

# **Port competition and selection in contestable hinterlands; the case of Austria**

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*This paper deals with port competition and port selection for cargo to/from Austria. Austria is located centrally in Europe and seaports in at least five countries are used for imports and exports. Changes of market shares over time of different ports serving Austria are analysed. Switching of cargo between ports does take place, but friction prevents instantaneous switching. Consequently, it took a decade for the new potential of inland shipping to Austria, resulting from the opening of the Rhine-Main-Donau canal, was fully realised. A survey was held to analyse port choice decisions of two types of decision makers: shippers and forwarders. These results show shippers and forwarders have similar views on port selection, but shippers have a less price-elastic demand.*

**Keywords:** port choice, port competition, hinterland, Austria, case study

## **1. Introduction**

Port competition has become fiercer over time (Meersman and Van de Voorde, 2002), amongst others because of the rise of international trade, concentration in the shipping industry and liberalization of transport markets. Furthermore, the nature of port competition has changed; port services are no longer provided in isolation, but need to fit into door-to-door supply chains. Terminal operating companies (TOCs) as well as port authorities not only provide services to shipping lines, but increasingly play a role in *hinterland transport*. This is explained by a number of reasons. First, an increasing amount of door-to-door costs are inland costs (Notteboom and Rodrigue, 2004). Thus, the efficiency of hinterland transport

becomes more important for the competitive position of TOCs in supply chains. Second, whereas TOCs have in general been able to improve terminal operations to accommodate increasing volumes (and ship sizes), dealing with these increased volumes has proved more difficult in hinterland transport. Third, unlike the shipping industry that is dominated by relatively few global players, the number of firms involved in providing hinterland services is huge. Thus, there is need for the effective *coordination* of hinterland services (De Langen and Chouly, 2004).

In this paper an analysis is made of port competition and port selection in Austria, a country that is served by at least six different ports in five different countries: Hamburg and Bremen (Germany), Rotterdam (The Netherlands), Antwerp (Belgium), Trieste (Italy), and Koper (Slovenia). The analysis of port selection processes in a region with fierce competition from ports in different countries adds to existing studies of port selection. In the remainder of this paper, first, a theoretical background for analysing hinterlands of ports is provided, and second, an analysis of changing market shares of the ports competing for Austrian cargo is made. Third, results of a survey of port choice decisions of shippers and forwarders are discussed and fourth, an overview of the perceived quality of the six competing ports is presented. A concluding section finalises the paper.

## **2. Analysing port hinterlands**

Sargent (1938) provides a first analysis of port hinterlands. Other contributions to understanding port hinterlands include Morgan (1951), who argues that the hinterland of a port is different for each commodity. He also argues that 'liner port hinterlands' are the most complicated. Taaffe et al. (1963) analyse increasing concentration of transport flows on a few corridors to the hinterland. Bird (1963) describes spatial change of port complexes and Van Klink (1995) argues that ports increasingly create networks with hinterland nodes to increase the competitive position of the port. Van Klink and van den Berg (1998) and Rodrigue (2004) further emphasise the importance of corridors to the hinterland. Notteboom and Rodrigue (2004) introduce the concept of 'island formations' that can give a port a competitive edge in a hinterland. De Langen and Chouly (2004) stress the importance of analysing hinterland access as an 'interorganisational issue'.

A distinction can be made between *captive* and *contestable* hinterlands. This distinction is very similar to the distinction made by Morgan (1951) between primary hinterlands, the area where the port is well established and secondary hinterlands, with rivalry among ports. All regions where one port has a substantial competitive advantage because of lower generalized transport costs to these regions belong to the captive hinterland of this port. Consequently, this port handles the vast majority of all cargoes to/from these regions. Haralambides (2002) observes that for most ports, such captive hinterlands have diminished. Contestable hinterlands consist of all those regions where there is no single port with a clear cost advantage over competing ports. As a consequence, various ports will have a share of the market. Figure 1 shows, in stylized form, the distinction between captive and contestable hinterland.

