The Competitiveness of Global Port-Cities:

The Case of Mersin – Turkey

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ABSTRACT

This working paper offers an evaluation of the performance of the port of Mersin, an analysis of the impact of the port on its territory and an assessment of policies and governance in this field. It examines port performance over the last decades and identifies the principal factors that have contributed to it. The effect of the ports on economic and environmental questions is studied and quantified where possible. The value added of the port cluster of Mersin is calculated and its interlinkages with other economic sectors in Turkey delineated. The major policies governing the ports are assessed, along with policies governing transport and economic development, the environment and spatial planning. These include measures instituted by the port authorities, as well as by local, regional and national governments. Governance mechanisms at these different levels are described and analysed. Based on the report's findings, recommendations are proposed with a view to improving port performance and increasing the positive effects of the port of Mersin on its territory.

JEL classification: R41, R11, R12, R15, L91, D57

Keywords: ports, regional development, regional growth, urban growth, inter-regional trade, transportation, input/output

FOREWORD

This study is the fifth in a series of case studies within the *OECD Port-Cities Programme*, which attempts to identify the impact of ports on their territories and possible policies to increase the positive impacts of ports on their territories. The report has been realized at the request of the Cukurova Development Agency.

This working paper is part of a series of *OECD Working Papers on Regional Development* published by the OECD Public Governance and Territorial Development Directorate. This paper was written by Olaf Merk (OECD) and Oguz Bagis. It was directed by Olaf Merk and it draws on the work of a number of other contributors, in particular César Ducruet (CNRS – Université de Paris I Panthéon-Sorbonne), Walter Manshanden and Evgueny Poliakov (TNO, Netherlands), Nicolas Winicki and Jing Li. Within the framework of this study, interviews with a series of actors and stakeholders have been conducted.

The paper can be downloaded on the OECD website: www.oecd.org/regional/portcities

Further enquiries about this work in this area should be addressed to:

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TABLE OF CONTENTS

Tables

Figures

Boxes

EXECUTIVE SUMMARY

The port of Mersin is one of the emerging gateway ports in the East Mediterranean. It has shown sustained growth rates over the last decades (on average 5.8% per year over 1971-2011), is now the second container port of Turkey and, notwithstanding the global economic crisis, managed to increase its port volume by 6.5% since its privatisation in 2007.

However, it is relatively weak with respect to its maritime connections. It is not often included in intercontinental routes of the large global container carriers and has maritime connections that are less diverse than most Mediterranean ports. Moreover, it is not subject to much competition, being the only container port in the region and having only one terminal operator, namely PSA/Akfen, the consortium that won the concession bid in 2007.

The port cluster of Mersin has considerable economic impact, representing at least 17,000 jobs and EUR 0.6 billion of economic value added per year according to our estimates, although lack of data makes it difficult to come up with accurate numbers. Maritime transport in Mersin is highly interlinked with trade and manufacturing, in particular with respect to food products and textiles. One euro extra output in the port leads to additional output in the national economy of EUR 1,20. The environmental impact of the port is difficult to assess, as these data are hardly publicly available, but these impacts are within the legal norms, according to Mersin International Port.

The importance of ports, including Mersin's, for the national export-driven growth strategy is well acknowledged, but policy challenges remain with respect to the coherence of port policy, the creation of benefits from the port's presence, and in limiting negative impacts. The effectiveness of regional development policies in Turkey could probably be increased by more emphasis on the facilitation of cross-sectoral collaboration. Finally, environmental policies by the Mersin International Port could be more pro-active and transparent, realising that "greening" the port of Mersin could become a competitive advantage.

RECOMMENDATIONS

- Improve the quality of information on port impacts
- Consider creating a public port authority, which could also have functions as "community manager", facilitating exchange between operator, port clients, regional development agency and city.
- Focus a new term of the regional development strategy on cross-sectoral challenges, in which logistics could play an essential role. The Cukurova Development Agency could try to make sure that the port contributes to regional development and is sensitive to demands from local businesses.
- Formulate a pro-active and transparent environmental policy within MIP.
- Liberalise rail freight transport, in order to attract the interest of the private sector in investing in freight railway operations.

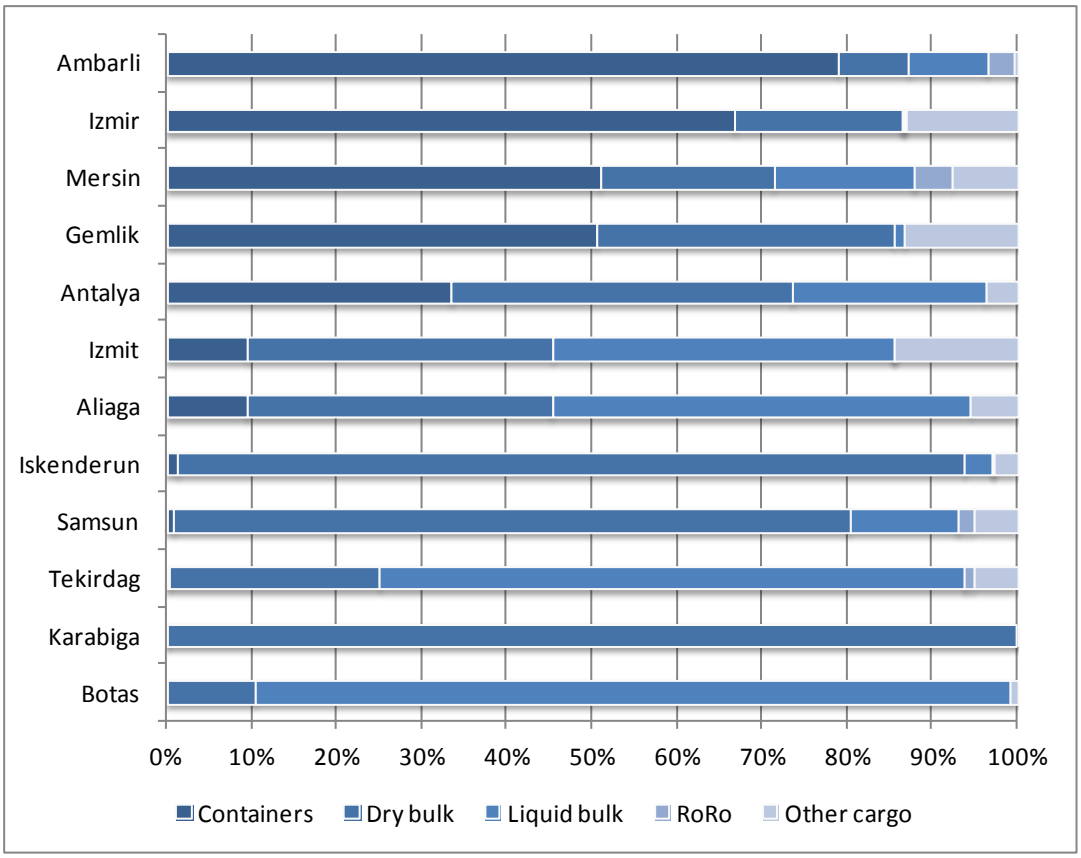
1. PERFORMANCE

1.1 Port characteristics

The port of Mersin is located in the south of Turkey, in the east of the Mediterranean Sea. It belongs to a region that is called Cukurova consisting of several large cities, including Adana and Mersin, as well as smaller cities and fertile rural land. Mersin is located close to Eastern Turkey, Lebanon, Syria, Iraq and Israel, as well as several central Asian countries. The Eastern Mediterranean counts 5% of total port calls and around 20% of all calls to European ports. The Mediterranean Sea is one of the three maritime entries to Turkey, in addition to the Aegean Sea and the Black Sea. The Mersin International Port (MIP) is the most important but not the only port in Mersin. In this report the Mersin International Port is considered as the port of Mersin. At the same time, other ports in Mersin and Cukurova exist, such as the port of the Mersin Free Zone, located just next to the MIP, as well as the Atas Petroleum port.[1] The volumes of these ports are however relatively limited. In addition to that, there are several other even smaller ports in Mersin and Cukurova.

The port of Mersin has a strong specialisation in containers. In 2011 it realised a port volume of 25 million tonnes, and just over half of this volume was in containers, equivalent to 1.1 million twenty-foot equivalent units (TEUs). This made Mersin the second container port of Turkey, after Ambarli, and the fifth largest port with regards to overall tonnage. The largest cargo port in Turkey is Botas, an oil port, followed by ports located in the main Turkish metropoles, such as Izmit (Istanbul) and Aliaga (Izmir). The container volumes in Mersin represent a fifth of total Turkish port container volumes, and a third of the containers of the Turkish Mediterranean coastline, which includes Ambarli, Mersin and Iskenderun. Only the ports of Ambarli and Izmir have a larger share of containers in their port cargo mix (Figure 1). The second largest cargo category in the port of Mersin is dry bulk, representing around 20% of the total tonnage handled by the port; the other cargos handled there are liquid bulk (17%), roll on-roll off (4%) and other cargo. Mersin is one of the few large ports in Turkey that handles roll on-roll off-traffic (RoRo), being the largest Turkish port in this category. The specialisation pattern of Mersin (half in containers, a fifth in dry bulk and a sixth in liquid bulk) is rather unique in the Mediterranean, and indeed in Europe. Ports with a more or less similar profile are Hamburg and Valencia, both very specialised in containers, with still considerable shares of dry bulk and somewhat less in liquid bulk.

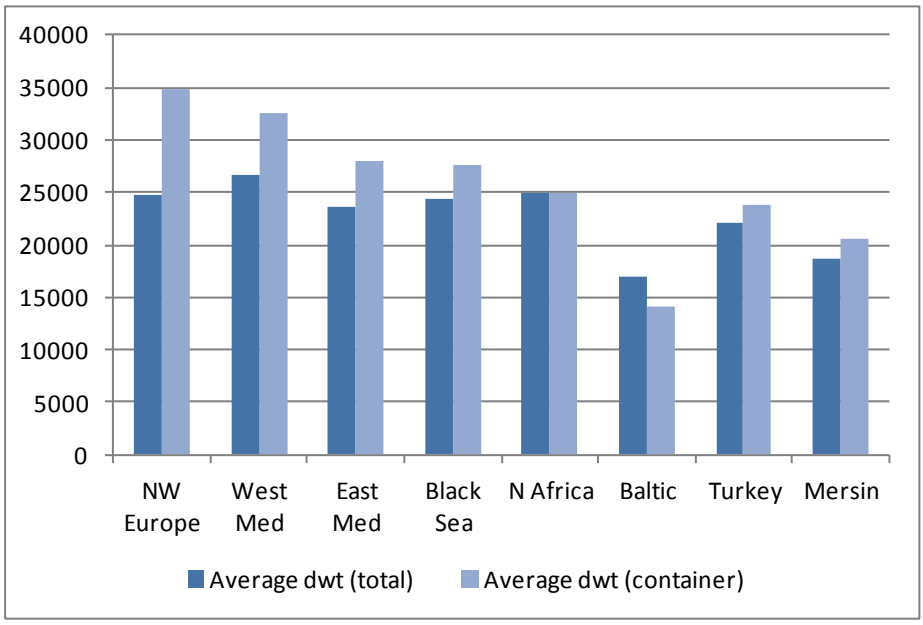
Figure 1. Cargo mix of main Turkish ports (2011)



Source: Author's own elaboration based on Eurostat database.

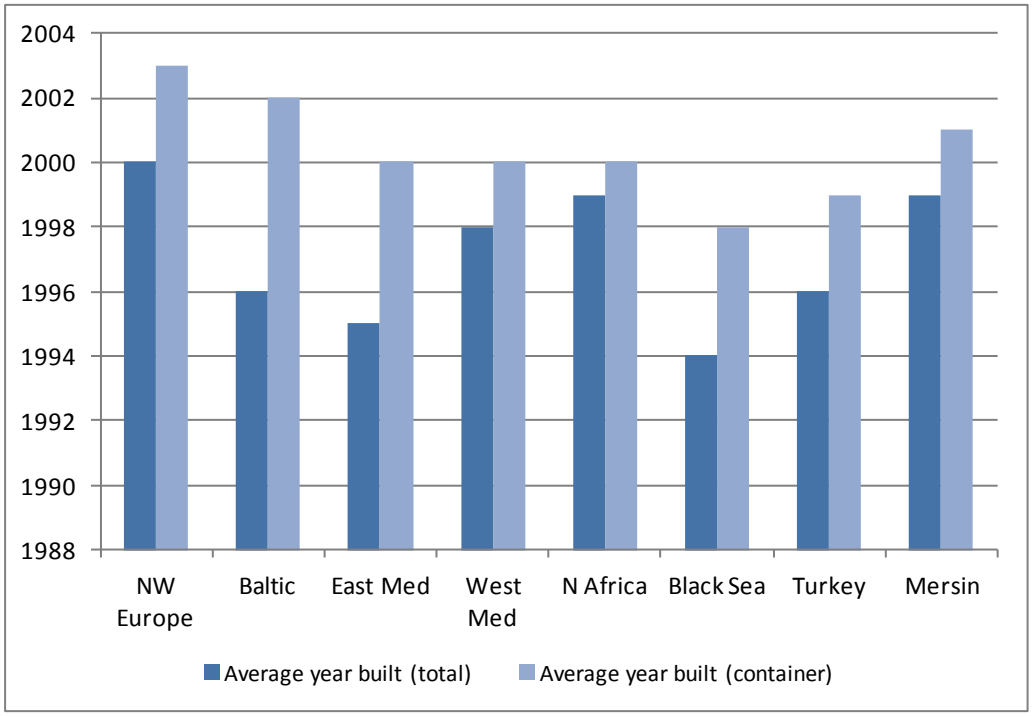
Unlike some ports in the East Med, Mersin is not a transhipment port. Almost all of its traffic is related to the Cukurova region and other regions relatively close by. The port is not used as a hub for transhipping large vessels from Asia to smaller feeder vessels. Its transhipment rate does not exceed 5% far removed from transhipment rates in some East Med ports. A similar conclusion can be reached from looking at the average size of vessels (total and container vessels) calling the port of Mersin (Figure 2): on average these vessels are smaller than the average for the whole of Turkey, the East Med (as well as West Med and North-West Europe). As the last decades have seen a dramatic increase in vessel size, the limited average ship size could have been explained by relatively old age of the vessel calling Mersin, but a look at vessel movement statistics reveals that this not the case: the average ship calling Mersin is in fact a fairly new ship (Figure 3).

