A LONG TERM TREND ANALYSIS OF THE INTERNATIONAL TRANSPORT FREIGHT RATES: A TREND ANALYSIS OF THE SHIPPING RATES

Enrico Pastori, TRT Trasporti e Territorio srl, Milan, Italy

Giuseppe Galli, TRT Trasporti e Territorio srl, Milan, Italy

Silvia Maffii, TRT Trasporti e Territorio srl, Milan, Italy

Enrico Tosti, Banca d'Italia, Rome, Italy*

Simonetta Zappa, Banca d'Italia, Rome, Italy*

**The views expressed are personal and are not the responsibility of the Bank of Italy*

Email for correspondence: pastori@trt.it

ABSTRACT

The paper focuses on some of the most interesting sectors of international freight transport and aims at highlighting how the freight rates are influenced by different factors and how the transport market reacts to and reflects the overall trend in the economy, by considering the main determinants of the transport rates applied for international shipments.
Data are basically taken from the survey on the international freight transport conducted since 1998 by the Bank of Italy, which enables to have at disposal a relevant historical trend to estimate the market dynamics. The survey is aimed to feed the estimates of the Balance of Payments; it is led on a big sample of operators (road, rail, air and maritime services), quantifying information about freight rates, broken down by: transport mode, direction, geographical area of origin and destination, load size.
The available time series allows to carry out detailed analysis of correlation between freight rates, costs, and volumes in the international transport, as well as with main indicators such as the GDP and the fuel prices.
The correlation analysis between shipping rates and the business cycle provides interesting results and allows to present the differences recorded for the various sectors, bearing different features in terms of number and size of operators, internal and external competition.
The results presented in this paper confirm the importance of keeping track of the transport costs and freight rates as proxy of the general trend in the economic cycle.

The analysis of such kind of data is also providing a detailed overview of the shipment cost, useful to evaluate the importance of the competitiveness of the economy, the level of accessibility, the impact of transport network development.

Keywords: business cycle, sample survey, shipping rates, market analysis, international transport

INTRODUCTION

Since 1998, the Bank of Italy[1] carries out yearly a sample survey on international transport with the aim of gathering the information necessary for the compilation of Balance of Payments both for the estimation of items related to the freight services and for the transformation from CIF value to FOB value for the imports of goods, as required by international conventions (currently, V Manual by the International Monetary Fund[2]).
There are many activities carried out during the analysis. The main one concerns the sample survey on unit costs of international transport of Italy, divided according to the mode of transport. Secondly, the origin/destination matrix for Italian goods trade is periodically revised according to the main mode of transport in order to eliminate inconsistencies and to estimate further breakdown. Finally, a survey of the market shares held by the Italian operators (for air, sea and rail modes of transport) and an estimate of the ship owners resident in Italy are carried out.
In addition to the requirements of the compilation of the Balance of Payments, the survey provides a lot of information useful for the analysis related to the costs of international transport and international trade, which is the objective of the present work.
In detail, in Section 1 we describe the contents and objectives of the sample survey on international transport costs. In Section 2 we analyse the determinant factors of international transport costs for each mode, with comparisons with the existing literature. In Section 3 we show the trends of these costs in the last two decades, through an analysis of the cyclical aspects of maritime freight and interactions with the factors of supply and demand, in an attempt to provide an answer to the question debated in the literature about their actual reduction (in nominal and real terms).

1.THE SURVEY ON INTERNATIONAL TRANSPORT COSTS

The survey methodology has essentially been the same over the years, with improvements and additions suggested by the experience. The first objective is the production of an information dataset for the demand and the supply of international freight transport.
On the supply side, it is necessary to consider the shortage of reliable and comprehensive information on rates of transport services. The sample survey on transport companies

[1] Started by former Italian Exchange Office, later merged into the Bank of Italy in January 2008, the survey is carried out by an external company (TRT Trasporti e Territorio), selected through an European tender.
[2] IMF Balance of Payments and International Investment Position Manual – Fifth edition, 1993.

operating in Italy has been deemed to fill this information gap, and represent a continuous source for updating the market trends over time.

The main aim of the survey is therefore to obtain form a relevant sample (nearly 200 operators interviewed in 2011) the unit costs[3] classified by rather homogeneous cluster in terms of handling, transport and tariff features. The survey achieves its reliability in the collection of an adequate number of "*representative shipments*", that are processed to provide the estimate of the average unit costs of transport and of the auxiliary services associated. Representative shipments are characterised and grouped as a function of the mode of transport used, considering the shipment origin/destination, the flow direction and the type of goods shipped.

The modes of transport taken in account are nine:

1) Ship, divided into 5 sub-modes: liquid bulk, dry bulk, container, general cargo and Ro-Ro.
2) Railway, further divided in container (or intermodal), traditional (or bulk).
3) Road, with differentiation between full load and groupage loads.
4) Air cargo.

The geographical distribution is defined according to its relevance in the volume of foreign trade and varies depending on the mode of transport. While for road and rail transport the zones considered are more detailed for short distance shipments (continental), the disaggregation detail is higher for extra European exchanges, in the case of maritime and air transport.

Table I shows, separately for each mode of transport, the data related to the survey conducted in 2011 in terms of: number of operators interviewed, number of representative shipments, sample error, response rate and number of geographical areas.

Table I – Sample survey summary (2011)

Transport mode	Number of operators	Representative shipments	Sample error	Response rate	Geographical areas
Road FTL		770	4,4%		13
Road Groupage		956	5,4%		13
Road Total	**63**	**1.726**	**4,7%**	**39,4%**	
Rail Intermodal	16	170	6,5%	84,2%	13
Rail Traditional	8	85	10,8%	72,7%	13
Rail Total	**24**	**255**	**8,8%**	**80,0%**	
Maritime Container	40	837	8,1%	66,7%	11
Maritime Bulk	17	138	10,7%	77,3%	3
Ro-Ro	16	262	6,0%	88,9%	8
General Cargo	13	176	12,3%	86,7%	4
Maritime Total	**86**	**1413**	**10,4%**	**74,8%**	
Air Cargo	**25**	**576**	**6,1%**	**39,1%**	11
Total weighted average	**198**	**3.970**	**8,7%**	**53,7%**	

[3] The costs are got by weight unit (ton) or by load unit (vehicle or container), in some cases by volume or number of pieces, but the costs are always led back to price per ton or price per load unit. The survey also distinguishes "net" shipping rates by other components, i.e. ancillary services and commissions for agents and brokers; in this work we consider, except when otherwise specified, the total cost of the freight services.

Source: elaborations on Bank of Italy data, 2012

Representative shipments are more numerous for road and maritime container modes, for which the average size of a shipment is smaller, in order to ensure that sample rate is as uniform as possible in terms of flows transported. The overall sample error obtained, weighted by volume of import and export exchanges, is lower than 9%. Higher values are observed for the modes of transport characterized by strong internal variability (e.g. maritime general cargo, gathering various types of goods) while the lowest statistical errors emerge from the most competitive sectors, (e.g. less than 5% recorded on the road transport).

The demand analysis is the second pillar of the methodology. The starting point is represented by the imported and exported quantity of goods; the foreign trade data provided by ISTAT (the Italian Institute for Statistics) are available though at a lower level of detail, only the main modes of transport are considered (ship, rail, road and air).

These data require some adjustments with regard to the main mode of transport used. To this end, other sources of information are used, in particular sector statistics more oriented to consider the transport peculiarities (Eurostat data, the CAFT data provided by the Ministries of Transport of Switzerland, Austria and France, etc.).
Secondly, the data must also be adjusted to align the modal distribution between the four modes, because of a structural overestimation of the road to the detriment of the other three main modes, in particular rail, which are unavoidably multimodal. A major distortion of statistical data is related to the Community interchanges (subject to Intrastat declaration), since under a detection threshold the information on the transport mode is not mandatory and therefore it is a missing data.
Analysing the "correct" historical series since 1989[4] of the Italian Trade (volume, value and unit values), broken down by modes of transport, it is noteworthy that the container ship has become the main mode of maritime transport for export in volume, while in import the bulk segment (linked to the procurement of raw materials) is still the largest, as represented in the following tables.

