THE IMPORT CONTENT OF THE INDUSTRIAL SECTORS IN SPAIN

The authors of this article are Alberto Cabrero Bravo and Miguel Tiana Álvarez of the Directorate General Economics, Statistics and Research.

Introduction

During the last economic upturn the Spanish economy posted a sizable deficit on its balance of goods and services. Some of this deficit has been corrected during the recent economic crisis, as a result of the contractionary impact of the decline in national demand on imports and of some improvement in competitiveness. However, the persistence, even in these circumstances, of the external deficit suggests the presence of structural obstacles to adjustment, including shortcomings in the workings of goods and factor markets. Moreover, the imbalances built up during the expansionary phase prior to 2007 and, in particular, the excessive growth of construction have highlighted the need for the productive model to be underpinned by a broader and more competitive export base, not giving rise to such intensive resort to imports.

The aim of this article is to identify some of the distinguishing features of our economy from the prism of the industrial sectors, emphasising their dependence on imports. The findings for Spain are compared with those of the three biggest euro area economies (Germany, France and Italy). In this connection, information is taken from the input-output tables (IOTs) in the European System of Accounts (ESA 1995), taking as sources the OECD (Structural Analysis Databases) and Eurostat, down to an extensive level of detail (a breakdown of 40 productive sectors).[1] The analysis is conducted in nominal terms, since the information contained in the IOTs is at current prices, advising caution when assessing the results obtained.[2] It should further be borne in mind that the latest IOTs reflect the productive structure for 2007, whereby the analysis conducted in this article does not envisage the changes that may have taken place since then, which is another reason for caution when interpreting the results.

The article is structured as follows. After this introduction, the second section gives a descriptive view of the economy's structure from the supply side. Drawing on the main conclusions of this analysis, the third section introduces the concept of *import content*, which refers to the proportion of output value that relates to imported intermediate inputs. This indicator has a comparatively higher level in our country, helping explain why the characteristics of the Spanish productive model contribute to the persistence of the trade deficit. The fourth section builds on this exercise, setting out an analysis that shows that import content is also higher in Spain in terms of final demand components. Lastly, the fifth section draws together the main conclusions of the article.

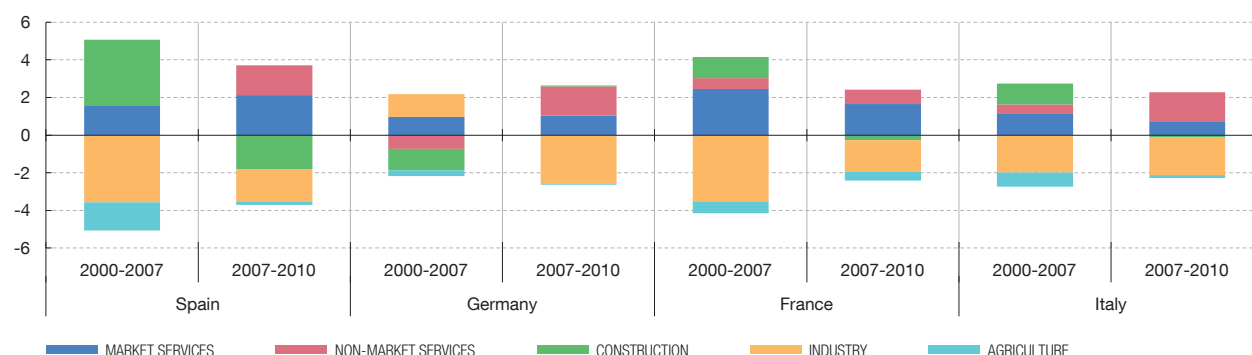The structure of economic activity in Spain and in the main European countries

Spain and the three main euro area countries evidence, like other developed countries, a high degree of *tertiarisation* (see top panel of Chart 1). In Spain, value added in services has progressively gained weight in output over the past decade, standing in 2010 at 72% of the total, while industry (encompassing the manufacturing and energy sectors) has lost

---

1 The latest official input-output tables (IOTs) available at the time of this article going to press are for 2007 (source-destination tables). The latest symmetric input-output table (SIOT) is for 2005. A description of the input-output framework for Spain can be found on the INE website. Specifically, INE describes in two methodological notes (2005 and 2009) the compilation of the source and destination tables (SDTs) and the SIOT. Further, a use of the input-output framework for Spain can be found in Cañada (2001). An application of the IOTs to the industrial sector can be found in Cañada (1994).

2 The concept of output used in the article – that under the input-output framework – differs from the concept of GDP in National Accounts. To obtain GDP on the basis of output, inputs must be deducted from the latter and net taxes on products added to it. Likewise, output and value added in the IOTs are valued at basic prices, while GDP is valued at market prices.

