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Vertical specialisation in Europe: Evidence from  
the import content of exports

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# VERTICAL SPECIALISATION IN EUROPE: EVIDENCE FROM THE IMPORT CONTENT OF EXPORTS

by Emanuele Breda\*, Rita Cappariello\* and Roberta Zizza\*

## Abstract

We use input-output tables to estimate the import content (IC) of exports for several European countries, interpreting this as a measure of internationalisation. Between 1995 and 2000 the IC grew everywhere but in France; the transport equipment sector emerged as the most internationalised one. The change we detect for a set of EMU countries is remarkable when compared with previous estimates over the 20-year period between 1970 and 1990. Italy and Germany showed very different patterns, although both started from a very low level of IC. Italy experienced the weakest growth and Germany the most sizeable rise. We argue that Italian firms might have felt less pressured to transform their organisation due to the delayed effects of the 1992 and 1995 Lira crises.

**JEL Classification:** F14, C67.

**Keywords:** external trade, outsourcing, import content, input-output analysis.

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## 1. Introduction<sup>1</sup>

One of the consequences of global market integration is the international fragmentation of production, i.e. the localisation abroad of phases of production which previously took place in the home country.<sup>2</sup> This process reflects the firms' organisational choices aimed at reducing costs and increasing productivity on international markets (Antràs and Helpman, 2003; Helpman, 2006).

Vertical fragmentation of production takes place mainly in two ways, outsourcing and off-shoring. Outsourcing refers to firms giving up stages of their intermediate production chains and, consequently, buying parts from foreign suppliers; off-shoring refers to the establishment or acquisition of plants abroad to produce intermediate goods and services. An important role in this process has been played by the progress in the field of information and communication technologies, which makes it possible to reduce the coordination costs emerging when production is divided into separate stages (Jones and Kierzkowski, 2001).

Over the last decades world trade has grown faster than both world GDP and manufacturing value added; intra-industry trade in final and intermediate goods accounts for a large part of trade growth, signalling the rising importance of the international fragmentation of production. Since the mid-nineties a stream of literature measuring this phenomenon has emerged. Feenstra and Hanson (1996) estimate that in the United States the share of imported inputs on the total purchase of intermediate products grew from 5.5 per cent in 1972 to 11.6 in 1990. Hummels *et al.* (1998, 2001) and Chen *et al.* (2005) detect an upward trend in a set of OECD countries during the final part of the last century. Egger and Egger (2003) show that between 1990 and 1997 international outsourcing rose, on average, in eleven European countries, markedly in the Southern EU member states. A study by the European Central Bank (ECB, 2005a) confirms the growth in international fragmentation for the euro area as a whole between 1995 and 2000. For Italy, Breda *et al.* (2006) find an increase of the import content of exports between 1995 and 2000, while, according to ISAE (2005), the import content declined between 1990 and 2000.

There also exists a large body of empirical research devoted to estimating the effects of international fragmentation of production on labour market developments (Feenstra and Hanson, 1996 and 1999; Amiti and Wei, 2004; Hijzen *et al.*, 2004) and on output and value added volatility (Bergin *et al.*, 2006). A study by the European Central Bank (ECB,

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<sup>2</sup> Many different terms have been used in the literature for this phenomenon: outsourcing (FEENSTRA R.C. and HANSON G.H., 1996), international fragmentation of production (JONES R.W. and KIERZKOWSKI H., 2001), vertical specialisation (HUMMELS D. *et AL.*, 2001; GOH A.T. and OLIVIER J., 2004), delocalisation (LEAMER E., 1998), vertical production networks (HANSON G.H. *et AL.*, 2005), production sharing (FEENSTRA R.C., 1998). We will use them interchangeably.

2005b) aims at a better understanding of the external trade impulse to the euro area growth by considering the exports net of their import content.

Many studies are based on input-output (intersectoral) tables; for each product in a given economy the tables provide the intermediate inputs involved in its production (classified according to their origin, either foreign or domestic), the imports of the product itself as well as the uses of the product for satisfying the different components of the final demand (private and public consumption, investment, exports).

Despite the significance of this issue in the economic and political debate, literature on international fragmentation, though nowadays quite vast, is far from being consolidated. Since it is not possible to observe directly the vertical specialisation at an aggregate macro level, proxies are needed. Various indicators have been developed, conditionally on data availability, with the aim of enhancing “comprehensiveness” by taking into account the complexity of the phenomenon. Furthermore, only few studies delve into the methodological and measurement issues and propose a reliable cross-country comparison.

This paper adds to this literature by providing comparable estimates of the import content of exports by industry for a set of European countries; we stick to the approach originally introduced by Hummels, Ishii and Yi (2001; HIY, henceforth). We rely upon harmonised information on production processes provided by the input-output tables at current prices published, for Italy, by the Italian National Institute of Statistics (Istat) for years 1995 and 2000 (see Istat, 2006) and collected and published, for the other EU countries, by Eurostat.

The paper is organised as follows. Section 2 reviews the literature with a focus on conceptual and measurement issues. In Section 3 the measure of the import content of exports is defined at a detailed level and the methodology for its estimate is introduced. Results for a set of European countries are presented and compared in Section 4, with a focus on Germany and Italy. An analysis by sector is presented in Section 5. Finally, Section 6 resumes the main results.

## **2. Defining and measuring international fragmentation: a review of the literature**

The conceptualisation and measurement of the international fragmentation phenomenon have been tackled by relevant literature in different ways, resulting in a variety of possible indicators. A first group of papers focuses on imported inputs as a share of total inputs; among them are Feenstra and Hanson (1996) and the European Economic Advisory Group (2005). In the same vein, Feenstra and Hanson (1999) propose two slightly different sectoral indicators in order to evaluate the effects of outsourcing on wages in US: a *narrow index*, i.e. the ratio for each sector between the inputs imported from the same industry abroad and the total (domestic and foreign) inputs from that industry; and a *broad index*, i.e. the ratio between the inputs imported from all sectors and the total (domestic and foreign) inputs employed in that industry. These indices have also been used by Bracci (2006), Falzoni and Tajoli (2007) and Daveri and Jona-Lasinio

(2007)<sup>3</sup> in their assessments of outsourcing in the Italian manufacturing sector between 1995 and 2003.

