

DOES THE LOGISTICS SECTOR GAIN FROM MANUFACTURING
INTERNATIONALISATION? AN EMPIRICAL INVESTIGATION ON THE ITALIAN
CASE

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SOMMARIO

The present paper deals with the impact of manufacturing internationalisation, in the forms of international trade, cooperation agreements and FDIs, on the logistics sector. Some descriptive statistics are provided for the Italian macro-areas and the logistics employment and an econometric analysis is carried out at the “regional-industry” level (20 NUTS2 regions and 11 logistics sub-sectors) with reference to the Italian case in the period 1996-2001. Results show that export and FDIs positively affect the logistics employment variation in 1996-2001, while import and cooperation agreements display a negative or not significant impact.

Key words: logistics, employment, internationalisation, trade, FDI, cooperation agreement

JEL codes: F23; L91; R12; R15

1. INTRODUCTION

The globalisation of the economy, which has been fostered by the trade barriers reduction and the falling transport, communication and co-ordination costs (GLAESER and KOHLHASE, 2004; KRUGMAN *et al.*, 1995), has changed the structure of the production processes from being integrated in one plant to being segmented in different plants and in different countries, at least as long as the costs for logistics and reorganisation do not overwhelm the marginal advantage. As a result, trade flows do not only include final goods, but also of intermediate and unfinished goods being transferred from one country to another in order to be processed according to a specific cooperation agreement (BALDONE *et al.*, 2002; 2006). At the same time, an increasing share of firms undertake foreign direct investments (FDIs) in order to have a direct control of their production activity, and this phenomenon gives birth to intra-firm trade, which is growing alongside inter-industry and intra-industry trade.

Therefore, nowadays manufacturing firms may adopt three internationalisation strategies: the traditional international trade, cooperative agreements and FDIs. The impact of these internationalisation forms is highly debated in literature, both at microeconomic scale, i.e. on the internationalised firm (for an overview see LIPSEY, 2002; BARBA NAVARETTI and VENABLES, 2004; MOLNAR *et al.*, 2007) and at macroeconomics scale, i.e. on the national and regional economic system (see, among others, BERNARD and JENSEN, 1997; HELG and TAJOLI, 2005; SAVONA and SCHIATTARELLA, 2004; MARIOTTI and PISCITELLO, 2007).

Our paper deals with the effects of manufacturing internationalisation, at a regional scale, on a strategic industry that is highly affected by this phenomenon, i.e. logistics. This holds intuitively because the increasing flows of people and goods to be moved and the related warehousing activities imply a reorganization of the supply chain and a growth in the demand for logistics services. However, the entity of the impact on the logistics sector depends on the specific internationalisation strategy, undertaken by the internationalised firms (trade, cooperation agreement, FDI), on the type of sale and purchase contracts used in internationalisation (cost, insurance and freight – CIF – contract and the free on board – FOB – contract), on the type of logistics organisation of the manufacturing firm (insourcing, outsourcing, co-sourcing) and, finally, on the degree of complementarity or substitution among the different internationalisation forms.

At least to our knowledge, the present paper is the first empirical work investigating the impact of internationalisation on logistics with an econometric model and considering simultaneously the three forms of internationalisation.

The paper is structured into seven sections. The introduction is followed by a description of the different internationalisation strategies. Section three is devoted to the literature review of the impact of internationalisation on the logistics employment. Section four focuses on data and methodology. The descriptive statistics and the econometric analysis are presented and

discussed in sections five and six, respectively. Conclusions and policy recommendations follow.

2. INTERNATIONALISATION STRATEGIES

The internationalisation process consists of three main strategies: (i) international trade; (ii) cooperation agreements and (iii) FDIs.

International trade (i) is the most common form of internationalisation and the first entry mode adopted by a firm facing the global scenario, because it implies low involvement and risky degree for the internationalised firm. It consists of the exchanges of not only final goods and services through the national borders but also intermediate and unfinished goods. These exchanges should be realised among different industries (inter-industry trade), within the same industry (intra-industry) and between the parent company and its foreign affiliates (intra-firm trade). Precisely, more than three quarters of the international trade is developed by the multinational enterprises (MNEs) and more than a quarter is intra-firm (IETTO-GILLIES, 2005). This is related to the fact that a new model of production is spreading: the previously integrated productive activities are segmented and spread over an international network of production sites, which implies the international fragmentation of production (see, among others, ZYSMAN and SCHWARTZ, 1998; ARNDT and KIERZHOWSKY, 2001). Therefore, the one-to-one relationship between the characteristics of a domestic economy and its specialisation in final goods is nowadays less common, because each single country only seldom can be considered “the producer” of a particular final good. Rather, each country might specialise in stages of the production chain, which may have different lengths (BALDONE *et al.*, 2002; 2006). The international fragmentation of production is pursued through the other two forms of internationalisations: cooperation agreements and FDIs.

Cooperation agreements (ii) are more advanced and risky than international trade. This strategy is mainly adopted by small and medium sized enterprises (SMEs) because it does not require capital investment and is of short – medium term.

The cooperation agreement is entered into by a firm and a foreign partner operating backward, forward or in the same stage of a value chain. This agreement refers to the development, distribution, and/or manufacture of final goods to be sold in the foreign market. It is a non-equity strategy because it is developed through agreements between a firm and one (or more) of its suppliers or distributors in order to supply, manufacture, or distribute goods and/or services without equity sharing. These agreements can take the following forms: a) licensing; b) franchising; c) alliances; d) subcontracting (for a detailed overview see IETTO-GILLIES, 2005).

