PORTOPIA

7th Framework Programme
SST.2013.6-2. Towards a competitive and resource efficient port transport system
Collaborative Project
Grant Agreement no. 605176

Deliverable 1.1 & 1.2 & 1.2

State of the EU port system – market trends and structure update. Data availability, comparability and disaggregation.

DOCUMENT ID
PORTOPIA|D|1.1|DT|2014.12.01|V|02

DUE DATE OF DELIVERABLE
YYYY-MM-DD

ACTUAL SUBMISSION DATE
[Publish Date]

DISSEMINATION LEVEL
CO (Confidential, only for the member of the consortium, including Commission Services)

DELIVERABLE 1.1 & 1.2

State of the EU port system – market trends and structure update. Data availability, comparability and disaggregation.

AUTHORSHIP

Author(s)	Notteboom T., Parola F., Satta G., Vonck I.
Beneficiary Partner	ITMMA – University of Antwerp (UA), University of Genoa (UNIGE)
Issue Date	2013-12-31
Revision	Dooms M., De Schepper S., Langenus M.
Status	Final revised
Contributors	/
Pages	110
Figures	12
Tables	59
Annexes	1

SIGNATURES

Author(s)	Notteboom T.
Coordinator	Dooms M.

DELIVERABLE 1.1 & 1.2

State of the EU port system – market trends and structure update. Data availability, comparability and disaggregation.

REVISION

Revision Date	Reviewer Name	Reviewer Signature
2014-02-28	Dooms M., Langenus M.	Dooms M., Langenus M.
2014-05-12	Dooms M., Langenus M.	Dooms M., Langenus M.
2014-12-02	De Schepper S.	De Schepper S.
2015-11-05	Vonck I	Vonck I
2015-11-13	Langenus M.	Langenus M.

DELIVERABLE 1.1 & 1.2

State of the EU port system – market trends and structure update. Data availability, comparability and disaggregation.

Summary Report

This report includes two Deliverables: Deliverable 1.1 and 1.2.

Deliverable 1.1 (D1.1) is focused on the state of the EU port system and an update on the market trends and structure. This Delivery includes four specific tasks:

(1) An update of the traffic forecast of the EU Ports Policy impact assessment;

(2) A synthesis of the information regarding container transshipment volumes;

(3) The modal split figures of the core TEN-T ports;

(4) An approach to integrate intra-European dynamics into the Market Trends and Structure

Deliverable 1.2 (D1.2) relates to Deliverable 1.1 as it provides an update of the commonly used indicators. As such the Deliverable includes two specific tasks:

(1) An analysis of the data analysis and comparability problems toward the most used indicators on Market Trends and Structure;

(2) A detailed analysis on the feasibility and desirability in terms of disaggregation levels for the indicators on Market Trends and Structure.

DELIVERABLE 1.1 & 1.2

State of the EU port system – market trends and structure update. Data availability, comparability and disaggregation.

