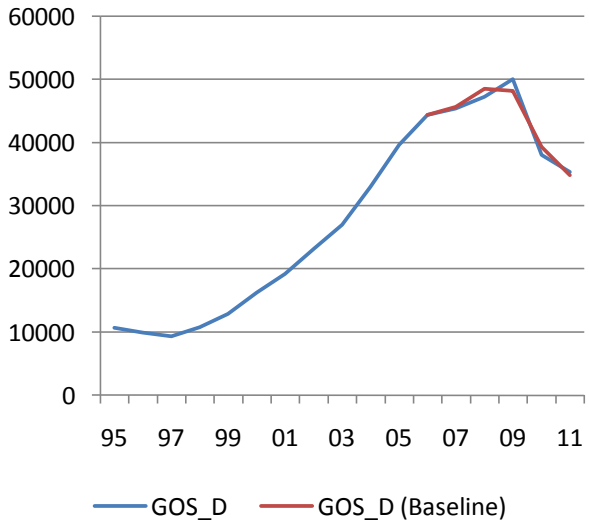
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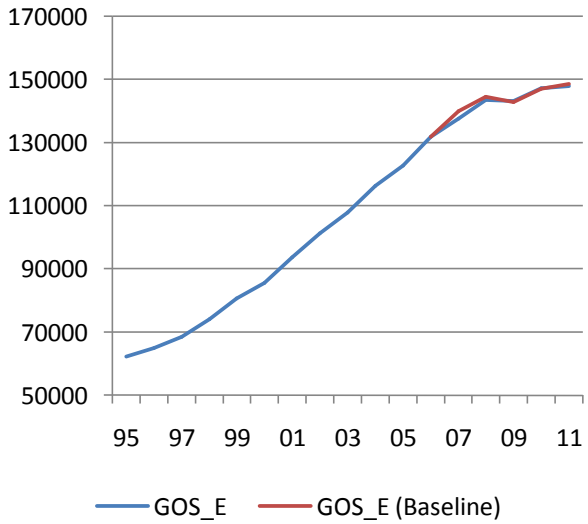
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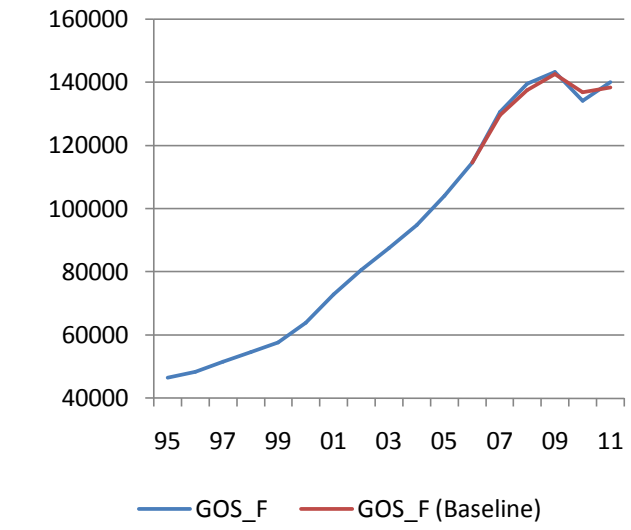
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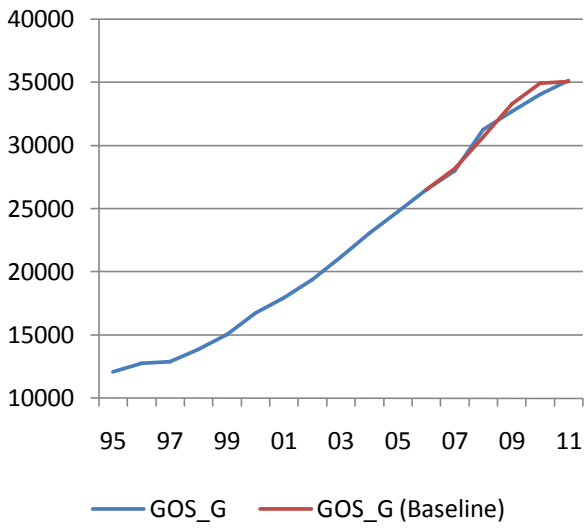
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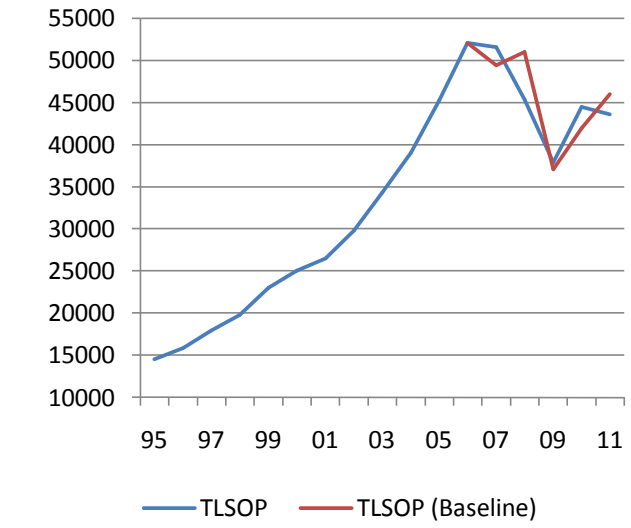
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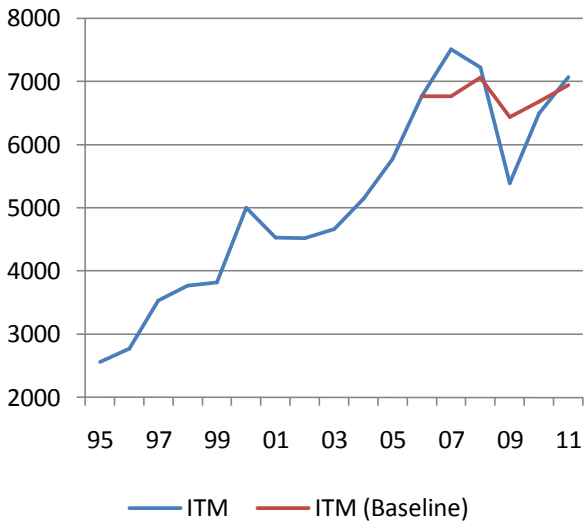
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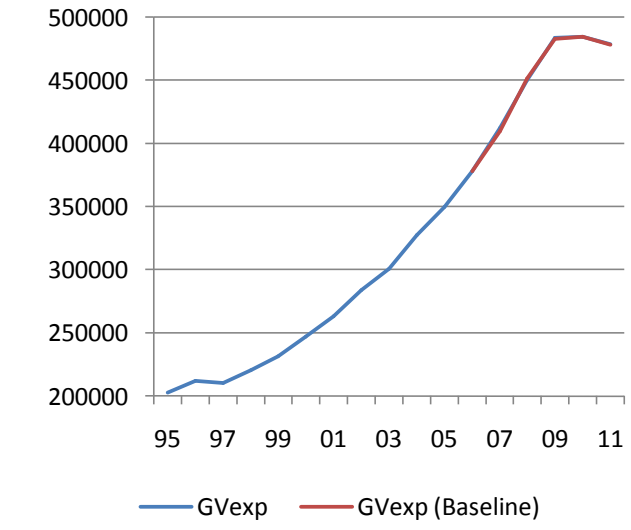
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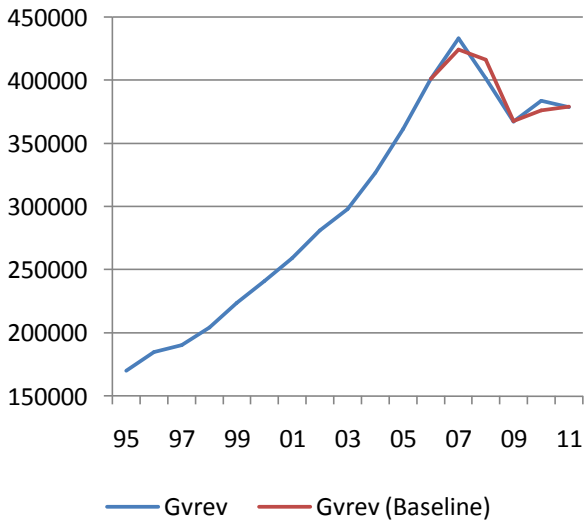
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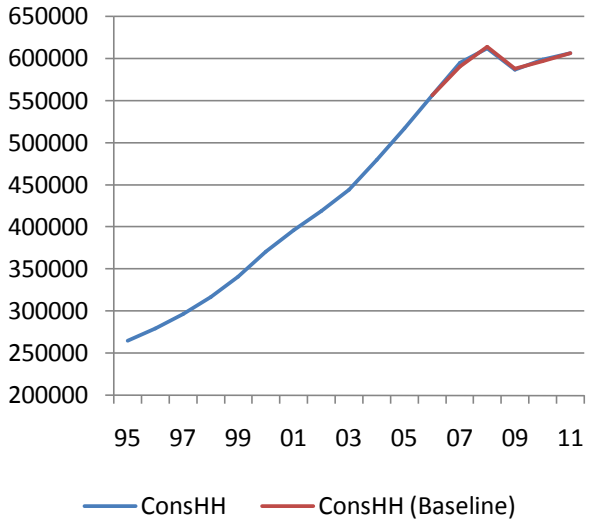