Cooperation agreements are typically linked to the exchange of intermediate and unfinished goods being transferred from one country to another in order to be processed. Such intermediate and unfinished goods give rise to the so-called “processing trade” (PT), that is, trade in goods being exported (or imported) for reason of processing abroad and subsequently re-imported (or re-exported). Under such so-called ‘trade regime’, data are collected on four different types of trade flows: (i) temporary exports of goods exported by a EU country to be processed in a non-EU member and (ii) re-imports by the EU of the processed goods on one

hand; (iii) temporary imports of goods to be processed in the EU and (iv) re-exports of those goods to the country of origin outside the EU, on the other. The first two flows measure the so-called outward processing trade (OPT); the last two measure inward processing trade (IPT) (BALDONE *et al.*, 2006).

Finally, FDIs (iii) represent the most articulated and binding mode to enter the foreign markets, because it requires a significant capital investment and a medium-long term obligation. FDIs are the main tool adopted by medium and large sized firms, which aim to share the capital of a foreign firm, eventually with one or more partners. The literature defines two typologies of FDIs: greenfield investment, when a new firm is settled, and brownfield investment, in case of merger and acquisition of a foreign firm, when foreign firms merge with or buy more than 10% of the assets of national firms. Besides, FDIs are labelled equity agreement, because it implies company shares.

According to the development level of the country of destination and, therefore, to the activities which are transferred abroad, FDIs are distinguished between vertical investments (VFDIs) and horizontal investments (HFDIs). In particular, firms which undertake vertical investments actually dismantle the structure of their value chain through the re-localisation of the labour-intensive activities in low-cost countries. VFDIs are principally driven by differences in factor endowments between home and host countries, and they are explained by the need to exploit location-specific factors of production (cheap labour, natural resources, specific skills) (MARKUSEN *et al.*, 1996). VFDIs typically represent an alternative strategy to the cooperation agreements (VENABLES, 1999) because they imply the transfer of labour intensive activities of the production process to low-wage countries. HFDIs are instead defined as the replication of all or part of the home production process in a foreign country “thus producing similar output in both home and host countries, and economising on any cost of exporting” (MOLNAR *et al.*, 2007).

3. THE IMPACT OF INTERNATIONALISATION ON LOGISTICS

3.1 Conceptual framework

The fragmentation of production process and the growing global trade rate highly impact on the logistics activities. The expansion into large international markets brings about not only more supervision, coordination and control over geographical-dispersed activities, but also the extension of activities and functions that are generally centralised at the headquarters level such as logistics, R&D, marketing, etc. (BLOMSTROM *et al.*, 1997; FORS and KOKKO, 1999). Logistics, therefore, plays a key role in connecting the different import and export markets and the vertically disaggregated components of production system, which are widespread in the world (YIEMING *et al.*, 2002; MAGGI *et al.*, 2008).

Specifically, the impacts of the different internationalisation strategies on the logistics industry can be summarized as follows.

Firstly (a), an increasing large share of goods and people flows must be managed by transport and other logistics functions. These flows are composed by: (i) the imported inputs and the exported final goods (trade strategy); (ii) the movements of intermediate and unfinished goods being transferred from one country to another in order to be processed (cooperation agreements, which give rise to the processing trade – OPT and IPT); (iii) the flows of goods and people between the different production and distribution foreign affiliates of the MNEs (FDIs strategy). Specifically, as concern this last point, when a multinational enterprise undertakes a VFDIs, it tends to transfer there semi-manufactured products, which once completed, will be re-imported in the home country, thus increasing the flows of goods. An impact on the logistics services is also generated by HFDIs because the MNE replaces the whole production cycle in the foreign countries, thus extending logistics activities.

Secondly (b), the need to connect very distant locations and the high number of input and output markets have increased the complexity of the logistics system and have extended the supplying, production and distribution networks. As a result, both the manufacturing firms and the logistics providers have restructured their networks, rationalising the logistics nodes (ECMT, 1996; MAGGI, 1998).

These two impacts increase the demand for logistics services, causing two additional effects (c, d). The logistics providers' industry is restructuring (c): the logistics firms are becoming larger and are changing their supply, offering an increasing number of "integrated" and high value-added services, able to manage the entire supply chain or a significant part of it (BREWER *et al.*, 2001; BOSCACCI, 2003).

Finally, the labour demand of workers specialised in planning, managing and controlling the logistics activities is increasing (d). The present paper focuses on this final effect, investigating the impact of trade, cooperation agreements and FDIs on the labour demand of the logistics sector at the regional-industry level (20 NUTS2 regions and 11 logistics sub-sectors). The aim is to verify the relationship between internationalisation and the employment of the logistics sector.

The effects of internationalisation on the logistics employment are closely related to (a) the way in which the logistics services are managed; (b) the type of sale and purchase carriage contracts that has been adopted by the manufacturing firms towards foreign customers and suppliers; (c) the relationship of complementarity or substitution among the different internationalisation strategies.

As regards the first issue (a), the effect on employment may occur either within the internationalised manufacturing firm, when logistics is managed in-sourcing, or within the logistics suppliers, when logistics is outsourced, or both at the manufacturing firm and its logistics suppliers, in case of co-sourcing (joint management of logistics services). Specifically, the paper focuses on the impact of internationalisation on the logistics sector, hence in case of outsourcing and co-sourcing.

As far as the contracts are concerned (b), it is expected a higher positive impact on labour demand when a firm adopts the cost, insurance and freight (CIF) sale contract and the free on board (FOB) purchase contract. The CIF sale contract, actually, implies the need to transport the output from the firm's establishment to the customer's production or distributive units, in other words in this case transportation is to the firm's charge; the FOB purchase contract

implies that the firm has to manage the handling of the suppliers' raw material, semi-components or manufactured products. In both cases, therefore, it is the manufacturing firm to manage logistics, thus inducing an increase of the logistics services' labour demand. Opposite results can be found when the sale contract is FOB and the purchase contract is CIF.

