HOW FAR DO WE TRADE INTERMEDIATE INPUTS?

Differences between a *new* and an *old* sector

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Abstract:

We look at determinants of intermediates inputs imports focusing on the role of distance as a direct measure of the costs involved in spreading a production process across different economies. We consider imports to two countries: Italy, whose competitive advantage is still hinged in the traditional sectors, and Germany, strongly specialized in skilled and capital intensive activities; in two sectors, footwear and PCs; in two periods end of the 80s and end of the 90s. Delocalization of stages of that part of the production which serves the domestic market to a foreign country is a costly activity at least because of the transport costs from re-importing goods home. The evidence of falling off imports with distance captures exactly how transport costs can offset other cost advantages from the use of cheaper resources. Our results would suggest this is not the case in all sectors, at least not in the production of computers and their parts. Imports of intermediates inputs for electronic components are not a clear indication of activities outsourced, delocalized with the aim of reducing costs. Other characteristics of trade patterns and of their production technology will have to investigated in order to understand the map of their production and their movements across borders, i.e. the determinants of the fragmentation of their production process.

JEL Classification:

Keywords: outsourcing, intermediate inputs, distance and trade flows

Introduction

The activity of outsourcing has been receiving increasing attention in the literature. The interest has been expressed by studies on the 'globalization' wave and the processes of economic integration which have interested world economies during the last two decades. First analyses have overlooked the dramatic changes which are occurring in the nature of international trade. Standard trade models have been used to study a changed pattern of cross-country specialization without introducing any modifications to the dimensions needed for defining comparative advantages[1].

As a result, the contribution of trade to recent phenomena in OECD labour markets and its interactions with other forces have been understated because of a misreading of the data (Feenstra and Hanson, 2001). At first, studies have simply looked at trade in final goods and mainly ignored the recent dramatic increases in trade of intermediate inputs, i.e. global production sharing.

In a second wave of papers, the phenomena of distributing across two or more countries the activities involved in producing a good has been studied and called in different ways depending on the focus of the analysis. De-localization (Leamer, 1998, and Grossman and Helpman, 2002), fragmentation (Deardorff, 2001, Arndt and Kierzkowski, 2000), intra-product specialization (Arndt, 1998), intra-mediate trade (Antweiler and Trefler, 1997), vertical specialization (Hummels, Ishii and Yi, 2001). What is common to these different perspectives is that the fragmentation of production into discrete phases allocated across countries has introduced an intra-industry pattern of exchanges not only between similar countries but, also, between countries different for their income levels. As in the 'classical' case of inter-industry trade, countries' differences in factor endowments have been found at the heart of this bidirectional North-South movement of 'unfinished', semi-finished or intermediate goods. Indeed, such evidence calls for a dimension in the definition of comparative advantages and countries' specialisation well beyond the standard idea of a sector.

This paper contributes to the recent research on patterns and determinants of the international fragmentation of production at the sectoral level (Freudenberg and Lemoine, 1999; Baldone, Sdogati e Tajoli, 2001). We look at the determinants of intermediates inputs imports to industrialized countries focusing on the role of distance as a direct measure of the costs involved in spreading a production process across countries. That geography and therefore distance matters greatly for many economic interactions is a robust result in the literature (Venables, 2001). Trade flows, as investment and knowledge transfers have normally been found to fall off very rapidly with distance. Increasing distance implies higher costs in the exchanges activities across country. Also in a macro perspective declining transaction costs have been found a crucial factor in explaining the observed increase in outsourcing (De Groot, 1998).

A negative sign for the distance variable is common to all the gravity exercises reported in the literature. Almost generally regressions have been run at the

[1] Recent papers have looked at the activity of outsourcing within the new trade theory general equilibrium models of trade (Grossman and Helpman, 2002) or within the Heckscher-Ohlin framework (Egger and Falkinger, 2001).

country level. The question of this paper is: how common is this evidence across different sectors? Are heterogynous results on distance suggesting a different interpretation on why countries exchange intermediate inputs?

This analysis uses a gravity approach to investigate on the determinants of imports of intermediates inputs (recorded in the data as parts and components) in two different sectors: a traditional one (footwear) and a *new* sector (computer and electronic integrated circuits). Delocalization of stages of that part of the production which serves the domestic market to a foreign country is a costly activity at least because of the transport costs from re-importing goods home. The evidence of falling off imports with distance captures exactly how transport costs can offset other cost advantages from the use of cheaper resources.
Imports of intermediate inputs are investigated in two countries: Italy, whose competitive advantage is still hinged in the traditional sectors and Germany strongly specialized in skilled and capital intensive activities. We also consider two periods (an average value for end of the 80s and a similar average for end of the 90s) in order to evaluate robustness of results in time. Data have been collected at the highest level of disaggregation (8-digit-CN code) and the extreme detail of product definitions distinguishing parts and components from other products at the industry level has been used to identify outsourcing.

The paper proceed in the following way. Next section will discuss some issues relative to the nature of outsourcing and the relevant implications for measuring it. The empirics of spreading production across countries is discussed with the aim of identifying other important determinants at the industry level which can be relevant since our sectoral focus. We will then discuss the links from distance to the fragmentation of production with the idea that several elements are potentially important for evaluating distance as a cost entry that offsets parts of the gains from delocalization. Distance could play a different role in different sectors because of their different ability in creating markups. Markups can be used by sellers in the international markets in order to offset some costs. Distance has been found to be one of them. Therefore distance can count less in sectors with higher markups. As an alternative explanation, different evidence on distance can be used to distinguish that part of trade which still represent the phenomena of fragmentation of production but not delocalization. Therefore, import flows of intermediate inputs cannot be always interpreted as one strategic response to increased competition in the domestic or export markets.
The descriptive analysis of the data and the model used and results will follow.

The Nature and the Empirics of Outsourcing

The geographic separation of the activities involved in producing a good (or a service) across several countries has been studied along different dimensions of analysis. The several terms used in the literature have aimed at stressing aspects of the recent economic integration process which are different and, most of all, involve different types of countries. The starting point of any further reasoning is the slicing of the value chain (Krugman, 1995): during the last decades the

production process has become easier to be decomposed in several sequential stages which have also become more inter-dependent in some cases but less in some others. The fact we can produce footwear uppers in Romania and heels in Bulgaria did not change the fact that uppers and heels are assembled together in order to obtain a final product. Moving to another production process, i.e to another product, makes a lot of difference. All the stages for producing an integrated circuit can be followed by any operation involved in the manufacture of several different products, i.e. all those commodities which have an electronic part. Notably, each of them can be located in a different country according to the geography of production of the specific final good. The complexity of this passage from the intermediate product to the final good depends both on the specific technological content (in terms of type and applicability) of the commodities (both in their intermediate and final use) and clearly on the costs of moving them around the world.

This potentially complicates a lot any analysis on the determinants and incentives to outsourcing especially whenever aggregate data are used. If the possibility to break the production process in different slices and then to de-localise some of them in another area is strictly dependent on the same nature of the manufacturing of a commodity, then the geography of production has to be studied keeping in mind the characteristics of the industry and of the firms which operate inside the industry[2] and on the geographical distribution of those factor of production intensively used in each slice of the chain.

In this paper we take a start from the different incentives involved in moving production from one country to another which is similar (as in the case of horizontal FDI) and the ones involved in two countries, different for their factor endowments, contributing to the production of the same commodity (vertical FDI). Both cases are likely to be linked to recent changes in the geographical distribution of the production process of a commodity. The main motivation for horizontal FDI has been found proximity to final markets access reason, particularly when trade barriers are relevant (Di Mauro, 1999).
Outsourcing is identify whenever the use of resources located outside the national boundaries is motivated by the geographic distribution of the factor endowments. It may well be occur through foreign direct investment (FDI), as multinationals move production of parts and components or product assembly abroad, or may occur through a shift in contracting practices, in which firms replace domestic production of intermediate inputs with imports purchased from suppliers located abroad. Both cases are linked by the first aim of reducing production costs, mainly as a consequence of the increasing competition in the international markets from low-wage producers.