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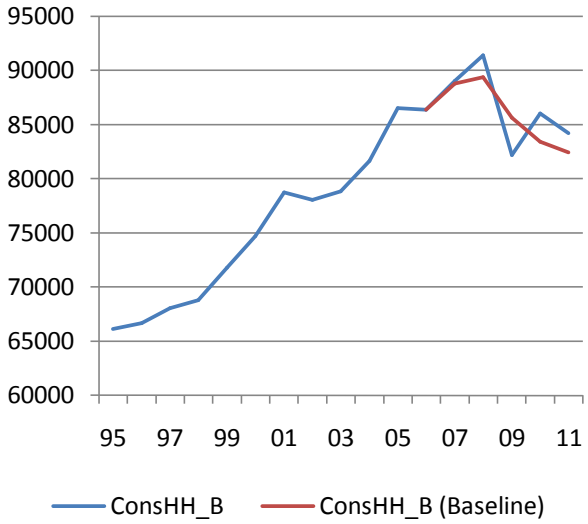
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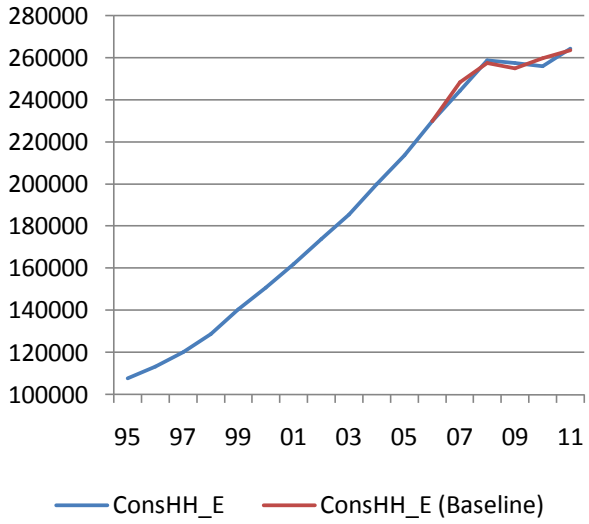
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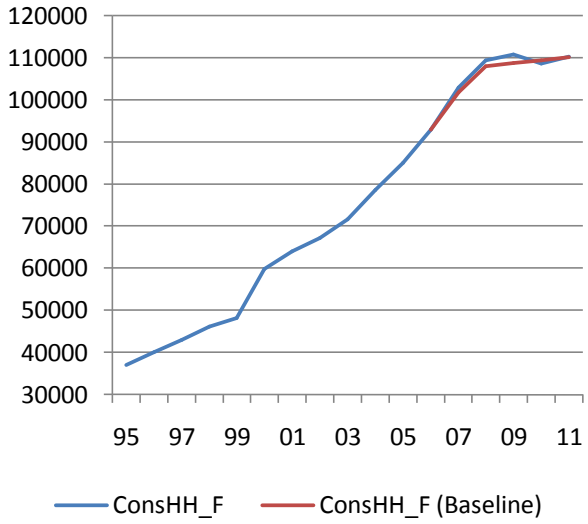
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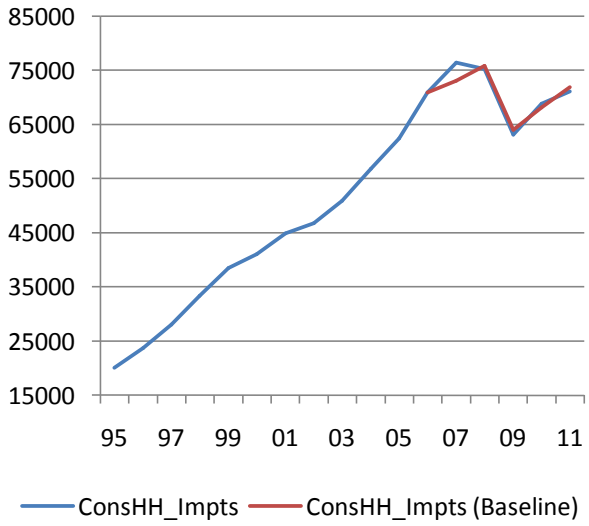
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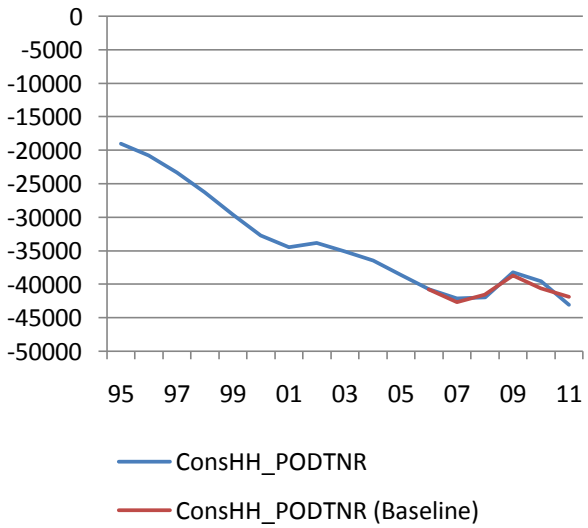
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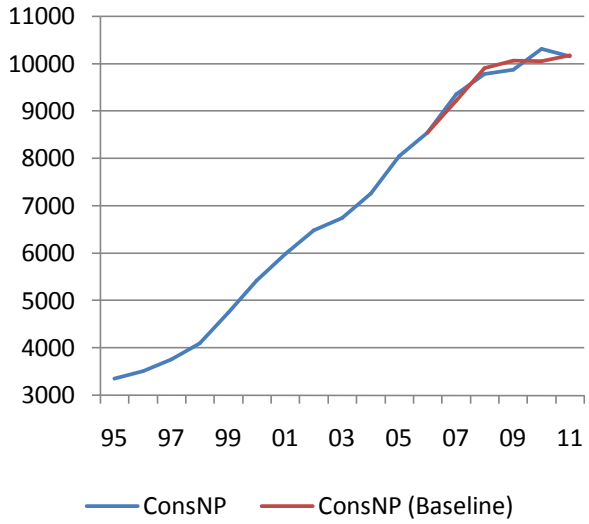
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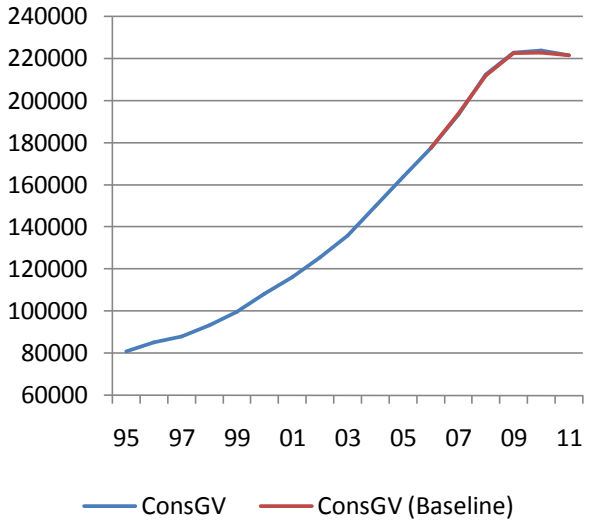
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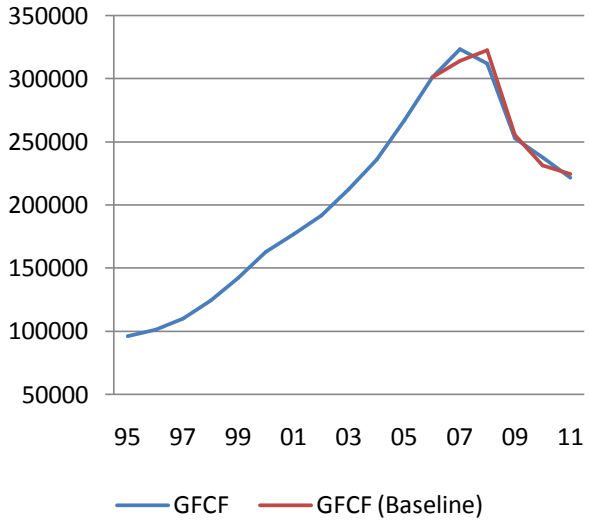
