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# **Long term evolution of the bilateral Intra Industry Trade between Portugal and Spain, 1988-2011**

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# Long term evolution of the bilateral Intra Industry Trade between Portugal and Spain, 1988-2011

## *Abstract*

This paper offers the first results of an ongoing research project on the Intra Industry Trade (IIT) in Spanish trade using microdata from COMEXT database to calculate the levels of IIT in manufactures trade between 1988 and 2011. The analysis offers the figures of the long term evolution of IIT between Portugal and Spain, and also its distribution between horizontal and vertical IIT. Besides, the paper offers the sectorial levels of IIT and presents a shift-share analysis to explain the influence of the different sectors in the evolution of total IIT.

JEL: F14 Empirical studies of trade

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## **1.- Introduction**

This paper offers the first results of an ongoing research project that use microdata from COMEXT database to calculate the Intra Industry Trade (IIT) levels of the Spanish trade in manufactures between 1988 and 2011. The starting point of this analysis is the information on IIT in Spain generated for the Ph.D. thesis of one of the coauthors (De Diego, 2004) that covers the period 1988-1999, where a comprehensive analysis of the literature on the subject was done and where IIT levels were measured with different indexes and procedures, and compared with those calculated by other authors.

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<sup>1</sup> The authors want to express their gratitude to María del Carmen Flores Troyano for her collaboration in the preparation of IIT indexes for the period 2000-2011.

COMEXT database experienced a change in the units from ECU to euro at parity in 1999 and the TARIC classification was also modified. The authors has opted for a similar procedure of that used in the Ph.D. dissertation cited above to build a series that, although is not fully homogeneous, it allows the analysis of the long run development of this phenomenon between 1988 and 2011 in depth. Plenty of attention was dedicated to IIT in the 90s and first years of this century, but later less papers has been prepared on the subject, perhaps because the analysis developed reflected an increasing level that contributed to explain a great deal of the low costs of adjustment in Europe in a period to trade liberalization.

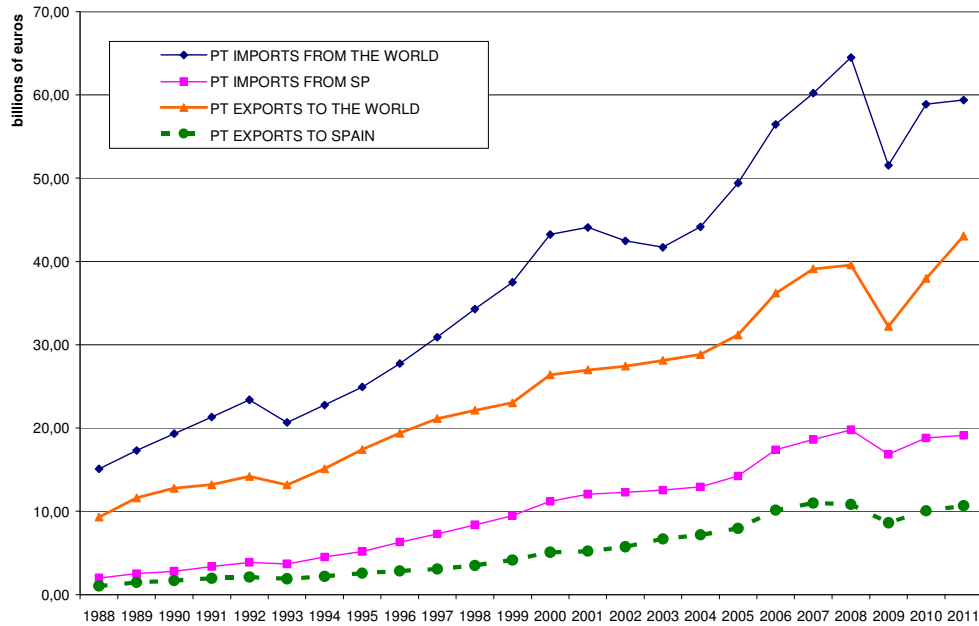
The economic crisis has brought back the attention to the external sector of the Spanish economy that is by now the only contributor to the recuperation of growth. It is worth questioning what has happened to IIT, in these years when external trade is experiencing big changes that are impacting our manufacturing industry.

So, after this introduction, the paper is structured in the following way: in the second section we pay attention to the trade of and between Portugal and Spain in this period to show that trade has increased dramatically, to the extent that Spain is the main trade partner of Portugal. In part three the methodology of measurement is presented and later, in section four the calculations of IIT in bilateral trade are displayed and compared with other papers, where the series 1988-1999 calculated in De Diego (2004) are extended to 2011 and IIT is divided between horizontal and vertical IIT, while part five offers data for 13 sectors of the manufacturing industry and a shift-share analysis of the effects of the sectors in the evolution of total IIT. Finally, in the last section are presented the main conclusions.

## 2.- Bilateral trade between Portugal and Spain

Portugal and Spain have an expanding bilateral trade relationship that has been growing uninterruptedly in the period 1988-2011, except in the recent crisis shared by the two countries. So Portugal exports to the world has more than quadrupled (from 9,3 to 43,1 billions euros) while exports to Spain had a tenfold increase in the same period (from 1,0 to 10,7). In the same time Portugal imports from the world have quadrupled in the period (from 15,1 to 59,4 billion euros) while imports from Spain have more than ninefold (from 2,0 to 19,1) (Figure 1).

Figure 1.- Evolution of Portugal trade, 1988-2011

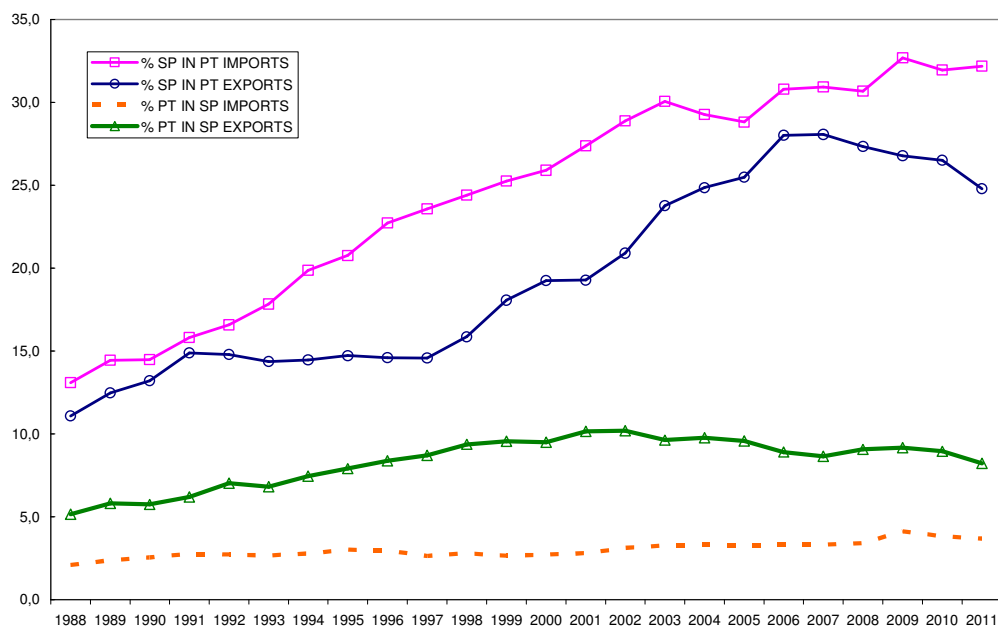


Source: Own elaboration based on data from <http://datacomex.comercio.es>.

This bilateral trade has been growing thus faster than total trade and have increased the share of this countries in each other trade. In 1988 Spain was the origin of 13,1% share of Portuguese imports while in 2011 it accounted for 32,3, while in 1988 Spain was the destination of 11,1% of Portuguese export, that figure reaches 24,8 in 2011, Spain being the main destination and origin of Portuguese trade (Figure 2). In the same time Portugal has also increased its participation in Spanish imports from 2,1 to 3,7% being the seventh more

important import partner (after Germany, France, Italy, China, Holland and UK), while its share in Spanish exports has advanced from 5,2 to 8,2%, with Portugal as the third main destiny for exports after France and Germany.

Figure 2.- Portugal and Spain participation in each other total trade, 1988-2011



Source: Own elaboration based on data from <http://datacomex.comercio.es>.

This trade increase has taken place in a period where growth has been irregular with two crisis shared by the two economies (1993 and the double dip from 2008 to date), having Portugal another crisis in 2003. The average GDP growth in the period has been 2,6 for Spain and 2,2 for Portugal (Figure 3). However, in the period 1988-1999 Portugal grew faster than Spain (3,7 against 3,1) while in the period 2000-2011 Spain has reached better results (2,2), against 0,7 for Portugal.

