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WP n. 187 **November 2006**

Stampato in proprio da:
Università Commerciale Luigi Bocconi – CESPRI Via Sarfatti, 25 20136 Milano
Anno: 2006

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June 2006

Abstract

In traditional trade models, whether based on technological differences or on relative factor endowments, merchandise composition and directions of trade are derived from closed-economy, pre-trade conditions. But nowadays one the basic assumptions of traditional trade models, i.e. that production processes are integrated within just one country, is being increasingly violated as previously integrated productive activities are segmented and spread over an international network of production sites: as a result, an increasingly large share of trade flows is made up of intermediate and unfinished goods being transferred from one country to another in order to be processed.

In this paper we submit that such new configuration of production processes has important effects on at least three dimensions of economic research. First, we show that international disintegration of production processes leads to a lessening of the power of comparative advantages when it comes to explaining both merchandise composition and directions of trade, while it is the concept of absolute advantage to become increasingly relevant; second, we show that empirical measures of revealed comparative advantages are inherently misleading if they do not account for differences in the stage-of-processing of traded goods; third, we estimate a simple model of aggregate demand accounting for international trade in intermediates: results of estimation lend support to our prior that participation of a country in the process of international fragmentation of production plays a specific and significant role in determining its year-over-year change in *GDP*.

JEL classification: F10, F15
Key words: International division of labor
Absolute and comparative advantages
International fragmentation of production
Processing trade

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1. Introduction

In traditional trade models, whether based on technological differences or on relative factor endowments, merchandise composition and directions of trade are derived from closed-economy, pre-trade conditions. Of course, such feature of the traditional models is well known to both theoretical and applied economists; also, we all believe that the basic theorems of international trade still apply in a world that is far more complex than that known to Ricardo, Heckscher, and Ohlin. Yet, when we realize that such is not the case, we tend to come up with an immense number of artful reasons to explain 'exceptions', departures of models from reality, and *vice versa* (as pointed out, for instance, in Davis and Weinstein, 2002).

Let us look dispassionately at our traditional models, some of which have guided us well for two centuries now, and let us ask the basic question at the root of this paper: do we really believe that international configuration of competitiveness is determined by pre-trade closed-economy characteristics of the trading partners? Would it still be meaningful to claim that a country's position in the international division of labor today is determined by the same factors that were important when the same country was just in the process of getting out of autarkic conditions? Is it not true that one of the basic assumptions of traditional trade models, i.e. that production processes are integrated within just one country, is being increasingly violated as previously integrated productive activities are segmented and spread over an international network of production sites? And again: is it not true that, as a result of that, an increasingly large share of trade flows is made up of *intermediate* and *unfinished* goods being transferred from one country to another in order to be processed?

The general aim of the paper is to show that trade patterns and their implications for domestic activity levels no longer can be properly understood if international fragmentation of production is not explicitly accounted for, the reason being that a large share of trade flows no longer responds to the motives behind final goods trade. In this paper we submit that such new configuration of production processes has important effects on at least *three* dimensions of economic research.

First, in Section 2 we argue that vertical, international disintegration of production processes leads to a lessening of the power of the concept of comparative advantages when it comes to explaining both merchandise composition and directions of trade − while it is the concept of *absolute* cost advantage to become increasingly relevant. We believe that one of the crucial reasons for the existing gap between traditional models' predictions and empirical observations is that a substantial share of trade takes place in intermediate inputs, parts and components, normally neglected in trade models – at least until Sanyal and Jones (1982). Indeed, it is no longer a new phenomenon that production processes originally integrated in one plant are segmented and the segments are allocated to different plants in different countries according to pure cost-differential criteria. In a model of international trade where international fragmentation of production can take place, the one-to-one relationship between the characteristics of a domestic economy and its specialization in final goods (as the term is normally understood in traditional trade models) does not hold anymore, because no single country

can be considered 'the producer' of a particular final good. Rather, each country might specialize in stages of the production chain, which may have different lengths. A country can specialize in the capital-intensive or in the skill-intensive stages of a fragmented production process, but it will not appear to be specialized in the production of a particular good.

Second, in Section 3 of the paper we show that empirical measures of revealed comparative advantages are inherently misleading if they do not account for differences in the reason for trade. Here we produce empirical evidence on the relevance of international fragmentation of production, measured in terms of the weight of trade for reason of processing (as defined and recorded by official statistics) in final trade flows. Using this type of data, we then build an index of relative propensity to fragment production internationally. This section produces two results, which are relevant to correctly specify the subsequent econometric analysis. First of all, it shows that, in the presence of fragmentation of production, trade flows can be misleading indicators of comparative advantage in the traditional sense. Secondly, total trade flows, given by the sum of final and temporary trade flows, are not an appropriate measure of foreign demand for domestic goods. We conclude that, to a large extent, the concept of Revealed Comparative Advantages (*RCA*) looses its traditional meaning and special care is needed when building *RCA* indices, that should be based on different types of trade flows. The empirical evidence produced in this section strongly supports the methodological considerations put forth in Section 2.

Third, in Section 4 we subject to econometric testing our hypothesis that trade flows in final goods and trade flows generated by international fragmentation of production can generate distinct effects on a country's level of aggregate activity. Within this framework, we assume that *GDP* growth differentials among European Union member countries depend upon their degree of openness not just in terms of trade flows, but also with respect to their degree of integration with the global production network. The economic literature extensively discusses and tests for the effects of openness on the economic activity of a country, generally finding a positive relationship between a country's openness and its growth rates. While our analysis is undertaken over a time span that is too short to assess the long-run effects of different forms of economic integration, estimation of our model lends support to our assumption that the participation of a country in the international production network plays a specific role in determining its level of economic activity.

2. International fragmentation of production and comparative advantages

In two-good, two-country, uniform-technology models of international trade, trade in goods can be seen as trade in factors of production embodied in the exchanged goods. In particular, in the Heckscher-Ohlin model each country exports with the goods sold abroad the relatively abundant factor and imports the relatively scarce one. This is why, under well-known hypotheses, we can predict that trade will bring about factor price equalization even if we assume that factors of production are immobile

between countries. When the assumption of international factor immobility is abandoned, factor price convergence will result from international movement of factors, as capital will flow from (relatively) capital-abundant countries toward (relatively) labor scarce countries according to international differences in rewards. Within these models, international movement of capital is tantamount to 'horizontal' foreign direct investment, and it will reproduce abroad a production process that used to take place in the home country.

In addition to these 'usual' forms of internationalization − trade and foreign direct investments − another form of internationalization named international fragmentation of production recently received increasing attention. With international fragmentation of production, a production process previously undertaken in a single location is split in two or more parts taking place in production sites located in different countries.[1] The increasing relevance of this phenomenon raises the issue of whether traditional modelling of the determinants of international competitiveness is still fully adequate for us to have a good grasp on the realities of international exchanges.

First and foremost, international fragmentation of production raises questions about the relevance of the traditional concept of comparative advantage. In traditional trade models, a country's comparative advantage arises from the economic conditions existing in autarky: this is true in the Ricardian model, where technological differences between countries determine production and trade patterns; in the Heckscher-Ohlin model, where the key role is played by relative factor endowments; and in the Krugman-Lancaster models with economies of scale in production. In all these models, a good is univocally defined and is considered to be the 'final' product of an integrated process taking place in one country, and therefore reflecting its characteristics.

But with international fragmentation of production the number of traded goods no longer coincides with the number of *final* goods. The implication is that trade patterns cannot be taken as indicators of comparative advantage in the production of final goods, and that is not simply an empirical problem. Indeed, when exchange of intermediates is allowed for, exports by any one country embody not just the technology or some portion of the factors of production with which that country is endowed: to the extent that a country uses foreign intermediate goods as inputs for production, the final (re-)exported goods embody both technology, know-how and factors of other countries. It follows that traded goods will embody 'advantages' specific to different countries, so that it will be impossible to say that the goods exported by a country are the ones where the country has a comparative advantage on.

Furthermore, it will be also difficult to identify comparative advantages in the production of intermediate goods, as in autarky the intermediate good by itself would not be produced, lacking a market of its own, and therefore we do not have the conditions to verify the existence of such comparative advantage. It is at least likely that what gives rise to an advantage in world markets and originates a trade flow is the existence of an *absolute cost advantage* and a specific combination of phases of production taking place in different countries.

[1] See Arndt (1997a, 1997b), Jones (2000), Deardorff (2001a, 2001b), Jones and Kierkowski (2001a and 2001b).

Besides raising the issue of the meaning of 'comparative advantages' as we understand them, international fragmentation of production calls for a fresh understanding of the causes of the growth of trade flows. Traditionally, growth rates of world trade higher than growth rates of world GDP have been explained with falling transport costs and progressive dismantling of tariff and non-tariff barriers to trade under way since World War II (see, for instance, Krugman,1995). This is a very sensible explanation, but international fragmentation of production offers a complementary reason for the increase in trade flows. First, while reductions of barriers to trade allow national economies to more efficiently exploit their comparative advantages in final goods, they also allow for lower costs of delocalization of phases of production processes previously integrated in the home country. Therefore, both composition and rates of growth of trade flows will change *also* because of fragmentation (see Yi, 2003). Second, falling transport, communication, and co-ordination costs make international fragmentation of production technically easier and economically more convenient, as the cost of coordinating production phases taking place at a distance drops.[2]

2.1. Some implications of fragmentation

The preceding observations can be arranged in a more organized framework. According to traditional theory, country A exports good C_1 to country B, consumed in both countries, in exchange for good C_2 – what we call *final good trade*.[3] Assume that fragmentation of production becomes possible and economically convenient (for any exogenous reason) for good C_1, the one in which country A had a comparative advantage. Fragmentation will have a number of consequences.

First, the production process will be divided in segments whose number and length will depend upon relative factor cost and productivity. These endogenous characteristics of fragmentation should be emphasized, since we are describing an on-going process, rather than a one-shot change in the pattern of trade.[4] Segmentation of the production process affects both volume and composition of international trade flows. Let us maintain the traditional assumption of a balanced trade condition holding in every period. In this case, both volume and value of trade flows will be univocally defined for given world prices. Keeping constant the world demand for good C_1, assume that country A decides to delocalize to country B some production phases required to produce C_1.[5] To keep things as simple as possible, we can assume that A will ship to B all the components of good C_1, and B will have only to assemble the inputs using its labor force, without the need to add further components

[2] Another issue related to the problem of co-ordination concerns the governance of the production network which is internationally fragmented. We have shown elsewhere (see Baldone *et al*., 2001) that fragmentation processes involving EU firms delocalizing toward Central and Eastern Europe are decided by EU firms themselves, and are 'accepted' by extra-EU firms that assemble and finish up goods originated in the EU.

[3] The end-use destination of such good, be it a consumption or an investment good, is irrelevant in our context.

[4] If it is convenient for country A to keep at home some stages of production, moving other stages to country B, in principle it may well be that country B could find convenient to delocalize some phases of production of good C_2 to country A. For the sake of simplicity, here we rule out this possibility.

[5] Given the assumption that fragmentation is economically convenient, the entire production of C_1 will be fragmented and this will be the only technique in use to obtain the good.

produced domestically. At this point we can see the first consequence of fragmentation on trade flows: the flow of good C_1 from country A to B will disappear from international trade statistics, which will register instead a new flow of exports from A to B, given by the n intermediate inputs (S_1, S_2, .., S_n). In this particular example, the number of goods exported by A will increase, given that all intermediate inputs produced in A will be exported to B to be assembled to obtain the final good C_1. Part of this production will be re-exported to A, while a part will be sold on B's home market. The value of exports of good C_1 by B will include the value added by the assembly process. Overall, an increase in trade flows between the two countries will likely be observed.

If, before fragmentation took place, country B was producing both final goods and its labor force was fully employed, we can have different scenarios. As some labor must be used to assemble the imported inputs, domestic production (referring here to the entire production process) of good C_1 or good C_2 must decrease.[6] Therefore, assuming a constant relative world demand for final goods, we might observe a fall in the exports of good C_2 from country B and we will certainly see that good C_1 is now *exported* by B!

This simple example shows that there are many reasons for an international trade economist to be confused when, using a traditional comparative advantage model, she sets about to study trade flows in a world with trade in intermediates: (1) there is an inversion in the 'revealed comparative advantage', as good C_1 previously exported by A is now exported by B; (2) B appears to be specialized in the production of both final goods; (3) international trade statistics record a remarkable increase of trade and display a new vector of exported goods, i.e. the intermediate inputs (S_1, S_2, .., $S_{n)}$ to be incorporated in final good C_1. This change will be observed as long as the analysis takes place at an adequate level of disaggregation. When looking at highly aggregated trade flows, where intermediate inputs and final goods flows are classified in the same category), it will appear that country A is both exporting and importing good C_1.[7]

2.2. A numerical example

The problems raised above can be clarified with a numerical example. Let two economies, A and B, produce goods C_1 and C_2 through the use of labor and C_2 and C_1 respectively. Within each economy each industry is structured along two stages of production: the first produces an intermediate product S_i (i= 1, 2); such good enters the second stage of the production process to be processed into good C_i (i= 1, 2). Assuming constant returns to scale, technologies in the two economies can be described through the following input-output matrices as well as the corresponding direct-labor requirement vectors.