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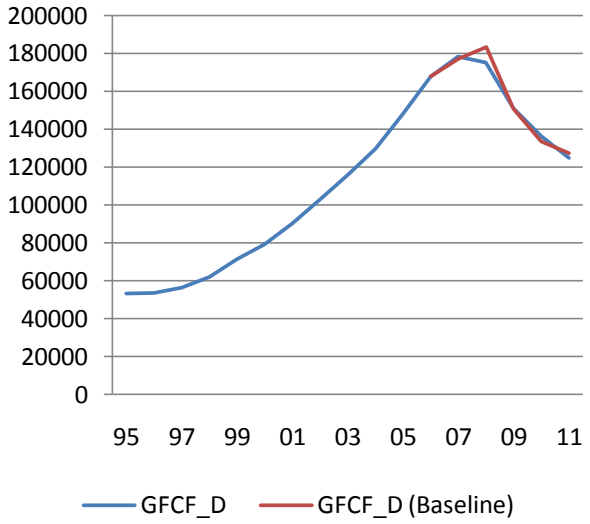
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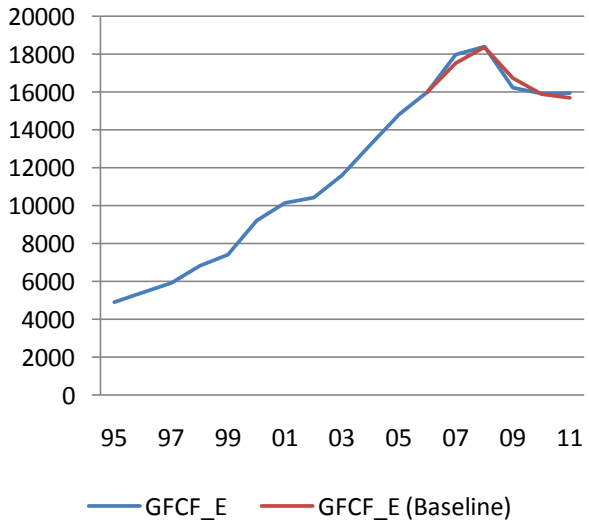
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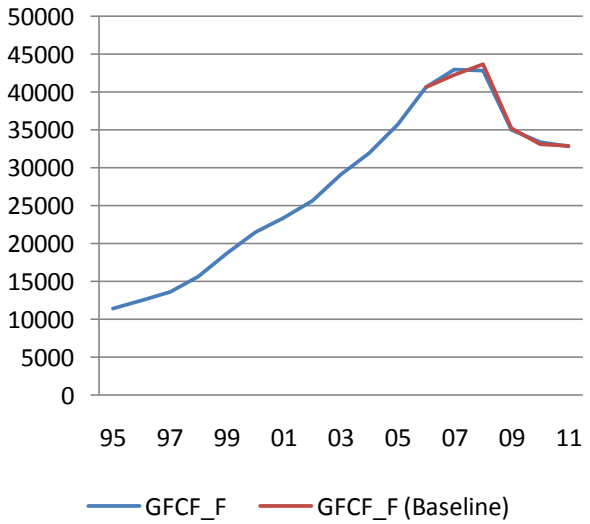
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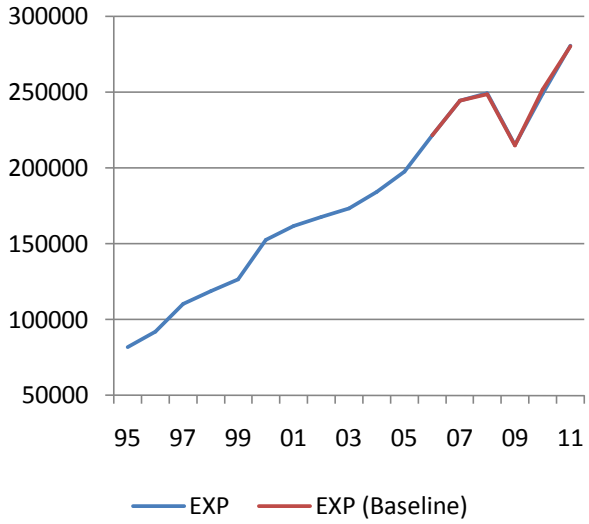
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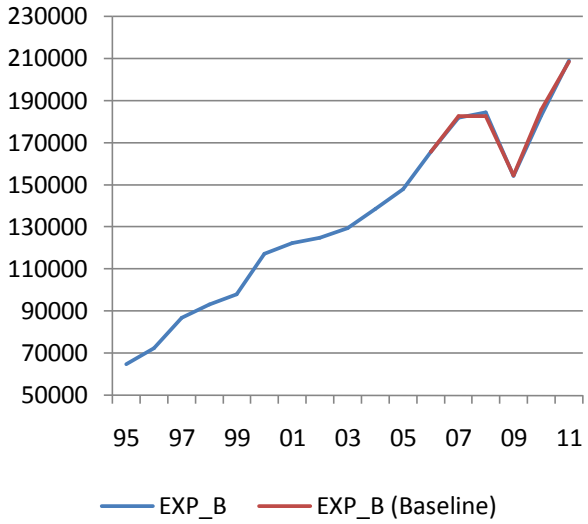
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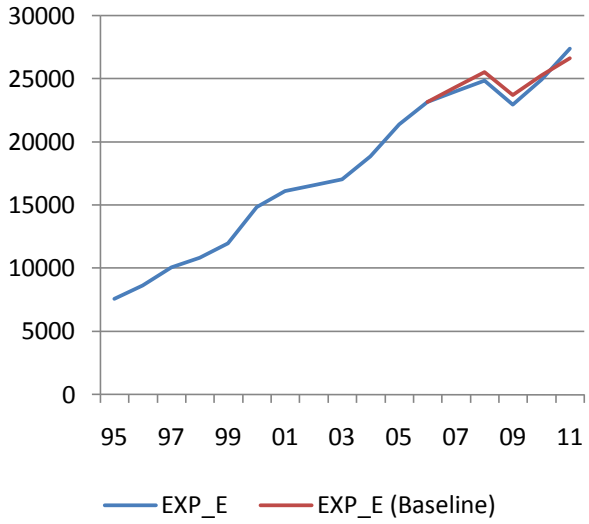
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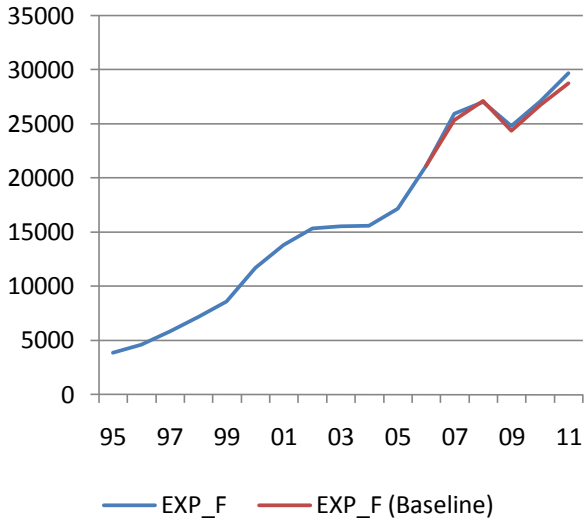
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11.5. Estimation of Exogenous Values and Scenarios