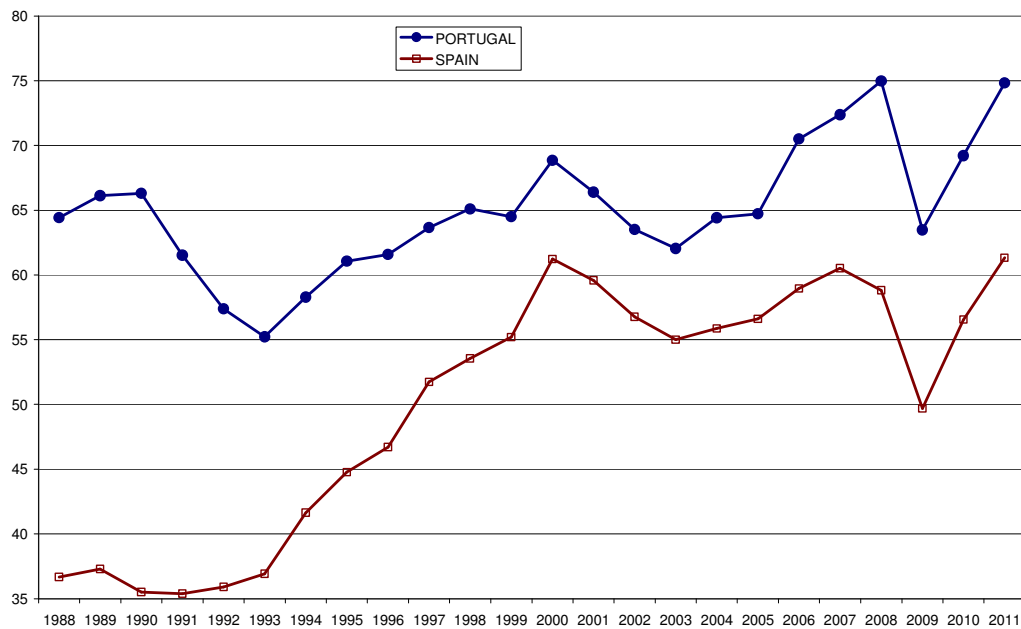
These growth of trade and GDP result in an increase of the share of trade in GDP, that in Portugal has mounted from 65 % in 1998 to 75% in 2011 with marked alterations during the period while in Spain that increased its openness from 36 in 1988 to 61 in 2000, and then has experienced a similar evolution to that of Portugal (Figure 4).

Figure 3.- Growth in Portugal and Spain, 1988-2011 (%)



Source: Own elaboration based on Worldbank data.

Figure 4.- Trade openness index, 1988-2011 (trade as % of GDP)

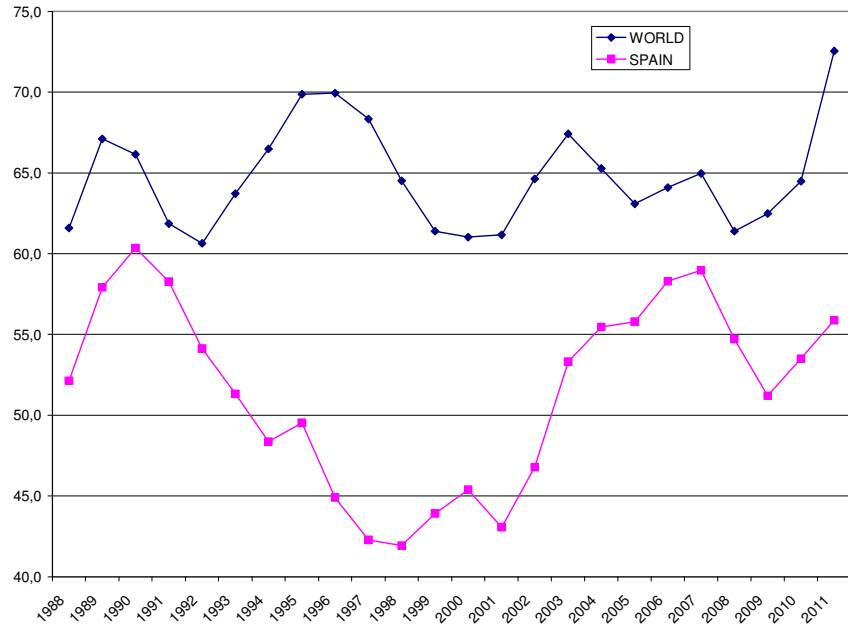


Source: Own elaboration based on Worldbank data.

Finally, it is worth taking into consideration the coverage ratio in the Portuguese trade that has oscillated around 65 % in the global trade (decreasing in the phases of GDP growth and increasing after the three crisis cited above), but has had a more complex

evolution in the trade with Spain where the dynamic do not seem to reflect the Portuguese GDP growth evolution but other factors (foreign direct investment, Spanish economy cycles...) (Figure 5).

Figure 5.- External trade coverage ratio of Portugal, 1988-2011 (exports as % of imports)



Source: Own elaboration based on Worldbank data.

This short review of the trade of Portugal and Spain in the period shows clearly that Spain is the most important single trade partner of Portugal and, thus, the interest to know better the degree of IIT in the comercial flows.

### 3.- Methodology

IIT has been calculated using the Grubel y Lloyd (GL) index, that measures the level of overlapping in trade flows, that is, it measures el part of two way trade in total trade<sup>2</sup> and allows to distinguish between IIT and inter industrial trade.

<sup>2</sup> Ample expositions of the different ways to measure IIT can be found in Vona (1991) and De Diego (2004).

The index for one product  $j$  is:

$$B_i = GL_{ij} = \left[ 1 - \frac{|X_{ij} - M_{ij}|}{(X_{ij} + M_{ij})} \right]$$

while for total trade of a country or sector it would be:

$$\bar{B}_i = GL_i = \left[ 1 - \frac{\sum_{j=1}^n |X_{ij} - M_{ij}|}{\sum_{j=1}^n (X_{ij} + M_{ij})} \right]$$

where  $X_{ij}$  and  $M_{ij}$  are exports and imports of country  $i$  in the product  $j$ . This index varies between 0 and 1. If the value is zero, then all the trade is inter industrial, so one of the directions of trade (either exports or imports) are not present. In the opposite if it reaches 1, all trade is IIT, exports and imports are of equal value and all trade is two way trade.

Fontagné and Freudenberg (1997) from CEPII proposed a different procedure (FF index) to analyze IIT in the EU that has been also widely used in literature. These authors consider that a exchange between two partners in a product is IIT when the lesser one is, at least, one tenth of the greater one. It can be formulated in the following way:

$$\frac{\min(X_{it}^{kz}, M_{it}^{kz})}{\max(X_{it}^{kz}, M_{it}^{kz})} > 10\%$$

They use this limit of 10% because under this threshold the minority flow must not be considered as relevant and, then, are not a structural characteristic of trade. An analysis comparing both indexes can be found in De Diego (2004): both indexes offer similar tendencies although FF index reaches sistematically higher values than GL index.

In the IIT literature it has been noted that there may be a problem of “statistical aggregation” that may generate measured levels of IIT bigger that the real ones when trade



classification with low level of disaggregation are used (Lipsey, 1976). So, in this paper we have used a 6 digit disaggregation of TARIC classification, where manufacturing is divided in 4.751 tariff headings for the period 1988-1999 and 5.083 for 2000-2011<sup>3</sup>.

Another kind of problems relates to the nature of IIT. In the literature two types of product differentiation are considered: horizontal and vertical. The horizontal types relates to varieties characterized by different attributes [in the sense of Lancaster (1980)]. Vertical differentiation is found when different varieties offer disparate levels of service or diverse levels of quality. In the IIT literature this vertical differentiation is associated with dissimilarities in factor content and in the technologies used in production. In this case, an increase in trade of these kind of products could generate bigger adjustment costs (in terms of unemployment, firm closure, etc.), more similar to those generated by inter industrial trade.

Greenaway, Hine and Milner (1994) proposed a methodology to distinguish between vertical and horizontal IIT (VIIT and HIIT, respectively). They used Abd-el-Rahman (1991), who differentiated VIIT and HIIT based on export and import unit values as a proxy to prices and as an indicator of quality. It is assumed that the more expensive good is also of a better quality than other of lesser price. Export and import unit values are

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<sup>3</sup> Results has been calculated also for 4 and 8 digits of the TARIC classification, dividing the manufacturing industry, respectively, in 1.063 and 11.600 products for 1988-1999 and, 1.089 and 11.946 for 2000-2011, respectively. These results are not presented in the text for economy of space.

