CENTRO STUDI LUCA D'AGLIANO

www.dagliano.uni-bocconi.it

DEVELOPMENT STUDIES WORKING PAPERS

Patterns and Determinants of International Fragmentation of Production. Evidence from Outward Processing Trade between the EU and the Countries of Central-Eastern Europe

Salvatore Baldone - Fabio Sdogati - Lucia Tajoli

N. 134 September 1999

University of Oxford
Queen Elizabeth House

http://www2.qeh.ox.ac.uk/

Patterns and Determinants of International Fragmentation of Production.

Evidence from Outward Processing Trade between the EU

and the Countries of Central-Eastern Europe

Salvatore Baldone, Fabio Sdogati, Lucia Tajoli

Dipartimento di Economia e Produzione

Politecnico di Milano*

September 1999

JEL classifications:
F14: Country and Industry Studies of Trade
F15: Economic Integration

Abstract

Both theoretical and applied research have been devoting much attention to the fact that large and growing shares of international trade flows among industrialized countries consist of intermediate goods. The new configuration of the productive structure underlying such phenomenon has been named 'internationally fragmented'. In this paper we investigate patterns and determinants of trade originated by a specific form of fragmentation, that is, that form giving rise to international trade for reasons of processing. Data on textile and apparel trade between major EU countries and six major Central-European countries show that the magnitude of traffic for reasons of processing greatly overshadows that of final trade. The implication is that the industry appears to be affected by a process of international fragmentation whose understanding requires a new definition of the concept of comparative advantage. Our analysis suggests that the process of transferring abroad more or less extensive segments of previously integrated production processes is activated by labor cost differentials as well as by reasons of geographic and cultural proximity. However, once the process has been activated, EU firms appear not to favor a strategy of further decentralization of production in the least-wage country. Rather, there is evidence that in time further segments of the production processes are allocated to the partner country originally chosen.

* Dipartimento di Economia e Produzione, Politecnico di Milano, Piazza Leonardo da Vinci 32, I-20133 Milano, Corresponding author: Lucia Tajoli, Tel. +39.02.2399.2752; Fax: +39.02.2399.2710; E.mail: lucia.tajoli@polimi.it

1. Introduction

The economic literature has devoted much attention to the process of integration of the world's economies and the consequences of this phenomenon. Among the different forms of economic integration, one that recently received increasing consideration is the process whereby previously integrated productive activities are segmented and spread over an international network of production sites. Accordingly, and in contrast with the traditional paradigm of international trade theory, evidence suggests that today the largest share of world trade takes place in intermediate goods, and final consumer goods sold in one country are often the assembly of manufacturing processes that take place in many different locations. In light of this notion, the usual analysis of the determinants of trade patterns and countries' specialization needs to be reconsidered.

The aim of this paper is to understand determinants of trade patterns in the presence of international fragmentation of production. The paper focuses on a specific -albeit very relevant- case, analyzing some recent changes in the pattern of production and trade in the textile and apparel (TA) industry in Europe. The TA industry is an excellent example of economic integration among countries through international delocalization of production, it being an industry affected by this process more than many others. As a consequence of the increasing competition, especially from low-cost producers, European Union producers of textile and apparel pursued strategies aiming at the reduction of their production costs. This required a number of changes in the organization of production, and resulted in the shift of the labor-intensive production phases toward countries characterized by relatively low labor costs, while maintaining in the producers' home countries the fundamental phases of creation and distribution of the goods. Abundant evidence on this phenomenon can be found in the data on outward processing trade between Western and Central-Eastern Europe.

The work is organized as follows. After reviewing the basic features of international fragmentation of production in section 2, data on outward processing trade in the TA sector (from the Eurostat-Comext database) are analyzed in the third section at a disaggregated level to assess the specific features of the recourse to segmentation of production by different European countries. The role of trade liberalization and geographic proximity between countries characterized by different factor prices in the process of international delocalization of production phases are also examined. The results show different models of delocalization used by different producers and varying degrees of integration between production and trade partners. The collected evidence indicates that the extent and forms of the delocalization of production in this sector are driven essentially by EU producers rather than by host countries' characteristics.

These findings constitute the basis of the econometric exercise presented in section 4. The exercise aims at verifying whether delocalization of production can indeed be modeled as a cost-minimizing decision by EU producers, in line with theoretical predictions, and which are the key variables in this process.

2. International fragmentation of production and trade flows

Recent work on fragmentation of production moves from the observation that international trade flows in the last decades have been increasing at faster rates than world production, so that nearly all countries today exhibit a higher trade/GDP ratio than forty years ago. The explanations coming to mind for the increased openness of countries are the decline in international transaction costs (in a very broad sense) and the process of trade liberalization that characterized the period after World War II (Krugman 1995). It can be observed that trade flows changed not only in terms of quantity, but in terms of quality as well. The share of basic commodities and natural resources in trade flows has been declining constantly, while trade in manufactured goods increased, as well as trade in services. Furthermore, trade in capital goods and intermediate inputs takes up now a substantial share of total trade (Feenstra, 1998). Jones and Kierzkowski (1997) argue that the increase of trade/GDP ratios is due not only to an extension in the number of goods and services that are tradable, but also to the fact that a larger part of countries' economies is intensively affected by trade, and name this process *intensive* growth of international trade.

The reason for this changing nature of world trade seems to be primarily internationalization of production (Hummels et al., 1998). Internationalization of production is normally associated with the activities of multinational enterprises (MNEs). Rather than concentrate production in a single country, an MNE owning production plants in different locations can split up production in different countries, so to exploit location advantages, such as easier access to the needed resources or proximity to markets. MNEs' activities give rise to increased trade flows when the production process of the firm is vertically integrated, that is when different phases of production take place in different countries, and intermediate goods are moved from one plant to another. But this sequential mode of production can also take place outside of MNEs. The ways in which international fragmentation of production takes place are in fact varied[1]. Producers in one country may decide to delocalize phases of the production process in other countries without creating and owning production plants abroad, but simply by negotiating a purchasing agreement with foreign producers. It is also possible to observe "spontaneous" vertical specialization of countries: different countries specialize in different goods, which are exported and can be used as inputs for production of other goods. In these

[1] It is maybe because of this reason that many different terms are used in the literature for the process we are describing, where a final good is the result of a production process that takes place in different locations. Some of the terms are delocalization of production, international fragmentation of production, vertical specialization, intra-product specialization, outsourcing.

cases, international fragmentation of production is carried out in arms-length transactions: a country imports a good from another country, uses that good as an input in the production of its own good, which is then exported to the next country (which can - but needs not to - be the initial one). This disintegration of production in itself leads to more trade, as intermediate inputs cross borders several times during the manufacturing process.

International fragmentation of production will occur if some conditions are met. First of all, production technology must allow to effectively split production into different stages that can be carried out in different locations. In general, the different stages of production should be characterized by different technologies (such as different factor intensities) that can exploit countries' differences. We can assume that fragmentation is costly, in that it requires resources to coordinate production internationally, but according to the prices of the final and intermediate goods, coordination and transportation costs can be low enough to make the process economically convenient (Deardorff, 1998b). In this case, fragmentation of production will substitute integrated production.

It seems that these conditions actually occur in the real world in a number of sectors. Hummels et al. (1998) show the increasingly important role played by vertical specialization (or specialization in different phases of production) in trade, as vertical specialization has been growing more rapidly than horizontal specialization. The factors that spurred the increase of trade in the last decades (decline in communication and coordination costs, and trade liberalization) seem to favor especially vertical trade. In fact, when a good crosses multiple borders, like it happens with vertical trade, the incidence of tariffs and other barriers to trade is multiplied.

New patterns of production and trade may emerge in response to international fragmentation of production. As shown in trade models with fragmentation of production, the splitting up of the production process may give a country a comparative advantage in a good where it had no advantage before (Deardorff, 1998a). Having a comparative advantage in a single production stage may allow a country to branch into international markets without any need to be an efficient producer of the entire product. Therefore fragmentation of production may lead to major changes in specialization of countries, as fragmentation of an activity not originally produced may allow some segments of this activity to start up (Jones and Kierzkowski, 1997). This is even more likely to be the case when some phases of production are intentionally delocalized by producers in one country toward other countries. A particularly relevant case modeled by Jones and Kierzkowski (1997) is the one of a labor-abundant country which proves non-competitive in the production of an integrated activity which may, after fragmentation, be able to produce some labor-intensive segments. The theoretical model also shows that fragmentation of production may allow a relatively capital-abundant country that looses its comparative advantage in a labor-intensive good to retain a comparative advantage in important phases of production of that good.

Trade between the EU and the CEECs is a significant example of such an occurrence. In a number of industries, growth of trade in intermediate inputs between Eastern and Western Europe outpaces trade in final commodities. Hoekman and Djankov (1997) find that imports of inputs are highly correlated with the composition of exports from the CEECs, and their analysis suggests that in many CEECs, imports of intermediate goods drove the changes in export structure observed during the 1990s. We argue here that - at least in some sectors - the observed imports of intermediate goods are not activated by the CEECs themselves, but are the result of a process of delocalization of production originated and controlled by EU producers.

The textile and apparel (TA) industry is one of the industries where the changes in specialization driven by international fragmentation of production can be observed more clearly. Spinanger (1995) observes that the above-mentioned conditions for fragmentation of production to take place are met quite precisely in the case of splitting apparel production between the EU (and Germany in particular) and the former Socialist countries. As a consequence of this fragmentation, on one hand, we see that the CEECs' export shares in TA products have increased remarkably, and the CEECs have been consolidating, at least until 1996, their comparative advantage in these labor-intensive products (Guerrieri, 1998). On the other hand, we observe that temporary exports of these goods from the EU to be processed in the CEECs increased as well. This evidence and its implication for specialization are discussed in the following section.

3. Changes in production and trade patterns of the European TA industry

3.1 Relevance of OPT

Most of the empirical work on international fragmentation of production is based on a very general definition of fragmentation, generally measured through volumes of trade flows in intermediate goods or components. In this paper we adopt a much stricter definition of the phenomenon: international fragmentation of production takes place when firm A (located in country A) farms out to firm B (located in country B) segments of a previously integrated, in-house production process. While it is immaterial, for the purposes of this paper, whether firm A directly or indirectly controls firm B, it is relevant to spell out the basics of the contractual relationship established between firm A (the principal, or main producer) and firm B (the agent, or sub-contractor). We postulate that the two firms agree to the following conditions: (1) the main producer supplies the foreign sub-contractor with the intermediate products (inputs) the latter is to process; (2) the main producer supplies the sub-contractor with detailed product-and-process specifications (blueprints) to which the sub-contractor is bound to abide; (3) in general, the principal retains the right to carry out quality controls and to reject the agent's output on the basis of quality, timing of delivery, and other agreed-upon contractual conditions; (4) the principal retains ownership rights over the inputs supplied to the agent and is committed to collect his output after the specified processes have been carried out; (5) the principal retains the right to market the final product or to subject it to further processing as necessary.

