1. Introduction

The role of ports and maritime transport within the supply chain of the furniture sector in Italy: an empirical analysis

Marco Mazzarino
IUAV - Dipartimento di Pianificazione

Elena Maggi
POLITECNIC OF MILAN - DIAP

The paper is based on an extensive empirical analysis carried out on the role that maritime transport and ports play in a specific supply chain, i.e., that of the furniture sector in Italy. The sector is a relevant one for the Italian economy, since Italy has a large and diversified industry that is mostly export-oriented. The role of the Mediterranean region is highlighted – a four-steps methodology is employed for the Italian case study: first, on the basis of various data, the generation (production sites analysis), distribution (markets) and modal split of traffic flows are analyzed, both at aggregate and disaggregate levels. Then, the decision-making process is examined on the basis of a questionnaire-based technique, in which main modes and port choice criteria (path choices) are identified. Main results demonstrate a generally positive trend for maritime transport services. However, port-maritime competitiveness is limited to extra-continental markets, in which the US market plays a driving role. With some notable exceptions (the UK market), shipping services turn out to be largely less competitive than road services for intra-EU markets, both in terms of costs and transit time. In the main, it is found that the role of main competitiveness factors (cost and transit time) strictly depends on the pricing policies (e.g., FOB vs. DDP) which crucially influence the choice of ports.

Keywords: supply chain; furniture sector; Italy; maritime transport and ports; decision-making process

is illustrated while highlighting the role of the maritime transport and ports in the Mediterranean. Then (par. 4) the Italian case is considered. In particular, we first aim at understanding the characteristics of the production (flows generation analysis) sector and the distribution of flows to various markets. Then, the role of the maritime transport in terms of mode choice is identified. Specifically, export flows (both totals and maritime ones) are analyzed either at aggregate and disaggregate level, that is, by markets (destinations) and by regional Italian areas (generation). The subsequent section (par. 5 and 6) is devoted to outline the decision-making process of the supply chain (Tiwari et al., 2003) so as to determine main mode and port choice criteria (specific path choices) and to highlight the role that Italian ports play in the logistics chain (Park and De, 2004; Haralambides et al., 2002). Specifically, paragraph 5 sums up, following the literature, how the transportation decisions are developed within the strategic supply chain planning and it explains the methodology employed in the empirical case. Paragraph 6 describes the main actors and patterns of the furniture and that the choice criteria. Finally, some future trends and conclusions are drawn.

2. The international scenario of the furniture sector

2.1 Introduction

In this section the main characteristics of international flows in the furniture sector – with particular reference to the
maritime transport and the Mediterranean - are examined. We start by identifying the most important import and export countries throughout the world on the basis of available international data (Boske and Cuttino, 2003). In particular, we identify furniture imports and exports data and their incidence on overall trade flows for each country. In doing so, the relative importance of the furniture sector in overall trade is shown. Methodologically, such data allow us to identify the main generating areas. Afterwards, the distribution of trade flows of the identified countries are determined, i.e. the main origin-destination axes. We are then able to characterize the maritime axes of interest for the Mediterranean. The section ends with the analysis of the organization of the maritime and port services in the Mediterranean with respect to the axes considered.

2.2 Main import-export countries

On the basis of relevant international data, the main importing countries of furniture are found to be the following (table 1):

<table>
<thead>
<tr>
<th>Country</th>
<th>1995 value *1000(€)</th>
<th>2000 value *1000(€)</th>
<th>% on overall imports (2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>9,660,647</td>
<td>20,633,646</td>
<td>1,54</td>
</tr>
<tr>
<td>Germany</td>
<td>7,092,151</td>
<td>6,265,558</td>
<td>1,63</td>
</tr>
<tr>
<td>Japan</td>
<td>3,364,044</td>
<td>3,170,063</td>
<td>0,84</td>
</tr>
<tr>
<td>France</td>
<td>3,140,327</td>
<td>3,086,163</td>
<td>0,21</td>
</tr>
<tr>
<td>UK</td>
<td>2,310,636</td>
<td>3,110,232</td>
<td>0,21</td>
</tr>
<tr>
<td>Canada</td>
<td>1,655,301</td>
<td>1,105,330</td>
<td>0,21</td>
</tr>
<tr>
<td>Mexico</td>
<td>499,716</td>
<td>2,141,945</td>
<td>0,01</td>
</tr>
<tr>
<td>Belgium-Lux</td>
<td>1,947,954</td>
<td>1,037,531</td>
<td>0,01</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1,701,579</td>
<td>1,083,397</td>
<td>0,01</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1,765,391</td>
<td>1,054,255</td>
<td></td>
</tr>
</tbody>
</table>

Source: elaboration from ITC Databases of U.N. - COMTRADE data

Table 1: International scenario:
Top 10 import countries in the furniture sector

As for the world exports, the most important countries are (table 2):