A final issue that must be taken into account concerns the relationship of complementarity and substitution that might occur among the three internationalisation strategies (c) (for a detailed overview see AITKEN *et al.*, 1994). Specifically, the literature mainly focuses on the relationship between trade and cooperation agreements or trade and FDI. Generally, when production segments are moved towards low-wage countries (VFDIs or cooperation agreements), an increase of the flows of goods occurs; therefore, the strategies are complementary. When, instead, FDI is undertaken in an industrialised foreign country (HFDI), in order to reproduce the production cycle of the parent company, it generally substitutes export¹. In the first case, the effect of internationalisation on the logistics' employment is amplified, because of the increasing temporary export and import flows. In the second case, the impact on logistics is negative since the goods that were previously exported are now produced directly in the host country.

3.2 Empirical evidence

The issue of the impact of internationalisation on the employment is highly debated and analysed by several empirical studies.

Specifically, as concern the trade strategy, the magnitude of trade's impact on the regional labour markets remains widely contested (RICHARDSON, 1995; KAPSTEIN, 2000); generally, international trade changes the labour composition (high skilled and low skilled workers), causing a decline in relative demand for low skilled employees (BERNARD and JENSEN, 1997; KRUGMAN *et al.*, 1995, FEENSTRA and HANSON, 1996). The effects on employment depend on different factors, such as the industrial structure and the trade patterns (MARKUSEN *et al.*, 1991).

However, there is no evidence on the effects of international trade on the employment of a specific industry, such as logistics, which, as above underlined, is clearly affected by the global growth of import and export flows.

The empirical studies on the cooperation agreement strategy mainly define it "international fragmentation of production" and measure it in terms of processing trade (IPT and OPT) because of the lack of data. Data on IPT and OPT are collected since 1988 at the EU Member country level. The reason for data collection about this special type of trade is that goods re-imported and re-exported after processing abroad are subject to customs treatment particularly advantageous to final imports and exports. Actually, the data on these flows are underestimated (for details see BALDONE *et al.*, 2002) mainly because firms are not obliged to declare the processing trade.

Specifically, HELG and TAJOLI (2005) estimate that, during the 1990s, international fragmentation of production has given a contribution to the increase of the high skilled-to-low

skilled labour ratio in Italy, while it has not influenced the German demand for high skilled labour.

FEENSTRA and HANSON (2004) demonstrate that in USA, from 1972 to 1994, trade affects particularly the employment of those firms involved in the process of international fragmentation of production. These firms are exposed to changes in the employment composition and in the workers' relative wages.

The results of the empirical study by CORÒ and VOLPE (2006) show that in the period 1996-2002 the loss of jobs in the Italian industrial areas, which are involved in the international fragmentation process, is smaller than the loss in the other areas.

SAVONA and SCHIATTARELLA (2004) investigate the impact of this form of internationalisation on the services' labour demand over the period 1991-1996 within the Italian NUTS3 provinces specialised in the *made in Italy* sectors. The authors provide some evidence on the transportation sub-sector, concluding that internationalisation towards low wage countries shows a significant impact on the more traditional services' employment (wholesale, transport and financial services).

Finally, as concern the FDI's strategy, the empirical studies have mainly investigated the direct effects of investments (on the employment of the internationalised firms – direct effects), while less attention has been placed on the employment of the local context in which the firms belongs to, i.e. on their suppliers, distributors, competitors (indirect effects).

The studies on the direct impact agrees in finding a positive relationship between outward FDI's and the MNE's employment (see, among others, SLAUGHTER, 2000 on the US MNEs; HEAD and RIES, 2002 on the Japanese MNEs; CASTELLANI *et al.*, 2008 on the Italian MNEs).

The results change when the unit of analysis is both the investing firm and the local context in which it operates. Specifically, MARIOTTI *et al.* (2003) adopt as unit of analysis the "regional industry"ⁱⁱ and find that the variation in employment in the foreign affiliates of Italian manufacturing MNEs has significantly influenced the labour intensity of domestic production, in the period 1985-95. In particular, the impact is negative for vertical investments made in less developed countries and positive for horizontal and market-seeking investments in advanced countries. ELIA *et al.* (2007) use the same unit of analysis and investigate the impact of outward FDI's upon the demand for high and low skilled workers, in Italy throughout the period 1996-2002. It results that outward FDI's have significant negative effects on the demand for low skilled workers in the parent company's regional-industry, but this is true only for FDI's in lower wage countries (Central and Eastern Europe). Conversely, the demand for high skilled workers does not seem to be influenced by outward FDI's.

Only the study by MARIOTTI and PISCITELLO (2007) devotes attention to the indirect effects on the tertiary sector and only one study, at least to our knowledge, focuses on the logistics sector (MAGGI *et al.*, 2008). Specifically, MARIOTTI and PISCITELLO (2007) investigate the impact of FDI's on the services' labour demand within the industrial districts in Veneto region in Italy in 1996-2003, finding that the more internationally involved an industrial district, the higher the employment growth in the service sector.

MAGGI *et al.* (2008) provide evidence on the relationship between FDIs undertaken by the industrial district firms located in Veneto region and the employment change in the logistics industry, which has occurred in the same industrial districts in 1996-2003. It results that, although all the internationalised industrial districts show an increase in the logistics labour demand, only in a few of them an internationalisation degree above the average is positively correlated to a logistics' employment growth.