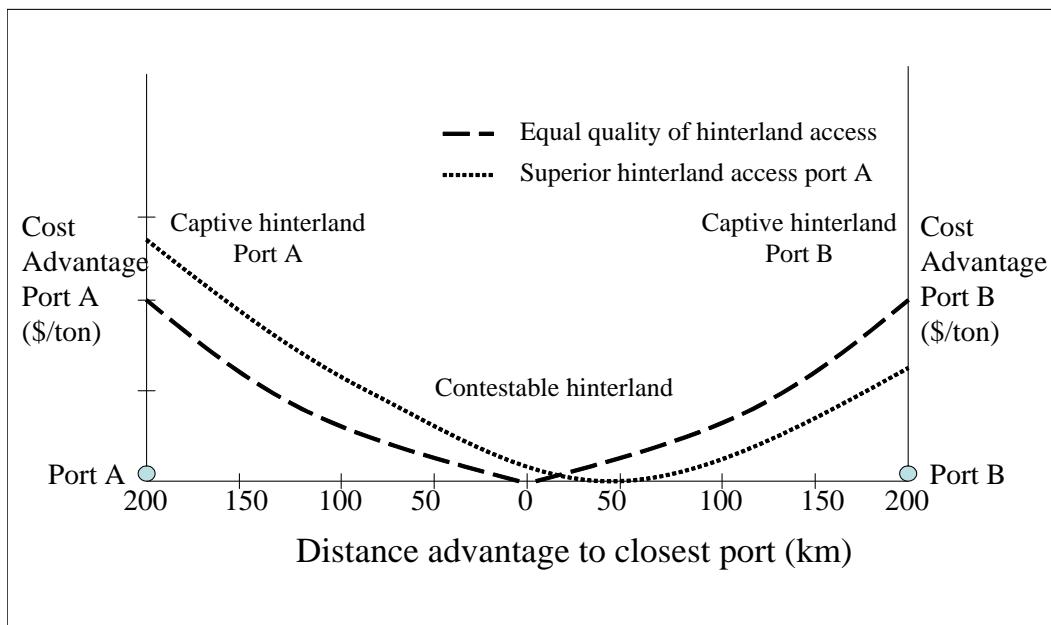


Figure 1. Captive and contestable hinterlands.

Figure 1 shows the cost advantage of a port related to its distance advantage compared to a competing port. When the quality of hinterland access is exactly the same for both ports, the cost difference is nil as the distance to both competing ports is exactly the same. Various factors other than distance influence the level of ‘generalised transport costs’ to locations in the hinterland, such as quality of the infrastructure, frequency of services and natural or political barriers (see Vigarie, 2004). The dotted line in figure 1 shows an example of a port (port A) with a cost advantage not solely explained by distance.<sup>1</sup> Port competition is fiercest in those regions where no single port has a lasting cost advantage compared to other ports. Such regions are part of the *contestable hinterland*.

In Europe, the clearest example of such a contestable hinterland is Austria. Ports from 5 different countries compete for and have a substantial market share of Austrian cargo. Thus, an analysis of port competition and selection in this country is especially relevant for understanding how competitive advantage can be created in contestable hinterlands.<sup>2</sup> Such an analysis is presented in the following paragraphs.

### 3. The evolution of Austria’s maritime transport routes

Austria is a relatively small, open and prosperous economy in Europe. The country’s goods imports were about 91 billion euro and goods exports were about 90 billion euro in 2004

<sup>1</sup> The shape of the ‘cost advantage curve’ in figure 1 is upward sloping rather than linear. This assumes the presence of scale economies due to higher frequencies or better vehicle utilization in regions in the proximity of the seaport.

<sup>2</sup> The Mid-West of the USA (around Chicago) is perhaps the best example of a contestable hinterland in North America. This region is served by US and Canadian ports on the west coast, such as LA/Long Beach and Vancouver, ports in the Gulf coast, most importantly the ‘Lower Mississippi ports’, ports on the West Coast, such as New York/New Jersey, and Great Lakes ports, such as Montreal.

(Statistics Austria, 2006). Both imports and exports are more than 35% of the country's GDP. The majority of trade is continental European trade, to countries such as Germany, by far the largest trading partner and Italy, the second largest trading partner. Major overseas trading partners are the US, China and Japan (Statistics Austria, 2006).