International flows of goods originated as a consequence of contractual relationships of the type just described are known as Outward Processing Traffic (OPT), which is nothing other than international shipments for the purpose of processing abroad and consequent re-import. Data on OPT are collected at a very high level of merchandise disaggregation since 1988 at the EU member country level, the reason for data collection about this special type of traffic being that goods reimported after processing abroad are subject to customs treatment particularly advantageous relative to final imports. The data set thus assembled allows for the monitoring of the international sequel of the production process, because the reimported goods must clearly contain the goods originally shipped abroad for processing if they are to be admitted to the customs preferential treatment.

Being collected to register a very specific type of international traffic of goods, OPT data necessarily underestimate the extent of international fragmentation of production in its general definition (see footnote 1). Yet, we believe that it is primarily using this type of data that one can pinpoint features and extent of that phenomenon elsewhere defined as 'international trade in production processes' (Baldone, Sdogati and Zucchetti, 1997), for what OPT data capture is the extent to which previously in-house held production processes are disintegrated internationally in a manner that allows the originator of the outward traffic to control the whole production process according to its own specifications.

The importance of OPT relative to domestic production is highlighted in Table 3.1, which reports both levels of OPT and domestic production (at current prices) and the ratio of the former to the latter. It is apparent that the strong-currency countries, that is Germany and the Netherlands, exhibit a substantially larger access to the OPT practice relative to the value of domestic production. When measured by apparel reimports, such ratio grows from 11% to 26% between 1989 and 1996 in the case of Germany and from 20% to 43% in the case of the Netherlands, *vis-a-vis* a much smaller, though also growing, ratio for France and Italy. It is most interesting to point out that the ratio of apparel production to textile production is generally lower for the countries with the more widespread access to the OPT practice, and that sizable increases in the access to OPT take place at the same time as domestic production contractions. A possible causal interpretation of this evidence is that growing competitive pressures from low labor-cost countries negatively affect domestic production and make it necessary to increase the access to the OPT practice as a means to achieve the reduction of production costs necessary to hold on to established market shares.

[Table 3.1]

Three more features of the 'German model' of OPT are highlighted by Table 3.1. First, Germany is the country with the longest tradition in the practice of OPT in both textile and apparel; second, it is the country showing the largest recourse to the practice still in 1996 (the latest year for which final production data are available for most countries); and third, it is the country comparatively exporting to the CEECs relatively more textiles that apparel.

We have shown in a related paper (Baldone, Sdogati and Tajoli, 1999) that for any given EU country the weights of each merchandise group are not distributed uniformly across CEECs. We have postulated that such phenomenon may be due

1. to differences in the degree to which the process of International Delocalization of Production (IDP) is being pushed, according to the size of the array of production segments being delocalized. The existence of different degrees to which segments of the production process are disintegrated internationally may be due to differing degrees of reliability and technical skills shown by the CEECs, skills and reliability being themselves a function of the length and intensity of previous arrangements;

2. to differences in the merchandises being subjected to OPT. [2]

Lest the ratio of OPT to domestic production leave doubts about the relevance of international trade due to processing reasons, evidence about the relative weight of OPT to final trade, shown in Table 3.2, should dispel them. In 1996, at the peak of the phenomenon, the value of EU-4 re-imports from the CEECs-6 was on average thrice as much as the value of final imports, up from a ratio of 1:1 in 1988.[3]

[Table 3.2]

In the next section we discuss evidence about the first of these possible explanations for the existence of unequal distribution of weights of merchandise groupings across CEECs for any given EU country. This is accomplished by analysing first the structural differences in the composition of traffic between each EU country and the relevant CEECs, and then the differences between each CEEC and the relevant EU countries.

[2] In Baldone, Sdogati and Tajoli (1999) we found, for instance, that a high weight of re-imports of knitted products over total re-imports of clothing is associated with a high weight of temporary exports of clothing.

[3] The reason the ratio sistematically falls in 1997 in virtually all instances is a statistical one, and has no implication as far as the recourse to the economic practice of IDP is concerned. Indeed, the reduction (often to zero) of EU import duties from many of the CEECs that took place on January first, 1997 have made it not only unnecessary for EU producers to apply for permission to access the OPT system, but also to face the unnecessary cost required to go

3.2 Do structures of traffic differ across EU countries (the principals)?

The issue of whether principals specialize in the temporary export (reimport) of some merchandise groupings was addressed in two steps. First, we computed the weights of each merchandise grouping over total outward processing traffic for each principal relative to all agents. The differences in the principals' structures were then measured through the Standardized Euclidean Distance (SED).[4]

Table 3.3 reports the dynamics of SED between each of the major EU member countries and Germany relative to the aggregate of the CEECs for the aggregate TA flows. It is apparent that the first half of the sample period is characterized by a *reduction* in structural differences, whereas in the second half the process of structural convergence comes to a stop. Indeed, with the only exception of Netherlands, structural differences between the commodity structure of OPT traffic do persist, and France’s even increases, relative to the German model of specialization.

[TABLES 3.3 AND 3.4]

The most important feature of such differences appears to be the distribution of the relative weight of apparel in re-imports relative to their distribution in temporary exports: over the last three years French and Italian re-imports of apparel consist of goods originally temporarily exported under the heading ‘apparel’consistently to a much larger proportion than is the case for Germany (34% and 27% for France and Germany respectively, against a three-year average of 13% and 11% for Germany and the Netherlands respectively). We interpret these differences as an indicator of the fact that Germany and the Netherlands have been transferring to the CEECs a larger number of segments of the overall textile-to-apparel production process than France and Italy, the latter being countries shipping abroad relatively more apparel to be subjected to ‘only’ terminal phases of production abroad.

Further disaggregation of the commodity bundles ‘textiles’ (chapters coded 50 through 60 of the Combined Nomenclature) and ‘apparel’ (chapters coded 61 and 62) into chapters allows for a more detailed breakdown of structural differences in the composition of OPT by each EU

---

through the application process.

[4] SED is computed as

$$SED = \sqrt{\sum_{i=1}^{N} \left(q_{i,G} - q_{i,m}\right)^2} \Big/ \sqrt{2}$$

where N is the number of merchandise groupings onto which total traffic is disaggregated, $q_{i,G}$ is each grouping’s share in German traffic, and $q_{i,m}$ is each grouping’s share in country m's traffic. Since individual structures are defined over the unit complex, the maximum Euclidean distance between any two of them is $\sqrt{2}$. It follows that SED can take on values in the interval between 0 (identical structures) and 1 (when the structures are entirely identified by two different commodities).

member country. Inspection of Table 3.5 highlights

[TABLE 3.5]

- the (already found, albeit at a different level of product aggregation) greater similarity between the composition of Dutch and German OP traffic in both directions;
- the greater weight of semi-finished products in the temporary exports of France and Italy relative to Germany and the Netherlands;
- the greater weight of natural-fiber textiles (wool and, especially, cotton) in the overall temporary exports of Germany and Italy relative to those of France and the Netherlands;
- the greater relevance that temporary exports of man-made fibres and textiles have for Germany and the Netherlands than they do for France and Italy on average;
- the different composition of temporary exports of man-made fibres and filaments for Germany, the Netherlands and and France on the on hand and Italy on the other, with the former group specializing in temporary exports of man-made staple fibers, whereas Italy specializes in temporary exports of man-made filaments;
- for Italy, and even more so for France, the importance of temporary exports of articles of apparel and clothing accessories, whether or not knitted or crocheted' (Chapters 61 and 62 of the CN) relative to those of more up-stream intermediate products.

Summarizing, two 'models' seem to emerge from the available evidence. On the hand one can identify a 'Dutch-German model' of international delocalization of production, a model characterized by a tendency to transfer abroad a larger number of segments of the production process –as revealed by the larger share of textiles temporarily exported from these countries and re-imported directly as 'apparel'; and a 'French-Italian' model which differ from the former in that we witness a preference to temporarily export products already classified as 'apparel', that is, a tendency to let finish abroad products already at an advanced stage of completion. It is worth emphasizing that such differences are also due to different national legislations implementing EU regulations. In particular, the more restrictive implementation in Italy is certainly due to the cautious approach to OPT taken by Italian trade unions, relatively more concerned about the potentially adverse employment effects of the practice, but it is also true that EU legislation was modelled upon the characteristics OPT had in the past, when it was basically a 'German' phenomenon.

The second step we have taken to assess the extent to which each principal may be said to specialize was to look at the relative composition of traffic for each couple principal-agent. In order to uncover potentially different patterns of specialization we take Poland's commodity structure of OPT as a benchmark against which to measure the deviation of all the other principals' structures.[5]

[TABLE 3.6]

It is immediately apparent that Germany exhibits a structure of traffic with each of the agents markedly different from that it exhibits relative to Poland. Such difference is least for Germany relative to the other principals and, over the later years of the sample, for Italy, than for France and the Netherlands. In general, it would appear that the principal's choice of agents has implications not only in terms of volume of overall traffic but also, to some extent, for its commodity composition as well. Thus, the problem arises as to the extent to which the choice of agent by each of the principals is guided not only by its own specialization, but also by the productive specialization of the agent.

3.3 Do Agents Specialize?

If agents were significantly specialized in specific (though potentially extended) segments of the production process, then one should expect that flows of traffic from (and to) a given agent would be similar for different principals in terms of commodity composition of traffic. This is to say that if agent A exhibited a comparative advantage in carrying out a specific segments in the value-added chain, then one should observe that the commodity composition of outgoing traffic should be similar across principals, and similarly for the incoming traffic. Table 3.7 show the dynamics of the degree of difformity of each of the principals relative to Germany.

[TABLE 3.7]

The evidence thus generated leads to the conclusion that, for any given agent, the structural differences among the traffic generated by each principal are smaller for those segments of the production process involving transformation of textiles into apparel rather than those involving only the terminal parts of transformation of apparel, the latter requiring more labor-intensive technologies relative to the former. This finding is complemented by the previously identified one, that is, that Germany is the country originating the largest volume of traffic and, at the same time, the least differentiating among its agents. We view the evidence as suggesting rather strongly that the CEECs involved in product processing originated im the EU do not exhibit relevant degrees of production specialization.

It follows that structural differences in the commodity composition of traffic are determined more by individual strategies of the principals than by the agents' specialization.

[5] The choice of Poland as a benchmark is due to the fact that it is a most relevant partner for all the principals, and at times even the most important one. Italy being an exception to this pattern, we have also adopted Hungary as a benchmark in this instance.

The case of Romania (Table 3.7 (b), and see Baldone, Sdogati and Tajoli 1999) lends itself particularly well to this interpretation. It is also worth noting that Bulgaria, the least homogeneous country to the EU relative to all other CEECs, and possibly the least ready to practice IDP due to both institutional and industrial considerations, is on average the country with the least degree of differentiation with respect to both comparisons we have run –the one with respect to each principal's traffic with Poland and the other with respect to each agent. Our interpretation of this evidence is that the choice of this agent by the principal is due to the low cost of labor associated with a high degree of standardization of the segments of the production it carries out.