4. DATA AND METHODOLOGY

The aim of the paper is to investigate the effects of internationalisation (in the forms of trade, cooperation agreements and FDIs) on the logistics industry employment at the regional-industry level, where the “regional industry” is defined as the ensemble of firms operating in the same logistics sector and localised in the same geographical NUTS2 region (11 logistics sub-sectors and 20 regions) (Table 1). Therefore, the dependent variable is the employment growth rate in the logistics sectors of each Italian region that has occurred in the period 1996-2001. The underlying assumption is that the logistics activities are mainly carried out by suppliers located near the manufacturing firms' domestic establishments, provided that it has also been demonstrated that geographical proximity has a strong influence on the selection of the logistics suppliers in Italy (ISFORT, 2003). The dependent variable measures the employees of all logistics firms located in Italy, independently from their ownership (national or foreign). Data come from the Italian Statistical Institute (ISTAT) and refer to the NACE “I – Transport, warehousing, communications” category, at the third digit level, that is the eleven logistics sub-sectors presented in Table 1ⁱⁱⁱ.

Table 1 Italian NUTS2 regions and the NACE logistics sub-sectors

Regions	Logistics sub-sectors	NACE Codes
Abruzzo	Land transport; transport via pipelines	60
Basilicata	Transport via railway	60.1
Calabria	Other land transport	60.2
Campania	Transport via pipelines	60.3
Emilia Romagna	Water transport	61
Friuli Venezia Giulia	Sea and coastal water transport	61.1
Lazio	Inland water transport	61.2
Liguria	Air Transport	62
Lombardia	Scheduled air transport	62.1
Marche	Non-scheduled air transport	62.2
Molise	Supporting and auxiliary transport activities; activities of travel agencies	63
Piemonte	Cargo handling and storage	63.1
Puglia	Other supporting transport activities	63.2
Sardegna	Activities of travel agencies and tour operators; tourist assistance activities	63.3
Sicilia	Activities of other transport agencies	63.4
Toscana		
Trentino Alto Adige		
Umbria		
Valle d'Aosta		
Veneto		

Both data on international trade and cooperation agreements come from the Coeweb dataset by ISTAT. These data allow to distinguish between definitive imports and exports and outward and inward processing trade (IPT and OPT). The former represents the international trade while the latter is typically used in the literature as proxy for cooperation agreements. The information on these strategies refer to the years 1996 and 2001^{iv} and are expressed in terms of growth rate.

Outward FDI, which have been undertaken by the Italian manufacturing MNEs, are measured as the cumulated sum of the employees in their foreign affiliates from 1994 to 2000^v. The lag between FDI and employment stands on the hypothesis that foreign affiliates need one-two years time to fully work and this delay is necessary to the logistics suppliers to reorganise their activities in order to satisfy the new customers' demand. The data source for the Italian outward FDI is Reprint dataset, which is developed by the Department of Management Engineering of the Milan Polytechnic and it is sponsored by the Italian Institute for Foreign Trade - ICE. Reprint provides a census of both foreign affiliates of Italian firms, and Italian affiliates of foreign firms (in terms of number of employees and sales) since 1986, and it is yearly updated (for details see MARIOTTI and MUTINELLI, 2007).

Outward FDI have been divided into three categories according to the host countries: OECD countries, Central and Eastern European (CEE) countries, and other developing countries (DEV), in order to catch the effects related to the different investments' typologies (vertical vs. horizontal investments). As suggested by the literature (MARKUSEN *et al.*, 1996), when a MNE undertakes FDI in a developed country (OECD), it replicates there the complete production structure of the home establishment (HFDIs). When FDI are undertaken in CEE the MNE re-deploys only part of its production process (VFDIs). The former is more often market driven; the latter, therefore, is principally driven by differences in factor endowments between home and host countries (CARR *et al.*, 1998). Furthermore, VFDIs give birth to intra-firm trade more than HFDI. Finally, FDI towards DEV countries can be either vertical or horizontal because low-wages countries like China and Brazil also represent a final market where to sell the output. The different production structure associated to the vertical and horizontal FDI are likely to have a different impact on the logistics organisation.

The methodology employed to test the impact of internationalisation on the employment of logistics sector consists of a descriptive statistics and an econometric analysis. The latter makes us of the following OLS estimation:

$$\Delta_{96}^{01} \log Emp_{s,r} = \alpha_{s,r} + \beta_1 \Delta_{96}^{01} \log Y_{m,r} + \beta_2 \log \sum_{t=94}^{00} FDI_{m,p} + \beta_4 \log I_{m,r} + \beta_3 \log X_{m,r} + \beta_5 \log IPT_{m,r} + \beta_4 \log OPT_{m,r} + \varepsilon_{i,p}$$

where s are the 11 logistics sectors, r the 20 NUTS2 regions (from now on "regions"), m the whole manufacturing sector^{vi}.

$\Delta_{96}^{01} \log Emp_{s,r}$: is the logarithmic difference of the number of logistics workers in 1996-2001, in each sector s and region r ;

$\Delta_{96}^{01} \log Y_{m,r}$: is the logarithmic difference of the manufacturing production (m), measured in terms of value added, in 1996-2001, in each region r ;

$\log \sum_{t=94}^{00} FDI_{m,r}$: is the total cumulated sum of FDIs in the manufacturing sectors (m) undertaken by the regions r from 1994 to 2000;

$\Delta_{96}^{01} \log I_{m,r}$: is the logarithmic difference of the import flows of manufacturing goods (m) in 1996-2001, undertaken in each region r ;

$\Delta_{96}^{01} \log X_{m,r}$: is the logarithmic difference of export flows of manufacturing goods (m) in 1996-2001, undertaken in each region r ;

$\Delta_{96}^{01} \log IPT_{m,r}$: is the logarithmic difference of IPT of manufacturing goods (raw materials, semicomponents) (m) in 1996-2001, undertaken in each region r ;

$\Delta_{96}^{01} \log OPT_{m,r}$: is the logarithmic difference of OPT of manufacturing goods (raw materials, semicomponents) (m) and in 1996-2001, undertaken in each region r .