SECTORS. RELATIVE WEIGHT (PERCENTAGE OF ECONOMY-WIDE TOTAL GVA)

MARKET SERVICES   NON-MARKET SERVICES   CONSTRUCTION   INDUSTRY   AGRICULTURE
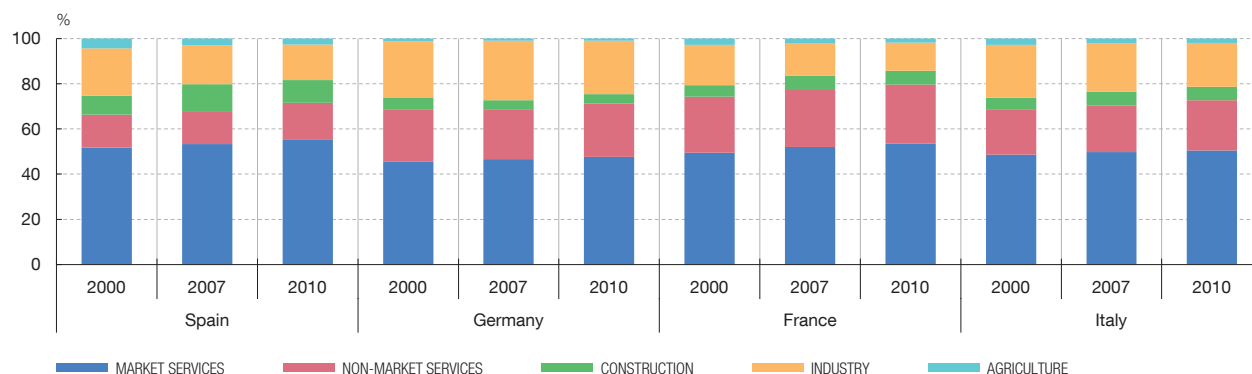
SECTORS. CHANGE IN RELATIVE WEIGHT

MARKET SERVICES   NON-MARKET SERVICES   CONSTRUCTION   INDUSTRY   AGRICULTURE

SOURCES: INE and Eurostat.

relative weight, accounting for 15.6% of the total in 2010. The weight of construction has fallen continuously since 2007, its value added at end-2010 standing at 10% (2 pp less than at the start of the crisis). In contrast, in the main euro area economies the share of construction has been lower and the weight of industry greater. In any event, there has been a progressive loss of relative weight of the industrial sectors, due to some extent to ongoing outsourcing by companies in the sector of part of their services activities, which were previously pursued in-house, to other companies belonging to this sector.

During the period of economic expansion to 2007, value added in Spain grew forcefully, underpinned mainly by the services sector and construction, while the contribution of industry was substantially lower than the other two sectors (see the lower panel in Chart 1). From the onset of the crisis to date, the lowest contribution to the growth in value added was by the industrial sector (which actually subtracted 2 pp from growth in 2009), compared with the more moderate negative contribution of construction. After the worst of the recession, the level of value added in Spanish industry – and also in services – has held virtually flat, while in the main euro area economies (particularly in Germany) both sectors have been more buoyant, revealing that the impact of the crisis is proving more lasting in Spain.[3]

---

3   The swift recovery in German industry is partly related to developments in car manufacturing. Indeed, the sharp improvement in this productive sector in Germany from April 2009 to the summer of 2011 accounts for around 30% of the cumulative growth differential in the overall index between Germany and Spain during this period. The related figures are even greater in the cases of France (38%) and Italy (46%).

	Spain		Germany		France		Italy (2005)	
	Position	Weight in output (%)	Position	Weight in output (%)	Position	Weight in output (%)	Position	Weight in output (%)
MAIN SECTORS FROM THE SPANISH STANDPOINT								
Construction	1	15.4	7	4.7	4	7.3	4	6.4
Non-market services	2	13.7	1	15.6	1	16.7	1	14.0
Other business activities	3	6.6	2	9.2	2	11.5	2	7.7
Real estate activities	4	6.4	3	7.8	3	8.7	3	6.9
Hotels and restaurants	5	5.5	20	1.5	11	2.4	10	3.5
Food and beverages industry	6	4.5	11	3.2	7	4.0	9	3.9
Wholesale trade	7	4.1	8	4.2	6	5.0	5	5.4
Financial intermediation	8	3.7	6	4.8	5	5.2	8	3.9
Retail trade	9	3.3	9	3.5	8	3.3	6	4.2
Manufacture of motor vehicles and trailers	10	3.0	4	6.5	10	2.8	25	1.4
Electricity, gas, steam and air conditioning	11	2.7	15	2.3	12	2.3	13	2.5
Land and pipeline transport	12	2.5	19	1.6	14	2.1	11	3.5
Manufacture of metal products	13	2.2	12	2.7	17	1.9	12	2.9
Agriculture	14	2.2	26	1.1	13	2.2	18	1.7
Chemical industries	15	2.1	10	3.3	9	3.0	14	2.5
OTHER RELEVANT SECTORS								
Machinery and mechanical equipment	22	1.5	5	5.0	18	1.9	7	4.0
Manufacture of other transport equipment	28	0.6	28	0.8	19	1.7	33	0.6
Manufacture of computing, electronic and optical equipment	30	0.6	13	2.5	24	1.3	24	1.4
Air and space transport	32	0.5	31	0.6	31	0.5	35	0.3
Textile industry	34	0.4	34	0.3	33	0.3	26	1.3
Maritime transport	38	0.1	33	0.5	34	0.3	37	0.2

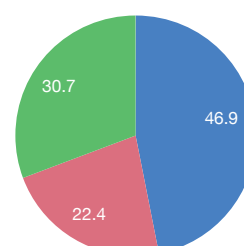SOURCES: OECD, Eurostat and Banco de España.