Figure 2 shows the main seaports serving Austria (Seehafenbilanz, 1997; 2004).<sup>3</sup> These ports can be classified in three pairs, the North ports (Hamburg and Bremen), the West ports (Rotterdam and Antwerp) and the South ports (Trieste and Koper). The ports in the same pair use to a large extent the same infrastructure to serve Austria. Thus, port performance can be expected to be an important determinant in the competition between such ports. A relevant question in this respect is: 'is competitive advantage specific to one port, or instead specific to a port pair?' If the latter is the case, cooperation between the ports in the same pair may be sensible.



*Figure 2. The main seaports serving Austria*

The volumes of overseas imports and exports and their distribution over ports in 2003 are given in table 1.

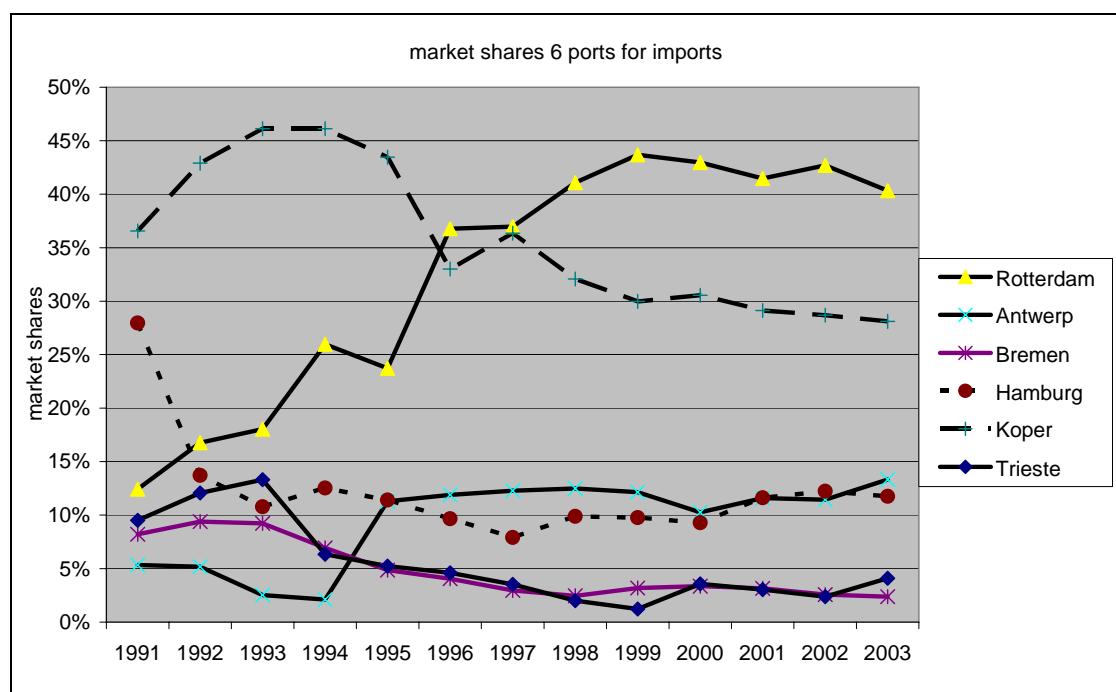
<sup>3</sup>The existence of these 'port pairs' is interesting in the context of scale economies in transport. The existence of port pairs seems to indicate that at least some scale economies are relevant for corridors, but less so for specific port activities. This issue is not further explored in the paper.

**Table 1. The volumes of the six largest ports for Austrian cargo**

	Volume in 2003 (*1,000)		
	Import	Export	Total
Rotterdam	3,180	648	3,828
Antwerp	1,051	453	1,540
Bremen	187	662	849
Hamburg	926	1,207	2,133
Koper	2,216	568	2,784
Trieste	324	610	934

Source: Seehafenbilanz (2004)

These data cannot be split up into commodities as is generally done in seaports, because these data are not collected in Austria.<sup>4</sup> A substantial fraction of the imports consist of raw materials, while the exports are mainly finished goods (Statistics Austria, 2004). Figure 3 and 4 show the evolution of market shares of the six most important ports for Austrian imports and exports respectively, over the last decade.