[6] If we assumed unemployment in B, then labor there could be employed in the assembly of good C_1 without reducing production in other sectors of the C_1 industry nor in industry C_2.

[7] This will look like intra-industry trade, which indeed seems to be growing in international trade statistics, even if we are describing a different phenomenon, resulting from international fragmentation of production.

$$A^A = \begin{matrix} \\ S_1^A \\ C_1^A \\ S_2^A \\ C_2^A \end{matrix} \begin{matrix} \begin{matrix} S_1^A & C_1^A & S_2^A & C_2^A \end{matrix} \\ \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0.2 \\ 0 & 0 & 0 & 1 \\ 0 & 0.2 & 0 & 0 \end{bmatrix} \end{matrix} \qquad A^B = \begin{matrix} \\ S_1^B \\ C_1^B \\ S_2^B \\ C_2^B \end{matrix} \begin{matrix} \begin{matrix} S_1^B & C_1^B & S_2^B & C_2^B \end{matrix} \\ \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0.1 \\ 0 & 0 & 0 & 1 \\ 0 & 0.1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$L_D^A = \begin{bmatrix} 4 & 3 & 2 & 4 \end{bmatrix} \qquad L_D^B = \begin{bmatrix} 6 & 24 & 13 & 22 \end{bmatrix}$$

Total labor requirements (i.e., the sum of direct and indirect labor requirements) embodied in each commodity amount to

$$L_T^A = \begin{bmatrix} 4 & \frac{205}{24} & 2 & \frac{185}{24} \end{bmatrix} \qquad L_T^B = \begin{bmatrix} 6 & \frac{3350}{99} & 13 & \frac{3800}{99} \end{bmatrix}$$

Assume that labor supply amounts to 156 units in economy A, and that in economy B it were perfectly elastic at the going wage. Let final goods C_1 and C_2 be consumed in the ratio of one-to-one in both economies.

In autarky, production and consumption of final goods in economy A will be respectively:

$$Q_{C_1}^A = Q_{C_2}^A = 12 \qquad C_1^A = C_2^A = 9.6$$

If in autarky B were to consume the same bundle of final goods, its total production would be

$$Q_{C_1}^B = Q_{C_2}^B = 32/3 \cong 10.67$$

with employment in B amounting to $2080/3 \cong 693.33$ units of labor.

Let now the two economies open up to international trade in final goods only: thus, trade between A and B will take place in C_1 e C_2, both produced in the respective home country within vertically integrated industries. Comparative advantages demand that A specialize in the production and export of good C_2 and economy B specialize in good C_1. Production in A will be determined by the condition:

$$2Q_{C_2}^A + 4Q_{C_2}^A = 156$$

so that $Q_{C_2}^A = 26$. Since C_1 and C_2 are consumed in a proportion of one-to-one in both countries, total consumption of one good must equal total consumption of the other. Taking into account that both goods are re-employed in their own production processes, it must be true that $Q_{C_2}^A - 0.1Q_{C_1}^B = Q_{C_1}^B - 0.2Q_{C_2}^A$ and, thus, $Q_{C_1}^B = (12/11)Q_{C_2}^A = 312/11 \cong 28.36$. In each country there will be goods available for world consumption in the amount of $26 - 0.1(312/11) = 1274/55 \cong 23.16$ units of each good.

Let unit wages in the two economies be W^A=1 and W^B=1/5 when expressed in a common currency. To keep things simple, ignore the one-period time delay between inputs and outputs, thereby

ignoring the interest rate as if it were negligible.[8] Then prices for C_1 and C_2 can be easily derived from production costs

$$2 + 0.2P_{C_1} + 4 = P_{C_2}$$
$$6/5 + 0.1P_{C_2} + 24/5 = P_{C_1}$$

which yield $P_{C_1} = 330/49 \cong 6.73$ and $P_{C_2} = 360/49 \cong 7.35$.

Under our assumptions, from trade balance equilibrium

$$P_{C_2}(C_2^B + 0.1Q_{C_1}^B) = P_{C_1}(C_1^A + 0.2Q_{C_2}^A)$$

the level of consumption in each economy turns out to be

$$C^A = \left[\tfrac{1274}{115} \quad \tfrac{1274}{115}\right] \cong [11.08 \quad 11.08]$$
$$C^B = \left[\tfrac{15288}{1265} \quad \tfrac{15288}{1265}\right] \cong [12.09 \quad 12.09]$$

Thus, as expected, international trade has a positive impact on consumption. economy A will stay at full employment (156 units of labor), and B will move to $9360/11 \cong 850.9$ units of labor employed.

Let us now suppose that international trade were to be extended to intermediate products as well. Since ratios of direct labor requirements in B and A are respectively 1.5, 8, 6.5 and 5.5, and given that W^A/W^B=5, on the basis of the so-called 'chain of comparative advantages' (Dornbusch *et al*., 1977) one might be tempted to conclude that A would be better off specializing in production stages C_1, S_2, C_2 , whereas country B would exhibit a comparative advantage in the production of S_1 only. Sustainability issues aside, if such were the pattern of specialization and assuming transport and coordination costs to be negligible, prices (costs of production) would be $P_{S_1} = 1.2$, $P_{S_2} = 2$ for the intermediates and $P_{C_1} = 45/8 \cong 5.63$ and $P_{C_2} = 57/8 \cong 7.13$ for the final goods. Production levels would be at $Q_{C_1}^A = Q_{C_2}^A = Q_{S_1}^B = 52/3 \cong 17.33$ and consumption would be at $C_1^A = C_2^A = 598/85 \cong 7.04$ in A and $C_1^B = C_2^B = 1742/255 \cong 6.83$ in B. Employment in B would be $(52/3)6 = 104$ units.

Yet, it is easy to verify that country A producers of C_2 find it advantageous to have their intermediate product processed in country B.[9] The new pattern of specialization, according to which production stages C_1 e S_2 would be allocated to A and stages S_1 and C_2 allocated to B, is that which would result from the chain of comparative advantages if one were to take into account not just direct-labor requirements in each stage of production, but total labor contents of each stage of production which include direct labor requirements and labor embodied in intermediate inputs.[10] The latter mode

[8] The example we put forward here builds on a Ricardo-Sraffa approach similar to the one developed by Samuelson (2001, 2004).

[9] It could be maintained that producers of C_2 in country B find it profitable to engage in the processing stage only by acquiring the corresponding intermediate products from country A. Whether such phenomenon should be looked at the result of a decision by A's producers to resort to outward processing trade or, rather, as a decision by B's producers to resort to international outsourcing, cannot be said on the basis of the simple numerical example adopted here: trademark ownership, differences in the ability to access the international distribution channels, information asymmetries are just some of the reasons leading to one interpretation or the other.

[10] In our example the amounts of direct and indirect labor requirements in each stage of production are $\left[4 \quad \tfrac{109}{24} \quad 2 \quad \tfrac{137}{24}\right]$ in

of specialization allows for lower production costs for both C_1 and C_2 relative to the former configuration, for we have $P_{C_1} = 274/49 \cong 5.59$ and $P_{C_2} = 341/49 \cong 6.96$.

Under the assumption of full employment in country A and trade balance equilibrium, final good productions will be $Q_{C_1}^A = 572/19 \cong 30.11$ and $Q_{C_2}^B = 624/19 \cong 32.84$, while consumption levels will be $C_1^A = C_2^A = (2548/95)(95/205) \cong 12.43$ and $C_1^B = C_2^B = (2548/95)(110/95) \cong 14.39$, which en-tail a welfare increase with respect to the trade-in-final-goods-only scenario. Employment in country B will amount to $(572/19)6 + (624/19)22 = 17160/19 \cong 903.16$ units.

What can we learn from the numerical example just discussed?

First, we see that when trade in intermediate products is allowed for, that is, when production is internationally fragmented, we could observe an inversion of the patterns of specialization, at least at data-collection level: indeed, while economy A would specialize in the production of C_2 and economy B would specialize in the production of C_1 under vertical integration, that is, in the final-goods-trade-only scenario, under the alternative scenario *cum* fragmentation A keeps at home the final stage of processing of C_1, while that for C_2 is allocated to country B.

Second, under international fragmentation of production neither economy specializes in production *stages* in which each is relatively more efficient – neither on the basis of direct-labor content nor on the basis of total labor content, as it would be more appropriate. As already noted, the resulting pattern of specialization is that which can be forecast on the basis of the so-called 'chain of comparative advantages', which compares relative productivities in the different industries in the two countries to relative wages. But such comparison actually implies that *absolute* costs of production be compared. It follows that the pattern of specialization cannot be univocally determined on the basis of the autarkic equilibria: by requiring that the basic two-by-two model of trade be abandoned, international fragmentation of production requires that stages of production be selected on the basis of their *absolute* cost advantage. For instance: production of S_2 in country B, though *comparatively* more efficient in terms of labor requirement in the stage of production leading to the final product C_2, is substituted for (in cost terms) by the corresponding production in A. International trade in intermediates and stages of production allows, at least in theory and within the limits given by the actual degree of fragmentation, for the selection of a composite set of production processes leading to the realization of the principle of absolute advantages and the minimization of global costs of production.[11]

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economy A and $\left[6 \quad \frac{2756}{99} \quad 13 \quad \frac{2513}{99}\right]$ in economy B. As to the problems arising with the definition of 'comparative advantages' when intermediate inputs are present see Deardorff (2005).

[11] It is worth remembering that Ricardian comparative advantages work on a pure technological ground, whereas absolute advantages involve, in some extent, political and institutional elements such as the level of development of a given economy and its economic policies. These elements may considerably influence both wages and exchange rates and, therefore, cost competitiveness of the different production stages. When leading to complete specialization, the principle of comparative advantages does not shed any light on issues of price competitiveness if one of the two economies is characterized by an absolute technological disadvantage. Complete specialization makes it impossible to conceive of a market for the same good produced in both countries, but one should not forget that the more efficient economy could expel the other form the international market, unless the latter reduces factor rewards to an extent sufficient to compensate for the technological disadvantage.

Third, we learn that the value of international trade must increase, growing from 219.26 in the final-good-only- trade scenario to 329.05 when trade in intermediates is allowed for.

3. Measures of propensity to international fragmentation and revealed comparative advantages in final goods

Relevance and detailed characteristics of international fragmentation of production are difficult to measure, as a proper analysis of the phenomenon would require firm level data, in order to follow appropriately the sequence of phases in the production process. Still, some recent studies attempt to estimate the extent of this phenomenon using data on trade flows generated by international fragmentation together with national input-output tables and presenting some case studies (Feenstra, 1998, Hummels *et al*., 2001).

In this paper we use trade data generated by Processing Trade (*PT*), that is, trade in goods being exported (or imported) for reason of processing abroad and subsequently re-imported (or re-exported). Trade in these goods is recorded accurately by most countries, including the European Union.[12] Under such so-called 'trade regime', data are collected on four different types of trade flows: (1) temporary exports (*TE*) of goods exported by a EU country to be processed in a non-EU member and (2) re-imports (*RI*) by the EU of the processed goods on one hand; (3) temporary imports (*TI*) of goods to be processed in the EU and (4) re-exports (RE) of those goods to the country of origin outside the EU, on the other. The first two flows measure the so-called outward processing trade (*OPT*); the last two measure inward processing trade (*IPT*). Analysis of these trade flows by country allows to characterize it both as a destination of fragmented production activities as well as the origin of fragmentation activities. As these data are available at a high level of industrial disaggregation, it is also possible to see which are the industries most affected by this process.

[Table 1] and [Table 2]

Table 1 shows the relevance of the different types of trade between the EU and the rest of the world over the period 1990-2003, and in particular the weight of *IPT* and *OPT* with respect to final trade flows. It is worth noting that the EU turns out to be an important destination of processing trade, more so than an origin of this type of flows, and this characteristic persists during the entire observation period.[13] Data reported show that the level of *IPT* grew throughout the nineties, as tendentially did

[12] Similar trade regimes exist in a number of other countries, albeit with different names.