4. The choice to delocalize production toward the CEECs: econometric evidence

The evidence discussed above indicates that international fragmentation of production in the TA sector in Europe can be ascribed to a large extent to the decision by EU apparel producers to delocalize labor-intensive phases of production in the CEECs, rather than to the autonomous development of a comparative advantage in this industry by the CEECs[6]. To understand patterns of specialization and trade, a relevant question is therefore what drives the decision of EU producer to delocalize production in one country rather than another. To answer this question we first look for country-specific variables that are correlated to OPT, by running a regression of the share of each CEEC in OPT over a number of variables that intuitively could explain such choice. The estimated coefficients show which variables are correlated (positively or negatively) with the decision to delocalize.

Given the short time series of data available for our estimates (the first relevant year for our series is 1989), we run a panel regression for the period 1989-1996 and the four CEECs (Hungary, Poland, Bulgaria and Romania) for which series are complete over this time span.[7] The estimated equation, in its general form, is the following:

$$\text{(4.1)} \qquad OPTSHARE_{i,t} = \alpha_i + \beta W_{i,t} + \gamma\, PROX_{i,t} + \delta\, CHAR_{i,t} + \varepsilon_{i,t}$$

where OPTSHARE is the value of EU re-imports from a given country i over the total value of re-imports from the CEECs, W represents wages in the CEECs, PROX is a set of variables used to indicate proximity (geographical and economic) between the trading partners, CHAR is any variable representing CEECs' characteristics that may favor location of TA production, such as the pre-existence of a well-developed industrial structure or a substantial TA industry, t is a time

[6] The fact that OPT flows in TA are much larger than final TA flows between EU and the CEECs is also supportive of this interpretation.

[7] Czech Republic and Slovakia were discarded because of the discontinuity produced in the series by the splitting of the two countries in 1992.

index, and Greek letters are parameters. Different specifications were tested, using all the variables of equation (4.1), or only part of them, using the absolute level of salaries, rather than the ratio between the CEECs and the UE wages, and using different proximity measures. Results of these estimates are reported in Table 4.1.

[TABLE 4.1]

The results indicate that wages seem to be the single most important variable correlated with OPT flows, supporting the assumption that delocalization of production takes place in the most labor-intensive segments, in order to save on production (labor) costs. The coefficient on the wage variable is negative (as expected) in all specifications and always statistically significant at the 0.95 level at least. This result is robust to changes in the specification of the regression (such as using different explanatory variables) and to changes in the variable itself, which was used in the regressions both in absolute terms and relative to the average wage level in the EU[8].

Different variables were tested to verify the influence of links between the CEECs and the EU. As a proxy of the economic integration between the two areas we used both the stock of foreign direct investments (FDI) into each CEEC, and the average level of tariff imposed by the EU on imports from the CEECs. While the coefficient of this last variable always displays the expected negative sign (we assume that higher tariffs imply a lower level of integration that can discourage delocalization of production), it is not always significant. This is not a surprising result, considering that the level of tariffs imposed by the EU on Eastern trade flows was very low already in the early 1990s, and it declined rapidly as the liberalization process between the two areas proceeded. Furthermore, TA re-imports are partially exempted from border duties, and this is one of the reasons for their fast growth during the last decade. Therefore, we cannot read tariff level as a direct obstacle to OPT flows, but we used this variable to test for correlation between delocalization of production and a measure of economic integration (in the traditional sense) between EU and the CEECs. One possible interpretation of the result is that tariffs by themselves are not a good measure of such integration. A similar interpretation can be given to the FDI variable. The FDI stock variable displays very poor results, being significant with the expected positive sign only in one case. Our evidence seems too weak to allow to conclude whether fragmentation of production is positively correlated to other, more traditional, forms of integration between countries, even if some results point in that direction. This is certainly an important aspect of the phenomenon that deserves further inquiries.

We also tested if OPT flows are correlated to geographic proximity, as a reduction of

[8] The coefficient of the wage variable was statistically significant when the variable was used in the regression simultaneously and also lagged one period. In the final specification we chose to use the lagged variable to reduce possible endogeneity problems.

transportation costs should foster delocalization of production. The variable used was a dummy that indicates the distance of each country from the EU border. This variable turns out to be significant in most regressions, but when it is used in the regression together with particular indicators of economic integration, a problem of multicollinearity emerges, and significance disappears. Finally, the country's characteristic we tested for was the importance of the apparel sector in each CEEC at the beginning of the period, in the presumption that experience in this kind of manufacturing could be relevant in the decision to delocalize production[9]. The coefficient on this variable always has the expected positive sign, but it is non-significant in most cases. The existence of a large apparel sector does not appear as a crucial factor in the decision to delocalize.

In all regressions, we included a lagged dependent variable both for economic and statistical reasons. It seems plausible that OTP flows do not shift rapidly between countries and that some persistence exist in this variable. The use of this variable in the regressions also eliminated the problem of serial correlation in the residuals.[10]

Regressions similar to the ones presented in Table 4.1 were also performed referring to German and Italian OPT respectively. That is, we used as dependent variable the value of re-imports of Germany (or Italy) from a given country i over the total value of re-imports from the CEECs toward Germany (or Italy). Results remained very similar to those obtained through the total EU regressions, and the robustness of the coefficient on the wage variable was confirmed, being always negative and significant. The only remarkable difference in the regressions run for each country separately is that the coefficient on the distance dummy for Italy was either non-significant or negative, contrary to what occurred for the whole EU.

Given these preliminary results, it is indeed reasonable to see OPT flows of apparel toward the CEECs as the result of the decision to delocalize phases of production in order to minimize costs[11]. The solution to the problem of minimizing production costs produces a set of input demands. This allows us to model re-imports of apparel from the CEECs as input demand functions, that can be conveniently modeled using a flexible functional form. As shown by Kohli (1991), geographically disaggregated import functions can be modeled in this way. Following Kohli (1991), such a function will take the form of a translog import function, where the demand for each import component can be expresses in share form, with the share of imports (re-imports, in our case) from each country as the dependent variable, and the price of imports as the explanatory variables.

Here ‘prices’ are the costs of the re-imported manufactured goods. Given the labor-

[9] When proxied by the relevance of manufacturing at large, the country's characteristic turns out to be consistently irrelevant.

[10] A Durbin’s h-test performed for all regressions presented in Table 4.1 accepted the hypothesis of no serial correlation in the residuals.

[11] The increasing competitive pressure on industrialized countries’ producers and the loss of comparative advantage in many segments of TA production support the view that EU producers should follow a cost-minimizing strategy.

intensive production delocalized in the CEECs, we will assume that the relative price of re-imports is given primarily by relative wages in each country. Therefore, the system of equations to be estimated is the following:

$$s_i = \alpha_i + \sum \beta_{ij} \log(W_j) \qquad i,j = \text{Bul, Pol, Rum, Hun, Cze}$$

where s is the share of each country in re-imports of apparel toward the EU, and W are wages.

To implement the model, we divide the first four wages by the fifth, thus eliminating the last term in each row and column of the parameter matrix, and we drop the fifth share equation to obtain a nonsingular system.[12] Therefore we end up estimating the following system of four equations, one for each CEEC, where the share of OPT from country i is regressed against the wage in all the countries of our sample.[13]

$$(4.2) \quad OPTSHARE_{Bul,t} = \alpha_{Bul} + \beta_{Bul,Bul} \log(W_{Bul,t}/W_{Cze,t}) + \beta_{Bul,Pol} \log(W_{Pol,t}/W_{Cze,t}) + \beta_{Bul,Rum} \log(W_{Rum,t}/W_{Cze,t}) + \beta_{Bul,Hun} \log(W_{Hun,t}/W_{Cze,t}) + \delta_{Bul}\, OPTSHARE_{Bul,t-1}$$

$$OPTSHARE_{Pol,t} = \alpha_{Pol} + \beta_{Bul,Pol} \log(W_{Bul,t}/W_{Cze,t}) + \beta_{Pol,Pol} \log(W_{Pol,t}/W_{Cze,t}) + \beta_{Pol,Rum} \log(W_{Rum,t}/W_{Cze,t}) + \beta_{Pol,Hun} \log(W_{Hun,t}/W_{Cze,t}) + \delta_{Pol}\, OPTSHARE_{Pol,t-1}$$

$$OPTSHARE_{Rum,t} = \alpha_{Rum} + \beta_{Bul,Rum} \log(W_{Bul,t}/W_{Cze,t}) + \beta_{Pol, Rum} \log(W_{Pol,t}/W_{Cze,t}) + \beta_{Rum,Rum} \log(W_{Rum,t}/W_{Cze,t}) + \beta_{Rum,Hun} \log(W_{Hun,t}/W_{Cze,t}) + \delta_{Rum}\, OPTSHARE_{Rum,t-1}$$

$$OPTSHARE_{Hun,t} = \alpha_{Hun} + \beta_{Bul,Hun} \log(W_{Bul,t}/W_{Cze,t}) + \beta_{Pol,Hun} \log(W_{Pol,t}/W_{Cze,t}) + \beta_{Rum,Hun} \log(W_{Rum,t}/W_{Cze,t}) + \beta_{Hun,Hun} \log(W_{Hun,t}/W_{Cze,t}) + \delta_{Hun}\, OPTSHARE_{Hun,t-1}$$

The system is estimated simultaneously, and imposing the symmetry of the cross-wage coefficients in all equations, using both an iterative seemingly unrelated regressions (ISUR) method, and a iterative three-stage-least square (I3SLS) estimation technique. It is quite natural to suspect that wages, our explanatory variables, are endogenous is such a system, as the

[12] For details on the appropriate estimation method for such a system derived from a translog function, see Greene (1997), Ch. 15.
[13] The estimation methods chosen compute maximum likelihood estimates of the parameters, to ensure invariance with respect to the choice of which share equation to drop (see Greene, 1997). In this system we dropped the equation

demand for labor in the CEECs is likely to be influenced by foreign demand of the goods produced. This problem is dealt with by using wage variables lagged by one period when estimating using the ISUR method, and by using the I3SLS estimator, as suggested by Kohli (1991). We added a lagged dependent variable in all equations, because there is evidence of serial correlation, which is eliminated in this way. ISUR and I3SLS estimates of the system (4.2) are reported in Table 4.2.

[TABLE 4.2]

The two different methods produce fairly similar results in terms of overall goodness of fit of the equations and signs of the coefficients. Estimates show that wages in the CEECs are indeed a very relevant variable, as the good fit of all equations shows. The direct effect of its own wage level on each country's OPT share is always negative, as expected, even if significance is not robust. Estimates obtained through either ISUR or I3SLS methods for the impact of direct wages show a significant negative effect in the case of Poland and Hungary. These are the two countries where wages increased more rapidly during the past decade, and it is plausible that the negative effect on the choice to delocalize in this case is stronger. Wage changes in Bulgaria and Romania appear to be less relevant, probably because salaries are still of an order of magnitude smaller than in the EU.

Most cross-wage effects are non-significant, especially when the I3SLS estimation method was used. This result seems to indicate a low degree of substitutability or complementarity between production processes in different CEECs for the EU as a whole.[14] Instead, the lagged dependent variable is in general very significant, and it brings an important contribution to the fit of the equations.

Also in this case, we estimated the equation system for Germany and Italy too, taken individually. For Germany, there is a high (and unsurprising) similarity in the results with the ones obtained for the whole EU, while more differences are registered for Italy. A difference to remark is that the goodness of fit of the equations is different for the two countries: the equations with the highest R-squared for Germany are the ones for Hungary and Poland, while for Italy the highest R-squared appears in the case of Hungary and Romania. In general, though, goodness of fit for Germany and Italy is lower than for the whole EU.