When looking at trade data the fact of using resources abroad which are cheaper than the ones home is consistent with different possibilities. Movements at the border could well be either imports of intermediates which are further manufactured home and then sold or re-exported as finished

[2] Including suppliers of raw materials and intermediate inputs and firms providing all services needed to the manufacturing operations.

products abroad, or exports of raw materials (parts and components) which are processed and/or assembled abroad and then re-imported as final goods. At the base of such distinction there is the phase of the commodity chain which has been delocalized. Most of the papers following the seminal paper of Feenstra and Hanson (1996) have recorded and given a measure of outsourcing of the upstream activities (inputs). Recently some interesting discussion has been provided on the movements of downstream activities from China to Hong Kong (Feenstra and Hanson, 2001). Traders in Hong Kong import goods from China and then distribute them to a final destination. Such goods for re-export cannot be subject substantial manufacturing but this does not exclude other type of processing such as sorting, packaging or service activities such as marketing or transport.

But outsourcing is also consistent with bi-directional movements of parts and components where goods exiting the country rich of the factor intensively used in the intermediate production stages are of a much higher then the goods entering the border. Usually import and export unit value differences are used to measure of such relevant outward processing. The validity of such procedure, which used with aggregate data can be easily influenced by quality asymmetry issues, can validly rest on a high level of detail of the trade data used.

The evolution of trade flows of a country, both in terms of quantity and types of partners, through time and the differences of such evolution between the upstream and downstream activities of a production process are likely to say something about the way a country faced the increased competitive advantage in the international markets from countries owning cheaper resources. The European footwear industry and its national distribution can be taken as an example of such heterogeneity of results (Brenton, Pinna and Vancauteren, 2000). Shoes' production has almost disappeared in some countries such as UK, Germany and Sweden, while Spain and Portugal have received lots of capital aimed to take advantage of lower production costs. The case of Italy introduces another possibility. The existence of bi-directional trade symmetric in quantities but not in values at a high level of disaggregation is the testimony also Italy faced the increased competitive pressure by cutting on some costs, by delocalizing, presumably, the most unskilled intensive activities of the production of a shoe. But those imports of parts and components are further processed home by using skills and resources not available abroad and adding quality to the commodities of the Italian firms.

Size, pattern and determinants of intermediate inputs trade

Various evidence indicates that intermediate goods play an increasingly important role in trade. Feenstra and Hanson (2001) look at 'processing trade', i.e. goods which are recorded at customs offices for inward processing (import of intermediate inputs for processing and subsequent re-export of the final product). Such trade has increased enormously particularly between countries with high differences in income. For the case of China and Hong-Kong data show that in 10 years (1988-98) exports for outward processing have increased from about one-third to over one half of total Chinese exports. Lower but still

growing shares move on the other direction[3]. Also when looking at trade of the US with other industrialized countries the ratio of processing trade has increased from 13.7% to 23.7% when isolating 'peripherical' countries as destination for processing, such as Greece, Ireland, Portugal and Spain.

Movements of goods for outward processing from European countries to CEEEs have been measured by Baldone, Sdogati e Tajoli (2001). They record for the textiles industry increasing shares of temporary exports over production, particularly from Germany (14.2 in 1994-96) and the Netherlands(7.5) which are then re-imported as apparel which account for respectively 24.1% and 42.2% of total production.

Freudenberg and Lemoine (1999) proposed an alternative measure referring to the UN Broad Economic Categories and grouping products according their end-of-use. Intermediate products increased their share both in imports and exports reaching, in 1996, 54% of total trade in both directions. Imports to EU12 countries were concentrated in 5 sectors: basic metal, chemicals, wood and paper, machinery and electrical machinery while exports included also textiles[4].

The most updated calculations by Feenstra and Hanson (1999), based on I-O tables to infer the purchases of each type of input and then to multiply this by the economy wide import share of that input, report for the US a share of 11.6%.

Campa and Goldberg (1997) repeated the same calculations for Canada, Japan and the UK, reporting an sharp increase in foreign outsourcing particularly in the UK with the machinery sector (both non-electric and electric) and transport equipment being the core industries to share production stages with other countries.

There is a potential of overestimation in the measure firstly introduced by Feenstra and Hanson (1996), at least if outsourcing to countries with cheaper resources has to be picked up. Data on imported intermediate products, available from input-output tables does not distinguish between low-wage and high-wage sources, and not even the share of imports does distinguish by country of origin[5].

In this paper we have used the definition of the CN classification which identifies at the 8-digit level those products which are parts and components and therefore can be considered intermediate stages of production. Our measure does perhaps underestimates the amount of outsourcing since stages of production can be outsourced also for products which are not precisely defined as parts and components. We think that is less the case in the sectors under study in this paper, particularly in the traditional one.

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[3] The phases of the production or commodity chain involved in this bidirectional movement of goods are opposite in a cardinal scale. Hong Kong exports to China raw materials to be processes in mainland China while China exports products which are finished but do not exclude simple processing, such as sorting or packaging, or service activities, such as marketing or transport (Feenstra and Hanson, 2001).

[4] Which probably came back to Europe as Clothing.

[5] Anderton and Brenton (1997), Anderton, Brenton and Oscarsson (2000) and Brenton and Pinna (2001) focus only on imports from non-OECD countries as a measure of outsourcing. They report increasing shares of trade of North-South type. Also here there is a potential for overestimation since imports by their final use cannot be distinguished.

One alternative we were left was COMEXT information on flows which are specifically declared at the custom borders for inward processing. For a firm the incentive to declare goods specifically for outward processing and then re-import was due to the gain in custom taxes which, after declaration, were due only to the part of value added processed abroad. Such incentive at least for trade between the EU and the CEECs has been lost after the Europe Agreements and the reduction or cancellation of taxes at the border.

Type of industry and firms

At the same time industry, firm and product level characteristics are likely to influence the propensity to fragmentation of production. Some recent economic analyses show that delocalisation of production in Europe has interested the textile and apparel industry, one of the 'sensitive' sectors along with footwear. Also firm-specific factors account for this decision. Firms have to face alternative strategic options such as raising product quality, increasing automation, and so on. Barba Navaretti, Falzoni and Turrini (2000) find that the probability of delocalising some production stages abroad is higher for these firms that focus on low-price, low- quality strategies. High quality products, in fact, require skilled labour that is in general scarce in low wage countries. Moreover, production technology must allow to effectively split production into different stages that can be carried out in different locations. The different stages of production should be characterised by different technologies (such as different facto intensities) that can exploit countries' differences (Baldone, Sdogati, Tajoli, 2001).

Moving to the export side, recent literature has disclosed that industries which rely most heavily on re-exports are those that produce differentiated products, such as apparel, footwear, toys and consumer electronics (Feenstra and Hanson, 2001).

How the costs implied in distance influence trade volumes of intermediate inputs? Till now the literature has expressed only some indirect evidence (mainly in the form of intuition) that de-localization of some stages of production is less likely to occur if countries are far away each other *(other things equal)*[6]. The following paragraph is devoted to the issue.

Distance and fragmentation of the production chain. What are the links?

That geography matters greatly for many economic interactions is a standard result in the literature. More than for capital, finance and technology it has been found important in trade flows analysis. Trade costs are typically assumed to be a function of a number of geographical variables (and also of cultural or political factors). Distance is the most important one. The estimates of the elasticity of aggregate trade flows with respect to geographic distance range between –0.9 to -1.5 (Venables, 2001)[7].

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[6] Feenstra and Hanson (2001) use the expression arms-length suppliers located abroad. Of course different voices contribute to the costs of de-localisation (vedi variabili importanti nei diversi studi)

[7] Trade costs have many different elements, some observable (transport cost), while others, such as costs of acquiring information, are much more difficult to observe directly (Overman,

Is this true for all types of cross border exchanges? Are imports of intermediate inputs used in different sectors equally influenced by distance? These questions have been discussed only indirectly in the literature.

