

## Intermediate Products' Trade and Supply Chains

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### Abstract

*It is known that the intermediate products trade, as part of the global trade, is growing due to the international externalization. Companies divide the production activities and develop networks based on comparative advantages on a large scale. For that purpose, they take into account the legal situation in the target-countries for externalization. Therefore they analyze the intermediate goods trade structure trend versus other types of goods for the EU-27 countries in the last decade. Based on the common descriptive analysis methods in the specific economic literature, the analysis stress the intermediate goods trade models that lead to an extension of the intermediate goods trade.*

**Key words:** intermediate goods, supply chain, international trade, externalization

**J.E.L. classification:** F14

### 1. Introduction

Multi-national nature of products is not only a specific feature of high-tech products such as mobile phones or cars. It is rare that a product is manufactured entirely from components or inputs in the country where it is assembled and sold; at least some components or services involved are often purchased from abroad. This is the case of direct inputs, wherein companies buy intermediate components for production from domestic or foreign markets. A component of a particular country may already include other components from other countries, and they are subsequently used indirectly in production. In another cases, companies send high-tech components in countries where the final product assembly takes place. The

complex nature of supply chains at individual products level was documented in a series of case studies for different products such as T-shirts (Rivoli, 2004), Barbie doll (Tempest, 1996), computers (Kraemer and Dedrick, 2002), iPod (Linden, Kraemer and Dedrick, 2007, Varian, 2007) and Boeing (Grossman and Rossi-Hansberg, 2009).

The purpose of the above mentioned studies and our analysis is to highlight the relative importance of intermediate products trade within the world trade for the EU-27 and individual groups of countries, its specific structure, and its trends over time. Therefore we shall try to answer the following questions: What is the share of trade with intermediate products in the overall trade, both exports and imports? Have the share of trade in intermediate products changed in time and if so, was it caused by changes within sectors or between sectors? We will analyze the patterns of specialization regarding the trade with intermediate products of the countries. We will also analyze the amount of the two-way trade and geographical structure of intermediate products over time.

The importance of intermediate products trade as for industries that use them is analyzed from different points of views: What is the size of intra-industrial link within certain industry groups, including service industries, and - most important for the present study - what is the size of the imported intermediate products into these industry groups and how much has it changed through time?

The economic crisis had a serious impact on trade flows, and perhaps the intermediary products trade might have played a special role. The impact of the financial crisis on intermediate products trade is further analyzed, addressing the following questions: To what extent intermediate goods trade was

more affected than other product categories? Greater impact on intermediate products trade results from commercial decline of industries with high levels registered in terms of inputs and components trade, or was there a rift that led to disruption of the overall supply chain?

These questions must be addressed on different levels of analysis: the global economy, for certain industries or groups of products, and finally, the individual companies or products. Aggregated to higher levels, the complex nature of international relations is reflected in particular in business models that reflect the aggregate supply chain. Therefore, this study contains analysis on different levels of aggregation, using detailed trade information, statistics and information from input-output. Each of these sets of data are important. Detailed trade data per product enables product differentiation in terms of their use as intermediate components, industrial goods or consumer goods.

However, the single use of trade statistics does not provide a complete image of supply chains. In particular, it does not reveal industrial differences regarding the structures source. The reason is that imports of intermediate goods cannot be attributed to industrial people who use trade statistics. For example, even there is information on imports of a specific product; the commercial information can not indicate which industries have imported products, or the extent to which imports are used in the production process. This issue can still be studied using information from input-output tables as discussed in detail below. Regarding specific products, supply chains and strategies companies can be revealed using detailed case studies analyzing source structure, national or international, for each individual component of the product.