1 POSITIONING OF THIS REPORT IN WP1 8

2 AN UPDATE OF THE TRAFFIC FORECAST OF THE EU PORTS POLICY IMPACT ASSESSMENT 9

2.1 TRAFFIC FORECAST OF THE EU PORTS POLICY IMPACT ASSESSMENT 9

2.2 RECENT DEVELOPMENTS IN THE EUROPEAN PORT SYSTEM 10

2.2.1 Recent traffic evolutions in the European port system 11

2.2.2 Recent economic, political and market related developments 25

2.3 TRAFFIC FORECAST UPDATE 52

3 SYNTHESIS OF THE INFORMATION REGARDING THE CONTAINER TRANSSHIPMENT VOLUMES 56

3.1 DEFINITION OF TRANSSHIPMENT 56

3.2 A GLOBAL PERSPECTIVE OF THE TRANSSHIPMENT MARKET 58

3.3 DATA COLLECTION ON TRANSSHIPMENT ACTIVITIES IN EUROPEAN PORTS 64

3.4 AN OVERVIEW OF THE T/S MARKET IN EUROPE AND IN EUROPEAN PORTS 65

3.4.1 The environmental and business transformations 65

3.4.2 The evolution of transshipment operations in North and South Europe 70

3.5 DISCUSSION AND EXPECTATIONS FOR THE FUTURE 79

3.5.1 Overall transshipment incidence in Europe and European port ranges 79

3.5.2 The Mediterranean and Black Sea 83

3.5.3 The Baltic 85

3.5.4 The UK/Ireland 87

3.6 CONCLUSIONS AND RECOMMENDATIONS 87

4 THE MODAL SPLIT FIGURES OF THE CORE TEN-T PORTS 89

4.1 MODAL SPLIT IN THE EUROPEAN UNION 89

4.1.1 Eurostat figures 90

4.1.2 Uniformity using the German approach 91

4.2 INTERMODAL TRANSPORT IN MEMBER STATES 93

4.2.1 An attempt to uniformity 93

4.2.2 Belgium 94

4.2.3 Italy 98

4.2.4 Spain 106

4.2.5 The Netherlands 109

4.2.6 Germany 110

4.2.7 France 112

4.3 METHODOLOGY OUTLINE FOR INTERMODAL DATA GATHERING 114

4.1 GENERAL OVERVIEW 114

4.3.1 4.2 Input section 114

4.3.2 Methodology section 115

4.3.3 Output section 116

5 INTRA-EUROPEAN DIMENSION 118

5.1 CONCEPT OF INDICATORS ON INTRA-EUROPEAN DYNAMICS 118

5.1.1 'European traffic dependency index' or 'Intra-European traffic incidence' 118

5.1.2 ‘Transshipment incidence’ 119
5.1.3 ‘Motorways of the Seas incidence’ 119
5.1.4 ‘GDP multiplier’ 121

6 REFERENCES 124

7 APPENDIX 126

DELIVERABLE 1.1 & 1.2

State of the EU port system – market trends and structure update. Data availability, comparability and disaggregation.

LIST OF TABLES

Table 1 EU 2030 port traffic by region of loading/unloading according to PWC (2013) 9
Table 2 The top 15 European container ports (1985-2013, in 1000 TEU) 19
Table 3 Real GDP growth rate in European countries (2006-2015) 28
Table 4 EU-27 population projection (2013-2060). 32
Table 5 The equity throughput ('000) handled by carriers and hybrid operators in European ports (2011) 48
Table 6 World container port throughput and its components (million TEU) 58
Table 7 Estimated container transshipment activity by region (transshipment volumes and incidence) .60
Table 8 The delocalization of transshipment in North Africa: the building of "competing" port capacity 68
Table 10 Transshipment incidence in European container ports (based on throughput in TEU) 70
Table 11 Main markets served and shipping lines involved in the transshipment business in the major ports. 77
Table 12 Carriers' investments in hub terminals in Europe. 79

Deliverable 1.1 & 1.2

State of the EU port system – market trends and structure update. Data availability, comparability and disaggregation.

LIST OF FIGURES

Figure 1 Year-on-year growth in total EU port traffic (basis = ton) and EU27 GDP 11
Figure 2 The GDP multiplier between world container port throughput growth and world GPD growth - 2008-2012 12
Figure 3 Strong growth differences between individual ports – TEU traffic 13
Figure 4 Total traffic per cargo group for the EU27 port system 14
Figure 5 Year-on-year growth in total EU port traffic (basis = ton) for cargo groups....14
Figure 6 Distribution of cargo flows in the EU port system....15
Figure 7 Index evolution of throughput in the EU port system (2008=100) 17
Figure 8 Traffic shares of port ranges in the European container port system....18
Figure 9 Multi-port gateway regions in the European container port system....20
Figure 10 Expected contribution by member state to GDP recovery in 2014....30
Figure 11 2012 Global Cities Index – future position of emerging cities....33
Figure 12 EU-27 urban agglomerations exceeding 1 million inhabitants (2013) 34
Figure 13 Population densities by NUTS 2 regions: EU-27, 2011 36
Figure 14 EU-27 Merchandise Trade (euro billion) 37
Figure 15 EU-27 Merchandise Trade (euro billion) 39
Figure 16 EU-27 merchandise trade with extra EU countries 39
Figure 17 The operated fleet capacity of the top 30 ocean carriers 42
Figure 18 The evolution and the instability of main consortia and alliances 43
Figure 19 The evolution of PPP foreign entry strategies in the container port industry (1990–2010) 45
Figure 20 Direct and indirect PPP transactions by foreign entry strategy in main port regions 46
Figure 21 The growing relevance of equity joint venture agreements in the container port industry....47
Figure 22 Profitability and reliance on assets for selected commodity traders (average 2008-2011)....50
Figure 23 The strategic role of traders in cargo routing and port traffic - example for oil products 52
Figure 24 Types of sea-sea transshipment (Source: Ducruet and Notteboom, 2012) 57
Figure 25 Global transshipment markets in 2008 61
Figure 26 Main transshipment hubs worldwide: container volumes transshipped in 2011 62
Figure 27 Terminal ownership in the Rhine-Scheldt Delta....63
Figure 28 The emergence of Europe-Far East long-haul shipping services: New “centrality” of the Mediterranean 66
Figure 29 The generations of hubs in the Mediterranean basin 69
Figure 30 Transshipment incidences vs. diversion distance for a sample of European container ports - year 2004....72