<table>
<thead>
<tr>
<th>Country</th>
<th>1995 value *1000(€)</th>
<th>2000 value *1000(€)</th>
<th>% on overall exports (2000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>8,924,152</td>
<td>8,309,005</td>
<td>0,04</td>
</tr>
<tr>
<td>Canada</td>
<td>5,179,353</td>
<td>5,179,205</td>
<td>0,04</td>
</tr>
<tr>
<td>USA</td>
<td>3,323,310</td>
<td>4,743,607</td>
<td>0,01</td>
</tr>
<tr>
<td>Germany</td>
<td>4,569,305</td>
<td>4,755,880</td>
<td>0,01</td>
</tr>
<tr>
<td>China</td>
<td>2,887,960</td>
<td>4,882,042</td>
<td>0,01</td>
</tr>
<tr>
<td>Mexico</td>
<td>1,350,905</td>
<td>3,314,650</td>
<td>0,01</td>
</tr>
<tr>
<td>France</td>
<td>2,111,433</td>
<td>2,403,441</td>
<td>0,01</td>
</tr>
<tr>
<td>Poland</td>
<td>1,611,279</td>
<td>1,606,757</td>
<td>0,01</td>
</tr>
<tr>
<td>Denmark</td>
<td>1,970,453</td>
<td>1,399,504</td>
<td>0,01</td>
</tr>
<tr>
<td>Belgium</td>
<td>1,760,351</td>
<td>1,710,750</td>
<td>0,01</td>
</tr>
</tbody>
</table>

Source: elaboration from ITC Databases of U.N. - COMTRADE data

Table 2: International scenario:
Top 10 export countries in the furniture sector

2.3 Main traffic flows

Having shown the relative importance (%) of the furniture sector in overall trade of each country, then we consider the aggregate data of imports and exports (O-Ds) of every country (WTO, 2001; Eurostat, 1999). Specifically, we identify the main origin-destination axes for each of the country previously considered (we also present them in percentage terms on total imports/exports). As for imports, the axes (O-Ds) are the following (table 3):

<table>
<thead>
<tr>
<th>Import country</th>
<th>Country/area of origin</th>
<th>Market share* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>Asia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Western Europe</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>Belgium - Lux</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>The Netherlands</td>
<td>21.2</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>13.5</td>
</tr>
<tr>
<td>France</td>
<td>Belgium - Lux</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>33.1</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>16.4</td>
</tr>
<tr>
<td></td>
<td>The Netherlands</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>14.3</td>
</tr>
<tr>
<td>UK</td>
<td>Germany</td>
<td>27.2</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>18.5</td>
</tr>
<tr>
<td></td>
<td>The Netherlands</td>
<td>13.8</td>
</tr>
<tr>
<td>Canada</td>
<td>N.America</td>
<td>64.4</td>
</tr>
<tr>
<td></td>
<td>Asia</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Western Europe</td>
<td>12.1</td>
</tr>
<tr>
<td>Belgium-Lux</td>
<td>Germany</td>
<td>28.5</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>19.5</td>
</tr>
<tr>
<td></td>
<td>The Netherlands</td>
<td>23.3</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>11.9</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>Belgium-Lux</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>38.9</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>13.1</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>20.5</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Germany</td>
<td>39.9</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>15.4</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>12.4</td>
</tr>
</tbody>
</table>

* on overall imports of the country

Table 3: International imports of furniture - main O-Ds

The export axes are shown in table 4.

3. The role of maritime transport and Mediterranean ports in the furniture sector

3.1 The present scenario

From the analysis of traffic flows we note that the potential routes of interest for the maritime transport services in the Mediterranean can be classified in two categories:

- Long-range (ocean) routes
  - North America-Western Europe;
  - North America-Asia;
  - Western Europe-Asia;
  - Latin America-Western Europe

- Intra-EU (short-range) routes
  - Germany-Italy
  - France-Italy
  - France-Spain
  - Spain-Italy

It should be pointed out that in the furniture sector containers are the most common transport unit in use, therefore the specificity of the sector in terms of logistics and transport needs does not come out clearly, rather it refers to the more
general issue of containerized flows (Haralambides et al., 2002). We then consider the organization of maritime transport in the container sector in the view of the main routes that have been previously identified. In other words, we use the identity furniture-container.

The organization of container traffic in the Mediterranean is considered with reference both to transshipment and direct services. On the basis of recent researches (CNEL, 2002) we examine the characteristics of container services in the Mediterranean related to the above mentioned routes (both oceanic and intra-EU).

It seems that the strongest port areas (in terms of services provided) with reference to the long-range routes of interest for the furniture sector are the following:


With regards to these strong port areas (again, for the same routes of interest) we note that transshipment services tend to prevail on the following O-Ds:

- between the Liguria ports (Genoa, La Spezia) and the Northern Europe;
- between the Campania ports (Naples, Salerno) and the Northern Europe;
- between the Campania ports and the US East Coast;
- between the Campania ports and the Far East;
- between the ports of Pirae / Izmir and Asia, USA and North Europe.

In conclusion, there seems to be a predominance of transshipment services (Baird, 2002) on direct ones with regard to the routes of interest for our sector and with regard to the strong port areas identified.

Given such a predominance of transshipment services we note that the main transshipment ports in the Mediterranean (2001) are (table 5):

<table>
<thead>
<tr>
<th>Transshipment port</th>
<th>TEU *1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeciras</td>
<td>2.151</td>
</tr>
<tr>
<td>Marsaxlokk</td>
<td>1.165</td>
</tr>
<tr>
<td>Gioia Tauro</td>
<td>2.448</td>
</tr>
<tr>
<td>Taranto</td>
<td>186</td>
</tr>
<tr>
<td>Port Said</td>
<td>544</td>
</tr>
<tr>
<td>Damietta</td>
<td>696</td>
</tr>
<tr>
<td>Total</td>
<td>7.190</td>
</tr>
</tbody>
</table>

Table 5: Main transshipment ports in the Mediterranean

It seems that a specific in-depth analysis of the Gioia Tauro port with regard to the furniture sector is of importance (since furniture-specific data are available for that port). Using the data base of the port of Gioia Tauro for the period 2000-2001 it is found that the main ports using Gioia Tauro as transshipment terminal and the respective routes (n. of container bigger than 50) are the following:

- the port of Ancona, on the routes to America (USA and Canada) and to Asia and the Middle East;
- the port of Constanta, on the routes to America;
- the port of Koper, on the routes to America;
- the port of Livorno, on the routes to USA and the Middle East/Japan;
- the port of Salerno, on the routes to the EU and Middle East/Japan.