*Figure 3. Market shares of ports for Austrian imports 1990-2003*

The figures yield three interesting observations. First, the overall fluctuations of the market shares are large, both for import and for export flows. These fluctuations indicate competition is fierce; ports can gain or lose substantial market share in a short period. Factors that have influenced the development of market shares in this period include the opening of the Rhine-

<sup>4</sup> The six port authorities do not have data on market shares to Austria for specific commodities either. They may be able to roughly estimate their market shares, but such figures would be rather unreliable. Furthermore, whereas an estimate for the present situation may be possible, the analysis of the data is based on a time series of more than 10 years. Port authorities cannot possibly estimate such data accurately.

Main-Donau Canal, in 1992, the water levels in the Rhine<sup>5</sup>, and political instability in former Yugoslavia.

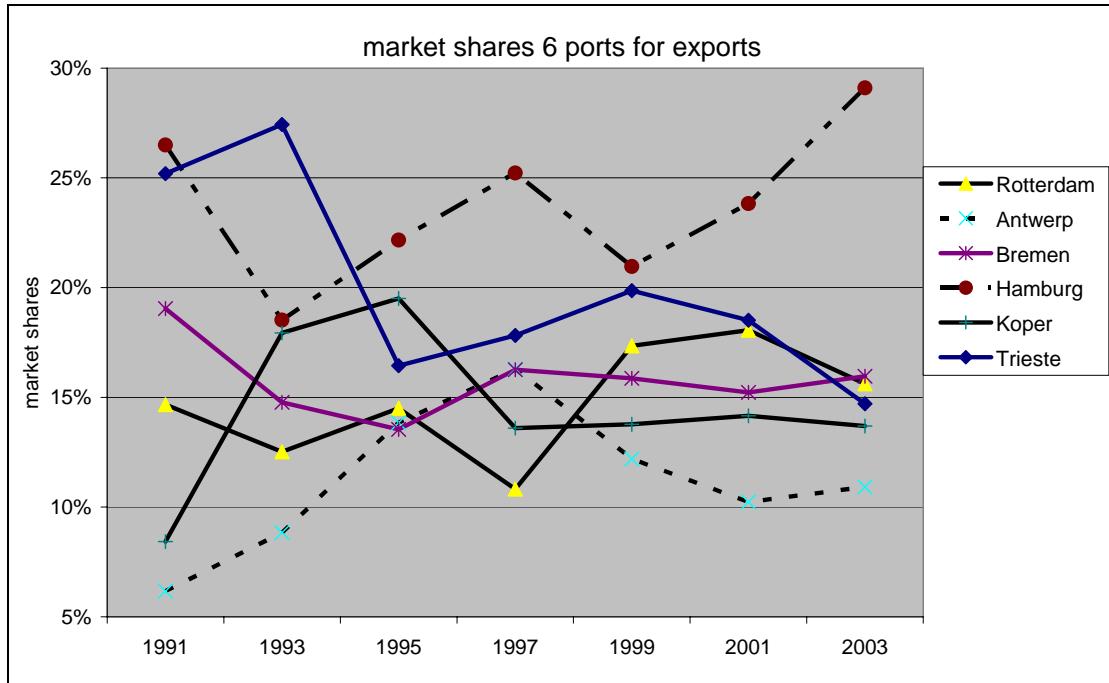


Figure 4. Market shares of ports for Austrian exports 1990-2003

Second, the market share of Rotterdam has risen sharply. The same applies, though to a smaller extent, to Antwerp. This rising market share can be attributed to the opening of the Rhine-Main Donau Canal. This has led to a larger market share for inland shipping. Rotterdam and Antwerp have benefited from increased inland shipping volumes as they are well connected to the river Rhine. This explains their strongly increased market shares for imports: especially the bulk imports are less time sensitive and thus suitable for inland waterway transport. The rise in market share *has taken roughly a decade*. This is a substantial period. Two kinds of explanations may be put forward. First, it may be argued that many decision makers make decisions on the basis of history and existing relations (D'este and Meyrick, 1992; Tongzon, 2002). Second, it may be that switching from one transport mode and port to another incurs costs. For instance, the structure of supply chains and storage locations may need to change, or firms may need to invest in inland shipping terminals or inland barges. These ‘switching costs’ explain why switching does not take place immediately, but ‘friction’ has to be overcome (see Hesse and Rodrigue, 2004).