<sup>6</sup> The values 0,87 and 1,15 have been selected so that is indifferent which value is used as numerator, VUX o VUM, i.e., if values 1,15 and 0,85 are used:  $1,15/1 = 1,15$  and  $1/0,85 = 1,17$ , in this case, the variation would be 17% and not 15%. Then it would not be the same to select one value or the other as numerator and denominator.

compared and if the difference between them is lesser than 15% then it is supposed that the exchanged good have a similar quality and the two way trade is VIIT. Its expression is<sup>6</sup>:

$$0,87 < \frac{VUX_{ij}}{VUM_{ij}} < 1,15$$

where  $VUX_{ij}$  y  $VUM_{ij}$  refer to export and import unit values in the trade of country  $i$  in product  $j$ .

If, in the opposite case, the difference between the unit values is bigger than 15%, then it is supposed that the exchanged goods have different levels of quality and thus the two way trade is VIIT<sup>7</sup>. Its expression is:

$$\frac{VUX_{ij}}{VUM_{ij}} < 0,87 \quad \text{ó} \quad \frac{VUX_{ij}}{VUM_{ij}} > 1,15$$

However, using unit values is not exempted of problems that may result in measurement errors in HIIT and VIIT.

Greenaway, Hine and Milner (1994) also proposed to differentiate the VIIT in two parts: VIIT of superior quality (VIITs) and VIIT of inferior quality (VIITi). So, a two way trade would be VIITi if the price of exports is inferior to that of imports:

$$\frac{VUX_{ij}}{VUM_{ij}} < 0,87$$

while it would be VIITs if the price of exports is superior to that of imports, that is:

$$\frac{VUX_{ij}}{VUM_{ij}} > 1,15$$

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<sup>7</sup> Abd-el-Rahman (1991) and Greenaway, Hine and Milner (1994) use the 15% threshold. Although this is an arbitrary selection the figure is justified because freight cost do not impose a difference of 15%. However, Greenaway, Hine and Milner (1994) and Gordo and Martín (1996) used a 25% threshold and did not find different results than using 15%.

In this paper we have use this methodology and we have used data from Eurostat COMEXT database that offers exports and imports in euros and tons, using thus unit values per ton.

So, to develop VIIT and HIIT we have used GL index, being  $j$  the products and  $i$  the partners of the reporting country, the value of HIIT in the bilateral trade with country  $i$  would be::

$$HIIT_i = \frac{\sum_{j^*} [(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|]}{\sum_j (X_{ij} + M_{ij})} \quad \forall j^* | 0,87 < \frac{VUX_{ij}}{VUM_{ij}} < 1,15$$

where  $X_{ij}$  and  $M_{ij}$  refer to exports with destination and imports with origin in country  $i$  of product  $j$  and  $VUX_{ij}$  and  $VUM_{ij}$  are, respectively, export and import unit values of product  $j$  with country  $i$ .

VIIT is calculated with the same equation, changing only the conditions in the summation:

$$VIIT_i = \frac{\sum_{j^*} [(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|]}{\sum_j (X_{ij} + M_{ij})} \quad \forall j^* | \frac{VUX_{ij}}{VUM_{ij}} < 0,87 \quad \acute{o} \quad \frac{VUX_{ij}}{VUM_{ij}} > 1,15$$

In the same way VIIT<sub>i</sub>, where exports have a lesser price than imports, can be calculated:

$$VIIT_i = \frac{\sum_{j^*} [(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|]}{\sum_j (X_{ij} + M_{ij})} \quad \forall j^* | \frac{VUX_{ij}}{VUM_{ij}} < 0,87$$

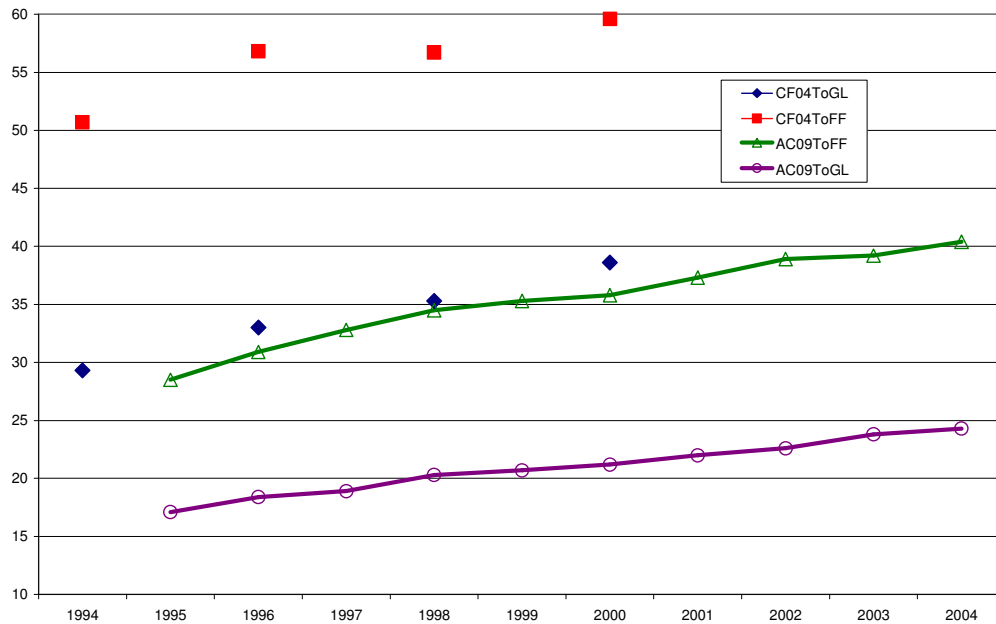
And VIIT<sub>s</sub>, where exports price are bigger than import price:

$$VIIT_s_i = \frac{\sum_{j^*} [(X_{ij} + M_{ij}) - |X_{ij} - M_{ij}|]}{\sum_j (X_{ij} + M_{ij})} \quad \forall j^* | \frac{VUX_{ij}}{VUM_{ij}} > 1,15$$

#### 4.- IIT in the bilateral trade between Portugal and Spain

Several papers has offered data on the evolution of IIT in Portugal. Measuring IIT with different indexes and dissimilar levels of disaggregation: Crespo and Fontoura (2004) for the period 1994-2000 and Amador and Cabral (2009) for the period 1995-2004 had shown and increase of the level of IIT in the Portuguese trade (Figure 6) of around 20 point in the periods studied. That tendency is very clear irrespectively of the index used, however it seems stronger in the first part of the period.

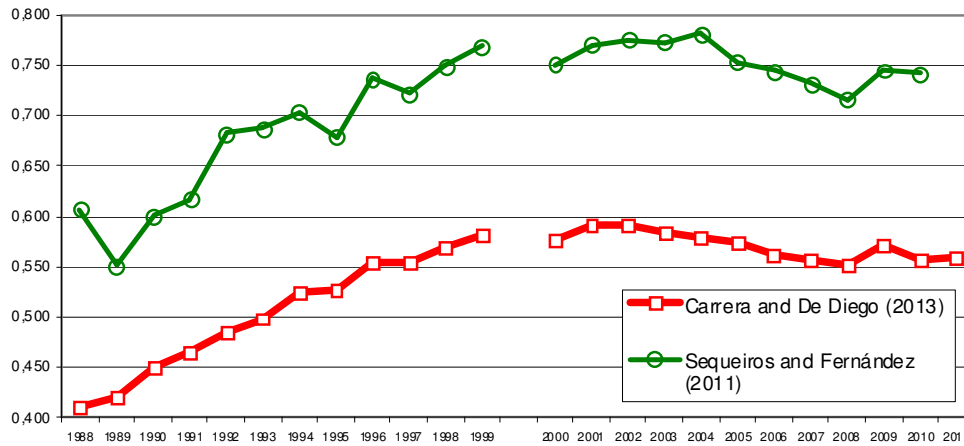
Figure 6.- IIT of Portugal, 1994-2004 (GL and FF indexes)



Source: Own elaboration on Crespo and Fontoura (2004) [CF04ToGL and CF04ToFF] and Amador and Cabral (2009) [AC09ToFF and AC09ToGL].

In the case of Spain we can find a big increase of IIT in Spain in the period 1988-1999, that from levels of 40 % to levels of 60 por 100 measured with GL indexes and from 60 to almost 80 % measured with FF indexes (Figure 7). However, that tendency stops around 2001 and later the indexes drop to levels of 55 % with GL and 75 with FF. Carrera and De Diego (2013) and Sequeiros and Fernández (2011) use different indexes but the tendencies in the indexes are very similar. As in De Diego (2004) FF values are always superior to those offered by GL but the tendencies shown are the same.