The scenario for the furniture sector is then characterized by:
- a limited number of distribution nodes of continental Europe, specifically in the Adriatic (Ancona and Koper) and in the Tirrenian (Livorno and Salerno) that
- are related to the main markets given by America (USA and Canada), Asia and the Middle East.

On top of that, we note the relevance of the port of Constanta...
towards America and the port of Salerno for the EU. As for the short-range routes (infra-Mediterranean) we illustrate some statistics related to the most important ones, i.e. those between – on one hand – Italy and – on the other hand – Spain and France (table 6).

<table>
<thead>
<tr>
<th>Destination country</th>
<th>1998</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>13.591.722</td>
<td>33.468.826</td>
</tr>
<tr>
<td>Spain</td>
<td>6.238.846</td>
<td>14.717.078</td>
</tr>
<tr>
<td>Mediterranean</td>
<td>30.839.339</td>
<td>72.811.359</td>
</tr>
</tbody>
</table>

Source: elaboration from CNEL (2002) on DRI-Standard&Poor data

Table 6: Maritime exports for Italy: some Mediterranean routes

Maritime services structure – weekly supply – can be summarized by the table 7:

<table>
<thead>
<tr>
<th>Destination</th>
<th>France</th>
<th>Italy</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valencia</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Marseille</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Genoa</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Barcelona</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Naples</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lecce</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Genua Tursi</td>
<td>0.47</td>
<td>0.47</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Source: elaboration from CNEL (2002)

Table 7: Maritime intra-Mediterranean routes - container (departures-week)

By considering these data, one can conclude that:
- the most important short-sea routes are those between France and Spain, being related to the ports – on one hand – of Marseille and – on the other hand – of Barcelona and Valencia;
- these are followed by the routes between Italy and Spain, which are of interest for the ports of Genoa and Barcelona, and between Italy and France, in particular the Genoa-Marseille route;
- a good performance is that of the routes of interest for the port of Naples towards Spain (Valencia and Barcelona).

Overall we note a significant degree of competitiveness (Veldman and Bückmann, 2003) of the Italian ports with regard to the Mediterranean container flows both for the long-range routes (Liguria and Campania areas) and for the short-range routes (Liguria).

4. The Italian picture: the role of maritime transport in the furniture chain

4.1 General aspects and relevance of import-export flows

Before analyzing the flows structure it is useful to briefly illustrate the geography of the furniture sector in Italy. Indeed, this picture supports the forward analysis on maritime and port aspects (Boske and Cuttino, 2003).

The furniture production (more than 20 billion Euros) accounts for some 1% of GDP in Italy. This percentage has remained constant since 1992. The production has then developed over time at the same rate of GDP. The location of main production sites is clearly of interest in order to understand the choice of various port ranges. The geographic distribution of main sites and their development over time is shown in fig. 1-2. The most important areas (in terms of employees) are Veneto (North-East Italy), followed by Lombardia (North West) and Friuli-Venezia Giulia (North East). They account for more than 50% of total output. Average size of plants is quite low (about 5 employees/plant), since firms are small and medium enterprises.

Import and export flows are displayed in fig.3. It appears clearly a strong predominance (both in physical and monetary terms) of exports, which have shown a positive trend for the last 10 years – from 1.8 to 4.9 billion Euros. This is not surprising since Italy detains the world leadership of the sector. This is the reason why we will focus our analysis on the export flows.

4.2 Modal split of export flows

Modal split of overall export flows is firstly shown – in absolute figures – by identifying the share of maritime transport (Fig.4).

In the diagrams of Fig.5 percentage figures of mode share are shown with regard to sea, rail and road modes, both in physical and monetary terms.

By absolute figures we note a significant positive trend of the maritime sector (from 190.000 tons to 570.000 tons).
By percentage figures a determinant role of the road sector comes out, whose market share is around 70%. However, road market share has been decreasing in the last ten years while maritime market share has increased in the same period (it was around 20% ten years ago while today it accounts for some 30%). These results suggest a more in-depth analysis of flows with regard both to sub-areas in Italy and to markets in order to clearly understanding the main factors determining the positive trend of maritime transport in the supply chain.

The data of overall flows by destination country can be then further specified — in the next paragraph — by identifying those countries which are particularly of interest for maritime transport.

### 4.3 Export flows analysis by destination country

**Overall flows**

If we analyze the development of overall flows broken down by destination country (markets) we obtain the fig. 6. We note — from monetary figures — that the most important countries for export flows are USA, Western Europe (Germany and France), the UK, Switzerland, Belgium and the Russia Federation. Other countries are represented by The Netherlands, Austria and Spain. Specifically, we note — since 2001 — that the US have become the most important market having overcome Germany; however, this is mostly due to the decline of export flows towards Germany rather than to a strong increase of the US market (US market, however, shows a strong positive trend).