[13] International flows on processing trade from official statistics, like the ones we use, need to be interpreted carefully, especially after 1996. In fact, starting from January 1st 1997, tariffs on goods coming from the countries that signed the Association Agreements with the EU (ten countries in Central and Eastern Europe, plus

its weight relative to final trade. Falling rates of growth of world output and, especially, of world trade in 2000-2001 took their toll on both EU final and inward processing trade. The fact that both the level and the share of *IPT* kept falling over 2002-2003 even though world trade was again growing strongly is probably due to the appreciation of the Euro beginning in 2001 as well as to the rapidly increasing role of China and India as destinations of processing trade at the world level. The rising competitive pressure of many emerging economies is the likely reason for the steadiness of EU's *OPT* following its reduction (as a share of total trade) observed at the end of the nineties.[14]

Table 2 reports a detailed picture of the evolution of both geographic and industry break-down of *IPT* and *OPT* for the EU15. Data reported are percentage distribution of the relevant trade flow − *IPT* and *OPT* − by region and by industry. Re-imports are our measure of *OPT*; re-exports are measure of *IPT*. From the table it can be observed that *PT* tend to be concentrated in a few industries and regions. In fact, not all production processes display the technological characteristics that make international fragmentation of production possible and economically convenient. But where it occurs, it explains a large share of trade flows. It is also worth noticing that international fragmentation of production is not only led by the search of low labor cost locations, as the intensity of processing trade between the EU and the US shows.

3.1 Propensity to international fragmentation of production

In Table 3 we present an index of 'relative revealed propensity to fragment production internationally'. This index, based on the well-known Balassa index of revealed specialization, is defined as:

$$R_{ji} = (F_{ij}/F_{dj}) / (F_{iUE}/F_{dUE})$$

where

R_{ji} is the index of revealed propensity of country j measured with respect to the flow of type i
F_d measures final trade flows
F_i measures temporary trade flow of type i
EU is the whole European Union −15 members
j refers to the EU country j

Malta and Cyprus) were virtually abolished. As one of the main reasons for recording trade flows under the *PT* regime was the exemption for tariff payment when the processed good was re-imported into the EU, removal of tariffs removed one of the most important incentives to adopt this procedure, involving a significant amount of red tape. Therefore, statistical records of *OPT* underestimate the phenomenon of fragmentation of production, especially since 1997, while these statistics tend to inflate the amount of trade recorded as final. The apparent decline of the ratio between processing and final trade in the last years of our sample is due to the fall of processing trade and to the corresponding increase in final trade because of the statistical reasons mentioned. Some evidence about this phenomenon is supplied in Appendix.

[14] On this issue see footnote 13.

For each country and with respect to each type of flow, this index measures the propensity to undertake processing trade as the share of each temporary flow relative to final flows, using the average EU propensity as a benchmark. A relatively high (low) propensity will be shown by the index taking values above (below) one.

The index is computed for all EU15 countries.[15] The index shows that there are countries, such as France, and to an increasing extent Finland, that display a high propensity to international

[Table 3]

fragmentation of production both in terms of *IPT* and *OPT*. Other countries, such as the United Kingdom, Ireland and Belgium, display a strong propensity to IPT, while they are below the EU average in terms of propensity to undertake *OPT*.[16] Finally, there are countries such as Germany and Italy that display a tendency to *OPT*, but result below average in terms of *IPT*. Germany in particular is by far the most active country in originating *OPT* from the EU. Italy increased its *OPT* flows since 1992-93, showing in recent years a relatively high propensity to delocalize phases of production, but the propensity to *IPT* is quite low and even declining.[17]

3.2 International fragmentation of production and measures of revealed comparative advantages

As far as we know, measures of revealed comparative advantages present in the literature are generated using total trade data, that is to say, without separating final trade flows from trade flows for reason of processing. Using the sum of the two types of flows to measure the existence of comparative advantages makes the interpretation of these indexes potentially ambiguous for at least two reasons. First of all, a misleading indication may come from the inclusion of re-exports in such an index: an index that uses total trade data will indicate that the exporting country has a comparative advantage in the production of a good even when the country may only assemble a good that is in fact 'produced' elsewhere. The presence of temporary exports may give rise to further problems: the *RCA* index computed without purging total trade data from temporary flow data may reveal a comparative advantage in an industry where temporary exports are in reality due, for example, to a technological gap that re-

[15] Belgium and Luxembourg have been aggregated, and for the three countries that entered the EU in 1995, data are reported from that year on.

[16] It is worth remembering that these countries are also favorite locations of American and Japanese direct investments, and that foreign plants in these countries are often used to serve the entire EU market.

[17] Such low propensity to *ITP* can be explained both by the Italian pattern of specialization, still very much oriented toward traditional, labor-intensive industries, more apt to foster outward processing than to attract inward processing, and by the comparatively small stock of inward *FDI* in Italy.

quires that maintenance and repair of some goods be performed abroad. Of course, this needs not to be the case, and a comparative advantage may indeed exist, but the index could not discriminate between different cases. To put it differently: in the presence of processing trade the *RCA* index computed on the basis of total trade flows is a very poor indicator of a given country's comparative advantage, because it considers flows of goods that merge characteristics and advantages of more than one country. Therefore, even before discussing statistical properties of the index and related matters,[18] a first, necessary correction is to build *RCA* indexes using only *final* trade flows.

The problems we just mentioned are not unusual oddities, but often give rise to a number of distortions in the representation of the comparative advantages of a country, as we show in Tables 4 and 5.[19] In those tables we compare the Balassa *RCA* index calculated using total trade flows with the same index calculated using total trade netted of trade for reasons of processing – what we have been calling *final* trade. Final trade flows (statistically defined as 'normal trade', i.e. goods exported or imported definitively) overestimate trade in 'final' goods. Final trade flows in fact include international trade in intermediate goods (e.g. due to outsourcing) and also trade in goods to be processed that firms prefer not to declare as such.[20] Considering only trade in 'final' goods properly defined would further reinforce our conclusions.

In the tables we report the *RCA* of Germany and Ireland toward selected geographical areas. These countries were chosen because they exemplify different types of involvement in *PT*: Germany is active in *IPT* and especially in *OPT*, showing the higher relative propensity toward *OPT* in the EU; Ireland is extremely involved in *IPT*, showing the highest propensity to this trade in the EU, but its amount of *OPT* is very limited. In this respect, Ireland is comparable to the CEECs. For each of these countries, the comparison between indexes calculated in the two different ways produces indicative results.

As far as Germany's *RCA* toward the Central-Eastern European countries is concerned, the largest difference between the two indexes can be found in the textile sector. The index calculated using total trade flows shows that Germany has an unexpected *RCA* in producing these goods, maintained for the entire time period. Also, textile exports seem to represent over 5% of total country's export. The index calculated using only final trade flows and leaving aside temporary exports never shows an *RCA* in the textile sector and, for most years, the weight of textiles over total final exports is below 5%.

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[18] Balassa indexes have been criticized for many, probably well-founded reasons (see, for example, Hillman, 1980), but they still are widely used as indicators of comparative advantage, lacking a better and just as practical alternative measure.

[19] In a very recent paper, it is being noted that, while "*RCA*'s indexes have been used for decades [...], ECFIN's calculations of these measures for the analysis in the present paper resulted in *RCA*'s which were counter-intuitive for a large number of country groupings. These rather strange results could in fact be linked to the internationalisation of the production process [...]" (European Commission, 2005). In this section we find similarly counter-intuitive *RCA's* indexes, but we show they are so only when computed using *total* trade flows.

[20] The elimination of tariffs and quantitative barriers to international trade and an efficient system of *VAT* reimbursement in international transactions reduce firms' incentive to declare shipments as 'trade for reasons of processing'. See footnote 13.

[Table 4a] and [Table 4b]

This difference should not come as a surprise. The diverging indications coming from the index calculated using different trade flows show that the index works properly, if built correctly. The divergence arises because Germany practice extensively *OPT* in the textile and apparel industry: the index if affected by the large amount of German temporary exports of textile goods to the CEECs that, after processing, are eventually re-imported by Germany as apparel. This explanation is supported by the observation that Germany shows a high propensity to import apparel goods from the CEECs when considering total trade flows, but this is no longer true when looking at final flows only. Turning upside down our reading of the index, we can observe that the CEECs appear specialized in the apparel industry with respect to Germany only when considering processing trade, while their specialization 'disappears' when we consider trade in final goods only. This observation gives rise to concerns about the evaluation of the CEECs' comparative advantage in the apparel industry: the apparel industry in the CEECs mainly processes textiles and semi-finished apparel coming from the EU, but does not seem to have so far an autonomous capacity to penetrate the European markets.

There has been much discussion about the Irish success story in the EU. Ireland seems to be a favourite production location, attracting foreign direct investment or other forms of delocalized production. Given the attractiveness of the country for foreign firms, we can expect the extent of *IPT* in Ireland to be high enough to produce distortions in the *RCA* index built using total trade flows. This hypothesis is confirmed when comparing Tables 5A and 5B.

[Table 5a] and [Table 5b]

According to the index built on total trade flows, Ireland seems to have a *RCA* in producing mechanical machinery, electrical machinery and precision tools, and exports in these sectors should represent at least 5% of total manufacturing exports. Instead, when computed correctly (that is, looking at 'entirely Irish' trade flows and leaving *IPT* and *OPT* aside), the *RCA* index indicates the existence of a comparative advantage neither for machinery nor for precision tools, whose weight in manufacturing exports falls below 5%. In the goods' classification adopted here, the Combined Nomenclature, the group 'mechanical machinery' includes computers and other office machinery. Knowing that in Ireland there was a large inflow of foreign direct investment in this industry, it seems reasonable to interpret this evidence as an indication that Ireland does not have an intrinsic comparative

advantage in these sectors, but rather an absolute advantage making convenient for large firms to delocalize in this country phases of the production process (possibly the assembly) of such goods.

4. International fragmentation of production and national income

4.1 The relationship between international fragmentation of production and GDP

With trade in final goods, foreign demand for home goods represents foreign derived demand for home factors. If international fragmentation of production is allowed for, two important issues arise: on the one hand, demand for final goods exported by a country will not be entirely directed to that country's factors of production, since the final good processed in more than one country will embody many countries' factors of production and technologies; on the other hand, international trade for reasons of processing is *direct* demand for factors of production located in the country where processing takes place. Therefore, we expect that trade may affect an open economy involved in international fragmentation of production (and its factor markets especially) in ways other than those we could observe were final goods only to be traded.

Recall our discussion in Section 2.1: when country A delocalizes parts of the production process of good C_1 to country B, country A's demand is not directed to the domestic goods produced in B (even if such goods will eventually be re-imported by A), but rather to B's factors of production. In other words, demand for factors used in the phases of production delocalized to B is *direct* demand for those factors. This distinction between direct demand for factors of production and indirect demand stemming from demand for home goods allows to underline some important points about the determinants of trade patterns and the effects of trade for the countries sharing an international production network. We discuss those point briefly, as they point the way to the modelling of the relationship between *forms* of trade integration and domestic economic activity.

As already discussed, it is only under the final-goods-only-trade that trade flows can be explained purely in terms of comparative advantage, since it is only under such conditions that they truly embody a country's relative factor endowment and technology. Re-exports after processing are instead due to the existence of an absolute advantage of the country where the processing takes place, an advantage identified and exploited by foreign firms through international fragmentation of production.[21] In other words, while final exports identify those industries in which a country holds a comparative advantage, re-exports are a measure of the existence of absolute advantages in the home economy. This implies that the effects of final trade on a country will be primarily re-allocative, shifting factors between sectors along a fixed frontier of production, while processing trade, even though re-allocation effects will still be present, will generally shift the frontier of production outward (see for example

[21] For an early discussion of this point, see Baldone *et al*. (1997).

Deardorff, 2001a). Therefore, when looking at the effects of trade on a country's economy, the two types of flows should be accounted for separately.

It follows that we should expect a country open in terms of *IPT* to benefit from receiving additional resources from abroad (in the form of foreign inputs) and additional demand for its factors of production. Therefore, we expect *IPT* to have a positive effect on domestic production. On the other hand, we would expect that *OPT*, i.e. the process of moving abroad phases of the production process, could have negative effects on the domestic level of economic activity, al least in the shorter run. In the longer run, to the extent that international fragmentation of production leads to higher competitiveness of the home firm through cost reductions,[22] the home country's economy could receive a positive stimulus. Therefore, we can expect *OPT* to have two different effects, with opposite signs: a direct negative effect on the level of domestic activity in the short run, and a positive, indirect effect in the longer run.

Preliminary observation of the relationship between *IPT* and the level of economic activity shows that the sign of the relationship is indeed positive: the correlation coefficient between the *IPT* index (as defined in Tab. 2) and *GDP* growth rates for the EU countries (taken as a proxy of the level of economic activity) in the last decade is equal to 0.77. The rate of growth of *GDP* is instead negatively correlated to relative intensity of *OPT* (measured through the index used in Table 2) and the correlation coefficient is -0.43.