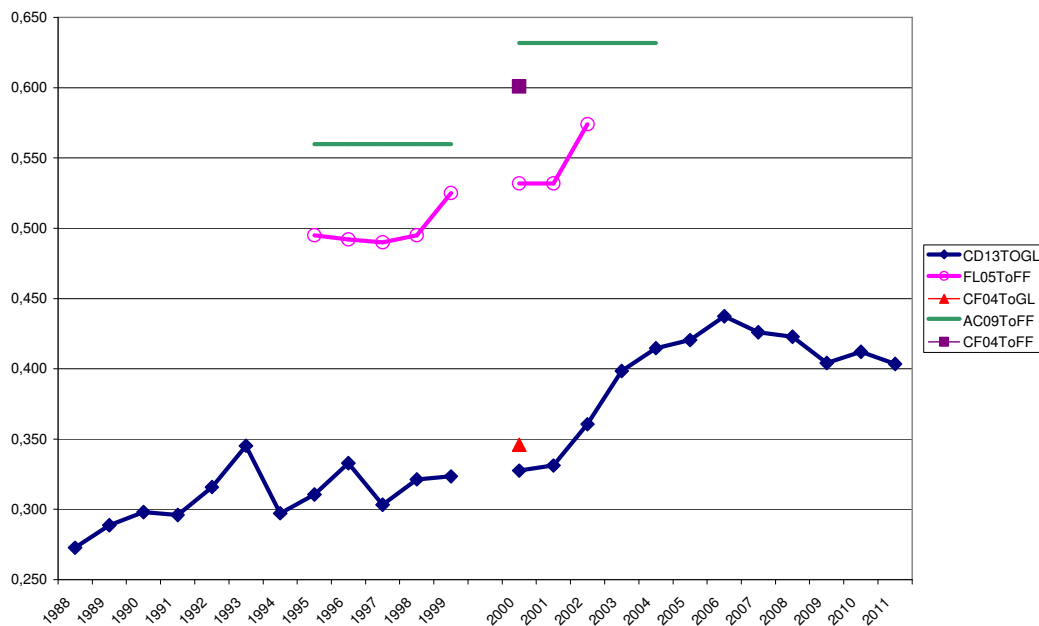
Figure 7.- IIT of Spain, 1988-2011 (GL and FF indexes calculated with TARIC 6 dígitos)



Source: Own elaboration on Carrera and De Diego (2013) and Sequeiros and Fernández (2011).

We offer a series 1998-2011 of total IIT measured con GL index in the bilateral trade between Portugal and Spain. Data show an increase between 1988 and 1993 from 27 to 35 %, then the index drops and remains around 32 until 2001 when begins a new increase to reach values of almost 45 % that falls again with the crisis to remain over 40 % (Figure 8).

Figure 8.-Total IIT on the bilateral trade between Portugal and Spain, 1988-2011 (GL and FF indexes)



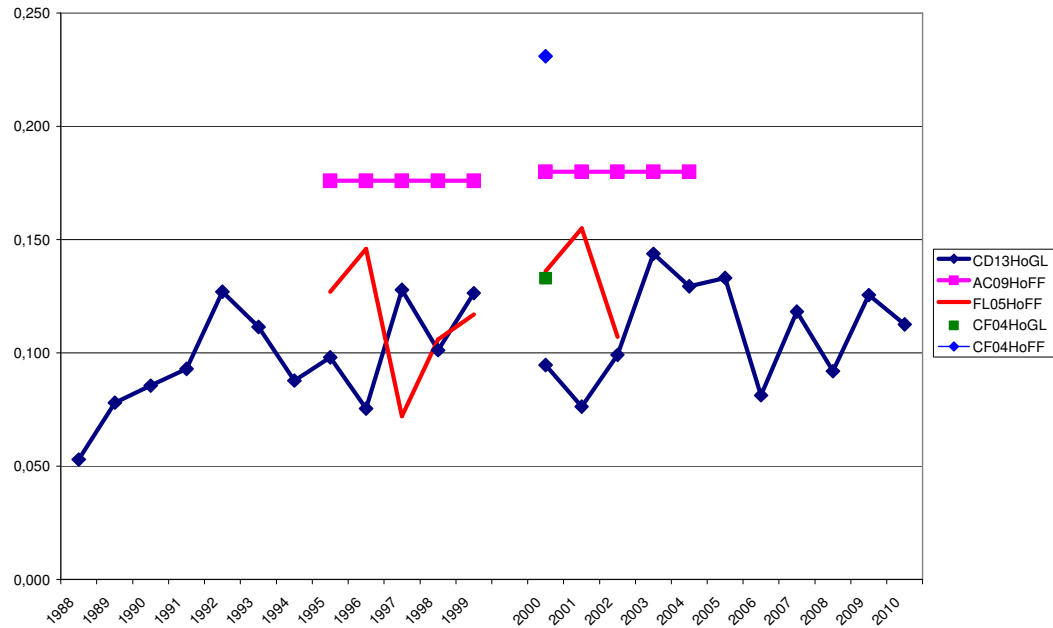
Source: Own elaboration [CD13TOGL] and Crespo and Fontoura (2004) [CF04ToGL and CF04ToFF], Faustino and Leitao (2005) [FL05ToFF] and Amador and Cabral (2009) [AC09ToFF].

Our series is coherent with existing data. Crespo and Fontoura (2004) offer a GL index for 2000 slightly superior. It is worth mentioning that our data were obtained from COMEXT database using Spain as a declarant and Portugal as partner. On the other side, Faustino and Leitao (2005) and Amador and Cabral (2009) offer FF indexes that show a similar increase in IIT.

When the nature of IIT is considered using the Greenaway, Hine and Milner (1994) methodology some interesting results emerge from the new series from 1988 to 2010. First of all, no clear trend can be found on the evolution of horizontal IIT (Figure 9). Although in the first years considered there were a surge, the European crisis of the beginning of the 90s put an end to this trend. In the Spanish trade as a whole was also present an upward trend in the first years of the period considered but that goes on to the beginning of the new millennium (Carrera and De Diego, 2013). That upward trend was considered a sign of a kind of modernization of Spanish exports that were been able to match the quality level of the imports. No such a trend has been in the last decade in Spanish horizontal IIT nor is present in the bilateral trade with Portugal. Once more, the results are coherent with previous evidence present in the papers cited above. No clear trend was present in those calculations that begin after the European crisis of the beginning of the 90s. The levels varies according with the chosen methodology and the level of disaggregation of data, but the relative stability of the levels remains.

The Vertical IIT (the exchange of goods of different levels of quality) has been divided between VIIT of superior quality (when the goods exported by Portugal has a higher price) and inferior quality (when the goods exported by Portugal has a lower price), according with the Greenaway, Hine and Milner (1994) methodology presented above.

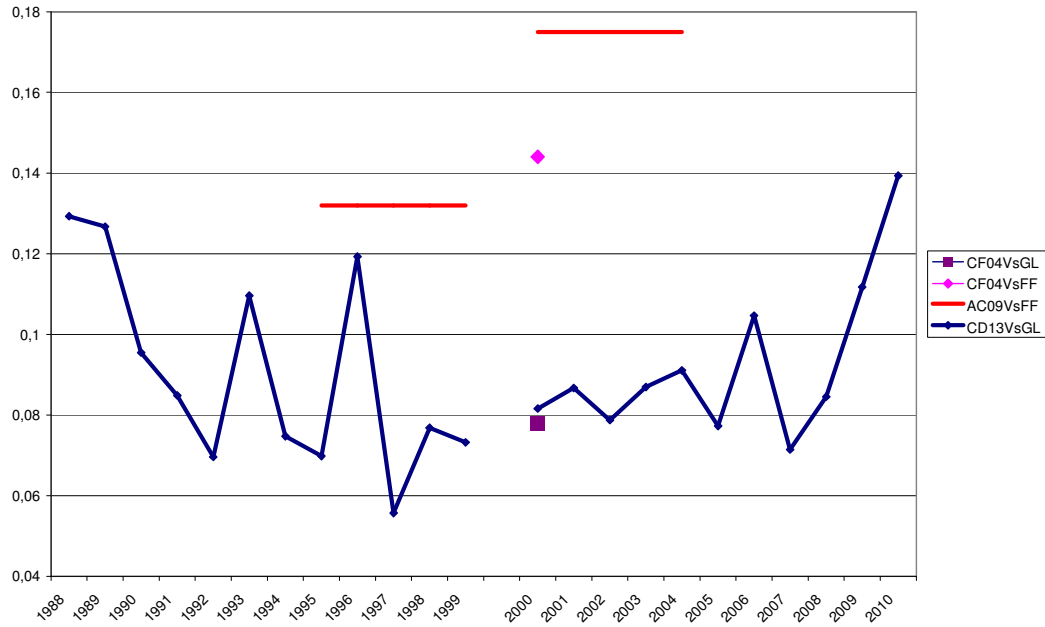
Figure 9.-Horizontal IIT on the bilateral trade between Portugal and Spain, 1988-2010 (GL and FF indexes)



Source: Own elaboration [CD13HoGL] and Crespo and Fontoura (2004) [CF04HoGL and CF04HoFF], Faustino and Leitao (2005) [FL05HoFF] and Amador and Cabral (2009) [AC09HoFF].