[4] The base year for the reconstruction of the Balance of Payments data carried out in conjunction with the introduction of the methodology.

Table II – Export per transport mode in volume (millions of ton)

Tons	MARITIME						RAIL			ROAD	AIR	TOTAL
	Container	Liquid bulk	Dry bulk	General cargo	Ro-Ro	Total	Container	Bulk	Total			
1989	7,6	13,8	5,5	6,4		33,3	3,5	5,3	8,8	26,0	0,5	68,5
1990	8,1	15,5	5,0	8,1		36,7	3,8	5,2	9,0	24,4	0,6	70,7
1991	7,4	15,6	5,6	10,9		39,5	4,0	5,1	9,1	22,2	0,6	71,4
1992	5,3	17,8	6,5	11,8		41,4	4,5	5,2	9,7	25,7	0,6	77,3
1993	12,1	19,1	5,3	11,1		47,5	4,7	4,7	9,3	26,9	0,4	84,2
1994	15,7	17,0	5,0	8,8		46,5	5,9	5,1	11,0	29,1	0,3	86,9
1995	15,3	15,8	5,6	7,9		44,7	5,9	4,9	10,7	33,7	0,4	89,5
1996	18,5	17,2	6,3	11,3		53,4	5,8	5,2	11,0	30,6	0,4	95,4
1997	19,2	19,7	5,9	12,0		56,8	6,8	4,9	11,8	33,4	0,4	102,3
1998	19,3	18,5	5,0	9,7		52,5	7,4	4,9	12,4	35,5	0,4	100,8
1999	20,1	19,7	4,8	9,0		53,7	8,3	5,2	13,5	38,4	0,4	106,0
2000	22,0	19,4	4,7	10,2		56,3	9,1	5,5	14,6	41,3	0,4	112,7
2001	22,0	19,5	4,2	10,1		55,8	9,7	5,7	15,3	42,3	0,4	113,8
2002	22,3	19,1	3,9	10,2		55,5	9,6	5,7	15,3	42,8	0,5	114,0
2003	21,3	21,9	3,2	9,6		56,0	9,7	5,7	15,5	42,9	0,4	114,8
2004	22,7	22,2	3,0	10,4		58,3	10,5	6,0	16,5	46,0	0,5	121,2
2005	23,3	25,6	2,8	10,9		62,7	11,3	6,3	17,6	48,7	0,5	129,5
2006	23,9	23,4	1,7	9,4	5,3	63,8	12,0	6,7	18,7	48,0	0,5	130,9
2007	25,3	27,5	2,7	9,6	5,5	70,5	12,7	7,3	20,0	54,3	0,7	145,6
2008	25,5	26,1	3,0	9,9	5,4	69,9	12,1	7,1	19,2	52,5	0,5	142,0
2009	21,6	24,5	2,4	7,1	4,2	59,9	9,8	5,9	15,7	42,1	0,4	118,1
2010	24,7	28,0	2,8	7,7	4,4	67,6	12,4	7,7	20,2	52,6	0,5	140,8
2011	25,8	23,9	2,5	7,6	4,1	63,9	12,6	7,8	20,4	53,5	0,5	138,4

Source: elaborations on Istat, Alps Crossing, Eurostat, ENAC data

Table III – Import per transport mode in volume (millions of ton)

Tons	MARITIME						RAIL			ROAD	AIR	TOTAL
	Container	Liquid bulk	Dry bulk	General cargo	Ro-Ro	Toatl	Container	Bulk	Total			
1989	8,6	109,1	60,0	13,2		190,8	4,6	17,5	22,1	28,1	0,3	241,3
1990	11,5	112,4	57,2	14,6		195,6	5,1	19,3	24,4	23,4	0,2	243,6
1991	10,5	113,2	60,7	16,3		200,7	5,5	20,4	25,9	21,5	0,2	248,4
1992	12,5	115,5	53,1	14,2		195,3	6,0	18,7	24,7	27,6	0,2	247,9
1993	10,3	114,0	51,9	12,5		188,8	6,1	16,3	22,4	22,3	0,2	233,7
1994	12,9	116,2	53,1	14,2		196,4	6,5	19,0	25,6	27,0	0,2	249,2
1995	13,1	114,4	60,3	16,6		204,4	7,2	17,7	24,9	30,5	0,2	259,9
1996	16,1	119,0	56,3	17,1		208,5	7,7	16,1	23,8	25,6	0,3	258,1
1997	15,0	119,7	55,2	16,6		206,6	8,2	17,1	25,3	27,9	0,2	260,0
1998	17,4	122,5	54,3	20,0		214,2	9,1	17,2	26,3	32,0	0,6	273,0
1999	17,2	127,6	55,9	21,8		222,6	9,5	17,5	27,0	35,6	0,4	285,6
2000	18,5	130,2	60,8	23,7		233,2	10,2	18,4	28,7	39,2	0,5	306,9
2001	17,8	124,9	62,1	24,9		229,7	10,4	18,4	28,8	41,1	0,4	300,0
2002	17,6	122,5	62,5	24,3		226,8	10,2	17,9	28,0	44,3	0,4	299,4
2003	18,6	118,6	65,8	24,7		227,8	10,5	18,0	28,5	46,8	0,4	303,4
2004	18,1	115,2	73,7	25,6		232,7	11,1	18,7	29,7	50,7	0,4	313,5
2005	17,6	114,8	71,0	24,8		228,2	11,0	18,5	29,6	52,9	0,4	311,1
2006	20,0	111,0	65,8	23,5	5,4	225,7	11,6	19,1	30,7	53,9	0,4	310,7
2007	21,8	114,0	70,3	24,7	5,2	236,1	11,8	19,9	31,7	58,4	0,4	326,6
2008	20,8	106,7	68,1	22,4	5,0	223,0	11,0	18,6	29,6	54,3	0,3	307,2
2009	16,9	99,2	48,9	14,6	4,4	184,0	9,3	15,8	25,1	47,8	0,3	257,3
2010	21,0	106,0	51,0	20,0	4,5	202,6	10,7	19,0	29,7	55,6	0,3	288,3
2011	20,1	97,8	49,0	21,1	4,7	192,7	10,7	18,9	29,6	55,8	0,3	278,3

Source: elaborations on Istat, Alps Crossing, Eurostat, ENAC data

2. THE DETERMINANT FACTORS OF INTERNATIONAL TRANSPORT COSTS

The experience gained through the survey and the analysis of data collected allow to determine which are the main factors that affect the international transport costs, and therefore provide an interpretation of their evolution over time.

The most important factor is the distance, which is frequently used as a *proxy* of the freight rates, even if its effect is strongly mitigated in sectors dominated by large economy of scale or by stronger competition. Several studies also include the fuel price, the quality of infrastructure or the transit time as main factors. In literature, see for example Hummels (1999a), Behar and Venables (2010), and specifically for the maritime sector, OECD (2010), other factors are taken into account: the imbalance in trade flows between two countries, the volume of trade (transport demand), the competition between the carriers and the carrying capacity of the world fleets (the potential of offering freight services), as well as geo-economic characteristics such as access to the sea and membership in a free trade area.

Taking advantage of the empirical evidence accumulated over time from the outcomes of the survey, we consider the definition of a functional relationship between the cost of international freight transport and main determinants. In formal terms, referring to Italy and calling *p* the partner country (either exporter or importer), for each transport mode *m*, we define:

$$(1)\ CTm_{pt} = f\ (D_p, G, B_{ptm}, C_t, F_t, E_t, FL_{tm})$$

with p = countries (p = 1,….,n), m = modes of transport (m = 1A,…,4), t = period of time

where D_p is the distance between Italy and the partner country p, G the goods category, B_{ptm} the imbalance between the flows of exports and imports, C_t is an index of international economic cycle, F_t an index of the cost of fuel (or oil prices), E_t is the exchange rate of the dollar against the euro, FL_{tm} is an index of the capacity of the world fleet.

The terms of the equation (1) can be grouped into two categories. The first group consists of the first three variables (D_p, G, B_{ptm}), related to the internal variability for each transport mode. The second group consists of the last four variables (C_t, F_t, E_t and FL_{tm}), affecting the entire structure of the freight rates in terms of temporal dynamics.