One can distinguish patterns of trade in intermediate products. Production structures adapt and adjust quickly to the source structures and to international production networks from abroad. This is a prominent feature of globalization. Therefore, it is shown that the intermediate goods trade as share of global trade is increasing due to international outsourcing. Companies distribute their production activities and develop their supply chains in different

locations depending on comparative advantages in a broad sense. The legal situation of potential target countries for outsourcing is taken into account as well. Thus, these trends in intermediate products trade are analyzed versus other types of trade for EU-27 countries over the last decade. Descriptive analysis is based on common methods and specialized literature, with emphasis on patterns of trade in intermediate products leading to the extent of intermediate products trade.

## **2. Intermediate products' trade quota in total international trade**

To support with documentation the relative importance of trade for the EU-27 and individual Member States, Table 1 shows the products' shares imported and exported in total imports and exports amount for each of the four categories of products in 2008. Share of intermediate components imported for the EU-27 is 53.7%, with the largest share of imports. Consumer goods represent the second category, with 22.6%, followed by industrial goods (17.6%). This large structure of imports is found in most countries, with few exceptions. Along with Germany, Slovenia, Poland, Czech Republic, Hungary and Slovakia have the highest share of intermediate products. One explanation could be that these countries are specialized in manufacturing and industries of these countries find production networks from abroad as important. This will be discussed in detail below.

Table 1 shows that exports of intermediate products represent an important part of trade for all countries. Models of intermediate products exports are compared with other categories of goods. Rates for different categories of products for the EU-27 are very similar to those for imports. Intermediate goods represent more than a half of exports, with a rate of 53.7, while exports of consumer goods and industrial goods represent 22.6%, 17.6% respectively.

Large shares of imports and exports of intermediate products in nearly all countries show that a typical distinction between outsourcing and target countries is not useful, so that such classifications must be made carefully. In addition, this indicates the existence of a significant intra-trade amount,

an aspect that we shall discuss in detail below.

*Table 1. Import and export quotas for end-use categories in 2008*  
%

Country	Imports				Exports			
	Intermediate product	Consumer products	Capital goods	Mixed category	Intermediate product	Consumer products	Capital goods	Mixed category
AT	54.2	22.0	17.8	6.0	55.7	18.1	21.6	4.6
BE	55.4	24.8	12.2	7.6	55.8	25.6	10.6	8.0
BG	52.4	19.6	21.5	6.5	61.9	24.6	8.4	5.0
CY	45.7	29.2	12.9	12.2	34.8	48.0	11.6	5.7
CZ	59.5	17.7	19.7	3.1	55.0	15.2	21.9	7.9
DE	58.0	19.3	17.8	4.9	49.0	16.0	23.8	11.1
DK	48.2	27.4	19.9	4.5	41.8	35.7	20.9	1.6
EE	51.9	21.7	15.0	11.4	58.0	20.9	11.6	9.5
ES	55.2	23.6	14.3	6.9	50.2	24.5	11.9	13.4
FI	51.8	19.2	21.6	7.4	53.0	7.4	33.9	5.8
FR	52.6	25.0	16.0	6.4	49.1	25.6	19.0	6.2
GB	46.8	28.1	17.3	7.7	50.7	22.8	17.3	9.3
GR	38.7	34.5	20.2	6.7	54.5	35.3	9.6	0.6
HU	60.8	15.4	19.5	4.3	46.7	19.5	26.6	7.3
IE	44.5	25.8	24.4	5.3	53.0	30.9	16.0	0.1
IT	54.7	22.9	14.3	8.2	50.2	26.8	19.4	3.5
LT	46.7	24.7	20.2	8.4	52.4	22.2	12.0	13.3
LU	43.8	15.9	32.0	8.3	50.6	9.5	37.8	2.1
LV	46.2	27.3	18.5	8.0	56.6	26.5	13.6	3.3
MT	59.4	26.4	9.6	4.6	68.2	22.2	8.2	1.4
NL	51.1	20.3	24.7	3.9	52.1	20.3	24.1	3.5
PL	57.5	17.4	20.2	4.9	51.8	28.6	13.0	6.6
PT	50.7	26.0	16.5	6.8	53.3	28.4	11.5	6.8
RO	53.9	18.7	21.4	6.0	57.8	21.8	12.8	7.5
SE	55.1	21.7	17.9	5.2	58.1	15.4	19.9	6.6
SI	56.6	16.7	16.2	10.5	51.7	22.8	12.7	12.8
SK	62.3	17.1	15.8	4.8	47.7	23.9	11.1	17.4
EU-27	53.7	22.6	17.6	6.1	51.2	21.6	19.6	7.6