Figure 2. Average ship size in European port ranges (2011)



Source: Author's own elaboration based on dataset from Lloyds Marine Intelligence Unit (2011)

Figure 3. Average age of ships in European port ranges (2011)

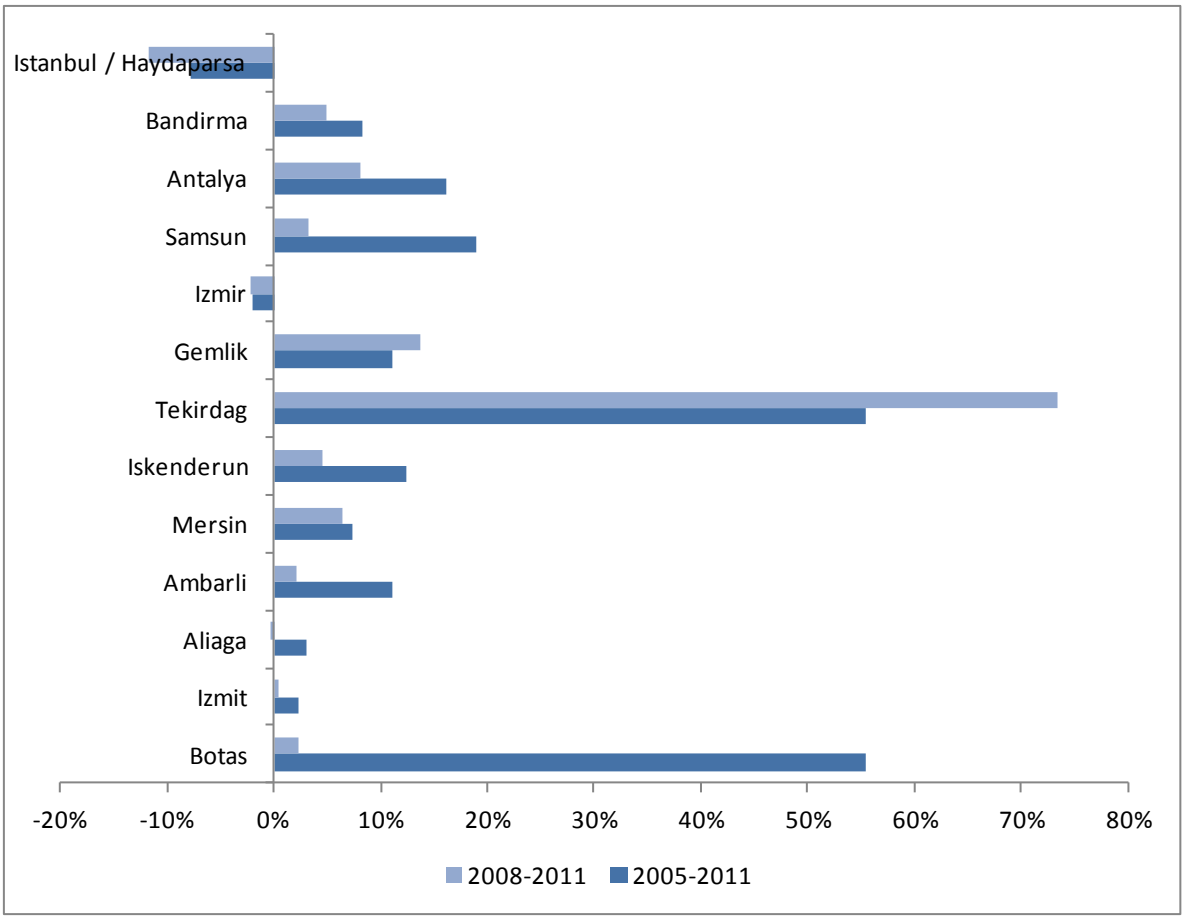


Source: Author's own elaboration based on dataset from Lloyds Marine Intelligence Unit (2011)

1.2 Port performance

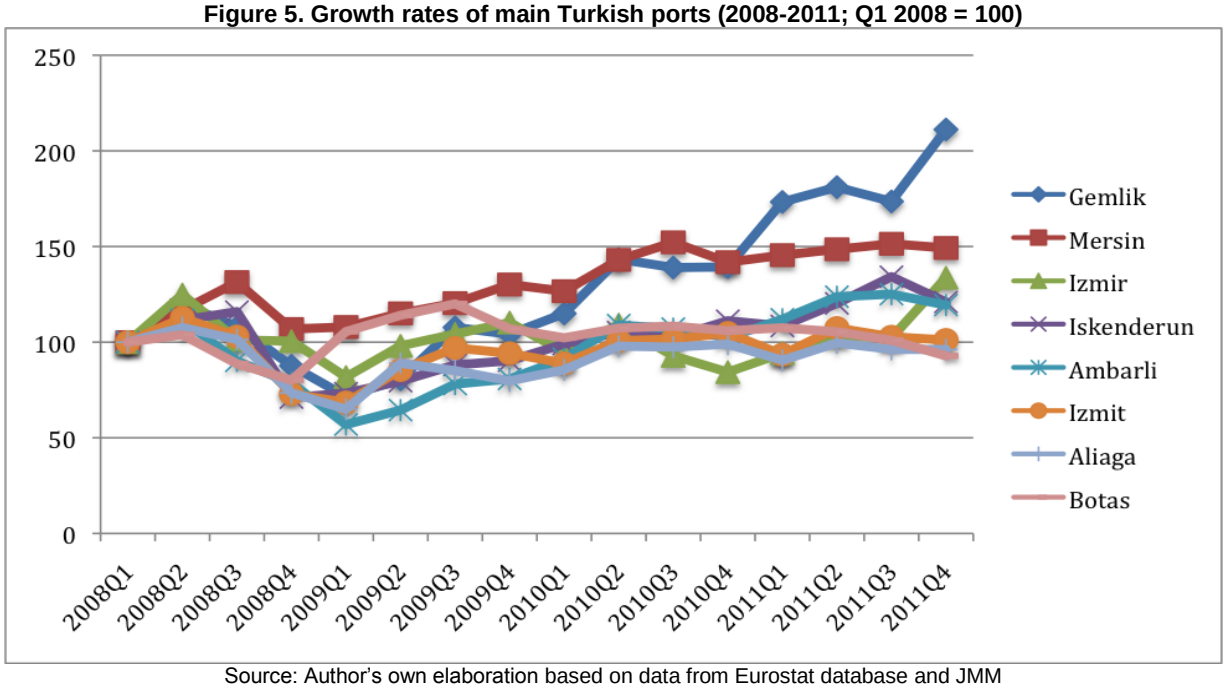
The port of Mersin has shown impressive long-term growth numbers. The average port growth rate between 1971 and 2011 was 5.8%, and 60% per year in container volumes between 1984 and 2011. This port growth has continued over the last decade with an annual port growth rate of 7.3% between 2005 and 2011, almost undisturbed by the global economic crisis with average growth rates of 6.5% per year between 2008 and 2011. This places Mersin in a remarkable position among the largest Turkish ports, although their growth rates have also been high and sometimes higher, most of the growth of these ports has been considerably slowed down since 2008, with the exception of the smaller ports of Tekirdag and Gemlik (Figure 4). This can also be concluded from indexed growth numbers per quarter between 2008 and 2011 (Figure 5).

Figure 4. Growth rates of main Turkish ports (2005-2011)



Source: Author's own elaboration based on data from Eurostat database and JMM

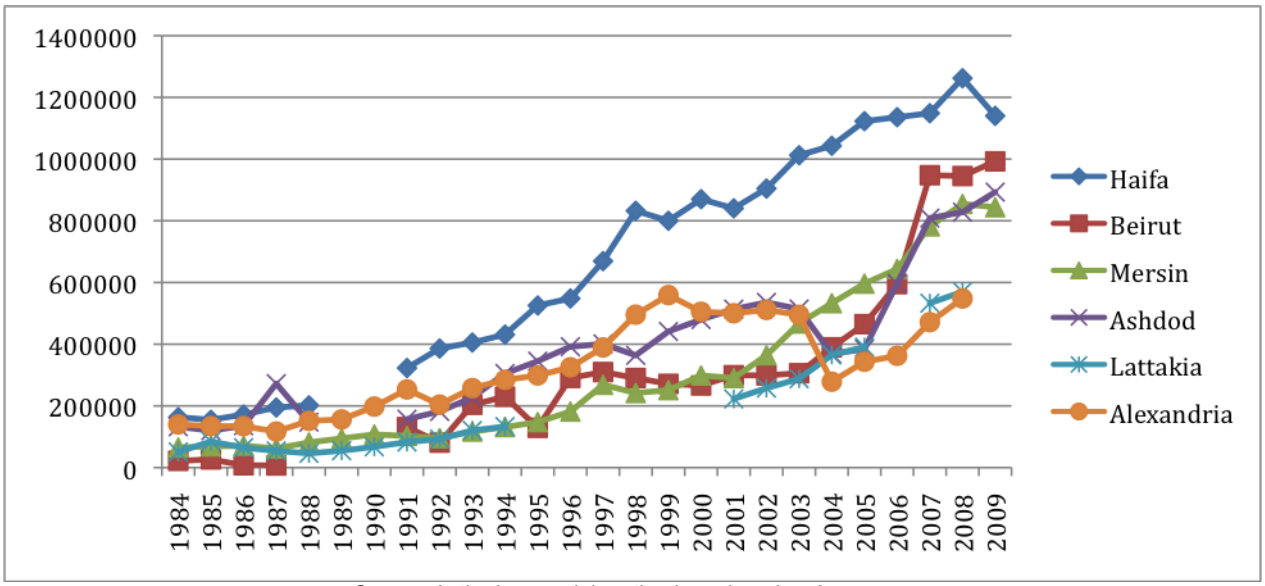
Figure 5. Growth rates of main Turkish ports (2008-2011; Q1 2008 = 100)



Source: Author's own elaboration based on data from Eurostat database and JMM
Note: the indicated ports are the largest eight Turkish ports.

Growth in the container sector in Mersin has really taken off in the last decade. Despite steady growth in the 1980s and 1990s, volumes remained fairly marginal, exceeding 200,000 TEU only in 1997. Impressive growth numbers has been realised in the last decade: was the container volume around 290,000 in 2001, the number had quadrupled ten years later, with Mersin becoming a relatively large container port in the East Med (Figure 6). Whereas several of the other East Med ports show volatile container developments, the volumes of the port of Mersin have been growing steadily.

Figure 6. Container growth rates in main East Med ports (1984-2009)



Source: Author's own elaboration based on data from JMM

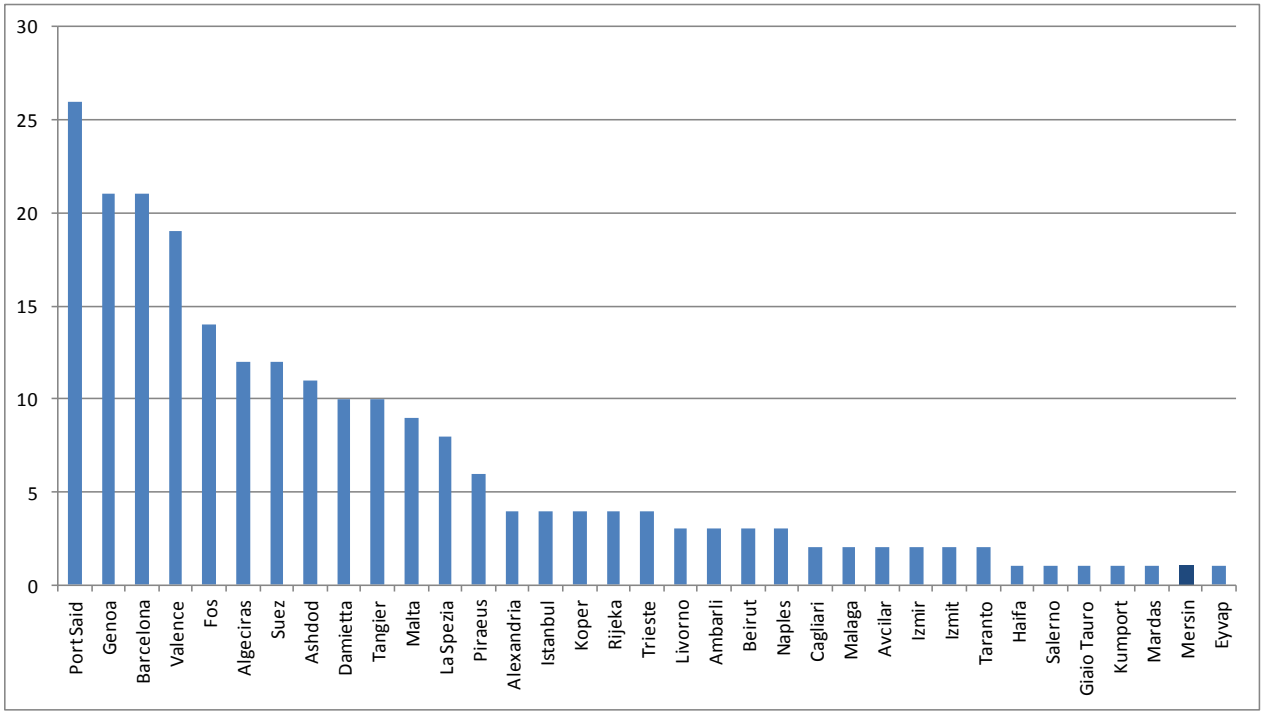
1.3 Determinants of port competitiveness

How can the growth rates of the port of Mersin be sustained? What are the main recipes for being a competitive port? Our study of existing port competitiveness reports suggest that there might be three determinants: maritime connectivity, efficiency within the port, and hinterland connectivity. How does the port of Mersin score on these indicators?