The level of Vertical IIT of superior quality experienced a downward trend until the European crisis of the beginning of the 90s. This trend matches the upward trend of HIIT reported above. From 1992 to the end of the decade the level presents no clear tendency with acute short terms variations. In the new millenium it can be seen a kind of improvement, more clearly after de last economic crisis (Figure 10). Once again, our calculations for 2000 are coherent with those obtained by Crespo and Fontoura (2004) and we also find that the level in the 1996-1999 period seems to be lower than the one measured for 2000-2004, however the differences we find are lower. The longer series we have calculated raises question on the long term evolution of this kind of IIT.

Figure 10.- Vertical IIT of superior quality on the bilateral trade between Portugal and Spain, 1988-2010 (GL and FF indexes)



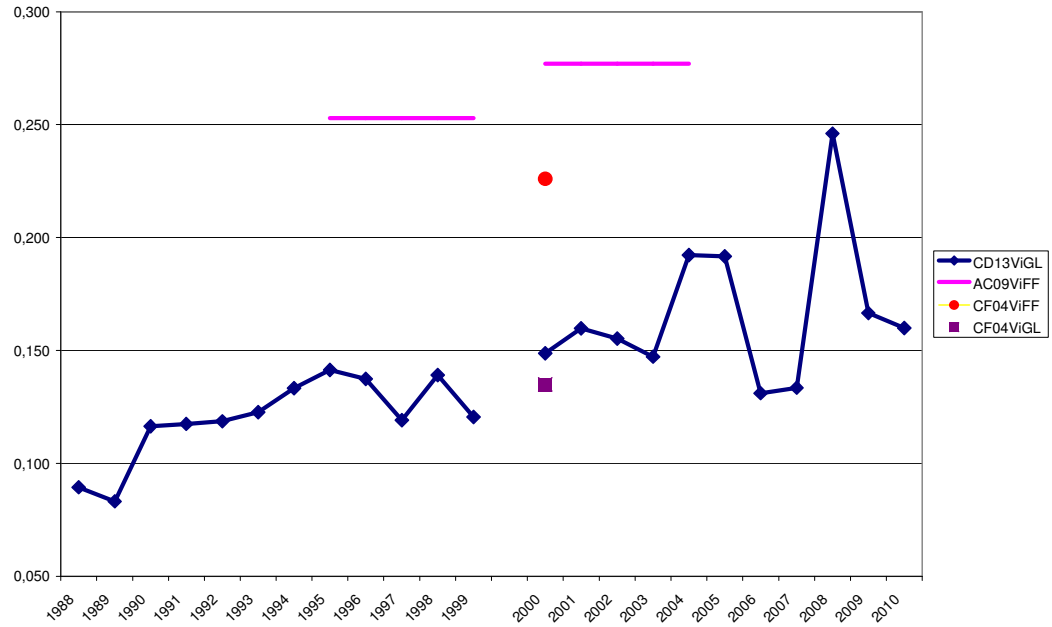
Source: Own elaboration [CD13VsGL] and Crespo and Fontoura (2004) [CF04VsGL and CF04VsFF] and Amador and Cabral (2009) [AC09VsFF].

Finally, we present our estimation of the level of VIIT of inferior quality. There it can be seen a somewhat clear long term upward trend where levels grow from less than 10 % at the beginning of the period to levels nearer to 20 %, although big short term variations are present, most of all at the end of the period. This upward trend was also in Amador and Cabral (2009) estimations and our estimation for 2000 is coherent with the level measured by Crespo and Fontoura (2004) for 2000 (Figure 11).

When the three parts of IIT are put together (Figure 12), it is plain to see that VIIT of inferior quality has been the main driver of the upward evolution of IIT in the bilateral trade between Portugal and Spain, while the other two parts has less clear tendencies.

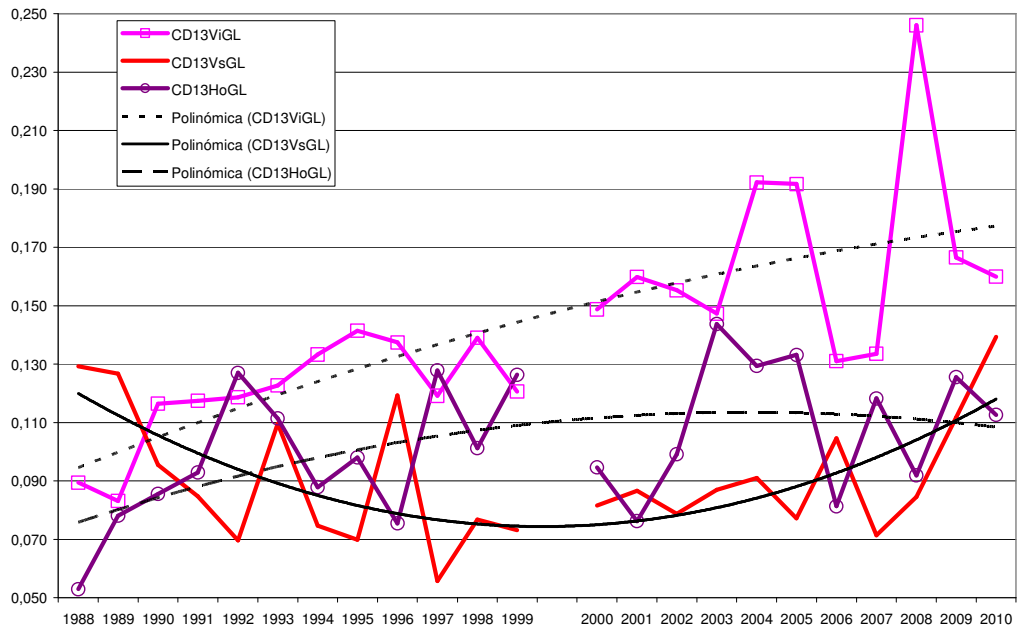


Figure 11.- Vertical IIT of inferior quality on the bilateral trade between Portugal and Spain, 1988-2010 (GL and FF indexes)



Source: Own elaboration [CD13ViGL] and Crespo and Fontoura (2004) [CF04ViGL and CF04ViFF] and Amador and Cabral (2009) [AC09ViFF].

Figure 12.- HIIT and VIIT of superior and inferior quality on the bilateral trade between Portugal and Spain, 1988-2010 (GL index)



Source: Own elaboration.

## 5.- Variation across sectors of IIT

Here will be presented the evolution of IIT in the different branches of Industry using the 13 sectors of NACE-CLIO R-25. We can find in all sectors an increase in the levels of IIT in the period 1989-2011, however the behaviour varies strongly across sectors (Table 1 and Figure A1).

Table 1.- Sectors classified by their level of IIT in 2011 and their evolution between 1989 and 2011

Level in 2011	25-35%	35-45%	45-55%
Increment			
Less than 10% points	<ul style="list-style-type: none"> <li>• Agricultural and industrial machinery</li> <li>• Paper and derived products</li> </ul>	<ul style="list-style-type: none"> <li>• Electrical goods</li> </ul>	<ul style="list-style-type: none"> <li>• Rubber and plastic products</li> </ul>
Between 10 and 20% points	<ul style="list-style-type: none"> <li>• Chemical products</li> <li>• Office machinery and other</li> </ul>	<ul style="list-style-type: none"> <li>• Wood and other manufactured products</li> </ul>	<ul style="list-style-type: none"> <li>• Transport equipment</li> <li>• Metal products</li> </ul>
More than 20% points	<ul style="list-style-type: none"> <li>• Food, beverages and tobacco</li> </ul>	<ul style="list-style-type: none"> <li>• Ferrous and non-ferrous metals</li> <li>• Non-metallic minerals and mineral products</li> </ul>	<ul style="list-style-type: none"> <li>• Textiles and footwear</li> </ul>

Source: Own elaboration. See Table A2 in the Annexes for the series 1989-2011 of the IIT in sectors.

