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**Conference Paper**

## The sustainable development of the European logistics industry: an analytic approach at micro and macroeconomic levels

44th Congress of the European Regional Science Association: "Regions and Fiscal Federalism", 25th - 29th August 2004, Porto, Portugal

**Provided in Cooperation with:**

European Regional Science Association (ERSA)

*Suggested Citation:* Boscacci, Flavio (2004) : The sustainable development of the European logistics industry: an analytic approach at micro and macroeconomic levels, 44th Congress of the European Regional Science Association: "Regions and Fiscal Federalism", 25th - 29th August 2004, Porto, Portugal, European Regional Science Association (ERSA), Louvain-la-Neuve

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# THE SUSTAINABLE DEVELOPMENT OF THE EUROPEAN LOGISTICS INDUSTRY: AN ANALYTIC APPROACH AT MICRO AND MACRO-ECONOMIC LEVELS

Flavio BOSCACCI

## **1. Introduction**

As an economical point of view, logistics sector offers a wide range of increasing relevance services in order to guarantee goods inlet within the market and make them available for further manufacture and consumptions. This process has to be in line with the new conditions settled by global competitive models.

Within the traditional enterprise culture, each single process aimed at raw materials, end and semi-manufactured products movements is included within firms activities hold in single departments, which are involved in transport and storage operations: Forwarding, Warehousing, Purchasing, Sale and Management Departments.

In opposition to this matter, it has been nowadays developed a modern management vision of logistics process: it can be seen, with a unitary identity, as a cost center and as a component of marketing-mix; thus, it is now possible to think at logistics as a productive field of process rationalization, functional integration and market development.

From this new concept of internal logistics it derives the trend of “make or buy:” a long-term decision making process aimed at reducing flow costs at the minimum rate, provided that the purpose of maximum quality service offered to the customer keeps being respected. It is through the enterprise decisions of transport or stocking outsourcing that it has been possible to foster the development of specialized firms providing customers with wide skills of effective management both of single parts and of the whole logistics support chains for specific supply chains.

Despite the fact that the position of this paper is willing to consider logistics as a set of integrated services, it is not given for granted that this position is being shared by all experts and workers in the field.

In addition, one should take into account that the present sectorial vision of spatial flows goods services has often objected the proper policy makers’ consideration of logistics role to the economical system effectiveness.

As it follows, logistics is here dealt according to the topics of internal efficiency and effectiveness for enterprises as well as for the whole sector. Then, in the last section of the paper, the outcomes of the present logistics process occurring in Europe are drawn, within the framework of sustainable development.

## **2. Why logistics industry and which analytics outlines**

### *2.1 Definitions*

Therefore, what is logistics and how should it be dealt once aimed at economical development and sustainability?

As a matter of fact, the expression “logistics” was first minted in “Business Administration” manuals during the 50s, outlining the evolution process of North American grocery goods distribution, where the influence of moving and stocking costs on final price is higher. Logistics trends started spreading within manufacture firms in the course of the 60s and 70s, while their development in Europe was going even slowly.

As indicated in figure 1, during the first phase, logistics was seen as a new function, interacting with former enterprise activities, first developed in the distribution chain, then in the supplying chain, finally within the process of manufacturing conversion.

On the contrary, during the second phase firms got the profit of a comprehensive approach to the abovementioned three processes. Thus, they introduced within their organizational model the so called “integrated logistics”. The aim of the system was to reach consisted in the optimization of goods flows, whatever their nature is (raw materials, end and semi-manufactured products), starting from the origins and ending with the final destination.

Finally, at the third phase co-ordination and integration of logistics activities overcame the borders of a single firm and involved any organization contributing to add value to the product, from the first supplier to the final seller. Thus the logistics that had to be optimized was not only the enterprise one, but it was also a compound system involving all the enterprises belonging to the supply chain. It consequently raised the concept of supply chain management, which is the managerial side of any supply chain.

International Bodies provide with a relevant range of definitions, outlining the whole evolution process. In 1986 the Council of Logistics Management with reference to integrated logistics was stating (Ballou, 1999): “*Logistics is the process of planning,*

*implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods and related information flow from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements”.*

While in 1994 the International Center for Competitive Excellence was referring to Supply Chain Management using the following words (Ballou, 1999): *“The supply chain management is the integration of business processes from end-user through original suppliers that provides products, services and information that add value for customer”.*

*Fig. 1 Evolution steps of logistics concept*

<b>Phases</b>	<b>What is logistics?</b>	<b>What does logistics deal with?</b>
I phase: logistics as independent function	It is an enterprise function	a) distribution b) supplying c) production support
II phase: integrated logistics	It is an integration process within a firm	It integrately manages the whole logistics process regarding the firm
III phase: logistics as supply chain management	It is an integration process among firms	It integrately manages the whole logistics process regarding the end product supply chain

*Source: Maggi e Borruso, 2001*

One can consequently come to the following definitions of logistics process and logistics operator:

- *logistics process*: it is a set of activities which, according to an holistic approach, plan and manage goods flows as well as the related information along the supply chain.
- *logistics operator*: it is the firm that plans and carries part or the whole logistics process on behalf of its customers.