Maritime connectivity

Mersin is only to a limited extent included in the intercontinental routes of the largest shipping companies of the world. This can be concluded from an analysis of the routes and service loops of ten of the eleven largest global shipping companies in March 2012, undertaken for this report. For this analysis the number of times that ports in the Mediterranean Sea were included in routes with Asia, North America, Latin America and Africa were counted. The position of Mersin in these routes appears to be moderate: it was included once in an Asia-Europe route, but not in routes with North America, Latin America or Africa. A large number of Mediterranean ports, including East Med and Turkish ports, are more frequently included in such routes. This is for example the case of Ashdod, Damietta, Piraeus, Istanbul, Izmir and Izmit (Figure 7). Inclusion in routes with Latin America remains rare for East Med ports, and they were not connected to routes with African ports. It has to be noted that Mersin is actually included in more shipping routes, but these are not the routes of the eleven largest shipping companies taken into account here.

Figure 7. Inclusion of Med ports in intercontinental routes with Asia (2012)

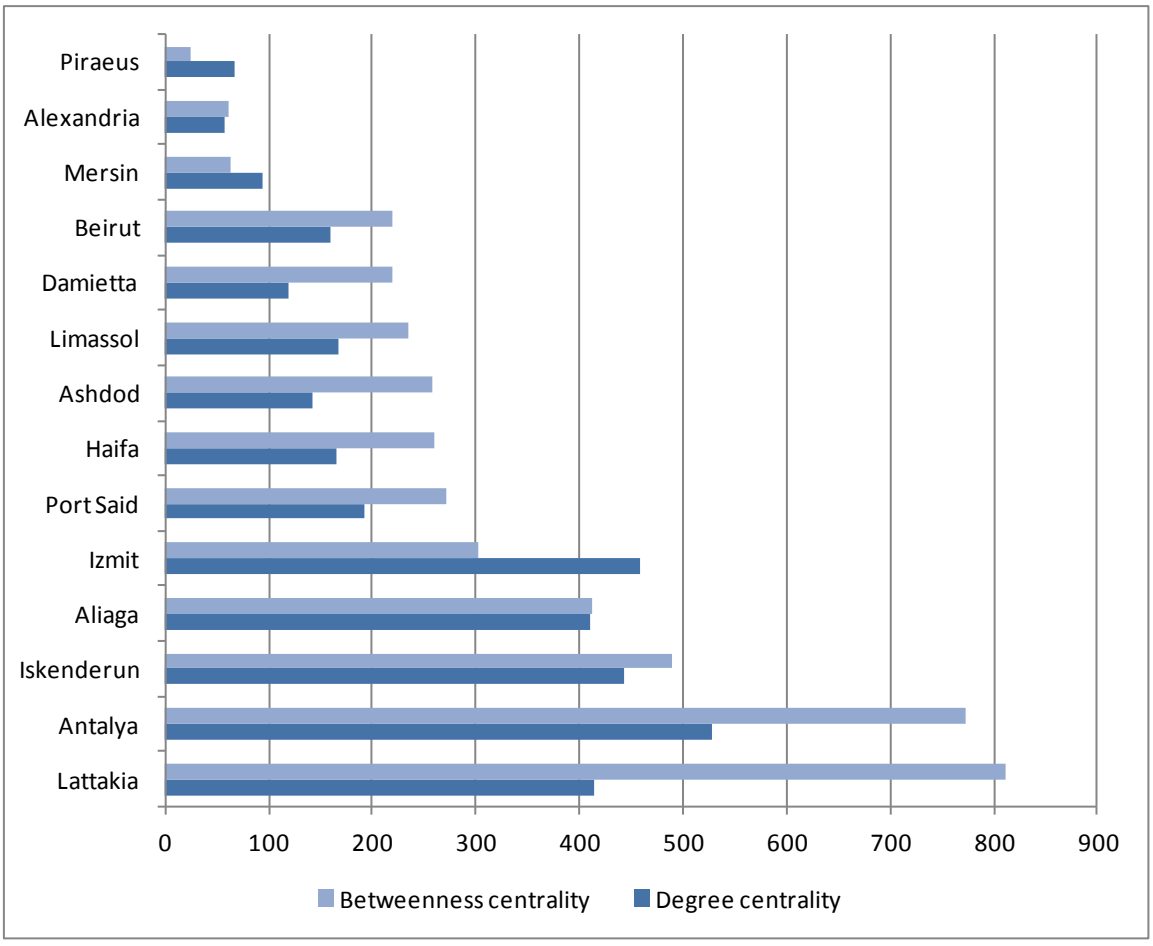


Source: Author's own elaboration of data from intercontinental routes from 10 of 11 largest global container carriers.

Despite this limited inclusion in inter-continental routes, Mersin has a central position in the ports system of the East Med. This can be concluded from its scores on centrality indicators. The hub-and gateway-functions of ports can be quantified with three different measures: degree centrality, betweenness centrality and clustering coefficients. *Degree centrality* expresses the number of adjacent neighbours of a

node; it is the simplest and most commonly accepted measure of centrality. It often correlates with total traffic (more connections imply more traffic). *Betweenness centrality* expresses the number of shortest paths going through each node. The *clustering coefficient* estimates whether the adjacent neighbors of a node are connected to each other (i.e. "my friends are also friends"), thus forming triangles (triplets); the coefficient is the ratio between the number of observed triplets and the maximum possible number of triplets connecting a given node. The ratio goes from 0 (no triplets observed) to 1 (all neighbors connected). When it comes to hub-functions in a transport system, in theory the "pure hub" will have a clustering coefficient near zero because it serves as a pivotal platform redistributing flows to/from satellite platforms (spokes) which are only connected to the hub (star-shaped network). Conversely, values close to 1 depict a denser pattern with more many transversal (and thus less hierarchical) links. In a maritime network, transshipment hubs should have low clustering coefficients as opposed to other configurations where links are more evenly distributed among ports (e.g. absence of hubs such as in the Baltic Sea or in the USA).[2] The port of Mersin scores comparatively high on centrality indexes: it is ranked third among East Med ports with respect to its degree centrality and betweenness centrality, on which it has rank 94 and 64 among all world ports. Only the ports of Piraeus and Alexandria have a more central position than Mersin, according to these indicators, but Mersin outranks other Turkish ports, such as Izmit, Aliaga and Iskenderun, as well as the other East Med ports (Figure 8).

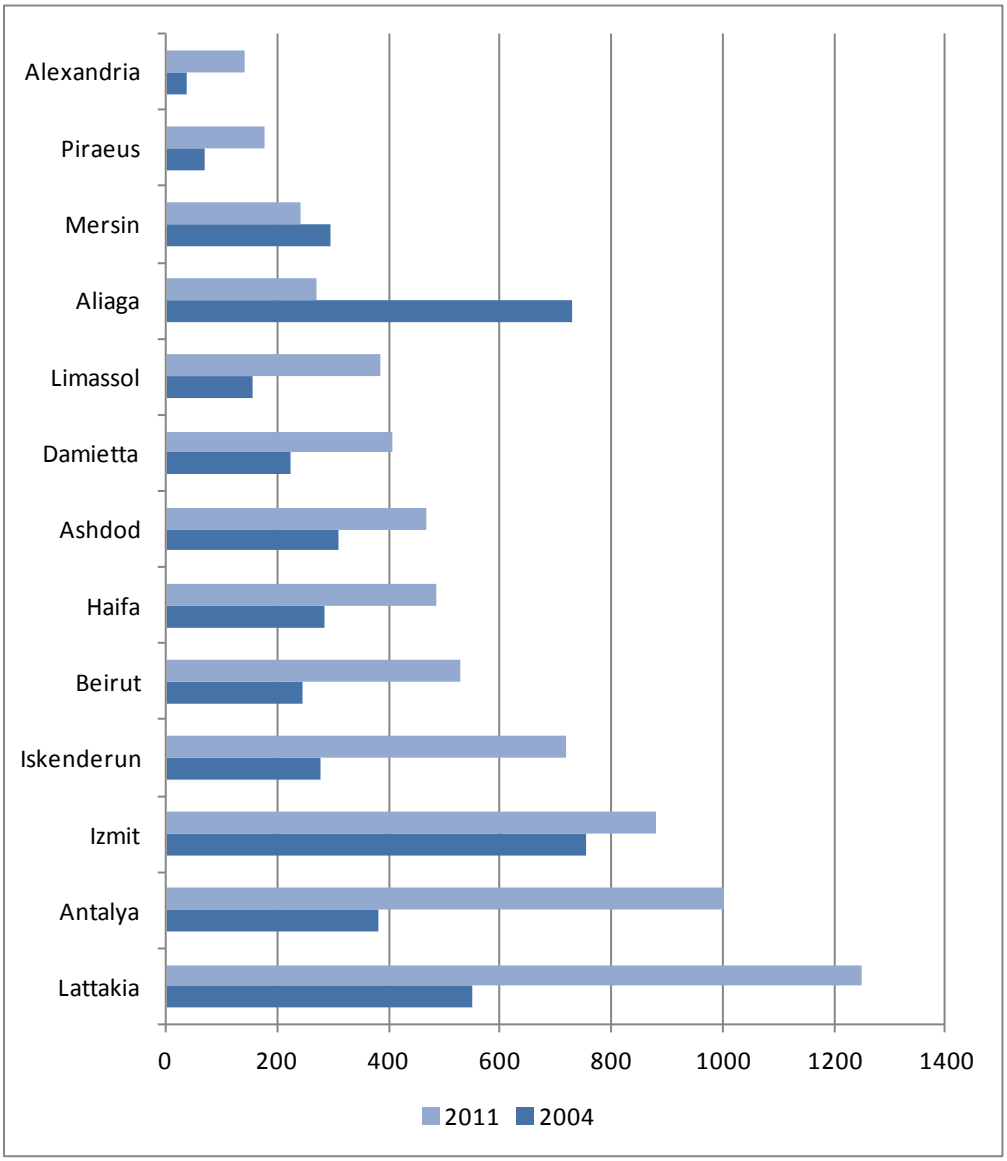
Figure 1. Centrality of main East Med ports (May 2011)



Source: Author's own elaboration based on dataset from Lloyds Marine Intelligence Unit (2011)

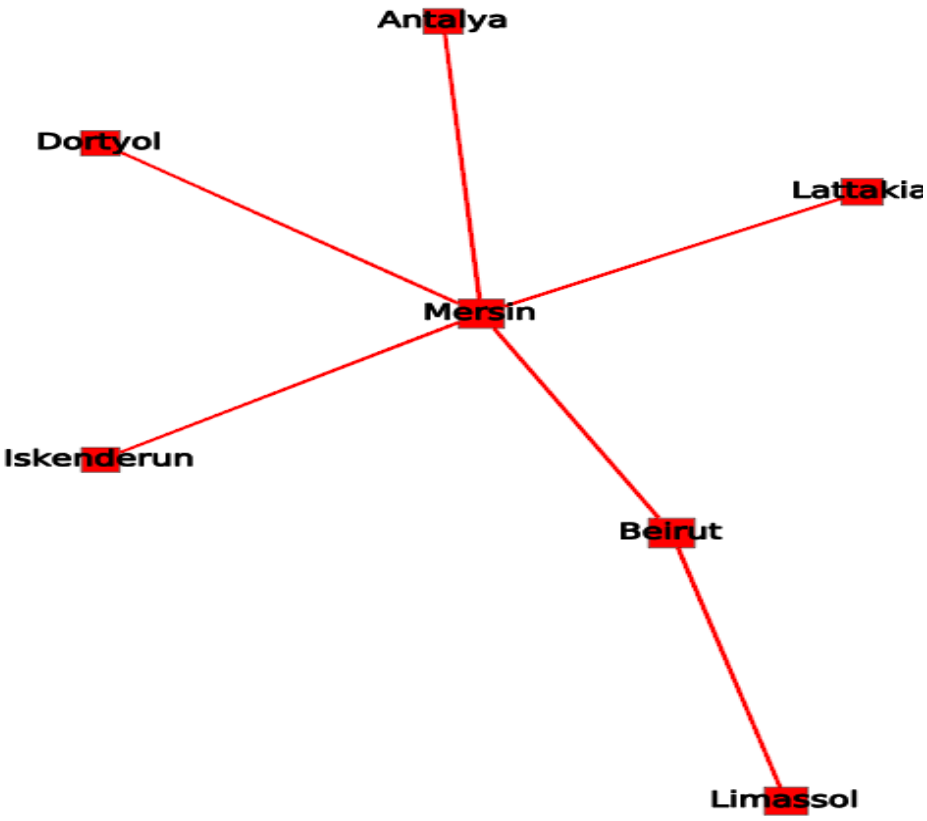
Over the last decade, the hub position of Mersin has increased, in contrast to most of the other ports in the East Med. The hub position can be expressed by the clustering coefficient, as was explained above. Also on this indicator Mersin occupies the third rank among East Med ports, but this hub position is relatively new. In 2004 there was a variety of East Med ports that could be considered to have more hub functions than Mersin. However, the hub functions of Mersin have increased, whereas these of most East Med have decreased. As a result, Mersin can now considered to have more hub functions than Haifa, Iskenderun, Beirut, Damietta and Limassol, all ports that had higher cluster coefficients than Mersin in 2004 (Figure 9). As such, the port of Mersin is the node in a network for ports such as Iskenderun, Beirut, Lattakia and Antalya, which are ports that have their strongest link with Mersin and could be considered the dependent ports in this network (Figure 10).