Moving down to a greater level of detail, the relative significance of each productive sector in terms of its weight in total aggregate output can be examined. As Table 1 shows, the industrial sectors with most weight in Spain in 2007 were food and beverages (4.5%), car and trailer manufacturing (3%) and chemicals (2.1%). As regards market services, four sectors stand out: other business activities – essentially encompassing professional, scientific and technical activities, and the administrative and ancillary services – (6.6%), real estate activities (6.4%), accommodation and food service activities (5.5%) and wholesale trade (4.1%). Broadly, these sectors are those with most relative significance in the other countries analysed. In the case of industry, the main exception was the machinery and equipment sectors, which were in a leading position in Germany and in Italy, but had less relative weight in Spain. As to services, the exception is the accommodation and food service activities sector; while it is the third biggest in the Spanish economy, its relative significance in the other countries is substantially less.
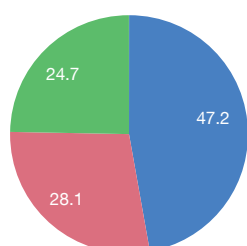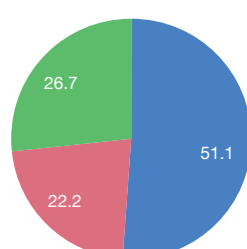
INDUSTRIAL PRODUCTION. BREAKDOWN FROM THE SUPPLY-SIDE STANDPOINT (PERCENTAGE OF VALUE OF OUTPUT). 2007

CHART 2

SPAIN

GERMANY

FRANCE

ITALY (2005)
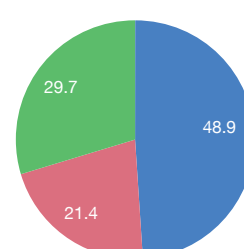
SOURCE: Eurostat.

The international comparison of the breakdown of output into inputs – national and imported – and value added provided in the IOTs helps identify certain specific characteristics of each country's productive processes. At the aggregate level, the weight of value added in Spain's total output – 50% – does not differ greatly from that of other countries, but the differences are greater as regards the breakdown between imported and national inputs. Specifically, the share in total output of imported inputs stands in Spain at 19%, almost 4 pp above that of the other countries.

At a greater level of detail, the most notable differences in sectoral composition can be seen in industry. Specifically, in the main industrial sectors the relative weight of value added is clearly less in Spain, while that of imported intermediate inputs is substantially greater (see Chart 2). Although the sharpest differences are recorded for Germany (whose industrial sector shows a relative weight of value added that is 6 pp higher than that of Spain), the differences are likewise evident regarding the other two countries. The main services sectors have a fairly similar structure in all the countries, with a very low relative weight of imported inputs (in a range from 1% to 7%) and a predominant contribution of value added, which generally accounts for between 50% and 60% of the value of output. In construction, the higher content of national intermediate inputs in Spain as opposed to Germany or France[4] is notable; set against this, the relative weights of imported intermediate inputs and of value added are somewhat lower.

4 This channel for the propagation of side adjustment of the construction sector to other sectors played a significant role during the crisis in Spain [see Maza and Peñalosa (2011)].

Import content from the standpoint of the industrial sectors

In addition to the direct import of intermediate inputs, the industrial sectors incorporate intermediate inputs indirectly. When a sector decides to increase its output, it resorts to the use of imported inputs, but also uses national intermediate inputs from other sectors which, in turn, will comprise national and imported intermediate inputs. In this way, the output of a sector generates, in turn, knock-on effects on the demand for imported inputs from other sectors.[5] Both factors determine the portion of output of a specific productive sector that leaks out abroad via imports, which is known, in the input-output framework, as the import content (IC) of output.[6]

Analysis of the data in the input-output tables reveals that Spanish output had, throughout the 2000-2007 period, a significantly higher import content (IC) than that of the other countries considered. Specifically, the Spanish economy's IC amounted in 2007 to 20.7%, up 2 pp and 5 pp, respectively, on Germany and France[7] (see Chart 3). These differences are not attributable solely to Spain's traditional energy dependence. Indeed, if the energy sectors are excluded, Spain's import content falls by close to 2 pp, but so too does that of the other countries (1.2 pp in France, 1.5 pp in Germany and 1.8 pp in Italy), meaning that, even adjusting for the different influence of energy, the IC differences across the countries do not change substantially. Besides, the IC of output can generally be seen to be on a rising trend, which is probably due to the increasingly greater integration of economies into a framework in which comparative advantages are sought. In this respect, the fact that Germany is the country that showed, over the period analysed, the biggest increase in import content, might be related to the ongoing delocalisation of its industry towards the Eastern European countries which, with skilled labour forces, can compete favourably costwise.