If distance is a measure of the delocalization costs it is also likely that the effect of distance on trade exchanges will be a function of sectoral, firm and product level characteristics. Further along this line distance could have an effect on goods' movements at the borders depending also on the level of processing that commodities already contain.
Some insightful suggestions along this direction can be derived by some studies on exports flows. Theoretically, in perfect competitive markets, buyers pay the full transport cost. In this way markups from re-exports (last stages of production are moved to a richer country and then they are sold in the international markets) would be orthogonal to transport costs (Feenstra and Hanson, 2001). But if traders have market power they may absorb some of the transport costs by way of price discrimination (Feenstra and Hanson, 2001). In this case markups for the same product will differ according to the distance they are shipped. Another phenomena, 'the Washington Apple effect' (Alchian and Allen, 1964) describe the situation where fixed costs associated with transport induce firms to export relatively high-value goods. Therefore, when comparing several commodities, goods with the highest markups are the ones shipped the longest distances. Such conclusion can be extended to sectors and firms characteristics. Distance is likely to affect less the more profitable industries and firms where large markups can be realised.
Summing up, the two arguments predict that: 1) between two products the one with the higher markups are shipped the longest distance (Washington Apple effect); 2) referring to the same product, if the markup decrease in distance there is evidence of price discrimination so that to offset transport cost (Young, 1999; Feenstra and Hanson, 2001).
This reasoning has important implications when speaking about fragmentation of production. Goods involved in foreign processing have on average higher markups (Feenstra and Hanson, 2001). The less the processing embodied in a product the lower markups that can be realized. If it is also true that high markups allow a lower sensitivity of goods' movements to transport costs, then we should find that intermediate products flows exhibit a steeper decline to the increase of distance than final products.

This paper aims to shed some light in this direction. We investigate separately on how distance influences imports of intermediate inputs in two sectors which differ for technological content, industry characteristics and types of firms, and we consider the two activities in two countries which differ for type

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Redding, Venables, 2001). Hummels (1999) and Limao and Venables (2001) have found elasticities of transport costs with respect to distance between 0.2 and 0.3. Sharing a common border substantially reduces transport costs, and overland distance is around 7 times more expensive than sea distance. Being landlocked increases transport costs by approximately 50%.For a given distance, other factors which have been found can proxy such less visible costs include whether countries share large immigration flows or ethnic business network (Gould, 1994; Head and Ries, 1998 and Rauch and Trindade, 1999).

of specialization. We interpret distance as direct measure of the costs involved in spreading a production process across countries. In case intermediate inputs are a measure of how much a country is outsourcing abroad the costs of distance are a voice which counterbalance the gains from reducing production costs through the use of cheaper factors located abroad. We should then find therefore a higher propensity to outsourcing to neighbouring countries.
In a different way should be interpreted the possibility that distance does not affect imports of intermediate commodities. Some alternative explanations are left. Either some sectoral, firm or product characteristics are easing the costs implied in distance. Alternatively, trade in intermediate inputs in some sector should not be linked to the need of delocalizing abroad production previously run home in order to face the increased competition in the international markets.

Descriptive Analysis

We have employed data on trade in parts and components in the footwear sector or in the *New* one (data processing machines and electronic integrated circuits) reported in the EUROSTAT-COMEXT database. We have focused on the upstream activities of a production process, by looking at the highest level of detail (8-digit) and using the definition of 'parts and components' in the same CN classification. For each good COMEXT statistics show: the trade flow (imports or export); the reference period; the reporting country; the partner country; the unity of measurement (volumes or values). We have used Italian and German imports flows from about 60 countries[8]. All trade flows are expressed in values (thousands of ECU).

At first we look at intermediate inputs imports to know which is their sectoral share (how they weight on total sectoral imports). Then we are interested in showing the list of the principal partner countries of Italy and Germany. We also consider two periods (an average value for 1988-90 and a similar average for 1998-2000) in order to evaluate changes in time.

First of all, the two sectors are different as regards the importance of parts and components imports. In the *new* one they matter more. If we compare the shoe sector with the *new* one, we point out that the impact of shoe parts imports is less pronounced.
The figure of the Italian traditional sector demonstrates that between 1988 and 2000 imports of intermediate inputs has doubled: from 15.7% to 32.3% (Tab.1). We should infer that outsourcing has been increasing. We know that the fragmentation of the production chain and globalisation allow firms to reduce their costs, by moving the production of unskilled intensive activities to low wage countries. With the analysis of the partner countries we assess whether such a phenomenon is prevalent in Italian and German

[8] Our reporting countries are from EU and Central and Eastern Europe; Balkans; OECD countries; some Mediterranean countries such as Algeria, Tunisia, Egypt and Morocco; South Africa, Israel, Pakistan, India, Bangladesh, Thailand, Laos, Vietnam, Cambodia, China; Australia and the East Asian counties (Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan and Hong Kong).

manufacturing. However, Table 1 shows that in Germany shoe parts imports affect a very small share of sectoral flows: from 9% in the first period (88-90) to 10% in 98-2000. This is consistent with countries' different specialisation pattern: Italy has a competitive advantage in the traditional sector, where significant competition comes from countries with lower costs of labour, and Germany is strongly specialised in skilled and capital intensive activities.

Moving to the computer and electronic integrated circuits we found different results (Tab.2). In both countries intermediate inputs imports have a great impact on the sectoral performance. In Italy their share in total imports of the sector has increased by 8.5 percentage points between 1988-90 and 1998-2000 (from 63% to 71.5%). In Germany the increase has been more striking (23 percentage points between the two periods): from 55.9% to 79.9%.

The second dimension of our interest refers to the geographic distribution of trade partners in the two sectors and in the two countries. Italian imports of shoe parts almost come from the extra-EU area Tab.3a, 3b). In particular, in the first phase the overall traffic has involved Yugoslavia (46.8%) and India (19.9%), later on we register imports flows from CEEEs. At the top of the list there are Romania (41% of imports), Tunisia (11.8% of imports) and Albania (10.2% of imports). Such a picture suggests that growing competitive pressure from low wage countries makes it necessary to access to the outward processing practice as a means to save on the production costs and to gain market shares.
The study at the highest level of disaggregation (8-digit-CN code) shows that Italy exports mostly to Romania for the purpose of processing abroad and consequent re-import to create the final product. As already mentioned, usually import and export unit values differences are used as a measure of outward processing. Thus, the analysis of this bi-directional trade has been conducted by using unit values[9] (Tab.7) and refers to imports of parts and components as well as of finished product (the shoe). We find greater export unit values in the final good, but lower when moving to parts and components flows. Import unit values are much higher when observing uppers and other labour intensive parts movements. This may confirm that Italy is delocalising, presumably, the most unskilled intensive activities of the production of a shoe. But those imports of parts and components are further processed home by using skills and resources not available abroad and adding quality to the commodities of the Italian firms.

As regards Germany, we know that it has lost comparative advantage in the traditional sectors and this is confirmed by the low ratio of intermediate inputs imports (about 10%). Germany mostly imports the shoe completely processed. Traffic mostly interests extra-EU countries. During the 1988-90 term the main German suppliers were Italy, Yugoslavia, Portugal, India and Hungary (Tab.4a). In the next period (1998-2000) the list of the primary partners includes central, eastern European and Balkan countries (Tab.3b). These are

[9] Unit value is the value/volume ratio: V/Q

Poland, Czech Republic, Croatia and Romania. A more disaggregated analysis leads us to identify a German model of international delocalization of production, characterised by a tendency to transfer abroad a larger number of segments of the production process. This model certainly varies from the Italian one, where we witness a preference to import unskilled products to be finished at home. Such contrast has to be linked to the different national specialisation.

However, both countries share a common feature: the relocation of production towards Central and eastern European economies (geographic closeness seems to be fundamental) with the aim of fighting the stronger competition of the low wage countries. The phenomenon has been supported by three conditions: (i) the decrease of transportation, communication and coordination costs; (ii) trade liberalisation; (iii) geographic closeness. Shoe is in fact a product which needs proximity to markets because it is subject to frequent design changes (a fashion product) and a process of improvements that requires a constant interaction (face-to-face contact). The production and supply chain has to be managed and this involves an activity of information exchange and monitoring. Given the difficulties of codifying information, we may infer that spatial closeness is a central feature.