The expected signs of the function are positive for D_p, for C_t (a sustained demand for transport produces a rise in freight rates), for F_t and E_t (defined as the dollar against the euro, so a depreciation of the dollar causes an increase in ships rates that are generally traded in that currency); a negative sign is instead expected for FL_{tm} (an increase in the transport supply contributes to reduce the rates). Goods category brings about effects in the costs (i.e. perishable, precious, dangerous goods lead to an increase in the transport cost).

Regarding B_{ptm}, the discrepancy between the import and export flows influences the difference between the freight rates on the same route (for example, from China to Italy and vice versa), for which it is to be placed more appropriately in relation with this discrepancy rather than the absolute rate. This difference is derived by the high probability of empty load returns (total or partial), for which it is a commercial practice the demand for a "higher" price on the more requested direction, such as to compensate to some extent the lower freight rate practiced on less busy direction. As an example, figure 1 shows the trends of the relationship between the import and export freight rates and the corresponding volumes transported by

container ship to/from China and Italy, from which it results the close link between the two phenomena.

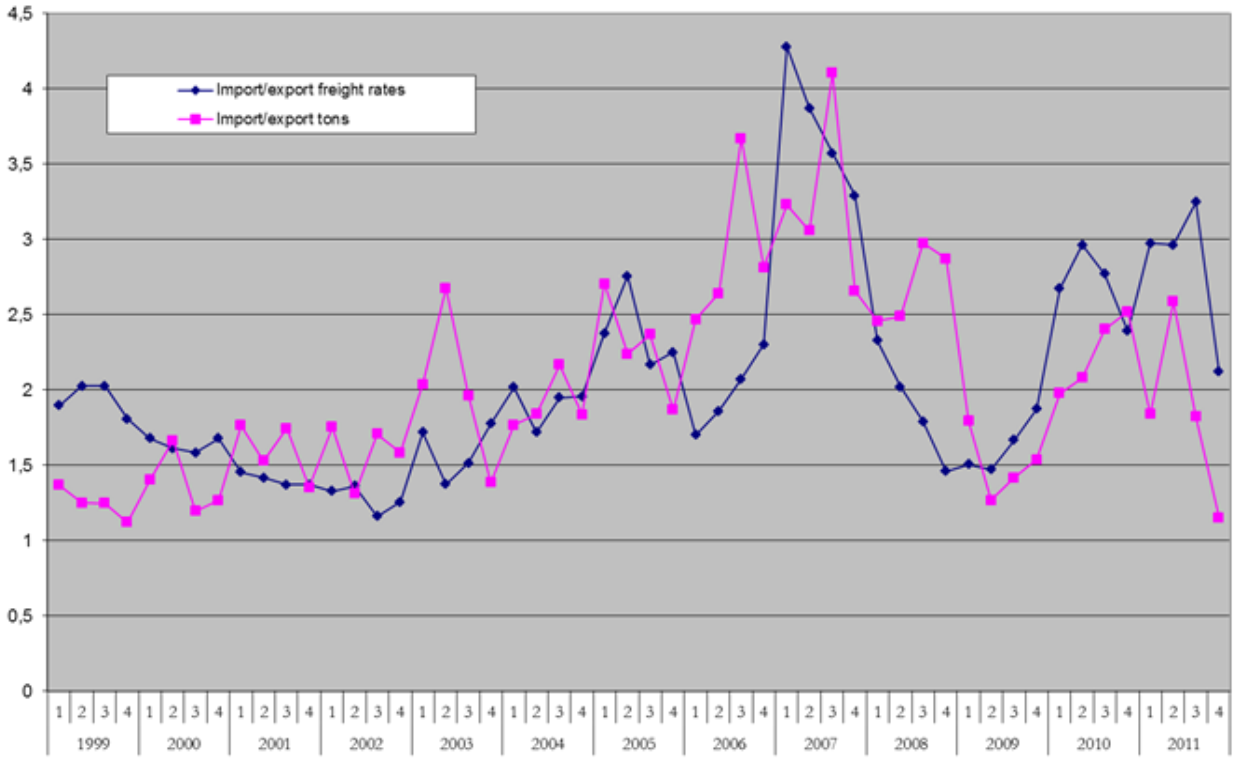


Figure 1 – Italy-China, container ship: Import/export rates and import/export volumes (1999-2011, quarterly averages)
Source: elaborations on Bank of Italy and ISTAT data, 2012

The sample survey provides only qualitative information for two variables mentioned in the literature between the determinants of the cost of transport: transit time and level of competition in the various market segments.
In the first case, transit time is closely linked to the distance, and is also negatively correlated with the economic cycle: in the phases of sustained demand, transit times tend to be reduced, while during a stagnation of international trade, they grow in order to reduce fuel consumption and operating costs. It is assumed, therefore, that the informative contribution of this factor is already included in the proposed model.

With regard to the competitiveness degree, the survey and the data consulted allows to identify a quality evaluation in connection with the number of companies in the sector and the degree of market concentration, as shown in the table below.

Table IV – Main characteristics of each market segment

Market segment	**Number of companies**	**Market concentration**	**Competitiveness**
1A) Maritime Liquid Bulk 1B) Maritime Dry Bulk	Low-Medium	Medium	Low-Medium
1C) Maritime Container	Medium	Medium-High	Medium-High
3) Road freight	High	Low	High
4) Air Cargo	Low	Medium	Medium

Source: elaborations on Bank of Italy data, 2012

The **Maritime container** sector is characterized by the main shipping companies leadership, that over the last years have pushed strongly towards the construction of new and giant ships. The level of competition is quite high and increasing over time, despite an equally high level of market concentration.
The 10 major shipping lines control almost 60% of the world fleet in terms of load capacity and around 50% in terms of number of ships; for the major 20 lines, these figures raise respectively to 80% and 67%.
In maritime bulk (liquid and dry) segment is more difficult to quantify the degree of market concentration. However, it can be noted that the number of operators is low both on the supply side and, in particular, on the demand side, constituted principally by energy companies and broker/intermediaries that have their own strategies to limit te market oscillations.
The road freight sector, unlike other countries, in Italy is highly fragmented and characterized by small size operators, in terms both of turnover and number of employees. This fact is among the causes of a high degree of competition, even if a slow concentration process is ongoing towards more structured operators whose activities are more diversified also in terms of logistics services provided.
Air cargo: the market is managed by agents and shipping companies, which tend to use a limited number of airline companies with whom they have established business relationships. This is among the reasons of a relative stability of freight rates over time. The structure of the market is therefore characterized by a high concentration: the bigger 10 IATA agents cover up to 50% of the market while the first 25 covers around two thirds of the market. Anyhow, the effect of concentration is mitigated by the actual absence of a national carrier, which attract more competition from external airlines

Below, the results of the sample survey are described, so identifying the major determinants of the cost of transport per mode, focusing the analysis on road transport, container ship and air cargo; the foreign trade data are those “revised” according to the procedure that was mentioned earlier.

2.1 Road transport

The road transport is geographically limited to the European area and characterized by flows of goods with small loads.
The product category is but of limited importance in the determination of freight rates, (exceptions or for dangerous goods, refrigerated cargoes and off limits loads) and the exchange rate with the dollar is negligible since prices are generally fixed in euro; an indirect effect is observed through oil price oscillation. In addition, the low rigidity of the transport supply, resulting from the quick construction of new vehicles, makes the land freight basically independent of this element. These factors produce a reduced temporal variability than for other (sea) modes and the absence of breakthrough that may generate rapid changes in the market.

The estimates carried out for the sample survey represents annual average for different geographical areas and direction of flow. The resulting rates are weighted averages of the full load and groupage rates. It is noteworthy note that groupage is currently accounting for about the 30% of the market, share rising over the last years as a likely consequence of the changing supply chain models and the international crisis.