The differences discernible in the import content of output between Spain and the other countries may, a priori, have two causes that are not mutually exclusive. One possibility is that the Spanish economy is more specialised than others in sectors evidencing a high IC. The other option is that, relative weight being equal, most industrial sectors tend to show a greater propensity to import in Spain. As Chart 4 reveals, in a comparative analysis at a level of disaggregation of 40 productive sectors of the divergences in terms of import content and of relative weight in output between Spain and the other countries under study, most sectors are very close to the source on the vertical axis, meaning they have a relative weight in Spain not very different from that of its euro area neighbours. However, they are to the right on the horizontal axis, indicating that most sectors have a higher-than-average import content.[8] These results suggest that the differences in terms of IC are possibly due to the greater propensity to import of Spanish industrial sectors, and not to the differences in productive structure.
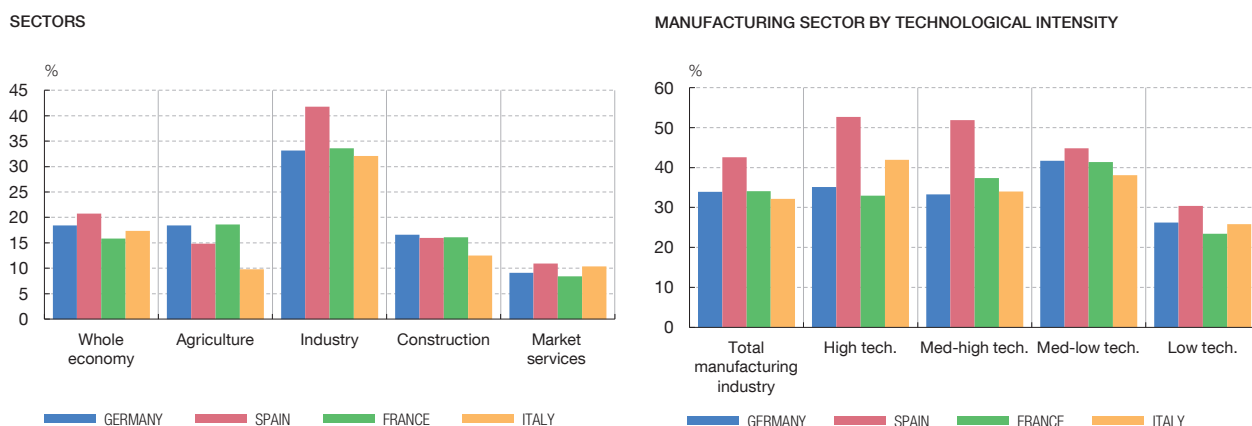
By sector, the biggest differences in import content are found in market services and, above all, in industry (see once more Chart 3). If the 15 sectors with most import content in Spain are analysed, it can be seen that nearly all of them are in the industrial sector. And it is those with most technological content, besides the energy sectors, that are in the uppermost positions (see Table 2). For example, in the case of car and trailer manufacturing

---

5 A description and interpretation of the different knock-on effects on the IOTs can be found in Reis and Rua (2009).

6 Annex 1 offers a somewhat more detailed description of the means of calculating import content.

7 While the input-output tables tend to reflect economies' more structural behaviours, it cannot be ruled out that these ratios may have undergone some changes following the recession in 2008 and 2009.

8 Indeed, Spanish IC would be even higher if our country had the productive structure of the other economies (and the IC of each sector were its own). Specifically, if Spain had the structure of the German economy, its IC would be 24% (3 pp more than actually observed). The figure would be 22.1% if the Spanish economic structure reflected the average of that for the other three countries.

SECTORS

MANUFACTURING SECTOR BY TECHNOLOGICAL INTENSITY

%

%

GERMANY   SPAIN   FRANCE   ITALY

GERMANY   SPAIN   FRANCE   ITALY

SOURCES: Eurostat, OECD and Banco de España.

a Information based on 2007 IOTs for Germany, Spain and France, and 2005 IOTs for Italy.