Source: Eurostat COMEXT, The Vienna Institute for International Economic Studies (WIIW) calculation

So far, analyzes have focused on the situation in 2008. Public and academic debates on trade with intermediate products focused on changes in the importance of intermediate products trade and the relative importance of production networks across the borders. In this regard, Table 2 presents an index of nominal import and export values

for 2008, expressed as an index value in 1999 was equal to 1. Those amendments on rates are expressed in percentage points for the four categories of end-use between 1999 and 2008.

*Table 2. Changes at import and export levels and of import and export quotas for end-use categories for the EU-27*

Index 1999=1 Change item In percentage points.								
	Intermediate product	Consumer products	Capital goods	Mixed category	Intermediate product	Consumer products	Capital goods	Mixed category
Imports	1.85	1.82	1.55	1.49	2.75	0.74	-2.38	-1.12
Exports	1.87	1.84	1.64	1.69	1.99	0.46	-1.94	-0.51

Imports of intermediate goods rose faster than other categories of goods by 85 %, followed by imports of consumer goods, which increased by 82 %. This resulted in a higher share 2.75 of intermediate goods in 2008 compared to the year 1999, consequently, shares of industrial goods and mixed products category declined. However, some individual countries have registered higher growth in terms of import value of this intermediate period, for all products. This group of countries consists mainly of EU-12, wherein the growth tends to be over 3 percent. Imports increased for these countries in terms of other product categories. Therefore it could be more important to consider whether the structure of imports has changed over time, as indicated by the rates.

Interestingly, the share of imported intermediate goods fell for a number of countries. This group also includes some countries from Member States, for example: Romania, Hungary and Bulgaria, along with EU-15 countries such as Britain and Finland. Another group of countries recorded growth rates of intermediate goods. This group includes Germany, Spain, Austria, Italy and Sweden, if we mention only some of the EU-15, but also Slovakia, Slovenia, Czech Republic and Poland. Thus, although there was a general tendency towards a higher share of imported intermediate goods, almost half the EU-27 countries experienced a decline in terms of share of imported intermediate goods and the extent to which these changes were significantly different in these countries. It may be noted that these general trends are the result of the economic crisis that hit the world economy in 2008.

A similar pattern, though of different scales, can be found in case of changes between 1999 and 2007. Exports of intermediate goods in the EU-27 exhibited the highest growth rate, followed closely by exports of consumer goods. Rates of exports were higher than those of imports, although the difference is relatively small for intermediate goods and consumer goods in particular. Specific patterns of individual countries in terms of product categories are rather mixed. It should be, however, noted that growth rates for EU-12 are often large for the groups of products other than intermediate goods. This group of countries started from a relatively low level, what partly explains the high growth of rates. In the EU-15 exporting countries such as Germany have registered increases slightly higher than the EU-27 average in terms of product categories. However, higher exports to other countries like Britain, France, and Italy have increased in average growth rate. Finally, the table presents the average of differences between industrials regarding these patterns. Table 3 shows the share of intermediate goods imported and exported in total imports and exports amount by industry sector of EU-27. Imports of intermediate goods vary from almost zero for the tobacco industry and clothing, up to very high rates of up to 100 percent for industries producing base metals. It seems that these models are relatively stable over time and quite similar. Correlation analysis shows correlation coefficients for all cases above the value of 0.8 and in most cases above the value 0.9. Export structures are very similar to those for imports, as it is shown in Table 3.