The road freight rates are sensitive to changes in the European economic cycle, which recorded in the observed period macroeconomic dynamics significantly weaker than the global one. The road sector is characterised by being much more labour-intensive than the maritime sector, the staff costs weigh for about 30% of the rate, as found in the literature (see Casamassima et al, 2009) and confirmed by the interviewees. It is significant, but not particularly high the reactivity to fuel costs, in connection with the high degree of competition in the sector, which implies that relevant increases in the level of costs are, in the short term, frequently absorbed by the compression of profit margins and/or offset by other costs reductions (increased use of low-cost labour, speed reduction, wider use of roads without tolls, etc.), given the low market power of road transport operators.

The figure below represents the trend in road transport rates, compared to the growth of GDP and the growth of shipped volumes; though with a strong perturbation in 2009, a strong long term correlation is clearly visible (index 2000=100).

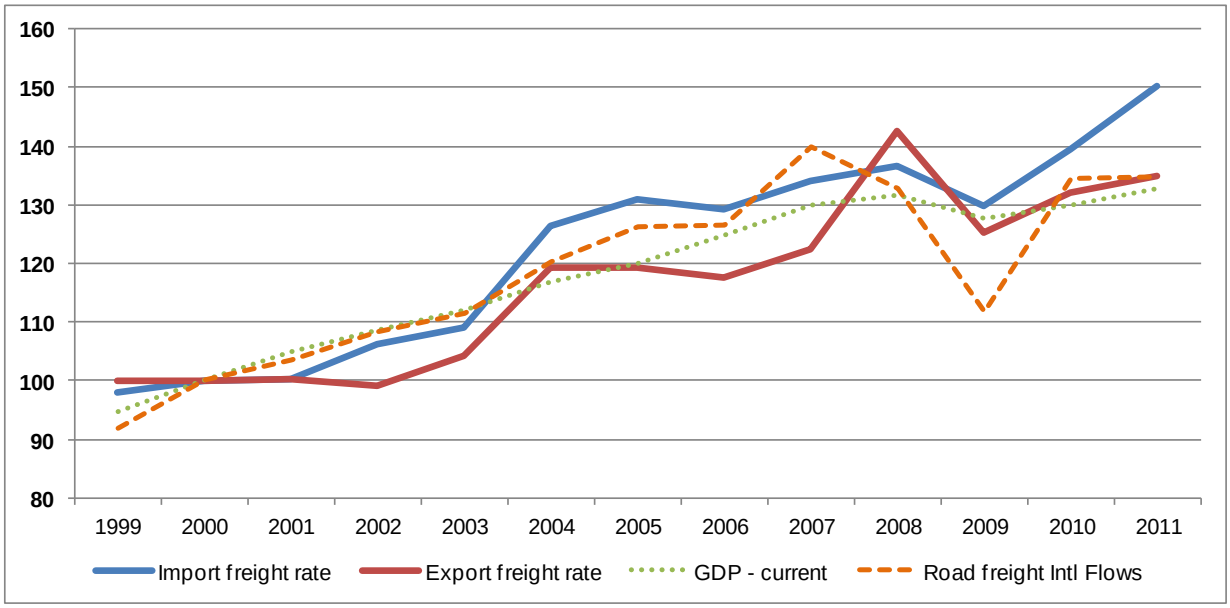


Figure 2 – Italian road transport rates for export and import: weighted average by volumes (euro/ton), compared to the growth of GDP at current values and the demand growth
Source: elaborations on Bank of Italy and ISTAT data, 2012

2.2 Container ship

In this sector, showing medium-high levels of competition, the overall rates are normally fixed on a base rate plus additional elements, although recently are emerging business practices of setting "all in" rates (i.e. without explicit separation of the various components). The base rate is the component that is more sensitive to demand changes, while the additional rates

are used by transport companies to react to changes in their running costs: typically, the fuel (Bunker Adjustment Factor, BAF), as well as for ship container fluctuations in exchange rates, generally in U.S. dollar as the rates are generally fixed in that currency (Currency Adjustment Factor, CAF). Transported goods are industrial goods, but, with the exception of refrigerated and special dimension cargo, the product category is of limited importance.
Freight rates are estimated with reference to the standard type of load (TEU twenty-feet equivalent unit), quarterly, since it has been observed a greater temporal variability, considering the flow direction and geographical macro-zones.
As a common feature of all the maritime sector, the presence of significant economies of scale is very relevant: the higher is the load capacity of the vessel and the distance travelled, the lower are the unit costs of transport. This has been the fundamental driver of the sector over the last years, together with the concentration that led the 10 major shipping companies to control over 60% of the world fleet.
This is a consequence of the characteristic of a highly capital intensive industry, where the incidence of the workforce costs quite low and estimated around 10% of rate (see Casamassima et al, 2009 and Stopford, 2009). Figure 2 points out the distribution by distance cluster of the marine container rates (in dollars per TEU/nautical miles), as resulting by the last survey (2011), which shows the inverse relationship between the distance and the rate by travelled distance.

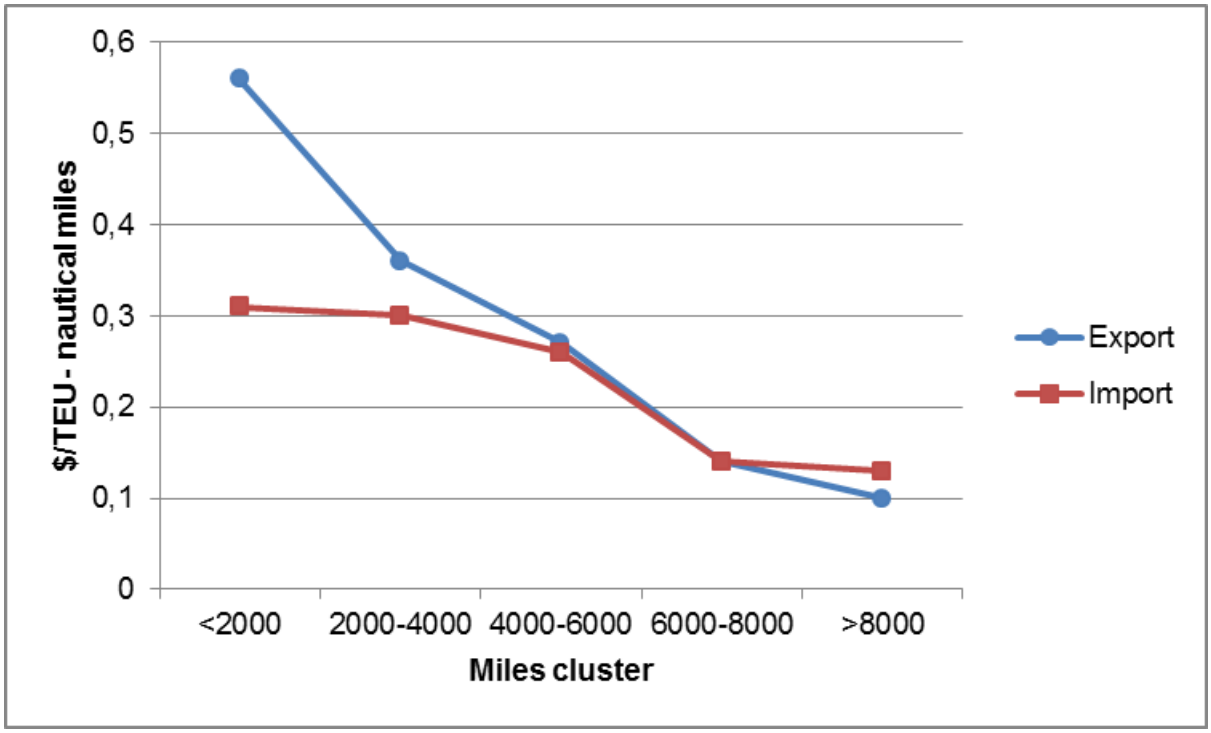


Figure 3 – Italian average container rates for import and export by distance cluster ($/TEU-nautical miles, 2011)
Source: elaborations on Bank of Italy data, 2012

As resulting by the sample survey, the figures below point out the trend in container rates over the last ten years (export and import), for the geographical areas that represent the main demand aggregates. Analysing the trend, the average import rates show more up and down in respect to the export ones (also due to the exchange rate oscillations), in particular

in correspondence with the international crisis in 2008. As explained above, unbalance between export and import ends up into different and in some cases opposite variations of the corresponding freight rates. Looking at the ten years time series illustrated, a more or less stable tendency is observed (though with oscillation driven by demand boosts or exchange rate and oil price variation). This has to be considered in relation to the average dimension of ships, fast growing over the last decade, the main factor that allowed considerable economies of scale and as a consequence a reduction of operating costs.