Third, the figures show that, unlike many observers in the shipping industry have forecasted (Fageda, 1999), no shift from the ‘North ports’ and ‘West ports’ to the ‘South ports’ has occurred, even though the South ports have a clear distance advantage. This demonstrates distance alone does not explain market shares in the hinterland (Malchow and Kanafani, 2004).

<sup>5</sup> When the water level in the Rhine is low, inland barges cannot be fully loaded. Consequently, less cargo is transported by inland waterway and ports with good barge connections lose market share.

#### 4. Port selection of shippers and forwarders: results from a survey.

There is a growing literature on port selection. In one important research approach, transport choice is modelled (see Mangan et al., 2002), amongst others with discrete choice models (Malchow and Kanafani, 2004; Tiwari et al., 2003). A number of relevant research findings have been obtained.<sup>6</sup> First, the importance of location (the origin or destination in the hinterland) turns out to be the most important factor in port choice (Malchow and Kanafani, 2004). Second, *good characteristics* (such as value density and refrigerated or not) influence port choice (Malchow and Kanafani, 2004). This is explained because different goods have different time sensitivities (De Langen, 1999). Third, the number of ship calls and routes offered by a particular port are relevant (Tiwari et al., 2003).

Notwithstanding these findings, the approach has one major shortcoming: differences in the *behaviour* of decision makers in port choice are not included in the analysis. There are however indications that ‘behavioural factors’ are relevant in port choice.<sup>7</sup> Mangan et al. (2002) show for instance that driver factors, such as onboard facilities and opportunities to have a rest break, influence the choice of ferry ports. They also argue that partnership relations between road transport firms and RoRo carriers influence port choice. Tongzon (1995) has shown the relatively high concern of shippers with *indirect* costs, such as unreliability, damage and adverse reputation effects. Murphy et al. (1992) show that port selection factors are valued differently by freight forwarders and shippers.<sup>8</sup>

This study complements existing studies by dealing specifically with port selection of shippers and forwarders in contestable hinterlands. Tongzon (2002) distinguishes three kinds of shippers: those with long term contracts with shipping lines, those that outsource logistics to forwarders and third, ‘independent shippers’ (Tongzon, 2002) who make transport choices themselves. He concludes that both independent shippers and forwarders engage in port choice continuously. Hesse and Rodrigue (2004) introduce the term ‘supply chain power’ and attribute this power to third party logistics providers, such as forwarders. This underlines the relevance of analysing port selection processes of forwarders.

The survey results were obtained by e-mailing a survey to a sample of about 300 Austrian shippers and forwarders. The addresses were obtained from websites with contact details of forwarders, importers and exporters.<sup>9</sup>

The use of various data sources ensures a relatively random sample. All firms were asked to return the survey if they regularly engaged in port selection decisions. This reduces the response rate as not all selected firms make such decisions (e.g. when they only deal with

<sup>6</sup> In this discussion, no attention is paid to the selection of transshipment ports, for this issue see Lirn et al., 2003.

<sup>7</sup> These ‘behavioural factors’ may be perfectly rational for the involved decision-makers. We regard factors as ‘behavioural’ when they are ‘actor specific’. Malchow and Kanafani (2003, p. 319) argue that ‘the shipper preferences are wholly subsumed within the choice of a carrier’ (or forwarder). However, it seems more realistic to assume such actors also influence port choice for ‘company specific reasons’ such as the need for effective repositioning of empties, volume discounts in contracts with ports and the like.

<sup>8</sup> Murphy and Daley (1995) analyse previous studies where shipper and carrier preferences are compared. They conclude that the ranking of various carrier selection factors is very similar between carriers and shippers, while the mean importance attributed to various factors differs between carriers and shippers.