There is no apparent relationship between the level of IIT in 2011 and the increase in the period 1989-2011. For example, Food, beverages and tobacco began with a low level of IIT which grew intensely across the period. In the opposite situation, Rubber and plastic products began with a very high level of IIT but grew very little. Any way, the most intense growth has occurred in sectors of low technological intensity and low growth of demand where 4 sectors has a growth of more than 20 per cent points, while those of intermediate and high level has experienced lower increments.

To understand better the influence of each sector in the evolution of the total level of IIT we have performed a shift-share analysis of the variation of IIT in the bilateral trade between Portugal and Spain. Our goal is to decompose this variation on three parts:

- The effect of the variation of IIT in each one of the sectors.
- The effect of the variation of the weight of the sectors in trade.
- The effect of the interaction between these two effects.

The analysis begin with Grubel y Lloyd index, where for every sector at every moment of time:

$$IIT_{it} = 1 - \frac{|X_{it} - M_{it}|}{X_{it} + M_{it}}$$

where  $t = 1989, \dots, 2011$  and  $i = \text{sector}$ . For the IIT in the bilateral trade between Portugal and Spain it would be:

$$IIT_t = 1 - \frac{\sum_i |X_{it} - M_{it}|}{X_t + M_t}$$

where:

$$\sum_i X_{it} = X_t$$

$$\sum_i M_{it} = M_t$$

This same expression of  $IIT_{it}$  can be reached beginning with the summation of the product of the weight of every sector for the IIT level in the sector:

$$IIT_t = \sum_i \left( \frac{X_i + M_i}{X + M} \right) IIT_{it} \quad (1)$$

In one moment of time:

$$\begin{aligned}
IIT &= \sum_i \left( \frac{X_i + M_i}{X + M} \right) IIT_i = \sum_i \left( \frac{X_i + M_i}{X + M} \right) \left( 1 - \frac{|X_i - M_i|}{X_i + M_i} \right) = \\
&\sum_i \left( \frac{X_i + M_i}{X + M} \right) - \sum_i \left( \frac{X_i + M_i}{X + M} \right) \left( \frac{|X_i - M_i|}{X_i + M_i} \right) = 1 - \frac{\sum_i |X_i - M_i|}{X + M}
\end{aligned} \tag{2}$$

From (1) IIT change could be divided between the change in the share of sectors and the change in the levels of IIT in each sector. We would begin with the expression:

$$IIT_t - IIT_{t-1} = \sum_i \left( \frac{X_i + M_i}{X + M} \right)_t IIT_{it} - \sum_i \left( \frac{X_i + M_i}{X + M} \right)_{t-1} IIT_{it-1} \tag{3}$$

And then we can add up and subtract the following products:

$$\begin{aligned}
&\sum_i \left( \frac{X_i + M_i}{X + M} \right)_t IIT_{it-1} \\
&\sum_i \left( \frac{X_i + M_i}{X + M} \right)_{t-1} IIT_{it-1} \\
&\sum_i \left( \frac{X_i + M_i}{X + M} \right)_{t-1} IIT_{it}
\end{aligned}$$

And we can put them into groups:

$$\begin{aligned}
IIT_t - IIT_{t-1} &= \sum_i \left( \frac{X_i + M_i}{X + M} \right)_t IIT_{it} - \sum_i \left( \frac{X_i + M_i}{X + M} \right)_{t-1} IIT_{it-1} = \\
&= \sum_i \left( \frac{X_i + M_i}{X + M} \right)_{t-1} (IIT_{it} - IIT_{it-1}) + \sum_i \left[ \left( \frac{X_i + M_i}{X + M} \right)_t - \left( \frac{X_i + M_i}{X + M} \right)_{t-1} \right] IIT_{it-1} + \\
&+ \sum_i \left[ \left( \frac{X_i + M_i}{X + M} \right)_t - \left( \frac{X_i + M_i}{X + M} \right)_{t-1} \right] (IIT_{it} - IIT_{it-1})
\end{aligned} \tag{4}$$

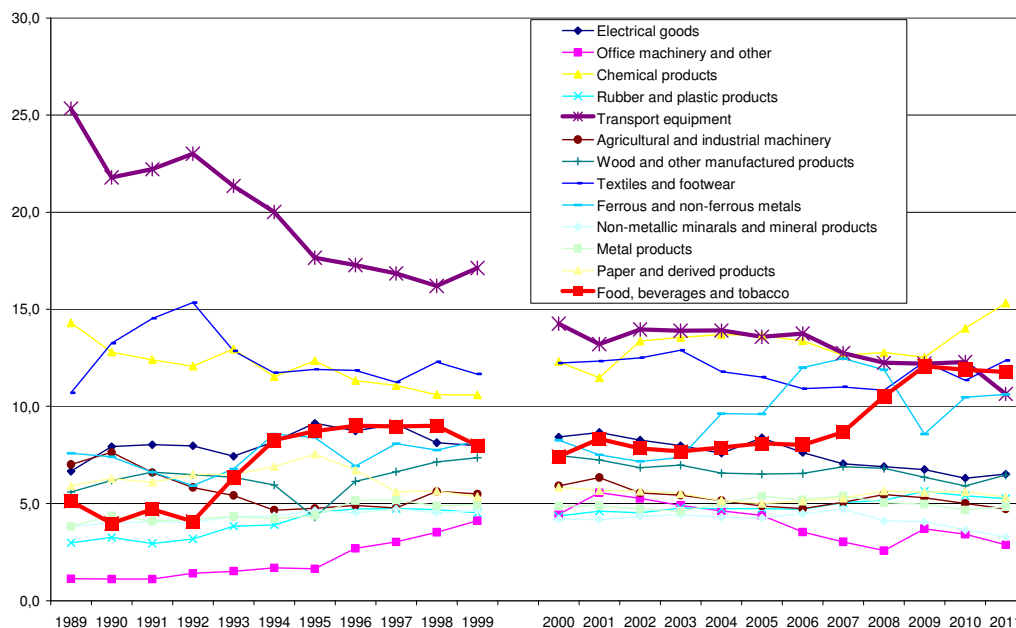
So the first addend reflect the effect of the variation of the IIT of each sector, supposing that the relative share of the sectors do not change; the second addend account for the effect of the variation in the relative share of the sectors, if the level of IIT in every sector remains unchanged; finally the third addend offers the effect of the interaction of the previous effects.

Using expression (4), we have divided the IIT rise described above into these three effects in the period 1989-2011. Calculations have been performed using the COMEXT

database to extract information of the first and last year of the series for the trade of Portugal and Spain, being Spain the declarant country and Portugal its partner.

Before presenting the results of the shift-share analysis it is worth mentioning that there has been some important changes in the relative weight of the sectors (Figure 13).

Figure 13.- Share of sector in trade, exports plus imports, 1989-2011 (%)



Source: Own elaboration. See detailed data in Table A3.

The most relevant is the relative downsize of Transport equipment that began as the main sector and has not finished in the three first positions. On the contrary, Food, beverages and tobacco has increase its share in the trade of manufactures between Portugal and Spain. Chemical products has always been relevant but now is the most important, thanks to the increased value of raw materials, that has had a relevant impact on the prices of petrochemical products.

In the period 1989-2011 the total IIT level has increased 11,4 per cent points, from 0,289 to 0,403. The analysis show that all sector has contributed positively to the increase

of IIT, since IIT has increased in all of them. On the contrary, the loss of weight of Transport equipment in trade involves a heavy setback to the evolution of IIT since it was one of the sectors with higher IIT. When the total effects by sector are considered Transport equipment has a negative effect on the evolution of IIT of 41,1 %, that means that total IIT would have descended 4,7 per cent points due to the effect of this sector. However, other sectors have more than compensated this negative effect. Three traditional sectors has given a big stimulus to the IIT level: Food, beverages and tobacco (+30,5), Textiles and footwear (+28) and Ferrous and non-ferreous metals (+24,8). Adding up the effect of all traditional sectors (from Wood and other manufactures products to Food, beverages and tobacco in the bottom part of Table 2) we obtain a value of 110,1%. This means that all the increase in IIT level in the bilateral trade between Spain and Portugal has come from these traditional sectors.