Figure 9. Hub position of main East Med ports (2011 and 2004)



Source: Author's own elaboration based on dataset from Lloyds Marine Intelligence Unit (2011). Port Said is not included in this figure as it was lacking in the 2004 database.

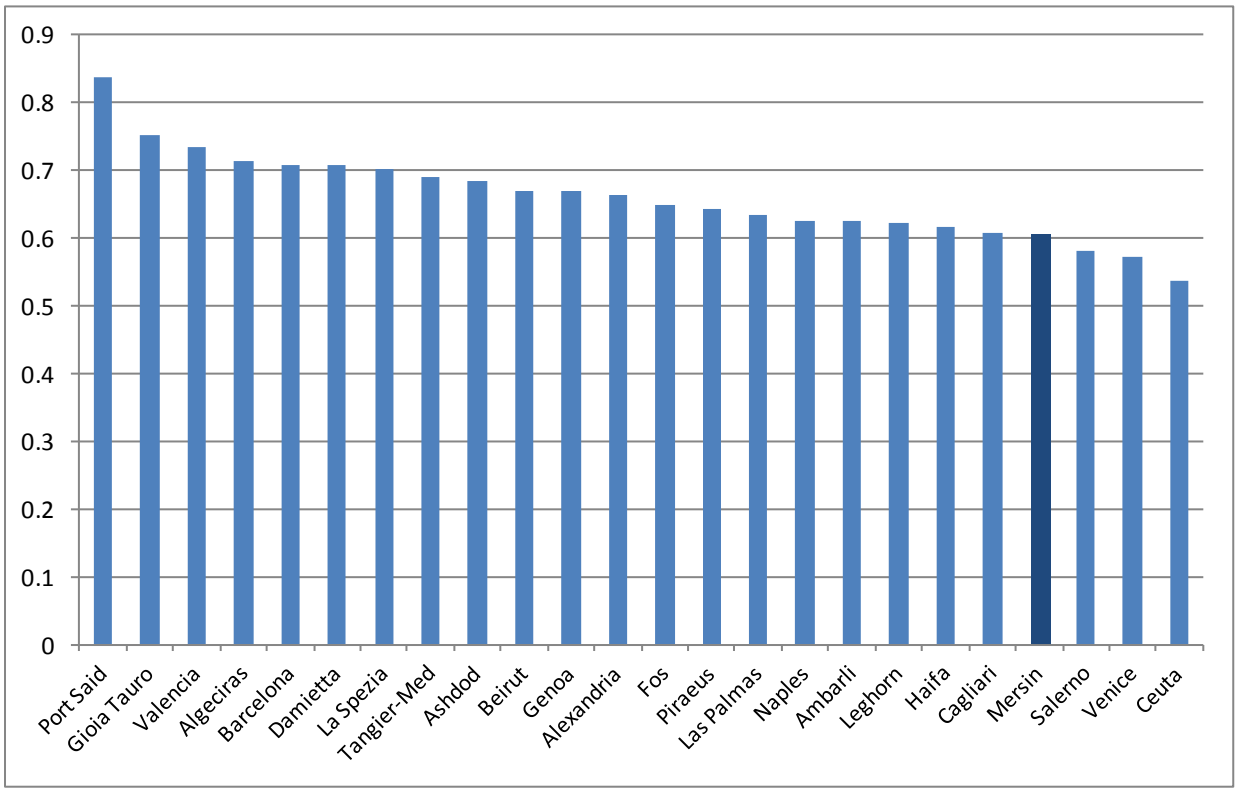
Figure 10. Mersin's container hub function (2011)



Source: Author's own elaboration based on dataset from Lloyds Marine Intelligence Unit (2011)

On another maritime connectivity indicator, the diversity of its foreland, Mersin has modest scores. The can be concluded from its score on a maritime foreland connectivity index that we constructed for this study, which makes it possible to compare the diversity of maritime of connections of world ports. This index is applied to ports' worldwide traffic distribution at country level, and defined as the inverse of the sum of differences in shares compared with world average, applying a methodology developed in Ducruet et al. (2011). Our calculations of this index over 2011 show that Singapore has the most diverse set of maritime connections (score 100). In the Mediterranean Sea, Mersin is one of the large ports with the least diverse maritime connections; its score is 60, whereas the scores of most Med ports are higher, including the East Med ports: around 70 for ports like Damietta, Beirut and Ashdod.

Figure 11. Maritime foreland diversity of Med ports (2011)

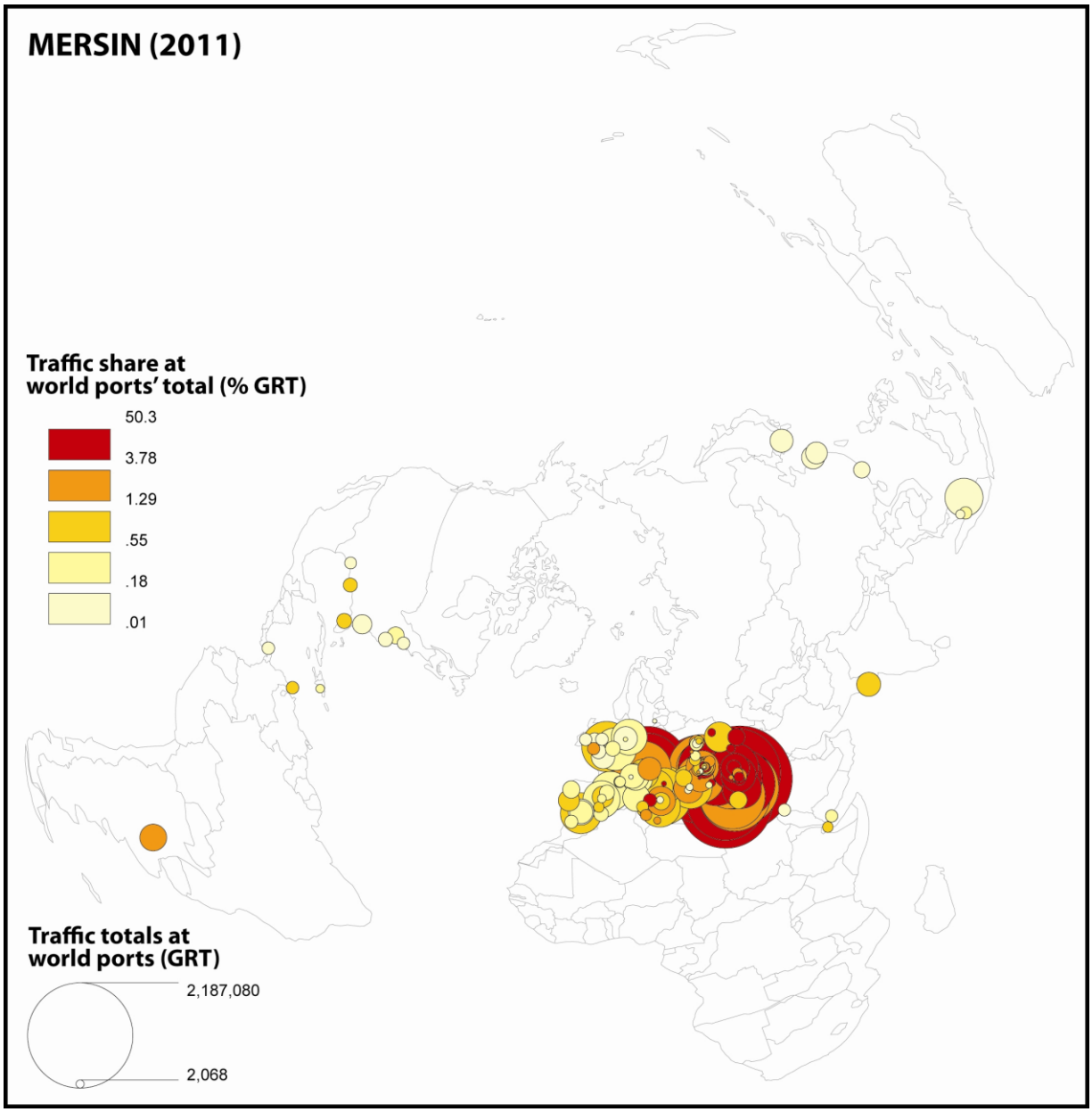


Source: Author's own elaboration based on dataset from Lloyds Marine Intelligence Unit (2011)

Most of the maritime connections of Mersin are in the Mediterranean and Europe. This can be visualised in a maritime foreland map, which indicates the ports with which Mersin has connections, with the absolute number of cargo transported between the port pair indicated, as well as the share that this volume represents upon the total port volume of that port (Figure 12).

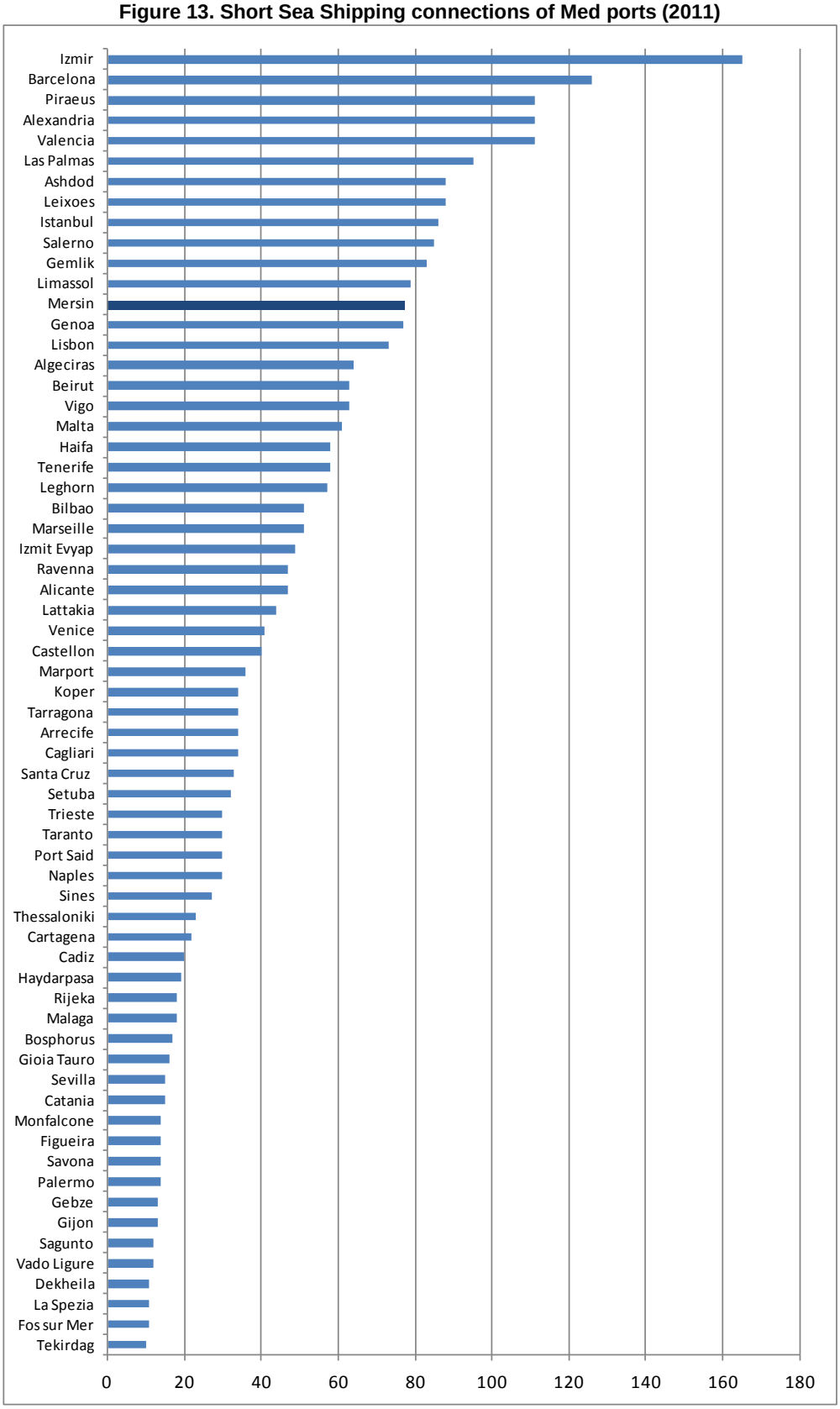
If the intercontinental connections of Mersin were found to be modest, its short sea connections are large and diverse. This can be concluded when analysing a database on short sea shipping constructed for the purpose of this report. This database is based on the different schedules (service loops) in 2011 of main 34 short-sea shipping companies operating in Europe, counting the frequency of 211 European ports in these service loops, as well as the connections between the ports. Only regular liner services in container transport are included in this database. From this database it can be concluded that short sea shipping in Mersin is well developed. In this analysis, the port of Mersin was found to have almost 80 SSS connections, which is relatively high compared to other Med ports, although below other Turkish ports such as Izmir, Istanbul and Gemlik (Figure 13). Main short sea shipping connections of Mersin are with Alexandria, Izmir, Beirut, Lattakia and Gemlik.