<sup>9</sup> The websites [www.transportdata.de](http://www.transportdata.de), [www.compass.net](http://www.compass.net), [www.gelbeseites.at](http://www.gelbeseites.at), [www.trend.at](http://www.trend.at) and [www.austrianexport.org](http://www.austrianexport.org) were used. The data collection was carried out by S. Vergouw, for his Masters thesis on this topic (Vergouw, 2004).

continental supply chains<sup>10</sup>). Furthermore, the fact that surveys were send by email may have lowered the response rate, which was 11%. The 15 shippers and 17 forwarders that did return a completed survey engage in port selection processes and provide a sufficiently large sample to draw some tentative conclusions. Table 2 shows the opinions of both shippers and forwarders with regard to a number of propositions on port selection.

**Table 2. Responses to a number of port selection propositions<sup>11</sup>**

<b>Proposition</b>	<b>Forwarder (n=15)</b>		<b>Shipper (n=17)</b>	
	<b>Agree (%)</b>	<b>Disagree (%)</b>	<b>Agree (%)</b>	<b>Disagree (%)</b>
Port choice is based on historical reasons/tradition	14	79	8	83
Port choice is based on personal relations in port	20	67	13	56
Port choice is based on (perception of) price	73	7	59	12
Port choice is based on (perception of) quality of port	80	0	65	6
Total transport costs are important but not decisive in port selection	60	33	76	24
Quality and service determine port choice, as long as the price does not exceed a certain level our company is willing to pay.	73	13	71	24
A lower price can compensate a lower service level	53*	33*	12*	82*
When more ports offer an attractive price/quality, cargo is distributed over various ports	21	79	53	41
Port choice is continuously re-assessed	60	40	65	29
If our current port provides satisfactory services, there is no reason to change ports, even if price advantages exist	13*	87*	35*	47*

\* Significant differences in opinion between shippers and forwarders, p<0.03

Table 2 shows that shippers and forwarders have similar opinions with regard to most propositions: for both, traditions or personal relations are not important in port choice, while costs and quality are. Both also indicate costs are important but not decisive. The only disagreement is related to the propositions ‘A lower price can compensate a lower service level’ and ‘If our current port provides satisfactory services, there is no reason to change ports, even if price advantages exist’. Shippers are less willing to accept lower service levels and less eager to change ports for price reasons.<sup>12</sup> This indicates that the demand for port services of shippers is less *price elastic* (price sensitive) than the demand of forwarders. This can be explained by the fact that one of the capabilities of forwarders is to purchase transport services cheaply. This capability is less important for shippers; because transport costs are only a fraction of overall costs, their demand is less price-elastic. Furthermore they may pass transport costs on to their customers. Forwarders ‘change’ this relatively price-inelastic demand of shippers to a price-elastic demand.

Table 3 shows reasons for selecting a more expensive port for both groups and confirms the larger price sensitivity of forwarders: the reasons they frequently mention (especially the location of a port, connections to the hinterland and the frequency of shipping services) directly lead to lower costs in other parts of the transport chain, while the reason frequently mentioned by shippers (risk of delay) incurs costs to the supply chain, but does not have a direct effect on transport costs.

<sup>10</sup> Such firms did not return the survey, but were included in the sample. The same applies for importers and exporters that have outsourced transport and logistics.

<sup>11</sup> Percentages of ‘no opinion’ are not shown in the table for reasons of clarity of the presentation of data. Therefore, percentages do not add up to 100%.

<sup>12</sup> This conclusion is drawn on the basis of the replies of all shippers, but there are differences between shippers. Shippers of high value commodities are more likely to value quality than the low value shippers.

**Table 3. Reasons for selecting a more expensive port (% of all forwarders/shippers that mentions reason)**

<b>Port selection criteria</b>	<b>Forwarder (%)</b>	<b>Shipper (%)</b>
Frequency and quality shipping services	92*	44
Efficiency of port	58	67
Location port	75*	22
Risk of delay in other port	25	67*
Connection to hinterland services	67*	22
Equipment of port	58*	11
Customer focus in port	25	11
Personal relations	0	0

\* Significantly more frequently mentioned than other actor, P< 0.05

Table 4 shows the average means of various port selection criteria (Tongzon, 2002) for both shippers and forwarders. Again, shippers are somewhat more concerned with reliable and damage free handling than forwarders.