The analysis of the computer sector leads us to different findings: the fragmentation of the value chain also involves very distant countries. Since the possibility to fragment the production process is strictly linked to nature of the manufacturing of a commodity, our first hypothesis is that the *new* sector is more concerned by the segmentation of production but perhaps not of activities which have been delocalized. Data suggest on the import side that intermediate inputs are much more significant compared to the traditional one, and the choice of partner countries seems not to be affected by geographic distance.

In the first phase (Tab.5a) Italy principally imported from Germany, France, USA, United Kingdom, Japan, Netherlands and Singapore. Afterwards Netherlands became the main supplier of data processing machines and electronic integrated circuits (Tab.5b). As we can see, the level of imports penetration from low wage countries is not significant. We principally turns to the European areas, and also trade with extra EU markets concerns similar countries in size (population) and per capita income (Japan and USA). We have to underline that eastern Asiatic countries (Singapore, southern Taiwan and Korea) are beyond this speech. In fact, these countries knew a very quick growth which makes them like rich economies. Moreover, if one wants to differentiate PC components (8471) from the other High Tech parts (8542), it can be shown that Italy takes two different positions: even if importer in the computer field, it becomes specialised in a few productions catalogued with 8542 code.

The German figure is different from the Italian one because trade of High Tech inputs prevalently involves extra-EU countries. In the first analysis

period (Tab.6a), a good share of PC parts and electronic integrated circuits came from Japan (25.6%), United States (21.3%), United Kingdom (17.5%), Netherlands (8.8%) and Singapore (6.6%). Recently, the eastern Asiatic countries (Singapore, southern Korea, Malaysia and Taiwan), together with Netherlands, have become important in affecting total imports (Tab.6b).
It is clear that in the last years the Asiatic economies have known a process of new industrialisation and structural changes. After that, their specialisation moved from the traditional sectors to the new ones. Today, among these countries, the German economy imports from Singapore (8.3%), southern Korea (7.2%), Malaysia (5.2%) and Taiwan (4.6%). The analysis at a more disaggregated level shows the same results of Italy: although being a clear importer of PC parts, Germany is showing a specialisation in some high tech productions (inputs catalogued with the 8542 code). Probably both countries are moving themselves towards professional updating and workers' specialisation, but it is a long process to be completed. As regards distance, between the two countries there is a substantial difference: Germany registers intense trade flows with Asian economies, while in Italy this outcome is less clear. Probably that depends on the fact that the PC German market is more developed than the Italian one.
Moreover, as computers are standardised goods whose manufacture may require more information which is codifyable, distance may not to have a fundamental role in the productive process. Therefore, outsourcing concerns near countries in the traditional sector, but it doesn't happen in the high tech field.

The gravity approach

Recent developments in the literature teach us that geography and therefore distance matters greatly for many economic interactions (Venables, 2001). Trade flows, as investment and knowledge transfers have normally been found to fall off very rapidly with distance. It's a matter of fact that increasing distance implies higher costs in the exchanges activities across countries. In this paper our focus will be in particular on the role of distance as a direct measure of the costs involved in spreading a production process across countries. When we get to the empirical analysis, and we want to be able to understand the activity of outsourcing (international fragmentation of the production chain), we need a model that pick up its determinants: the gravity model. Developed in the 1960s (Linnemann, 1966) to explain bilateral trade flows, the gravity model describes the flow from an origin *i* to a destination *j* in terms of supply factors in the origin, demand factors in the destination and various stimulating or restraining factors related to the specific flow. It has proved to be a very successful empirical model of bilateral trade flows. Moreover, it can be compatible with both the traditional Heckscher-Ohlin and the Helpman and Krugman framework, without becoming a meaningless black box. In other words, the model can explain and synthesise the two approaches: the tendency for countries with high levels of income to trade more intensively with similar rich countries (intra-industry trade), and also the tendency to trade with different countries in terms of relative endowments (inter-industry trade).

The relationship we use to derive the gravity equation takes a CES form (see Overman, Redding, Venables,2001):

$$G_j^k = \left[\sum_i n_i^k \left(p_i^k t_{ij}^k \right)^{1-s^k} \right]^{1/\left(1-s^k\right)} \qquad (1)$$

This equation contains some number of countries and a number of industries. Country specific variables are sub-scripted and industries represented by super-scripts. Underlying the demand side of the model is a price index (or expenditure function) for each industry that aggregates different varieties in the industry and is denoted G_j^k. n_i^k is the number of varieties of industry *k* products produced in country *i*, p_i^k their fob prices, and t_{ij}^k the iceberg cost factor on trading industry *k* products from country *i* to country *j*. s^k is the elasticity of substitution between varieties, and sectors in which $s^k \to \infty$ produce homogeneous products.

If E_j^k is the total expenditure on industry *k* products in country j, then the sales of a single industry k product produced in country i and sold in j are given by

$$x_{ij}^k = \left(p_i^k \right)^{-s^k} \left(t_{ij}^k \right)^{1-s^k} E_j^k \left(G_j^k \right)^{s^k - 1} \qquad (2)$$

where x_{ij}^k is the quantity of an industry *k* good produced in country *i* and sold in country *j*. It contains information about bilateral trade flows between each pair of countries, *i* and *j*, and we can use it for assessing the impact of geography on these flows.

Equation (2) provides the basis for the following gravity trade relationship (derived by dropping the industry specific superscript, and multiplying by the number of varieties produced in each country and their price)

$$n_i p_i x_{ij} = n_i p_i^{1-s} \left(t_{ij} \right)^{1-s} E_j \left(G_j \right)^{s-1} \qquad (3)$$

It is usually estimated on aggregated data, but we use disaggregated data of a production sector as our estimates refer to the footwear and the computer sector separately. The left hand side is simply the value of trade between country *i* and *j*. The right hand side contains exporter country information (numbers of varieties and their prices), importer country information (expenditure and the price index), and trade cost information, t_{ij}. The exporter and importer country information can be proxied by income, area, population, and geographical features such as being landlocked. Trade costs t_{ij} are typically assumed to be a function of a number of geographical

variables, and perhaps also cultural and political ones. So, they are proxied by distance, and perhaps also by further between-country characteristics such as sharing a common border, a common language, history, or treaty relationship.

This specification has been modified and adapted over time to different technical needs, and we will estimate that one recently used by Di Mauro (2001). We will include in the model the following variables: an index of countries' difference in GDP per capita, an index of countries' similarity in size, geographic distance between the partner countries and a measure of the 'economic space' between the two countries, given by the sum of the two GDPs. The last variable is included to catch the need for a country to increase its market share because of the existence of economies of scale. Additional variables, such as a common border, a common language, or preferential trade agreements, that may reduce the transactions cost, can be introduced via dummy variables. This specification can easily be recognised as the 'gravity model'.

The general form of the gravity equation that we estimate is the following (Di Mauro,2001):

$$\ln Y_{ij} = \alpha + \beta_1 SUMGDP_{ij} + \beta_2 SIMILSIZE_{ij} + \beta_3 N/S_{ij} + \beta_4 \ln Dist_{ij} + \sum \gamma_k D_{kij} + \varepsilon_{ij}$$

with the following variable definitions: is the value of intermediate inputs imports from country *i* (home country) to country *j* (host country);

$$SUMGDP_{ij} = \ln(GDP_i + GDP_j)$$

$$SIMILSIZE_{ij} = \ln\left[1 - \left(\frac{GDP_i}{GDP_i + GDP_j}\right)^2 - \left(\frac{GDP_j}{GDP_i + GDP_j}\right)^2\right]$$

$$N/S_{ij} = \left|\ln\frac{GDP_i}{POP_i} - \ln\frac{GDP_j}{POP_j}\right|$$

Distij is the distance between countries i and j, Dkij are dummy variables (mostly country dummies or year dummies) used when appropriate.