Figure 12. Maritime forelands of the port of Mersin (2011)



Source: Author's own elaboration based on dataset from Lloyds Marine Intelligence Unit (2011)

Figure 13. Short Sea Shipping connections of Med ports (2011)

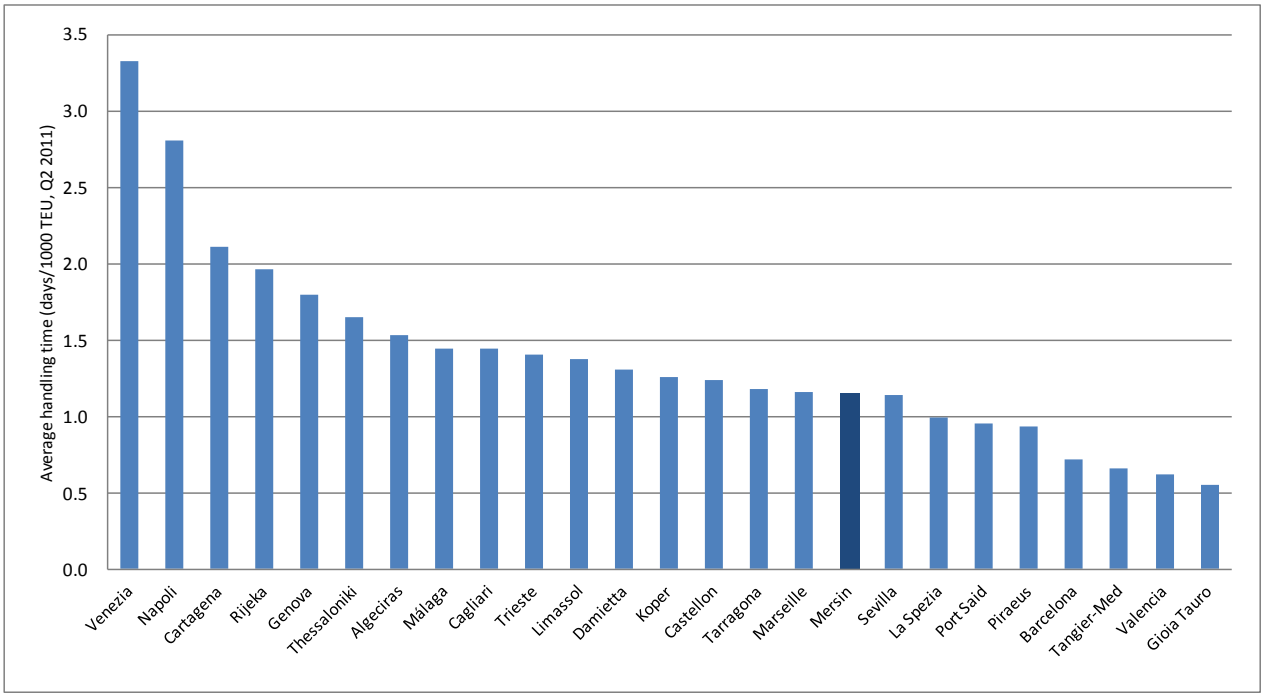


Source: Author's own elaboration of data on services loops of 34 large SSS companies in Europe (2011).

Port efficiency

Mersin is a relatively time efficient port. Turn-around time of vessels in ports (time efficiency) is one of the determinants of port competitiveness. Time efficiency is here considered to be the average time that a vessel stays in a port before departing to another port, which is known through detailed vessel movement data, as collected by Lloyd's Marine Intelligence Unit (LMIU). This turn-around time is generally considered to be an important determinant of port competitiveness as quick turn-around allows for reduction of port congestion and larger port throughputs. Time efficiency of main European ports was measured using a methodology described in annex 1 and using a LMIU-dataset over May 2011 and container throughput data from Eurostat over the second quarter of 2011. Elaborations and calculations were made to come up with a measurement of average handling time of a port in days per 1000 TEU. The only European East Med ports that are more time efficient than Mersin are Piraeus and Port Said (Figure 14). Mersin is also doing well in comparison with most Western Med ports, despite a few exceptions including Barcelona, Tangier-Med, Valencia and Gioia Tauro.

Figure 14. Time efficiency of container ports in the Mediterranean (2011)



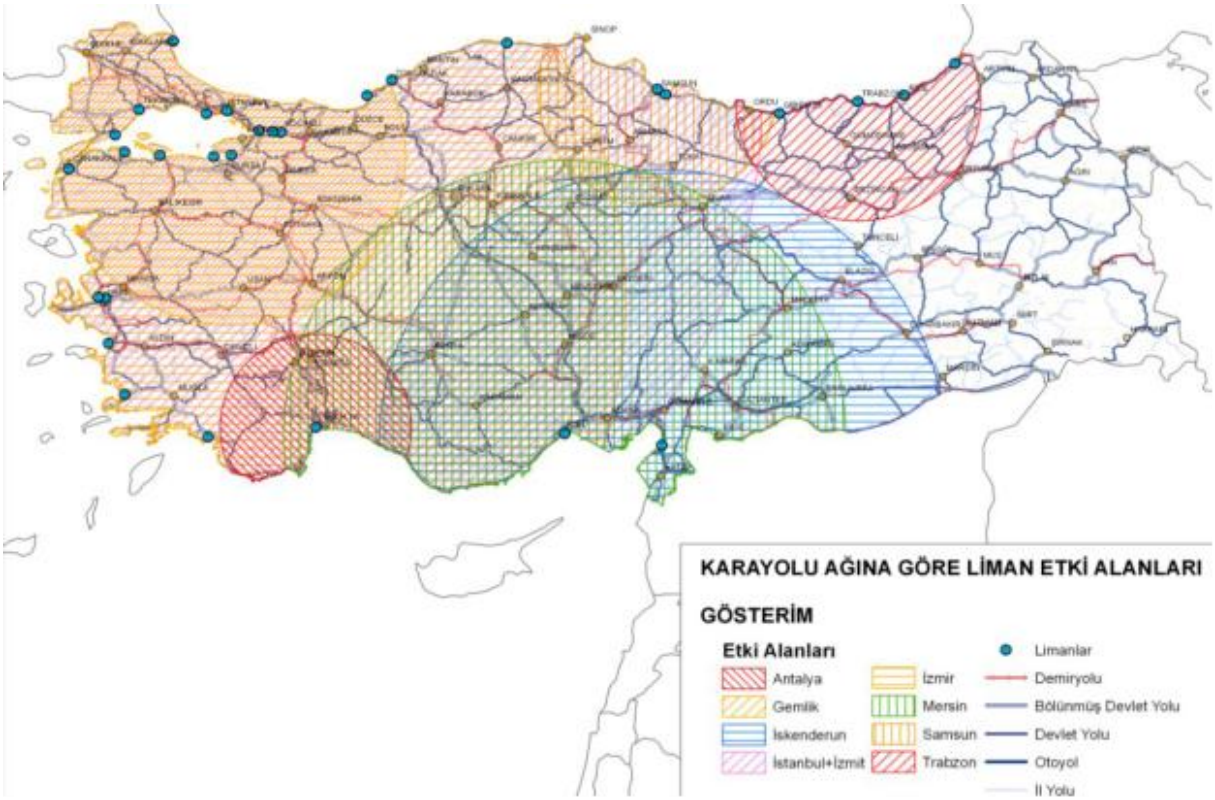
Source: Author's own elaboration of Eurostat database and LMIU dataset

Port hinterland connectivity

Most of Mersin's hinterland is captive; that is, it can hardly be contested by other ports. Data provided by MIP show that approximately a third of total container volumes of Mersin port is connected to the two cities of Mersin and Adana; around half of total container throughput is related to hinterlands that are within 300 km reach of the port of Mersin. Main hinterlands are located in the East of Turkey and to a lesser extent Iraq (6%). Turkey's largest metropolises, such as Istanbul, Ankara and Izmir are to a certain extent serviced by the port of Mersin, but these container flows are relatively limited. Considering that there are not many container ports surrounding Mersin, most of its hinterlands could be considered captive.

This situation might change with the creation of a container port in Iskenderun, that would have a road network to reach hinterlands that largely overlap with Mersin's and thus be in a competition to compete with the Mersin port (Figure 15). The projected privatisation of Taşucu-Seka port will also have an impact on competition and tariffs for dry bulk.

Figure 15. Hinterlands of Turkish ports



Source: Turkish Ministry of Transportation, Maritime Affairs and Communication

Intra- and inter-port competition

Port competition in Mersin can be considered limited. There are not many container ports close to Mersin, which gives it more or less free rein for being a regional gateway. In addition to that, there is no intra-port competition with respect to cargo handling. The concession in 2007 that transferred port operations in Mersin to the private sector covered all cargo handling operations and was granted to one consortium: PSA/Akfen. As a result, MIP enjoys a relative monopoly position. This contrasts with container ports of similar size as Mersin, in which in many case competition exists between different container terminal operators.

2. IMPACT

Data currently available on the impact of ports in Turkey is limited. Port impacts can be distinguished in economic, environmental and social impacts. Most of the port impact studies of world ports have focused on economic impacts, which include calculations of direct and indirect value added of the port-related economy, port-related employment, investments in port-related sectors and port-related tax revenues. In addition to that, several ports collect environmental data and data on location of port workers and port jobs in order to get an idea of social impacts. The port-cities included in the OECD Port-Cities Programme all have some of these data available, of course some more than others with both the Netherlands and Belgium providing a yearly update of economic impacts of its main ports (Box 1). This is not the case in Turkey, where information on port impacts is not publicly available, and existing information sources can only give a fragmented impression of the impacts of Turkish main ports. This chapter aims at filling this gap, by providing new estimations of port-related value added and employment in Turkey and Mersin.

Box 1. Monitoring port impacts in Belgium and the Netherlands

Port impacts in Belgium are calculated and monitored by the National Bank of Belgium on a yearly basis. The impacts that are monitored are direct and indirect value added, direct and indirect port-related employment, investments in port-related sectors and port-related tax revenues. The ports included are all important maritime ports, such as Antwerp, Zeebrugge, Ghent and Ostend, as well as inland ports, such as Brussels and Liège. A uniform methodology is used, making comparison between ports and over the years possible. The reports are publicly available on the website of the National Bank of Belgium. A similar series of studies on port impacts exist in the Netherlands. These studies are carried out by the Erasmus University of Rotterdam, at the request of the national port council. Like the studies in Belgium, value added, employment and investments are monitored, using a common methodology and definition of port-related sectors. These studies not only include the large Dutch ports, but also relatively small ports are taken into account. A collection of port impacts from 2003 to 2010 is now publicly available.

2.1 Value added of port clusters in Turkey and Mersin

Direct value added of the port of Mersin can be estimated at EUR 0.2 billion. This figure can be derived at by making several assumptions. First of all, it is assumed that the direct value added of the ports sector can be defined as water transport, for which some data for Turkey as a whole are collected by the Turkish Statistical Institute. The value added of the total water transport sector in Turkey amounted to EUR 2.8 billion in 2002, representing 0.93% of total GDP in Turkey in 2002 (the last date for which I/O-tables were available to us). These data only exist at the national level, so a second assumption is needed to translate this into a figure for Mersin, namely that Mersin's share in Turkish port value added is proportional to its share in total Turkish port volume. This share is approximately 7%; applying this share to the total port value added of Turkey gives a number of EUR 0.2 billion port value added for Mersin.

The port of Mersin has important forward linkages with the trading and manufacturing sectors. Forward linkages describe the use of a sector, in this case of water transport services, by other sectors of the economy. These forward linkages can be established through analysis of detailed input/output tables of a national economy. The most recent input/output table that is available for Turkey dates from 2002. Analysis of this table learns that 62% of intermediate input originating in the water transport sector in Turkey goes into manufacture and retail and wholesale trade. Trade consumes more water transport services (37%) than manufacture (26%) due to importance of imported finished consumer goods in the Turkish economy. Table provides the intermediate outputs from the water transport sector in Turkey and

the main sectors that consume these intermediate outputs, in million Euros. These input/output-tables only exist at the national level in Turkey. Unlike many European countries, Turkey does not have multi-regional input/output-tables. Neither does it have the detailed data (e.g. on employment per sub-sector per region) that would make it possible to construct regional input/output-tables. This means that it is not possible to provide a fully accurate assessment of forward linkages of maritime transport in Mersin or Cukurova. In order to get an impression of what the forward linkages might be, we assume that their extent is similar in Mersin as they are in the whole of Turkey. Based on this assumption, table 1 presents the intermediate outputs from maritime transport in Mersin.

Table 1: Intermediate input from water transport (mil. EUR)

Mersin port	Turkey	Sector
293	**4,202**	**Total**
52	752	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
41	589	Wholesale trade and commission trade, except of motor vehicles and motorcycles
31	451	Water transport
21	307	Land transport; transport via pipelines
15	214	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale services of automotive fuel
14	201	Public administration and defence; compulsory social security
13	185	Manufacture of coke, refined petroleum products and nuclear fuels
10	145	Construction
10	141	Manufacture of chemicals and chemical products
9	136	Manufacture of food products and beverages

Source: Author's own elaboration based on data from Eurostat database -- Input-output table for Turkey, 2002.
Notes: Converted from Turkish liras at the annual average exchange rate. The estimate for the Mersin port is obtained with the share of Mersin port in the total freight handled in Turkey.