**Table 4. Average means of various port selection criteria for shippers and forwarders**

<b>Port selection criteria</b>	<b>Forwarder</b>	<b>Shipper</b>
Quality of shipping services (frequency, first port of call)	4.1	4.1
Quality terminal operating companies	3.4	4.3*
Quality of equipment	3.1	4.0*
Quality connections to hinterland services	3.8	3.4
Location of port	3.6	3.3
Information services in port	3.1	3.4
Customer focus	2.9	3.5
Good reputation related to damage and delays	2.8	3.3
Personal contacts in port	2.9	2.7

\* Significantly more important for shipper, P< 0.05

These survey results provide (preliminary) evidence that shippers and forwarders have similar preferences on most port selection issues, and both select ports on the basis of clear criteria, rather than traditions or relations. The main difference between both is the fact that forwarders are more price sensitive than shippers. This conclusion is relevant for ports since forwarders make port choices for large volumes of cargo (Port of Rotterdam, 2004).

## 5. Port competitiveness

A final issue addressed in the survey is the competitiveness of the three port pairs and six major ports for attracting Austrian cargo. Table 5 shows the differences in the evaluation of the three port pairs North, West and South.

**Table 5. The quality of North, West and South ports for Austrian cargoes**

<b>Port region</b>	<b>West ports</b>	<b>North ports</b>	<b>South ports</b>
Location of port	3.5	4.3**	3.9
Efficiency of cargo handling	3.8	4.3*	3.5
Quality terminal operating companies	3.6**	4.0*	3.2
Quality of equipment	3.7	3.9**	3.3
Quality of shipping services (frequency, first port of call)	3.8	3.9**	3.4
Information services in port	3.1	3.4*	3.0
Good reputation related to damage and delays	3.4	3.7**	3.0
Customer focus	3.2	3.6*	3.0
Connection to hinterland modes	3.6	4.1**	3.7
Personal contacts in port	3.1	3.4**	2.9
Overall score	2.5	2.7**	2.3

\* Significantly better than other two port regions, P<0.05

\*\* Significantly better than worst port region, P<0.05

Table 5 shows that the North ports are evaluated significantly better than the South Ports. The difference is especially large for the efficiency of cargo handling. Only the location of North ports is not judged as more positive than that of the South ports; the South ports are much closer to the Austrian market. For a number of variables, most importantly the efficiency of cargo handling<sup>13</sup> and the quality of information services, North ports also score better than West ports. The latter may be related to the fact that Austrian shippers and forwarders and the German ports have the same native language, which may enable better exchange of information. Table 6 shows the scores of the six individual ports and the significance of differences between the two ports in the same region.

**Table 6. Scores of six ports competing for Austrian cargo**

<b>Region</b>	<b>West</b>		<b>North</b>		<b>South</b>		
	<b>Port</b>	<b>Rotterdam</b>	<b>Antwerp</b>	<b>Hamburg</b>	<b>Bremen</b>	<b>Koper</b>	<b>Trieste</b>
Number of respondents	29	18	24	16	14	13	
Location of port	3.6	3.4	4.3	4.1	3.8	4.0	
Efficiency of cargo handling	3.9	3.7	4.3	4.3	3.5	3.5	
Quality terminal operating companies	3.7	3.3	4.0	3.9	3.1	3.2	
Quality of equipment	3.9*	3.4	3.9	3.9	3.4	3.3	
Quality of shipping services (frequency, first port of call)	3.9	3.7	4.0	3.7	3.5	3.3	
Information services in port	3.2*	2.9	3.4	3.3	3.1	2.8	
Good reputation related to damage and delays	3.6	3.3	3.6	3.8	3.1	2.9	
Customer focus	3.3	3.1	3.6	3.6	3.0	3.1	
Connection to hinterland modes	3.8	3.4	4.2	3.9	3.8	3.7	
Personal contacts in port	3.3*	2.7	3.3	3.5	2.9	2.9	