The equation suggests that the demand for logistics workers in 1996-2001 within a region is related to: (i) growth rate of the manufacturing industries' value added (Y), (ii) export and import growth rate, (iii) IPT and OPT growth rate and (iv) the cumulated sum of the manufacturing FDIs undertaken in 1994-2000^{vii}. The Y variable is measured in terms of value added, following BERMAN *et al.* (1994). The value added is expressed at current prices for the years 1996 and 2001 and it comes from the Italian Statistical Institute (ISTAT).

Finally, the following dummy variables have been included: DummySector, DummyMacroarea, DummyBirth and DummyDeath. The first two dummies allow to control for the logistics sub-sectors and geographic macroareas (North-East, North-West, Centre, South & Island)' heterogeneity. Besides, the third and the fourth dummies have been added in order to take into account for the significant changes in the number of logistics employees in the period of analysis, which may be due to the economic cycle; specifically, as concerns the cases of firms' birth (DummyBirth: working firms in 2001 and not working in 1996) and "death" (DummyDeath: working firms in 1996 and not working in 2001).

As we stated in Section three, the impact of internationalisation on the logistics employment change depends also on the way in which the logistics services are managed (in-sourcing, outsourcing and co-sourcing), on the type of sale and purchase carriage contracts (CIF or FOB) that have been adopted by the manufacturing firms towards foreign customers and suppliers, and on complementarity and substitution among the internationalisation strategies.

As regards the first two issues, a higher positive impact on the logistics employment growth is expected if the firm outsources and adopts the CIF sale contract and the FOB purchase contract. Opposite results hold in case of FOB sale contract and CIF purchase contract. Unfortunately, in Italy no detailed information is available on the in-sourcing, outsourcing and co-sourcing modes as well as on the carriage contracts' typologies at regional and logistics industry level. Thus, the different effects on the logistics labour demand cannot be investigated. The empirical evidence, referring to the whole country, shows a limited rate of outsourcing^{viii} and a significant use of FOB sale contracts and CIF purchase contracts. Nevertheless, the transport of goods is more likely to be outsourced when goods cross the national borders than when they are moved within the domestic country. Besides, as stated by

the Italian Exchange Office, 61% of export flows is done by FOB contracts and 67% of import by CIF (CONFETRA, 2002).

Complementarity and substitution among the three different internationalisation categories must also be taken into account, since it makes it difficult to study the separate impact of each form of internationalisation on the employment and raises endogeneity problems in the econometric analysis. In order to face this problem, the three forms of internationalisation have been studied in three separate equations:

$$\Delta_{96}^{01} \log Emp_{s,r} = \alpha_{s,r} + \beta_1 \Delta_{96}^{01} \log Y_{m,r} + \beta_4 \log I_{m,r} + \beta_3 \log X_{m,r} + \varepsilon_{i,p} \quad (1)$$

$$\Delta_{96}^{01} \log Emp_{s,r} = \alpha_{s,r} + \beta_1 \Delta_{96}^{01} \log Y_{m,r} + \beta_5 \log IPT_{m,r} + \beta_4 \log OPT_{m,r} + \varepsilon_{i,p} \quad (2)$$

$$\Delta_{96}^{01} \log Emp_{s,r} = \alpha_{s,r} + \beta_1 \Delta_{96}^{01} \log Y_{m,r} + \beta_2 \log \sum_{t=94}^{00} FDI_{m,p} + \varepsilon_{i,p} \quad (3)$$

Equation (3) has been further developed by disaggregating the FDIs in three categories according to the country of destination: OECD, CEE and DEV. The high correlation among the three categories of FDIs suggested to run three different regressions (n. 4, 5 and 6 in Table 3).

5. DESCRIPTIVE STATISTICS

The descriptive statistics shows that the logistics employment growth is mainly linked to the NACE 63 sector “Supporting and auxiliary transport activities; activities of travel agencies” (+61%), which concerns the majority of the logistics firms which offer integrated logistics services (the so-called “integrated logistics operators”) and to the 62 sector “Air transport” (+16%) (Table 1). Specifically, within the first sector there has been an increase of the cargo handling and storage category and of the other supporting transport activities. Within the sector 62, an increase of the scheduled air transport has occurred, thanks to the low cost air companies. Besides, the employment of the sectors 60 and 61 present a negative growth rate (-3% and -16%, respectively). In particular, within the land transport, there is a high reduction of the employment in the rail transport (-45%), mainly caused by the national railway company’s restructuring process; while the employment of road transport increases (+11%). Within the 61 sector the employment cut regards the inland water transport (-63%), while the sea and costal water transport shows slight increase (+8%).

It is important to emphasise that the two sectors which show a higher growth rate (62, 63) concern logistics services, which are characterised by a higher value added than mere transport, like: handling and storage of replacements, product personalisation (packaging, labelling, etc.) and final manufacturing.

Table 1 Growth rate of employment (%) in the logistics sector (1996-2001)

Logistics sub-sectors	NACE codes	Growth rate
Land transport; transport via pipelines	60	-2.90
Water transport	61	-16.61
Air Transport	62	15.79
Supporting and auxiliary transport activities; activities of travel agencies	63	60.72
Total	60,61,62,63	13.24

Table 2 provides some descriptive statistics for the dependent variable (logistics employment growth rate) and the explanatory variables. The mean value of the dependent variable is positive, suggesting that an increase in employment in the logistics sector seems to have occurred between 1996 and 2001. The Italian regions seem to have experienced an increase of manufacturing activities between 1996 and 2001, provided that the mean value of Y is positive and the standard deviation is low. FDIs are a cumulated sum and are divided among OECD countries, CEE and DEV.

As concerns international trade and cooperation agreements, imports seem to have grown more than exports and OPT more than IPT. However the two proxy that account for cooperation agreements also display a high variance.