The 'economic space' variable ($SUMGDP$)[10] is expected to have a positive impact on PC parts imports, but it shouldn't be significant in the shoe sector.

[10] We refer to GDP registered in the IMF (International Monetary Fund) Year Book (2000).

The index of size similarity (*SIMILSIZE*) takes values between - inf. (i.e. the log of a number near zero) in case of perfect dissimilarity and -0.69 (the log of 0.5) for perfect similarity. Similarity in size could have an uncertain effect on imports of parts in both sectors. We have to remember that the variable is a measure of absolute likeness as it refers to the absolute values of GDP. Thus, if we find a positive coefficient, this means that countries similar in size will trade more, as the Helpman and Krugman theory of increasing returns predicts(trade is of intra-industry nature). Therefore the sign of the variable is uncertain.

Differences in the development level of countries (N/S)[11] are measured here by the absolute difference in GDP per capita. A negative coefficient in the imports equation is a sign that Helpman and Krugman's theory of intra-industry trade prevails: similar countries trade more. This fact should concern more the new sector than the traditional one. Instead, a positive coefficient is consistent with conclusions from "classical trade models" stating that the exchanges across countries are determined by differences in their factor composition or technology. A positive sign is expected to affect the footwear sector, where our countries have to adopt a strategic response to increased competition in the domestic or export markets. Thus, firms could cut their costs by de-localisation of the labour intensive production's stages toward poorer countries, characterised by low level of wages.

As for distance, its negative sign is common to all the gravity exercises reported in the literature. Till now the literature has expressed only some indirect evidence (mainly in the form of intuition) that de-localisation of some stages of production is less likely to occur if countries are far away each other (*other things equal*)[12]. So, being distance a proxy for transport costs, its effect on imports of parts and components whose production has been delocalized should be negative.

The variables we used and their description can be found in Tables 8 and 9.

Results

Before presenting results we show the matrix of our variables correlation. Looking at the tables 10-13 we have to underline the distance variable behaviour. It is positively correlated to electronic components imports, while negatively to that of footwear parts. This is consistent with the evidence that our countries adopt a different strategy on the two sectors. Imports flows concerns neighbouring countries more in the traditional sector that in the new one. Another important fact regards the positive correlation between the *SIMILSIZE* and the N/S variable. This means that the greater countries' similarity in 'size', the greater their likeness in their per capita income level.

[11] Data on Population come from the IMF (International Monetary Fund) Year Book (2000).
[12] Feenstra and Hanson (2001).

The footwear sector

First we estimate the gravity equation for Italian imports of footwear parts and components. The first results (Tab.14) show *SUMGDP* is not significant, while *SIMILSIZE* seems to affect positively the dependent variable. The N/S variable has a significant and positive effect on imports and this is consistent with our hypothesis: the greater the difference in GDP per capita, the larger the volume of outsourcing. If the difference in countries' per capita income level (the N/S variable) increases by one percent, imports of footwear parts will rise by almost 0.8 percent. Already by looking at the descriptive analysis, we found an increase of intermediate inputs trade for the footwear sector. Such increase is coupled with an increase in bi-directional movement of goods, and that seems to be a strategic response to the new competitive pressure on markets. Italy, in fact, seems to react by moving the labour intensive stages of production toward much poorer but neighbouring countries. To confirm this remark about the location effect of a country pair on intermediate inputs imports, we find that the coefficient of the distance variable is negative and significant at the one percent level: the greater the distance between the partners, the lower the imports of parts. In particular, a one percent increase in the distance lowers imports by 1.6 percent. This means that in a traditional sector such as the footwear, the outward processing activity has to be linked to geographic contiguity. As already mentioned, larger distance increases transport costs, thus discouraging intermediate inputs exchange. Therefore, in the Italian footwear sector, the de-localisation of production concerns much poorer but neighbouring countries.

The coefficient of the EU dummy has the expected negative sign cause the descriptive analysis shows that trade of intermediate goods involves the countries of Central-Eastern Europe. Also a year dummy has been introduced to catch any fluctuation over the two periods (1988-90 and 1998-2000), but there are no significant findings.

The same regression run to estimate German imports of parts and components in the footwear sector lead to very similar results (Tab.14). Again, the difference in countries' income levels and spatial closeness seems to matter a lot, but the effect of the two variables is. greater for Italy than for Germany. A one percent increase in the N/S variable increases imports by 0.7 percent, while the same increase of the distance variable lowers the imports by 1.2 per cent. The EU and year dummies have not a significant coefficient.

Pooling the observations of the two countries we find identical results (Tab.14). The specific of the model was not any better when introducing country ($Dcountry$)and year (Dy) dummies, as their coefficient are not significant. That means that from 88-90 to 98-00 did not occurred important changes, and that the determinants of the dependent variable are the same ones either in Italy or in Germany.

As was mentioned above, distance could have an effect on goods' movements on the borders depending also on the level of processing that commodity already contain. The evidence of the literature (Alchian and Allen, 1964; Feenstra and Hanson, 2001) show that goods with the highest murk-ups are

the ones shipped the longest distances. This reasoning has important implications when speaking about fragmentation of production. The less the processing embodied in a product the lower mark-ups that can be realised. If it is true, we should find that distance affect less final products flows than intermediate ones. Thus, as a control, we compare results for intermediate inputs with that on imports of finished products, which should embody higher murk-ups (Tab.16). Our evidence in consistent with results in the literature and can be extended to both countries. Intermediate product flows exhibit a steeper decline to the increase of distance than final products. In Italy, for instance, a one percent increase in distance lowers imports of footwear by 0.4 percent, while the same increase produces a greater decline in footwear parts imports (1.6 percent).

Data processing machines and electronic integrated circuits

Moving to a sector with different characteristics such as production of computers and electronic components, we find different results (Tab.15). Our expected signs are confirmed. *SUMGDP* and *SIMILSIZE* variables have a significant and positive effect on imports. This is consistent with the fact that trade of high tech goods needs to be supported by the economic space available and the size similarity of the partner countries. This fact is further confirmed by the negative coefficient of the N/S variable: a one percent increase of it, reduces the imports of PC components by 1 percent. It means that the greater the difference in GDP per capita, the fewer Italy imports from that country. In this sector trade in intermediate inputs seems not to be linked to the aim of reducing production costs. Imports of high tech intermediate goods are motivated more by other reasons linked to the fragmentation of production. As the distance variable is not significant, this confirms the hypothesis that in this sector trade costs influence exchanges in a different way. Thus, we infer that the determinants of vertical specialisation in the new sector are different if compared to the traditional one. Distance have no influence on the decision of importing intermediate commodities for a number of reasons. Certainly the transport costs don't heavily affect the overall costs of production because of the nature of the manufacturing and the industry's characteristics. Also the simple process of technology and knowledge transfer makes easier the exchanges between countries located far away each other. The *DEU* and *DAsian* [13] dummies have a great impact on the dependent variable. The coefficient of the year dummy reveals that imports are increased from the first to the second period. However, the interaction with the main variables of the model are not useful.

As a control we have tested also imports of whole computers (final good) and we find that the determinants are similar to the ones found for its parts and components (Tab.16). *SUMGDP* and *SIMILSIZE* are significantly positive, the N/S variable has a negative coefficient, and distance is not significant. However, as was mentioned before, we have to take into account that the

[13] *DAsian* dummy refers to: Hong Kong, Taiwan, Singapore, South Korea, Malaysia, Indonesia and Philippines.

manufacturing of the new sector is very different from the traditional one. Thus, if we can produce shoes uppers in Romania and heels in Bulgaria to assemble them together in a normal shoe, when moving to the high tech sector things seems already to be different. In fact the intermediate inputs of an integrated circuit can be used in the manufacture of many products (all those commodities which have an electronic part). This means that in the *new* sector our results about the final products (computers) are not capturing the whole phenomenon.

As regards German imports of PC components, we can deduce the same results (Tab.15). The empirical evidence leads to similar comments also when Italian and German data are pooled in a single regression(Tab.15)[14].