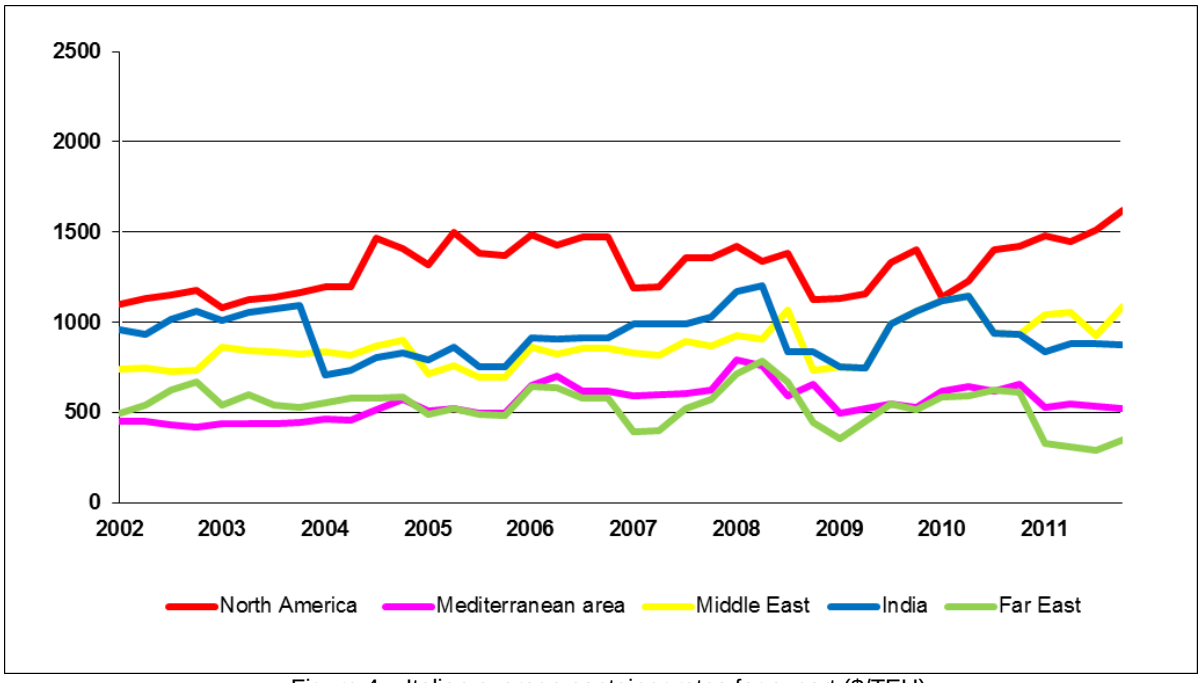


Figure 4 – Italian average container rates for export ($/TEU)
Source: elaborations on Bank of Italy data, 2012

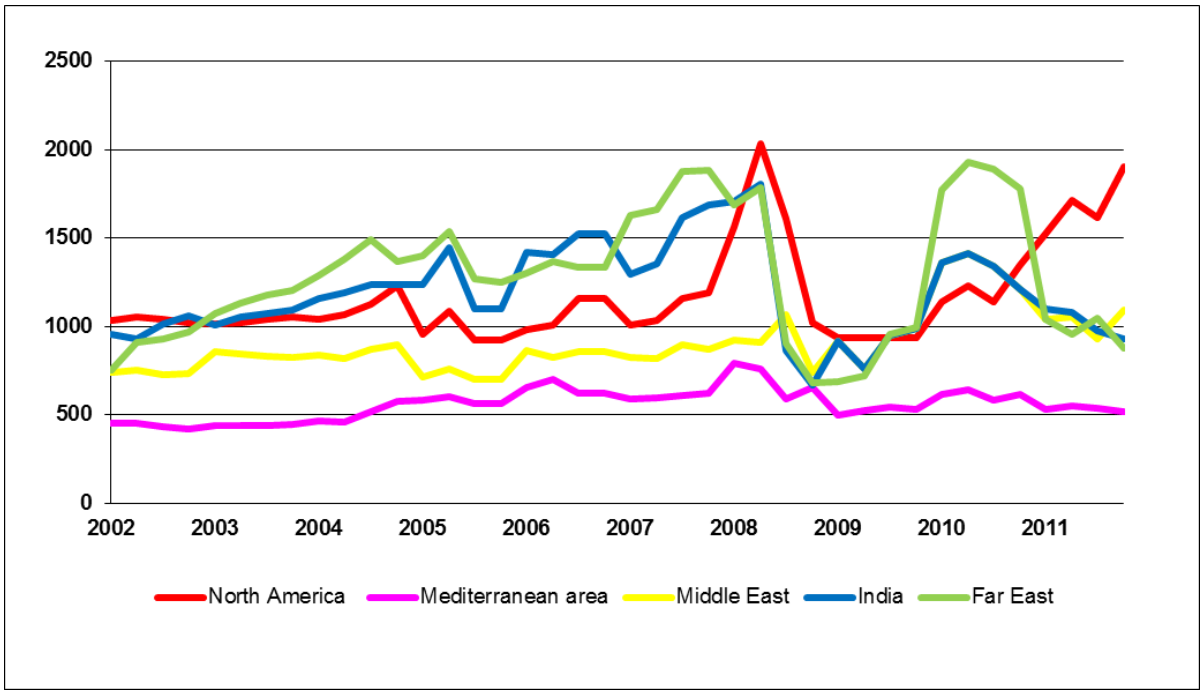


Figure 5 – Italian average container rates for import ($/TEU)
Source: elaborations on Bank of Italy data, 2012

2.3 Air cargo

The air transport, often carried by passenger aircrafts belly, is marginal from the point of view of overall volumes, but significant in terms of overall values. As for the land, we can assume that freight rates are substantially independent on the supply level. The goods carried are generally high-value ones. The overall rates include a base rate plus additional elements, related to the fuel price (which recently accounted up to 50% of the overall rate) and the security of transport. They are recorded in euro in particular for export flows and the product category is not significant in their determination.

Distance, size of the shipment, global demand and exchange rate are all factors affecting the changes in freight rates over time.

As resulting by the sample survey, the figures below point out the trend in air cargo rates in the last ten years (export and import), split among the main geographical areas. After the world crisis in 2008, the average freight rates have gained again, mainly in import, coming up to the pre-crisis level of rates.