11.5.1. Intermediate Inputs for 2012 and 2013

In the last section of this work the effects of scenarios are evaluated for the period 2014 - 2018. However since the WIOD data only provides sectoral intermediate inputs until 2011 a rough estimate of these inputs has been obtained for 2012 and 2013.

Looking at INE data one can obtain the value added growth rate for each of the sectors selected for this work except for the manufacturing and mining sector (sector B) and the energy sector (sector C) which are put together. If one takes the last observed sectoral relation between intermediate input (2011) value added and applies it to the INE data then a rough estimate of the sectoral intermediate inputs for 2012 and 2013 can be obtained, although it must be said that 2013 is an early forecast and is not that trustworthy. To separate the value added of sector C and sector B I assumed that the value added growth for the energy sector would be 10% for both years, which is very similar to the last few years up to 2011. With that I could now obtain an estimate of the value added growth of the manufacturing sector. The estimated values can be found in the table below.

Sectoral intermediate input estimation

	2012	*2013*
A	21.090	21.717
B	383.987	378.161
C	53.251	56.077
D	90.186	81.714
E	259.823	254.941
F	111.961	109.837
G	67.826	68.085

Units: Millons of €

11.5.2. Scenarios for 2014 - 2018

Three different scenarios will be looked at. In this case, through the many interesting possible scenarios, one that has recently arrived was chosen. The scenario will be the effects produced by variations in exports and tourism given by the possible different growth scenarios for the rest of the European economies. This scenario arises

given the recent announcement of adjustment of forecasts of European economies with a lowering of expectations.

In particular the scenarios will deal with IMF forecasts from the Economic Outlook Database (April 2014). The optimistic scenario will be based on the growth forecasts given by the IMF. The intermediate scenario will consist of the actual growth being half of that forecasted in the optimistic scenario while the pessimistic scenario will assume no real growth rates. In all scenarios inflation will be considered unchanging with respect to the IMF forecast. These IMF forecasts will be given below.

11.5.3. Exogenous variables for 2014 - 2018

Regarding the GDPs of EU28 and EA17, the data will be taken from the IMF forecast (IMF, World Economic Outlook Database, April 2014). With those forecasts I've calculated the forecast of GDPs in current prices and subtracted IMF's forecast for Spain's GDP in current prices, thus obtaining the values for the necessary exogenous variables used in the model. Results are shown in the following table along with the other two scenarios.

GDP in market prices (scenarios)

		2014	2015	2016	2017	2018
Optimistic (IMF forecast)						
	EU-EA	3.748.261	3.934.216	4.130.592	4.338.430	4.559.916
	EA-Spain	8.803.718	9.035.806	9.304.416	9.583.064	9.888.589
Intermediate						
	EU-EA	3.697.315	3.831.278	3.971.238	4.117.681	4.270.145
	EA-Spain	8.747.712	8.906.539	9.094.426	9.287.955	9.503.904
Pessimistic						
	EU-EA	3.646.368	3.729.456	3.815.374	3.904.211	3.993.167
	EA-Spain	8.691.706	8.778.102	8.887.289	8.999.021	9.130.086

Units: Millons of €
Source: Self-made from IMF Outlook Database, April 2014 and Eurostat data

Regarding the sectoral intermediate inputs, they will be exponentially smoothed and modified for each scenario accordingly since a variation in exports and foreign tourism produces a variation in final demand which in turn produces a variation in

national demand, both of which produce a variation in intermediate inputs since there is a different final demand.

The process starts with the intermediate scenario. The exponentially smoothed intermediate inputs are put into the model and an adjustment is done so that they are in accordance with final demand (consumption, investment, and exports)..

This adjustment is done by introducing the final demand *y* into $x = (I - A)^{-1} \cdot y$ thus obtaining *x* which is the total demand, when assuming a fixed A, give intermediate inputs as explained previously. With this, the intermediate inputs for the intermediate scenario are ready.

The intermediate inputs for the other two scenarios will be obtained by considering the effects that the variations of exports produce with respect to the intermediate scenario. In this way the variation in intermediate inputs directly due to the variations in exports (again, with respect to the intermediate scenario) is also calculated by means of $x = (I - A)^{-1} \cdot y$ where in this case *y* would be the variation of exports and *x* the variation of final demand, which in turn gives the variation of intermediate inputs. This variation of intermediate inputs is applied to the intermediate scenario. To clarify, a variation increase in exports and tourism with respect to the intermediate scenario produces a variation with respect to the intermediate inputs of the intermediate scenario.

This variation of intermediate inputs gives a variation of demand which, again, is translated to a variation of intermediate inputs through $x = (I - A)^{-1} \cdot y$ and which is applied to all the following periods in order to represent the effect that a variation of the demand in a certain period has in the following periods in terms of intermediate inputs. Once this is done the exogenous data is ready for the three scenarios.

11.5.4. Results

First of all the results are given for the intermediate scenario, which can be seen in figures 1 and 2. After that, the variations for the other two scenarios will be given and can be seen in figures 3 and 4.