Summing up, we find that in the traditional sector outsourcing concerns neighbouring countries, while in a new sector such as computers' production distance doesn't seem to be a relevant factor. Moreover, in the first one the fragmentation of production into discrete phases has introduced an intra-industry pattern of exchanges between different countries for their income levels, while in the new sector trade involves similar countries. So, we started the analysis with a common fact to all the gravity exercises reported in the literature: imports generally fall off with distance. However, our heterogeneous results on distance would suggest that, in the two sectors, we should interpret differently countries' exchanges of intermediate inputs. In other words, the fragmentation of a production process in order to better allocate phases of production across different countries, is not a clear indication of activities de-localised with the aim of reducing costs.

Conclusions

How the costs implied in distance influence trade volumes of intermediate inputs? Till now the literature has expressed only some indirect evidence that de-localization of some stages of production is less likely to occur if countries are far away each other.

In this paper we have looked at the determinants of intermediates inputs imports focusing on the role of distance as a direct measure of the costs involved in spreading a production process across countries. We have considered two countries (Italy and Germany), two different sectors (footwear and data machines) and two periods (end of the 80s and end of the 90s).

Our results show that in both countries intermediates inputs imports fall off with distance in the footwear sector but not in the integrated circuits one. Footwear is one of the 'sensitive' trade sector. One of the industries which has witnessed a strong increase in the competitive pressure from low-wage countries and where firms may have closed all or part of the production home and moved it out of the national boundaries. This type of trade of intermediates inputs is therefore sensitive to trade costs as transport costs.

[14] Regression's results without DAsian show that the distance variable becomes significant, with a positive effect on both Italian and Germany imports.

Imports of intermediate inputs of IT products are instead not influenced by distance. As a control we have tested also imports of whole computers (final good) and we find the determinants are similar to the ones found for its parts and components.

Our evidence would suggest that imports in intermediates inputs, an indication of increased possibilities of fragmenting a production process in order to better allocate phases of production across different countries, are not a clear indication of activities delocalized with the aim of reducing costs. At least not for the activities involved in the production of computers and their parts. This is true also when differences across income levels between trade partners contribute to explain such flows.
For these products (in our case inputs with an high technological content) the evidence from such disaggregated data would suggest that delocalization is less of an issue. They could have never been delocalized in the first place. Other characteristics of trade patterns and of the production technology will have to investigated in order to understand the map of their production and their movements across borders, i.e. the determinants of the fragmentation of their production process. Distance could play a different role in different sectors because of their different ability in creating markups. Markups can be used by sellers in the international markets in order to offset some costs. Distance has been found to be one of them. Therefore it can count less in sectors with higher markups.

Table 1 Footwear sector: sectoral share of parts and components imports

	88-90	98-00
Italy	15.75	32.35
Germany	10	9

Footnote: (M6406/M64)%

Table 2 PC and electronic integrated circuits: : sectoral share of parts and components imports

	88-90	98-00
Italy	63.04	71.5
Germany	55.94	78.99

footnote: (Mparts 8471/M Tot8471)%

Tab3a 10 most important Italian trade partners: imports footwear parts (88-90)

1	YUGOSLAVIA	46.80
2	INDIA	19.92
3	GERMANY	11.63
4	SPAIN	5.57
5	FRANCE	3.78
6	SWITZERLAND	3.48
7	TAIWAN	2.54
8	PAKISTAN	2.49
9	TUNISIA	2.07
10	UNITED KINGDOM	1.72
TOT		100.00
	INTRA-EUR15	20.66
	EXTRA-EUR15	79.34
TOT		100.00

Tab.3b 10 most important Italian trade partners: imports footwear parts (98-00)

1	ROMANIA	41.07
2	TUNISIA	11.78
3	ALBANIA	10.23
4	INDIA	9.56
5	HUNGARY	8.24
6	BULGARIA	7.02
7	SLOVAKIA	3.75
8	BOSNIA-HERZEGO	3.02
9	CZECH REPUBLIK	2.79
10	CROATIA	2.54
TOT		100.00
	INTRA-EUR15	5.14
	EXTRA-EUR15	94.86
TOT		100.00

Tab4a 10 most important Germany trade partners: imports footwear parts (88-90)

1	ITALY	21.27
2	YUGOSLAVIA	20.80
3	PORTUGAL	15.70
4	INDIA	13.85
5	HUNGARY	10.38
6	AUSTRIA	4.60
7	FRANCE	4.43
8	SOUTH KOREA	3.38
9	TUNISIA	3.14
10	TAIWAN	2.45
TOT		100.00
	INTRA-EUR15	36.99
	EXTRA-EUR15	63.01
TOT		100.00

Tab.4b 10 most important Germany trade partners: imports footwear parts (98-00)

1	PORTUGAL	20.82
2	ITALY	16.93
3	INDIA	15.07
4	HUNGARY	14.39
5	POLAND	10.59
6	CZECH REPUBL	8.37
7	CROATIA	6.29
8	AUSTRIA	2.79
9	INDONESIA	2.59
10	ROMANIA	2.14
TOT		100.00
	INTRA-EUR15	34.61
	EXTRA-EUR15	65.39
TOT		100.00

Tab.5a 10 most important Italian partners: PC parts and electronic integrated circuits imports (88-90)

1	GERMANY	22.25
2	FRANCE	20.97
3	UNITED STATES	16.64
4	UNITED KINGDOM	12.79
5	JAPAN	9.07
6	NETHERLANDS	6.32
7	SINGAPORE	5.72
8	TAIWAN	2.54
9	BELGIUM AND LUX	1.89
10	SWEDEN	1.82
TOT		100.00
	INTRA-EUR15	60.05
	EXTRA-EUR15	39.95
TOT		100.00

Tab.5b 10 most important Italian partners: PC parts and electronic integrated circuits imports (98-00)

1	NETHERLANDS	25.28
2	GERMANY	20.02
3	FRANCE	18.98
4	UTD. KINGDOM	13.23
5	USA	7.77
6	IRELAND	4.13
7	JAPAN	3.15
8	SINGAPORE	2.69
9	CANADA	2.41
10	SOUTH KOREA	2.36
TOT		100.00
	INTRA-EUR15	38.97
	EXTRA-EUR15	61.03
TOT		100.00

Tab.6a 10 most important Germany partners: PC parts and electronic integrated circuits imports (88-90)

1	JAPAN	25.60
2	UNITED STATES	21.32
3	UNITED KINGDOM	17.53
4	NETHERLANDS	8.89
5	SINGAPORE	6.62
6	FRANCE	5.69
7	AUSTRIA	3.98
8	ITALY	3.96
9	SWEDEN	3.24
10	TAIWAN	3.17
TOT		100.00
	INTRA-EUR15	27.60
	EXTRA-EUR15	72.40
TOT		100

Tab.6b 10 most important Germany partners: PC parts and electronic integrated circuits imports (98-00)

1	NETHERLANDS	28.69
2	JAPAN	12.59
3	USA	11.55
4	UTD. KINGDOM	10.00
5	SINGAPORE	8.29
6	FRANCE	8.00
7	SOUTH KOREA	7.18
8	MALAYSIA	5.19
9	TAIWAN	4.59
10	IRELAND	3.92
TOT		100.00
	INTRA-EUR15	17.49
	EXTRA-EUR15	82.51
TOT		100.00

Tab.7 Bidirectional trade: Italy-Romania (unit values)

	imports V/Q	**exports V/Q**
Footwear	9.75	15.30
Parts of footwear	17.54	6.51
Uppers and parts	20.01	16.15
Outer soles and heels	3.68	4.68
Parts of footwear of wood	3.00	7.00
Other parts of footwear	10.16	6.77

Tab.8a Italy: Variable Description

	Mean	**St. Dev.**
ln Y88-90 foot.	7.17	2.42
ln Y 98-00 foot.	6.44	3.41
ln all foot.	6.04	3.09
ln 88-90 PC	7.69	3.88
ln 98-00 PC	8.06	4.31
ln Y all PC	7.89	4.1