4.2 Estimating the effects of international fragmentation of production on the level of domestic activity

On the basis of the previous reasoning, we derived an equation that can be estimated to test more adequately the correlation between trade for reasons of processing and annual *GDP* changes. The regressions we run have as a dependent variable the *GDP* yearly growth differential between each country in our sample and the average EU *GDP* growth rate. The hypothesis we want to verify here is whether the different degree of participation of EU member countries to the process of international fragmentation of production (measured through the relative intensity of *IPT* and *OPT* for each country) has a specific role in explaining the observed differences in *GDP* growth rates.[23]

In order to verify this hypothesis, we have to take into account other elements that may have contributed to the observed differentials in growth rates. First of all, domestic policies and in general domestic demand will certainly affect *GDP* yearly growth rates. Therefore, in all the estimated equations we introduced the growth of domestic expenditure (as a proxy for domestic demand of domestic

[22] We have shown elsewhere (Baldone *et al*., 2002) that German and Italian firms in the textile and apparel industry could significantly re-gain competitiveness through the use of *OPT* with the CEECs, delocalizing there the most labor-intensive phases of production of those goods.

[23] Here and throughout in the paper we refer to *IPT* and *OPT* of EU member states with the rest of the world, excluding intra-EU trade, since European statistics collect data on intra-EU processing trade only up to December 1992.

factors of production) also taken in terms of differences from the EU average. Furthermore, we want to take into account the effects of foreign demand through 'traditional' trade flows, as we assumed that this might have a different, separable impact on the national economies. To capture this, we used the relative weight of final exports over GDP (as a proxy for the traditional, indirect foreign demand of domestic factors of production). In this way, the variable used to measure the propensity to undertake international fragmentation of production should capture the specific effects of this phenomenon on the national economic activity. The estimated equation, in its general form, is the following:[24]

$$DIFGDPGR_{it} = b_0 + b_1 * DIFDEM_{it} + b_2 * DIFEXPFIN/GDP_{it} + b_3 * IPT_{it} + b_4 * OPT_{it} + e_{it}$$

where

$DIFGDPGR_{it}$ = difference between country *i*'s annual growth rate of *GDP* and the EU's average;
$DIFDEM_{it}$ = difference between country *i*'s growth rate of annual domestic expenditures and the EU's average;
$DIFEXPFIN/GDP_{it}$ = difference between country *i*'s degree of openness (as measured by the ratio of final exports to *GDP*) and the EU's average;
IPT_{it} = country *i*'s index of revealed propensity to *IPT* (measured in terms of re-exports)
OPT_{it} = country *i*'s index of revealed propensity to *OPT* (measured in terms of re-imports)

Estimation results are reported in Table 6. Goodness of fit is always quite good, and this is not surprising as we are basically estimating an adjusted version of a Keynesian income-expenditure equation. In line with our expectations in fact, the coefficient of the domestic demand variable is always very significant, positive and stable. Instead, the coefficient measuring the different exposure to the international business cycle through the traditional export flows is generally not significant, even if positive. This seems to confirm that for the EU countries – having different production structures and different trading partners – foreign demand for final or 'normal' exports is not uniformly affecting *GDP* changes.

[Table 6]

What is more interesting here is the significance of the *IPT* variable, which, contrary to the 'normal' exports, is significantly and positively correlated with GDP growth rate differentials in almost all cases. If we run the regression over the entire sample period 1990-2003, the *IPT* variable is

[24] For homogeneity with the trade data used throughout the paper, the National Accounts data used in the regression are taken from Eurostat.

strongly significant, but its significance disappear if introducing countries' fixed effects. This particular specification and period is the only case when the variable looses its significance.[25] If we move onward the regression period, even keeping in the fixed effects, as an Hausmann test confirmed their contribution to the explanatory power of the regression, from 1991 onward the *IPT* variable is significant again, and it increases its positive coefficient and significance with time. This is a very robust result, as it is repeated in all the different specifications of the equation.[26] It seems that especially in the early 1990s, when the policy' heterogeneity among the EU members was still quite large the fixed effects were capturing many specific country characteristics influencing *GDP* growth rates and reduced the significance also of *IPT*. Over a shorter and more recent sample period, *IPT* variable becomes increasingly significant even when controlling for countries' heterogeneity, this can be interpreted as confirming the growing importance of this phenomenon in affecting the national economies. In the regression table, we chose to present results for the entire time span and for the 1995-2003 period, as over this time lag we have a balanced panel for the EU15 members.

[Table 7]

To verify the robustness of our conclusions on the specific role of *IPT*, we also run regressions including a direct measure of openness due to fragmentation instead of the *IPT* index. The variable used was the weight of re-exports over *GDP*, included together with the weight of final exports over *GDP*, as well as the control variable for domestic demand. The two terms measuring the different types of export flows can be added directly to measure the overall weight of total exports over *GDP*. When splitting total exports into final export and re-exports components like we did, the two variables should display the same coefficient if they had the same impact on *GDP*. In these last regressions, the variable measuring relative openness in terms of re-exports was strongly significant again, while final exports were not (see Table 7). We performed a Wald test to verify the identity of the coefficients of the two openness measures. The test clearly rejected the identity hypothesis, allowing to conclude that final trade flows and trade for reason of processing play a different role in determining *GDP* changes.

The role of *OPT* is not as clear in our estimates. The regressions including the *OPT* index (measured in terms of re-imports) produce an estimated coefficient for this variable generally not significantly different from zero, and with a sign sometimes positive and sometimes negative. This uncertain result can be explained by the fact that, as mentioned above, *OPT* levels in the EU are much lower

[25] Without fixed effects, the coefficient of final exports over *GDP* is also significative in the longer time span, but it looses its significance with fixed effects.
[26] Other specifications of the equation were tested (including lagged variables or other instruments for the control variables), but they are not reported here to save space. In all specifications, the *IPT* variable is significative with a positive sign.

than *IPT*, and therefore the effects of outward processing on the economic activity are at best weak. But given that the expected sign of the variable was uncertain, this result is not at all surprising.

5. Concluding remarks

It was the overall aim of this paper to highlight some of the implications of international production networks (or international fragmentation of production) on the relevance of comparative advantages, on some of their measures, on the determinants of the level of economic activity.

First, we emphasized that vertical, international disintegration of production processes necessarily blurs the concepts of comparative advantage as we know it and leads to a lessening of its power in explaining both merchandise composition and directions of trade; on the other hand, the concept of *absolute* advantage becomes increasingly relevant, as trade in intermediates grows at the world level. The basic reason for this result is that with trade in intermediates the factor content of traded final goods is no longer solely determined by pre-trade, autarkic relative factor endowments (in the Heckscher-Ohlin class of models), nor by pre-trade, autarkic relative productivities (as the Ricardian class of models).

Second, we have shown that with international fragmentation of production traditional measures of revealed comparative advantages may still be useful under the condition that the overall trade flows are properly disaggregated by reason of exchange. Data on trade in intermediates are useful in that they can offer a measure of the degree of *production* integration of any given domestic industry within the international production network: the upshot is that integration should no longer be thought of as simple trade integration, as we are accustomed to think of. The measure of the degree of international fragmentation of production we computed on the basis of processing trade data for EU member countries shows that this phenomenon is growing and that our sample of countries takes part in this process to different extents and in different ways. Such evidence led us to inquire about the potential effects that the degree of production integration may have on the level of domestic economic activity.

Third, we moved on to estimate a simple model of aggregate demand accounting for international trade in intermediates: our estimates show that the participation to this form of international division of labor can significantly affect the level of economic activity of a country above and beyond effects due to more traditional forms of international economic integration. More precisely: inward processing traffic appears to be a powerful contribution to GDP growth in ways other that those followed by 'traditional' exports of final goods; and the effects of outward processing traffic on GDP growth appear to be ambiguous, as the theoretical prior on such effects was.

A better understanding of these effects would require that further empirical research be based on firm-level data sets; however, the results we obtained are suggestive that international fragmentation of production is not a marginal phenomenon in the general process of globalization and growth,

and that the results we obtained for the EU could hold *vis-à-vis* countries other than those included in our present sample.

Appendix

TABLE A1. Selected CEECs trade statistics: CEECs-sources versus EU15-sources

Ratio between data from CEECs and EU sources										
	Imports					Exports				
	1999	2000	2001	2002	2003	1999	2000	2001	2002	2003
	Total imports					Total exports				
POLAND	0.96	0.96	0.96	0.97	0.96	1.03	1.03	1.05	1.06	1.04
CZECH REPUBLIC	0.93	0.91	0.92	0.89	0.88	1.03	1.00	1.02	1.01	1.01
SLOVAKIA	1.00	1.03	1.03	1.01	1.01	0.96	1.09	1.03	0.95	0.95
HUNGARY	0.92	0.88	0.91	0.90	0.89	1.02	1.04	1.02	1.09	1.08
	Final imports					Final exports				
POLAND		0.90	0.89	0.88	0.89		0.71	0.71	0.74	0.76
CZECH REPUBLIC	0.73	0.71	0.72	0.73	0.75	0.65	0.63	0.64	0.67	0.70
SLOVAKIA	0.60	0.54	0.63	0.65	0.63	0.36	0.37	0.41	0.42	0.42
HUNGARY	0.80	0.77	0.82	0.81	0.82	0.82	0.85	0.89	0.96	0.96
	Temporary imports					Re-exports				
POLAND		3.90	4.85	6.20	6.36		7.32	10.60	12.63	13.49
CZECH REPUBLIC	6.41	6.85	9.25	7.26	5.09	8.95	11.13	13.94	12.21	9.03
SLOVAKIA	8.75	11.98	10.98	13.93	15.98	11.38	16.79	17.38	21.60	28.41
HUNGARY	3.52	3.65	3.90	4.21	4.04	4.31	5.52	4.82	5.84	5.91
	Re-imports					Temporary exports				
POLAND		0.15	0.13	0.16	0.18		0.29	0.31	0.40	0.52
CZECH REPUBLIC	0.52	0.24	0.31	0.43	0.59	1.78	0.81	0.72	0.67	0.76
SLOVAKIA	0.07	0.06	0.11	0.09	0.13	0.00	0.15	0.26	0.13	0.13
HUNGARY	0.05	0.06	0.05	0.07	0.08	0.10	0.09	0.14	0.09	0.08

Source : Eurostat, *Comext database* .

In its latest version of Comext database (Supplement 2, 2005), Eurostat supplies data for the new ten member countries since 1999. It is therefore possible to compare a same trade datum generated by different national sources remembering that EU15 imports from one of the CEECs measure exports of that country towards EU15. Table A.1 reports on comparisons between data generated by EU15 countries and those generated by four important trade partners of the EU15 (later to become actual members) for the period 1999-2003. It is apparent that data collected by the different national statistical services generally agree as to the size of total trade in every year in the sample; however, huge differences appear when total-trade data are disaggregated by reason of shipping, the general rule being that CEECs are much more careful than EU15 countries in recording temporary imports and, especially, re-exports after temporary imports of goods to be processed.