Thus:

*Logistics sector (or the industry of logistics) is the whole set of logistics operators employed in a specific economic system.*

## 2.2. *Logistics as a growing sector*

Within the logistics sector, the market tends to give value to those firms which are capable of controlling, integrating and managing all the phases forming the logistics process, which is meant to be considered as a “unitary complex product”. As a consequence, it happens to be “the winner” to those entrepreneurs who are ready to face even relevant changes in their activities as for organizational models and market policies, as well as those who are skilled in proposing new services to their clients and partners.

By whom is therefore nowadays represented logistics sector? Three main categories of logistics operators can be mentioned:

- a. entrepreneurs of traditional sections: transport and warehousing operators, terminal operators, carriers and forwarders;
- b. enterprises come from industrial *spill over*: from logistics activities divisions concerning motor, plastic, iron, food, housing appliances, electronic industries...
- c. the common *incumbent* of mass public services: Post and Railway Enterprises.

From these entrepreneurial realities great logistics operators grew, whose turnover counts hundreds millions euros, who can work on international markets and interact with more dynamic industrial frameworks. In Italy, as it generally happens for all the split productive structures, the greater logistics operator stands side by side with a myriad of small and medium size operators who, besides keeping ordinary contacts with their clients, look at more innovative solutions, provided they respect the limits of their investment capabilities.

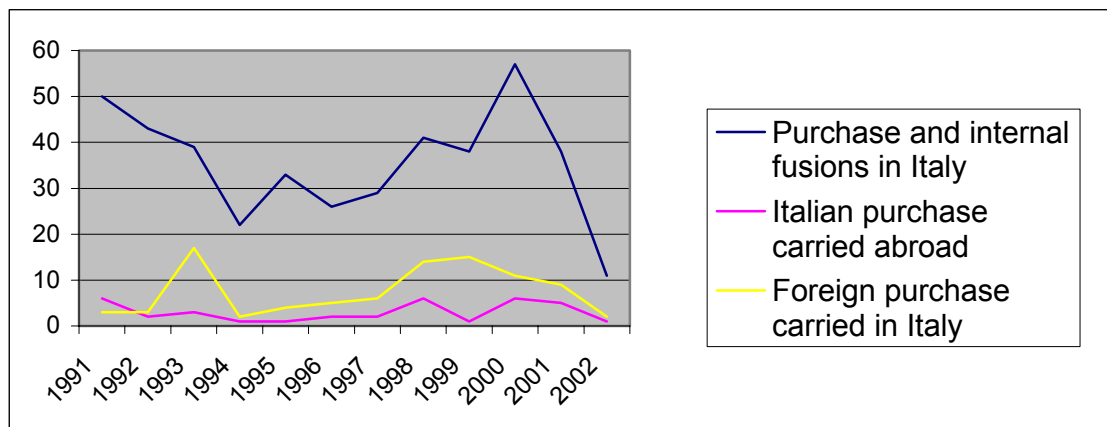
The shortage and lack of homogeneity of statistics data does not allow a satisfactory knowledge of the whole sector structure, even if in recent times in Europe it has been observed a lively flow of entrepreneurial concentration. The main and most numerous operations concerning this concentration has been accomplished through *Mergers&Acquisitions* operations (see figure 2); the most relevant initiative has been with no doubts carried by Dutch firms, followed by the English and German ones that every year acquire tens of enterprises to insert in their international networks.

One can notice a parallel growing of technological and managerial investments, among which those listed in Figure 3 clearly show the European situation as concerns the agreement rate of logistics enterprises to the application of the most innovative techniques of communication and data dealing.

Following this reconstruction and development path, firms lose their characteristics of strict belonging to a specific “activity division”, and they acquire the capability of integrating the logistics process, thus being able to master sectorial activities within the supply chain.