Table 2.- Results of the shift-share analysis of the IIT evolution, 1989-2011

<i>Sectores</i>	IIT		Effects (%)			
	1989	2011	IIT	Share	Interaction	Total
Electrical goods	0,372	0,375	0,1	-0,5	0,0	-0,3
Office machinery and other	0,168	0,281	1,1	2,6	1,7	5,4
Chemical products	0,234	0,340	13,2	2,1	0,9	16,2
Rubber and plastic products	0,478	0,491	0,3	9,5	0,3	10,1
Transport equipment	0,407	0,528	26,7	-52,3	-15,5	-41,1
Agricultural and industrial machinery	0,203	0,291	5,4	-4,1	-1,8	-0,4
Wood and other manufactured products	0,277	0,437	7,8	2,1	1,2	11,1
Textiles and footwear	0,303	0,522	20,5	4,4	3,2	28,0
Ferrous and non-ferrous metals	0,133	0,362	15,2	3,5	6,1	24,8
Non-metallic minarals and mineral products	0,177	0,423	8,2	-0,8	-1,1	6,2
Metal products	0,379	0,503	4,2	3,4	1,1	8,6
Paper and derived products	0,214	0,256	2,2	-1,1	-0,2	0,9
Food, beverages and tobacco	0,095	0,338	10,9	5,5	14,1	30,5
<i>TOTAL</i>	0,289	0,403	115,7	-25,7	10,0	100,0

Source: Own elaboration.

## 6.- Conclusions

This paper has offered some interesting contributions to the knowledge of IIT in the bilateral trade of manufactured goods between Portugal and Spain. The first one is a long-term series of IIT that has been set in the context of the evolution of Portuguese and Spanish economies. The trade between both countries has increased dramatically in the period and Spain has arrived to be the main trade partner for Portugal. The level of IIT has also increased but there is not a sustained trend in this evolution. The calculations presented in the paper are coherent with other papers that have addressed this subject.

IIT has been divided between horizontal and vertical IIT. The horizontal IIT has not improved significantly in the period. Vertical IIT of superior quality shows a decreasing value in the first part of the series and later a sharp increase after 2008 crisis. Results has also shown that the main driver of the rise of IIT has been vertical IIT of inferior quality. Based in this calculations, it can be said that the long term evolution of these indexes do not show an improvement of the relative quality of the products exported by Portugal, in relation with those imported from Spain.

We have presented de evolution of IIT in the 13 sectors of NACE-CLIO R-25 classification. The growth and the levels of the sectors are not apparently correlated and the most interesting result obtained from the analysis is that the most traditional sectors have experienced a more intense growth of IIT levels. A shift-share analysis has been performed for the period 1989-2011 to understand de effects of the different sectors in the total level of IIT, due to the change in the level of IIT in the sector or because of the change in the weight of the sector in total trade. On the one hand, all sectors contribute positively to IIT increase since the level of IIT has risen across all industry. On the other hand, Transport equipment has lost weight in the total trade of manufactures and that has

had a negative impact on the levels of IIT that has been more than compensated by the increase of IIT in the traditional sectors that account for all the increase of IIT.

This paper raises interesting questions and lines of research that the authors hope to address in the future. For example, the relation of foreign direct investments that have arisen in the period in both directions with IIT or a closer look at the effects of each sector in the different types of IIT.

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## Annexes

Table A1.- IIT in the bilateral trade between Portugal and Spain, by type, 1989-2011  
(GL indexes calculated with 6 digit TARIC)

	Total	Vertical Superior	Vertical Inferior	Vertical	Horizontal
1988	0,273	0,089	0,129	0,219	0,053
1989	0,289	0,083	0,127	0,210	0,078
1990	0,298	0,116	0,095	0,212	0,086
1991	0,296	0,117	0,085	0,202	0,093
1992	0,316	0,119	0,070	0,188	0,127
1993	0,345	0,123	0,110	0,232	0,111
1994	0,297	0,133	0,075	0,208	0,088
1995	0,311	0,141	0,070	0,211	0,098
1996	0,333	0,137	0,119	0,257	0,075
1997	0,303	0,119	0,056	0,175	0,128
1998	0,321	0,139	0,077	0,216	0,101
1999	0,323	0,121	0,073	0,194	0,126
2000	0,328	0,149	0,082	0,230	0,095
2001	0,331	0,160	0,087	0,247	0,076
2002	0,361	0,155	0,079	0,234	0,099
2003	0,398	0,147	0,087	0,234	0,144
2004	0,415	0,192	0,091	0,283	0,129
2005	0,420	0,192	0,077	0,269	0,133
2006	0,437	0,131	0,105	0,236	0,081
2007	0,426	0,134	0,071	0,205	0,118
2008	0,423	0,246	0,085	0,331	0,092
2009	0,404	0,167	0,112	0,278	0,126
2010	0,412	0,160	0,139	0,299	0,113
2011	0,403				

Source: Own elaboration.

Table A2.- IIT in the bilateral trade between Portugal and Spain,  
by sector, 1989-2011  
(GL indexes calculated with 6 digit TARIC)

	Electrical goods	Office machinery and other	Chemical products	Rubber and plastic products	Transport equipment	Agricultural and industrial machinery	Wood and other manufactured products	Textiles and footwear	Ferrous and non-ferrous metals	Non-metallic minerals and mineral products	Metal products	Paper and derived products	Food, beverages and tobacco
1989	0,372	0,168	0,234	0,478	0,407	0,203	0,277	0,303	0,133	0,177	0,379	0,214	0,095
1990	0,413	0,184	0,250	0,544	0,332	0,221	0,289	0,306	0,261	0,194	0,408	0,246	0,144
1991	0,428	0,208	0,245	0,511	0,321	0,237	0,307	0,321	0,185	0,221	0,431	0,246	0,125
1992	0,351	0,231	0,274	0,420	0,374	0,241	0,335	0,342	0,228	0,249	0,433	0,223	0,192
1993	0,296	0,312	0,483	0,381	0,423	0,222	0,374	0,359	0,207	0,246	0,387	0,245	0,187
1994	0,328	0,262	0,322	0,365	0,291	0,279	0,307	0,348	0,192	0,253	0,411	0,231	0,284
1995	0,322	0,155	0,374	0,392	0,305	0,241	0,265	0,368	0,226	0,238	0,411	0,272	0,293
1996	0,297	0,169	0,335	0,432	0,397	0,250	0,267	0,395	0,226	0,257	0,410	0,377	0,287
1997	0,270	0,132	0,264	0,431	0,372	0,231	0,272	0,404	0,234	0,268	0,383	0,267	0,239
1998	0,311	0,227	0,304	0,425	0,324	0,214	0,294	0,422	0,331	0,285	0,423	0,264	0,271
1999	0,286	0,214	0,326	0,428	0,340	0,224	0,295	0,416	0,379	0,278	0,401	0,220	0,269
2000	0,312	0,252	0,324	0,405	0,279	0,240	0,347	0,440	0,405	0,271	0,440	0,227	0,261
2001	0,291	0,258	0,337	0,394	0,290	0,227	0,350	0,461	0,426	0,295	0,438	0,259	0,235
2002	0,281	0,204	0,272	0,448	0,458	0,261	0,355	0,494	0,472	0,327	0,458	0,272	0,261
2003	0,298	0,265	0,292	0,503	0,560	0,304	0,360	0,521	0,465	0,438	0,482	0,259	0,277
2004	0,304	0,312	0,353	0,470	0,546	0,263	0,386	0,506	0,494	0,419	0,505	0,294	0,332
2005	0,300	0,338	0,362	0,458	0,628	0,287	0,404	0,525	0,413	0,429	0,487	0,277	0,313
2006	0,286	0,349	0,430	0,458	0,675	0,342	0,410	0,534	0,320	0,485	0,529	0,290	0,344
2007	0,337	0,162	0,393	0,480	0,590	0,360	0,401	0,563	0,372	0,468	0,512	0,280	0,344
2008	0,371	0,232	0,382	0,474	0,508	0,291	0,444	0,565	0,463	0,458	0,516	0,271	0,312
2009	0,344	0,392	0,356	0,448	0,507	0,300	0,412	0,554	0,414	0,385	0,457	0,265	0,293
2010	0,362	0,379	0,328	0,509	0,499	0,317	0,450	0,557	0,371	0,392	0,470	0,315	0,358
2011	0,375	0,281	0,340	0,491	0,528	0,291	0,437	0,522	0,362	0,423	0,503	0,256	0,338

Source: Own elaboration.