**Maritime flows analysis by destination country**

The picture of maritime export flows — in monetary terms — is shown in fig. 7. We identify the following main markets:

- USA, in sharp development over the last ten years and neatly the main export market for maritime transport;
- Japan, showing a positive trend over the last ten years, however with a decline in the period 1998-99;
- Israel, showing a very strong performance;
- Canada, showing a constant rate of increase;
- The Emirates, showing a strong positive trend;
- Saudi Arabia, a relevant market with — however — a constant share over time, after a strong development in the period 1991-94.
respect to rail traffic. Overall, data on land-based export flows of furniture show that main destination countries are the European ones (Germany, France, the UK and Switzerland) and the Russian Federation.

4.4 Export analysis by regional areas

In this paragraph we break down the overall data of exports by main regional areas in Italy (South, Centre, North-East and North-West). It is found that the leading regional areas for exports are the Northern ones, in particular the North-East areas having a market share of some 50%. However, it must be noted that in last decade or so both the North-East and the North-West areas have shown a small decline in percentage terms (market share). On the other hand, the Southern areas of Italy have gained in the same period a lot in terms of competitiveness and actually doubled their market share (today, around 18%). The Centre remained stable in the period.

By considering the disaggregated data by regional areas in terms of modal split, one can define the “relative propensity” towards maritime transport, that is, the degree to which each regional area chooses maritime transport with respect to its own exports. A significant result arises: the Southern areas show (flows in monetary terms) a strong relative propensity towards maritime transport, which is definitely bigger than that in other areas. However, by considering data in physical terms, a strong relative propensity of the Central areas emerges too, which is almost equal to that of the Southern areas. The interpretation can be such that both areas strongly choose the maritime mode, however the value of goods exported from the South is relatively higher.

Another point of interest turns out to be the relative low propensity towards maritime transport of the North-East areas (both in physical and monetary terms). This means that the North-Eastern areas are very strong areas with regard to production (output) and export of goods, but they tend to choose maritime transport only marginally. On the other hand – as suggested – the Southern areas show a small export market share – however in sharp development – but a strong tendency “towards the sea” – again, increasing in the last decade (from 50% to 60%). We can then state that a strong positive correlation between export growth and the use of maritime transport exist for the South.

Such results can be usefully complemented by the information on the “absolute propensity” towards the sea of different regional areas, that is, how much maritime transport is used by each regional areas with respect to the overall maritime exports. Taking the absolute propensity, data show constant market shares among regional areas in the last decade, with a slight growth for the South.

In terms of modal split, we note that the North-East areas show the highest absolute propensity towards road transport. It is interesting comparatively to note that the North-East areas present a substantial contribution on overall maritime exports while having a low relative propensity towards the sea.

It is also useful to analyze – for each regional area – the main destination countries of export flows whereby identifying possible “geographical specializations” of various areas or, on the contrary, an identical pattern with respect to total exports in Italy.

Data in monetary terms show that:
- The USA are the main market anyway (for all regional areas);
- Japan is relevant for the North (in particular for the North-West areas) but less so for Central and Southern areas;
- Arab countries are significant mainly for the North-West and Central areas (partly for the North-East areas), while very much less for the South;
- The Middle East is prevalent for Central, Southern and North-Eastern areas but not so much for the North-West;
- It is definitely significant the role of the UK for the Southern areas: this means that for British destinations the competitiveness of maritime and port services is particularly strong only as long as the Southern areas of Italy are considered. In fact, the UK is not found within the first top 10 destinations for all the other areas, for which the road sector is prevalently chosen.

4.5 General trends of furniture imports

Trends of imports of furniture in Italy – both in physical and monetary terms – show a shape which is similar to that of exports, however in a relationship of 1 to 10.

As for the data on modal split of total imports two aspects are of interest:
- firstly, the significant growth trend of maritime transport, which is currently above 20%. It has actually doubled its competitiveness in the last decade;
- the strong decline of the railway sector, in particular in physical terms.

The road sector remains absolutely predominant (around 70% of market-share) even if a small decline is under way.

Total imports (all modes) by origin country (in monetary terms) show that the most important markets are Europe (Germany, France, Austria, Spain and partly Switzerland), along with China and Romania. In physical terms the most important markets are Romania and China. This is clearly due to the low value of products coming from these two countries. Generally speaking, trends are up, in particular for China and Romania. Data on maritime imports by origin country show in the last decade:
- a very strong growth of China and Indonesia, mainly since 2000;
- a relevant share for USA and Taiwan, again especially since 2000.

In the main we note the significant relevance of all the Far East (China, Indonesia, Taiwan, India, Thailand, the Philippines, Vietnam) and the USA.

By breaking down import data by regional areas in Italy we find that the most important areas of imports are the North-West and the North-East. The South shows – as for the exports - a picture in which the (absolute) market share
of imports is low but trend has been very positive in the last decade.

5. The transport decisions in the supply chain decision-making process

5.1 Some theoretical aspects

The quantitative analysis of the previous section has determined the relative importance of the maritime transport within the furniture sector in a number of perspectives. Now it is necessary to clarify the factors which determine such a scenario, i.e. to explain how the decision-making process develops (Tiwari et al., 2003) in the furniture supply chain. Recent transportation and logistics literature suggests that all the transportation decisions are strictly related to objectives and contents of the logistics strategic planning, which in turn depends on the supply chain strategic mission. Moreover, decisions made by different actors of the supply chain are clearly interrelated so as to determine an overall balanced structure. (Nagurney et al., 2002).

![Diagram of supply chain planning]

From figure 8 we note that the first step is that of developing the so called corporate strategic planning (Rushtow and Saw, 1993) in order to define the global mission of the firm. There are potentially three different strategies to be followed: product innovation, differentiation based on customer service levels and cost leadership (Ballou, 1999).