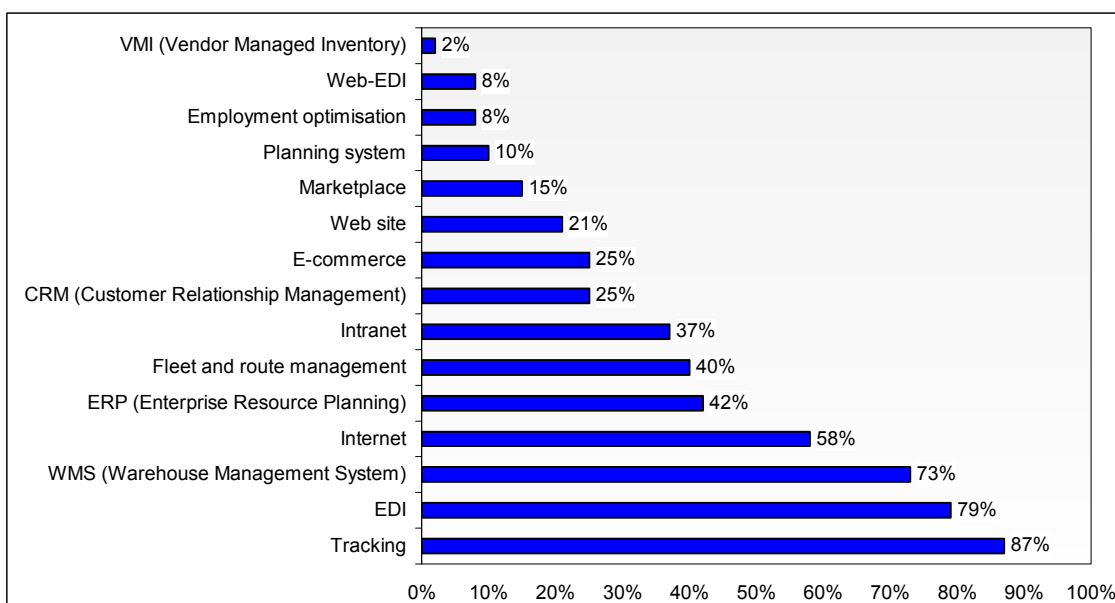
It further derives the necessity of outlining those elements which can be defined as the new functional articulations of the here discussed industry. One of these is possible and useful once you have assumed as discriminants those dimensions which are common to all the sector subjects: a) the number of functions carried within the *supply chain*; b) the variety of the dealt goods.

*Fig. 2. Trends of Mergers & Acquisitions operations within the logistics services sector.*



Source: Federtrasporto-Nomisma, 2003

*Fig. 3. ICT investments by European logistics firms*



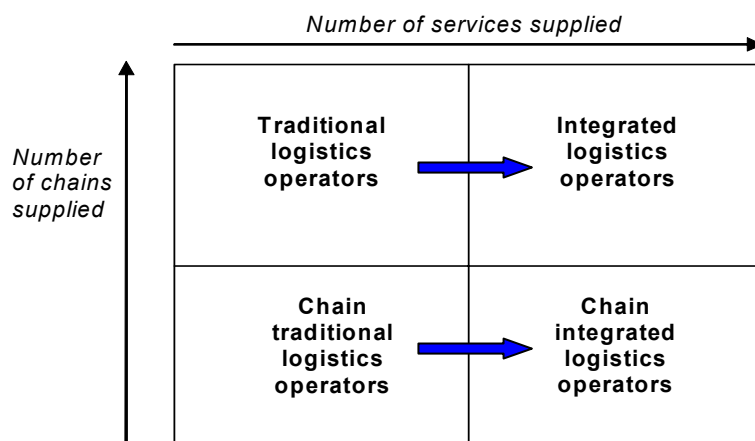
Source: Commission Européenne, 2001

The combination of these two elements offers the possibility of making a distinction among four logistics operators categories; the latter are characterized as follows:

- *chain traditional logistics operator*: he develops just one single function within a single chain/product;
- *traditional logistics operator*: he develops one single activity within the supply chain, thus he is specialized for a specific activity and for a specific kind of plant, besides being open to a multitude of supply chains/ product;
- *chain integrated logistics integrator*: he carries the activities of the whole supply chain in a specialized way for a supply chain/product;
- *integrated logistics operator*: he is able to follow the entire set of supply chain for a multitude of supply chains/product.

Recent surveys have confirmed that the interviewed entrepreneurs recognize themselves within one of the abovementioned functional categories (which have been underlined as ideal types) and that (see Fig. 4) they share the trend both of supply chain operators and of traditional ones to strategic shift to the managerial configuration belonging to the logistics integrator; in other words, the most complete figure of the operator who by definition aims at having a handle on an integrated and system vision of his own activity.<sup>1</sup>

*Fig.4 Potential inter-sectorial trends*



The development of logistics services supply, following the above mentioned model, is affected by market demand as well as it is being shaped according to outsourcing decisions taken by manufacturing industry, by the great distribution.

It is known that at the present in Mediterranean Countries the outsourcing rate concerning the logistics demand in modern terms is limited, even if improving chances are high.