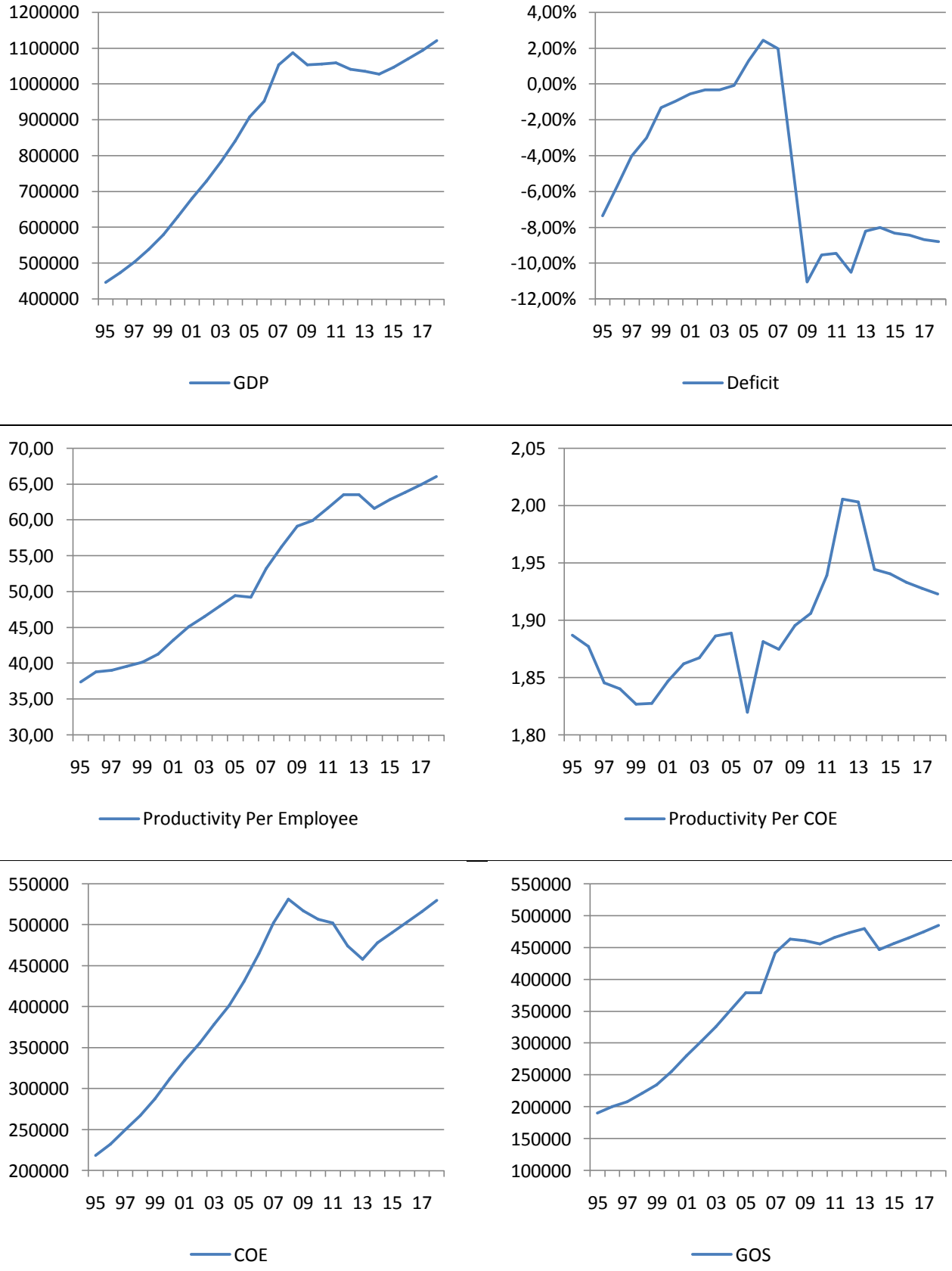
The model predicts, given the exponential smoothing and adjustment of the intermediate inputs, a recovery for the Spanish economy at a growth rate similar to that predicted for the rest of Europe in a much slower fashion than the pre-crisis unnatural growth. As for the budget deficit, it is predicted to slowly increase. It must be said that while analyzing the explanatory variables for the deficit, even for recent data (until 2013) which I analyzed separately from the model to be sure, government spending seems to not factor in the budget deficit, even for the most recent years where this was apparently increasingly important for the government.

Productivity per employee is predicted to rise following the general historical tendency while productivity per compensation of employee will be diminished at a slow rate indicating that unitary labor costs will once again increase after the crisis. Employment and household consumption and investment, will follow the growth path of the whole economy, but in a more timid fashion than before the economic crisis. As opposed to household consumption, government consumption will hardly grow at all.

In figures 3 and 4 all three scenarios are compared with growth rates. These results show an interval between the optimistic scenario and the pessimist scenario in accordance with the exogenous variables corresponding with the EU's and Euro Area's GDPs.

In general for the optimistic scenario the result is simply that the growth rates increase with respect to the intermediate scenario. In the pessimistic scenario the opposite happens. The economy shows low growth rates which in most cases are decreasing and either nearing 0% or becoming negative like in the case of employment, government consumption and investment.

It's also interesting to note that the increase in exports in the optimistic scenario due to heavy increase of the EU's and Euro Area's GDPs is quite offset by the increase in compensation of employees, which lowers exports. The contrary happens for the pessimistic scenario.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GDP
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Deficit
70,00
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Productivity Per Employee
2,05
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Productivity Per COE
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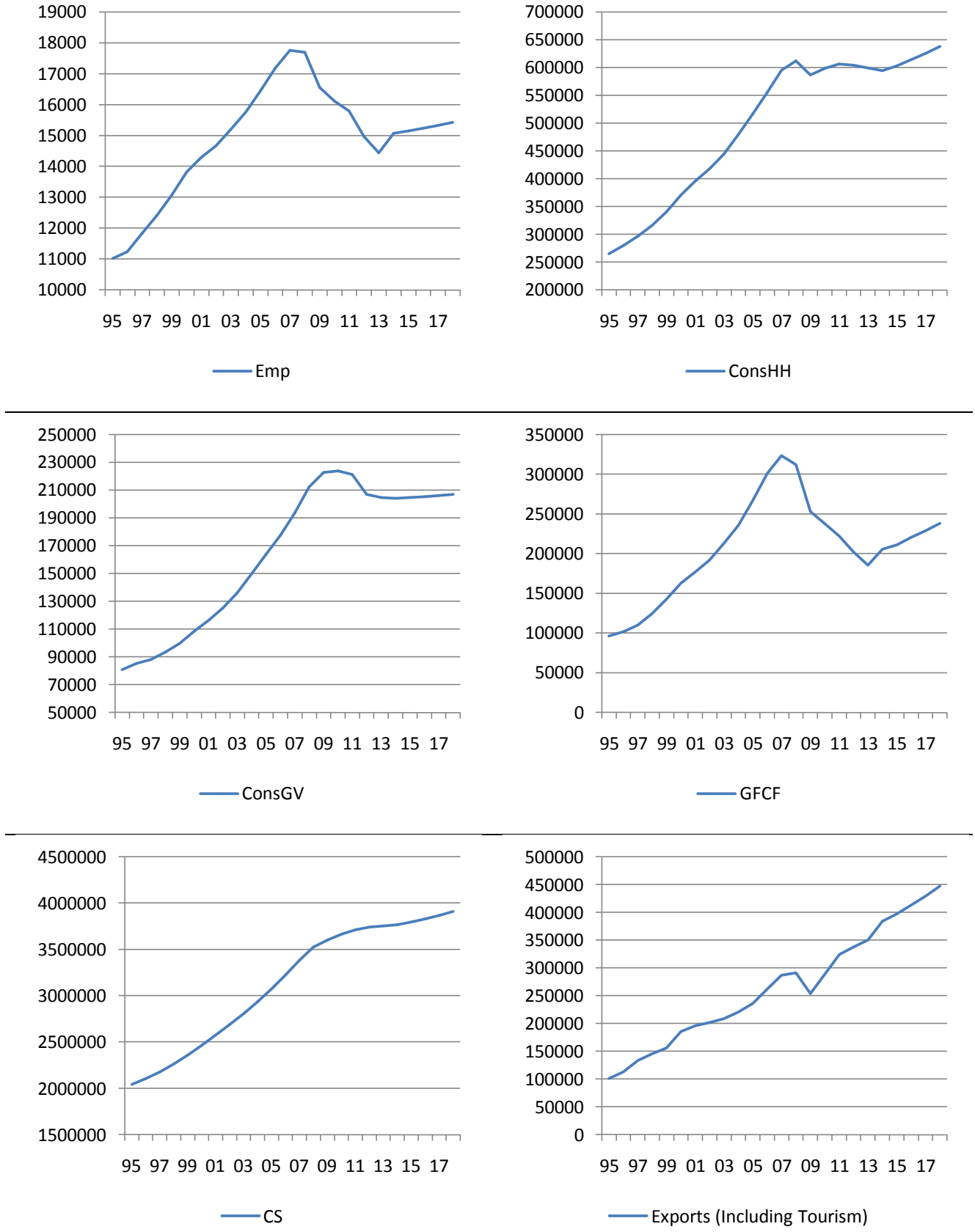
GOS