The results of these estimates show that national comparative advantage still has a role to play in the international division of labor, even in presence of international fragmentation of production. Labor costs are certainly important in determining trade patterns of a labor-intensive

relative to the Czech Republic to avoid problems of discontinuity in the dependent variable.

[14] It is interesting to note, though, that the cross-wage coefficient between Hungary and Romania is significant. Anecdotical evidence indicates that as wages increased rapidly in Hungary, delocalisation of production moved toward Romania, who experienced a fast increase in OPT flows.

commodity. It appears, though, that this is not enough to explain international trade flows when segmentation of production occurs. Relatively low substitutability among locations of production and indications of persistence in the model of delocalisation suggest that the exploitation of a latent comparative advantage in particular phases of production requires relevant start-up costs. In the case of the TA sector here examined, these costs are probably undertaken by EU producers urged by the shift of their own comparative advantage.

5. Conclusions

In this paper we dealt with a specific form of international fragmentation of production. In our definition, international fragmentation is characterized by two major features: first, an integrated production process previously located in one country is segmented and some of the segments are farmed out to foreign firms; second, the original producer retains property rights over the intermediate products supplied to the subcontractor. Our definition has two important implications: on the empirical level, it allows for detailed trade data to be used as a proxy for fragmentation; on the theoretical level, it makes it necessary to address the issue of what concept of 'comparative advantage' is relevant when firms no longer specialize in the production of goods but, rather, in specific segments of a production process.

We started out by showing that our definition of fragmentation is only apparently narrow, for it originates the largest share of trade between the EU and the CEECs in the TA industry. We also documented that such practice appears to be negatively correlated with the levels of production in the process-originating countries, and postulated that OPT may be one the most important ways in which EU producers react to competitive pressures from low-wage competitors at least in labor intensive industries.

Next we run a detailed analysis of the structure of trade for reasons of processing, and found out that there exist no evidence that the choice of processing country operated by EU firms is due to pre-existing comparative advantages (as traditionally defined) on the part of the latter in the given industry. Rather, our evidence suggests that the choice of foreign processing location rests on the EU firm. The implication of this finding is that we cannot read total trade flows from the CEECs as an indication of an autonomously developed comparative advantage.

Preliminary econometric evidence confirms that labor costs, along with geographic and cultural proximity, are the most important reason for the original choice of a given country as a processing partner. However, there is robust evidence that, once the process has been activated, EU firms do not necessarily keep looking for the lowest labor cost country as the preferred partner: in particular, it would seem that once the processing country (firm) has been selected, EU firms tend to stay with that country even though lower labor cost countries open themselves up to the practice. Such is certainly the case of Germany, the earliest and most important originator of OPT. On the other hand countries such as Italy, being both late-comers and prone to delocalize the most labor intensive segments of the production processes, tend to select partners much more on the basis of labor cost considerations. The upshot seems to be that once the processing-abroad practice has started, EU firms tend to delocalize in the country originally chosen more and more up-stream segments of the production process, rather than move the same labor intensive segments to countries with lower labor costs. In this process of vertical re-integration in the processing country foreign direct investment may be playing an important role as it allows, through direct proprietary control, a tighter supervision of processes and products.

REFERENCES

Baldone, S., F. Sdogati e L. Tajoli (1999), Il Traffico di Perfezionamento Passivo con i Paesi dell'Europa Centro-Orientale nel comparto Tessile-Abbigliamento: un'analisi strutturale per i principali committenti dell'Unione Europea. Politecnico di Milano, Dipartimento di Economia e Produzione. Mimeo.

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

Deardorff, A.V. (1998a), Fragmentation in Simple Trade Models, School of Public Policy, RSIE Discussion Paper No. 422, University of Michigan.

Deardorff, A.V. (1998b), Fragmentation across Cones, School of Public Policy, RSIE Discussion Paper No. 427, University of Michigan.

Feenstra, R.C. (1998), Integration of Trade and Disintegration of Production in the Global Economy, *Journal of Economic Perspectives*, Vol. 12, No. 4.

Greene W., (1997), *Econometric Analysis, 3rd ed*., Prentice-Hall International, London.

Guerrieri P. (1998), Trade patterns, FDI, and industrial restructuring of Central and Eastern Europe, BRIE Working Paper 124.

Hoekman B. and S. Djankov (1997), Determinants of the export structure of countries in Central and Eastern Europe, *World Bank Economic Review*, vol. 11, n. 3.

Hummels D., D. Rapoport and K.Yi, (1998), Vertical specialization and the changing nature of world trade, Economic Policy Review, *Federal Reserve Bank of New York*, vol.4, n.2.

Jones R. and H. Kierzkowski (1997), Globalization and the consequences of international fragmentation, Festschrift in Honor of Robert A. Mundell, The World Bank.

Kohli U., (1991), Technology, duality and foreign trade, Harvester Wheatsheaf, London.

Krugman P., (1995), Growing world trade: causes and consequences, *Brookings Papers on Economic Activity*, no. 1.

Spinanger D. (1995), Prosperity for all? Reflecting on the MFA complex after Marrakech, *The World Economy*.

Tab. 3.1 **Shares of OPT to domestic production. Major EU countries.**

Values (MEcu)		**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**
Temporary exports											
Germany	T	797.2	941.4	1143.8	1373.4	1548.4	1900.4	2156.5	2392.5	2400.6	2267.1
	A	122.5	135.1	168.4	217.9	223.3	288.5	336.6	379.7	413.6	365.8
The Netherlands	T	97.4	113.5	135.7	149.5	166.0	183.2	122.9	222.0	310.4	249.9
	A	13.7	17.4	20.3	27.1	31.1	35.7	26.6	40.9	62.9	43.5
France	T	129.0	187.9	186.5	165.7	197.7	238.2	243.9	257.4	426.0	253.5
	A	46.3	62.3	63.8	69.5	74.1	80.7	118.6	133.2	170.7	138.8
Italy	T	7.5	18.6	23.6	45.0	82.6	142.5	200.7	250.5	311.5	346.1
	A	2.4	4.3	4.9	12.4	32.6	48.7	87.4	123.3	190.5	236.4
Reimports											
Germany	T	18.1	20.2	31.9	42.6	46.9	63.9	87.5	108.2	116.6	90.7
	A	1253.9	1496.0	1847.1	2325.3	2434.6	2877.6	3355.8	3575.6	3717.0	3665.0
The Netherlands	T	0.3	0.2	0.3	0.4	0.4	1.2	1.3	1.6	2.7	7.9
	A	160.6	177.1	209.3	237.2	281.6	314.3	371.2	469.9	445.6	358.6
France	T	9.5	10.8	10.5	7.6	7.8	7.2	6.8	7.4	7.9	10.2
	A	201.9	307.5	348.9	322.0	400.8	449.2	477.3	515.0	365.4	512.9
Italy	T	0.9	1.4	1.4	1.5	3.0	7.3	21.9	29.9	35.5	35.5
	A	7.4	25.2	26.7	61.0	117.8	192.4	317.6	418.0	617.1	697.3
Production											
Germany	T	18499.1	19720.4	20582.8	20643.0	20234.8	18732.3	17632.3	16239.3	15303.3	
	A	13407.9	14128.1	15057.7	15898.7	15501.1	15457.7	15313.6	14910.7	14034.2	
The Netherlands	T	2321.1	2399.7	2564.2	2567.5	2568.1	2727.6	2700.9	2886.5	3043.2	
	A	792.6	898.3	988.5	997.5	972.0	1010.2	1033.8	988.9	1029.2	
France	T	15717.6	16303.3	16702.8	15988.3	16291.9	15212.7	16421.2	16943.1		
	A	9746.6	10187.1	10708.6	10489.4	10568.5	10248.6	10344.1	9972.5		
Italy	T	37082.3	41040.9	41703.7	41565.8	40066.3	34308.9	37095.3	36029.3	37411.3	
	A	18895.8	20703.7	21812.3	22887.5	23247.5	17827.0	18543.8	18727.2	20088.9	
Shares over production											
Temporary exports											
Germany	T	0.043	0.048	0.056	0.067	0.077	0.101	0.122	0.147	0.157	
	A	0.009	0.010	0.011	0.014	0.014	0.019	0.022	0.025	0.029	
The Netherlands	T	0.042	0.047	0.053	0.058	0.065	0.067	0.045	0.077	0.102	
	A	0.017	0.019	0.021	0.027	0.032	0.035	0.026	0.041	0.061	
France	T	0.008	0.012	0.011	0.010	0.012	0.016	0.015	0.015		
	A	0.005	0.006	0.006	0.007	0.007	0.008	0.011	0.013		
Italy	T	0.000	0.000	0.001	0.001	0.002	0.004	0.005	0.007	0.008	
	A	0.000	0.000	0.000	0.001	0.001	0.003	0.005	0.007	0.009	
Reimports											
Germany	T	0.001	0.001	0.002	0.002	0.002	0.003	0.005	0.007	0.008	
	A	0.094	0.106	0.123	0.146	0.157	0.186	0.219	0.240	0.265	
The Netherlands	T	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	
	A	0.203	0.197	0.212	0.238	0.290	0.311	0.359	0.475	0.433	
France	T	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000		
	A	0.021	0.030	0.033	0.031	0.038	0.044	0.046	0.052		
Italy	T	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	
	A	0.000	0.001	0.001	0.003	0.005	0.011	0.017	0.022	0.031	

Legenda: T = Textiles, A = Apparel

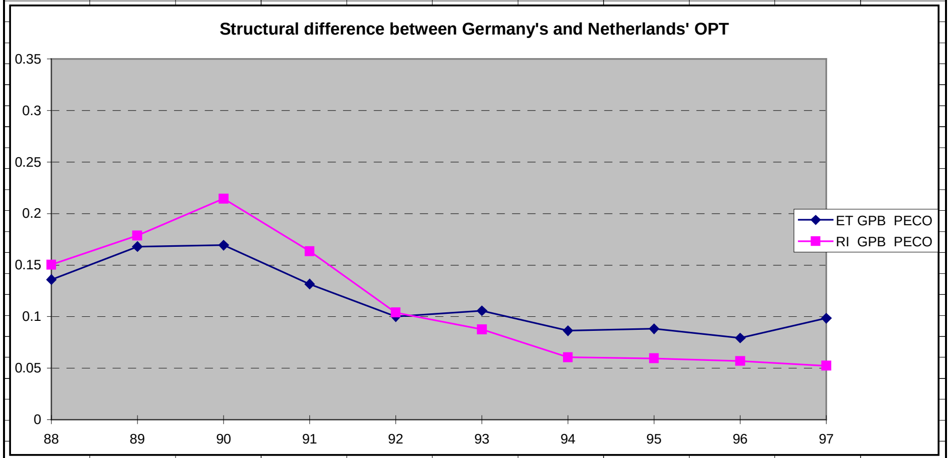
Source: Eurostat, *Comext* and OECD, *STAN database*