Starting from the former discussion and trends leading to consistent services aggregates, one could reasonably wonder if and how the national economic systems and the European one in its whole can take advantage from a more efficient and effective logistics.

### *2.3 Logistics constants*

Before dealing with the analysis of the foreseen logistics effects, as on a micro and on a macro-economic side, it is fruitful to underline some specific constants which can be pointed out on the analytical side. These constants can be summed up as follows (Boscacci, 2003):

- the logistics effectiveness and efficiency, in addition to the values regarding any economic sector, are characterized and tied by punctuality and timeliness in supplying in a context of high quality in service offering;
- the product which is being offered by the logistics firm is indeed a complex set of integrated services applied to the goods through an industrial production process, endowed with high material and immaterial locking ups and with a specified use of professional expertise;
- logistics, as a support to *supply chain*, works in partnership with each single firm, fostering the supply chain working process of different production sections and the integration between economic and territorial activities;
- the moving operations –via road, track, air, water, pipe, cable, ..- imply a matching of private sources (entrepreneurial and professional) and environmental ones (soil, air, energy, landscape), which are only partially handled by logistics, thus leaving wide room to the policy maker decisions.

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<sup>1</sup> Those data come from a set of surveys carried in 2003 by Politecnico di Milano on behalf of National Observatory of Transport and Logistics, Isfort of Rome. See [www.isfort.it](http://www.isfort.it)



### **3 Effectiveness and efficiency of logistics on the microeconomics side**

#### *3.1 The involved quantities*

The supply flows which are due to logistics are addressed to three different directions:

- a) industrial supplying (raw materials, semi-products, components, various materials);
- b) commercial supplying (products for wholesale trade and for distribution branches);
- c) consumer's supplying (consumption products for families, communities, boards).

Sided to these supplying flows, return flows (even if less substantial) have to be matched (reverse logistics); that is to say the recovery, reconditioning and redestination of goods, belonging to the categories of “returns”, “production rejects”, “packaging”. These activities have been acquiring growing importance in recent times, due to the community principle stating the producer responsibility extension to the post-consumption phase.

Each direction towards delivery/recovery keeps its different characteristics as for loading modes and units. The range goes from the envelope to the small item to pallets and big containers. It is relevant to underline how technology has fostered the possibility to transfer goods to long distance at decreasing real costs and how further costs cuts –particularly those of transaction- have been offered by the logistics innovation itself and by its Integrated Logistics Operators.

As it concerns the trade distribution service (retailed one and big planned distribution) and the final consumer distribution one, the procurement chain has to be able to guarantee even the delivery of minimum quantities of product. Such as it typically happens in mail service and in the innovative *e-commerce*, where the final user is expected to receive at his own house several kinds of products: food, books, music instruments, medicines, etc., in small quantities and thus also in smaller items.

Logistics has therefore to deal with containers, pallets, different dimensions items, but also with packets of minimum weight compared with those transferred for business client.

Besides being fostered by the expectations of final demand, the downgrading process of the moved items is also promoted by managerial changes in the trade distribution

operators, who gives less and less spaces to their store goods stocking, and consequently provoke a relevant increase in the supplying frequency.

Just to quote an example, shops of pharmaceutical products distribution, supported by 10.000 warehousing references, get an average of 5-6 daily delivery, concerning items whose average weight reaches around 8 kilos.

Delivery frequency is also matched with another phenomenon which has been presently growing in importance: the low load factor cost per commercial vehicles per journey. Italian Transport System Study Center has esteemed that the present average loading coefficient of commercial vehicles in 30% of the cases is inferior to the 25% of its loading capacity and in 50% of the cases it is inferior to the 50% (Carrara, Monticelli, 2000); according to the recent General Plan of Transport and Logistics (Ministero delle Infrastrutture e dei Trasporti, 2001b), 35,5% of trade vehicles journeys occurs when they are empty, while the same situation is registered in France for 20% of the cases, mainly due to the overbalance of traffic flows along the North-South backbone.

Meanwhile, logistics is increasing its economic influence and its co-ordinating function within the several phases of the supply chain and it outlines the consequences of a constantly increasing road traffic. It derives an environmental problem (see section 5) which is becoming more and more relevant and which is inducing public administrators to take decisions on the compatibility, mainly on the urban field, of a furnishing service which foresees the free presence of logistics operators on behalf of third parties- those who are here considered as belonging to the logistics industry- and of operators on their own, more responsible of the misuse of trade vehicles.

### *3.2 Lead time*

In order to guarantee the maximum lead time restriction, it is necessary to rely on the same level of efficiency as that one allowing the delivery of smaller quantities of product. The organization again has to be as big as the physical and economic distances (supply chain functions) which have to be covered: as for the Global market, one should assume the “*Global Logistics Chain*” vision, that is the vision of the “*Global Logistics Provider*”.