A second class of studies focuses on the concept of vertical specialisation, proxied by the import content of exports. According to the original definition by HIY, vertical specialisation occurs when goods and services are produced in multiple stages across different countries, with each country being involved in some stages of the good's production sequence and then exporting the good-in-process to the next country. Their index of international outsourcing includes not only the value of imports *directly* contained in the exports, but also the value of inputs which are *indirectly* used in the production of an exported good. The same approach is followed in Chen *et al.* (2005) and in a study by the European Central Bank (ECB, 2005a).

Finally, a third class of studies (e.g., Egger and Egger, 2003) considers the import content of domestic production - proxied by the share of imported intermediate inputs on gross production - as an indicator of international outsourcing. This measure attempts at representing the firm's decision to substitute domestic value-added with foreign production. However, it fails to fully capture the production chains that link different countries, acting either as producers in intermediate stages or as exporters of final goods. Moreover, as traded goods are those which are more heavily affected by international competition, it is just in their production that the adoption of cost-reducing strategies is particularly essential.

### 3. The import content of export: concepts and measures

There are two main ways in which firms internationalise their production process: foreign direct investments and outsourcing, i.e., the purchase of intermediate inputs from foreign firms.<sup>4</sup> As in HIY, the measure of *vertical specialisation* we adopt is based on the idea that countries link sequentially to produce goods. We therefore focus on imported intermediate goods and services used by a country to make goods or services which are later exported to another country, irrespective of the relationship the domestic firm has established with the foreign supplier.

As an indicator of vertical specialisation we choose the import content (*IC*) of exports, calculated on the basis of the input-output tables. Using these tables helps avoiding an arbitrary classification between intermediate inputs and other categories of goods: they allow us to disentangle the output of each sector into two parts, the first representing inputs to the other sectors, the second representing goods which satisfy the final demand. Obviously, they do not account for the international outsourcing to foreign subsidiaries of the whole production and distribution process (*export platform*), as this

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<sup>3</sup> FEENSTRA and HANSON (1999) derive data on imported inputs by a given industry by assuming that any manufacturing industry would employ imported inputs in the same proportion, whereas the studies on the Italian economy rely upon imported intermediate data provided by input-output tables.

<sup>4</sup> PISCITELLO L. and TAJOLI L. (2005) show that for Italy there exists a positive relationship between different kinds of internationalisation in a given sector on a given market; they do not substitute one another and they tend to strengthen mutually.

case neither implies flows of goods and services across home country borders, nor a change in the import content of exports.

Following HIY, the indicator of vertical specialisation include imports of intermediate inputs from both foreign affiliates and foreign suppliers (i.e., *direct* import content), as well as imports that are already incorporated in the capital and intermediate inputs acquired from domestic suppliers (i.e., *indirect* import content). In order to calculate the value of imports directly contained in the exports we resort to the following formula, here reported using matrix notation:

$$(1) \quad \text{direct IC of exports} = IC_{dir} = u_M A \cdot EXP$$

where  $u$  is a unit vector of dimension  $n$ ,  ${}_M A$  is an  $n$ -dimensional square matrix containing the production coefficients for imported inputs,  $EXP$  is the  $n$ -vector of exports, with  $n$  being the number of sectors. Each element  $a_{ij}^M$  of the matrix  ${}_M A$  measures the value of imported intermediate goods and services classified in the branch  $i$  and used to produce one unit of output in sector  $j$  (Guarini and Tassinari, 1993).

Using the input-output tables allows us to calculate also the value of inputs which are *indirectly* employed in the production of an exported good. An imported input can indeed be used in a sector whose output is in turn employed in another sector, then possibly in a third sector and so on, to be eventually included in a good sold abroad. In this case the measure of the import content of exports includes both directly and indirectly imported inputs, the latter being defined as those contained in domestic inputs. The measure for the whole import content is the following:

$$(2) \quad IC \text{ of exports} = IC = u_M A(I - {}_D A)^{-1} EXP$$

where  ${}_D A$  is the matrix of the input coefficients for domestic intermediate goods and  $(I - {}_D A)^{-1}$  is the term capturing imported inputs embodied in the domestic output in the first, second, third, etc. stages of production before being used to produce the good that will eventually be exported.

## 4. Vertical specialisation in Europe. A whole-economy, cross-country comparison

### 4.1 Data sources

The analysis on vertical specialisation is based on symmetrical input-output tables, which are compiled approximately every five years by the EU national statistical agencies and collected by Eurostat. For Italy, the tables used are those recently released by Istat and compiled according to a new methodology which guarantees more consistency between intersectoral transactions and national accounts statistics, making it possible to quantify domestic and international outsourcing using *direct* data on imported and domestically produced goods and services (Bracci, 2006).

The symmetrical tables distinguish between intermediate purchases from domestic suppliers (the so-called ‘domestic matrix’) and imported intermediate purchases (‘import matrix’). The latest available tables for a representative set of countries are at current prices and refer to years 1995 and 2000. Tables at current prices do not allow telling apart the effects due to a variation in technical coefficients for domestic and imported inputs from the effects due to a change in relative prices. We chose, however, not to deflate the aggregates derived from the tables since detailed and reliable data on export and import prices are not currently available for all countries.