The forward linkages multiplier is 2.2; this means that one extra euro of maritime transport outputs in Mersin leads to 1.2 euro of additional output in the economy. A large part of this multiplier takes place is the sectors that are most dependent on water transport, such as retail trade, wholesale trade and land transportation. This set of sectors can be considered a port-related economic cluster because of its dependence on water transport services. The most important manufacturing sectors dependent on water transport are textiles and food products and beverages (Table 2).[3]

Table 2: Full requirement coefficients for water transport services (supply input-output model)

Full requirements coefficient	Sector
1.076	Water transport
0.130	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
0.111	Wholesale trade and commission trade, except of motor vehicles and motorcycles
0.087	Land transport; transport via pipelines
0.069	Manufacture of food products and beverages
0.063	Manufacture of textiles
0.058	Construction
0.047	Public administration and defence; compulsory social security
0.043	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale services of automotive fuel
0.043	Manufacture of basic metals
1.727	**Subtotal for the port-related sectors**
2.204	**Total for economy**

Source: Author's own elaboration based on Eurostat -- Input-output table for Turkey, 2002.

The backward linkages multiplier of maritime transport in Mersin is 1.79. Backward linkages describe the inputs into water transport services from other sectors of the economy. This means that a one-euro expansion in the final demand for water transport services will lead to an increase of EUR 1.79 in the total output of the whole economy, including an increase of EUR 1.56 in the sectoral outputs of the port-related economic water transport cluster shown in the table 3. This table also represents the sectors most related to water transport in terms of deliveries to water transport services. It presents the largest coefficients of the water transport column of the full requirements matrix from the standard demand-driven input-output model. The entries in the table represent extra demand for these sectors' outputs given a one-euro increase in the final demand for water transport services. These are the sectors that benefit most in terms of demand for their products with the expansion of the water transport sector. These sectors include other transport modes (delivering goods to/from ports), petroleum and gas products (supplying fuels and lubricants for shipping), repair services for ships, financing of shipping, other transport equipment.

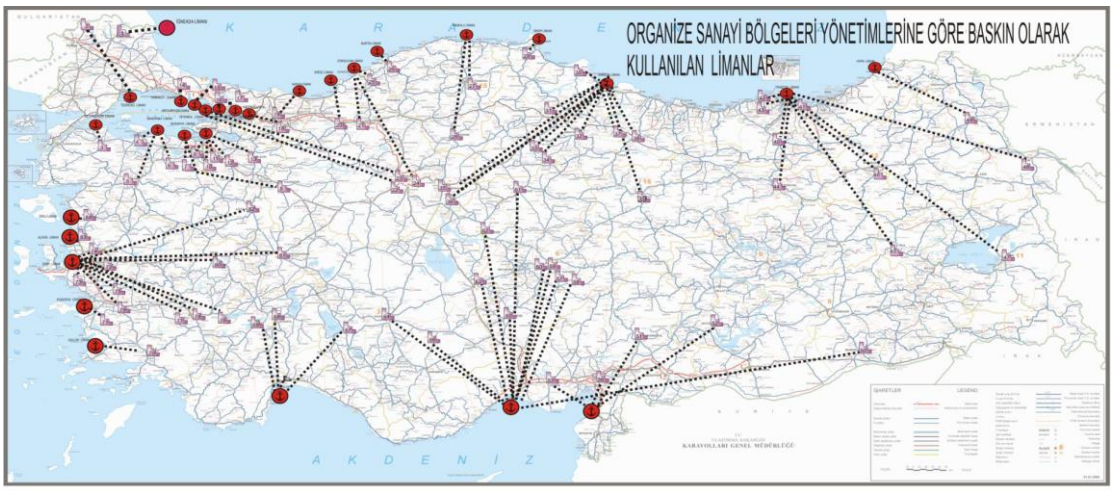
Table 3: Full requirements for water transport services (demand input-output model)

Full requirements coefficient	Sector
1.1046	Water transport services
0.1118	Supporting and auxiliary transport services; travel agency services
0.0860	Land transport; transport via pipeline services
0.0620	Coke, refined petroleum products and nuclear fuels
0.0352	Crude petroleum and natural gas; services incidental to oil and gas extraction excluding surveying
0.0328	Trade, maintenance and repair services of motor vehicles and motorcycles; retail sale of automotive fuel
0.0287	Financial intermediation services, except insurance and pension funding services
0.0278	Basic metals
0.0252	Other transport equipment
0.0219	Machinery and equipment n.e.c.
0.0211	Wholesale trade and commission trade services, except of motor vehicles and motorcycles
1.5571	**Subtotal for the above sectors**
1.7897	**Total for economy**

Source: Eurostat -- Input-output table for Turkey, 2002.

Many of these backward and forward linkages take place through functional relations between the port of Mersin and the various Organised Industrial Zones (OIZs) in Turkey. OIZs are manufacturing clusters created by the Turkish government through favourable conditions and incentives, in order to create economies of scale and synergy effects. In 2009 there were 265 of such OIZs throughout Turkey. The Turkish "Port Masters Plan 2010" gives the ports that are most frequently used by the different OIZs; according to this plan, there are 13 OIZs that mostly use the port of Mersin: these links are indicated in the map below (Figure 16). According to the Ports Master Plan 2010 the port of Mersin is the most used port facility for the OIZs of Mardin, Kayseri, Yozgat, Kırsehir, Aksaray, Konya Center, Nigde and Konya Eregli.

Figure 16: Turkish ports most used by Organised Industrial Zones



Source: Ports Master Plan 2010

Total direct and indirect value added of the port of Mersin is here estimated to be EUR 0.6 billion. The total port value added could be defined as the water transport sector, as well as the sectors delivering to the water transport services (forward linkage), as well as the sectors using water transport services (backward linkage). In the case of water transport, the forward linkage is the most relevant from the point of view of policymakers. The forward linkage is 2,204 – each extra euro into the water transport sector results in 1,204 extra euro of value added in sectors that use water transport services. With a forward linkage of 2,2, this results into 440 million euro. If the backward definition applies, this amounts to some 360 million euro. These sums can be aggregated, but the result has a limited economic meaning, as it assumes a full clearing of markets: demand will fully adapt to extra supply, and supply will fully adapt to extra demand, which is not an assumption that generally holds fully. If water transport disappears, a certain part of the supply will find new markets, and a certain part of the demand will find new suppliers. In general, with the assumption of an elasticity of 1, the most reasonable assumption is the rule of half, which would mean that the indirect economic effects (forward and backward linkages) do not amount to EUR 0.8 billion but to EUR 0.4 billion. It implies that with an estimated direct value added of the port of Mersin of EUR 0.2 billion, the total port value added in Mersin would be EUR 0.6 billion (Table 4). This includes the water transport services in Mersin, the sectors using shipping, and the sectors delivering to shipping.

Table 4: Total value added of the port of Mersin

	Million Euros
Water transport services in Mersin	200
Forward linkages	220
Backward linkages	180
Total	**600**

Source: Author's own elaboration based on data from Eurostat database

2.2 Port-related employment

There are no studies on the number of port-related jobs in Mersin, or Turkey for that matter, not are there statistical datasets that would make it possible to resolve this question in a satisfactory way. As mentioned above, there are detailed employment numbers per economic sub-sector, but only at the national level. Even if we would assume that the port-related employment in Mersin would be proportional to its share of port volume in the national port volume this would require a definition of port-related employment that is difficult to establish. A well-known problem in defining port-related employment is its discretionary character: what is considered port-related employment in one location is not considered as such in another place. There are methodologies to solve this problem (Musso et al. 2000), but that would require detailed employment data per locality and at sub-sector level, which do not exist in Turkey.

Our rough estimation would suggest that the number of port-related jobs in Mersin is at least 16 800. This estimation is based on employment numbers provided by the Mersin International Port (MIP), the Mersin Chamber of Shipping, the Free Trade Zone of Mersin and the Free Trade Zone of Adana. We consider the number of staff by MIP as maritime transport, the employment of the members of the Mersin Chamber of Shipping as maritime services, whereas the employment in the free trade zones is both trade and manufacturing. As the proportion between trade and manufacturing jobs for the Free Trade Zone in Mersin was provided by their authorities, a further breakdown in manufacturing was made on the basis of the number of firms in the different subsectors, assuming the same average number of staff in each sub-sector. Based on these data and assumptions, a total number of port-related jobs was derived, as well as a number of jobs according to sector. Besides maritime transport and maritime services, sectors with many port-related jobs are wholesale and retail trade, the food products and beverages sector, and the textile-manufacturing sector (Table 5). These sectors correspond nicely with the sectors that were found to have largest forward and backward linkages with the port of Mersin, assessed in the chapter section 2.1.

Table 5: Port-related jobs in Mersin (number of jobs, 2012)

Maritime services	8600
Food products and beverages	3600
Wholesale and retail trade	1500
Maritime transport	1400
Textile industry	600
Other	1100
Total	**16800**

Source: Author's own elaboration based on various data sources

2.3 Environmental impacts

Although several environmental impacts related to the port of Mersin are reportedly measured and monitored, relatively few of these impacts are publicly available. According to MIP officials, regular measurements are carried out with respect to air quality (CO_2, NO_x, SO_2 and PM), dust, carbon footprint, energy use, water quality and waste. These results are communicated to the environmental authorities and within the limits set by legislation, according to the MIP; and local authorities are authorized to sanctions related to environmental impacts. Most of these data are not publicly available or easily accessible, so the environmental impact of the port of Mersin is difficult to establish. The Environmental Impact Assessments (EIA) of proposed port extensions were made available, which gives an insight in estimated and modelled environmental impacts, but not on actual current impacts.

Many world ports show growing transparency on their environmental impacts. E.g. the port of Los Angeles produces every year an air quality inventory in which air emissions from port activities are systematically monitored and compared to previous years. Other ports, such as Antwerp, produce every year a Sustainability report, in which environmental impacts and policies are highlighted. Such initiatives have been established following pressure from citizens, but also in response to emerging demands from port clients, such as shipping companies. The fuel switch programme in the port of Gothenburg is developed in close cooperation with world's largest container shipping company, Maersk. Environmental concerns are also central to some of the port of Mersin's clients, such as UN RoRo, an important carrier for Mersin that has an environmentally friendly profile, being member of the BSR Clean Cargo Working Group. Some of the East Med ports are also increasingly becoming more environmentally sustainable. This is for example the case for the Israeli port of Ashdod, which has an extensive set of environmental policies (described in more detail in chapter 3). Transparency to the public and to clients on environmental impacts may become a more important determinant for port choice, especially if the current trend of port clients' demands for more sustainable port policies would continue.

3. POLICIES AND GOVERNANCE

The Turkish government has, in its 9th national development plan for 2007-2013, laid out an export-driven growth vision in which transportation and ports are important facilitators. This vision has fed into a variety of other strategic documents such as the "Turkish Industrial Strategy 2011-2014" and the "Export Strategy of Turkey 2012-2023 and Action Plan", which became operational in the 2013 annual development programme. One of the aims of these strategies is to rank among the top ten world economies by 2023, the centenary anniversary of the Turkish Republic, and reach 500 billion dollars of exports, which would necessitate an average increase in exports of 11.7% per year.

In order to achieve this goal, improving ports and the logistics sector have become government priority. The forecasts in the "2023 Export Strategy Plan" show that the total container handling capacity of the national ports will need to be increased from 11 million to 30 million in the period of 2011-2023. The government policy to stimulate economic development in other areas than the Marmara region, as vindicated in the Input Supply Strategy (GITES), might increase exports from the region and thus the need for more port capacity. This capacity will be increased by the creation of three new container ports, including one in Mersin, a plan that will be discussed more in detail below. In addition, hinterland connectivity is being improved by investments in road and rail links, with the aim of better connecting Turkish ports to the Trans-European Transport Network (TEN-T).

The importance of logistics is also underlined in the policies of regional and local actors. The Regional Development Strategy 2010-2013 of the Cukurova region has indicated logistics as one of the nine sectors that it supports. Finally, the importance of logistics is underlined by the Mersin Logistics Strategy, developed by the Mersin Logistics Platform, in which the main actors in logistics and transport participate, as well as the city of Mersin. This emphasis on port development and logistics by different plans and actors provides a fruitful basis to solve three related challenges: evolving towards competition-enhancing port policies, creating regional benefits, and mitigating negative impacts.

3.1 Towards competition-enhancing port policies

The Turkish ports sector has undergone extensive privatization since 1994. The privatization of the ports aims at improving port operations by attracting private investments and eliminating the financial responsibility of the state. According to the 1994 Privatization Act, public ports can be given to private operators by granting the rights to operate for a certain period of time. In this respect, two different Turkish public ports can be distinguished: ports under the aegis of the Turkish Maritime Organization (TDI) and those under the Turkish State Railways (TCDD). All of the TCDD ports, except the Haydarpasa container port, were included in the privatization process by the decision of the Privatization Higher Council (OYK) in December 2004. Since the final decision of "Privatization Higher Council" on privatizing the ports in June 2005, TCDD has privatized the ports of Mersin, Iskenderun, Bandırma and Samsun, while s only the ports of Izmir and Derince are left in the portfolio of privatization department. TCDD remains in place as the monitoring and supervising body during the concession period to ensure successful implementation of the concession agreements rather than a governance structure. The concession agreements include specific investment requirements for each port privatization process such as increasing the capacity.