The costs variable has in the past times acquired a growing importance, especially if interpreted in terms of punctuality and availability. It is almost clear that, besides by specific market conditions, lead and cost times are affected by many other boundary factors:

- a) the intensity of delivery frequency;
- b) the firms location and the production units fragmentation;
- c) the spreading rate of final customers;
- d) the number and dimension of stocking places;
- e) the availability, organization and fluidity of infrastructures.

Point a) is related to several trends: the economic system development, the wealth rate, the international division of labor. In an economic advanced system the services rate matched with intermediate and consumption goods is high and it is naturally high the rate of these referring to the delivery service. In these terms, e-commerce and e-business tend to endow logistics industry with a growing role and importance.

As for b), c), d) points, it is clear how lead costs are to increase according to the increasing of the productive system fragmentation in a multitude of productive units and of the final customers' spreading. Finally, point e), lead times and costs will be affected by the availability and quality of social fix capital: mainly land and communication infrastructures available for the economical and social system.

### *3.3 The costs and prices issue*

In economically developed Countries the general increase in supplying distances does not seem to have jeopardized either punctuality or costs. Transport costs do not actually increase the influence of logistics in final cost; the latter stays quite low or it decreases its affection to the good final price. This trend has to be related to the technical and managerial innovations which have been introduced in the system, as well as to the falling of several barriers in the sector.

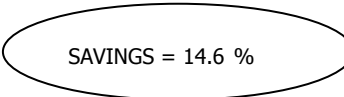
Logistics, once fostered by these transformations, is being shaped in different ways within the market: a) in global market relevant entrepreneurial concentrations are evident, especially in some crucial sectors, like maritime shipownership and couriers, operating in an oligopoly regime, b) in regional markets the entry barriers have been indeed decreased and competition has grown.

As a matter of fact, in an open market regime, regarding almost any kind of goods - raw materials, semi and end products- logistics is necessarily globalized, thus among local and global operators there is more co-operation than competition. In most of the cases co-operation comes to vertical integration among functions and enterprises; in other cases, it is the great operators who get logistics services on regional market.

As above seen, in the past few times there has been (and it actually still goes on) a sort of race to shopping of local enterprises by the greatest operators (3PL), while several scale and purpose economies have been acquired also through 3PL cross selling and in general through the most dynamic logistics operators. Many organisations have set the purpose of creating distribution network global/local, through which it is possible to drive massive goods flows coming from a multitude of clients, who can in this way effectively take benefits from an externalization process of its internal logistics.

This trend towards the concentration of logistics services supply should produce, at least on a theoretical point of view, a double effect on costs and prices: average production costs should be reduced in order to foster scale economies and to empower the suppliers contractual capabilities; on the other hand, services costs should better defend themselves, thus giving room to satisfactory economic margins. Following the example shown in figure 5, it is possible to underline that the costs savings in the logistic sector for motor industry consequent to the acquisition of a further client is almost equal to 15% (McKinsey, 2003).

*Fig. 5 Scale economies impact on logistics costs structure*



SAVINGS = 14.6 %

Primary Transportation	15.0	85.4	
General warehousing	15.0	15.0	
Secondary Transportation	15.0	12.8	
Local warehousing	15.0	12.8	15.0
		12.8	
Local distribution	40.0	32.0	20.0
	Single client	Two clients	

*Source: McKinsey, 2003*

Scope economies in logistics processes are quite evident as almost all the investments are fixed: warehouses, vehicles, moving means are normally simultaneously used for several purposes and services. Not to mention ICT technologies which are by definition transversal and that have acquired in logistics a crucial role for the concrete possibility to produce those services which are required by the market.

Therefore, as for the costs side, logistics firms have wide control margins. The results, maybe because of a critical business cycle, seem to be even contradictory, once compared the balance sheets of logistics firms operating in Italy and in Europe<sup>2</sup>. The usual indicators referred to the sale returns and to the average output of owned means which have been invested in these activities are quite low, both for local firms and for global ones. More negatives for big and small enterprises, relatively better for medium sized firms.

Situation is fluid, thus there are not further explanations to the phenomenon, but it is generally accepted that logistics is suffering its position of service towards industrial clients who are by themselves in search of supplying costs saving, as it is rushing towards goods addressers who ask for higher logistics quality services.

#### **4 Effectiveness and efficiency of logistics on the macroeconomics side**

Besides affecting the service cost, the effectiveness and efficiency of logistics on the macroeconomics side have consequences on the effectiveness and on the competitiveness of the economical system as a whole. This cause-effect reaction does not have the same intensity in any system as it is mediated by various situations, structural or contingent.