DIFFERENCES IN IMPORT CONTENT AND RELATIVE WEIGHT IN OUTPUT. ANALYSIS BY PRODUCTIVE SECTOR. 2007   CHART 4

Import content (difference vis-à-vis the average)   %
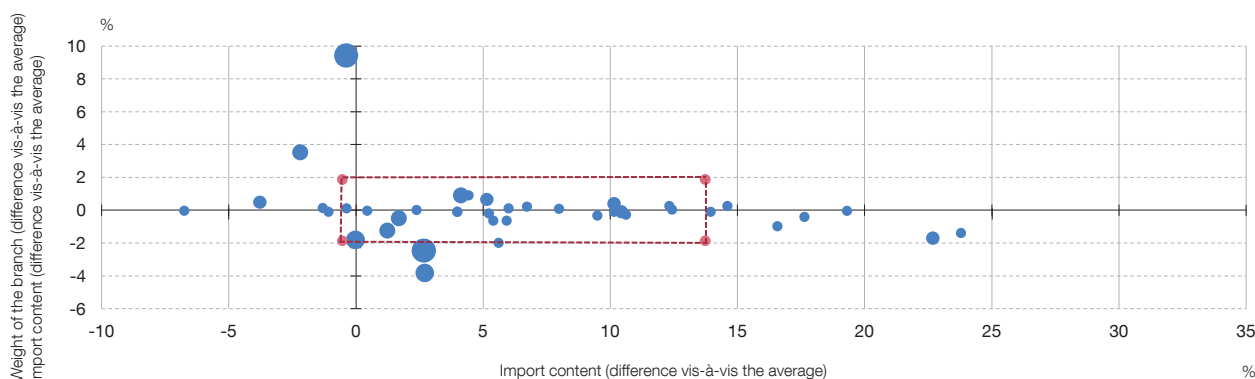
SOURCES: OECD, Eurostat and Banco de España.
NOTE: Inside the box are the values whose differences in relation to the average oscillate in a range of ± a standard deviation.

(an activity under the medium-high technology heading which includes car assembly), import content is 20 pp and 25 pp, respectively, higher than that observed in France and Germany. In the case of this industry, import dependence may be due, at least in part, to the fact that Spanish production is carried out entirely by subsidiaries of foreign firms, unlike the other countries considered, where it is localised at parent companies. This explanation could be applied to the aggregation of all the industrial sectors, since there appears to be some relationship between the extent to which multinational subsidiaries are present – measured by the volume of foreign direct investment (FDI) – and IC.[9]

Taking the technological content of the various activities, the biggest differences are found in the high- and medium-high technology content sectors[10], where the import content of manu-

---

9 Thus Spain, with a percentage of inward FDI in the country of 44% of GDP in 2010, is the country with the highest ratio of the economies analysed, almost doubling the weight observed in Germany.

10 Pharmaceuticals and IT, electronic and optical products are classified as high technological content activities. Activities of medium-high technological content include the chemical industry (excluding pharmaceuticals), and the manufacture of machinery and equipment, electrical equipment, motor vehicles and other transport equipment.

	Spain		Germany		France		Italy (2005)	
	Position	Imp. Cont. (%)	Position	Imp. Cont. (%)	Position	Imp. Cont. (%)	Position	Imp. Cont. (%)
MAIN SECTORS FROM THE SPANISH STANDPOINT								
Coke, refined petroleum products and nuclear fuels	1	82.8	1	82.2	1	70.0	1	74.0
Manufacture of motor vehicles and trailers	2	63.3	9	37.7	2	43.5	4	36.5
Chemical industry	3	54.8	14	33.6	14	28.5	2	46.7
Air and space transport	4	52.2	10	36.3	6	35.0	7	34.2
Manufacture of computing, electronic and optical equipment	5	48.5	4	44.8	18	24.3	8	33.6
Manufacture of other transport equipment	6	48.0	18	26.2	7	34.6	6	35.1
Textile industry	7	46.3	7	39.3	3	42.5	10	31.3
Paper industry	8	45.2	13	34.1	5	37.3	14	28.1
Rubber and plastic products industry	9	43.5	3	45.5	23	20.3	5	36.1
Manufacture of machinery and electrical equipment	10	42.5	12	36.0	9	33.2	13	28.9
Recycling	11	39.1	26	17.6	10	31.3	22	21.7
Wood and cork industry	12	38.8	11	36.0	8	33.6	18	26.6
Metallurgy	13	38.8	16	28.3	16	28.3	3	42.7
Maritime transport	14	38.5	2	50.1	4	40.4	21	22.3
Tobacco industry	15	36.7	6	43.1	11	31.1	36	10.4
OTHER RELEVANT SECTORS								
Machinery and mechanical equipment	22	27.3	19	25.4	18	21.0	17	26.6
Food and beverages industry	23	26.9	29	14.5	7	24.0	20	22.3
Construction	27	23.6	34	8.6	27	14.0	29	12.5

SOURCES: OECD, Eurostat and Banco de España.

facturing output in Spain exceeded the average level in Germany and France by around 20 pp in 2007 (see Chart 3). At the same time, productive activities of high- or medium-high-technology content accounted that year for 30% of Spanish industrial output, while this percentage amounted to 41% in France and 52% in Germany. Conversely, the differences between countries in the productive structure of the food and beverages industry, an activity classified as being of low technological content, are much smaller. The main conclusion from these results is that Spanish industrial sectors, in particular those of high- and medium-high technology content, show lower value added and greater dependence on intermediate goods imports.