References

Arndt, S., (1997a), Globalization and the Open Economy, *North American Journal of Economics & Finance*, 8(1), 71-79

Arndt, S., (1997b), Globalization and the Gains from Trade, in K. Jaeger and K.J. Koch (eds), *Trade, Growth and Economic Policy in Open Economies*, Springer-Verlag, New York

Baldone, S., F. Sdogati and L. Tajoli (2001), Patterns and Determinants of International Fragmentation of Production. Evidence from Outward Processing Trade between the EU and the Countries of Central-Eastern Europe, *Weltwirtshaftliches Archiv*, 137 (1), 80-104

Baldone, S., F. Sdogati and L. Tajoli (2002), Moving to Central-Eastern Europe: Fragmentation of Production and Competitiveness in the European Textile and Apparel Industry, *Rivista di Politica Economica*, XCII (I-II), 209-281; reprinted in S. Manzocchi (ed.), *The Economics of Enlargement*, Palgrave Macmillan (2003)

Baldone, S., F. Sdogati and A. Zucchetti (1997), From Integration through Trade in Goods to Integration through Trade in Production Processes? Evidence from EU OPT Statistics, in Baldone, S. e F. Sdogati (eds), *EU-CEECs Integration: Policies and Markets at Work*, Franco Angeli, Milano

Davis D.R. and D.E. Weinstein (2002), What Role for Empirics in International Trade?, in R. Findlay, L. Jonung, M. Lundahl (eds), *Bertil Ohlin: A Centennial Celebration, 1899-1999,* Cambridge, MIT Press

Deardorff, A.V. (2001a), Fragmentation in Simple Trade Models, *North American Journal of Economics and Finance* 12, 121-137

Deardorff, A.V. (2001b), Fragmentation across Cones, in S. Arndt and H. Kierzkowski (eds), *Fragmentation. New Production Patterns in the World Economy*, Oxford University Press

Deardorff, A.V. (2005), Ricardian comparative advantage with intermediate inputs, *North American Journal of Economics and Finance*, 16, 11-34

Dornbusch R., S. Fisher, P.A. Samuelson (1977), Comparative Advantage, Trade and Payments in a Ricardian Model with a Continuum of Goods, *American Economic Review*, 67, 823-839

European Commission (2005), Rising International Economic Integration. Opportunities and challenges. The EU economy 2005 Review, *European Economy* 6

Feenstra, R.C. (1998), Integration of Trade and Disintegration of Production in the Global Economy, *Journal of Economic Perspectives*, 12 (4)

Hillman A. (1980), Observations on the relation between 'Revealed Comparative Advantage' and comparative advantage as indicated by pre-trade relative prices, *Weltwirtshaftliches Archiv,* 116 (1)

Hummels D., J. Ishii and K-M.Yi, (2001), The nature and growth of vertical specialization in world trade, *Journal of International Economics* 54, 75-96

Jones R. W.(2000), *Globalization and the Theory of Input Trade*, Cambridge, MIT Press

Jones R.W.and H. Kierzkowski (2001a), Globalization and the consequences of international fragmentation, in R. Dornbusch, G. Calvo and M. Obsfeld (eds), *Money, Factor Mobility and Trade: the Festschrift in Honor of Robert A. Mundell*, MIT Press, Cambridge, MA

Jones R.W. and H. Kierzkowski (2001b), A Framework for Fragmentation, in S. Arndt and H. Kierzkowski (eds), *Fragmentation. New Production Patterns in the World Economy*, Oxford University Press

Krugman, P. (1995). Growing World Trade: Causes and Consequences. *Brookings Papers on Economic Activity*, (1), 327-377

Sanyal, K.K. and R.W. Jones, (1982) The Theory of Trade in Middle Products, *American Economic Review*, 72 (1), 16-31

Samuelson, P.A. (2001), A Ricardo-Sraffa Paradigm Comparing Gains from Trade in Inputs and Finished Goods, *Journal of Economic Literature*, XXXIX(December), 1204-1214

Samuelson, P.A. (2004), Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization, *Journal of Economic Perspectives*, 18(3), 135-146

Yi, K-M. (2003), Can vertical specialization explain the growth of world trade?, *Journal of Political Economy*, 111 (1), 52-102

TABLE 1 - EU temporary and final trade with the rest of the world

Trade flows (mln ECU)														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Outward processing														
Temporary exports	5941	7323	8319	9629	11032	12813	13973	15173	12186	11846	13607	13622	13230	14099
Re-imports	7115	8624	9516	10019	11950	13209	14037	15380	13932	14326	14426	15273	14233	15476
Inward processing														
Re-exports	56268	59188	62254	68771	77120	83705	87748	97262	106084	109028	127636	124709	113128	92937
Temporary imports	28346	30656	29526	31627	37072	40292	44850	51138	55268	59996	69499	66278	54995	47667
Final trade														
Final exports	357657	361268	369810	409149	453466	476758	524572	608694	615157	639319	800801	847423	870930	872540
Final imports	428163	455970	451648	445782	489606	491752	522128	606049	641339	705503	949511	946844	919917	929533
Weight of temporary trade over the corresponding final trade flows (%)														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Outward processing														
Temporary exports	1.66	2.03	2.25	2.35	2.43	2.69	2.66	2.49	1.98	1.85	1.70	1.61	1.52	1.62
Re-imports	1.66	1.89	2.11	2.25	2.44	2.69	2.69	2.54	2.17	2.03	1.52	1.61	1.55	1.66
Inward processing														
Re-exports	15.73	16.38	16.83	16.81	17.01	17.56	16.73	15.98	17.25	17.05	15.94	14.72	12.99	10.65
Temporary imports	6.62	6.72	6.54	7.09	7.57	8.19	8.59	8.44	8.62	8.50	7.32	7.00	5.98	5.13

Source : Eurostat, *Comext database* .

TABLE 2 - Structure of EU processing trade (percentage weight in the correspondig trade flow)

Geography	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Re-imports														
America	20.50	22.28	18.72	14.15	14.83	12.92	15.23	17.60	23.16	22.16	21.55	24.89	32.11	33.26
of which USA	*17.81*	*17.38*	*15.04*	*11.17*	*11.44*	*10.50*	*12.79*	*15.38*	*20.00*	*19.70*	*19.39*	*23.12*	*30.68*	*32.45*
non-EU European countries	51.11	52.48	54.71	58.42	57.79	59.81	59.45	55.51	59.74	57.63	56.82	51.44	48.24	50.27
of which CECCCs	*22.41*	*25.90*	*32.63*	*37.44*	*38.76*	*41.14*	*43.47*	*39.72*	*40.30*	*38.93*	*36.03*	*31.89*	*30.80*	*29.50*
Asia and Oceania	20.60	19.46	20.65	21.73	22.00	22.44	20.64	22.14	10.74	10.79	12.64	15.51	10.64	8.84
of which East Asia	*19.52*	*18.40*	*19.46*	*19.83*	*20.14*	*20.69*	*18.76*	*20.34*	*8.53*	*8.87*	*10.35*	*13.33*	*8.75*	*7.53*
Africa	7.80	5.78	5.91	5.69	5.38	4.83	4.69	4.75	6.36	9.42	8.98	8.16	9.01	7.64
Re-exports														
America	47.69	45.05	44.78	45.06	44.83	40.39	40.19	42.97	48.69	50.04	52.97	55.12	55.41	50.43
of which USA	*39.86*	*34.90*	*34.94*	*35.83*	*36.02*	*30.95*	*31.46*	*33.96*	*38.34*	*40.48*	*42.73*	*43.61*	*44.01*	*41.02*
non-EU European countries	11.13	12.19	13.98	13.28	13.18	14.89	14.94	13.64	13.85	14.23	12.19	11.30	11.63	13.47
of which CECCCs	*1.54*	*2.40*	*2.73*	*2.54*	*2.87*	*3.33*	*4.02*	*3.45*	*3.06*	*2.48*	*2.18*	*2.04*	*2.12*	*2.56*
Asia and Oceania	32.55	33.38	33.65	35.60	35.96	38.82	38.77	38.41	31.15	29.56	29.30	28.48	28.19	29.77
of which East Asia	*19.46*	*20.18*	*20.49*	*22.57*	*24.57*	*28.11*	*28.21*	*28.24*	*21.45*	*19.68*	*19.99*	*18.72*	*16.82*	*17.75*
Africa	8.63	9.38	7.59	6.06	6.03	5.90	6.10	4.98	6.31	6.16	5.54	5.10	4.76	6.32
Merchandise composition	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Re-imports														
Textiles and apparel	37.46	37.60	38.01	42.36	42.46	45.47	46.54	42.29	43.96	41.01	39.91	35.68	31.72	27.03
Footwear	4.05	3.83	3.58	3.77	3.47	2.64	2.64	3.05	4.17	4.01	4.13	3.96	3.92	3.32
Machinery and mechanical appliances	16.00	14.40	13.28	11.00	11.02	8.98	9.91	9.14	10.05	10.26	12.35	9.77	9.46	9.20
Electrical machinery and equipment	17.49	22.65	23.07	22.50	23.37	24.17	21.75	22.75	12.70	13.33	11.12	9.52	8.75	8.21
Motor vehicles	3.05	2.59	2.72	1.99	4.05	4.29	5.37	8.17	12.04	14.77	13.04	19.61	25.85	27.70
Aircrafts	7.75	6.43	6.93	4.88	2.35	2.42	2.27	2.83	3.15	3.54	4.55	7.67	5.02	10.75
Optical and precision instruments and	2.74	2.67	2.80	2.85	2.67	2.53	2.60	2.60	3.01	2.98	3.08	2.63	2.90	2.67
Other products	11.47	9.84	9.62	10.66	10.61	9.49	8.91	9.18	10.93	10.11	11.82	11.17	12.37	11.10
Re-exports														
Beverages and spirits	3.11	3.13	3.16	3.07	2.87	2.67	2.56	2.77	1.98	2.00	1.95	1.96	2.35	2.86
Organic chemicals adn pharmaceutical	4.56	5.14	5.39	5.42	5.86	6.27	4.53	4.38	4.23	4.20	6.19	6.34	5.27	5.14
Machinery and mechanical appliances	17.33	17.35	18.20	18.47	18.61	16.30	15.89	18.14	17.15	15.26	15.34	14.68	13.41	15.06
Electrical machinery and equipment	5.45	5.73	5.24	6.23	7.14	8.11	9.11	10.82	10.69	11.16	9.90	7.69	5.53	4.63
Motor vehicles	24.52	17.96	17.33	22.32	24.99	23.66	25.35	25.29	24.37	24.65	24.44	27.87	34.54	38.96
Aircrafts	15.11	19.68	20.45	16.08	13.41	14.76	11.91	11.49	17.40	19.55	17.87	19.31	16.32	9.81
Optical and precision instruments and	2.97	3.04	2.99	3.23	3.13	2.92	3.28	3.60	3.74	4.26	4.61	3.61	2.82	2.73
Other products	26.95	27.96	27.25	25.20	23.99	25.31	27.38	23.51	20.45	18.93	19.70	18.55	19.75	20.82

Source : Eurostat, *Comext database* .

TABLE 3 - Index of revealed relative propensity to international fragmentation of production

FRANCE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Outward Processing														
Temporary Exports	1.277	1.075	0.951	1.093	1.076	0.995	0.990	1.269	1.035	1.050	1.091	0.932	0.987	0.975
Re-Imports	1.478	1.211	1.130	1.206	1.231	1.147	1.058	1.155	1.177	1.208	1.176	1.103	1.233	1.345
Inward Processing														
Re-Exports	1.203	1.512	1.502	1.462	1.443	1.502	1.376	1.391	1.865	2.030	1.871	2.042	1.900	1.268
Temporary Imports	1.598	1.856	1.737	1.616	1.763	1.698	1.595	1.686	2.695	2.847	2.622	2.973	2.822	2.858
BELGIUM-LUX.														
Outward Processing														
Temporary Exports	0.461	0.423	0.375	0.507	0.396	0.473	0.446	0.470	0.582	0.546	0.541	0.711	0.540	0.566
Re-Imports	0.353	0.274	0.288	0.306	0.366	0.421	0.380	0.738	0.666	0.539	0.643	0.997	0.778	0.518
Inward Processing														
Re-Exports	1.151	0.969	0.822	1.232	1.397	1.261	1.138	1.220	1.151	0.932	0.879	1.067	1.003	1.172
Temporary Imports	0.587	0.535	0.554	1.200	1.253	0.753	0.616	0.701	0.625	0.530	0.562	0.627	0.626	0.719
NETHERLANDS														
Outward Processing														
Temporary Exports	1.837	1.238	1.786	1.291	0.995	1.331	1.651	1.627	1.203	1.354	1.631	1.219	1.222	0.910
Re-Imports	1.273	1.161	1.105	1.156	0.818	0.745	0.636	0.663	0.368	0.376	0.549	0.381	0.390	0.381
Inward Processing														
Re-Exports	1.739	1.586	1.695	1.632	1.213	1.356	1.234	1.059	1.026	0.884	0.743	0.455	0.348	0.411
Temporary Imports	1.256	1.121	1.153	0.983	0.908	0.686	0.575	0.490	0.409	0.260	0.237	0.253	0.269	0.265
GERMANY														
Outward Processing														
Temporary Exports	1.199	1.323	1.239	1.354	1.449	1.553	1.535	1.422	1.380	1.283	1.226	1.261	1.244	1.301
Re-Imports	1.745	1.781	1.695	1.749	1.766	1.976	2.054	2.037	1.913	1.867	1.784	1.863	2.045	1.870
Inward Processing														
Re-Exports	0.812	0.651	0.663	0.778	0.841	0.978	1.028	0.952	0.894	0.924	0.994	1.086	1.275	1.441
Temporary Imports	0.558	0.523	0.524	0.475	0.497	0.551	0.547	0.546	0.507	0.621	0.761	0.680	0.762	0.768
ITALY														
Outward Processing														
Temporary Exports	0.854	0.997	1.112	1.013	0.979	0.960	0.904	0.680	0.875	0.995	0.923	0.980	0.947	0.928
Re-Imports	0.690	0.814	0.987	0.925	1.043	1.019	1.103	0.932	1.196	1.186	1.165	1.205	1.132	0.950
Inward Processing														
Re-Exports	0.402	0.381	0.343	0.349	0.287	0.311	0.274	0.278	0.322	0.324	0.349	0.303	0.375	0.383
Temporary Imports	0.851	0.844	0.719	0.741	0.680	0.654	0.667	0.700	0.807	0.796	0.939	0.806	0.907	0.846
UNITED KINGDOM														
Outward Processing														
Temporary Exports	0.654	0.611	0.645	0.583	0.572	0.702	0.688	0.769	0.825	0.730	0.768	0.739	0.817	0.676
Re-Imports	0.290	0.293	0.351	0.338	0.367	0.352	0.362	0.357	0.467	0.535	0.474	0.335	0.467	0.591
Inward Processing														
Re-Exports	1.761	1.840	1.766	1.442	1.529	1.632	1.773	1.568	1.387	1.315	1.413	1.285	1.415	1.432
Temporary Imports	1.376	1.409	1.437	1.601	1.482	1.678	1.736	1.622	1.473	1.411	1.378	1.387	1.365	1.467
IRELAND														
Outward Processing														
Temporary Exports	0.410	0.153	0.316	0.240	0.352	0.226	0.497	0.643	0.049	0.177	0.194	0.055	0.054	0.034
Re-Imports	0.020	0.014	0.011	0.007	0.046	0.044	0.081	0.050	0.011	0.026	0.028	0.006	0.009	0.004
Inward Processing														
Re-Exports	2.732	2.175	2.620	3.244	2.863	3.827	3.169	3.883	3.052	2.170	2.464	1.938	0.597	0.663
Temporary Imports	3.099	3.816	3.574	3.890	4.973	5.906	5.572	4.311	1.288	1.282	0.784	0.682	0.520	0.419
DENMARK														
Outward Processing														
Temporary Exports	0.604	0.599	0.580	0.595	0.659	0.706	0.724	0.807	1.073	1.135	1.200	0.882	0.718	0.584
Re-Imports	1.222	1.080	1.269	1.107	1.013	1.222	1.274	1.366	1.768	1.978	2.245	1.412	0.496	0.332
Inward Processing														
Re-Exports	0.347	0.480	0.517	0.509	0.552	0.657	0.644	0.806	0.656	0.640	0.484	0.419	0.400	0.493
Temporary Imports	0.812	0.782	0.794	0.702	0.649	0.812	0.827	0.870	0.848	0.970	1.001	1.044	0.984	0.740