A structural variable which is deeply affecting logistics effectiveness, as it has been above discussed, is related to the fragmented rate of the productive and commercial units, in addition to the spreading of consumers. In a similar situation the logistics role, as here interpreted, becomes even more relevant as a mediator between systems: the territorial and economic ones.

A better knowledge of this role is therefore essential in order to face the inefficiency of infrastructure systems, economic policies, tax policies and of external competition.

Here it is possible to underline the lack of information on logistics. While it is possible to easily know the exact rates of goods carried by different vectors, little is known about the quantities and the values which have been produced within the logistics industry as

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<sup>2</sup> From "I primi 1000 fornitori di servizi logistici", attached to *Il giornale della Logistica*, may 2002; it emerges an average R.O.E. for 2001 of 2,5%. In "The McKinsey Quaterly" Newsletter, May 2003 2002 EBITDA main European firms have been recorded: Exel, TPG, Tibbet&Britten, Ryder System, Wincanton, Danzas, Hays, Christian Salvesen, Fiege, UPS; their average does not overcome the rate of 3,4%.

a whole; the latter is therefore included or even disregarded within the structural and economic statistics.

While analyzing the Italian economy, the Added Value rate which can be nowadays summed up by official sources is quite imprecise: the 39,6 billions Euros, as reported in table 1, is at the same time over and underrated. Transport activities, with the exclusion of the road ones, count the non-separable rate of passengers, while logistics activities carried by mail or express courriers operators are not taken into account. From the data of the Italian Ministry of Transport, it is further underlined as the majority of integrators which are not dealing with relevant transport issues, following an opposite trend compared to that one here used, are indeed included within the auxiliary activities in transport.

*Table 1 Added value to transport and logistics (auxiliary) activities to market prices in Italy (millions of euros)*

<b>Activity</b>	<b>Added value Logistics activities</b>	<b>% on total Added Value</b>
Rail transport	1.548	4%
Goods road transport	21.454	54%
Maritime transport	5.036	13%
Air transport	3.312	8%
Auxiliary activities	8.333	21%
Total Italy	39.683	100%

*Source: Ministero delle Infrastrutture e dei Trasporti, 2001a*

According to these estimated rates, it is possible to state that this area of activities counts for almost 4% on National GDP.

The logistics value in Europe has been instead estimated up to 1000 billions euros, a rate which is almost 10% of European GDP.<sup>3</sup>

Further recent studies have determined the sector dimension in an indirect way, that is evaluating the logistics services demand (thus excluding from the calculation the data related to transport activities). The Censis 2001 Report, for example, makes an estimation of the logistics market through the outsourcing rate of these activities held by

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<sup>3</sup> These data have been put into evidence during the SITL International Week of Transport and Logistics held in Paris, further commented by Achille Rosa (*Il Giornale della Logistica*, 5/2002).

manufacturing firms towards specialized operators, from which it results that the Italian productive system outputs almost 159 billions euros of transport and logistics services, 77 of which belong to “logistics with no transport”. The total outsourcing amount reaches the 34% rate, while the logistics incidence is 15%.

The two mentioned sources are with no doubts useful to the knowledge, but they leave also some gaps in a different ranking of the here studied subjects. Through further surveys held in Europe and North America, new indicators of growing 25-30% have been underlined, but the comparison with the Italian data is as a matter of fact unfeasible, as in foreigner sources what has been externalized is the “integrated logistics”; this concept is closer to the topic of logistics industry than what can be inferred from ISTAT/ATECO and other surveys used for the Italian case.

*Table 2 Invoice Italy 1999 on logistics services (millions euros)*

<b>Type of Activity</b>	<b>Total A</b>	<b>One's own B</b>	<b>Third party C</b>	<b>Outsourcing Rate D = C/A * 100</b>
Automotive transport	66,62	39,25	27,37	41,1
Sea	10,12	-	10,12	100,0
Airplane	1,96	-	1,96	100,0
Rail	3,05	-	3,05	100,0
Pipes	0,10	-	0,10	100,0
Inner navigation	0,05	-	0,05	100,0
Total transport	81,91	39,25	42,66	52,1
<b>No transport logistics</b>	<b>77,47</b>	<b>65,59</b>	<b>11,88</b>	<b>15,3</b>
Total logistics	159,38	104,84	54,54	34,2

*Source: Censis, Italy, 2001*

The lower Italian outsourcing rate, once compared to the European average, reflects the already mentioned phenomenon of fragmentation and it suggests further considerations on the weakness of the inner logistics offers services; this weakness has a constitutional nature, as it is evident from the data of the commerce balance (see table 3).

In 2001, the export/import rate of logistics services has underlined a negative value approaching 3 billions euros, with a growing trend, if compared to the previous years.