Figure 1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Emp
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ConsHH
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GFCF
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CS
500000
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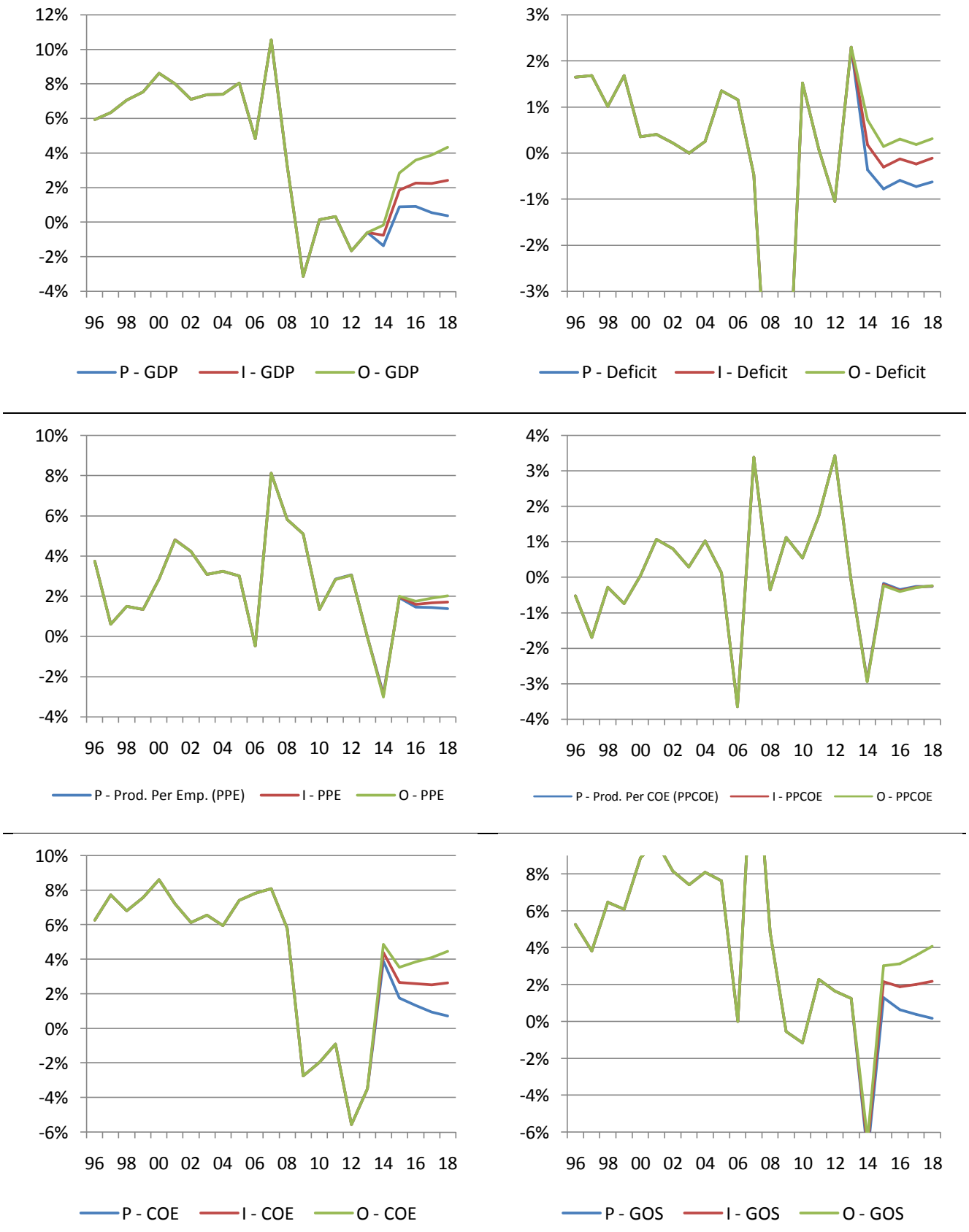
0
95 97 99 01 03 05 07 09 11 13 15 17
Exports (Including Tourism)

Figure 2


12%
10%
8%
6%
4%
2%
0%
-2%
-4%
96 98 00 02 04 06 08 10 12 14 16 18
P - GDP
I - GDP
O - GDP
3%
2%
1%
0%
-1%
-2%
-3%
96 98 00 02 04 06 08 10 12 14 16 18
P - Deficit
I - Deficit
O - Deficit
10%
8%
6%
4%
2%
0%
-2%
-4%
96 98 00 02 04 06 08 10 12 14 16 18
P - Prod. Per Emp. (PPE)
I - PPE
O - PPE
4%
3%
2%
1%
0%
-1%
-2%
-3%
-4%
96 98 00 02 04 06 08 10 12 14 16 18
P - Prod. Per COE (PPCOE)
I - PPCOE
O - PPCOE
10%
8%
6%
4%
2%
0%
-2%
-4%
-6%
96 98 00 02 04 06 08 10 12 14 16 18
P - COE
I - COE
O - COE
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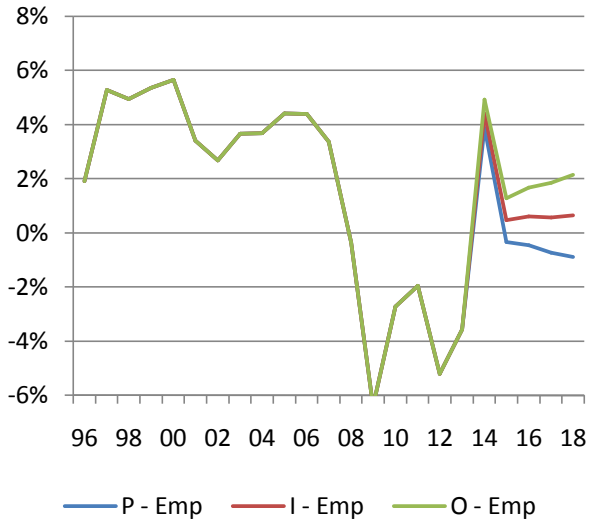
96 98 00 02 04 06 08 10 12 14 16 18
P - GOS
I - GOS
O - GOS