In line with these privatisation policies, a concession to operate the port of Mersin was granted to a private consortium in 2007. This consortium consisted of the global port terminal operator PSA, together with the Turkish construction agglomerate Akfen. In August 2005, port of Mersin is privatized to "Singapore Port Authority (PSA)-Akfen holding" joint venture with a tender of 755 million dollars. Three consortiums, DP World, HPH and PSA/Akfen participated in the bid and after 20 rounds of bidding, PSA-

Akfen won bidding USD 755 million. The concession agreement was made for a 36 year period and required a performance increase in first five years to not less than 1.2 million TEU and 7.5 million ton in dry-cargo handling or depending on the operator's decision only 1.7 million TEU (1 TEU=15 ton) in container handling. In addition, the agreement contains specific clauses to establish healthy competitive port operations; these clauses would forbid the actions of monopolistic manner such as discrimination, high tariff and restriction of the supply.

After it was granted, a controversy arose over whether the concession for the Mersin port would result in a private monopoly. This was the fear of the national port union (Liman-İş) that filed a claim against the decision to prevent such a monopoly position. It proposed a separate privatization scheme taking into account the reflections of the National Competition Authority. According to the opinion of the competition authority, insufficient market control mechanism existed for the privatized ports due to a lack of national port governance and related monopolies over the captive hinterlands, so the competition authority proposed the privatization of the port by granting separate concessions to different operators. In November 2006, the Council of State, which is the highest administrative court in Turkey, rejected all claims against the privatization of the port of Mersin with the argument that the restrictive clauses in the concession agreement would fulfil the claims of the competition authority (Atiyas and Oder, 2008).

In parallel to this process, the national government in Turkey decided to build a new container port in Mersin, together with new ports in the Aegean and the Black Sea. This new container port project would have to be realized by reclaiming the land next to the current port facility, for which a series of feasibility and EIA studies were carried out. The capacity of the project would reach 1.7 TEU to 1.9 million TEU in the first phase by 2014 with the maximum capacity of 10.3-11.4 million TEU by 2033. The port is projected on top of the fully reclaimed land next to the current port facility with an area of 409.1 ha and the cost of whole project is calculated as EUR 2.954 million. The project is analyzed and addressed as a necessary project in the most recent and comprehensive study "Coastal Structures Master Plan 2010" done by the Ministry of Transport.

Meanwhile, the current port operator MIP has submitted proposals to expand the container reception capacity and construction of a new cruise port by reclaiming the land within the existent breakwater. As per the concession agreement between MIP and TCDD, the port operator needs to expand the container capacity to at least 1.7 million TEU annually by 2012. MIP proposes to increase the annual capacity of the container port with the expansion plan from 1.368.000 TEU to 3.094.833 TEU annually. However, this project is still in EIA approval process.

The above succession of events shows the on-going challenges in combining port privatisation with port competition. Instead of introducing intra-port competition by granting two concessions for the operation of the Mersin port, as suggested by the National Competition Authority, the Turkish government granted the operation of the whole port to one consortium, subsequently constraining the possibilities of this consortium to grow by proposing a new container port just next to MIP, that would effectively change its port lay out and disable its own extension plan. The Turkish ports privatization policy is based on the assumption that the private sector would be more efficient in operating a port than the public sector; and the efficiency of the Mersin port, as well as its growth rates since privatization could be considered evidence for that assumption. At the same time, it wants to promote competition and does this based on assumptions about development of port traffic in the future. A challenge arises on the question if the incumbent operate can be assumed to capture this new traffic. The feasibility studies for the New Container Port in Mersin studied various possible locations and indicated the location just next to MIP as the best option considering environmental conditions and hinterland connections. Independent of whether this is the case or not, the most current practice with respect to new port development seems nowadays to expand in less densely populated areas in order to limit negative impacts, e.g. the development of Tanger-Med (Box 2).

Box 2. Tanger-Med: the emergence of a new hub in the Mediterranean?

The Port of Tanger-Med in Morocco is one of the largest ports on the Mediterranean and the largest in Africa. The port, about 35 kilometers east from Tangier, is located on the Strait of Gibraltar, which is at the crossing of the East-West and North-South major shipping lanes. The port complex is an important strategic plan for the Moroccan government to facilitate the economic and social development in the North Morocco region. The vision of the port authority is to build "a world class transshipment platform serving the needs of global and regional container trade, and an efficient import/export hub fostering Morocco's competitiveness in world trade". The port went into service in July 2007 with an initial capacity of 3.5 million twenty-foot equivalent units (TEU). The Tanger Med I has two container terminals, and about 85% of the port's activities is concentrated on container transshipment. An expansion plan of the port called the Tanger Med II was approved in 2009 and the construction was launched in the same year. The project is expected to bring an additional 5 million TEU capacity to the existing port complex by 2016. In addition, the port has a ro-ro terminal, which has an annual capacity of 7 million passengers, 2 million cars and 700,000 trucks. There is also a bulk terminal mainly for cereals and a newly built hydrocarbon terminal with an investment of €134 million, which will enable ships passing through the Strait of Gibraltar to refuel on-shore and off-shore. The Port of Tanger-Med reported to have rapid growth in the container business as its throughput increased by 68% to 23 million tonnes in 2010 than 2009. However, a two-month labor dispute in 2011 slowed down its operation and the container traffic grew 17% to 27million tonnes and 2.09 million TEU.

Growth was also observed in other sectors at the Port of Tanger-Med. In terms of the passenger traffic, more than 1.7 million passengers and 640,000 vehicles transited through the Port in 2011 with a growth rate of 51% and 67% respectively. Because of its key location on the Atlantic and Mediterranean trade routes, the port complex has also been developed in conjunction with logistical, commercial and industrial free zones, as well as road and rail infrastructure projects. Over 20 billion euros has been invested in the infrastructure connecting the port to nearby roads and national railway systems. A large logistics free zone adjacent to the port is under construction with land capital extendable up to 150 hectares. It will be dedicated to logistics and post-processing activities and offer added-value to transshipment. The 500-hectares Tanger Free Zone was launched in 1999 and operated as a multi-purpose zone dedicated to export processing. It has more than 600 companies set up within the zone. The French automobile manufacturer Renault just started its operation in the Dedicated Automotive Industry Free Zone in February 2012, which is the biggest car plant in North Africa. The factory employs about 2,000 local staff and expects to triple its current annual capacity of 147,000 cars by 2014. The development of Tanger Med automotive cluster is to create a synergy between the industrial platforms and the Tanger Med Port to reach South European car manufacturers and provide logistics services for the entire supply, storage and delivery chain. The rise of the Moroccan new port complex has sharply increased competition in the Mediterranean for container transshipment, especially when its labor costs are much lower than their European counterparts, such as the Port of Algeciras in Spain.

Local firms have expressed their unease with tariff increases by the Mersin International Port. As port of Mersin is the only modern container port facility in the region, the pricing policy of the port would impact all of the industries in the region. According to local newspapers, the operator has increased the tariff by 10% in April 2008 one year after the takeover although the port operator is not permitted for a tariff increase in the first three years period after privatization. In addition, there was another tariff increase in 2010, which is three year after the takeover. After this last increase, the local NGOs and chambers (chamber of shipping, industry, union of exporters) have declared in a press announcement that the port operator continued its monopolistic price policy despite warnings from the Turkish State Railways. Several stakeholders have expressed their concern about the increase in transportation costs due to this tariff policy.[4] MIP has declared that the port has increased its cargo handling performance and the price policy of the port complies with the concession agreement, which contains restrictions on price discrimination and excessive pricing, by taking into account the cost of service, the price paid for the concession, tariffs in other comparable Mediterranean ports and average costs in the sector.

In order to deal with such and other regional issues, the creation of a public port authority is warranted. The Turkish central government was traditionally strongly involved in cargo ports via the TCDD. This involvement has become much smaller with the privatization of almost all of its ports. In many countries in which port operations are privatized, a public port authority takes up the remaining

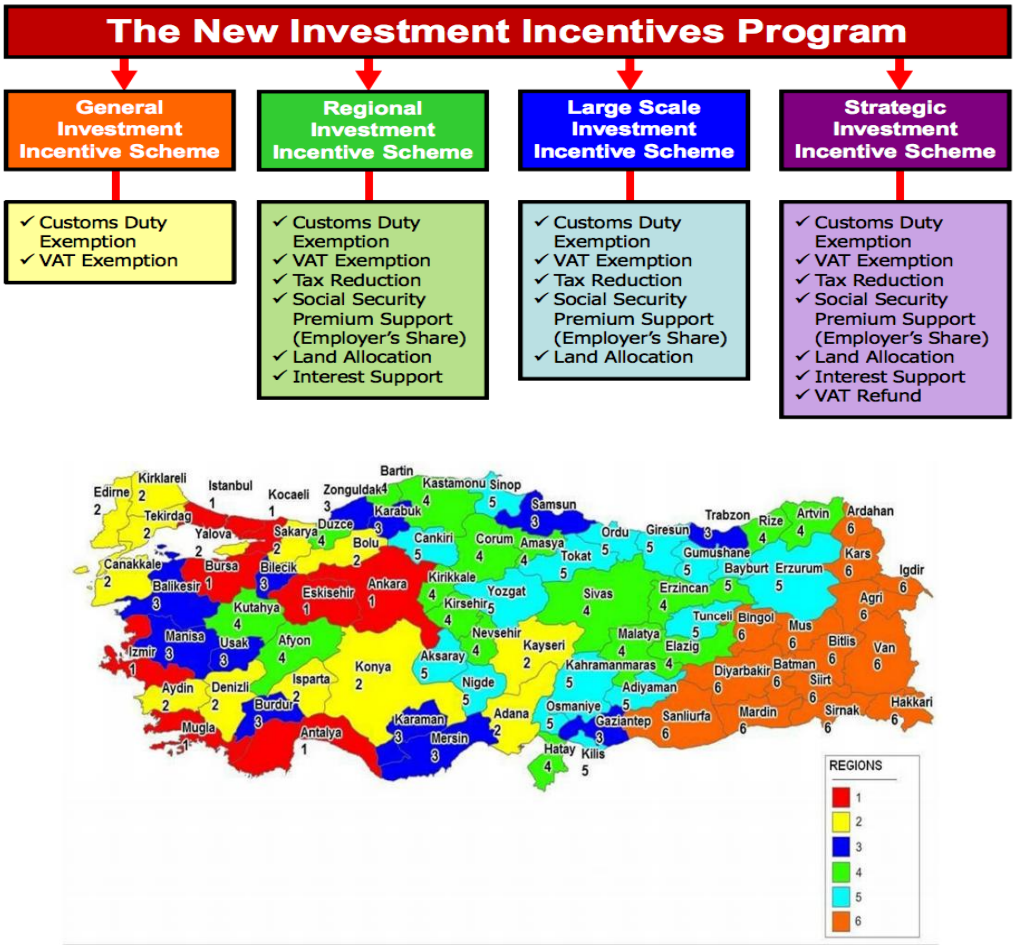
public functions, such as harbour master functions, but also the function of community manager, facilitating exchange between the operator, port clients, the regional development agency and the port-city. The creation of such a port authority function could also clarify the chain of command in port related decisions and investments plan. As such, both operators of privatized ports and regional economic actors would know better which regulation system they should comply with. These ideas align nicely with those expressed in the 2010 official government policy on port governance, but will need to be implemented.

3.2 Creating regional benefits from a port

Increasing regional competitiveness is essential to achieve the goals formulated in the 9th development plan. In this context, the organization of regional development agencies have been officially stimulated in 2006 and included in the 9th development plan. The mission of the development agencies is to establish strategic plans by prioritizing the key private sectors in order to eliminate regional economic imbalances with sustainable development policies. As such, the Cukurova Development Agency has prepared the Cukurova Regional Plan 2010-2013", which formulates the vision to be the leader region in the East Mediterranean by exploiting its regional "comparative advantages" and geostrategic position. In the plan, three sorts of sectors are supported: first, leader sectors, characterized by value added production making use of R&D and innovation; secondly strong sectors for which expansion of market networks is important; and third, developing sectors in which the supply function needs to be enhanced. In the Cukurova plan textile, food-agriculture and chemical industries are considered to be leader sectors; strong sectors are logistics, heavy machinery and paper, whereas tourism, furniture and renewable energy are labeled developing sectors.

The main supporting instruments are the promotion of production activities via R&D, innovation and entrepreneurship to activate the savings in the region. In this context, the Cukurova Development Agency have provided roughly TL 62,5 million for the focus sectors in order to enhance their competitiveness levels in the period of 2008-2011. The logistics sector, in addition to its own value-added performance to regional economy, impacts other sectors by defining their transportation cost in exporting. Therefore, the development agency financially supported the logistics sector considering its multiplier effect on other sectors. In the 2008-2011 period, 17 logistics related projects were supported with a total amount of TL 12 million, including a project on agriculture logistics such as packaging and storage of the products. More traditional instruments, such as free trade zones and national incentive schemes for underdeveloped regions, supplement these regional development policies. The free zone provides ad hoc custom, corporate and income tax incentives both for production and trade activities. In an attempt to boost exports, firms in free trade zones are under certain conditions exempted from the income tax on its employees. In addition, a new incentive system was created in 2012 to promote production and employment creation in organized industrial zones, especially in the less developed regions in Turkey that are located in the hinterland of port of Mersin. The incentive system includes discounts in social service costs and tax incentives depending on to the region class. This new plan classifies the cities into six regions according to their development levels (1 is most developed and 6 is least developed) and provides four different incentive schemes. Mersin is ranked as third region. Port investments, which are included in the "large scale investment scheme", in Mersin, will receive 60% of tax discount and 35% rate of contribution to the investments. Additionally, port investment will receive land allocation, VAT exemption, customs duty exemption and social security support. With this scheme, the government attempts to attract foreign port investors into Build-Operate-Transfer methods of the public port projects.