The two sectors in Spain that have a far higher relative weight in overall output than that of the other countries – namely accommodation and food service activities, and construction – have a lower IC than that of the average for the Spanish economy. In this respect, the recent significant adjustment in the construction sector has, on its own, had a moderate impact on the correction of the external imbalance via imports.

In view of these results, it is worth asking what consequences the high import content of productive sectors in Spain may have on the functioning of the economy. On one hand,

the degree of import penetration in an economy may be due to various factors, such as price and cost levels in relation to national output or the greater variety or quality of imported products. On the other, the fact that a country incorporates a comparatively higher proportion of imported intermediate inputs might be indicative of a more efficient use of the advantages of the international division of labour.[11] In this respect, a high demand for imported intermediate inputs cannot per se be considered as a sign of greater inefficiency of the national industrial sectors [Altamonte et al. (2008)]. Further, it can also be seen that the smaller a country is, the greater the proportion of imported intermediate inputs in the total value of its output [Bussière et al. (2011)]. That said, high and generalised external dependence in all the industrial sectors might also be interpreted as a structural shortcoming in domestic technology, which would be compensated for through the incorporation of a greater proportion of imported intermediate inputs [Banco de España (2008)].

In any event, a high import content has unequivocal implications for the scale of the knock-on effects from one industrial sector on others. Specifically, the greater a sector's IC, the lower the effect of an increase in the final demand of this sector on the economy's value added, since its knock-on effects will leak out to a greater extent abroad (via its direct and induced demand for imported intermediate inputs). Hence, given the greater import content of Spanish industry and the lower relative share of value added in industrial output, the elasticity of the economy's total value added to changes in the final demand of the industrial sector would conceivably be lower in Spain than in the other countries considered. In concrete terms, and according to the estimates of the demand model of the import-output tables for 2007[12], an increase of 1% in the final demand of the Spanish industrial sector would prompt an increase in the economy's total value added of 0.16%, while the related elasticities in Germany and in France would be more than double this (0.39% and 0.36%, respectively). These results therefore suggest that, in the absence of changes in the import content of Spanish manufactures, the industry's capacity to act as a growth catalyst is lower than in other countries.

Import content from the standpoint of the final destination of output

This section seeks to complete the analysis of import content from the standpoint of the various components of final demand (i.e. private consumption, government consumption, gross capital formation and exports). In this connection, and in addition to considering imports of intermediate goods and services, as was done in the estimate of import content, imports of *final* products must be taken into account. Accordingly, a broader concept must be used, namely the degree of *import intensity* which, for a given component of demand, is defined as the sum of import content and of the relative weight of final imports of goods and services in the total of that demand component.[13]

The analysis of imports of final products offers some worthwhile conclusions. As can be seen in Table 3, these imports accounted in Spain for a higher weight than that of the other three countries in the case of both private and government consumption. Conversely,

---

IMPORT INTENSITY BY FINAL DEMAND COMPONENT (a)   TABLE 3

	Private consumption	Government consumption	Gross capital formation	Exports (b)
IMPORTS FOR FINAL USE (as a percentage of total component final demand)				
Germany	10.4	1.6	19.2	15.8
Spain	**12.1**	**2.3**	**13.6**	**—**
France	12.0	2.0	12.3	4.9
Italy	8.1	0.6	12.7	—
IMPORT CONTENT				
Germany	15.4	7.8	20.9	31.6
Spain	**17.0**	**11.1**	**22.2**	**39.0**
France	14.6	7.8	17.6	29.5
Italy	15.4	7.2	18.6	29.1
IMPORT INTENSITY				
Germany	25.8	9.4	40.0	47.4
Spain	**29.0**	**13.3**	**35.8**	**39.0**
France	26.6	9.8	29.8	34.4
Italy	23.5	7.8	31.3	29.1
Memorandum item: Imports for final use as a percentage of total imports				
Germany	42.4			
Spain	**32.9**			
France	38.1			
Italy	27.7			

SOURCES: INE and Eurostat.

a Data based on 2007 IOTs for Germany, Spain and France, and 2005 IOTs for Italy.
b To calculate technological intensity, Spanish and Italian direct imports intended for export are assumed to be zero.

in the case of investment, Germany is the country with the highest weight of final imports in the total. Finally, in the case of exports, the significant role in Germany and France of imports of final goods that are then re-exported is highlighted. This process would be due, at least in part, to the presence in these two countries of major seaports that would act as a gateway for goods earmarked for third markets, although it is difficult to explain why there is no similar information on these re-exports in Spain's and Italy's IOTs.[14]

All the various final demand components show a higher import content in Spain than in the other countries.[15] Specifically, the greater IC of exports in Spain than in the other countries considered should be highlighted.[16] This would be partly due to the high dependence of certain exporting sectors on imported intermediate inputs, although perhaps the smaller size of Spain's economy compared with Germany or France might be another explanatory factor, given the existence of an inverse relationship between size and import content [Bussière et al. (2011)].