(over)

TABLE 3 (continues)

GREECE	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Outward Processing														
Temporary Exports	0.235	0.247	0.263	0.317	0.427	0.506	0.569	0.522	0.625	0.796	0.718	1.439	2.629	4.288
Re-Imports	0.012	0.009	0.019	0.012	0.047	0.094	0.170	0.321	0.691	0.904	1.181	1.189		
Inward Processing														
Re-Exports	2.247	1.624	1.755	1.065	0.626	0.740	0.735	0.801	0.677	0.591	0.529	0.670	0.796	0.812
Temporary Imports	1.240	0.605	0.427	0.289	0.415	0.483	0.358	0.510	0.400	0.246	0.307	0.296	0.315	0.297
PORTUGAL														
Outward Processing														
Temporary Exports	0.085	0.057	0.060	0.078	0.168	0.148	0.113	0.158	0.250	0.285	0.293	0.259	0.161	0.081
Re-Imports	0.083	0.122	0.063	0.063	0.050	0.054	0.035	0.031	0.033	0.078	0.170	0.114	0.057	0.056
Inward Processing														
Re-Exports	0.322	0.297	0.213	0.429	0.341	0.480	0.686	0.476	0.472	0.482	0.652	0.561	0.413	0.585
Temporary Imports	0.526	0.492	0.254	0.326	0.391	0.754	0.541	0.400	0.232	0.136	0.421	0.486	0.252	0.702
SPAIN														
Outward Processing														
Temporary Exports	0.472	0.449	0.464	0.283	0.197	0.215	0.169	0.268	0.254	0.334	0.575	0.569	0.570	0.452
Re-Imports	0.160	0.179	0.207	0.001	0.000	0.087	0.098	0.167	0.173	0.192	0.143	0.194	0.261	0.145
Inward Processing														
Re-Exports	0.278	1.126	1.385	0.755	0.764	0.654	0.758	1.000	0.681	0.572	0.685	0.494	0.415	0.447
Temporary Imports	0.659	0.755	1.303	0.654	0.559	0.418	0.587	0.615	0.500	0.410	0.342	0.167	0.178	0.208
SWEDEN														
Outward Processing														
Temporary Exports						0.518	0.406	0.470	0.613	0.462	0.498	0.443	0.415	0.464
Re-Imports						0.493	0.434	0.428	0.533	0.747	0.891	0.711	0.568	0.712
Inward Processing														
Re-Exports						0.022	0.036	0.070	0.089	0.069	0.066	0.105	0.101	0.131
Temporary Imports						1.054	0.986	1.064	0.773	0.760	0.735	0.626	0.657	0.851
FINLAND														
Outward Processing														
Temporary Exports						0.389	0.560	0.827	1.342	1.749	0.516	0.583	1.026	1.143
Re-Imports						0.493	0.527	0.487	0.858	0.908	0.696	0.712	1.559	1.411
Inward Processing														
Re-Exports						0.173	0.611	0.909	1.043	1.270	0.763	0.645	0.662	0.522
Temporary Imports						0.527	1.231	1.240	1.198	1.142	0.577	0.596	0.582	0.565
AUSTRIA														
Outward Processing														
Temporary Exports						0.796	1.231	1.047	1.103	1.393	2.069	2.734	2.544	2.974
Re-Imports						0.826	1.262	1.185	1.117	1.108	1.543	2.207	0.867	2.516
Inward Processing														
Re-Exports						0.970	0.817	0.648	0.548	0.615	0.591	0.658	0.712	0.940
Temporary Imports						0.924	1.187	1.216	1.038	1.265	1.253	1.309	1.339	0.981

Source : Eurostat, *Comext database* .

TABLE 4A - German total trade with the CEECS: RCA indexes calculated with respect to the EU*

Exports														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Agricultural products	0.91	0.71	0.60	0.66	0.58	0.58	0.72	0.63	0.60	0.61	0.53	0.53	0.54	0.53
Food	0.88	0.89	0.95	0.93	0.87	0.79	0.82	0.89	0.88	0.90	0.93	0.94	0.92	0.90
Beverages and tobacco	0.57	0.47	0.56	0.42	0.52	0.59	0.52	0.52	0.77	0.79	0.89	0.91	0.86	0.81
Textiles	1.17	1.17	1.18	1.21	1.17	1.27	1.23	1.16	1.10	1.07	1.01	0.96	0.90	0.85
Apparel	0.80	0.88	0.95	0.97	0.91	0.90	0.87	0.82	0.76	0.71	0.62	0.56	0.63	0.71
Leather and leather goods	0.83	0.99	1.09	0.98	0.95	0.96	0.83	0.82	0.77	0.79	0.67	0.61	0.58	0.56
Shoes	0.74	0.79	0.69	0.58	0.53	0.46	0.39	0.37	0.33	0.36	0.34	0.30	0.29	0.30
Wood and wood products	1.03	1.35	1.31	1.20	1.29	1.10	1.06	1.13	1.09	1.04	1.03	1.04	1.00	0.97
Paper and printing	1.17	1.06	1.15	1.17	1.13	0.92	0.93	0.94	0.92	0.97	0.98	0.99	1.03	1.03
Petroleum products	0.95	1.02	0.41	0.37	0.52	0.42	0.42	0.40	0.62	0.72	0.87	0.91	1.11	1.02
Chemical products and synthetic fibers	0.85	0.94	0.89	0.85	0.84	0.87	0.86	0.85	0.83	0.82	0.80	0.81	0.78	0.82
Pharmaceuticals	0.92	0.97	0.92	0.84	0.79	0.74	0.71	0.68	0.60	0.62	0.62	0.55	0.51	0.54
Rubber and plastic	0.95	0.99	1.01	1.02	1.03	1.01	1.09	1.11	1.08	1.13	1.13	1.13	1.12	1.11
Non-metallic mineral products	0.69	0.81	0.78	0.79	0.77	0.80	0.79	0.82	0.88	0.91	0.89	0.90	0.98	0.97
Metals and metal products	1.04	1.10	1.17	1.12	1.14	1.08	1.09	1.09	1.09	1.11	1.11	1.13	1.11	1.10
Machinery and mechanical appliances	1.04	1.11	1.09	1.05	1.05	1.04	1.04	1.09	1.08	1.07	1.07	1.04	1.04	1.04
Electrical machinery and appliances	1.21	1.21	1.26	1.20	1.21	1.13	1.09	0.98	0.94	0.92	0.93	0.98	1.00	1.05
Precision tools	1.15	1.20	1.21	1.20	1.17	1.17	1.15	1.14	1.13	1.15	1.09	1.17	1.08	1.04
Auto and motor vehicles	1.12	1.04	1.03	1.01	1.04	1.10	1.13	1.20	1.26	1.26	1.29	1.32	1.29	1.23
Other means of transport	0.70	0.18	0.23	1.01	0.39	0.81	1.02	1.16	1.19	0.65	0.91	0.89	1.17	1.06
Furniture	0.90	1.01	0.96	0.89	0.81	0.73	0.70	0.70	0.77	0.80	0.81	0.78	0.80	0.79
Other manufactured products	0.77	0.90	0.95	1.11	1.18	1.19	1.09	1.17	1.09	1.02	0.99	0.96	1.01	0.95

Imports														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Agricultural products	0.81	0.80	0.80	0.83	0.83	0.85	0.87	0.88	0.87	0.82	0.91	0.85	0.84	0.90
Food	1.24	1.17	1.19	1.18	1.20	1.15	1.09	1.15	1.09	1.07	1.13	1.09	1.09	1.05
Beverages and tobacco	0.81	0.78	0.88	0.81	0.80	0.75	0.71	0.75	0.72	0.75	0.96	0.94	1.00	0.88
Textiles	0.85	0.77	0.71	0.70	0.61	0.66	0.72	0.80	0.92	0.90	0.89	0.92	0.88	0.83
Apparel	1.34	1.18	1.11	1.13	1.13	1.15	1.12	1.07	1.00	0.96	0.94	0.89	0.83	0.80
Leather and leather goods	0.84	0.80	0.79	0.80	0.77	0.90	0.88	0.79	0.79	0.84	0.69	0.69	0.63	0.60
Shoes	1.20	1.05	0.93	0.81	0.75	0.72	0.68	0.64	0.61	0.61	0.57	0.56	0.53	0.49
Wood and wood products	0.94	0.91	0.95	1.00	1.04	0.94	0.94	0.95	0.93	0.89	0.87	0.85	0.78	0.76
Paper and printing	1.06	0.96	0.87	0.91	0.98	0.91	0.91	0.90	0.88	0.91	1.01	1.10	1.16	1.17
Petroleum products	0.75	0.92	1.01	0.84	0.73	0.55	0.56	0.63	0.65	0.68	0.71	0.70	0.64	0.66
Chemical products and synthetic fibers	0.69	0.69	0.69	0.62	0.64	0.68	0.65	0.64	0.68	0.62	0.63	0.61	0.61	0.68
Pharmaceuticals	1.03	1.22	1.05	0.86	0.90	0.82	0.75	0.82	0.71	0.66	0.62	0.72	0.50	0.49
Rubber and plastic	0.93	0.82	0.81	0.87	0.93	0.94	0.95	0.96	0.96	0.98	1.01	1.05	1.03	1.01
Non-metallic mineral products	0.91	0.99	1.11	1.15	1.19	1.18	1.15	1.10	1.08	1.01	1.00	0.97	0.92	0.95
Metals and metal products	1.12	1.08	1.07	1.06	0.97	0.93	0.98	0.95	0.96	0.99	1.00	1.03	1.00	1.03
Machinery and mechanical appliances	1.07	1.11	1.06	1.03	1.06	1.03	1.08	1.17	1.18	1.14	1.14	1.18	1.22	1.12
Electrical machinery and appliances	1.07	1.09	1.08	1.12	1.21	1.20	1.10	1.00	0.93	0.92	0.90	0.88	0.91	0.91
Precision tools	1.11	1.20	1.20	1.17	1.28	1.36	1.39	1.36	1.23	1.19	1.18	1.23	1.22	1.21
Auto and motor vehicles	0.59	1.00	0.89	0.77	0.80	1.00	0.98	1.03	1.06	1.14	1.14	1.18	1.18	1.25
Other means of transport	0.71	1.09	0.81	0.94	0.84	1.19	0.74	1.07	1.20	1.29	1.07	0.82	0.89	1.02
Furniture	1.34	1.27	1.27	1.30	1.33	1.36	1.36	1.32	1.27	1.21	1.22	1.18	1.10	1.10
Other manufactured products	1.41	1.31	1.34	1.18	1.41	1.50	1.45	1.27	1.45	1.45	1.45	1.39	1.50	1.33

* Cells are shaded when sectoral trade is at least 5% of the corresponding overall trade.