Figure 3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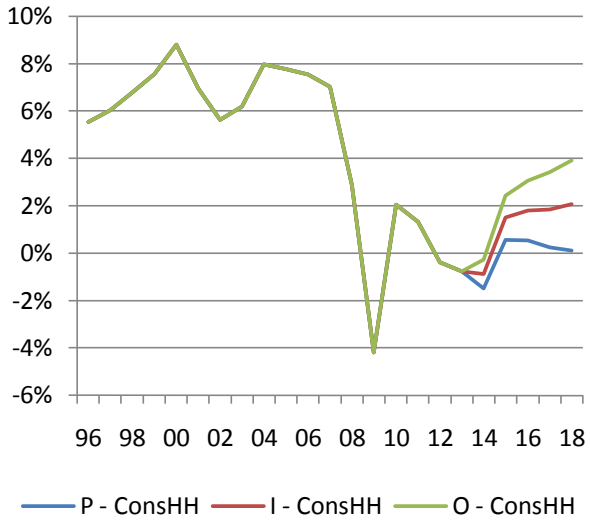
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P - ConsHH
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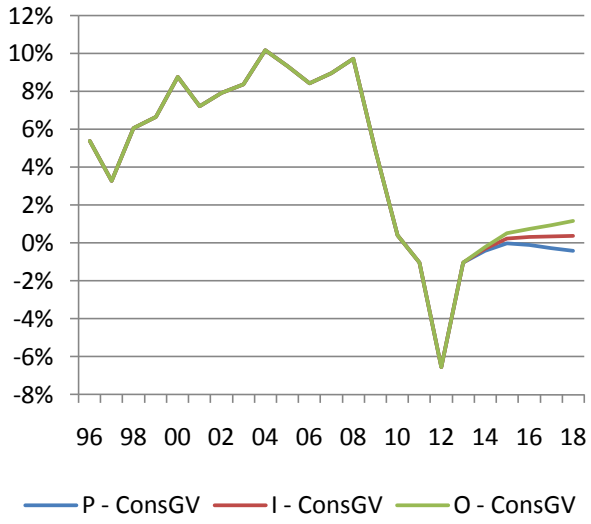
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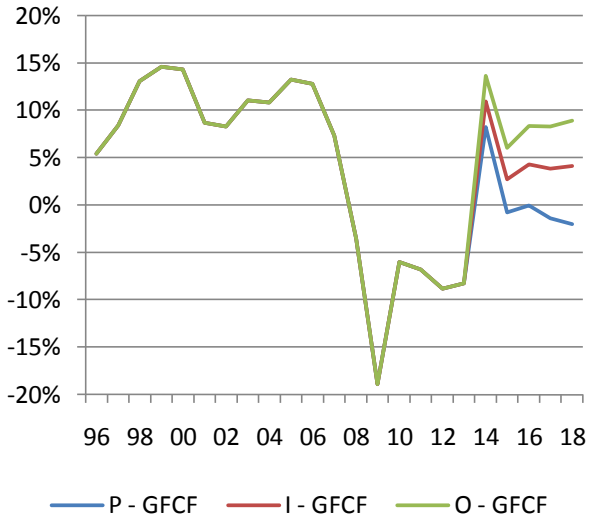
-8%
96 98 00 02 04 06 08 10 12 14 16 18
P - ConsGV
I - ConsGV
O - ConsGV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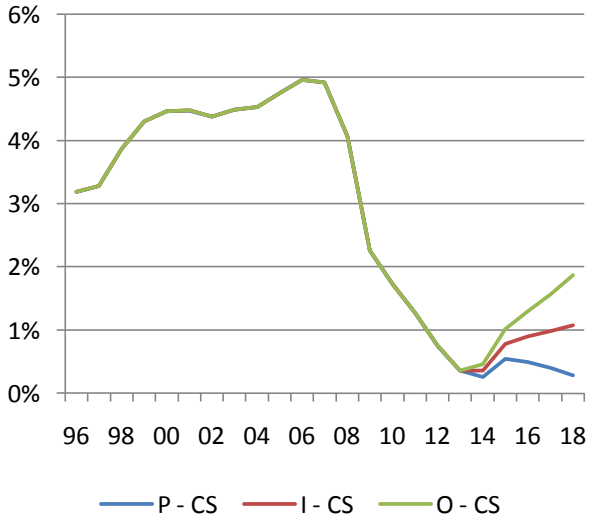
-20%
96 98 00 02 04 06 08 10 12 14 16 18
P - GFCF
I - GFCF
O - GFCF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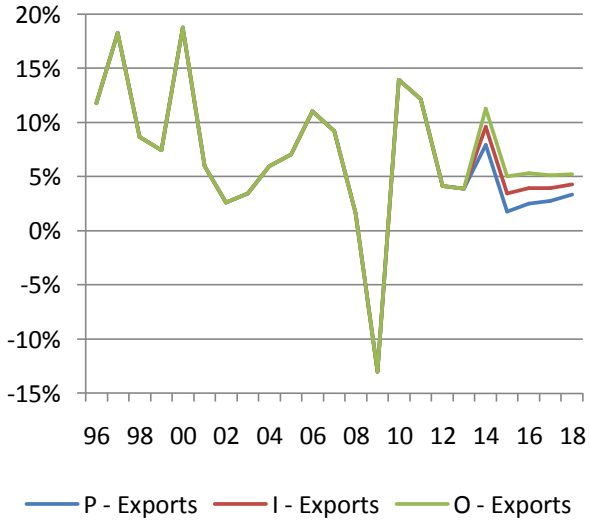
P - CS
I - CS
O - CS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96 98 00 02 04 06 08 10 12 14 16 18
P - Exports
I - Exports
O - Exports

Figure 4

12. Conclusion

As a closing to this work, one can clearly see that Spain's production system has a wide array of problems in many sectors. It also comes to light that this hasn't been so apparent to the general public due to the unnatural pre-crisis growth due to the equality unnatural over-reliance in construction due to the now burst housing bubble.

Today, Spain finds itself in a terribly position. First and foremost, a high unemployment rate, with a dual labor market with both very secure and very insecure low paying jobs, especially for the young. In this context the industrial sector remains characterized, as it has traditionally been, by medium to low technology products as well as a labor intensive production. As other countries become more competitive these issues can harm Spain export, of which industry is of the greatest importance to. The other key sector in Spain, the service sector, is very dependent on tourism while other aspects like business services are underdeveloped. This leads to a very labor intensive service sector which thus tends to have lower productivity and higher dependence on foreign economies. To top it all off, Spain has no monetary policy of its own, has recurrent budget deficit and generally has a very negative trade deficit characterized by a big energy imbalance with enormous reliance on oil.

In a state where Spain tries to finally overcome the economic crisis and where the risk of resurgence of a European crisis is pointed out by some, the Spanish productive system finds itself lacking in aspects which could firmly push it forward. Bigger effort than those that historically have been made are needed in this direction, by both firms and the Spanish government, in order to incentivize changes especially in the industrial and, also to a certain extent, in the service sector which is over reliant on tourism.

One of the tools that can be quite useful in this sense are input-output tables. Presented in this work, it is clear that they are a versatile tool that, aside from the descriptive function that they play, can be used for analytical purposes since it picks up on the direct and indirect effects of economic phenomena over the different sectors. In fact, in the last part of this work a model for these tables is made, which is later used to give a forecast that predicts a growing economy for the following years. Different scenarios are given considering the effect on exports and tourism of the growth of foreign economies.

13. References

Blanes, J. V., & Martín, C. (2000). *The nature and causes of intra-industry trade: Back to the comparative advantage explanation? The case of Spain.* Weltwirtschaftliches Archiv, 136(3), 423-441.

Greenaway, D. and C. Milner (1983). *On the Measurement of Intra-Industry Trade*. The Economic Journal 93 (372): 900 908.

Gardner, David M. (1971). *Is There a Generalized Price-Quality Relationship?* Journal of Marketing Research (JMR) Vol. 8 Issue 2, p241-243

Eitan Gerstner (1985). *Do Higher Prices Signal Higher Quality?* Journal of Marketing Research, Vol. 22, No. 2, 209-2015

OECD (2011), *ISIC REV. 3 TECHNOLOGY INTENSITY DEFINITION*: http://www.oecd.org/sti/ind/48350231.pdf

Slesnick, D. T. (1998). *Empirical approaches to the measurement of welfare*. Journal of Economic Literature, 2108-2165.

Kirman, A. P. (1992). *Whom or what does the representative individual represent?*. The Journal of Economic Perspectives, 117-136.

Gascón, C. S., García, G. R. S., Roca, J., & Oses, J. (2008). *Instituciones y economía: cómo las instituciones condicionan el funcionamiento de la economía española.*

Fernández Otheo, C. M., García Delgado, J. L., Garrido Torres, A., Jiménez, J. C., Myro Sánchez, R. (2013). *Lecciones de economía española*. 1ª ed., 1ª imp. Edition. Editorial Aranzadi, S.A..

How the European Union works: Your guide to the EU institutions. (2013). Luxembourg: Publications Office.

Council Regulation (EC) No 1234/2007 of 22 October 2007

Wilkinson, G. (1980). *Agriculture and the problem of surpluses*. Green Europe, European Community Newsletter on the Common Agricultural Policy (170): 27

European Commission (1991), *The Development and Future of the CAP*. COM(1991) 100

European Commission (2011), *Determining Measures on Fixing Certain Aids and Refunds Related to the Common Organization of the Market in Agricultural Products*. COM(2011) 629 final

Pezaros, P. (1998). *Agenda 2000: Reforming the common agricultural policy further.* EIPASCOPE 1998.1 : 1-8.

López, R. C., & Álvarez-Coque, J. M. G. (2009). *La reforma de la PAC y la agricultura española: alternativas y oportunidades para España.* Documento de trabajo, 40, 200.