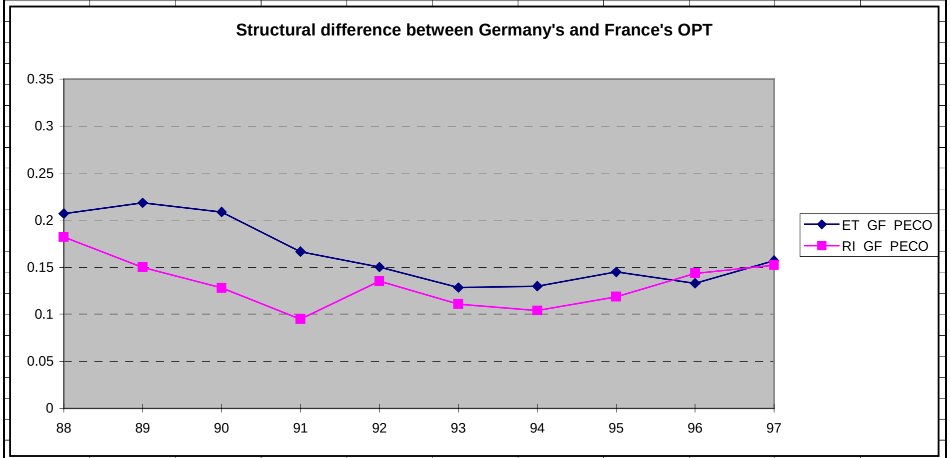
Table 3.2 Shares of EU re-imports after processing in the CEECs-6 relative to final imports

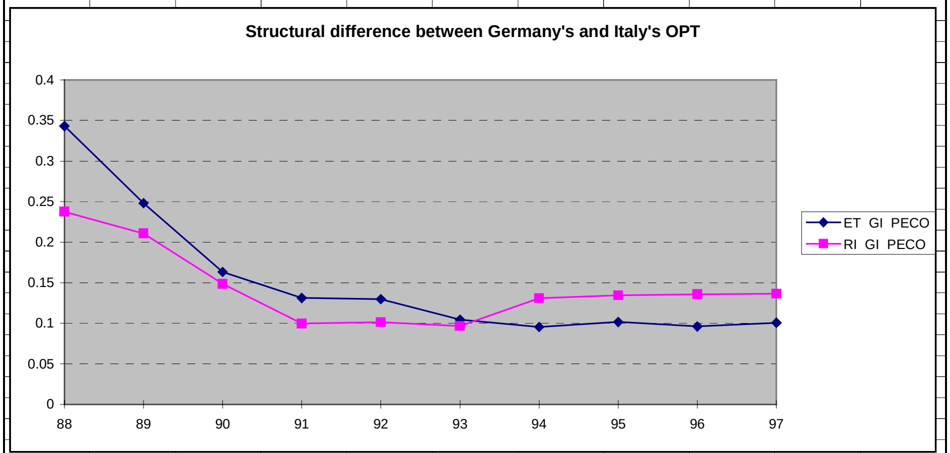
Germany	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Poland	3.73	5.39	4.67	5.17	4.25	4.76	6.67	6.71	6.21	2.22
Czech R.	0.31	0.34	0.33	0.68	0.84	1.26	1.75	1.71	1.75	0.81
Slovakia	0.31	0.34	0.33	0.68	0.84	1.51	1.86	1.67	2.05	1.69
Hungary	3.43	3.73	3.04	3.51	2.46	2.5	3.39	3.64	3.89	2.22
Romania	1.99	2.4	3.22	4.13	5.51	3.49	6.38	6.61	7.67	7.24
Bulgaria	0.94	1.19	1.15	1.53	1.83	2.39	2.15	2.27	2.7	1.29
The Netherlands										
Poland	1.39	2.73	2.04	3.06	4.89	3.85	4.87	10.53	8.53	
Czech R.	0.41	0.64	0.96	0.87	0.81	0.22	0.3	0.27	0.23	0.17
Slovakia	0.41	0.64	0.96	0.87	0.81	1.62	1.4	3.42	4.21	2.22
Hungary	3.76	5.31	4.93	8.07	9.07	5.83	5.01	10.23	5.51	2.92
Romania	1.38	1.81	1.4	1.61	2.08	2.05	1.78	2.8	3.25	1.59
Bulgaria	0.03	0	0.1	0.41	1.95	2.11	2.44	8.94	4.34	1.42
France										
Poland	0.41	0.73	0.77	1.2	1.33	1.16	1.99	2.32	1.11	1.36
Czech R.	0.01	0.01	0	0.15	0.3	0.3	0.4	0.48	0.27	0.22
Slovakia	0.01	0.01	0	0.15	0.3	0.76	1.34	1.1	0.73	0.68
Hungary	1.88	2.37	2.27	2.75	3.17	5.46	6.96	4.37	1.44	1.69
Romania	0.35	0.4	0.52	0.63	2.46	2.1	1.67	1.96	1.28	1.79
Bulgaria	0.11	0.21	0.34	0.48	0.26	0.21	0.37	0.95	0.93	0.72
Italy										
Poland	0	0	0.02	0.14	0.33	0.97	1.03	0.69	1.41	0.88
Czech R.	0	0	0	0.13	0.25	0.2	0.13	0.12	0.21	0.16
Slovakia	0	0	0	0.13	0.25	0.81	0.44	0.52	1.19	0.88
Hungary	0.02	0.09	0.21	0.66	1	2.46	2.39	2.6	3.11	1.98
Romania	0.03	0.06	0.02	0.2	0.21	0.64	1.4	1.67	2.39	1.29
Bulgaria	0	0.02	0.05	0.07	0.2	0.31	0.52	0.73	0.98	0.63
TOTAL										
Poland	1.97	2.64	2.7	3.39	3.29	3.83	5.21	5.57	4.85	2.02
Czech R.	0.24	0.29	0.3	0.56	0.69	0.95	1.18	1.2	1.26	0.65
Slovakia	0.24	0.29	0.3	0.56	0.69	1.33	1.31	1.31	1.68	1.31
Hungary	2.25	2.45	2.35	2.85	2.36	2.85	3.48	3.72	3.3	2.14
Romania	0.84	0.95	1.23	1.46	2.05	2.1	3.1	3.34	3.69	2.74
Bulgaria	0.53	0.65	0.7	0.87	0.91	1.21	1.2	1.6	1.8	0.97
G. TOTAL	1.08	1.28	1.45	1.78	1.81	2.22	2.71	2.87	2.91	1.68

Source: Eurostat, *Comext*.

Table 3.3


Structural difference between Germany's and Netherlands' OPT
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
88
89
90
91
92
93
94
95
96
97
ET GPB PECO
RI GPB PECO


Structural difference between Germany's and France's OPT
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
88
89
90
91
92
93
94
95
96
97
ET GF PECO
RI GF PECO


Structural difference between Germany's and Italy's OPT
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
88
89
90
91
92
93
94
95
96
97
ET GI PECO
RI GI PECO

Tab. 3.4 Relative Weight of Textile and Apparel to Reimports of Apparel by EU Country

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
G: TE-T/RI-A	0.60068	0.5993	0.63712	0.62444	0.6699	0.67924	0.65195	0.67381	0.66254	0.64812
G: TE-A/RI-A	0.08579	0.08	0.09135	0.10381	0.10914	0.12035	0.11773	0.12644	0.13788	0.1342
G: RI-T/RI-A	0.00339	0.00462	0.01941	0.0203	0.01834	0.02008	0.02703	0.03079	0.03881	0.02837
NL: TE-T/RI-A	0.61912	0.55482	0.56475	0.51429	0.51558	0.45409	0.22304	0.3268	0.49966	0.44919
NL: TE-A/RI-A	0.03337	0.02869	0.04458	0.11117	0.1137	0.10142	0.05298	0.08849	0.14207	0.09897
NL: RI-T/RI-A	0.00102	0.00069	0.00184	0.00245	0.00114	0.00158	0.00213	0.00277	0.00362	0.0038
F: TE-T/RI-A	0.66081	0.62253	0.68851	0.57639	0.43601	0.4685	0.45078	0.41694	0.60411	0.38336
F: TE-A/RI-A	0.58149	0.51089	0.50448	0.4167	0.29252	0.27908	0.31562	0.31739	0.40044	0.34074
F: RI-T/RI-A	0.00701	0.017	0.00764	0.00186	0.00303	0.00837	0.01035	0.00435	0.01157	0.00989
I: TE-T/RI-A	0.97267			0.98203	0.75009	0.77691	0.65748	0.6377	0.54962	0.52706
I: TE-A/RI-A	0.0187	0.03486	0.13586	0.20681	0.29259	0.23592	0.2324	0.25272	0.26336	0.3152
I: RI-T/RI-A	0	0	0	6.1E-05	0.01953	0.0332	0.06516	0.06825	0.06128	0.05619

Legenda: G Germany; NL Netherlands; F France; I Italy; TE Temporary Exports; RI Reimports ;T Textile; A Apparel.
Source: Eurostat, *Comext*.

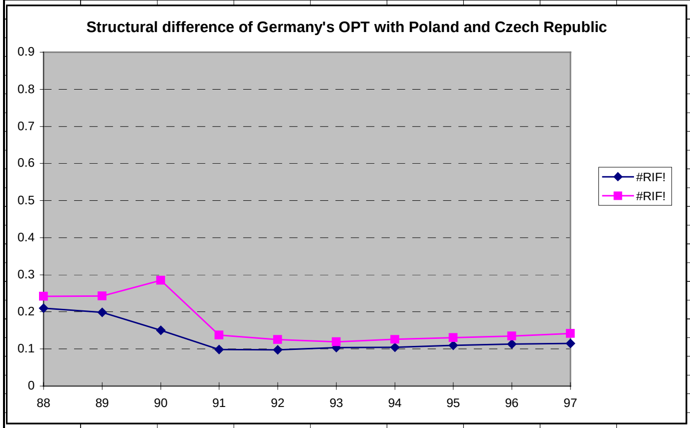
Tab. 3.5 Structure of EU Temporary Exports to, and Reimports from, CEECs-6 in 1996 and 1990