We provide a measure of the import content of exports for seven European countries: six Monetary Union members (Belgium, France, Germany, Italy, the Netherlands and Spain) and the United Kingdom. This panel of countries currently accounts for about 82 per cent of the EU-25 GDP and 76 per cent of trade in goods and services (86 and 82 per cent, respectively, of the EU-15 GDP and trade). The input-output tables provide a sectoral breakdown into fifty-nine sectors (according to the CPA classification), twenty-two of which are manufacturing sectors.<sup>5</sup> The development of the phenomenon of vertical specialisation in the course of the second half of the 1990s will also be measured for an aggregate of EMU members only, due to the unavailability of input-output tables for the United Kingdom in 2000.

#### *4.2 Differences and similarities in the extent of internationalisation*

Table 1 shows three different indicators of the import content of exports. The first one measures the overall (direct and indirect) import content of goods and services produced in the country and then exported; the second one regards manufactured goods only. The third one is a broader measure of internationalisation, which includes ‘transit trade’, i.e. goods imported in the declaring country and thereafter directly re-exported without any transformation.

The overall IC of exports emerges as being quite heterogeneous across countries. In 1995 it ranged between 22 and 42 per cent, with lower-end values characterising larger countries (France, Germany) and upper-end values characterising smaller countries (the Netherlands and Belgium). Five years later the ranking remains broadly the same, although no observation can be made for the UK. The IC grew between 1995 and 2000 in all countries considered but France; Spain and Germany experienced the strongest growth of import content in relative terms, with the latter country starting from a very low level in 1995. In 2000 the IC of exports was equal to about 27-28 per cent in Italy and Germany; it was 35 per cent in Spain, while in Belgium and the Netherlands the phenomenon was much more pronounced (47 and 37 per cent, respectively). When aggregating across the six members of the Monetary Union by using the export-weighted average of each country’s indicator, we observe an increase in the average import content of domestically

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<sup>5</sup> The international comparison is obviously more reliable if input-output tables with the same sectoral disaggregation are available. However, since for France no homogeneous tables are published for the two considered years, we use input-output tables from different sources. The 1995 table provides data which are broken down into 40 industries from the ISIC Rev 3 classification, whereas the 2000 table is broken down into 59 products from the CPA classification. Although the mismatch between the two classifications does not allow sectoral comparisons between the two periods, we still consider meaningful to compare the aggregate results for France in the two years.



produced exports from 25.5 to 30.0 per cent (29.5 per cent by keeping country export weights constant at 1995 level), largely reflecting the upward trend in vertical specialisation recorded in Germany.<sup>6</sup>

We claim this change is quite dramatic as the growth of the IC of exports we detect in a 5-year period (4.5 percentage points) overcomes that estimated by HIY over a 20-year period, from 1970 to 1990 (3.6 percentage points), for a partially overlapping set of OECD countries.

The growing intensity of vertical specialisation in Germany is confirmed by other indicators as well. For instance, the share of “own” (i.e., domestically produced) value added in the German manufacturing sector declined sharply in the second half of the 1990s, at a higher rate than in the other EU countries<sup>7</sup>. Sinn (2004, 2006) argues that Germany’s high wages and rigid labour market stimulated a wave of international relocation of production (especially in the automotive sector and towards the neighbouring Eastern European countries that would have later joined the EU),<sup>8</sup> leaving in Germany almost only the final stages of production, which are usually more capital and skill intensive. This is the so-called “bazaar effect”: to simplify, German firms export basic components and raw materials to their foreign affiliates located in lower-wage countries, assemble (almost) entirely their products abroad and re-import them to implement the final stages of production, “put the brand” and sell the final goods in domestic and foreign markets. This phenomenon generates a surge in international trade flows and, thanks to cost competitiveness gains, is likely to trigger a positive performance of exports market shares and current account balance; however, because of the lower domestically generated value added, this does not necessarily stimulate GDP growth.<sup>9</sup>

In the same period (1995-2000), on the contrary, the internationalisation of Italian production was just at its beginning: the Lira devaluation in 1992 and its depreciation in 1995 had temporarily boosted the price competitiveness of Italian goods, making the re-organisation of production processes plausibly less urgent. Between the end of the last decade and the beginning of the current one, many factors made the re-organisation of production much more compelling for Italian manufacturing firms.<sup>10</sup> Among these factors were the waning effects of the Lira crises on price competitiveness and the adoption of the Euro that, once and for all, eliminated exchange rate fluctuations for almost half of the Italian external trade, as well as the aggressive entry into world markets of low labour cost emerging countries, such as China and India. All these elements increased, above all, the competitive pressure on Italian “traditional” products (textiles and clothing, leather and footwear, furniture etc.). Further competitiveness losses were caused by the appreciation of the Euro during 2001-04 and by decreasing labour productivity. It later became clear that the model of the industrial districts, successfully implemented especially during the 1990s and quite widespread in that kind of productions, had to be rethought in face of the

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<sup>6</sup> Countries are aggregated without netting the intra-trade.

<sup>7</sup> See SINN H.-W. (2006, figure 3).

<sup>8</sup> See “The impact of FDI in import structure” in BUNDESBANK (2006, pages 54-55).

<sup>9</sup> See also DANNINGER F. and JOUTZ S. (2007). For critical or different views about the “bazaar economy” argument, see BECHERT S. and CELLARIUS G. (2004) and BELKE A. *et AL.* (2007).

<sup>10</sup> PISCITELLO L. and TAJOLI L. (2005) find some evidence of a process of internationalisation of production for Italian firms in more recent years.

increasing globalisation.<sup>11</sup> The lag Italy showed in the internationalisation process could be arguably put in connection also with structural factors, such as the predominance of small and medium enterprises and the lower diffusion of information and communication technologies with respect to the main European countries (OECD, 2004).