Garrido Medina, L. & González, J. J. (2005). *Mercado de trabajo, ocupación y clases sociales en Tres décadas de cambio social en España*. Alianza Editorial.

Baró Tomás, E. (2013) *¿Desindustrialización o metamorfosis de la industria? La nueva relación entre las actividades manufacturera y terciaria.* Economía industrial. - N. 387 (2013) La nueva política industrial.

Goñi, J. A. O., & de la Fuente García, T. (2012). *Industria española y competitividad: visión de los observatorios industriales.* Economía industrial, (385), 25-28.

Adiego, P., & Velilla, J. (2002). *1975-1985: Crisis económica y reconversión industrial, sección de El sector secundario en España*, en Geógrafos.

de los Monteros, C. E., & Álvarez, V. B. (2005). *Un análisis de la Política Industrial española.* INFORMACION COMERCIAL ESPANOLA-MONTHLY EDITION-, 826, 223.

España. Ley 21/1992, de 23 de noviembre, de Industria. Boletín Oficial del Estado, 23 de julio de 1992, núm. 176, p. 25498-25506.

Ruiz Ligero, Apolonio. (2007). *El ICEX en la historia del sector exterior español*. ICE: Revista de economía, Nº 838, págs. 3-9

Isbell, P. (2006). *La dependencia energética y los intereses de España.* Análisis del Real Instituto Elcano (ARI), (32), 1.

Mendiluce, M. & Linares, P., (2011). *Análisis de la evolución de la intensidad energética en España*, Economics for Energy

Martín, J. E. I., & González, M. C. (2008). *LA ENERGÍA EN ESPAÑA: UN RETO ESTRATÉGICO. ECONOMÍA*, (842), 141.

Adiego, P., & Velilla, J. (2002) *1975-1985: Crisis económica y reconversión industrial*, sección de El sector secundario en España, en Geógrafos,

Espinosa, C., & Boceta, V. (2005) *Un análisis de la Política Industrial española.* INFORMACION COMERCIAL ESPANOLA-MONTHLY EDITION- 826 (2005): 223.

http://www.energiaysociedad.es/documentos/T2_Tarifas_reguladas.pdf

Ofori, G. (1991). *The Construction Industry: Aspects of Its Economics and Management*. Edition. Singapore University Press.

Montalvo, J. G. (2003). *La vivienda en España: desgravaciones, burbujas y otras historias.* Perspectivas del sistema financiero, (78), 1-43.

Sánchez, M. T. (2003). *El plan de vivienda 1992-1995: un estudio de su incidencia redistributiva*. Instituto Valenciano de Investigaciones Económicas.

Espínola Salazar, J., & Ramos Aguilar, M. (2012). *El boom de la vivienda en España (1998-2007).* Revista Icade. PublicaciÓN De Las Facultades De Derecho Y Ciencias EconóMicas Y Empresariales, 0(75), 217-238.

A Luengo (2011). *La importancia del sector servicios en la actual economía española* (Temario de oposiciones de Geografía e Historia), Clío37.

Matea, M. L., J. Mora. (2009). *La evolución de la regulación del comercio minorista en España y sus implicaciones macroeconómicas*, Documentos de Trabajo, n.º 0908, Banco de España.

Blázquez, N., & Navarro, J. A. (2010). *La Directiva de servicios y los establecimientos comerciales* Diario La Ley, Nº 7347.

Delgado, S. C., Martínez, J. M. D., & del Paso, R. L. (2011) *El nuevo mapa del sistema financiero español*. Extoicos nº3

Alegre, J. C., & Komilova, M. (2013). El otorgamiento de avales del Estado a las emisiones de deuda de las entidades financieras: una aproximación al caso español. Dereito: revista xurídica da Universidade de Santiago de Compostela, (1), 91-113.

DOMÍNGUEZ MARTÍNEZ, J. M. (2009): *Sistema financiero: regreso al pasado para volver al futuro.* La Opinión de Málaga. pág. 27. 25 de noviembre.

DOMÍNGUEZ MARTÍNEZ, J. M. (2010a): *El sistema financiero andaluz, en La situación económica y social en Andalucía ante la encrucijada de la crisis y medidas para su recuperación.* Sevilla. Consejo Económico y Social de Andalucía. págs. 81-107.

Pateiro Rodríguez, C., García Iglesias, J. M., & Nuñez Gamallo, R. (2010). *La gestión de la liquidez del Banco Central Europeo durante la crisis financiera: 2008-2009* (No. 2010, 3). Economic analysis working papers.

Díaz, A. (2014) *De las cajas de ahorros (con ejercicio directo o indirecto de la actividad bancaria) y las fundaciones de carácter especial a las fundaciones bancarias: reglas y protocolo de transformación.* Análisis GA&P, Enero 2014.

Belda, A. N. (2005). *La competitividad de la economía española.* INFORMACION COMERCIAL ESPANOLA-MONTHLY EDITION-, 826, 435.

Chislett, W. (2013). *Foreign Direct Investment in Spain: Holding Firm Despite (or because of) the Crisis*. ARI, 10, 2013.

Antonio Rodríguez, Patry Tello (2014). *El Impacto de la Inversión Exterior Directa Sobre la Productividad y el Empleo del Sector Manufacturero Español (2001-2010).* Boletín Económico del Banco de España, Enero 2014

Casillas, E. F., Sánchez, R. M. P., & Andújar, J. R. (2012). *Análisis dinámico del impacto de los shocks en el precio del petróleo sobre el empleo por sectores productivos*. Economía industrial, (384), 85-98.

Ángel Estrada y Pablo Hernández de Cos (2008). *El precio del petróleo y su efecto sobre el producto potencial de la economía.* Boletín Económico del Banco de España, Octubre 2008

Roubini, N.; Setser, B. (2004), *The effects of the recent oil price shock on the U.S. and global economy*

Etxezarreta, M., Navarro, F., Riberia, R., & Soldevila V. (2011). *Boom and (deep) crisis in the Spanish economy: the role of the EU in its evolution.* Communication for 17th Workshop on Alternative Economic Policy in Europe, Vienna, Retrieved from http://www2.euromemorandum.eu/uploads/ws1_etxezarreta_et_al._boom_and_deep_crisis_in_the_spanish_economy_the_role_of_the_eu_in_its_evolution.pdf

Suarez, J. (2010). *The Spanish crisis: background and policy challenges.* Documentos de Trabajo (CEMFI) 5

Carballo-Cruz, F. (2011). *Causes and consequences of the Spanish economic crisis: Why the recovery is taken so long?*. Panoeconomicus, 58(3).

Arellano, M., & Bentolila, S. (2009). *La burbuja inmobiliaria: causas y responsables. La Crisis de la Economía Española: Lecciones y Propuestas.* FEDEA, http://www. crisis09. es/ebook.

Álvarez, C. (2011). *Mercado de Trabajo: Balance global*. Economistas, 126: 97-109.

Señán, G. B. (2010). *El consumo en tiempos de crisis: una aproximación sociológica a la distribución del gasto en España.* Aposta: Revista de ciencias sociales, (45), 1.

Observatorio Cetelem (2012) *Análisis del Consumo en España*. El observatorio Cetelem 2012

Mas, M., Pérez, F., & Uriel, E. (2013). *Inversión y stock de capital en España (1964-2011): evolución y perspectivas del patrón de acumulación*. Fundación BBVA.

Cruces, J., (2010). *Los salarios en España 2005/2010*. Estudios de la Fundación.

Maluquer, J., (2013). *La inflación en España. Un Índice de Precios de Consumo, 1830-2012.* Estudios de Historia Económica. Banco de España

Sánchez, A. M., & Roura, J. R. C. (2012). *Efectos de los movimientos cíclicos en la productividad española: análisis agregado y por sectores.* Cuadernos económicos de ICE, (84), 33-56.

Ten Raa, M. H., (2006). *The Economics of Input-Output Analysis*. Edition. Cambridge University Press.