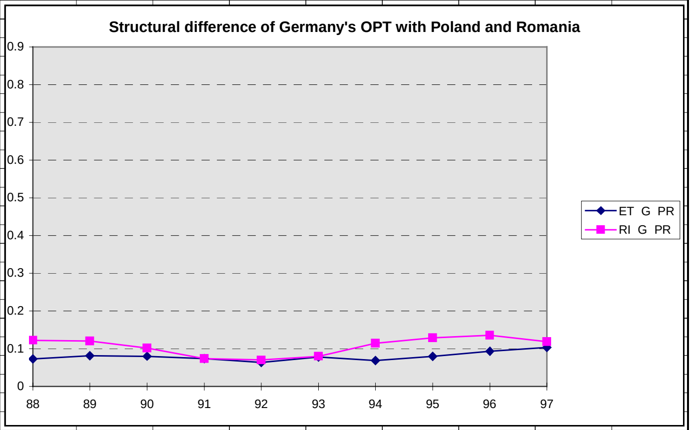
	Temporary Exports 1996				Reimports 1996			
CN Code	G	NL	F	I	G	NL	F	I
50	0.00384	0.00042	0.00127	0.0058	9.4E-06	0	0	0
51	0.14259	0.11466	0.1098	0.12556	0.00946	2.6E-05	0.00079	0.00508
52	0.1679	0.12009	0.07865	0.17012	0.00495	3.7E-05	0.00021	0.0155
53	0.01399	0.00881	0.0138	0.00747	4.9E-05	0	0.00599	0.00125
54	0.12792	0.07518	0.03396	0.16954	0.00552	4.5E-05	0.00033	0.02155
55	0.18948	0.28659	0.21187	0.07913	0.00638	6.7E-05	0.00055	0.00726
56	0.03204	0.02107	0.01258	0.02359	0.00125	0.00047	0.00042	0.00057
57	0.00056	0.00438	0.00113	0	0.00222	0.00268	1.4E-05	0
58	0.04658	0.03066	0.04186	0.02811	0.00319	3.4E-05	0.00019	0.00646
59	0.02509	0.02135	0.04359	0.02049	0.00087	0.00016	0.00021	4.5E-05
60	0.07773	0.0954	0.05287	0.04624	0.00346	8.6E-05	0.00274	3.4E-05
61	0.06442	0.10447	0.23437	0.14837	0.14063	0.144	0.32029	0.22006
62	0.09107	0.11431	0.15467	0.17438	0.76747	0.83355	0.64276	0.72018
63	0.01677	0.00261	0.00959	0.0012	0.05454	0.01884	0.02551	0.00202
Total	1	1	1	1	1	1	1	1

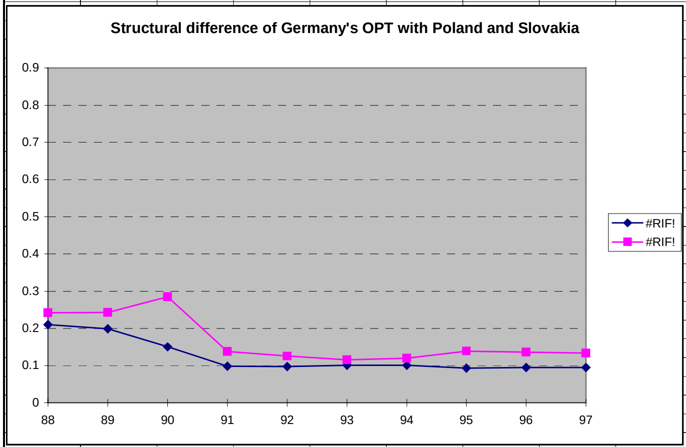
	Temporary Exports 1990				Reimports 1990 (1992 for Italy)			
CN Code	G	NL	F	I	G	NL	F	I
50	0.00433	0.0017	0.0023	0.01018	0	0	0	0
51	0.10896	0.17992	0.0861	0.26776	0.00083	0.00011	0	0.0005
52	0.17972	0.15991	0.05118	0.15626	0.00298	8E-05	0.00027	0.01572
53	0.01188	0.00489	0.00667	0.01474	0	0.0006	0.001	0
54	0.13546	0.11409	0.11493	0.1153	0.00318	0.00033	0.00247	0.00056
55	0.26441	0.32187	0.09895	0.08592	0.00869	0.00021	0.00081	0.00031
56	0.03937	0.02064	0.02224	0.0083	2E-05	0	9.3E-05	0.00166
57	0.00023	0	0	0	0.00206	0	0	0
58	0.04811	0.02987	0.02396	0.0176	0.00014	0	0.00016	0.0002
59	0.02539	0.01734	0.07959	0.01217	0.00084	0	4E-05	0.00013
60	0.05675	0.07661	0.0912	0.03116	0.00029	0.00051	0.00275	7.7E-05
61	0.03779	0.02672	0.30048	0.11175	0.07404	0.08739	0.16907	0.26114
62	0.07791	0.04581	0.1183	0.16793	0.89499	0.90996	0.81439	0.71112
63	0.00969	0.00062	0.00409	0.00094	0.01193	0.00082	0.00896	0.00859
	1	1	1	1	1	1	1	1

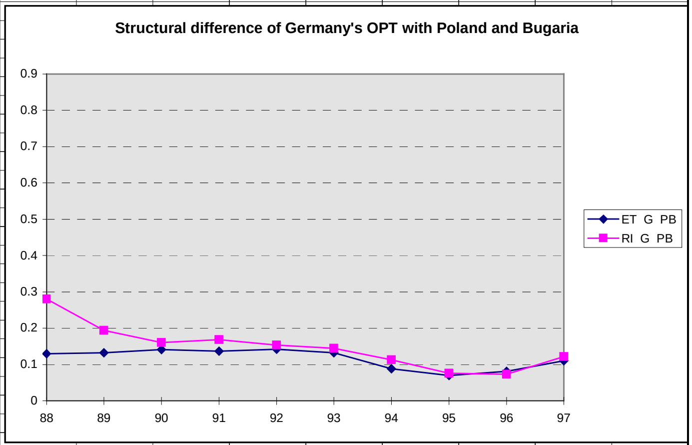
Legenda: CN codes 50-60 identify Textiles; codes 61-63 Apparel.
Source: Eurostat, *Comext*.

Table 3.6 **(a)**


Structural difference of Germany's OPT with Poland and Czech Republic
#RIF!
#RIF!


Structural difference of Germany's OPT with Poland and Romania
ET G PR
RI G PR


Structural difference of Germany's OPT with Poland and Slovakia
#RIF!
#RIF!


Structural difference of Germany's OPT with Poland and Bugaria
ET G PB
RI G PB

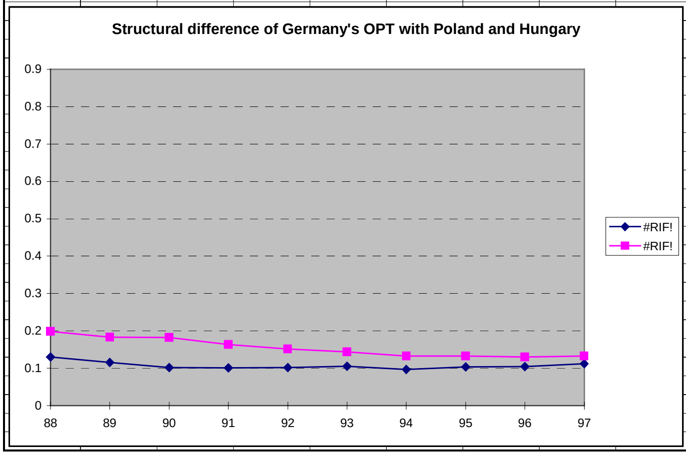
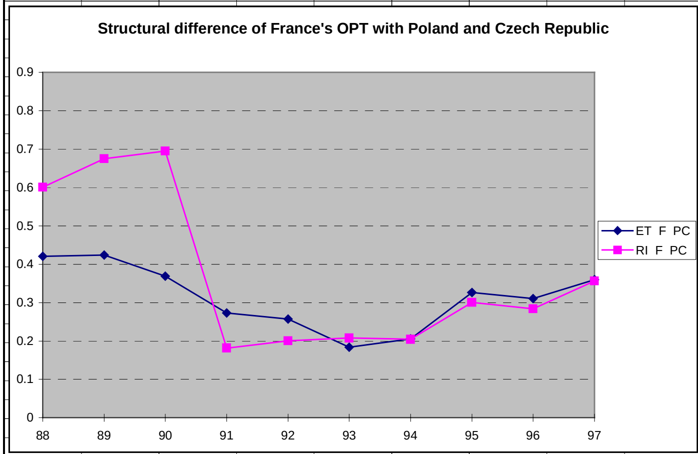
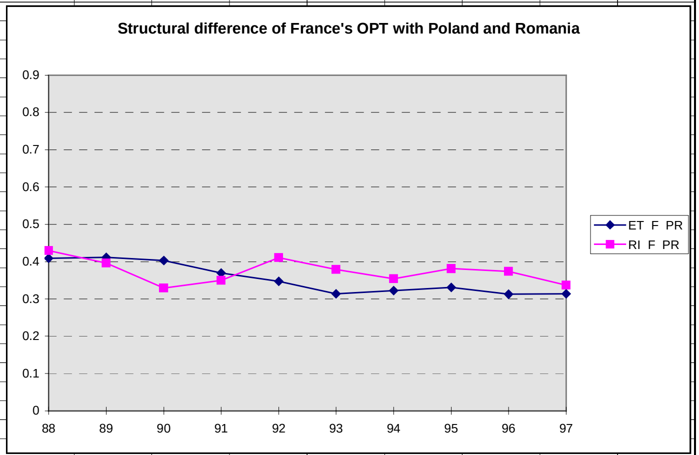
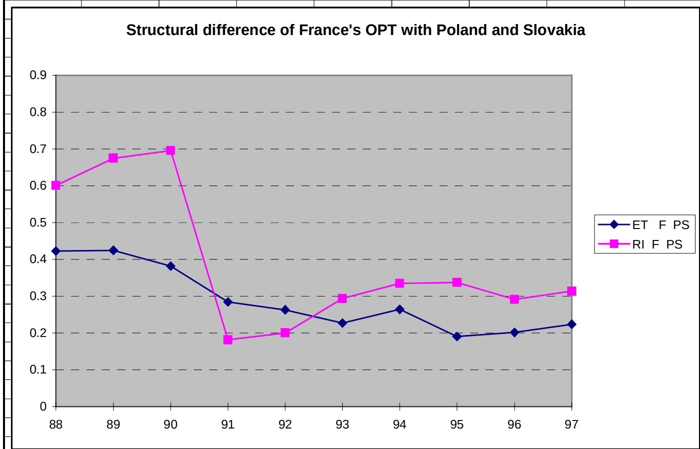
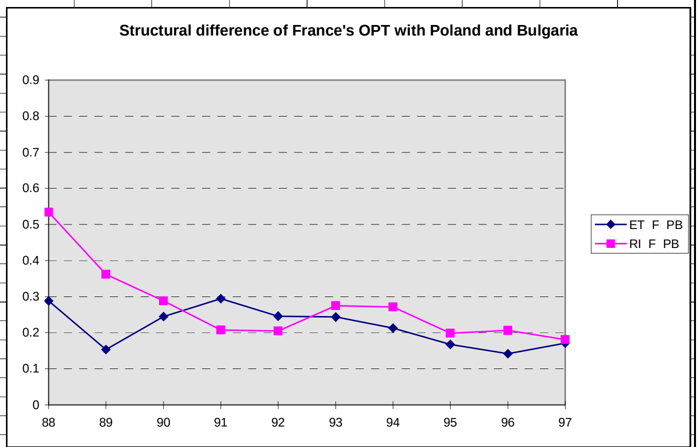

Structural difference of Germany's OPT with Poland and Hungary
#RIF!
#RIF!