This stylised picture for the period 1995-2000 - Italy started from a relatively low level of internationalisation of production and the phenomenon grew less than in the other EU countries, while Germany started from a relatively low level too, but experienced a growth rate above the average - is confirmed, at least for the share of international outsourcing implemented via direct investment activity, by the ratio between outward FDI stock and GDP. In Italy this indicator rose only from 9.0 per cent in 1995 to 16.4 per cent in 2000, widening the negative gap with respect to all the other countries analysed, while in Germany it started from the third lowest level (10.8 per cent) and almost tripled (up to 29.0 per cent). Spain's FDI stock to GDP ratio, probably due also to catching-up effects, experienced the most exceptional growth (from 5.9 to 29.6 per cent). In the other EU countries analysed the same indicator started from higher levels and more than doubled: in France it grew from 13.5 to 34.0 per cent, in the United Kingdom from 26.5 to 62.4 per cent, in Belgium (plus Luxembourg) from 27.8 to 72.5 per cent and in the Netherlands from 41.1 to 82.4 per cent.<sup>12</sup>

According to the broader measure of internationalisation, which includes 'transit trade', the IC of exports for the six EMU countries reached 41.7 per cent in 2000, from 33.5 in 1995. The figure for year 2000 compares with that estimated by the European Central Bank (2005a) for a slightly different subset of countries (44.2 per cent).<sup>13</sup>

This trend is broadly consistent with that of the European Economic Advisory Group (2005) in terms of both sign and order of magnitude, although those estimates are based on a different indicator.

The measure including transit trade shows an even higher variability across countries than the one excluding it. Transit trade is negligible for Italy and Spain, while it is extremely sizeable for the Netherlands and Belgium, due also to their size and geographical position. The developments for the manufacturing sector alone are quite similar to those referring to the whole economy.

#### *4.3 The rise in oil price: is it the whole story?*

In the period 1995-2000 the oil price, expressed in US dollars, rose by more than 64 per cent. Since we use input-output tables at current prices, our results are likely to be affected, at least partly, by the nominal growth of energy imports that "mechanically" inflated the IC. According to Eurostat trade statistics, between 1995 and 2000 the share of

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<sup>11</sup> Some districts, e.g. North-East textile and shoe manufacturers, switched from a "traditional district model" (headquarters and manufacturing facilities in the same geographic area) to a "new value chain model" (headquarters in Italy, manufacturing facilities in countries with lower labour costs; see OECD, 2004). For some case studies, see AMIGHINI A. and RABELOTTI R. (2003) and BENTIVOGLI C. and SCINTILLANI L. (2004).

<sup>12</sup> See UNCTAD (2005); for Italy, own calculations on Banca d'Italia – UIC and Istat data.

<sup>13</sup> The countries considered are Austria, Finland, Germany, Italy and the Netherlands. Also in the ECB's exercise the countries are aggregated without netting the intra-trade.

energy products on total imports grew by more than two percentage points in all the EMU countries considered: from 7.3 to 9.7 per cent in Italy, from 6.2 to 8.8 per cent in Germany, from 5.9 to 8.9 per cent in Belgium, from 8.3 to 10.6 per cent in the Netherlands, from 6.3 to 8.9 per cent in France and from 8.0 to 12.1 per cent in Spain. So, in order to eliminate the oil price effect, we calculate the IC of exports excluding energy minerals from imports and also excluding completely the energy input both in its domestic and imported components.

If we exclude energy products or sectors (Table 2), IC growth is still confirmed but, to a varying extent, less pronounced in all EMU countries but France where, as stated above, data at sectoral level are not fully comparable between 1995 and 2000. For Belgium and, in particular, for Germany both level and variation of IC are only slightly reduced by the exclusion of energy. For Italy, and even more so for the Netherlands, both the absolute levels and the 1995-2000 growth are significantly lower. In Italy the IC of total exports net of imported energy inputs grew from 23.6 to 25.4 per cent (by 7.9 per cent; see Table 2, first column) and from 30.4 to 31.2 (by 2.7 per cent) in the Netherlands. By including energy minerals, the two countries' IC of total exports grew, respectively, by 11.6 and 10.5 per cent (see Table 1, second column).

When aggregating across the six members of the Monetary Union in both exercises we detect an increase of about three percentage points which is still comparable, although to a less pronounced extent, with the result including energy.

## **5. The degree of internationalisation by industry**

Averaging on the five available countries, between 1995 and 2000 all manufacturing branches experienced a growth in the IC of exports (Graph 1).

In 2000 the degree of internationalisation in the transport equipment sector was particularly high in all the countries, ranging between 29 and 66 per cent, well above the average for manufacturing (Table 3). Due to its highly standardised production process, this is a typical sector in which international vertical specialisation is widely adopted.

Also in the chemical sector the degree of international fragmentation of production seems particularly high in all countries with the exception of France. The IC of exports for low-tech sectors such as “textile products and clothing” and “leather and leather products” is in line with the average for manufacturing everywhere but in Germany; for Italy, which is strongly specialised in these sectors, this seems to corroborate the findings according to which producing abroad was not so pronounced, at least until 2000.

In the two main service sectors, i.e. “transport and communication” and “wholesale and retail trade”, the IC turns out to be quite lower than in the manufacturing sector for all the countries.

The variation of import requirement between 1995 and 2000 was broken down into two parts according to the standard shift and share analysis. The first part accounts for the change in the intensity of IC within each sector; the second part for the change in the sectoral composition of exports (Table 4). The increase in the intensity of import content explains 95 per cent of the whole variation in the five-country aggregate; the branches providing the highest contributions to IC growth of exports are “chemical products and man-made fibres”, “transport equipment” and “electrical equipment and precision

instruments”. The change in the sectoral composition is found to play a marginal role (Table 5).