Tab.8b Italy: Variable Description

	Mean	**St. Dev.**
SUMGDP 88-90	7.40	0.40
SUMGDP 98-00	7.29	0.83
SUMGDP all	7.35	0.65

Tab.9a Germany: Variable Description

	Mean	**St. Dev.**
ln Y88-90 foot.	6.28	3.23
ln Y 98-00 foot.	5.6	3.73
ln all foot.	5.97	3.58
ln 88-90 PC	8.83	3.88
ln 98-00 PC	9.63	4.26
ln Y all PC	9.28	4.1

Tab.9b Germany: Variable Description

	Mean	**St. Dev.**
SUMGDP 88-90	7.59	0.35
SUMGDP 98-00	7.84	0.69
SUMGDP all	7.72	0.56

Tab.8c Italy: Variable Description

	Mean	St. Dev.
SIMILSIZE 88-90	-1.96	1.12
SIMILSIZE 98-00	-2.28	1.40
SIMILSIZE all	-2.12	1.28

Tab9.c Germany: Variable Description

	Mean	St. Dev.
SIMILSIZE 88-90	-2.13	1.19
SIMILSIZE 98-00	-2.72	1.53
SIMILSIZE all	-2.43	1.40

Tab.8d Italy: Variable Description

	Mean	St. Dev.
N/S 88-90	1.36	1.29
N/S 98-00	1.65	1.63
N/S all	1.51	1.48

Tab.9d Germany: Variable Description

	Mean	St. Dev.
N/S 88-90	1.39	1.29
N/S 98-00	1.87	1.73
N/S all	1.64	1.55

Tab.8e Italy: Variable Description

	Mean	St. Dev.
DIST 88-90	3530.66	3956.98
DIST98-00	3675.75	3951.10
DIST all	3601.96	3937.54

Tab.9e Germany: Variable Description

	Mean	St. Dev.
DIST 88-90	3475.86	3790.92
DIST98-00	3420.93	3781.03
DIST all	3448.16	3769.68

Tab. 10a Italy: Variables correlation matrix (foot. parts88-90)

	ln Y clz 88-90	N/S	SIMILSIZE	SUMGDP	DIST
ln Y clz 88-90	1.00				
N/S	0.07	1.00			
SIMILSIZE	0.26	-0.41	1.00		
SUMGDP	0.24	-0.18	0.53	1.00	
DIST	-0.23	0.29	0.09	0.04	1.00

Tab.10b Italy: Variables correlation matrix (foot. parts 98-00)

	ln Y clz98-00	N/S	SIMILSIZE	SUMGDP	DIST
ln Y clz98-00	1.00				
N/S	0.19	1.00			
SIMILSIZE	-0.11	-0.50	1.00		
SUMGDP	-0.01	0.38	0.02	1.00	
DIST	-0.36	0.13	0.29	0.03	1.00

Tab.11a Italy: Variables correlation matrix (PC parts 88-90)

	ln Y Pc 88-90	N/S	SIMILSIZE	SUMGDP	DIST
ln Y Pc 88-90	1.00				
N/S	-0.61	1.00			
SIMILSIZE	0.37	-0.42	1.00		
SUMGDP	0.20	-0.19	0.53	1.00	
DIST	0.13	0.30	-0.04	-0.02	1.00

Tab.11b Italy: Variables correlation (PC parts 98-00)matrix

	ln Y Pc 98-00	N/S	SIMILSIZE	SUMGDP	DIST
ln Y Pc 98-00	1.00				
N/S	-0.46	1.00			
SIMILSIZE	0.64	-0.51	1.00		
SUMGDP	0.27	0.39	0.00	1.00	
DIST	0.13	0.13	0.29	0.02	1.00

Tab.12a Germany: Variables correlation matrix (foot. parts88-90)

	lnYclz 88-90	N/S	SIMILSIZE	SUMGDP	DIST
lnYclz 88-90	1.00				
N/S	-0.16	1.00			
SIMILSIZE	-0.02	-0.40	1.00		
SUMGDP	-0.11	-0.16	0.60	1.00	
DIST	-0.23	0.30	0.04	0.05	1.00

Tab.12b Germany: Variables correlation matrix (foot. Parts 98-00)

	lnYclz 98-00	N/S	SIMILSIZE	SUMGDP	DIST
lnYclz 98-00	1.00				
N/S	0.15	1.00			
SIMILSIZE	0.12	-0.47	1.00		
SUMGDP	0.13	0.38	0.15	1.00	
DIST	-0.27	0.14	0.30	0.04	1.00

Tab.13a Germany: Variables correlation matrix (PC parts88-90)

	lnYPC 88-90	N/S	SIMILSIZE	SUMGDP	DIST
lnYPC 88-90	1.00				
N/S	-0.63	1.00			
SIMILSIZE	0.30	-0.39	1.00		
SUMGDP	0.17	-0.15	0.59	1.00	
DIST	0.12	0.32	-0.12	-0.01	1.00

Tab.13b Germany: Variables correlation matrix (PC parts 98-00)

	lnYPC 98-00	N/S	SIMILSIZE	SUMGDP	DIST
lnYPC 98-00	1.00				
N/S	-0.40	1.00			
SIMILSIZE	0.56	-0.46	1.00		
SUMGDP	0.24	0.34	0.16	1.00	
DIST	0.19	0.15	0.30	0.04	1.00

Table 14*: imports of footwear parts*

Dip.Var**: LN M foot parts**	**M foot.parts (I)**	**M foot.parts(D)**	**M footparts(I-D)**
Included observations	98	90	118
Excluded observations	20	27	47
C	19.414	23.192	17.797
	(4.887)*	(3.612)*	(4.776)*
SUMGDP	-0.087	-0.927	-0.440
	(-0.216)	(-1.287)	(-1.221)
SIMILSIZE	0.932	0.980	0.822
	(2.980)*	(2.543)**	(3.334)*
N/S	**0.787**	**0.673**	**0.819**
	(3.112)*	(2.213)**	(4.235)*
LNDIST	**-1.600**	**-1.207**	**-1.109**
	(-5.468)*	(-3.592)*	(-4.466)*
DY	0.872	0.132	0.357
	(1.626)	(0.182)	(0.822)
DEU	-1.702	-	-
	(-2.399)**		
DCOUNTRY			-0.104
			(-0.230)
DCONT			0.986
			(1.371)
Adjusted R-squared	0.240	0.107	0.158
S.E. of regression	2.542	3.089	2.828
Log likelihood	-226.873	-226.116	-458.114
F-statistic	6.094*	3.130**	6.010*

*1%;**5%;***10%

Table 15 ***Imports of PC and electronic integrated circuits parts***

Dip.Variable **LN M PC parts**	**M PC parts I**	**M PC parts D**	**M PC parts I-D**	**M PC parts I-D**
Included observations	98	98	197	197
Excluded observations	19	19	37	37
C	-6.531	-2.537	-4.849	-8.562
	(-1.652)	*(-0.540)*	*(-1.708)***	*(-2.864)***
SUMGDP	**1.537**	**1.624**	**1.545**	**1.337**
	*(4.076)**	*(3.393)**	*(5.426)**	*(4.376)**
SIMILSIZE	0.643	0.575	0.706	0.525
	*(2.187)***	*(2.045)***	*(3.535)**	*(2.460)***
N/S	**-0.969**	**-0.913**	**-1.006**	**-1.199**
	*(-3.996)**	*(-3.728)**	*(-5.969)**	*(-6.706)**
LNDIST	**0.433**	**-0.078**	**0.306**	**1.046**
	(1.290)	*(-0.228)*	*(1.288)*	*(4.848)**
DY	1.529	-0.572	0.593	0.584
	*(3.077)**	*(-1.053)*	*(1.607)*	*(1.463)*
DEU	3.521	2.381	2.801	2.836
	*(5.105)**	*(3.376)**	*(5.548)**	*(5.192)**
DASIAN	3.644	4.049	3.614	
	*(4.308)**	*(4.661)**	*(5.759)**	
DY*SUMGDP	-	-		
DY*SIMILSIZE	-	-		
DY*N/S	-	-		
DY*DIST	-	-		
Adjusted R-squared	0.631	0.580	0.584	0.513
S.E. of regression	2.376	2.432	2.465	2.667
Log likelihood	-219.680	-221.995	-450.922	-466.8849
F-statistic	24.725*	20.146*	40.144*	35.297*