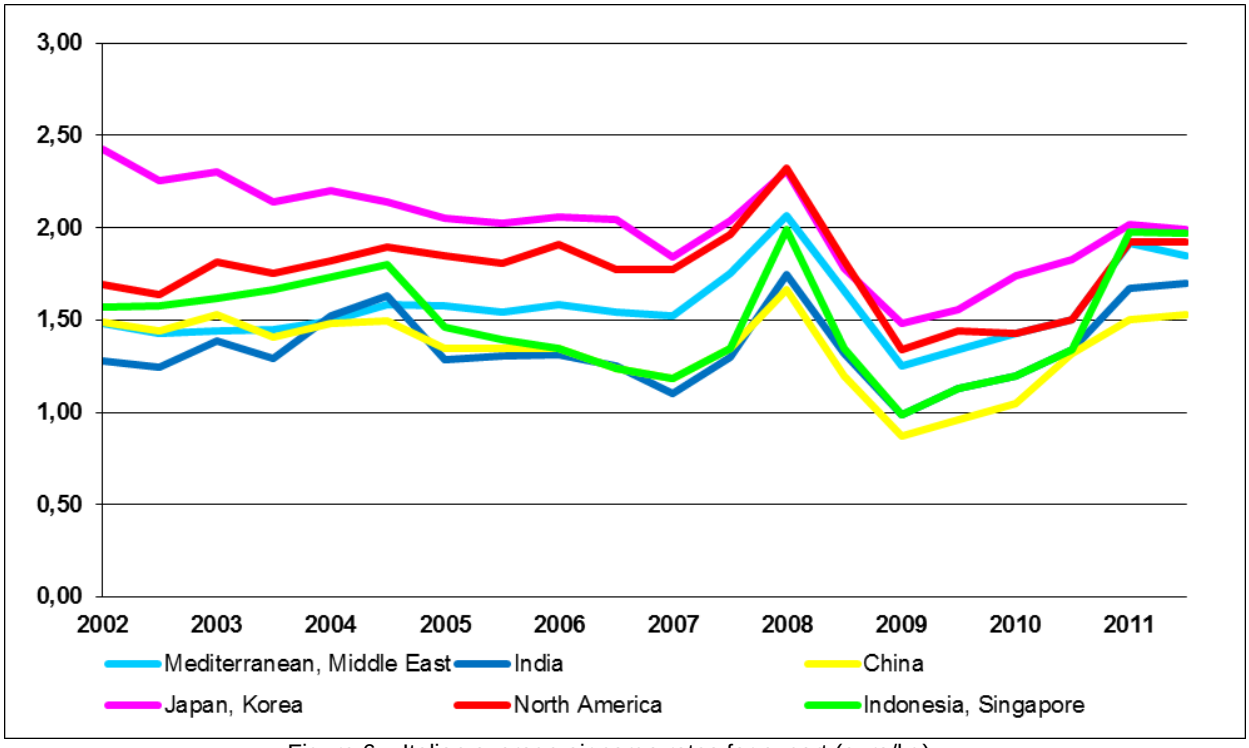


Figure 6 – Italian average air cargo rates for export (euro/kg)
Source: elaborations on Bank of Italy data, 2012

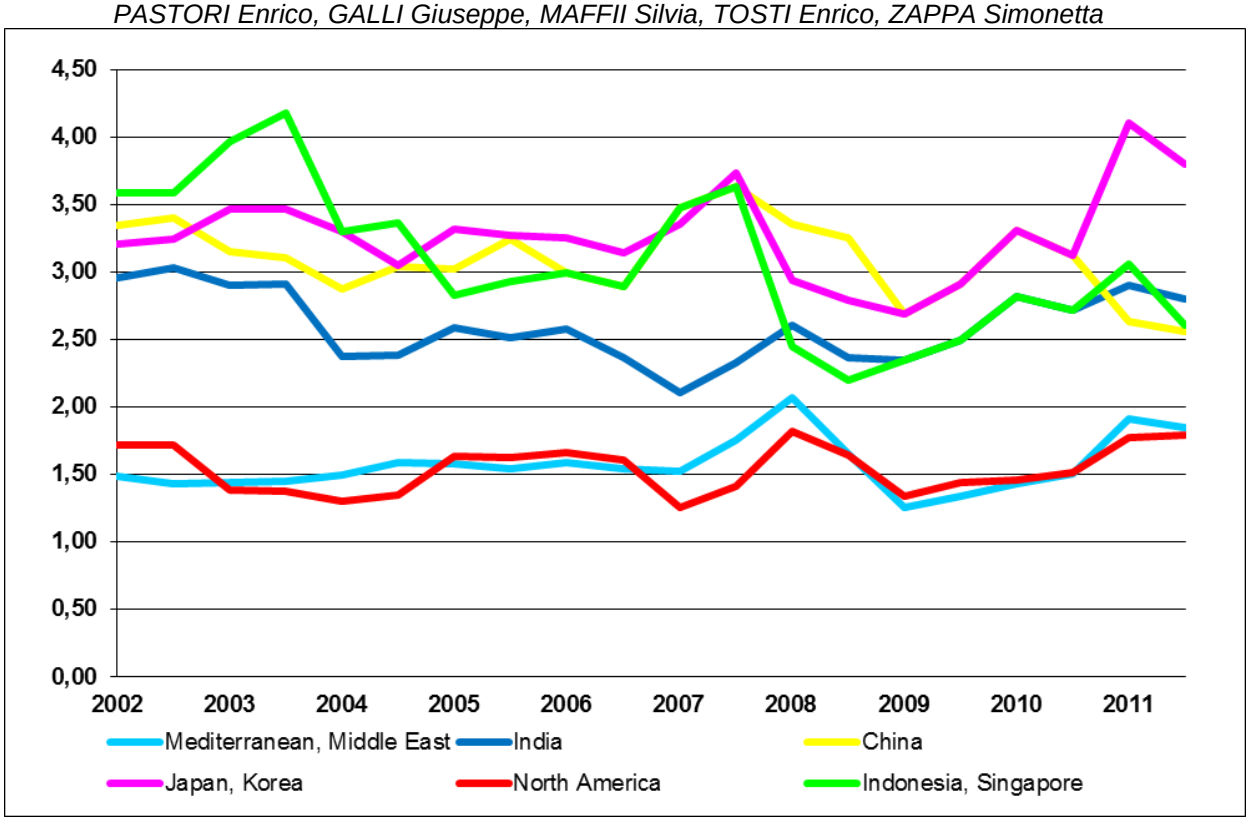
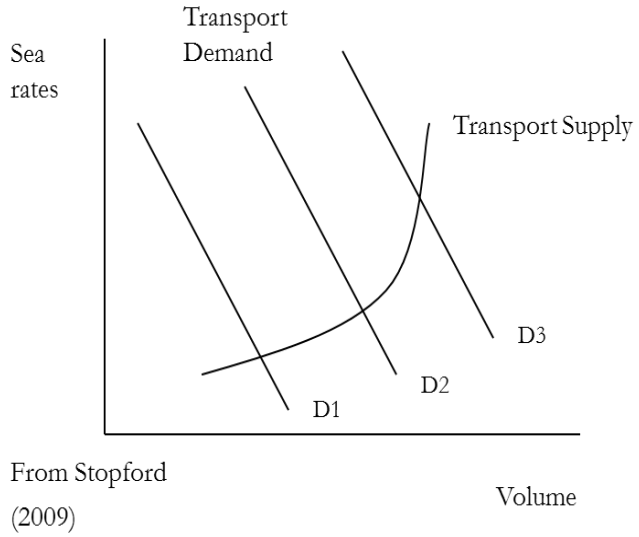


Figure 7 – Italian average air cargo rates for import (euro/kg)
Source: elaborations on Bank of Italy data, 2012

3. THE INTERNATIONAL TRANSPORT COSTS TRENDS

3.1. Supply, demand and shipping rates cycles in the container market

In order to compare the results of the survey with international trends, the container sector seems the most appropriate.



From Stopford (2009)

According to the theoretical framework developed by Stopford (2009), representing, in terms of traditional supply and demand curves, the shipping rates in the container sector, the more competitive, "globalized" and growing worldwide.
According to the schematic diagram, in the short period, the supply curve has the shape of a J, with an initial moderately upward, in which increases in demand (D2 line) are taken mainly from previously unused

capacity and organizational or technological improvements, such as reductions in time navigation and loading/unloading. Further demand increases intersect the inelastic portion of the supply curve (D3 line). Once saturated the potential to offer, there is a strong increase in freight rates in the short term.

In the medium to long term, especially with optimistic expectations by the ship-owners, the construction of new (and larger) ships and further organizational/technological improvements bring about the market re-balancing, which can then be in an opposite situation of oversupply, with downward pressure on freight rates, especially while the international cycle is falling down (D1 line).

The demand curve for transport in the short term has a low elasticity in respect to the freight rates. In the short term, therefore, significant variations in demand bring about limited variations in freight rates in the market until there is a sufficient load potential, and this has led some authors to consider the container sector as “demand driven” (or “trade driven”). Cost elements, such as fuel prices and the exchange rate, can have a significant influence, moving up (down) the supply curve.

3.2. The long-term trend

Following Stopford (2009), we can outline the various stages of the container market in the last twenty years and compare this analysis with the sample data observed for Italy. Figure 8 points out the container rates broken down by imports and exports weighted by the volumes transported, in U.S. dollars per TEU (left scale), and the values of the Euro/dollar exchange rate (right scale).