## 6. Conclusions

Following the methodology developed by HIY, this paper measures and compares the extent of vertical specialisation for a set of European countries, proxied by the import content of exports. This indicator is aimed at taking into account the linkages among production processes in a vertical trading chain across countries.

Our evidence supports a significant increase between 1995 and 2000 in the vertical specialisation of the countries considered, fairly comparable in terms of magnitude with that detected over a 20-year period by HIY. In the 5-year period, the import content of exports grew in Belgium, Germany, Italy, the Netherlands and Spain; results for France are less clear-cut due to underlying data which are non-fully comparable across time. The production of transport equipment emerges as the most internationalised sector. However, two of the biggest countries in this group show very different patterns: Italy started in 1995 from the second lowest level of IC and experienced the weakest growth (11.6 per cent, considering total exports); Germany started from the lowest level of IC but experienced by far the most sizeable rise (29.6 per cent).

When excluding energy products, so as to avoid the influence of their highly volatile prices, IC growth is still confirmed but is less pronounced for the aggregate area of EMU countries. However, for Germany level and variation of IC are only slightly attenuated, whereas for Italy both are significantly reduced.

Plausibly, at the beginning of the period, Italian firms felt a lower pressure to transform their organisation by locating segments of their production process abroad, due to the delayed effects on price competitiveness of the 1992 and 1995 Lira crises; only later Italian products, especially the “traditional” ones, started suffering from rising competition from developing countries and weak growth of world demand. Then it became clear that the model of industrial districts, particularly common in that kind of productions, had to be rethought in the light of the globalisation process. Also other structural issues, such as the small size of firms and low diffusion of information and communication technology, possibly contributed to explain why Italy was lagging behind in the process of internationalisation.

In the second half of the 1990s, on the contrary, German firms were already experiencing an increasing competition on both domestic and foreign markets (also from Italian products), so they started a rapid process of international outsourcing of manufacturing activities, leaving in their home country basically only the final (and most capital and skill-intensive) stages of production as well as R&D and marketing activities. Drawing from this evidence, some economists and observers started to define Germany as a “bazaar economy”.

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TABLE 1

**IMPORT CONTENT OF EXPORTS BY SECTOR OF THE MAIN EU COUNTRIES**  
(percentage values)

Countries	Year	Manufacturing	Whole economy	Whole economy, including transit trade
Italy	1995	27.5	24.4	24.7
	2000	30.6	27.2	27.8
Germany	1995	23.9	21.5	29.4
	2000	31.0	27.9	37.9
Netherlands	1995	42.6	33.8	50.0
	2000	48.1	37.3	56.6
Belgium	1995	49.9	41.5	55.2
	2000	54.3	46.6	60.4
France	1995 <sup>(1)</sup>	23.7	20.5	26.8
	2000	24.5	20.5	41.3
United Kingdom	1995	28.4	23.0	26.1
	2000	-	-	-
Spain	1995	33.5	27.5	27.5
	2000	42.9	34.9	34.9

Source: own calculations on Eurostat and, for Italy, Istat data.

(1) The 1995 results for France are based on OECD input-output tables with a different sectoral classification. See also footnote 4 in the text.



TABLE 2

**IMPORT CONTENT OF EXPORTS OF THE MAIN EU COUNTRIES EXCLUDING ENERGY***(percentage values)*

Countries	Year	Net of imported energy minerals	Net of energy sector
Italy	1995	23.6	22.4
	2000	25.4	24.2
Germany	1995	20.3	19.5
	2000	26.2	24.9
Netherlands	1995	30.4	30.1
	2000	31.2	31.1
Belgium	1995	39.8	37.2
	2000	44.1	40.7
France	1995 <sup>(1)</sup>	20.2	19.4
	2000	18.3	17.8
United Kingdom	1995	22.5	22.6
	2000	-	-
Spain	1995	25.9	24.7
	2000	31.8	29.9

Source: own calculations on Eurostat and, for Italy, Istat data.

(1) The 1995 results for France are obtained by utilising the OECD input-output tables with a different sectorial classification. See also footnote 4 in the text.

TABLE 3

## IMPORT CONTENT OF EXPORTS BY SECTOR IN SOME EMU COUNTRIES

(percentage values)