From the global strategic plan, the logistics strategic plan is developed both in terms of logistics revenues and costs. Consequently, a number of integrated plans are defined which are related to main logistics functions: procurement, production and distribution. Then, on the basis of distribution goals, the level of transport service and mode choice are determined.

The corporate plan and the functional plans can be decomposed in a number of decisions which can be of three hierarchical types: strategic, tactic and operational (Maggi, 2002). Mode choice is included in the strategic level, while port choice is more concerned with the tactical level. Moreover, make or buy decisions are included in the strategic planning and they can be related either to the whole logistics process or to specific sub-systems or functions, such as transport, warehouses, etc. In this case, it is clearly the logistics provider who decides in order to the mode of transport and infrastructures to be used. It is important to note that the driving factors for the firm with respect to the choice of the logistics provider are mainly cost factors – with respect to logistics efficiency goals – and service factors – with respect to logistics effectiveness goals (see the results of the empirical analysis).

It should be clear that:
- decisions in order to the mode choice are taken by actors “driving” the supply chain and/or by their logistics provider;
- choice criteria by decision makers derive from the overall strategy upstream.

On top of this, choices at each level are influenced by internal and external factors (Consiglio, 1993; Oxley and Rushton, 1993). External factors are concerned with macroeconomic variables, technology, competitiveness, etc. while internal factors are related to specific characteristics of the firm products, market demand (customers) and logistics system organization. In particular, physical characteristics of the products are one of the most important factors for the mode choice (Ballou, 1999).

Given the overall decision-making context, mode choices are based on comparison of costs and service standard of different alternatives, with the aim of optimizing the overall logistics system. Specifically, one aims at optimizing the sum of logistics costs having set a level of service to be provided to customers. Relevant service parameters can be classified in the following categories (Veldman and Bückmann, 2003; Maggi, 2002; Oxley and Rushton, 1993; Cullinane and Toy, 2000):
- speed (average door-to-door transit time);
- reliability (transit time variability);
- frequency of logistics services supply;
- flexibility of transport mean to manage different cargo types;
- safety;
- cargo capacity (with respect to weight/volume ratio).

5.2 Employed methodology

With reference to the theoretical aspects of the logistics decision-making process, we organise the analysis of the furniture supply chain decision-making process so as to determine (Mazzarino et al., 2002; European Commission, 1998; Baccelli, 2001):
- who are the actors of the supply chain (level of horizontal and vertical integration);
- how they interact (who decide what);
- which are the factors “driving” the choice within the supply chain in terms of cost and service standards (which are the choice criteria).

In doing so, we consider the export flows only, since statistics show a lower relevance of imports. Thus, after a short description of the whole supply chain, we focus the analysis on the distribution subsystem.

The analysis is carried out by using a questionnaire format and phone interviews to a selected number of producers. Producers are selected among the top 50 in Italy on the basis of their market share (Lojacono, 2001) and by their propensity towards export. As noted earlier, furniture companies in Italy
are mainly of small and medium size. We focus our analysis on companies all over the territory having a strong tendency to sell on foreign markets in which maritime transport can potentially play a major role.

The questionnaire structure is given by three parts:
- general information on the company, products, export flows, pricing policies;
- choice criteria with respect to logistics provider and ports;
- future trends.

In the first part we present questions that allow us to precisely identify the kind of company considered. Questions refer to revenues and employees, the incidence of exports on revenues, the kind of company products and the quantities produced, the percentage of revenues to exports and the main export markets. Relatively to every export markets, we ask the percentage of flows using maritime transport (on total exports), the ports used outbound and the type of cargo unit. Further, we ask for the pricing policies and the kind of customer (single dealer, multi-dealers, final customer, etc.).

The second part of the format is built trying to identify the choice criteria with regard to either the logistics provider – if logistics activities are outsourced – or the port – if such a decision is taken directly by the company itself. Respondents are asked to score – using a scale between 1 and 3 – the criteria, which are related to cost, service performance and other features.

In the last section we ask about the foreseen trends of markets, process/product innovations, logistics organization, etc. so as to envisage the future trends of growth of maritime export flows. However, after a number of personal interviews to producers we realized that the most part of our respondents were not able to clarify the complete structure of the decision-making process. In fact, furniture producers tend to sell on international markets using pricing policies such as FOB (free on board) or Ex Works. That means that the choice of the port and generally of the overall organization of the logistics service is up to the customer. Since interviewing hundreds of customers all over the world would have been clearly not realistic, we realized that the only type of decision-makers capable of providing information on mode and port choice criteria were the logistics operators. By using professional databases we selected those logistics providers dealing with the furniture sector as their relevant activity.

6. The decision-making process of the furniture supply chain

6.1 Main actors and patterns

As said, in order to properly understanding the decision-making process it is necessary to analyze the supply chain structure (procurement, production, distribution) of the furniture sector (the whole chain of actors that make the final product available to the market). It is also necessary to identify the role of the logistics operators within the chain and how market power is distributed among all the actors.

The procurement of raw materials (wood, essentially) is mainly done through a network of importers which are very concentrated spatially. Exceptions are some big producers buying directly from vendors, sometime also using e-procurement technologies. Other actors are given by land carriers, shipping companies and port terminal operators, since procurement markets are often very far from producers. The main logistics decisions are taken by the importers and/or their logistics providers.

As for the production section of the chain, there is a clear trend – especially in the home furniture sector – to fragment the production process on the basis of the specialization principle within districts (the “district production chain”).

In doing so, customization of final products is made at the production sites – conversely with respect to many other sectors. In some cases, however, a number of operations are performed at the destination site, such as a number of assembly operations.