\* Significantly better than other port in same port region, P<0.05

Table 6 shows that for three variables, (quality of equipment, information services in the port and personal contacts) Rotterdam gets a better score than Antwerp. This may partly explain

<sup>13</sup> This is in line with research on terminal efficiency, where substantial differences between ports are shown to exist (see Cullinane et al., 2002).

the large market share of Rotterdam compared to Antwerp.<sup>14</sup> In both other port regions, differences between the ports are relatively small.<sup>15</sup> Overall, for Austrian firms engaged in port selection, differences between *port regions* are more pronounced than between ports in the same region. This may provide an argument for cooperation between the ports in the same pair in order to improve their joint competitive position in relation to other port pairs.

## 6. Conclusions

In this paper an analysis was made of port selection and port competition for cargo to/from Austria. Austria was selected because this country is clearly a ‘contestable hinterland’ for various European ports. The analysis of Austria has yielded four relevant research findings. First, the year to year changes of market shares of competing ports are considerable. This demonstrates that cargoes do shift between ports and that market share can be lost or won. This may be attributed at least partially to fierce port competition. Thus, ports constantly run the risk of losing market share in their contestable hinterland. More research in this direction is required, and perhaps more detailed data like market shares for specific commodities could be collected to expand this study. A further research question with regard to switching of port users between ports is ‘can ports differentiate prices between contestable and captive customers?’

Second, the opening of the Rhine-Main-Donau Canal considerably improved the competitive position of the ports of Rotterdam and Antwerp, especially for low value commodities. The increase of market share of both ports did not take place in one or two years, but took a whole decade. Since the survey results demonstrate shippers and forwarders make ‘rational’ port choices instead of choices based on tradition or personal contacts, this long period of ‘adaptation’ to new transport options is explained by the existence of substantial ‘friction costs’ (see Hesse and Rodrigue, 2004). These friction costs prevent instantaneous shifts or cargo flows to another inland mode and port. This is a relevant research finding for other ports that invest in new infrastructure and leads to the interesting question what actors in ports can do (if anything) to accelerate the shift of cargo to their port. One important factor in this respect may be the problem that scale economies that can lead to lower transport costs do not arise spontaneously, but require ‘collective action’ (see De Langen and Chouly, 2004).

Third, the demand for port services of forwarders seems to be more price elastic than the demand of shippers. Due to the low response rate this conclusion cannot be drawn with certainty, but this tentative conclusion provides a basis for further research. Since forwarders control a large share of transport flows (see Murphy and Daley, 2001), research on the behaviour and port choice decisions of forwarders is relevant. The effects of the terminal handling charges on port choice deserve particular attention<sup>16</sup> (see Fung et al., 2003).

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<sup>14</sup> Other reasons, such as the fact that Rotterdam is somewhat better located for inland waterway traffic may also play a role.

<sup>15</sup> Some variables (such as the location of a port and the connections to the hinterland) are more, or at least equally, region specific than port specific, while other variables, such as the efficiency of cargo handling are clearly port specific. None of the differences between Hamburg and Bremen or Koper and Trieste is significant. This stems partly from the small sample size, but absolute differences are also small.

<sup>16</sup> The larger price sensitivity of forwarders is relevant in the discussion of the effects of ‘terminal handling charges’ (THCs) on port choice. These charges are paid by shippers and forwarders to shipping lines (Fung et al., 2003). However, ‘real’ terminal costs of shippers may differ from the THCs charged by the shipping lines (Dynamar,

A final, tentative conclusion is that shippers and forwarders that can choose from ports in different regions regard differences per region as more significant than differences between ports in the same region. This is partially explained by the fact that ports in the same region share the same hinterland infrastructure. This may provide an argument for port cooperation to improve their joint competitive position. Further research on ports where such cooperation has developed may be relevant in this respect (see Song 2002 for an application of the concept of co-opetition to seaports).

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2004). Given the price sensitivity of forwarders, these are likely to be sensitive to THC differences between ports. This may for instance explain why Rotterdam, with relatively high THCs, attracts less cargo from forwarders than Antwerp (Haezendonck, 2001).

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