Table 3.6 **(b)**


Structural difference of France's OPT with Poland and Czech Republic
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET F PC
RI F PC


Structural difference of France's OPT with Poland and Romania
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET F PR
RI F PR


Structural difference of France's OPT with Poland and Slovakia
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET F PS
RI F PS


Structural difference of France's OPT with Poland and Bulgaria
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET F PB
RI F PB

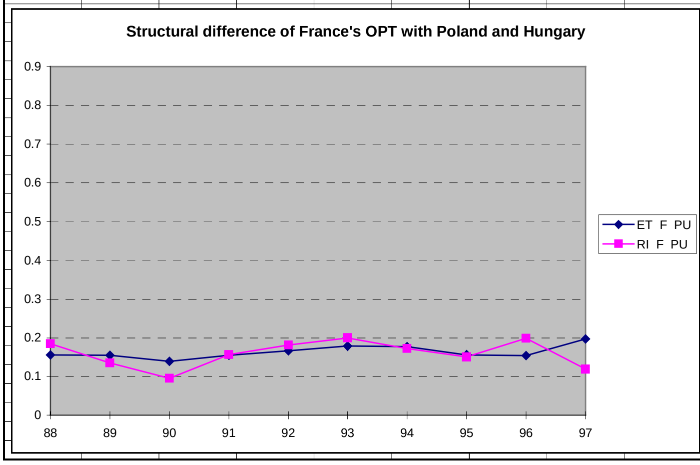
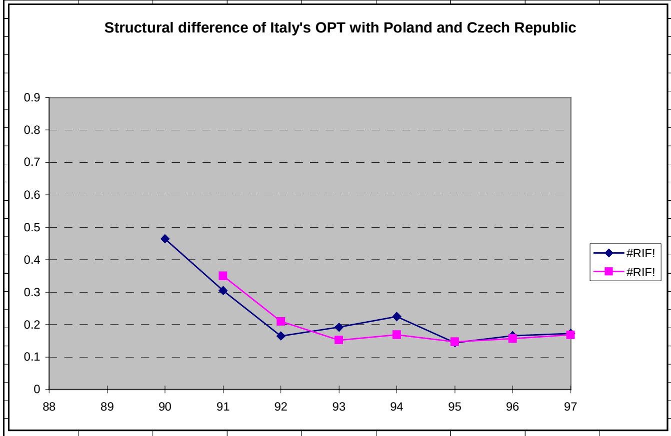
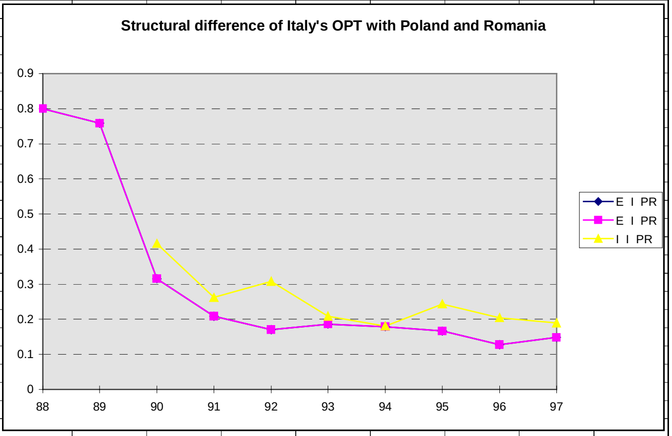
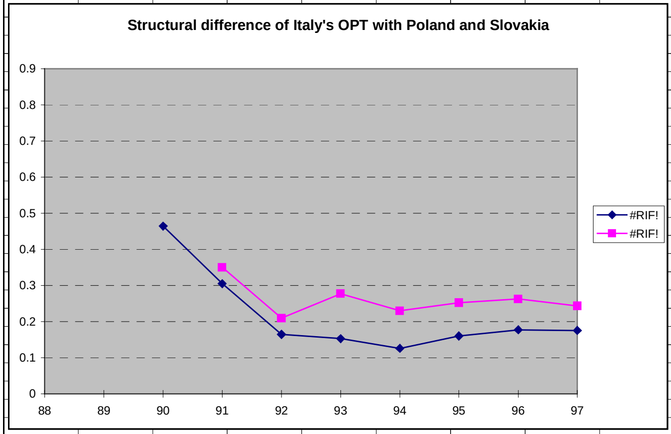
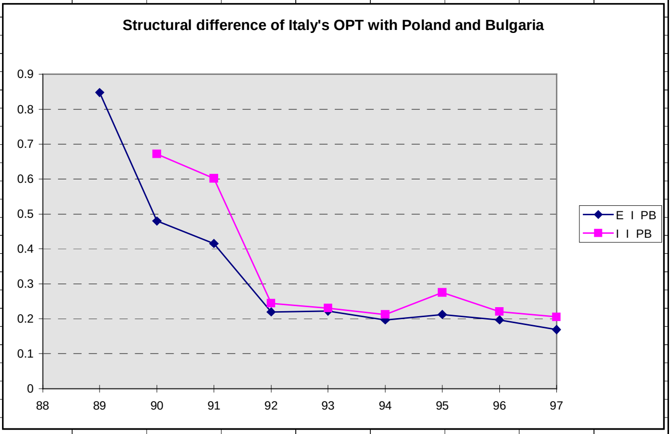

Structural difference of France's OPT with Poland and Hungary
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET F PU
RI F PU

Table 3.6 **(c)**


Structural difference of Italy's OPT with Poland and Czech Republic
#RIF!
#RIF!


Structural difference of Italy's OPT with Poland and Romania
E I PR
E I PR
I I PR


Structural difference of Italy's OPT with Poland and Slovakia
#RIF!
#RIF!


Structural difference of Italy's OPT with Poland and Bulgaria
E I PB
I I PB

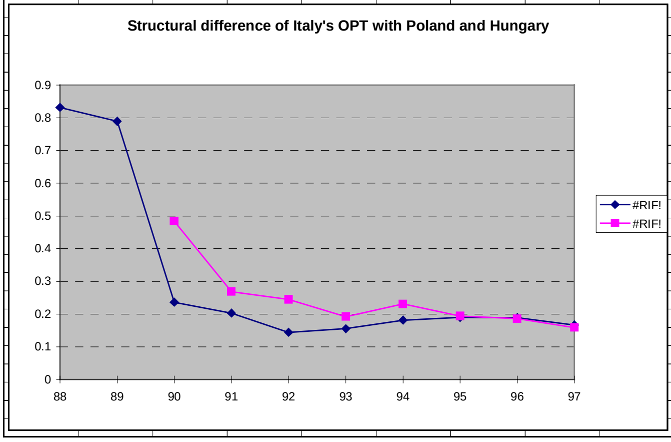
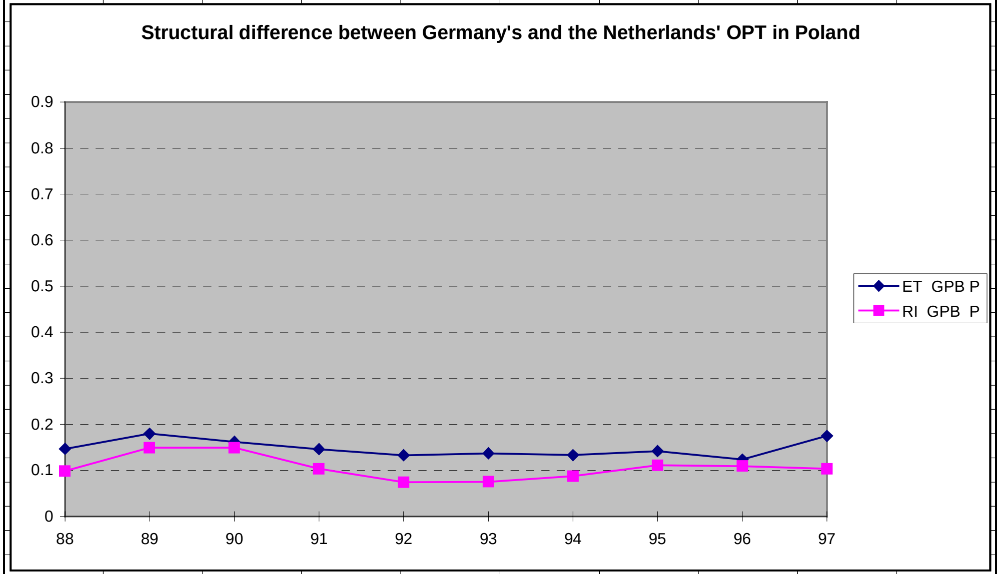
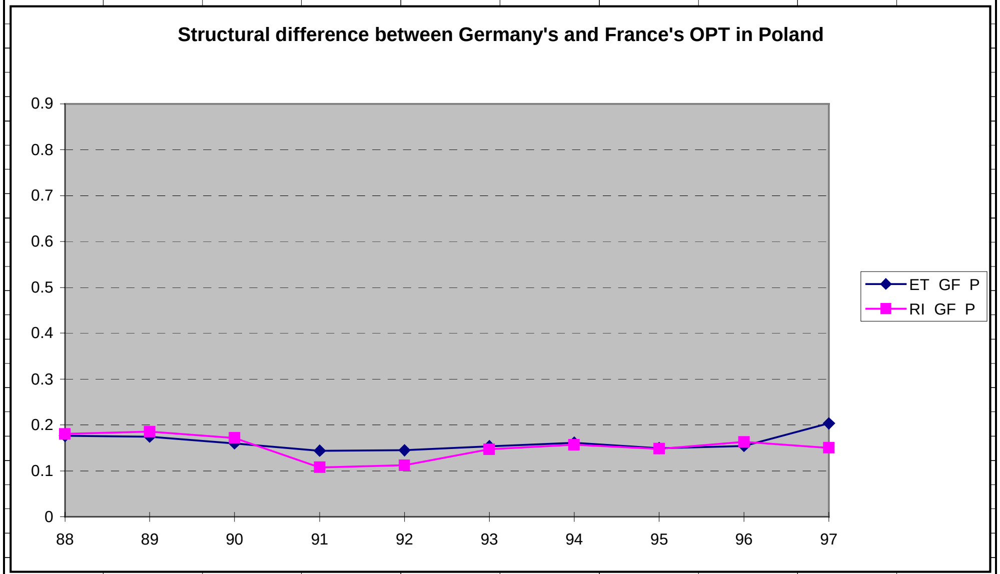

Structural difference of Italy's OPT with Poland and Hungary
#RIF!
#RIF!