*Table 3. Shares of imports and exports of intermediate industries achieved in 2008 for EU-27, in percents.*

No.	Products	Imports	Exports
15	Food and beverage	22,5	17,0
16	Tobacco	0,9	0,4
17	Textiles	50,8	62,5
18	Garments	0,8	2,3
19	Leather	12,3	14,4
20	Wood products	95,2	97,9
21	Pulp and paper	83,4	80,1
22	Publishing	26,7	30,7
23	Coke	92,5	77,1

24	Chemicals	69,8	63,5
25	Rubber and plastic	72,7	73,4
26	Other non-metallic products	90,0	91,1
27	Basic metals	100,0	100,0
28	Metal products	80,3	81,5
29	Machinery and other equipment	43,6	39,7
30	Desk/ office items	17,4	19,0
31	Electronic equipment	75,7	73,3
32	Radio and TV	37,6	32,6
33	Tools	16,1	15,4
34	Vehicles	37,7	35,1
35	Transport equipment	46,4	36,2
36	Furniture	19,0	18,4

Source: Eurostat COMEXT, WIIW calculation

### 3. Origin and destination of intermediate goods

Intermediate goods may come from different countries or groups of countries worldwide. Table 4 provides information about groups of countries from which intermediate goods come, and about the countries where they are exported. Considering the overall EU-27 situation, one can observe that most of the intermediate products are from EU-15 countries origin. As for other countries, like the advanced OECD countries, they have recorded 11.1 percent, EU-12 and BRIC countries recorded high rates as well, 8.7, while Asian countries registered only 3.8 percent. For the other groups of countries, variation in the EU-27 countries is even higher. Thus, in 2008, nearly 70 percent of intermediate goods came from the EU-27.

Source structures for intermediate goods are somehow different from those in other categories. Groups EU-15 and EU-12 record 70 percent of imports of intermediate goods, consumer goods and industrial goods, and even a greater share for the category of mixed goods, 84.6 percent. But there are some differences in terms of other countries-source partner for example. BRIC countries recorded 13.5, respectively 13.0 percent for consumer goods and industrial goods, but only 8.7 percent for intermediate products. On the other hand, advanced OECD countries have relatively high rates, 11.1 percent for intermediate goods and industrial supplies 13.7 percent.

Table 4. Import structures, end-use categories, and partner states for EU-27 in 2008, in percents.

	EU15	EU12	OECD advance	Asia	BRIC	RoW
Imports						
Intermediate	60,9	8,7	11,1	3,8	8,7	6,7
Consumer goods	59,0	8,8	7,8	3,7	13,5	7,3
Industrial goods	55,1	6,8	13,7	7,7	13,0	3,7
Mixed category	73,9	10,7	8,8	2,2	1,1	3,3
Exports						
Intermediate	58,1	10,1	11,6	3,3	5,9	10,9
Consumer goods	62,8	8,4	13,4	2,1	4,3	9,0
Industrial goods	48,6	9,2	12,8	3,7	9,9	15,7
Mixed category	57,0	6,9	18,2	1,2	5,3	11,4

Source: Eurostat COMEXT, WIIW calculation

Similarly, most of the exports of intermediate goods in the EU-27 countries are destined for the EU-15 countries. EU-15 share is 58.1 percent for the EU-27 and thus it is slightly reduced compared to imports. EU-12, advanced OECD countries and the rest receive a tenth each EU-27 exports. Share of EU-27 exports to the BRIC countries is 5.9 percent, while only 3.3 percent of EU-27 exports are destined for Asian countries. In addition, the share of exports from EU-12 countries to other EU-12 countries is also very high in most cases. Along with results of import structures, this suggests that there is also intra-regional trade in intermediate goods between EU-12 countries, indicating that outsourcing is important not only between advanced and less advanced economies, but also between countries with a similar development.