Figure 17. "2012 New Incentive System" City Classification and Programme



Source: Ministry of Economy, www.ekonomi.gov.tr

The effectiveness and long-term sustainability of these programmes can be questioned and rethinking Turkish policies for regions and regional development might be warranted. There is no systematic ex post evaluation of these programmes, but there are several elements that raise questions. The incentive scheme might be able to convince some firms to relocate their activities to more underdeveloped regions, but this comes at the price of considerable opportunity costs; the foregone government revenues due to the incentive scheme could have been more efficiently used to solve bottlenecks for certain sectors, with respect to skilled labour, infrastructure and entrepreneurship. In a similar vein, it would be interesting to assess the opportunity costs of free trade zones and compare these with their accomplishments. Free trade zones in the European Union have almost all been abolished in order to avoid state aid. Possible integration of Turkey in the European Union might thus have large consequences on the survival of these free zones. Finally, the regional development strategy of the Cukurova Development Agency has been operationalised in a subsidy programme that seems to support individual activities of firms rather than the improvement of overall framework conditions of selected economic sectors. The next development plan for the Cukurova region could facilitate more network activities in order to build on and help develop the cross-sectoral role of logistics.

This might help to implement a more integrated action plan for the development of certain sectors. An example of where such an approach could help is in cruise tourism. This is a sector in which the port of

Mersin could be a driving force for urban development, by developing its cruise activity. In 2011, the governorship of Mersin has initiated a "cruise action plan" in cooperation with the regional development agency and "Mersin International Port" officials. The governorship has prioritized "cruise tourism" in the regional strategic goals, which is based on the "Turkey Tourism Strategy 2023 and 2013 Action plan".[5] According to the plan, port of Mersin will be the cruise gateway port not only for the touristic attractions in metropolitan area of Cukurova region (Mersin and Adana), but further inland destinations such as Cappadocia and Gaziantep. Based on this regional cruise ambition, "MIP" aims to build and operate a new cruise facility in port of Mersin. The plan is part of the MIP's container port expansion project by reclaiming the land, of which EIA is still at approval process. The new cruise facility is planned separately from the cargo handling operations and increasing the current quay length from 140 meters to 392 meters with a parking capacity of 35 buses. But development of cruise tourism would also require competent ground staff, development of a package of touristic activities and amenities, new facilities, stronger city marketing and branding, and a possible link with the Mediterranean Games 2013.

3.3 Mitigating negative impacts

Environmental policies

The port of Mersin has implemented several environmental measures. It has initiated to start to use more sustainable energy sources rather than diesel; 10 electrified rubber tyred gantry cranes (RTG) with capacity of 45 tons each are operational in the cargo handling[6]. The port is equipped with proper waste reception and storage facilities in accordance with the international and national regulations (MARPOL) and discharging the waste to the authorized municipal reception centers. In addition, port of Mersin adheres to the priority of national policies regarding using more rail thus more environmental friendly modes in hinterland transportation. The Ministry of Transport, Maritime Affairs and Communications aims to increase the share of railway in national freight transport from 4.76% in 2010 to 15% by 2023, which is in accordance with "Turkey Transportation and Communication Strategy - Target 2023" and national development plans. The railway network reaching to quay walls is improved by making operational rail mounted RTG's within the port complex.

Extensive impact assessments are carried out in order to get approval for port extensions. Ports need to proof in their EIA reports that the project they want to develop complies with the environmental regulations regarding emissions, noise, dust, solid and liquid waste generations both during the construction and operation periods. The process starts by submitting the introduction documents to the Ministry of Environment and Urban Affairs. The ministry establishes a specific supervision commission regarding the project and proceeds with the public consultation and formatting procedures. Then, the project owner need to submit the final EIA report to the commission within one year with all environmental reasoning's and forecasts. If the result of evaluation process of the commission ends with approval; the project needs to start within five years. The environmental performance of the construction and the operation period are then monitored by periodic controls.

Mersin International Port has submitted and EIA application report for its expansion project for the container and cruise terminal complex. According to the report, as the project consists of mostly land reclamation operations rather than exploiting agricultural or forest areas; the environmental impact of the project is found within the limits of the regulation. Only the dust generation is found above the limits due to the sea filling operations planned to be done in 2.5 years. Therefore, a dust flow model will be exercised. The project is currently at evaluation and public consultation period; more detailed studies will be done in further documentation.

Despite these efforts, more would need to be done if Mersin would like to present itself as a "green port". More environmental monitoring studies could be made publicly available, and Mersin could be

connected to international initiatives from world ports to make port activities more environmentally sustainable, such as the World Port Climate Initiative, and the Environmental Ship Index. Some other East Med ports, in particular Ashdod, have introduced more far-reaching measures, including shore power and differentiated fees according to environmental performance (Box 3). These ports not only regard these measures as environmental measures, but also to let the port be one of the drivers for environmental innovation. The port of Los Angeles has created a programme to attract a Clean Tech cluster on its port site. Similar kind of programmes could help to attract high value added activities and be green at the same time.

Box 3. Environmental policy of the port of Ashdod

The Port of Ashdod in Israel is located on the Mediterranean coast, about 40 kilometers south of Tel Aviv. Its operation commenced in 1965 and it is one of few ports in the world built on an open sea. The Ashdod Port has broad and advanced infrastructure throughout the port, including fully automated freight terminals and an innovative computerized system entry and exit gate for trucks. Being one of the most technology advanced ports in the world, the Port of Ashdod has also taken its pride in integrating environmental protection into its decision-making, operation and development process. This desire to mitigate environmental implications resulting from port operation also stems from the legal requirements of laws and regulations customary in Israel, as well as international treaties to which Israel is a partner.

The workers and contractors at the port receive training and qualification to increase their awareness and commitment to the environment. The Port strives to make the information of its environmental policy and programs transparent to the relevant authorities and regulatory agencies, as well as to the public. The management of the Ashdod Port pays great attention to the prudent use of natural resources, such as land, sea, water and fuels. In the mean time, it puts effort in reducing the waste products and promoting the use of recycled materials. Additionally, the Port of Ashdod is the first port in Israel that joined the World Ports Climate Initiative (WPCI) and it adopted the Environmental Ship Index (ESI) on July 1st, 2012. The ESI is an international program that promotes cleaner ships and reduces harmful emissions by rewarding operators whose vessels exceed current environmental performance standards and regulations.

There are three main environmental protection projects at the Port of Ashdod.

Feeding the shores with sand; The sand movement along the shore of Israel is from the south to the north, the source of the sand being the Nile River in Egypt. During the construction of its terminal, the Port dried the sea to build new piers and breakwater. However, this causes an accumulation of sand trapped in the south and a shortage of sand supply on its north side, which could lead to the retreat of the shoreline. In order to solve this problem, the Port of Ashdod implemented a project that is to move about 180,000 cubic meters of retained sand in the south of the breakwater to the north side every year, which prevents the damages to its shoreline.

Prevention of contamination from loading bulk ships; Every year millions of tons of fertilizers like potash and phosphate are exported from the Port of Ashdod. In the past, these bulk ships were loaded through pipe loaders, which emit dust of phosphate and potash and contaminate the sea and air. The Port then developed an investment plan jointly with a private company to replace all the old loaders with dust suppressor ecological loaders that minimize the air contamination during operation. The replacement took four years to complete. A study conducted after the installation found out that the new loaders have reduced the dust emission by 95%.

Prevention of sea contamination during cargo unloading; Some major commodities at the Port of Ashdod include sulfur, grains, petroleum coke, and fertilizers. The traditional way of unloading these cargos was to use a shovel crane into trucks located under the unloading funnel, which creates environmental problems due to the spilled dusts and remnants being swept into the sea by wind and rain water. While all the bulk and general cargo piers at the Port of Ashdod were planned with a rear drainage system combined with settling pits, ensuring that all the leftover cargos will be absorbed and not overflow into the sea.

Promoting intermodal activities

Turkish development strategies to invest more in railway infrastructure have only to a limited extent been implemented. Since the 1950s Turkish transport policies have focused on road infrastructure, which have resulted in a very large share (90.6% in 2011) of road in national freight transportation. The 9th

development plan emphasises a corridor approach as an alternative transport mode, which is at the advantage of rail transport. . As part of this approach important railway projects were proposed such as the Marmaray project (the Rail Tube Tunnel under Bosporus in Istanbul) and the Baku-Tbilisi-Kars project, which will establish an uninterrupted railway connection between Europe and Asia. This could be beneficial to the port of Mersin, as it would deepen its hinterland connections. In addition, to these new projects, it was proposed that the existent railway infrastructure connecting ports be improved. These proposals have so for not been implemented to the required level and will need to be operationalised in order to achieve more sustainable hinterland transport. In addition, more liberalization of the freight railway market could help to attract private operators to invest. In several European countries, freight railway transportation options are offered by private operators, logistics firms and sometimes also initiated by carriers.

In order to facilitate inter-modal transport, a freight village near the port of Mersin is currently being constructed. In 2009, TCDD and the Ministry of Transport invested TL 50 million in the conversion of the Yenice railway station into a "freight village" facility in order to organize and unify the intermodal activities, which were once scattered in the city center. The project is strategically located in the crossroads of the railway route connecting the port of Mersin with the inner hinterland and international destinations. In addition to Yenice freight center project, which is still under construction, the Mersin Logistics Strategic plan suggests the crucial necessity of an international logistics center closely located to port and OIZ. This project is currently on hold, waiting for confirmation from the government.

Despite recent increases, the share of maritime in national container transportation is still very limited (3.6% in 2010). Increasing the share of cabotage is one of the goals in the 9th development plan, but not many concrete measures have been proposed to achieve this goal. There might be a variety of factors explaining this including the geographical shape of the country and the relative costs of short sea shipping in comparison to truck transport. In addition, the condition that this transport should be done by Turkish flagged vessels might also hinder national sea-to-sea transport. It has been observed in the US that similar restrictions as pose by the Jones Act have not stimulated national short sea shipping.

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ANNEX 1: TIME EFFICIENCY OF PORTS

Time efficiency of ports is here defined as the average time that a vessel stays in a port before departing to another port. Port time can be known through detailed vessel movement data. Port time can be considered a proxy for time efficiency, as the large majority of port calls will be connected to loading or unloading. Very brief port stays could be connected to re-fuelling, whereas very long port stays could be connected to repairs or other reasons. Both very brief (less than an hour) and very long port stays (more than 10 days) will be excluded in order to increase the probability that the data reflect time efficiency and not something else.

The data used are vessel movements, as collected by Lloyd's Maritime Intelligence Unit (LMIU) for 2011. The data are limited to the month of May; this month is considered to be a representative month by Lloyd's Maritime Intelligence Unit. The dataset contains for most vessels precise arrival and departure times (in hours and minutes). From the port calls of fully cellular container vessels (larger than 100 gt), the observations were excluded where arrival, or departure data, or both were missing, and some observations were excluded because they were considered to be extreme values that would skew the results; these are the vessel calls with a stay in one port of less than one hour or more than 10 days. Canals and strategic passages, as well as "non-port" locations (e.g. countries, straits, continents, seas, etc.) were excluded from the dataset and some paired terminals/ports were aggregated (e.g. Port Botany and Sydney).

In order to derive the total time that vessels stayed in a specific port, some less precise measurements (in days, not in hours and minutes) were incorporated for ports with missing values in the dataset. This is necessary, because for some ports only a very limited set of precise time observations was available, so taking exclusively these and extrapolate these would risk to be inaccurate. For these missing values, it is assumed that the port time for vessels arriving and leaving the same day is 12 hours, leaving the next day is equivalent to 36 hours, with a port stay of 2 days equivalent to 50 hours etc.

The main output indicator that is used is the average difference between "arrival date" and "sailing date" by port and all vessels (in number of days). The average is calculated here by dividing the total time that vessels spent in one port (multiplied by a coefficient of 89/31 in order to estimate the time for the second quarter instead of only the month of May) by the TEU throughput volume in that port in the second quarter of 2011, as reported by Eurostat. The data for the second quarter 2011 were taken in order to align as closely as possible to the May 2011 data from LMIU.

NOTES

[1] Other ports in the Mersin area include Anamur port, Tasucu Sumer port, Tasucu Municipality Port, POAS Petroleum Terminal as well as other coastal facilities.

[2] The different port hub-measures are related, but also complementary to each other. Very central nodes (high betweenness centrality) often act as hubs (low clustering coefficient) and it is common to observe a high correlation between degree centrality and betweenness centrality due to the physical constraint of coastlines for circulation. In some cases such as relay and remote hubs, some nodes can have higher betweenness centrality than degree centrality, i.e. they are very central globally but have only a few links locally. This is because they act as "bridge" between sub-components of the network, such as Anchorage in the global network of air freight being a bridge between Asia and North America.

[3] This table shows the most important users of the water transport services, i.e. the water transport cluster in terms of the forward linkage of the water transport sector. The coefficients in the table present the largest coefficients in the water transport row of the full requirement matrix of the supply input-output model. The supply input-output model, a.k.a. the Gosh model, relates the final demand and intermediate output (both taken as endogenous) to the sectoral outputs looked at as exogenous resources. In this setup, the direct requirement matrix is defined as the ratio of intermediate use and the output taken as the **row** total of the input-output table. This differs from the more standard, demand-driven Leontieff input-output model, where the direct requirements matrix is defined as the ratio of intermediate use and the output by the **column** total of the input-output table

[4] http://www.medya73.com/yazdir-1-244057.html

[5] Governorship of Mersin and "Mersin Logistics Platform" website- http://www.mersinkulturturizm.gov.tr/belge/1-97593/mersin-kruvaziyer-turizme-hazirlaniyor.html

[6] http://www.gazeteimece.com/ekonomi/limana-mega-proje.htm