Sectors	Italy		Germany		Netherlands		Belgium		France		Spain	
	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
Products of agriculture, forestry and fishing	7.4	8.3	11.8	15.1	17.7	19.8	25.7	27.2	-	13.2	11.1	13.8
Energy minerals	10.7	23.2	10.6	16.6	8.4	9.8	-	24.2	-	14.5	7.1	21.8
Non-energy minerals	13.9	16.4	11.4	16.6	19.5	22.2	25.2	28.8	-	18.1	11.2	20.8
<b>Manufactures</b>	<b>27.5</b>	<b>30.6</b>	<b>23.9</b>	<b>31.0</b>	<b>42.6</b>	<b>48.1</b>	<b>49.9</b>	<b>54.3</b>	<b>23.7</b>	<b>24.5</b>	<b>33.5</b>	<b>42.9</b>
<i>Food products, beverages and tobacco</i>	19.1	19.8	19.2	21.0	38.0	38.9	41.7	43.5	-	15.6	19.7	26.4
<i>Textile products and clothing</i>	24.5	28.0	30.6	36.2	50.6	48.7	47.8	51.1	-	24.6	30.9	36.0
<i>Leather and leather products</i>	25.7	30.2	32.4	38.3	36.7	39.0	47.0	53.3	-	21.7	26.4	32.3
<i>Wood and wood products</i>	22.5	24.9	14.9	19.5	39.3	39.7	39.7	46.5	-	15.6	22.7	33.8
<i>Paper and paper products, printing and publishing</i>	26.7	27.9	23.8	27.0	39.5	40.1	42.4	45.7	-	21.6	29.3	34.8
<i>Refined petroleum products</i>	49.7	69.7	72.6	81.2	74.5	80.8	63.5	83.4	-	51.3	59.7	73.6
<i>Chemical products and man-made fibres</i>	38.9	42.0	23.4	34.7	42.3	51.0	49.7	52.6	-	21.7	31.4	47.0
<i>Rubber and plastic products</i>	32.6	34.4	24.2	29.5	45.4	44.6	45.1	47.6	-	22.7	36.2	36.4
<i>Non-metallic mineral products</i>	18.0	20.1	12.0	16.6	27.2	28.4	30.4	36.5	-	13.9	12.1	18.5
<i>Basic metals and metal products</i>	28.5	29.9	28.0	34.1	37.6	40.1	51.4	56.1	-	29.1	25.7	31.6
<i>Mechanical machinery and equipment</i>	23.6	25.0	19.0	24.1	37.9	39.9	45.1	43.0	-	18.7	24.3	30.0
<i>Electrical equipment and precision instruments</i>	31.7	34.3	20.9	28.1	42.2	47.9	44.5	50.9	-	24.6	32.8	41.9
<i>Transport equipment</i>	31.2	34.4	27.6	35.0	50.0	52.3	62.1	66.2	-	29.2	45.5	55.7
<i>Other manufactures</i>	27.4	28.7	20.9	26.3	24.2	26.9	43.3	56.2	-	17.0	22.4	29.4
Electricity, gas and water	24.4	32.5	8.3	13.5	13.6	20.1	20.5	25.2	-	21.0	14.5	32.0
Construction	12.2	13.1	10.8	14.6	25.6	25.6	21.6	28.2	-	-	13.1	18.1
Wholesale and retail trade	10.3	12.0	5.7	9.3	16.6	17.4	13.6	28.5	-	5.3	5.9	9.8
Hotels and restaurant	11.8	11.2	12.0	14.3	18.2	19.1	20.5	24.0	-	-	-	-
Transport and communication	13.4	15.8	18.7	24.5	25.8	29.8	26.4	39.4	-	10.5	15.6	25.3
Financial intermediation	5.1	5.6	7.9	10.3	6.3	7.4	10.5	15.9	-	5.6	4.6	8.1
Real estate, renting and business activities, consulting	8.7	9.1	4.7	6.7	14.2	14.2	17.0	21.6	-	6.3	7.7	12.3
Public administration and services to households	4.7	5.4	4.7	6.5	9.0	9.7	5.4	10.2	-	5.5	6.1	8.2
<b>Total</b>	<b>24.4</b>	<b>27.2</b>	<b>21.5</b>	<b>27.9</b>	<b>33.8</b>	<b>37.3</b>	<b>41.5</b>	<b>46.6</b>	<b>20.5</b>	<b>20.5</b>	<b>27.5</b>	<b>34.9</b>
<b>Total including transit trade</b>	<b>24.7</b>	<b>27.8</b>	<b>29.4</b>	<b>37.9</b>	<b>50.0</b>	<b>56.6</b>	<b>55.2</b>	<b>60.4</b>	<b>26.8</b>	<b>41.3</b>	<b>27.5</b>	<b>34.9</b>

Source: own calculations on Eurostat and, for Italy, Istat data. See footnote 4 in the text for French data.

TABLE 4

**DECOMPOSITION BY SECTOR OF THE GROWTH OF THE IMPORT CONTENT OF EXPORTS IN FIVE EMU COUNTRIES**

*(percentage values)*

Sectors	Italy			Germany			Netherlands		
	Contribution to the growth of IC of total exports	Change in the intensity of IC within each sector	Change in the sectoral composition of exports	Contribution to the growth of IC of total exports	Change in the intensity of IC within each sector	Change in the sectoral composition of exports	Contribution to the growth of IC of total exports	Change in the intensity of IC within each sector	Change in the sectoral composition of exports
Products of agriculture, forestry and fishing	-0.01	0.01	-0.02	0.00	0.03	-0.03	-0.12	0.12	-0.24
Energy minerals	0.00	0.00	0.00	0.00	0.01	-0.01	0.06	0.04	0.02
Non-energy minerals	0.00	0.00	0.00	0.00	0.01	-0.01	0.02	0.01	0.01
<b>Manufactures</b>	<b>2.62</b>	<b>2.01</b>	<b>0.61</b>	<b>5.64</b>	<b>5.54</b>	<b>0.10</b>	<b>2.62</b>	<b>2.42</b>	<b>0.20</b>
<i>Food products, beverages and tobacco</i>	-0.01	0.03	-0.04	-0.03	0.07	-0.09	-1.12	0.15	-1.27
<i>Textile products and clothing</i>	0.08	0.31	-0.24	-0.10	0.12	-0.21	-0.21	-0.03	-0.18
<i>Leather and leather products</i>	0.11	0.19	-0.08	0.00	0.02	-0.02	-0.01	0.00	-0.01
<i>Wood and wood products</i>	0.01	0.01	0.00	0.04	0.02	0.02	-0.03	0.00	-0.03
<i>Paper and paper products, printing and publishing</i>	-0.01	0.02	-0.03	0.09	0.11	-0.02	-0.23	0.02	-0.25
<i>Refined petroleum products</i>	0.68	0.18	0.50	0.28	0.06	0.22	2.09	0.30	1.79
<i>Chemical products and man-made fibres</i>	0.72	0.23	0.49	1.24	1.35	-0.11	0.81	1.26	-0.45
<i>Rubber and plastic products</i>	0.04	0.06	-0.02	0.17	0.16	0.00	-0.10	-0.02	-0.08
<i>Non-metallic mineral products</i>	0.01	0.07	-0.06	0.04	0.06	-0.02	-0.05	0.01	-0.06
<i>Basic metals and metal products</i>	-0.13	0.11	-0.23	0.26	0.52	-0.26	-0.12	0.13	-0.24
<i>Mechanical machinery and equipment</i>	0.19	0.23	-0.04	0.34	0.72	-0.38	0.42	0.08	0.34
<i>Electrical equipment and precision instruments</i>	0.35	0.22	0.14	1.14	0.82	0.32	0.80	0.39	0.41
<i>Transport equipment</i>	0.50	0.28	0.22	2.11	1.43	0.68	0.33	0.11	0.22
<i>Other manufactures</i>	0.07	0.07	0.00	0.05	0.08	-0.02	0.02	0.02	0.00
Electricity, gas and water	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	-0.01
Construction	-0.01	0.00	-0.02	0.00	0.00	0.00	0.02	0.00	0.02
Wholesale and retail trade	0.14	0.12	0.02	0.23	0.21	0.02	0.17	0.08	0.09
Hotels and restaurant	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00
Transport and communication	0.00	0.13	-0.13	0.36	0.34	0.01	0.47	0.45	0.02
Financial intermediation	0.00	0.00	0.00	0.01	0.01	0.00	0.04	0.01	0.03
Real estate, renting, business activities	0.07	0.01	0.06	0.10	0.07	0.03	0.26	0.00	0.26
Public administration, services to households	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	-0.01
<b>Total</b>	<b>2.83</b>	<b>2.30</b>	<b>0.53</b>	<b>6.37</b>	<b>6.25</b>	<b>0.12</b>	<b>3.54</b>	<b>3.14</b>	<b>0.40</b>