Source : Eurostat, *Comext database* .

TABLE 4B - German final trade with the CEECs: RCA indexes calculated with respect to the EU*

Exports

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Agricultural products	0.94	0.72	0.60	0.64	0.54	0.54	0.68	0.56	0.54	0.55	0.48	0.50	0.52	0.51
Food	0.90	0.92	0.97	0.98	0.92	0.87	0.91	0.94	0.89	0.90	0.93	0.94	0.91	0.88
Beverages and tobacco	0.55	0.40	0.39	0.31	0.42	0.43	0.25	0.30	0.59	0.70	0.82	0.82	0.79	0.77
Textiles	0.85	0.86	0.88	0.89	0.77	0.87	0.88	0.91	0.97	0.98	0.94	0.91	0.86	0.81
Apparel	0.63	0.78	0.93	0.90	0.77	0.75	0.73	0.74	0.73	0.71	0.60	0.55	0.54	0.56
Leather and leather goods	0.51	0.60	0.74	0.76	0.77	0.83	0.77	0.78	0.83	0.87	0.71	0.64	0.58	0.53
Shoes	0.63	0.69	0.52	0.45	0.40	0.38	0.33	0.30	0.29	0.34	0.32	0.27	0.24	0.25
Wood and wood products	1.06	1.36	1.37	1.27	1.35	1.14	1.08	1.13	1.08	1.00	1.02	1.04	1.00	0.97
Paper and printing	1.18	1.05	1.17	1.22	1.17	0.94	0.93	0.94	0.90	0.96	0.97	0.98	1.03	1.03
Petroleum products	0.98	1.05	0.43	0.40	0.57	0.46	0.45	0.41	0.62	0.71	0.86	0.91	1.10	1.02
Chemical products and synthetic fibers	0.92	1.02	0.98	0.93	0.93	0.96	0.93	0.89	0.85	0.84	0.81	0.82	0.79	0.83
Pharmaceuticals	1.00	1.03	0.96	0.90	0.85	0.78	0.73	0.67	0.60	0.62	0.61	0.54	0.51	0.54
Rubber and plastic	1.00	1.02	1.01	1.03	1.04	1.02	1.08	1.09	1.06	1.12	1.11	1.12	1.11	1.11
Non-metallic mineral products	0.70	0.82	0.80	0.81	0.77	0.80	0.79	0.81	0.87	0.90	0.88	0.88	0.97	0.96
Metals and metal products	1.05	1.11	1.20	1.16	1.18	1.13	1.13	1.12	1.10	1.11	1.12	1.13	1.12	1.11
Machinery and mechanical appliances	1.06	1.13	1.12	1.12	1.11	1.10	1.09	1.12	1.11	1.08	1.08	1.04	1.04	1.03
Electrical machinery and appliances	1.24	1.20	1.24	1.22	1.22	1.16	1.16	1.01	0.96	0.93	0.92	0.97	0.98	1.03
Precision tools	1.20	1.24	1.26	1.27	1.25	1.22	1.18	1.16	1.13	1.15	1.10	1.17	1.09	1.06
Auto and motor vehicles	1.09	0.97	0.97	0.95	1.00	1.08	1.10	1.21	1.24	1.25	1.29	1.33	1.30	1.25
Other means of transport	0.93	0.30	0.67	1.61	1.37	1.31	1.24	1.24	1.38	0.79	1.11	1.09	1.30	1.35
Furniture	0.82	0.95	0.95	0.91	0.82	0.73	0.71	0.69	0.77	0.83	0.83	0.80	0.85	0.84
Other manufactured products	0.71	0.89	0.88	1.08	1.14	1.19	1.07	1.13	1.04	1.00	1.01	0.97	0.97	0.98

Imports

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Agricultural products	0.88	0.84	0.84	0.86	0.87	0.89	0.90	0.91	0.88	0.83	0.91	0.86	0.85	0.91
Food	1.41	1.30	1.33	1.31	1.34	1.22	1.13	1.18	1.10	1.04	1.11	1.06	1.04	1.00
Beverages and tobacco	0.96	0.90	0.92	0.83	0.84	0.77	0.75	0.76	0.72	0.76	0.98	0.93	1.00	0.88
Textiles	0.87	0.76	0.71	0.69	0.57	0.59	0.61	0.76	0.90	0.87	0.87	0.91	0.88	0.83
Apparel	0.96	0.88	0.91	0.98	0.88	0.91	0.91	0.86	0.93	0.91	0.89	0.82	0.73	0.70
Leather and leather goods	0.73	0.77	0.78	0.78	0.74	0.87	0.88	0.82	0.79	0.85	0.70	0.70	0.61	0.56
Shoes	0.84	0.78	0.57	0.57	0.59	0.69	0.70	0.67	0.67	0.68	0.62	0.60	0.55	0.49
Wood and wood products	1.01	0.97	1.00	1.05	1.10	0.98	0.97	0.97	0.94	0.88	0.86	0.85	0.79	0.76
Paper and printing	1.14	1.00	0.90	0.94	1.01	0.93	0.89	0.88	0.83	0.84	0.97	1.09	1.17	1.18
Petroleum products	0.79	0.96	1.05	0.88	0.77	0.58	0.58	0.65	0.65	0.68	0.72	0.70	0.64	0.67
Chemical products and synthetic fibers	0.77	0.74	0.74	0.66	0.68	0.71	0.67	0.65	0.69	0.62	0.63	0.61	0.61	0.68
Pharmaceuticals	1.11	1.27	1.13	1.06	1.13	0.89	0.81	0.85	0.79	0.70	0.62	0.72	0.51	0.50
Rubber and plastic	1.01	0.86	0.85	0.91	0.98	0.98	0.97	0.96	0.97	0.98	1.01	1.05	1.04	1.02
Non-metallic mineral products	0.98	1.04	1.16	1.22	1.26	1.23	1.20	1.14	1.09	1.01	1.00	0.97	0.93	0.95
Metals and metal products	1.24	1.15	1.13	1.12	1.02	0.97	1.01	0.98	0.97	0.99	1.00	1.04	1.01	1.03
Machinery and mechanical appliances	1.10	1.11	1.09	1.05	1.09	1.06	1.11	1.20	1.18	1.13	1.13	1.17	1.22	1.12
Electrical machinery and appliances	1.07	1.02	0.98	1.08	1.19	1.20	1.11	1.00	0.91	0.92	0.90	0.87	0.91	0.90
Precision tools	1.11	1.22	1.27	1.28	1.40	1.43	1.44	1.39	1.25	1.20	1.19	1.25	1.23	1.26
Auto and motor vehicles	0.61	1.01	0.84	0.76	0.79	1.04	1.01	1.05	1.08	1.14	1.14	1.19	1.19	1.25
Other means of transport	0.76	1.13	0.89	1.12	0.87	1.23	0.79	1.14	1.24	1.35	1.19	0.93	0.96	1.16
Furniture	1.14	1.25	1.27	1.30	1.34	1.37	1.37	1.33	1.27	1.20	1.21	1.18	1.09	1.10
Other manufactured products	1.51	1.37	1.41	1.23	1.50	1.60	1.51	1.30	1.45	1.46	1.47	1.38	1.50	1.32

* Cells are shaded when sectoral trade is at least 5% of the corresponding overall trade.

Source : Eurostat, *Comext database* .

TABLE 5A - Irish total trade with extra-EU countries: RCA indexes calculated with respect to the EU*

Exports														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Agricultural products	2.48	2.04	2.25	1.81	2.03	2.25	1.89	1.35	1.07	1.05	0.89	0.47	0.47	0.54
Food	4.22	3.71	3.47	2.99	3.04	3.26	2.62	2.09	1.88	1.90	1.77	1.81	1.69	1.48
Beverages and tobacco	1.73	1.58	1.38	1.23	1.17	1.18	1.09	0.89	0.80	0.68	0.68	0.66	0.50	0.66
Textiles	0.33	0.28	0.29	0.23	0.23	0.23	0.19	0.18	0.14	0.15	0.14	0.12	0.12	0.10
Apparel	0.48	0.47	0.41	0.41	0.32	0.24	0.19	0.15	0.09	0.15	0.16	0.19	0.19	0.20
Leather and leather goods	0.38	0.53	0.50	0.42	0.33	0.36	0.40	0.49	0.32	0.18	0.17	0.10	0.16	0.13
Shoes	0.07	0.07	0.05	0.04	0.03	0.04	0.03	0.04	0.01	0.02	0.02	0.01	0.01	0.01
Wood and wood products	0.30	0.32	0.28	0.25	0.18	0.10	0.11	0.10	0.11	0.12	0.10	0.09	0.14	0.22
Paper and printing	0.19	0.17	0.15	0.13	0.19	0.27	0.14	0.05	0.06	0.07	0.08	0.06	0.05	0.06
Petroleum products	0.07	0.04	0.02	0.06	0.05	0.06	0.04	0.08	0.07	0.14	0.13	0.10	0.11	0.10
Chemical products and synthetic fibers	1.91	2.10	2.00	2.18	2.16	2.07	2.22	2.55	2.73	3.28	3.82	4.19	3.92	4.26
Pharmaceuticals	3.34	3.46	4.11	2.98	3.04	2.08	3.13	2.84	3.43	2.26	1.89	1.39	1.97	1.55
Rubber and plastic	0.45	0.48	0.44	0.43	0.40	0.29	0.25	0.22	0.24	0.22	0.20	0.19	0.16	0.14
Non-metallic mineral products	0.87	0.94	0.79	0.61	0.58	0.48	0.50	0.48	0.40	0.37	0.32	0.28	0.27	0.26
Metals and metal products	0.17	0.17	0.24	0.23	0.22	0.18	0.16	0.15	0.09	0.14	0.11	0.12	0.12	0.12
Machinery and mechanical appliances	1.17	1.19	1.11	1.38	1.20	1.18	1.20	1.18	1.06	1.11	1.13	1.04	1.06	0.91
Electrical machinery and appliances	1.08	1.20	1.25	1.24	1.59	1.86	1.80	1.89	1.84	1.65	1.46	1.46	1.30	1.09
Precision tools	1.39	1.34	1.29	1.45	1.13	1.18	1.22	1.11	1.29	1.17	1.24	1.47	1.80	2.42
Auto and motor vehicles	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.04	0.01	0.01	0.01
Other means of transport	0.11	0.11	0.12	0.14	0.11	0.22	0.07	0.07	0.15	0.08	0.06	0.08	0.05	0.04
Furniture	0.12	0.15	0.12	0.11	0.10	0.09	0.07	0.11	0.10	0.06	0.06	0.06	0.07	0.06
Other manufactured products	2.24	1.91	1.75	1.54	1.93	1.75	1.77	1.97	1.93	1.32	1.40	1.47	1.50	1.92