Delocalization abroad is not so much relevant for the sector, the reasons being the need of quality control and the limited size of firms which hinder investments. Some firms, however, from the Puglia and the Veneto districts have decentralized some production operations in countries such as China (coach stuffing) and Hungary (new plants).

As for the distribution system on foreign markets – especially those of other continents and of peripheral Europe (UK, Russia) the dominant pricing policy is Ex Works, in which customers have the responsibility to deliver products to final destinations. Firms then do not have their own distribution networks and they mostly focus on production lead-time (i.e. to let product available to the customers at the plant site). Thus, the chain is short: final customers are mainly given by big importers, since it is difficult – using Ex Works policy – to sell directly to retailers. Sometime importers favour such pricing policies since they buy different parts or products from different firms and then assemble them to get the final products (e.g. kitchen or dining rooms). Moreover, they consolidate different deliveries, whereby creating high volumes and exploiting economies of scale especially in terms of transport costs.

The second most important distribution model is based on the FOB (free on board) pricing policy: it is then up to the seller the responsibility of the transport of goods from plant to the port. Some exceptions are given by a number of Puglia districts that have created their own distribution networks abroad and use DDU (Duty delivery unpaid) or DDP (Duty delivery paid) policies.

In the main, - as it will appear clear in the next section - the kind of pricing policy is the most relevant factor determining how the decision power regarding transport choice is distributed throughout the supply chain.

The role of integrated logistics operators is still limited in the sector: distribution aspects are still not well-managed and outsourcing not so well-developed. Moreover, Ex Works pricing policies imply that transport choices are in the hand of foreign customers, therefore logistics markets are mainly managed by foreign companies.
In the case of logistics outsourcing, logistics providers decide the transport mode and the infrastructure to be used. Interviews to furniture producers highlight that the most important criteria used in order to choose the logistics provider are (in descending order of importance) (Table 8): safety of cargo, door-to-door service, punctuality, specialization and flexibility (ability to cope with emergencies). Safety of cargo is a crucial criterion, in so far as probable damages to cargo negatively affects the subsequent assembly operations and therefore cause late deliveries. Damages are however quite common because firms frequently use a cheap kind of packaging (celophan with angles protected by polystyrene panels). In order to respond to safety needs some logistics operators (e.g. Schenker Stinnes Logistics) have developed a specialized road transport service using vans equipped with blankets and straps to protect the goods.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety of Cargo</td>
<td>3</td>
</tr>
<tr>
<td>All inclusive Service</td>
<td>2,75</td>
</tr>
<tr>
<td>Punctuality</td>
<td>2,5</td>
</tr>
<tr>
<td>Level of Specialization</td>
<td>2,5</td>
</tr>
<tr>
<td>Flexibility</td>
<td>2,5</td>
</tr>
<tr>
<td>Frequency</td>
<td>2,25</td>
</tr>
<tr>
<td>Short lead-time</td>
<td>2</td>
</tr>
<tr>
<td>Geographic range of activity</td>
<td>1,75</td>
</tr>
<tr>
<td>Cost</td>
<td>1,25</td>
</tr>
<tr>
<td>Supply if additional services on top of transport</td>
<td>1</td>
</tr>
<tr>
<td>Proximity to plants</td>
<td>0,5</td>
</tr>
<tr>
<td>Partnership</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 8: Ranking of logistics provider choice criteria in the furniture sector

6.2 Ports and mode/port choice criteria

Choice criteria for long-range services

The sea sector is the most important mode of transport used for exporting to extra-continental markets, since air transport is only a marginal and specific option. The choice between the two modes is mainly based on two parameters, that is, cost and speed. For non-urgent deliveries, maritime transport is a mandatory choice to carry medium-value products such as furniture. Precisely, the incidence of transport costs is quite high. Based on an analysis carried out on the Altamura-Mater district (Uniontrasporti, 2000), 43% of producers indicates an incidence of transport costs on revenues of 5-10%, and the 16,7% of companies an incidence of 10-15%.

The incidence of transport costs on selling price clearly decreases as product value increases, that is, we go from chairs to couches through home and office furniture. Given that the average incidence of logistics and transport costs is quite high, the maritime transport is generally chosen being less expensive. Air transport is used only occasionally, that is, for urgent deliveries due to delays in the production process that do not permit the lead-time to customer to be met, or to send samples or prototypes to potentially new customers. Competition within the logistics chain is then among ports and alternative port-shipping services (De Souza Junior et al., 2003). Referring to ports, interviews have confirmed that maritime deliveries are made by means of containers using ports equipped with appropriate terminals (Haralambides et al., 2002) and providing international services (direct or via transshipment). From the interviews the following Italian ports of interest are identified:

- Medium-High Adriatic: Trieste, Venice, Ravenna, Ancona;
- Medium-High Tirrenian: Genoa, Livorno, La Spezia;
- South Italy: Naples, Gioia Tauro, Taranto, Brindisi, Bari and Salerno.

Adriatic terminals are mainly feeder ports, except for some routes (e.g. Trieste towards Far East). Among the Medium-High Tirrenian ports, the most important ones are Genoa and La Spezia, while Livorno provides few direct services. In the South Italy flows are concentrated on Naples and the hub of Gioia Tauro. Taranto shows a sharp development as alternative hub. Brindisi is used mainly for routes to Greece. Bari has a direct intermodal service (block train) on Gioia Tauro which is used by Natuzzi (one of the main furniture manufacturer) whose plants have their own rail tracks. Bari and Salerno are ports feeding Gioia Tauro.