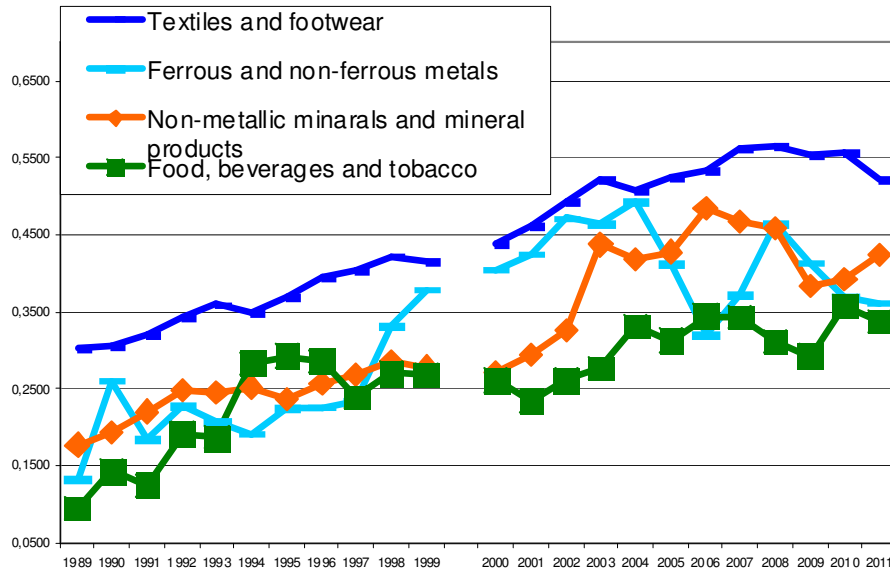
Table A3.- Share of sectors in the bilateral trade between Portugal and Spain, 1989-2011  
(% of manufactured goods trade)

	Electrical goods	Office machinery and other	Chemical products	Rubber and plastic products	Transport equipment	Agricultural and industrial machinery	Wood and other manufactured products	Textiles and footwear	Ferrous and non-ferrous metals	Non-metallic minerals and mineral products	Metal products	Paper and derived products	Food, beverages and tobacco
1989	6,7	1,1	14,3	3,0	25,3	7,0	5,6	10,7	7,6	3,8	3,8	5,9	5,1
1990	7,9	1,1	12,8	3,3	21,8	7,6	6,2	13,3	7,4	4,0	4,4	6,3	4,0
1991	8,0	1,1	12,4	2,9	22,2	6,6	6,6	14,5	6,6	4,0	4,1	6,1	4,7
1992	8,0	1,4	12,1	3,2	23,0	5,8	6,5	15,3	5,9	4,0	4,2	6,5	4,1
1993	7,4	1,5	13,0	3,8	21,3	5,4	6,4	12,9	6,8	4,3	4,3	6,5	6,3
1994	8,2	1,7	11,5	3,9	20,0	4,7	6,0	11,7	8,6	4,4	4,2	6,9	8,3
1995	9,1	1,6	12,4	4,5	17,7	4,8	4,3	11,9	8,4	4,6	4,4	7,5	8,7
1996	8,7	2,7	11,3	4,7	17,3	4,9	6,1	11,9	6,9	4,5	5,1	6,7	9,0
1997	9,1	3,0	11,1	4,7	16,8	4,8	6,6	11,3	8,1	4,7	5,2	5,6	9,0
1998	8,1	3,5	10,6	4,7	16,2	5,6	7,1	12,3	7,8	4,5	4,9	5,6	9,0
1999	8,0	4,1	10,6	4,5	17,1	5,5	7,4	11,7	8,2	4,6	5,0	5,3	8,0
2000	8,4	4,4	12,3	4,4	14,3	5,9	7,5	12,2	8,3	4,2	4,9	5,8	7,4
2001	8,7	5,6	11,5	4,6	13,2	6,3	7,2	12,3	7,5	4,2	4,9	5,7	8,3
2002	8,3	5,3	13,4	4,5	14,0	5,6	6,8	12,5	7,2	4,3	4,7	5,6	7,8
2003	8,0	4,9	13,5	4,8	13,9	5,4	7,0	12,9	7,4	4,4	4,6	5,5	7,7
2004	7,6	4,6	13,7	4,7	13,9	5,1	6,6	11,8	9,6	4,3	5,0	5,2	7,9
2005	8,4	4,4	13,7	4,7	13,6	4,9	6,5	11,5	9,6	4,3	5,4	5,0	8,1
2006	7,6	3,5	13,4	4,7	13,8	4,7	6,5	10,9	12,0	4,5	5,2	5,1	8,0
2007	7,1	3,0	12,6	5,1	12,7	5,1	6,9	11,0	12,5	4,7	5,4	5,3	8,7
2008	6,9	2,6	12,8	5,2	12,2	5,5	6,8	10,8	11,9	4,1	5,1	5,7	10,5
2009	6,7	3,7	12,5	5,6	12,2	5,3	6,4	12,3	8,6	4,1	5,0	5,6	12,1
2010	6,3	3,4	14,0	5,4	12,3	5,0	5,9	11,4	10,5	3,7	4,7	5,6	11,9
2011	6,5	2,9	15,3	5,3	10,6	4,7	6,5	12,4	10,6	3,3	4,8	5,3	11,8

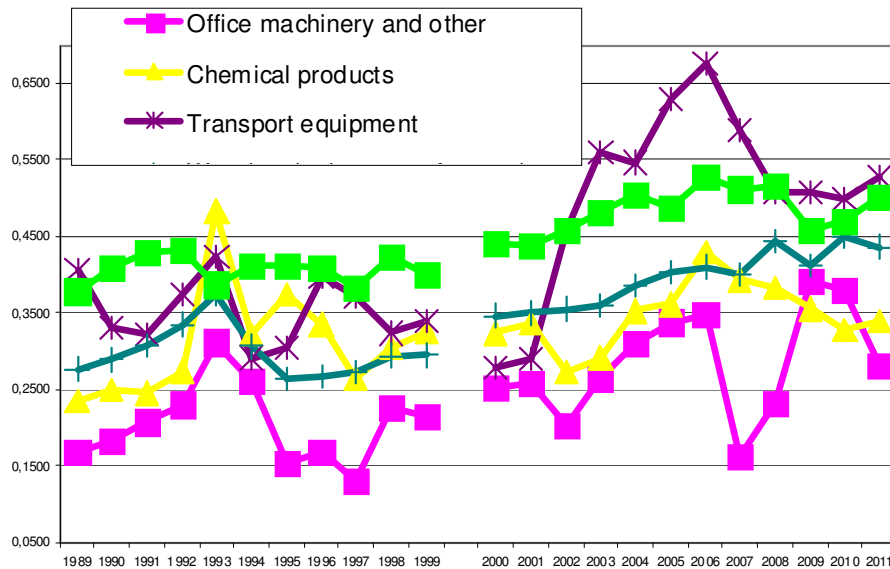
Source: Own elaboration.

Figure A1.- Evolution of IIT in different sectors in the bilateral trade between Portugal and Spain, 1989-2011

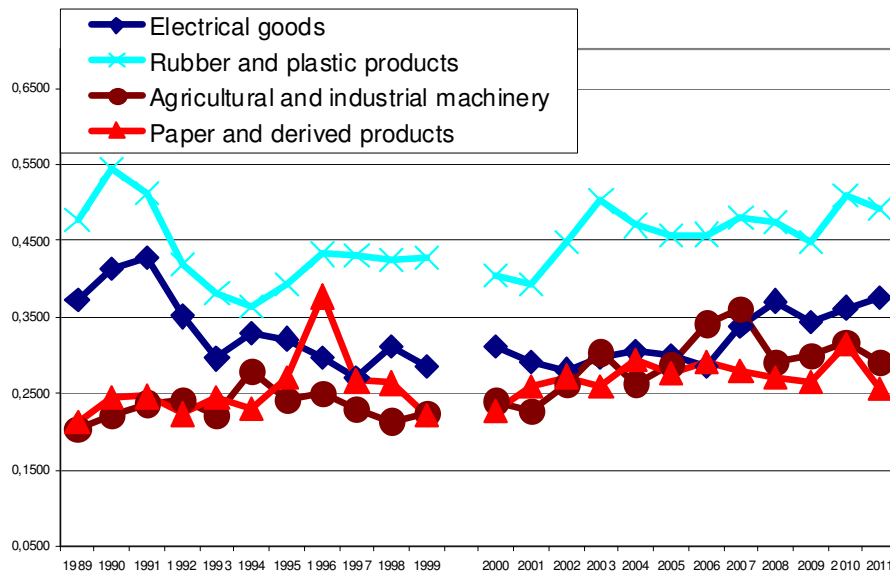
a) The sectors that have grown the most (more than 20%)



b) The sectors that have had an intermediate growth (between 10 and 20%)



c) The sectors that have grown the least (less than 10%)



Source: Own elaboration.