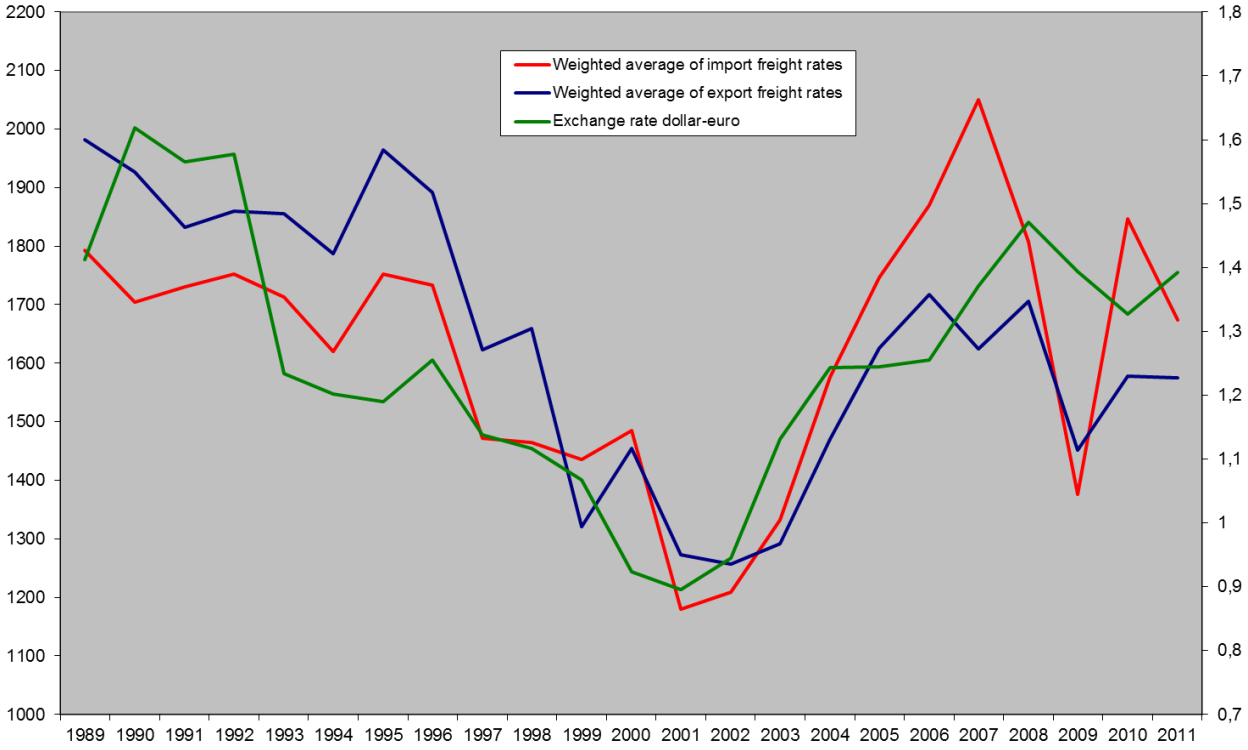


Figure 8 – Italian average container rates weighted by volume in import and export (US$/TEU, left scale) and correspondent exchange rates (US$/€, right scale)
Source: elaborations on Bank of Italy and ISTAT data, 2012

After a period of growth between 1993 and 1995, a decline period can be traced between 1995 and 1998, owing to a stagnation in demand linked to the Asian crisis in 1997-98, in conjunction with an upward phase of the dollar. Afterwards, the demand increase and a reduction in new vessels production led to a recovery in freight rates which from 2001 underwent a downward pressure due to the slowdown in the world economy, in particular in the United States ("dot com" crisis).
Global growth, mainly driven by China, produced a strong increase in world trade, which with a load capacity become insufficient (the "steep" section of the supply curve), exerted strong upward pressure on freight rates, which reached a peak in 2004.
The subsequent increase in the world fleet, resulting from growth expectations, produced a stop to this trend, which, however, was set by the oil price increase (that occurred between 2004 and 2008) and by a dollar depreciation. Since the summer of 2008, in connection with the global crisis and in a generalized situation of oversupply in the hold, there has been a fall in prices, with just a partial recovery in 2010 and a stagnation in 2011, despite a phase of dollar depreciation and an even higher fuel price level.
Currently, there is still a supply excess due to the significant increase in load capacity launched in the previous boom period on the basis of too optimistic expectations. So, the shipping rates are at low levels, in relation to a depressed world economy, despite the attempts made by shipping companies to avoid prolonged compression of profit margins, in connection with still high fuel prices (the fuel additional in 2011 was weighting on average more than 40% on the rate). At the same time, technical and operational strategies are adopted, such as reducing speed, higher load factors (reducing the number of trips and increase the number of stops) and "sharing agreements" between the companies (also typical of air sector).

A matter of debate in the literature about the long-term trend in transport costs is about the existence of a possible downward trend, that could ultimately have been a factor in propelling the international merchandise trade also in connection with the widespread diffusion of the "global value chains", i.e. the different processes in different parts of the world that each add value to the goods or services being produced.
The focus is in particular on the performance in the maritime container sector, which is increasingly important in world trade.
The data related to Italy confirms that both in nominal terms, in dollars per TEU and in euro per ton, both "ad valorem", the shipping rates (inclusive of ancillary services and feeder costs) appear in the period stable in import and slightly declining in export. It should be noted that the increasing use of the container, in particular to the detriment of general cargo sector, has contributed to a reduction in overall costs.
In fact, a decrease in nominal terms between 2000 and 2011 took place, with average annual rates of decline of 5.5% and 7.6%, occurred respectively for exports and imports (in euro cents per ton-km); all the other modes of transport have however registered an increase in prices per ton-km.

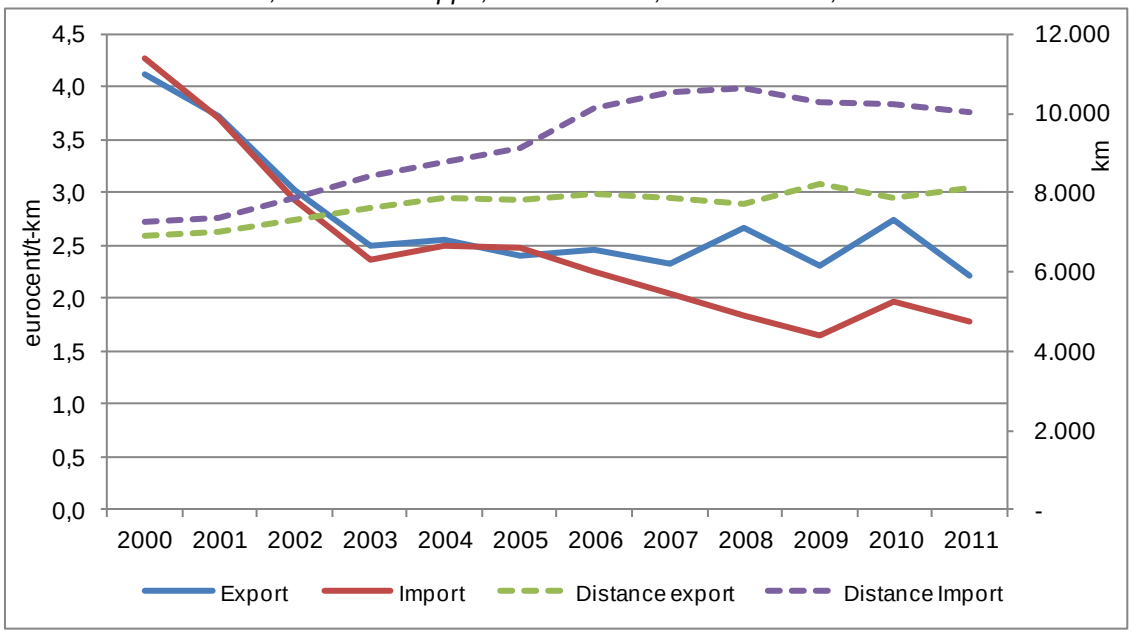


Figure 9 – Average container rates (eurocents per ton-km) and distances (km)
Source: elaborations on Bank of Italy, 2012

These trends must be considered in relation to an increase in the travelled distance by the goods transported by container ship (considering 2011 to 2000 of 18% for exports and 39% for imports, mainly due to the relevant increasing of the purchases from China and other emerging countries), largely higher than that recorded from all the other modes of transport. Simplifying, the massive growth of China and other emerging countries in the world trade could have significantly contributed to prevent a reduction in the container rates due to both a significant increase in average distances and an increase in average unit values (mainly in import) significantly lower than the overall average, suggesting an increasing use of container for goods of lower value which prevented a reduction of the “ad valorem” incidence.