The expectations of relevant outsourcing growing rates and the renewed and increased claims of services for the economic system let us think at deep development chances for Italian logistics on behalf of third parties

*Table 3 Balance of logistics services payments: Italy, 2001 (millions euros)*

<b>Logistics services</b>	<b>Exports</b>	<b>Imports</b>	<b>Export - Import Rate</b>
- maritime rent	1.962	3.326	-1.364
- flight rent	131	438	-307
- other rent	824	1.902	-1.078
<i>Total goods rent</i>	<i>2.917</i>	<i>5.666</i>	<i>-2.749</i>
- auxiliary maritime logistics services	2.340	2.536	-196
- auxiliary flight logistics services	1.684	1.521	163
- other auxiliary logistics services	1.102	1.248	-146
<i>Total auxiliary logistics services</i>	<i>5.126</i>	<i>5.305</i>	<i>-179</i>
Total logistics services	8.043	10.971	-2.928

*Source: Ministero delle Infrastrutture e dei Trasporti, 2001a*

## **5. Logistic nets and environmental system interactions**

### *5.1 Strategic efficiency of logistics*

It has been stated in the former paragraphs that logistics has high inner margins of improvement and that this situation creates a set of positive externalities for the economic system. These consequences are measured in terms of higher effectiveness of the services compared to the purpose of the clients, of industrial, commercial firms and of consumers (microeconomics efficiency) and in the possibility of reaching higher competitiveness levels within the whole economic system (macroeconomics efficiency). Within this broad scenario, it is possible to outline a paradigmatic “efficiency on a strategic point of view” in logistics.

This further concept is referred to a distinction between static and dynamic vision of the consequences coming out from the possible improvement in the logistics services supply. In a static vision, there are proper indicators allowing the measurement of the benefits got from each customer in order to reinforce his own competitive position, while keeping all the other factors untouched.

In opposition, in a dynamic vision the higher efficiency of logistics services can be considered as the increasing of choice opportunities offered to the clients, in terms of new aims accomplishment, of productive chain modification, as well as of enlargement of its own activities.



Therefore, logistics can support the customer strategic choices, as well as the system's ones: the industrial client who is endowed with an effective logistics is capable of focusing on his own core business, being basically released from the problems of procurement and distribution of goods. The economic system, the industrial cluster, the metropolitan area, the national economic system, can make further resources available for other relevant targets.

Newly, and in parallel, the macro vision of the existence of an advanced logistics industry will allow a strategic raise in the Country System; global and partial competitiveness will be thus fostered. On this field, capitals and the capability of the logistics industry are not capable by themselves to satisfy the system needs and requirements. Therefore it cannot be done without a strong combination of private capital, as for the enterprises, public capitals focused on infrastructure and services of public accessibility (planned, when not put into practice and managed, by the public board at different stages) and of public sources: space, air and environment quality.

### *5.2 The economic and territorial role of the set infrastructure-services*

It has been already discussed on the critical relation between logistics industry operativeness and networks at micro level, that is on the effects that disorganization and congestion have on logistics services production costs. The interactions between logistics industry and territorial and infrastructure system have to be analyzed at the macro territorial level.

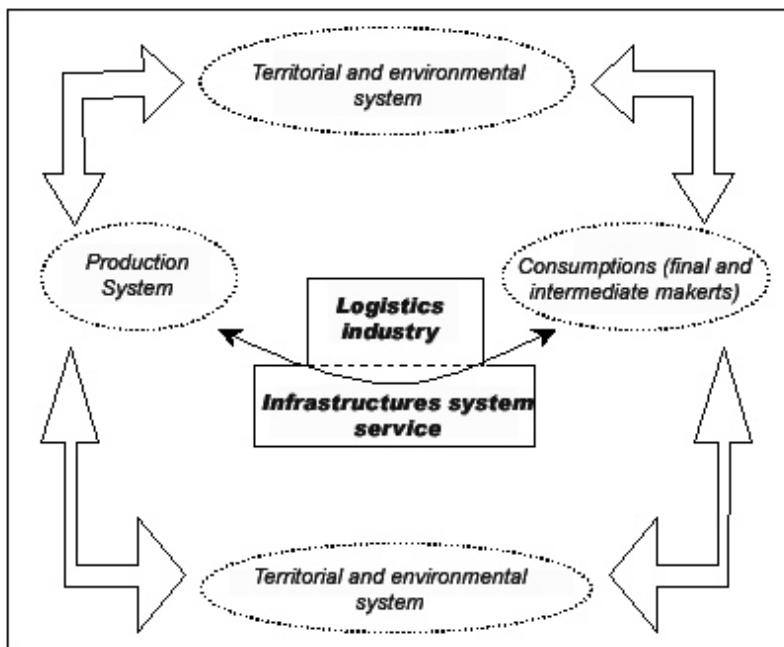
On this matter, one should better focus on the functioning model of the complex infrastructure-logistics which can be roughly represented as in the following figure 6.