Table 2 Descriptive statistics

Variables	Observations	Mean	Standard Deviation	Min	Max
$\Delta_{96}^{01} \log Emp_{s,r}$	220	0.238626	1.285315	-4.999462	5.438079
$\Delta_{96}^{01} \log Y_{s,r}$	209	0.395039	0.111172	0.229822	0.652597
$\Delta_{96}^{01} \log I_{m,r}$	220	0.492684	0.141822	0.247222	0.778814
$\Delta_{96}^{01} \log X_{m,r}$	220	0.372082	0.196257	0.151052	1.031591
$\Delta_{96}^{01} \log IPT_{m,r}$	220	0.299361	0.737895	-1.496861	1.707773
$\Delta_{96}^{01} \log OPT_{m,r}$	220	0.397717	0.802057	-1.254498	1.756098
$\log \sum_{t=94}^{00} FDI_{t,q,r}$	220	8.379364	2.102443	1.665818	11.69310
$\log \sum_{t=94}^{00} FDI_{oeed,t,s,r}$	220	7.577596	2.114383	1.472472	11.02135
$\log \sum_{t=94}^{00} FDI_{cee,t,s,r}$	220	6.684566	2.263201	-0.248461	10.40282
$\log \sum_{t=94}^{00} FDI_{dev,t,s,r}$	220	7.082232	2.434536	-1.89712	10.15128

Table 3 shows the geographic distribution of the FDIs among the different host countries (destination of the investments) and the four macro-areas (origin of the investments) in which Italian regions have been divided. These macro-areas have been identified according to the economic characteristics of the Italian regions and are: North-West, which is typically composed of both large and small-medium enterprises highly internationalised, North-East, which is mainly composed of small-medium enterprises highly internationalized, Centre,

which is typically composed of SMEs less internationalized, and South and Islands, which are less developed and which display a much more sporadic economic activity.

OECD countries attract 50% of the Italian MNE' investments (in terms of foreign workers), DEV and CEE follow with the 26% and 24%, respectively. The two macro-areas which display the higher internationalisation degree in terms of FDI are North-West and North-East (55% and 24%, respectively). Conversely, from Centre and South & Islands only the 12% and 9% of FDIs are originating.

Finally, table 4 shows the growth rates of all the other variables considered in the equations (1), (2) and (3) for each of the Italian macro-areas. North-West and North-East, more internationalised in terms of FDIs, experience also the higher increase in the logistics employment (19% and 14%, respectively). Besides, the North-East presents interesting growth rates in OPT (183%) and it is followed by the Centre, which also shows the higher growth rate of IPT (97%). The propensity to adopt OPT can be explained by the presence in the two areas of about one third of the Italian industrial districts, respectively, which are specialised in the made in Italy sectors (fashion, home furniture and furnishing, food and traditional mechanical engineering products). These districts are small and medium sized, thus more inclined to choose the strategies of internationalisation of export and cooperation agreements (IPT, OPT), as stated in section 2. In fact, the empirical evidence underlines a significant share of processing trade of made in Italy goods between Italy and, particularly, the Central and Eastern European countries, where the labour wage is lower (BALDONE *et al.*, 2002).

The North-West, instead, presents a negative growth rate of OPT and the lower value of IPT, because it mainly hosts medium and large sized firms, which are more willing to undertake FDIs.

As concerns trade, high growth rates of export are registered by the South and Island (39%) and the Centre (28%), the North-East and North-West follow. The position of the South & Islands has, nevertheless, to be taken with caution, since export in 1996 and 2001 departing from this macro-area accounts only for 7% and 8% of the total Italian export. Similarly, South & Islands account the higher growth rate of import (69%) and Centre follows (65%).

The most interesting evidence that seems to emerge from table 2 and 3 is a clear correlation between the increase of logistics employment and both the share of FDI and the increase of manufacturing activities (Y), since the highest values are reported in the two macro-areas of the Northern part of Italy. The relationship between logistics employment on the one hand and both import and IPT on the other hand seems to be clear too, but with a negative sign. Indeed, the regions located in the areas with the highest import (Centre and South & Islands) display the lower growth of logistics employment. Finally, a less clear evidence emerge from export and OPT: the areas that displays a high value of these types of internationalisation (e.g. North-East and Centre) have both high and low growth rates of logistics employment. A possible explanation is that export and OPT are the typical forms of internationalisation adopted by SMEs, which are highly diffused in these areas and which tends to in-source part of their logistics activity. A regression analysis is therefore required to better understand the relationship between logistics employment and the different forms of internationalisation.

Table 3 Distribution of employees (%) in the foreign affiliates of Italian MNEs, by macroarea (1994-2000)

Macro area	FDI tot	FDI OECD	FDI CEE	FDI DEV
Centre	11.9	44.5	26.9	28.6
North-East	24.2	49.8	21.5	28.6
North-West	54.9	52.6	25.0	22.5
South & Islands	9.0	46.3	17.1	36.6
Italy	100.0	50.4	23.7	26.0

Table 4 Growth rate (%) in 1996-2001, by macroarea

Macro area	Logistics employment	Y	Import	Export	IPT	OPT
Centre	11.7	47.4	64.7	28.0	96.8	58.7
North-East	13.6	64.0	52.6	27.4	44.4	182.9
North-West	19.0	59.0	54.1	21.0	31.1	-12.3
South & Islands	6.8	37.2	69.2	38.7	88.4	15.8
Italy	13.2	51.9	57.2	25.8	62.5	39.5

6. ECONOMETRIC FINDINGS

This section aims to verify whether the logistics' employment growth, showed by the descriptive statistics, is due to an increase in the internationalisation process, in all its forms, undertaken by the Italian regional-industries, and/or it depends on other variables.