*1%;**5%;***10%

Table 16 Imports of finished products (footwear and PC)

Dip.Var. **LN M final good**	**PC I**	**PC I**	**PC D**	**Footwear I**	**Footwear D**
Included observations	93	93	99	95	98
Excluded observations	24	24	18	23	19
C	-3.330	-19.573	-5.244	12.543	18.540
	(-0.178)	*(-0.831)*	*(-1.082)*	*(3.756)**	*(2.007)***
SUMGDP	1.322	0.496	1.829	-0.153	-0.681
	*(3.137)**	*(0.457)*	*(3.703)**	*(-0.451)*	*(-0.594)*
SIMILSIZE	0.657	0.683	0.604	0.706	1.377
	*(2.075)***	*(1.102)*	*(2.126)***	*(2.741)**	*(2.651)***
N/S	-1.080	-2.051	-1.125	0.366	-0.068
	*(-3.836)**	*(-4.890)**	*(-4.460)**	*(1.773)****	*(-0.214)*
LNDIST	**0.023**	**3.595**	**-0.046**	**-0.432**	**-0.662**
	(0.008)	*(1.049)*	*(-0.131)*	*(-1.912)****	*(-1.956)****
DY	1.697	3.610	0.979	1.305	3.073
	*(2.988)**	*(0.358)*	*(1.773)****	*(2.840)**	*(0.290)*
DEU	2.989	2.544	1.980		
	*(4.018)**	*(3.385)**	*(2.719)**		
DASIAN	3.200	3.059	3.165		
	*(3.380)**	*(3.330)**	*(3.532)**		
DY*SUMGDP		0.553	-		-0.269
		(0.462)			*(-0.207)*
DY*SIMILSIZE		0.428	-		-0.073
		(0.592)			*(-0.119)*
DY*N/S		1.556	-		0.992
		*(3.017)**			*(2.340)***
DY*DIST		-0.009	-		-0.369
		*(-1.754)****			*(-0.775)*
Adjusted R-squared	0.559	0.591	0.564	0.1	0.246
S.E. of regression	2.600	2.503	2.512	2.157	2.262
Log likelihood	-216.624	-210.882	-227.498	-204.73	-213.767
F-statistic	17.646*	13.075*	19.07432*	3.098**	4.513*

*1%;**5%;***10%

References

Alchian, Armen A.and Allen, 1964, University Economics, Belmont, CA: Wadsworth, 1964 and later editions.

Anderton, R., and P. Brenton (1998), "The Dollar, Trade, Technology and Inequality in the USA", *National Institute Economic Review*, 166 (October), pp. 78-86

Anderton, R., and P. Brenton (1999),"Outsourcing and Low-Skilled Workers in the UK", *Bulletin of Economic Research*, 51, pp. 267-286

Antweiler and Trefler, (1997), "Increasing returns and All That: A View from Trade", NBER Working Paper No.7941.

Arndt, Sven W. (1997), "Globalisation and the Open Economy", *North American Journal of Economics and Finance* 8: 71-79.

Arndt, Sven and Kierzkowski, (2001), Fragmenation: 2New Production and Trade Patterns in the World Economy", Oxford University Press, Oxford.

Baldone S., Sdogati F. Tajoli L. (2001),"Pattern and determinants of International Fragmentation of Production: Evidence from Outward Processing Trade between the EU and Central Eastern European Countries", *Weltwirtschaftliches Archiv*, Vol.137, pp.80-104.

Barba Navaretti, Falzoni and Turrini (2000), "The Decision to Invest in a Low Wage Country: Evidence from Italian Textiles and Clothing Multinationals", CEPR No.2395.

Brenton and Di Mauro (1999). The Potential Magnitude and Impact of FDI flows to CEECs', *Journal of Economic Integration*, 14, 59-74

Brenton, Pinna and Vancauteren, (2000), "Adjustements to Globalisation: a Study of the Footwear Industry in Europe", CEPS Working Document No.151.

Campa and Goldberg (1997), "The Evolving External Orientation of Manufacturing Industry: Evidence from four Countries", NBER Working Paper No.5919, Economic Policy Review, The Federal Reserve Bank of New York.

Deardorff, Alan V. (2000), "Factor Prices and the Factor Content of Trade Revisited: Wath's the Use?", *Journal of International Economics*, 50, 73-90.

De Groot, (1998), "Macroeconomic Consequences of Outsourcing", Vrije Universiteit Amsterdam (Free University)..

Di Mauro (2001), "Economic Integration between the EU and the CEEs: A Sectoral Study", Working Paper CEPS and ULB.

Egger and Falkinger, (2001), "A Complete Characterisation of the Distributional Effects of International Outsourcing in the Heckscher- Ohlin Model". Working Paper University of Zurich.

Feenstra, R. C. and G. H., Hanson, (1996), "Globalization, Outsourcing and Wage Inequality", *American Economic Review*, Papers and Proceedings, Vol 86, No. 2, May, pp. 240-245

Feenstra and Hanson (1999), "Productivity Measurement and the Impact of Trade and Technology on Wages: Estimates for the US. 1972-90", *Quarterly Journal of Economics*, 114(3), 907-940.

Feenstra and Hanson, (2001), "Intermediares in Entrepot Traede: Hon-Kong Re-export of Chinese Goods", NBER Working Paper No.8088.

Feenstra and Hanson, (2001), "Global Production sharing and Rising Inequality: A Survey on Trade and Wages", NBER Working Paper No.8372.

Freudenberg and Lemoine, (1999), Central and Eastern European Countries in the International Division of Labour in Europe, CEPII working paper N° 5.

Gould, David M. (1994); "Immigrant Links to the Home Country": Empirical Implications for U.S. Bilateral Trade Flows." *Review of Economics and Statistics* 76: 302-316

Grossman and Helpman, (2001), "Integration Vs. Outsourcing in Industry equilibrium", CESifo Working Paper No.460.

Grossman and Helpman, 2002, "Outsourcing in a Global Economy", NBER Working Paper 8728.

Head, Keith and John Ries, 1998, "Immigration and Trade Creation: Econometric Evidence from Canada", *Journal of International Economics* 31 (1): 47-62.

Hummels (1999a), "Toward a Geography of Trade Costs", mimeo University of Chicago.

Hummels (1999b), "Have International transportation Costs declined?", mimeo University of Chicago.

Hummels, Ishii and Yi, (1999), "The Nature and Growth of Vertical Specialisationin International Trade", mimeo, University of Chicago.

Krugman, (1995), "Growing World Trade: Causes and Consequences", *Brooking Papers of Economic Activities* pp.327-377.

Leamer, (1998) In Search of Stolper Samuelson linkages between International Trade and Lower Wages, in Susan M. Collins ed *Imports, Exports and the Amererican Worker*, Washington DC

Limao and Venables (2001), "Infrastructure, Geographical Disadvantage, Transport Costs, and Trade", *The World Bank economic Review*, vol.15, N0.3 451-479.

Linnemann H., 1966, "An Econometric Study of International Trade Flows", North-Holland Publishing Company, Amsterdam.

Overman, Redding, Venables, (2001), "The Economic Geography of Trade Production and Income: a Survey of Empirics", CEPR No.2978.

Rauch James E. and Victor Trindade, 1999, "Ethnic Chinese Networks in International Trade", NBER Working Paper No.7189.

Venables (2001) Geography and International Inequalities: the impact of new technologies, paper prepared for the World Bank annual conference on Development Economics, Washington May 2001

Young Alwyn, 1999, "Processing and Information: Value Added and the Circuitous Movement of Goods", Working Paper, Univ. of Chicago.