Source: own calculations on Eurostat and, for Italy, Istat data.

TABLE 4 (continued)

## DECOMPOSITION BY SECTOR OF THE GROWTH OF THE IMPORT CONTENT OF EXPORTS IN FIVE EMU COUNTRIES

(percentage values)

Sectors	Belgium			Spain		
	Contribution to the growth of IC of total exports	Change in the intensity of IC within each sector	Change in the sectoral composition of exports	Contribution to the growth of IC of total exports	Change in the intensity of IC within each sector	Change in the sectoral composition of exports
Products of agriculture, forestry and fishing	-0.03	0.01	-0.04	-0.02	0.15	-0.18
Energy minerals	0.00	0.00	0.00	0.00	0.00	0.00
Non-energy minerals	-0.03	0.02	-0.04	0.03	0.04	-0.01
<b>Manufactures</b>	<b>1.34</b>	<b>3.09</b>	<b>-1.75</b>	<b>5.60</b>	<b>6.32</b>	<b>-0.71</b>
<i>Food products, beverages and tobacco</i>	-0.27	0.15	-0.42	0.30	0.41	-0.11
<i>Textile products and clothing</i>	-0.26	0.14	-0.40	0.05	0.15	-0.10
<i>Leather and leather products</i>	-0.03	0.01	-0.05	0.02	0.10	-0.09
<i>Wood and wood products</i>	0.06	0.05	0.01	0.07	0.07	0.01
<i>Paper and paper products, printing and publishing</i>	0.24	0.07	0.17	0.08	0.13	-0.05
<i>Refined petroleum products</i>	1.63	0.66	0.97	1.27	0.38	0.89
<i>Chemical products and man-made fibres</i>	0.48	0.42	0.05	0.82	1.16	-0.33
<i>Rubber and plastic products</i>	-0.07	0.07	-0.14	-0.09	0.01	-0.09
<i>Non-metallic mineral products</i>	0.03	0.12	-0.09	0.10	0.17	-0.07
<i>Basic metals and metal products</i>	-0.41	0.48	-0.89	0.12	0.40	-0.28
<i>Mechanical machinery and equipment</i>	-0.19	-0.09	-0.10	0.37	0.32	0.05
<i>Electrical equipment and precision instruments</i>	0.96	0.32	0.64	0.74	0.65	0.09
<i>Transport equipment</i>	-1.06	0.48	-1.54	1.60	2.24	-0.65
<i>Other manufactures</i>	0.25	0.21	0.04	0.15	0.12	0.03
Electricity, gas and water	0.06	0.01	0.05	0.02	0.01	0.01
Construction	0.03	0.03	0.01	0.00	0.00	0.00
Wholesale and retail trade	1.45	1.31	0.15	0.28	0.24	0.04
Hotels and restaurant	0.02	0.03	-0.01			
Transport and communication	1.50	1.08	0.42	0.89	0.74	0.16
Financial intermediation	0.08	0.08	0.00	0.11	0.05	0.07
Real estate, renting, business activities	0.64	0.32	0.32	0.46	0.26	0.20
Public administration, services to households	0.01	0.02	-0.01	0.02	0.01	0.02
<b>Total</b>	<b>5.09</b>	<b>5.99</b>	<b>-0.90</b>	<b>7.40</b>	<b>7.81</b>	<b>-0.40</b>

Source: own calculations on Eurostat and, for Italy, Istat data.