Generally speaking, when the choice is not related to the “natural” port (i.e., the nearest one geographically), the distribution pattern of flows among Italian ports is the following:

- the production areas of North-West Italy choose the Medium-High Tirrenian ports with reference to America, the Middle-East and Far East markets (Genoa prevail especially for Far East destinations);
- the production areas of North-East Italy choose the Medium-High Adriatic ports with respect to the Middle East and Far East markets, and the Tirrenian ports with respect to the North and South America markets;
- the southern areas sites mainly choose the Southern ports for all the destinations and in particular they concentrate their flows on Naples and Gioia Tauro. As we noted earlier the data base of Gioia Tauro show – among other things – the feeding role of two foreign ports, that is, Constanta and Koper. While it seems that Constanta serves the Romanian production areas, Koper results in a competitor for other Italian ports, especially with regard to the North-East production areas.

In the main, interviews show that the Italian ports do not suffer from competition of Northern Europe ports, the only exception being related to the routes to US West Coast. Now, it is then necessary to understand who take such decisions and which are the main port choice criteria. Interviews show that main decision-makers are both shippers or receivers depending on the kind of pricing policy. Moreover, shipping companies play a major role in that they decide how to distribute shipping services among ports, frequencies and kind of services (direct services or via transshipment), possible “all inclusive” services. In doing so, they determine how traffic flows are allocated among ports (market shares) (Veldman and Brickmann, 2003).

Through the interviews it was asked respondents to score each criterion. Table 9 ranks the port choice criteria, following the empirical evidences.
In the case of direct choices by the seller it is shown that the most relevant criteria are (in descending order of importance): reliability, cost, frequency of services and speed of port operations. On the other hand, factors such as supply of additional services and partnership among producers are considered definitely not relevant. The results of personal interviews to the logistics operators highlight how port choice criteria vary depending on the pricing policies (see table 10). In particular, the dominant criterion varies from cost to transit time – as decision power shifts from shipper to receiver. When Ex Work conditions are used it is the customer who organizes the services and he requires a short transit time in order to be competitive in the market. Instead, when FOB (free on board) conditions are used, the seller tend to choose the “natural” port (i.e. the nearest one) in order to incur in low costs. However, quite often he must satisfy customer needs and then he chooses the port that guarantees the best transit time. Finally, when DDP or DDU conditions are used, the choice criteria of the seller, who often decides in partnership with his logistics operator, are both service-oriented and cost effective.

Transit time is particularly important whenever delays in production occur: both our interviews and Lojacono (2001) show that such cases are not rare and they imply a different port choice in order to exploit the benefits of a shorter transit time that avoids customer losses. As for the routes to the Middle and Far East the differences in performance of the Tirreanese and Adriatic ports are less relevant. Average transit time is 19 days from the Tirreanese ports and 20 from the Adriatic ones. Generally speaking, though, for Eastern markets transit time is less important than for the US markets. As already said, Italian ports seem not to suffer from competition by foreign ports. North European ports are preferred only for deliveries to the US West Coast, since Maersk has introduced block train services which make the deliveries from the terminals or Padova or Milan cheaper (5-10% of savings). Transit time – for instance - from Rotterdam to San Francisco is about 28 days. This highlights the major role of shipping companies in influencing the port choice by offering door-to-door services.

**Table 10: Port choice and pricing policies in the furniture sector**

<table>
<thead>
<tr>
<th>Pricing policies</th>
<th>Port choice power</th>
<th>Transport segment management</th>
<th>Main choice criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Ex Works</td>
<td>Buyer</td>
<td>Buyer</td>
<td>Mostly transit time</td>
</tr>
<tr>
<td>b) FOB on board</td>
<td>Buyer/Carrier</td>
<td>Maritime/Carrier</td>
<td>If carrier needs pre-cast cost</td>
</tr>
<tr>
<td>c) DDU/DDP</td>
<td>Seller</td>
<td>Maritime/Carrier</td>
<td>If customer needs pre-cast transit</td>
</tr>
</tbody>
</table>

It appears clear, however, that the “time” factor is going to become more and more important in the port choices. As far as the Italian ports are concerned, this means that to American markets (US markets firstly) – since the US are the first export market – traffic flows generated by the Northern production (North-West and North-East) areas are allocated to High-Tirreanese ports, while cargo volumes from Southern areas are directed to Southern ports (Gioia Tauro mainly). From table 10 we note that transit-time to America is longer from the Adriatic ports with respect to the Tirreanese ports, in that all Adriatic services to America are via transhipment, mostly through the Gioia Tauro or Malta hubs. The number of weekly services from the Adriatic ports are fewer too (table 11).
Uniontrasporti (2001) estimated that on specific O-Ds (e.g., Milan-Barcelona) the short-sea shipping costs (considering both accompanied and unaccompanied techniques) are lower than the "theoretical" road costs. It is quite well-known, however, that minimum road tariffs and constraints on the number of driving hours are rarely complied with, therefore the "theoretical" costs significantly differ from the "actual" ones: road results in the most competitive mode of transport.

Even if we assume the costs of short-sea and road services to be equivalent on the same O-D, other service factors results in the road sector being the most convenient service. As for the transit time it is necessary to focus on specific O-Ds. By analyzing the routes to the most important European markets - excluding Germany and France - we note that sea transit time is always longer, both to the UK and Black Sea markets (table 13). On the contrary, sea transit time is competitive to the Spanish market from La Spezia and Gioia Tauro. The reasons why short-sea shipping services are nevertheless not competitive on these markets - especially for Spain - are due to frequency and safety factors.