Logically, Spain's high import intensity has played an important role in reducing the external imbalance during the recent crisis, given the strong contraction in expenditure. In a setting such as the present, in which the growth of domestic demand is constrained by

---

14 For the purposes of calculating import intensity, it is assumed in Table 3 that the unavailable figure in these cases is zero.

15 The differences between the values of this indicator for each of the final demand components can be attributed to the different relative weights of the different industrial sectors participating in the production of those goods.

16 A detailed analysis of the import content of exports in Spain can be found in Pérez-Raposo and Carabias (2010). Another international comparison exercise, in this case for the period 1995-2000, can be found in Breda et al. (2007).

household and corporate deleveraging needs, it is desirable that the recovery of the economy should be underpinned by a greater gearing of output towards the external sector, harnessing business opportunities in other more dynamic markets. However, the analysis here suggests that the knock-on effects of an increase in exports on national output will, other things being equal, be lower in Spain than in other countries, as a result of their higher import content.

Conclusions

The sectoral structure of the Spanish economy has certain differential aspects in relation to our main European partners. Over the past decade, the most significant particularities have been linked to construction and manufacturing industry. In construction, following a boom period, a sharp correction prompted a gradual but sustained reduction of its weight in productive activity in Spain, while this weight has held relatively stable in the other countries. The industrial sector has also been acutely affected by the crisis, evidencing a comparatively lower capacity for recovery than in other countries. Spanish industry shows three distinctive features compared with the other countries considered: its greater specialisation in industrial sectors of low and medium-low technology content, lower gross value added generated per unit of output and the larger amount of imported intermediate inputs per unit of output.

One of the characteristic factors of Spain's production structure is its high import content, which exceeds that of the main euro area economies even if the potential influence of the energy sectors is excluded. This phenomenon appears to be due essentially to Spanish sectors' greater propensity to import – particularly in the case of the industrial sectors of high and medium-high technological content – and not so much to differences in productive structure. The comparatively higher import content in a majority of sectors might partly be due to the fact that the Spanish economy is smaller, which would warrant a greater degree of external openness. Nonetheless, the fact that import content in Spanish industry is so high and generalised across the various sectors means that, given an increase in final demand, the knock-on effect on the other national productive sectors is less in Spain than in other countries with a lower dependence on the external sector.

The greater import content of Spanish exports might also be highlighted in a setting in which the volume of exports in relative output terms is lower than that of France or Germany. One of the causes that may explain these results is the smaller average size of companies in Spain, since that tends to restrict the possibilities both of supplying inputs in the domestic market and of competing in third markets. In any event, the analysis performed suggests that, in the absence of structural changes, Spanish industry has a more limited capacity to act as a dynamic force for the economy, if compared with the other euro area countries. For the external sector to potentially contribute more resolutely to the economic recovery, it would therefore be necessary to step up efforts to increase exports, through obtaining gains in competitiveness and opening up to new markets, and to reduce import dependence, which comes about due – among other factors – to the insufficiency of national innovation efforts, and which is a potential drag on growth in the Spanish economy.

13.2.2012.

REFERENCES

ALTAMONTE, C., A. BARATTIERI and A. RUNGI (2008). Import penetration, intermediate inputs and productivity: evidence from Italian firms, Economic and Social Research Institute (ESRI), DYNGREG, Working paper no. 23 08.
EUROPEAN CENTRAL BANK (2005). Competitiveness and the export performance of the euro area, by a Task Force of the Monetary Policy Committee of the European System of Central Banks, Occasional Paper, no. 30.
— (2010). Monthly Bulletin, August, pp. 99-101.

BANCO DE ESPAÑA (2008). Economic Bulletin, July, pp. 58-59.

BARBA NAVARETTI, G., M. BUGAMELLI, F. SCHIVARDI, C. ALTOMONTE, D. HORGOS and D. MAGGIONI (2011). The Global Operations of European Firms, Blueprint, 12, Bruegel.

BREDA, E., R. CAPPARIELLO and R. ZIZZA (2007). Vertical specialization in Europe: Evidence from the import content of exports, Banca d'Italia Working Papers, no. 682.

BUSSIÈRE, M., G. CALLEGARI, F. GHIRONI, G. SESTIERI and N. YAMANO (2011). Estimating trade elasticities: Demand composition and the trade collapse of 2008-2009, NBER Working paper series, no. 17712.

CAÑADA, A. (1994). "Las tablas input-output como sistema de información de la actividad industrial. Una caracterización General", Economía Industrial, September-October, pp. 15-33.