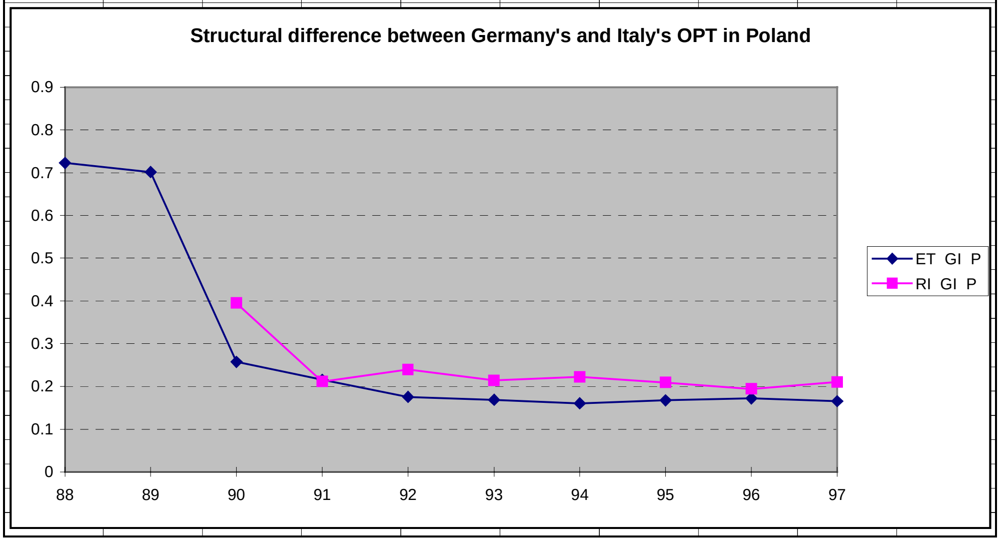
Table 3.7 **(a)**



Structural difference between Germany's and the Netherlands' OPT in Poland
ET GPB P
RI GPB P

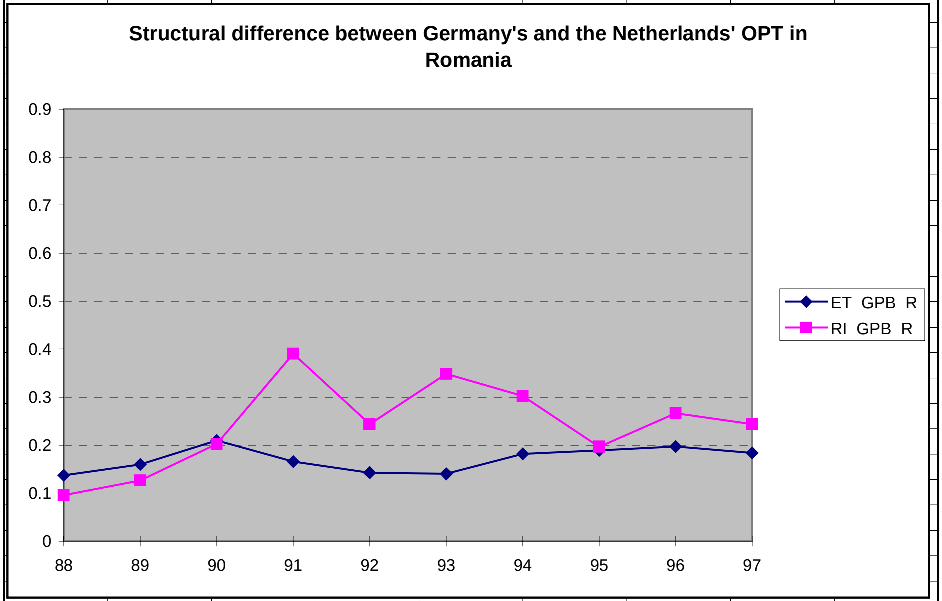


Structural difference between Germany's and France's OPT in Poland
ET GF P
RI GF P

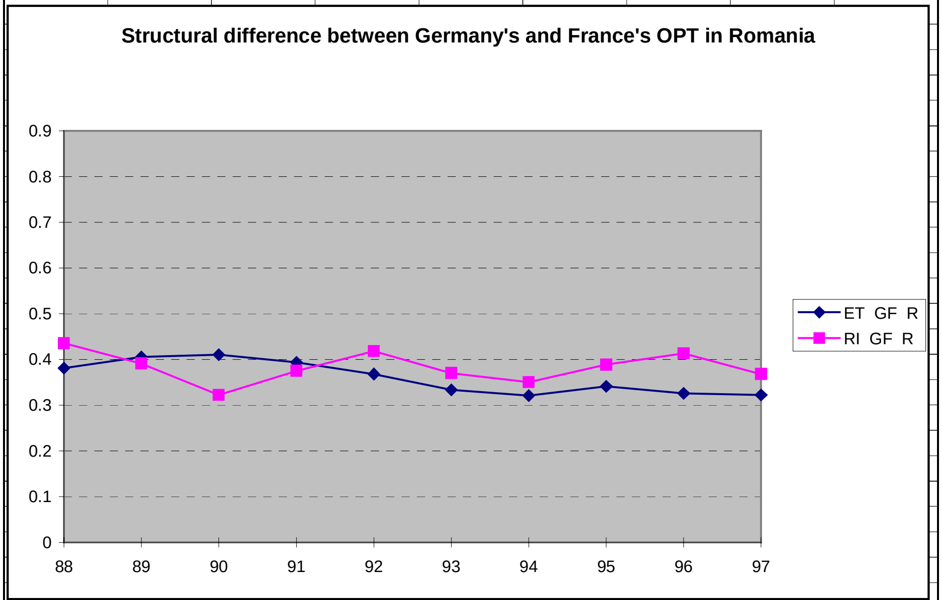


Structural difference between Germany's and Italy's OPT in Poland
ET GI P
RI GI P

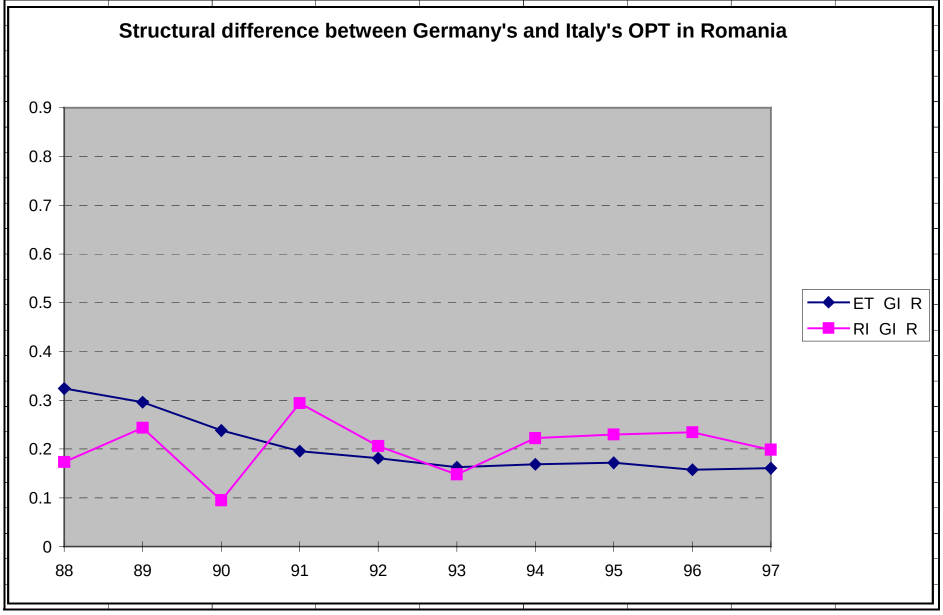
Table 3.7 **(b)**



Structural difference between Germany's and the Netherlands' OPT in Romania
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET GPB R
RI GPB R



Structural difference between Germany's and France's OPT in Romania
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET GF R
RI GF R



Structural difference between Germany's and Italy's OPT in Romania
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
88
89
90
91
92
93
94
95
96
97
ET GI R
RI GI R

Table 4.1 Results of the pooled least squares regressions

Dependent variable: OPTSHARE
Observations: quarterly data from 1989 to 1996, four countries

Explanatory variables	Regression 1		Regression 2		Regression 3		Regression 4		Regression 5	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
RELWAGE(i,t-1)	-0.2155	-2.9182	-0.1812	-2.2627	-0.1897	-2.3629	-0.2294	-3.0945		
WAGE(i.t-1)									-0.0001	-3.521
TARIFF(i,t)	-0.0003	-0.5649							-0.0011	-1.7740
FDI(i,t)			-0.00001	-0.6584						
FDIno(i)					-0.00001	-0.4198	0.0002	3.0884		
DIST(i)	0.0178	3.1787	0.0203	3.2249	0.0269	1.2681			0.0199	3.5519
APPSECT(i)	0.4280	0.9726	0.4907	1.1140	0.0396	0.0366	1.1691	1.8941	0.3057	0.7010
OPTSHARE(i,t-1)	0.8854	23.4611	0.8653	19.1250	0.8803	23.4198	0.8974	25.4801	0.8718	23.1711
	R^2 = 0.9854		R^2 = 0.9855		R^2 = 0.9854		R^2 = 0.9852		R^2 = 0.9859	

Note: An F-test accepted the null hypothesis of pooled least squares being the efficient estimator against the hypothesis of using fixed effects
The constant term of the regressions is not reported to spare space.

Legenda:

OPTSHARE(i,t) = re-imports of apparel (NACE Classification 61 and 62) of the EU from country i over re-imports of apparel of the EU from all the CEECs
RELWAGE(i,t-1) = ratio of average wage level in CEEC i over average wage level in the EU
WAGE(i.t-1) = average wage level in country i
TARIFF(i,t) = average tariff level imposed by the EU on imports from country i
FDI(i,t) = cumulated value of flows of FDI in country i
FDIno(i) = cumulated number of FDI operation undertaken by the EU in country i in 1996
DIST(i) = dummy variable for the relative distance of country i from the EU border
APPSECT(i) = share of the apparel sector output over total manufacturing output in country i in 1990

i = country index
t = time index

Table 4.2 Translog functional form of the re-import function
Parameter estimates

	ISUR		I3SLS	
	Coeff.value	t-statistic	Coeff.value	t-statistic
α_{Bul}	0.0177	3.6893	0.0041	0.5669
α_{Pol}	0.1713	3.5409	-0.0407	-0.4405
α_{Rum}	0.0241	0.9299	-0.0975	-1.7721
α_{Hun}	0.0442	1.9328	0.0651	1.7973
$\beta_{Bul,Bul}$	-0.0093	-2.6580	-0.0028	-0.6381
$\beta_{Pol,Pol}$	-0.0302	-1.7761	-0.0464	-1.8295
$\beta_{Rum,Rum}$	-0.0044	-0.3622	-0.0289	-1.4790
$\beta_{Hun,Hun}$	-0.0501	-4.4359	-0.0307	-2.2613
$\beta_{Bul,Pol}$	-0.0023	-0.4175	0.0002	0.0319
$\beta_{Bul,Rum}$	-0.0240	-4.5371	-0.0030	-0.3238
$\beta_{Bul,Hun}$	0.0053	1.1716	0.0007	0.1262
$\beta_{Pol,Rum}$	-0.0231	-1.8991	0.0114	0.6234
$\beta_{Pol,Hun}$	0.0342	2.8032	0.0174	1.1696
$\beta_{Rum,Hun}$	0.0155	1.1277	0.0393	1.6141
δ_{Bul}	0.0363	0.2343	0.8161	2.7552
δ_{Pol}	0.5194	4.1402	1.1041	4.6340
δ_{Rum}	0.7500	6.3524	1.3536	5.3458
δ_{Hun}	0.9014	14.3417	0.8390	8.8559
R^2 - Bul	0.7997		0.7081	
R^2 - Pol	0.6436		0.5636	
R^2 - Rum	0.7757		0.6935	
R^2 - Hun	0.9616		0.9701	

Note: the coefficients are the ones of system (4.2).
Estimation period 1989 - 1996, quarterly observations.