TABLE 5

**DECOMPOSITION BY SECTOR OF THE GROWTH OF THE IMPORT CONTENT OF EXPORTS  
BETWEEN 1995 AND 2000 IN A FIVE-COUNTRY AGGREGATE (1)**

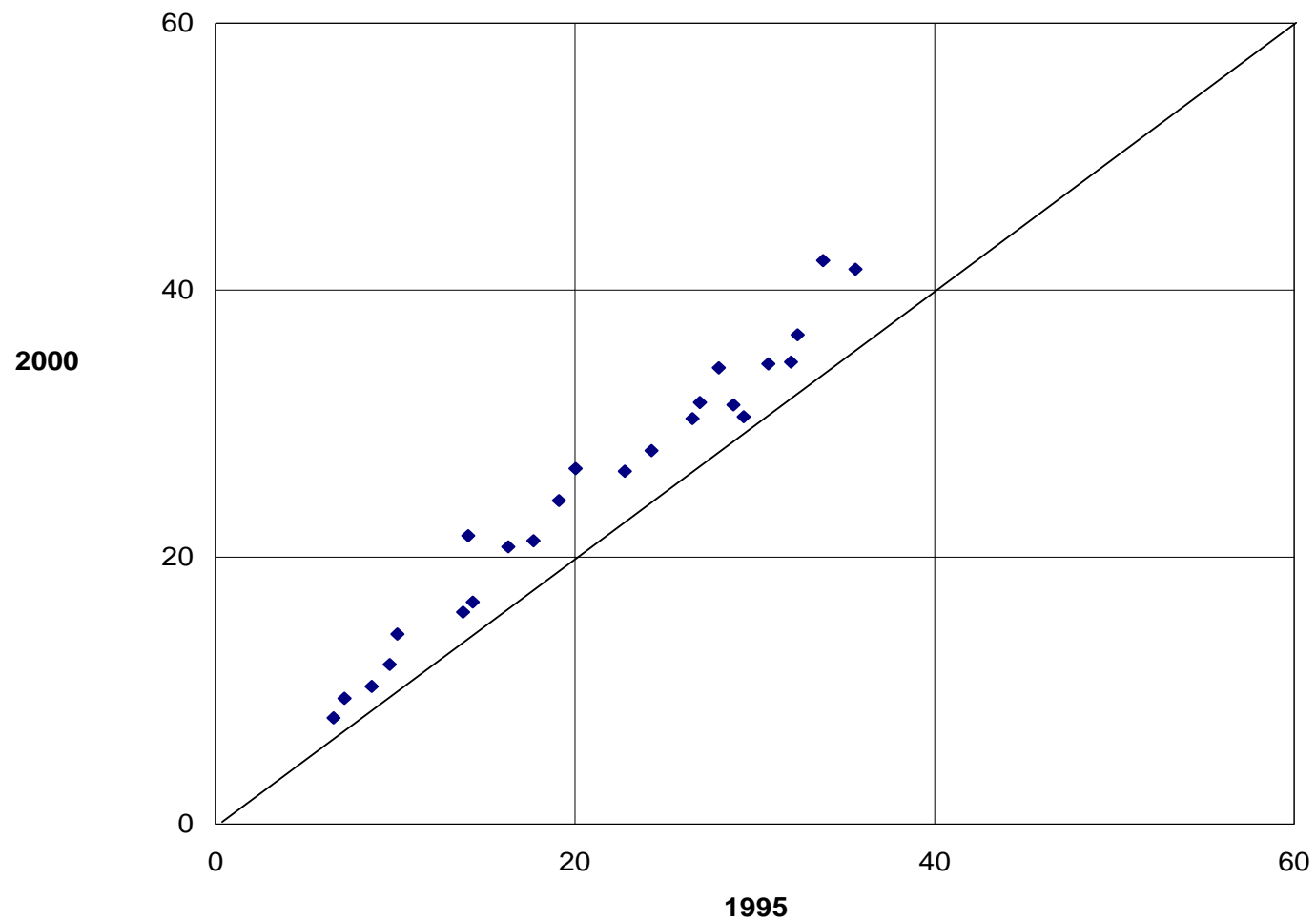
*(percentage values)*

Sectors	Contribution to the growth of IC of total exports	Change in the intensity of IC within each sector	Change in the sectoral composition of exports
Products of agriculture, forestry and fishing	-0.02	0.04	-0.06
Energy minerals	0.01	0.01	0.00
Non-energy minerals	0.00	0.01	-0.01
<b>Manufactures</b>	<b>4.06</b>	<b>3.90</b>	<b>0.16</b>
<i>Food products, beverages and tobacco</i>	-0.21	0.07	-0.28
<i>Textile products and clothing</i>	-0.11	0.14	-0.25
<i>Leather and leather products</i>	0.01	0.06	-0.05
<i>Wood and wood products</i>	0.03	0.02	0.01
<i>Paper and paper products, printing and publishing</i>	0.04	0.07	-0.03
<i>Refined petroleum products</i>	0.88	0.20	0.67
<i>Chemical products and man-made fibres</i>	0.89	0.94	-0.05
<i>Rubber and plastic products</i>	0.04	0.08	-0.03
<i>Non-metallic mineral products</i>	0.02	0.07	-0.05
<i>Basic metals and metal products</i>	0.03	0.33	-0.31
<i>Mechanical machinery and equipment</i>	0.21	0.42	-0.20
<i>Electrical equipment and precision instruments</i>	0.85	0.55	0.30
<i>Transport equipment</i>	1.32	0.86	0.46
<i>Other manufactures</i>	0.06	0.09	-0.03
Electricity, gas and water	0.01	0.01	0.00
Construction	0.00	0.01	-0.01
Wholesale and retail trade	0.33	0.29	0.04
Hotels and restaurant	0.01	0.01	0.00
Transport and communication	0.47	0.46	0.01
Financial intermediation	0.03	0.02	0.01
Real estate, renting and business activities, consulting	0.22	0.10	0.12
Public administration and services to households	0.01	0.01	0.00
<b>Total</b>	<b>5.13</b>	<b>4.85</b>	<b>0.27</b>

Source: own calculations on Eurostat and, for Italy, Istat data.

(1) Belgium, Germany, Italy, the Netherlands, Spain.

**IMPORT CONTENT OF EXPORTS BY SECTOR IN A FIVE-COUNTRY AGGREGATE IN YEARS 1995 AND 2000 (1)**  
*(percentage values)*



Source: own calculations on Eurostat and, for Italy, Istat data.  
 (1) Belgium, Germany, Italy, the Netherlands, Spain.

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