— (2001). "Una nota sobre coeficientes y modelos de multiplicadores a partir del nuevo sistema input/output del SEC95", Instituto Nacional de Estadística, Boletín Trimestral de Coyuntura, December.

CRESPO, A., G. PÉREZ-QUIRÓS and R. SEGURA-CAYUELA (2012). "Competitiveness indicators: the importance of an efficient allocation of resources", Econopmic Bulletin, Banco de España, January.

DIETZENBACHER, E., V. ALBINO and S. KUHTZ (2005). "The fallacy of using US-type input-output tables", mimeo (paper presented at the 15th International Conference on Input-output Techniques).

HEITZ, B., and G. RINI (2006). "Reinterpreting the contribution of foreign trade to growth", Trésor-Economics, no. 6 (December).

INSTITUTO NACIONAL DE ESTADÍSTICA (2010). "Panorámica de la Industria", at www.ine.es.

— (2009). "Los sistemas input-output en el SEC: SEC79 y SEC95. Nota Metodológica", at www.ine.es.

— (2005). "Nota metodológica sobre las tablas simétricas de la economía española en base 2000", at www.ine.es.

MAZA, L .Á., and J. PEÑALOSA (2011). "The residential investment adjustment in Spain: the current situation"», Economic Bulletin, Banco de España, January, pp. 92-104.

MUÑOZ CIDAD, C. (2000). Las cuentas de la nación: introducción a la economía aplicada, Cívitas.

PÉREZ-RAPOSO, B., and J. M. CARABIAS (2010). "Repercusión del sector exterior en la economía española", Boletín Económico del ICE, no. 2999, pp. 3-18.

REIS, H., and A. RUA (2009). "An input-output analysis: Linkages vs leakages", International Economic Journal, vol. 23, no. 4, pp. 527-544.

ANNEX: CALCULATION OF IMPORT CONTENT (IC)

Import content measures the impact that an increase in the final demand of a specific sector, of an economic sector or of the economy as a whole has on the intermediate inputs imported by an economy, all of which aspects are analysed in this article. This annex offers a more technical explanation of the procedure for calculating the import content of the whole economy.

To describe the import content calculation procedure, several fundamental concepts must first be introduced into input-output analysis.[1] The first of these concepts is that of "technical coefficient", which indicates which proportion of the value of output of sector j relates to national inputs from sector i. Therefore:

$$a_{ij}^d = z_{ij}^d / x_j \qquad [1]$$

where z_{ij}^d is the nominal value of intermediate inputs from sector i used by sector j, and x_i is the nominal value of the output of sector j. The total output of a sector can be allocated to the productive process of each of the sectors (as a domestic intermediate input) or to meeting final demand:

$$x_i = z_{i1}^d + z_{i2}^d + ...+ z_{in}^d + y_i^d \ \forall \ i = 1,...,n \qquad [2]$$

where y_i^d represents the final demand for sector i products. It is important to bear in mind that, given that z_{ij}^d and x_i are nominal values, the technical coefficients are sensitive to price changes.

---

1 A more exhaustive theoretical analysis of the input-output framework can be found in the previously mentioned reference Muñoz Cidad (2000).

Substituting [1] into [2] for the n sectors of an economy, a system of equations is obtained which, represented in matrix form, can be summarised in the following equation:

$$X = A^d X + Y^d \rightarrow X = (I - A^d)^{-1} Y^d \qquad [3]$$

where the expression $(I - A^d)^{-1}$ is known as the "Leontief inverse matrix", which is obtained from the A^d matrix, an n x n square matrix. Expression [3] therefore indicates how much the output of each sector increases (i.e. how much the column X vector changes) in the face of changes in final demand depicted by means of a change in vector Y^d. This expression is the basic equation of the "demand model" of the input-output tables, which allows for analysis of the repercussions on national output of changes in any of the final demand components of one or several productive sectors of an economy. On the basis of this expression, import content may be defined as follows:

$$Import\ content = A^m (I - A^d)^{-1} Q$$

where A^m is a row vector (1 x n) of technical coefficients of imported intermediate inputs, in which each component a_j^m thereof measures the weight of intermediate inputs imported directly by sector j in the total value of that sector's output, expressed in percentage terms. $(I - A^d)^{-1}$ is the Leontief inverse matrix, calculated on the basis of the technical coefficients of the matrix of national intermediate inputs.[2] Lastly, Q is an n x 1 column vector that shows the relative weight of the output of each sector in aggregate output. In this way, multiplying the Leontief inverse matrix, which reflects the total increase in output in each sector in response to a unit increase in the final demand of all the sectors, by A^m gives the total increase in imported intermediate inputs in response to the increase in final demand. In turn, multiplying this result by Q (i.e. weighting each sector by its weight in aggregate output) gives the import content of output in percentage terms for the whole of the economy.

---

2 Dietzenbacher et al. (2005) discuss the importance of using the technical coefficients of the domestic matrix and not the total matrix.