A comparison of geographical patterns for EU-27 exports to the four categories of products indicates that exports of consumer goods to the EU-15 is high, 62.8 percent, compared to 58.1 percent of intermediate goods and industrial goods 48, 6 percent. EU-27 exports and industrial intermediate goods to EU-12 countries are higher than other goods. This pattern is reversed for advanced OECD countries. For other groups of countries, exports of industrial goods are more important, especially the BRIC countries and rest of world category.

Below it is considered whether this model is stable. Table 5 provides information for EU-27 over the period 1999-2008. EU-15 and advanced OECD countries experienced large declines in the market shares of total

EU-27 imports, -4.6, -5.3 percentage points respectively, while the EU-12 and BRIC countries have gained market share, 3.9, 4.9 percentage points respectively. Considering the EU-27 countries, there is a significant change in imports from the EU-15 imports from the EU-12. Again, there is a considerable difference on geographical patterns changes. A common feature is that the EU-12 and BRIC countries have gained market share in all countries, while the advanced OECD countries have lost market share.

It remains to consider whether these changes are similar for all categories of products or if a specific model for intermediate products. EU-15 countries have lost market share in all categories, but they were significant for industrial goods and mixed goods category. Similarly, advanced OECD countries have lost market share in terms of industrial goods, -9.52 percent, and intermediate goods, -5.32 percent. BRIC countries have gained market share especially in terms of industrial goods 9.64 percent, this percentage is similar to the size of the decline in OECD countries. Market share of BRIC amounted to 5.21 percent for consumer goods and 4.94 percent for intermediate goods. Finally, EU-12 countries rank second in terms of market share, with 5.98 percent for mixed goods category and 3.18 percent for consumer goods.

Thus, in this period there was a significant change in the market in Europe, the EU-15 to EU-12 countries as suppliers of intermediate goods. However, EU-12 countries have started from a relatively low level of exports. It is interesting to note that these increases and losses were of the same size. In the same time, there was a significant shift in the BRIC countries against advanced OECD countries. Thus, one can observe a shift in EU structures and source for EU external import models.

*Table 5. Changes at import and export levels and for end-use categories for source region and for the EU-27, 1999-2008 (in percent points)*

	EU15	EU12	OECD advanced	Asia	BRIC	RoW
<b>Imports</b>						
Intermediate	-4,57	3,87	-5,32	-0,81	4,94	1,89
Consumer goods	-3,06	3,18	-1,93	-2,49	5,21	-0,90
Industrial goods	-5,31	4,22	-9,52	-0,23	9,64	1,20
Mixed category	-5,87	5,98	-2,16	-0,46	0,67	1,84
<b>Exports</b>						
Intermediate	-5,06	3,90	-3,42	-0,62	3,09	2,11
Consumer goods	-3,86	3,82	-2,86	-0,06	2,46	-0,50
Industrial goods	-10,95	4,59	-3,95	0,02	6,11	4,17
Unclassified	-14,50	3,98	-1,38	0,49	4,75	6,66

Source: Eurostat COMEXT, WIIW calculation

#### 4. Conclusions

As it is shown above, the geographical pattern of exports to EU-27 has changed in the last 10 years. EU-27 export quotas to the EU-15 advanced OECD countries and Asia have declined, while the EU-27 export share rose to EU-12, BRIC and Rest of the world. With few exceptions, these models can be identified for individual EU-27 countries. Considering the EU-27 change in the geographical structure of exports for product categories, it can be noted that exports to EU-15 show big declines for industrial goods and mixed goods category. Export quotas have increased for these categories. Changes are similar to the types of products for EU-12 countries, advanced OECD countries and Asia.

These changes in market shares can be related to changes in unit values reflecting the relative cost advantages of emerging or increasing quality. This problem is analyzed through changes in unit value ratios and market shares between 1999 and 2008. Analysis indicates that the EU-12 countries have improved the quality of goods exported to EU-27 markets; a similar pattern is seen for BRIC countries, although with a less pronounced improvement in quality. These models are similar to product categories and appear to be more pronounced in advanced technology industries (high tech) in general.

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