Here the single elements of the system and their main interactions have been taken into account: 1) the overall center point is represented by the strict relation between logistics industry and the whole set of physical and economical infrastructures aimed at the whole logistics services production; 2) the set logistics-infrastructure is by itself matched with the economic system, which is represented by the production system and by that one of consumptions, origin and destination of good flows; 3) the whole set, logistics and economic system, once put inside the macro territorial and environmental system, is represented by sources whose dynamics act as indicator of the problems settled by room and goods flow needs.

The choice of aiming at the construction of the logistics spatial-economic dimension brings about to an enlargement of the European dimension. It seems to be widely

accepted that European Countries have to give up to infrastructure sets, shaped according to the exclusive inner demands in order to be in line with a strict continental planning system, both to promote the physical continuity link and to make it more homogeneous the technological and functioning standard. On this point of view, each single national complex has been shaping itself in an international network, with a complete integration in the TEN network, thus opening each single inner logistics market, as it happened for the other markets.

*Fig. 6 Interactions between logistics system with the economic-territorial and environmental set*



*Source: Boscacci, 2003*

While the effectiveness and the quality of the territorial-economic system in its whole can be interpreted and measured at the broad scale and at long term perspective, the social effectiveness of logistics services is self-evident at the local scale, through the outputs, which are often harmful, of the intensive use of vehicles and of soil consumption, until the results of spoiling, for the construction of the necessary structures and infrastructures.

The main external costs of logistics concern with energy consumptions, volatile toxic substances emission, soil consumption for the infrastructures, damaging noise pollution, accident rating due to traffic, life quality loss.

A recent survey held by the European Union with the co-operation of Eurostat has esteemed polluting substance emissions within the fifteen European Countries, underlying the role of transport (see figure 7).

From this survey, relevant conclusions come out: 65% of NO<sub>x</sub> and 64% of CO emissions are due to transport and almost half of it has been produced by road transport. Even on a global level transport is responsible of 29% of CO<sub>2</sub> emissions, causing the greenhouse effect.

*Fig. 7 Emissions by type of pollutant in Europe in 1999*

	<b>Total emissions EU-15</b>	<b>of which :</b>		<b>of which :</b>	
<b>Pollutant</b>	<b>1000 tonnes</b>	<b>1000 tonnes</b>		<b>1000 tonnes</b>	
<b>NO<sub>x</sub></b>	9 936	6 415	65%	4 607	46%
<b>CO</b>	34 065	21 941	64%	19 552	57%
<b>NM VOC</b>	10 872	4 003	37%	3 373	31%
<b>SO<sub>2</sub></b>	6 734	470	7%	177	3%

*Source: European Union, 2003 on data European Environmental Agency*

If the research of the system effectiveness is one the most relevant elements for the sustainable development of any activities, from these results it clearly derives the necessity of an action of rationalization and optimization of the goods transport activities. Thus the appealing to policies of management of logistics activities oriented to the reduction of journeys number and road vehicles, matched with an increasing of the inter-modal use.

## 6. Conclusions

Within the present paper one has discussed a logical framework where to insert the economical variables to take into account when analyzing the growing logistics sector, to which a new conceptual definition has been given. Such a perspective demands clear purposes to be reached in terms of policy: these are summed up in the main concepts of economics and sustainability.

Therefore the goods logistics sector provides the whole economic sector with the chance of reducing production and distribution costs, thus improving the delivery quality in line with the market demands on this field.

The requalification itself of the sector is targeted at these purposes, despite the fact that the classical economic trend considers in an almost exclusive way the direct cost elements, while it underrates the critical problem of dealing with negative externalities, mainly due to road traffic for spatial goods flow.

It is therefore important to foster the intervention of public administration in order to improve land accessibility in respect of goods delivery and withdrawing, aimed at their production as well as consumptions. The investment in infrastructures and territorial services requires a particular combination of public and private capitals and the best solution, at the level of each single land, can be found where there are chances of externalities reductions with the combined actions of public partners and operators. The former act through an attentive planning of infrastructure interventions, the latter through the capability of giving satisfaction to the customers in terms of efficiency and effectiveness.

This specific position suggests the necessity that all the economic and territorial subjects embrace the integrated territorial-economic and environmental approach as a framework for a new governance of logistics sector.

The European Union is keenly involved on it; it is also required that national and regional governments do their duty, involving the greatest number of operators who are in the meantime strongly investing in their own activities.

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