It results that all the explanatory variables, with the exception of OPT, display an impact on the logistics employment change (Table 5)^{ix}. Specifically, the increase of manufacturing value added at regional level contributes to the logistics employment growth. Transport and logistics services are, indeed, inputs of manufacturing goods, thus their demand depend on the manufacturing demand (DANIELIS, 2002).

Besides, the positive impact of the FDIs and export on the logistics employment occurs mainly because of the increase of goods and people flows, the logistics system's complexity and the geographical extension of logistics networks. Moreover, the increase in the logistics employment may be found in the characteristics of the internationalised firms, which are larger than domestic uni-national firms (LIPSEY, 2002; BARBA NAVARETTI and VENABLES, 2004; CASTELLANI and ZANFEI, 2006), and hence, as the empirical literature stresses, are more likely to outsource logistics and to use CIF sale contract (CONFETRA, 1997; ISFORT, 2003). Furthermore, even when transport from an Italian plant to a foreign country is managed by foreign customers through the use of FOB sale contract, it is likely that foreign logistics suppliers have branches in Italy and/or subcontract the road transport to an Italian firm working in the same supply chain. In Italy the outsourcing rate of the road transport is significant; this transport mode is mainly managed by truck owner-operator or cooperatives (CONFETRA, 2002).

The positive and significant relationship between FDIs and the dependent variable persists when FDIs are disaggregated into the macro-areas of destination (OECD, CEE, DEV).

On the other hand, a negative relationship occurs between import and logistics employment. This may be related to the fact that the imports of goods towards Italy are more likely to be managed by foreign suppliers (CONFETRA, 2002).

As regards IPT and OPT, which are proxies of the cooperation agreement strategy, the former has a significant negative effect on the logistics employment growth, and the latter shows a positive but not significant sign. These results can be explained as follows. As regards the OPT, the positive sign derives from the fact that transportation of intermediate and unfinished goods is mainly undertaken by Italian firms, which temporarily export raw material and/or semi-components to be processed abroad and later re-import the processed goods in Italy. However, as we said in section two, most of processing trade is undertaken by SMEs, which mainly tend to manage logistics in-sourcing (ISFORT, 2003). This explains why the coefficient is not significant; OPT is likely to manifest its positive and significant impact on the logistics employment of the internationalized firms, which in-source logistics; but this issue is not part of our analysis. On the other hand, in case of IPT, the flows of goods are more likely to be managed by the foreign (non-EU) countries, which transport the raw material and/or semi-components towards Italy and then transport them back. These flows tend to be managed by logistics suppliers located in the non-EU countries also because of the lower transport costs. This explains why an increase of IPT has a negative and significant impact on the logistics employment growth.

Finally, all the six regressions show fixed effects for the 11 logistics sectors and the macro-areas. Besides, DummyBirth and DummyDeath show the expected signs: positive the first and negative the second.

7. CONCLUSIONS

In an era where internationalisation has become a strategic challenge that firms have to face in order to remain competitive, the analysis of the effects of this phenomenon has assumed a key role. It is widely recognised that the impact of internationalisation highly differs, according to the sector (manufacturing and services) and the geographical context, which is taken into consideration. There is, therefore, a need to carry out in-depth investigations about these effects and the factors driving them, in order to be able to convert potential negative effects into positive ones. Specifically, the social consequences of internationalisation, such as unemployment and job insecurity, are dominating the public debate and are warring both the policymakers and the population, especially on a regional scale. Particularly, a common opinion is widespread, that global trade and international fragmentation of production cause a decrease of employment rate in the home country.

The present paper gives evidence that the logistics sector, which supports the internationalisation strategies through the management of the growing flows, is not losing jobs but gaining them. This is the first empirical work, at least to our knowledge, considering all the three different internationalisation strategies (trade, cooperation agreements and FDIs)

and testing their specific impact on logistics employment by means of an econometric analysis.

The results are very interesting in terms of policy implications: internationalisation allows an extension of the logistics services' demand and therefore an increase of the logistics providers' potential market. This means that when logistics becomes more complex and strategic, as it happens within the internationalisation processes, manufacturing firms tend to outsource logistics activities to specialised suppliers which can reach economies of scale and scope. Therefore, the sector gains in terms of employment and competitiveness. As a consequence, it is important to remove the actual obstacles that limit the development of the logistics sector in Italy, such as the inefficient and insufficient transport infrastructures and the lack of culture on logistics that mainly dominates within the Italian SMEs. Moreover, there is also a negative consequence of internationalisation: more fragmentation and more global trade induce more flows and therefore more transport, with negative externalities affecting the environment. In fact, when the distances are not very big, the predominant mode of transport in Europe is the road, which is the most pollutant. Specific policies, aiming to reduce the externalities of the logistics activities and to promote the transport modes more environmental friendly, are advocated.

Further research is needed to investigate this issue, providing an answer to the following questions. First, in countries where the foreign logistics MNEs have a high share of the logistics market, such as Italy, does the employment growth concern both the domestic and foreign firms or mainly the last ones, which are larger and more competitive and offer integrated and high value added services?

Second, if a significant part of the internationalised manufacturing firms manage logistics inside (in-sourcing), an investigation on the impact of internationalisation on the logistics employment in the manufacturing company is required.