Imports														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Agricultural products	0.37	0.32	0.37	0.28	0.21	0.18	0.22	0.23	0.16	0.20	0.28	0.25	0.24	0.24
Food	1.41	1.41	1.58	1.36	1.30	1.01	0.90	0.81	0.73	0.72	0.81	0.87	0.84	0.73
Beverages and tobacco	0.58	0.43	0.46	0.27	0.34	0.41	0.48	0.51	0.45	0.58	0.63	0.73	0.84	0.92
Textiles	1.05	1.10	0.90	0.52	0.41	0.42	0.50	0.41	0.32	0.29	0.30	0.27	0.27	0.22
Apparel	0.37	0.33	0.34	0.25	0.24	0.22	0.27	0.29	0.26	0.27	0.33	0.35	0.35	0.30
Leather and leather goods	0.21	0.21	0.19	0.16	0.14	0.12	0.12	0.11	0.13	0.17	0.24	0.28	0.22	0.17
Shoes	0.88	0.99	2.02	1.89	1.21	0.46	0.44	0.23	0.19	0.18	0.22	0.20	0.19	0.17
Wood and wood products	0.81	0.71	0.82	0.60	0.61	0.38	0.51	0.51	0.50	0.48	0.54	0.62	0.61	0.69
Paper and printing	1.30	1.34	1.42	0.82	0.69	0.55	0.58	0.47	0.44	0.42	0.44	0.51	0.52	0.59
Petroleum products	0.31	0.46	0.60	0.45	0.40	0.32	0.28	0.36	0.32	0.25	0.29	0.26	0.20	0.17
Chemical products and synthetic fibers	1.45	1.68	1.74	1.75	1.55	1.53	1.58	1.40	1.27	1.26	1.39	1.30	1.76	1.58
Pharmaceuticals	0.52	0.76	0.55	0.53	0.87	1.09	0.84	1.64	1.39	1.09	1.68	2.25	1.74	2.00
Rubber and plastic	0.96	0.98	1.23	0.98	0.92	0.80	0.89	0.77	0.62	0.59	0.67	0.75	0.74	0.71
Non-metallic mineral products	0.77	0.84	0.94	0.81	0.71	0.58	0.68	0.55	0.52	0.55	0.69	0.62	0.58	0.58
Metals and metal products	0.33	0.33	0.35	0.31	0.35	0.27	0.25	0.26	0.22	0.23	0.21	0.23	0.26	0.30
Machinery and mechanical appliances	2.60	2.42	1.89	2.44	2.52	2.93	2.79	2.59	2.34	2.12	2.14	2.04	1.94	2.39
Electrical machinery and appliances	1.18	1.29	1.68	1.78	1.68	1.77	1.82	1.69	1.87	1.91	1.77	1.90	1.75	1.45
Precision tools	0.85	0.85	0.86	0.84	1.08	0.90	0.99	1.14	1.09	1.23	1.48	1.77	1.83	2.41
Auto and motor vehicles	1.38	0.92	0.45	0.79	0.82	0.43	0.31	0.72	0.54	0.69	0.78	0.53	0.53	0.48
Other means of transport	1.07	1.05	0.97	0.78	0.64	1.00	0.66	0.83	1.00	1.30	0.87	0.77	1.67	0.84
Furniture	0.46	0.42	0.46	0.31	0.24	0.25	0.26	0.34	0.28	0.28	0.36	0.37	0.39	0.42
Other manufactured products	1.21	1.09	1.09	0.85	1.28	0.83	1.00	1.02	1.23	0.95	0.96	1.15	1.04	1.31

* Cells are shaded when sectoral trade is at least 5% of the corresponding overall trade.

Source : Eurostat, *Comext database* .

TABLE 5B - Irish final trade with extra-EU countries: RCA indexes calculated with respect to the EU*

Exports														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Agricultural products	3.23	2.51	2.90	2.46	2.70	3.33	2.58	1.99	1.48	1.30	1.11	0.54	0.46	0.54
Food	1.60	1.46	1.52	0.95	0.96	1.41	1.27	1.09	0.98	0.74	0.57	0.50	0.43	0.37
Beverages and tobacco	2.70	2.32	2.15	2.06	1.91	2.17	1.82	1.57	1.27	0.98	1.02	0.90	0.56	0.78
Textiles	0.47	0.38	0.40	0.33	0.35	0.39	0.32	0.32	0.22	0.19	0.19	0.16	0.14	0.10
Apparel	0.52	0.53	0.49	0.56	0.43	0.36	0.27	0.22	0.12	0.18	0.19	0.22	0.19	0.20
Leather and leather goods	0.50	0.66	0.67	0.58	0.43	0.53	0.55	0.72	0.45	0.22	0.21	0.12	0.16	0.14
Shoes	0.09	0.08	0.06	0.06	0.04	0.04	0.04	0.05	0.02	0.02	0.02	0.01	0.01	0.01
Wood and wood products	0.37	0.38	0.36	0.33	0.23	0.14	0.14	0.14	0.14	0.14	0.12	0.10	0.13	0.21
Paper and printing	0.24	0.18	0.18	0.16	0.22	0.35	0.18	0.06	0.08	0.08	0.09	0.07	0.05	0.06
Petroleum products	0.08	0.05	0.03	0.08	0.07	0.09	0.05	0.11	0.09	0.17	0.17	0.11	0.11	0.10
Chemical products and synthetic fibers	2.17	2.34	2.20	2.65	2.53	2.61	2.70	3.52	3.58	3.91	3.74	4.22	4.02	4.38
Pharmaceuticals	3.41	3.42	3.84	3.35	3.48	2.49	3.58	3.77	4.65	2.78	2.33	1.45	1.93	1.44
Rubber and plastic	0.58	0.58	0.57	0.55	0.51	0.41	0.33	0.31	0.27	0.22	0.20	0.18	0.13	0.13
Non-metallic mineral products	1.09	1.12	0.94	0.77	0.74	0.61	0.66	0.69	0.52	0.42	0.35	0.31	0.25	0.25
Metals and metal products	0.19	0.19	0.25	0.19	0.19	0.16	0.15	0.17	0.10	0.14	0.11	0.12	0.11	0.11
Machinery and mechanical appliances	0.80	0.93	0.77	0.89	0.86	0.73	0.79	0.59	0.53	0.86	1.20	1.15	1.05	0.90
Electrical machinery and appliances	1.02	1.12	1.17	1.27	1.48	1.42	1.53	1.27	1.29	1.12	1.06	1.00	1.13	0.95
Precision tools	0.94	0.94	0.97	1.02	0.70	0.79	0.95	1.00	0.95	0.74	1.06	1.54	1.66	2.28
Auto and motor vehicles	0.02	0.02	0.02	0.01	0.03	0.02	0.02	0.01	0.01	0.01	0.07	0.01	0.01	0.02
Other means of transport	0.25	0.25	0.31	0.35	0.27	0.60	0.15	0.15	0.37	0.19	0.16	0.18	0.08	0.06
Furniture	0.12	0.17	0.14	0.13	0.12	0.12	0.10	0.15	0.12	0.06	0.06	0.07	0.07	0.06
Other manufactured products	2.74	2.33	2.22	2.17	2.59	2.60	2.41	2.89	2.66	1.64	1.82	1.67	1.45	1.88
Imports														
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Agricultural products	0.41	0.36	0.41	0.30	0.25	0.22	0.29	0.28	0.15	0.19	0.26	0.22	0.21	0.20
Food	1.59	1.65	1.83	1.63	1.67	1.37	1.22	1.01	0.74	0.74	0.79	0.85	0.83	0.71
Beverages and tobacco	0.72	0.57	0.60	0.36	0.49	0.62	0.71	0.71	0.53	0.64	0.70	0.79	0.88	0.96
Textiles	1.03	1.14	0.95	0.58	0.48	0.51	0.68	0.49	0.27	0.23	0.20	0.19	0.19	0.17
Apparel	0.45	0.43	0.44	0.35	0.36	0.36	0.44	0.42	0.31	0.31	0.35	0.37	0.36	0.31
Leather and leather goods	0.24	0.24	0.22	0.17	0.16	0.14	0.15	0.13	0.12	0.13	0.23	0.27	0.21	0.15
Shoes	1.08	1.23	2.47	2.38	1.63	0.67	0.63	0.31	0.21	0.20	0.23	0.21	0.19	0.18
Wood and wood products	0.91	0.82	0.94	0.70	0.77	0.50	0.68	0.62	0.50	0.48	0.53	0.60	0.59	0.66
Paper and printing	1.45	1.56	1.62	0.95	0.86	0.71	0.75	0.56	0.40	0.40	0.41	0.49	0.49	0.56
Petroleum products	0.35	0.54	0.70	0.54	0.51	0.44	0.38	0.44	0.33	0.26	0.29	0.26	0.19	0.17
Chemical products and synthetic fibers	1.24	1.32	1.47	1.32	1.16	1.53	1.51	1.41	1.20	1.25	1.36	1.28	1.81	1.59
Pharmaceuticals	0.51	0.92	0.52	0.58	1.01	1.00	1.07	2.07	1.45	1.16	1.70	2.25	1.70	1.97
Rubber and plastic	0.96	1.01	1.22	0.99	0.89	0.95	1.11	0.84	0.56	0.51	0.57	0.63	0.64	0.62
Non-metallic mineral products	0.78	0.88	0.94	0.86	0.77	0.67	0.85	0.63	0.49	0.56	0.69	0.58	0.56	0.56
Metals and metal products	0.32	0.33	0.34	0.32	0.39	0.31	0.28	0.29	0.20	0.21	0.20	0.21	0.25	0.29
Machinery and mechanical appliances	2.47	2.11	1.79	2.42	2.31	2.65	2.49	2.48	2.64	2.41	2.39	2.28	2.09	2.56
Electrical machinery and appliances	1.10	1.26	1.41	1.63	1.54	1.64	1.69	1.42	1.62	1.63	1.69	1.81	1.71	1.41
Precision tools	0.71	0.75	0.67	0.66	1.01	0.81	0.93	1.11	0.83	1.02	1.28	1.68	1.78	2.41
Auto and motor vehicles	1.61	1.10	0.51	0.99	1.13	0.64	0.47	1.00	0.61	0.77	0.77	0.57	0.57	0.50
Other means of transport	1.58	1.63	1.49	1.25	1.15	1.93	1.28	1.38	1.73	2.16	1.37	1.21	2.25	1.15
Furniture	0.54	0.51	0.55	0.38	0.33	0.36	0.36	0.43	0.29	0.29	0.36	0.37	0.38	0.41
Other manufactured products	1.38	1.30	1.27	1.03	1.63	1.15	1.39	1.30	1.31	1.00	0.97	1.10	1.01	1.25

* Cells are shaded when sectoral trade is at least 5% of the corresponding overall trade.

Source : Eurostat, *Comext database* .

TABLE 6 - Regression results

Dependent variable: $DIFGDP_{it}$

	EU15 Observation period: 1990-2003 (unbalanced sample)			**EU15** Observation period: 1990-2003 (unbalanced sample)			**EU15** Observation period: 1995-2003 (balanced sample)			**EU15** Observation period: 1995-2003 (balanced sample)			**EU12** Observation period: 1995-2003 (balanced sample)		
	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic
Explanatory Variable															
$DIFDEM_{it}$	0.714	0.049	14.683	0.637	0.044	14.559	0.488	0.056	8.730	0.487	0.057	8.586	0.482	0.057	8.407
$DIFEXPFINGDP_{it}$	10.860	1.878	5.784	3.055	4.152	0.736	2.381	4.764	0.500	2.415	4.696	0.514	4.220	4.685	0.901
IPT_{it}	0.451	0.115	3.921	0.117	0.243	0.481	0.566	0.221	2.558	0.572	0.220	2.601	0.614	0.233	2.633
OPT_{it}	-0.160	0.115	-1.397	0.365	0.253	1.443	0.096	0.243	0.396				0.542	0.322	1.685
constant	-0.212	0.134	-1.582												
Countries' fixed effects	no			yes			yes			yes			yes		
Tot. no. of observ.	181			181			126			126			99		
R-squared	0.790			0.846			0.896			0.896			0.923		
Adjusted R-squared	0.785			0.830			0.880			0.880			0.911		
S.E. of regression	0.826			0.735			0.641			0.639			0.600		
F-statistic	165.735			298.356			309.817			467.984			337.377		

Note: these are panel estimates, which include countries' fixed effects where indicated
and the standard errors are always heteroskedasticity-consistent

Variables' definition

$DIFGDP_{it}$: difference between country i yearly growth rate of *GDP* and EU average yearly growth rate of *GDP*

$DIFDEM_{it}$: difference between country i yearly growth rate of domestic demand and EU average yearly growth rate of domestic demand

$DIFEXPFINGDP_{it}$: difference between country i final exports over *GDP* ratio and EU average final exports over *GDP* ratio

IPT_{it}: inward processing trade propensity index

OPT_{it}: outward processing trade propensity index

TABLE 7 - Comparison of different export flows

Dependent variable: GDP_{it}						
	EU15 Observation period: 1990-2003 (unbalanced sample)			**EU15** Observation period: 1995-2003 (balanced sample)		
	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic
Explanatory Variable						
DEM_{it}	0.690	0.034	20.074	0.623	0.045	13.994
$EXPFINGDP_{it}$	1.739	3.186	0.546	-1.068	4.294	-0.249
$RIEXPGDP_{it}$	26.291	11.278	2.331	32.898	13.446	2.447
Countries' fixed effects	yes			yes		
Tot. no. of observ.	181			126		
R-squared	0.873			0.886		
Adjusted R-squared	0.860			0.869		
S.E. of regression	0.792			0.755		
F-statistic	561.536			422.077		
Note: these are panel estimates, which include countries' fixed effects where indicated and the standard errors are always heteroskedasticity-consistent						

Variables' definition

GDP_{it}: country *i* yearly growth rate of *GDP*

DEM_{it}: country i yearly growth rate of domestic demand

$EXPFINGDP_{it}$: country *i* final exports over *GDP*

$RIEXPGDP_{it}$: country *i* re-exports over *GDP*