Figure 10 represents the rates trend for the three transport modes analysed (road transport, container and air cargo) at constant values (PPI deflated). It can be observed that while road and air has kept close to a constant value, the container sector is the only sector that has undergone a stable decrease of freight rates.

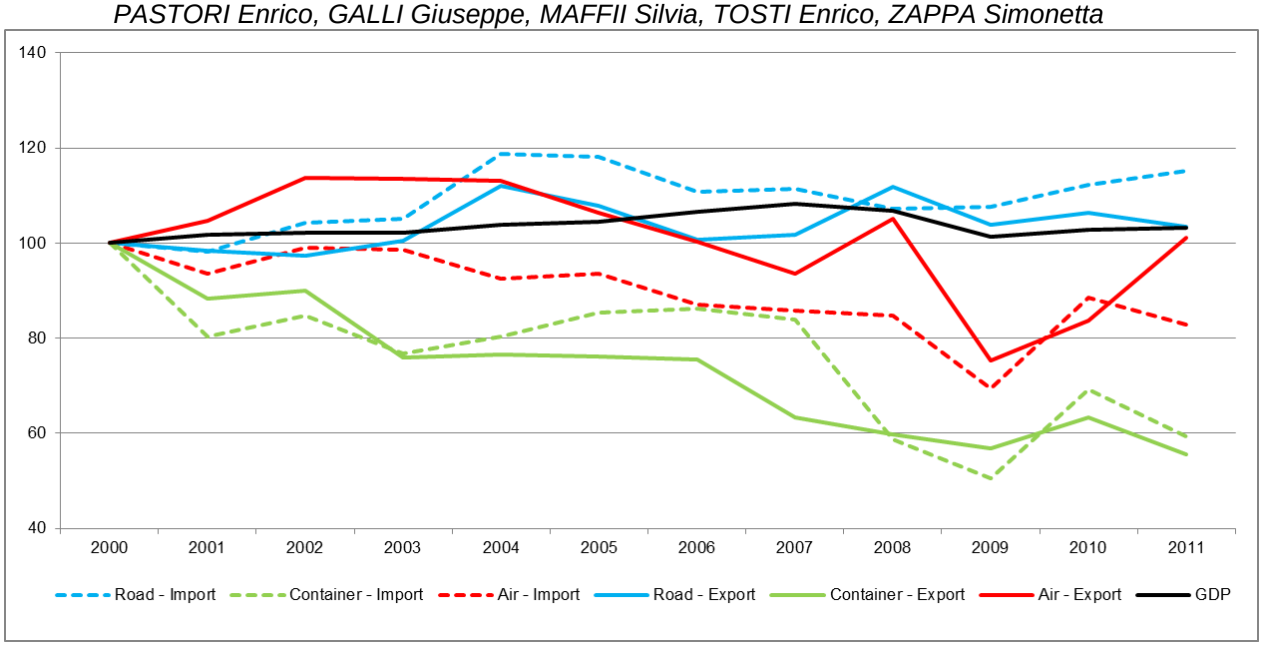


Figure 10 – Road, Container and air cargo shipping rates: evolution over the last decade in constant prices
Source: elaborations on Bank of Italy and ISTAT data, 2012

CONCLUSIONS

The objective of this paper is to provide an analysis of the data base offered by the Italian statistical survey on the international transport of goods, with a focus on transport costs, whose main variables and characteristics were analyzed for single mode from the point of view of their relation with the international trade cyclical phases and supply factors, such as the load capacity of the world fleets.

Each mode of transport presents different dynamics. The naval sector is characterized by being highly capital intensive, with significant economies of scale and a high supply rigidity resulting from the time of construction of new ships. The shipping rates in the container sector are characterized by a high degree of competitiveness and an inelastic demand in the short term, but this fact in a situation of shortage of supply (as it was recorded in 2003-2007) may lead to significant cyclical trend.

Land transport shows reduced cyclicality and price variability, with a dependence on European trade patterns limited to the road sector, in connection with a low (or no) rigidity on the supply side of transportation.

Air cargo represents a niche transport mode by volumes, but it is more relevant in respect to the goods value.

In terms of long-term trend, the Italian data seem to indicate that the transport costs are substantially declined over the last two decades. In other words, the transport costs, which now account on average no more than 4-5% of the value of goods traded[5], have certainly not been an element of strong brake on the expansion of international trade that occurred in the

5 This incidence derives by considering all the elements of cost, from shipping rates to ancillary services and road traction, with the addition of transport insurance, which is calculated on the value of the goods and generally varies between 0.2 and 0.5 per cent according to the sample survey. The incidence is aligned to the figures related to the advanced countries group (OECD, 2010).

last twenty years, but have been among the factors that allowed a considerable boost of international trade.
If it is true that in respect to the relocation decisions, transport costs might not be the main variable taken into account by enterprises (see UNCTAD (2010), p. 28-29), it must be underlined that they stood at historically so low as not to constitute an obstacle - except for underdeveloped and geographically disadvantaged countries – to the spread of "fragmentation of production" phenomena and to the development of global supply chains that have characterised the world economy in recent decades, contributing to the significant expansion of international trade.
The rising of new actors on the scene of international trade, China in particular, has contributed to an increase in the travelled distances, especially in the container shipping industry and to a rise in shipping rates (unprecedented in the dry bulk segment), however significantly declining from 2008 as a result of an excess of capacity due to investments in construction of new (and larger) ships and to the international economic crisis (trade collapse). The current situation still reflects an excess supply, which is reflected both in the decline in orders for new ship construction and in the prolonged compression of ship-owners profit margins, resulting frequently in bankruptcy or corporate restructuring.

MAIN REFERENCES

Banca d'Italia, *Sintesi dell'indagine campionaria sui trasporti internazionali dell'Italia*, various years

Banca d'Italia (2012), *Sintesi dell'indagine campionaria sui trasporti internazionali dell'Italia*, October, http://www.bancaditalia.it/statistiche/rapp_estero/altre_stat/trasporti/documenti/indagine-trasporti11.pdf

Behar, A. e Venables, A.J. (2010), *Transport Costs and International Trade*, University of Oxford, Department of Economics Discussion Paper Series, n° 488, June

Casamassima, G., Fiorello, D., e Martino, A. (2009), *The impact of oil prices fluctuactions on transport and its related sectors*, European Parliament, Directorate General Internal Policies of the Union, Policy Department Structural and Cohesion Policies, Transport and Tourism, EP 419.084, http://www.trt.it/english/Schede-progetti/European-parliament/EST25697-1.pdf

De Jong, G., Schroten, A., Van Essen, H., Otten M., e Bucci, P. (2010), *Price sensitivity of European road freight transport – towards a better understanding of existing results*, Report 9012-1, http://www.transportenvironment.org/sites/default/files/media/2010_07_price_sensitivity_road_freight_significance_ce.pdf

Hummels, D. (1999a), *Towards a Geography of Trade Costs*, University of Chicago, mimeo

Hummels, D. (2007), *Transportation Costs and International Trade in the Second Era of Globalization,* Journal of Economic Perspectives, vol. 21, no. 3

OECD (2010), *Clarifyng trade costs in marittime transport*, September, Paris (STD/TBS/WPTGS(2010)21

Stopford, M. (2009), *Maritime economics*, Routledge, London

UNCTAD (2010), *Oil Prices and Maritime Freight Rates: An Empirical Investigation*, UNCTAD/DTL/TLB/2009/2, http://www.unctad.org/en/docs/dtltlb20092_en.pdf