However, the route from Gioia Tauro to the UK is definitively competitive: the number of weekly departures is 3 and transit time is 4-6 days. On the same O-D, transit time from North Italy ports is less competitive: about 7 days while by road is 2-3 days. Another decisive factor which make the road more competitive is flexibility, in that it allows a better coordination and balancing of flows. On the contrary, short-sea services suffer from the problem of empty containers.

On top of the UK market, short-sea services are relevant for exports to Greece. For this market, transit time by road is high due to bad infrastructure network through the Balkans. As for the Russia Federation - which is the sixth most important market - the choice of short-sea services is hindered - on top of a longer transit time - by the high inefficiency of Black Sea ports. Moreover, shippers face difficulties in finding local reliable operators to transport the goods to the final destination.

7. Future scenarios and conclusions

In order to identify some quantitative forecasts for the furniture sector based on statistical data and the future international scenarios in the Mediterranean, it seems appropriate to employ a linear model. In fact, markets show a positive trend which is not, however, an exponential one: linearity seems appropriate in this case.

It seems reasonable to refer the forecasts to: - imports-exports by sea, so as to highlight the role of maritime transport within the trade patterns for Italy (aggregate analysis); - export trends for the most promising markets for maritime transport, which can be briefly summarized in: US, Middle East, Arab Countries, UK (disaggregate analysis by markets); - export trends by sea for Southern areas in Italy (disaggregate analysis by regional areas).

At the aggregate level forecasts suggest a strong positive trend for export flows. They indicate a monetary estimate of exports in the next 10 years of about 4,500 Euros, with an increase of about 50% with respect to current values.

As for the analysis by main markets we notice a consolidation and improvement of the US market, showing an increase of some 30%. Similarly, we notice a slight increase of Arab Countries and the Middle East markets. Also, the development of the UK market is going to be significant, reaching some 200 millions Euros.

The disaggregate analysis by regional areas shows the leading role of the Southern areas for export flows which present an increase of some 50%. This is particularly meaningful provided the strong propensity towards the choice of maritime transport of southern exports, also for intra-European flows. Yet, since quantitative forecast based on linear models seems not to be able to "see" some qualitative trends, it is necessary to highlight also further elements and aspects for the future regarding the supply chain decision-making process.

First, we underline how the main challenge in the medium-long period for Italy will be that of maintaining the world leadership in the sector. In fact, there is already an increasing competition by new actors, such as China and the Far East, and also Spain in the chair sub-sector. The traditional Italian competitive factors of design and innovation could not be sufficient in this respect, especially with reference to countries that are quite smart to imitate the Italian style at lower costs, thanks to the great availability of human resources and raw materials on top of less environmental and social constraints.

To cope with such new competitors some important innovation in the supply chain are needed, for which the distribution and logistics aspects are going to play a major role. It is foreseen a shift of decision power from the buyer to the producer whereby having a better control to the final market and the selling price (as competitive leverages). This implies a change in the pricing policies, i.e. a larger use of DDU or DDP terms on strategic markets through distributors and agencies.

The above process is clearly already under way, in particular firms can be classified as follows:
- "pioneer" companies;
- "changing" companies;
- non-evolved companies.

We assign to the first categories - for instance - the firms of the Murgia-Matera district (South Italy), which are reaching a leading position due to the effectiveness of the pricing policies. Also, many North-East companies are changing their pricing policies to become more competitive. The companies belonging to the last categories are going to be those that will
manage only a national market niche in the future. As a consequence of the distribution strategy development, outsourcing is going to develop too. The same is true for partnership agreements among firms – i.e., district logistics agreements. Also, the development of local distribution centers or transit-point could allow consolidation of flows while satisfying the constraints of transit time and production process delays. Pioneer firms have already undertaken such a path. Another logistics innovation – which is under way – aimed at improving the lead-time consists in the local customization of products. This allows inventory costs to be reduced. Generally speaking, the development of intra-district logistics partnership agreements and coordination could enable economies of scale to be exploited whereby acquiring greater market power with respect to the logistics operators and the shipping companies. Yet, the excessive individualism which are typical of Italian districts have hindered such a development so far.

Some trends in the production area (ISTAT-Federlegno, 2000) points towards product differentiation strategies. Technology innovation allows a lightening of materials, i.e., less use of solid wood and a larger use of wood-shavings panels. On top of that, modularity is going to develop further. Both trends imply lower transport costs. In order to face foreign competition on the costs front, the delocalization process is going to proceed at a fast rate. Many firms have already established new plants in China, Eastern Europe and South America (Brazil, etc.), where an abundance of raw materials and cheaper labour costs exist.

Finally, the development of e-business and e-logistics is also going to play a role. Some big companies in the North Italy (e.g., Fantoni) has already developed pilot systems for e-procurement. Others (e.g., Snaidero) have created marketplaces in order to integrate vendors, partners and human resources. Also, in some district areas initiatives are under way although – as said – with some difficulties: some telematic networks to improve coordination among actors of the districts and outside so as to attain a better logistics efficiency are already developing (e.g., the chair district of Manzano – North Italy). However, since e-business requires a significant amount of financial resources it does not seem reasonable to foresee fast rates of development for small and medium enterprises in the near future.

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1 The paper is the result of a common work of the authors. However, paragraphs 2, 3 and 4 should be assigned to Marco Mazzarino and paragraphs 5 and 6 to Elena Maggi. Paragraphs 1 and 7 are jointly written.