8. References

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Table 5 Results of the OLS

Dependent variable	$\Delta_{96}^{01} \log Emp_{s,r}$	$\Delta_{96}^{01} \log Emp_{s,r}$	$\Delta_{96}^{01} \log Emp_{s,r}$	$\Delta_{96}^{01} \log Emp_{s,r}$	$\Delta_{96}^{01} \log Emp_{s,r}$	$\Delta_{96}^{01} \log Emp_{s,r}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta_{96}^{01} \log Y_{s,r}$	1.2198**	1.0956*	1.1873*	1.1455*	1.3039**	1.0880*
$\Delta_{96}^{01} \log I_{m,r}$	-0.8640*					
$\Delta_{96}^{01} \log X_{m,r}$	0.5959*					
$\Delta_{96}^{01} \log IPT_{m,r}$		-0.1615*				
$\Delta_{96}^{01} \log OPT_{m,r}$		0.0856				
$\log \sum_{t=94}^{00} FDI_{t,r}$			0.0598**			
$\log \sum_{t=94}^{00} FDI_{t,r}$				0.0564*		
$\log \sum_{t=94}^{00} FDI_{t,r}$					0.0606**	
$\log \sum_{t=94}^{00} FDI_{t,r}$						0.0445*
_cons	-0.8888***	-1.1108***	-1.6161***	-1.5209***	-1.5753***	-1.3926***
DummyBirth	Yes	Yes	Yes	Yes	Yes	Yes
DummyDeath	Yes	Yes	Yes	Yes	Yes	Yes
DummySector	Yes	Yes	Yes	Yes	Yes	Yes
DummyMacroarea	Yes	Yes	Yes	Yes	Yes	Yes
n. obs.	209	209	209	209	209	209
F-statistics	19.39	19.34	20.63	20.57	20.68	20.49
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-2 – adj	0.6141	0.6135	0.6160	0.6153	0.6167	0.6143

***, **, * indicate significance at 1, 5, 10%, respectively

Appendix

Table 6 Correlation matrix

	$\Delta_{96}^{01} \log Y_{s,r}$	$\Delta_{96}^{01} \log I_{m,r}$	$\Delta_{96}^{01} \log X_{m,r}$	$\Delta_{96}^{01} \log IPT_{m,r}$	$\Delta_{96}^{01} \log OPT_{m,r}$	$\log \sum_{t=94}^{00} FDI_{tot,t,s,r}$	$\log \sum_{t=94}^{00} FDI_{oecd,t,s,r}$	$\log \sum_{t=94}^{00} FDI_{cee,t,s,r}$	$\log \sum_{t=94}^{00} FDI_{dev,t,s,r}$
$\Delta_{96}^{01} \log Y_{s,r}$	1.0000								
$\Delta_{96}^{01} \log I_{m,r}$	0.3489	1.0000							
$\Delta_{96}^{01} \log X_{m,r}$	-0.1498	0.4101	1.0000						
$\Delta_{96}^{01} \log IPT_{m,r}$	0.4470	0.2305	-0.2663	1.0000					
$\Delta_{96}^{01} \log OPT_{m,r}$	0.1730	0.2533	0.0638	0.2042	1.0000				
$\log \sum_{t=94}^{00} FDI_{tot,t,s,r}$	-0.2855	-0.2918	-0.0704	-0.5367	0.0073	1.0000			
$\log \sum_{t=94}^{00} FDI_{oecd,t,s,r}$	-0.2454	-0.2540	-0.0989	-0.4802	0.0460	0.9849	1.0000		
$\log \sum_{t=94}^{00} FDI_{cee,t,s,r}$	-0.3399	-0.3357	-0.1367	-0.4924	0.0249	0.9794	0.9506	1.0000	
$\log \sum_{t=94}^{00} FDI_{dev,t,s,r}$	-0.3042	-0.2919	0.0207	-0.6532	-0.0639	0.9698	0.9275	0.9331	1.0000

Notes

ⁱ More precisely, a part of the literature highlights that, even if the international production replaces exports, the investment may increase the export opportunities of correlated products or the same final products from the country of the investment towards other foreign countries (CANTWELL, 1994; IETTO-GILLIES, 2005).

ⁱⁱ The “regional-industry” is defined as the ensemble of firms operating in the same industrial macro-sector – constituted of interdependent sectors belonging to the same filière – and localised in the same geographical region, therefore investigating both the direct and indirect effects.

ⁱⁱⁱ The I 64.1 sub-sector (postal activities and couriers) has been excluded by the analysis because of the lack of data.

^{iv} In this period the EU member countries were 15 and the non-EU members 36, therefore temporary export and import and re-export and re-import towards Eastern European countries were counted as part of OPT and IPT. On 2008 the number of EU Members increased to 27.

^v It is worth observing that, given a certain MNE, the workers of its foreign affiliates have been distributed among the NUTS 2 regions where one or more MNE’s plants are located. The share of foreign affiliates’ workers has been attributed to the NUTS 2 regions where the MNE’s plants are located proportionally to the plants’ size in terms of number of employees. This method makes it possible to look at the impact of outward FDI not only on the employment of the region the MNE’s head quarters belongs to, but also on the employment of all the regions where the firm is present with its plants.

^{vi} The manufacturing sector is identified by the NACE codes from 15 to 45.

^{vii} FDIs have been included as cumulated sum instead of growth rate because their effect on the employment is continuous along the time, provided that investments occurred in the past need logistics services also at the present time. The same does not hold for export and cooperation agreements, which manifest and exhaust their effect in the moment they occur.

^{viii} The analyses carried out to measure the outsourcing rate in Italy do not show the same results; this is mostly due to the different samples and methodologies, which have been adopted (see for an overview, MINISTERO DELLE INFRASTRUTTURE E DEI TRASPORTI, 2001; CONFETRA, 2002). According to AT Kearney-ELA, Italy is characterised by one of the lowest outsourcing rates in Europe: 13% in 1997 and 16% in 2004.

^{ix} Robustness checks show that regressions fully respect all the OLS assumptions except the normality, which is not completely reached because of the Kurtosis of the distributions. However, it is likely that such a problem is due to the low number of data and that it disappears asymptotically.