Figure 31 Transshipment incidence vs. diversion distance for a sample of European container ports - year 2008 73
Figure 32 Transshipment incidence vs. diversion distance for a sample of European container ports - year 2012 73
Figure 33 European port ranges 81
Figure 34 Transshipment incidence in European port ranges, 2004 - 2008 - 2012 83
Figure 35 Share of port ranges in transshipment flows of the European port system, 2004 - 2008 - 2012 83
Figure 36 The market shares of container ports in the West Mediterranean. Ports grouped according to the diversion distance from the main shipping route (1975-2012) 84
Figure 37 Simplified view of cargo flows 90
Figure 38 Containerticker data 93
Figure 39 Belgian modal split figures in major ports 95
Figure 40 Data included by ADSEI 96
Figure 41 Belgian model split forecast 97
Figure 42 Data included by the National Bank of Belgium 97
Figure 43 Model split figures in main Italian container ports (data in '000 TEUs) 101
Figure 44 The container traffic share of the old (left) and new (right) port of Genoa in the main hinterland provinces (2007). 102
Figure 45 The container traffic share of port of La Spezia in the main hinterland provinces (2007). 103
Figure 46 The off-dock system between the port of La Spezia and the "close dry port" of Santo Stefano Magra (5 km away). 104
Figure 47 The modal split in major Spanish ports (all cargoes). Rail share in red, road share in yellow (data refer to 2008). 108
Figure 48 Modal split in the main Dutch ports 109
Figure 49 Modal split Netherlands (absolute amount) 110
Figure 50 Modal split Bremen containers 110
Figure 51 Modal split of the port of Hamburg 111
Figure 52 Percentage of non-road traffic in French ports 2007 112
Figure 53 Percentage of non-road traffic in French ports 2012 113
Figure 54 Intermodal split in French ports 113
Figure 55 Input section of intermodal dashboard 115
Figure 56 Methodology dashboard overview 116
Figure 57 Output section of dashboard 117
Figure 58 The main corridors of the Motorways of the seas in Europe. 121
Figure 59 The GDP multiplier in the EU container port system 122

1 POSITIONING OF THIS REPORT IN WP1

The aim of WP1 within the PORTOPIA project is to further develop the PPRISM indicators on market trends and structure and to seek meaningful expansions. The specific objectives of the work package include:

- Improving data availability and comparability of PPRISM indicators
- Collecting and presenting data at a more disaggregated level in terms of goods types and time periods
- Developing new indicators (ratios and indexes)
- Develop forecasts on short, medium and long term developments in port activities in Europe using a combination of techniques (modeling, meta-analysis and survey)
- Incorporation in a European Port Observatory (EPO) with link between indicators and specific policy targets in the EU transport policy.

Deliverable 1.1 (D1.1) is focused on the state of the EU port system and an update on the market trends and structure. This includes four specific tasks:

(1) An update of the traffic forecast of the EU Ports Policy impact assessment

(2) A synthesis of the information regarding container transshipment volumes

(3) The modal split figures of the core TEN-T ports

(4) An approach to integrate intra-European dynamics into the Market Trends and Structure

Deliverable 1.2 (D1.2) relates to Deliverable 1.1 as it provides an update of the commonly used indicators. As such the Deliverable includes two specific tasks:

(1) An analysis of the data analysis and comparability problems toward the most used indicators on Market Trends and Structure;
(2) A detailed analysis on the feasibility and desirability in terms of disaggregation levels for the indicators on Market Trends and Structure.

2 AN UPDATE OF THE TRAFFIC FORECAST OF THE EU PORTS POLICY IMPACT ASSESSMENT

2.1 Traffic forecast of the EU ports policy impact assessment

Table 1 presents the results of the traffic forecasting exercise reported in document SWD (2013) 181 final, one of the accompanying documents linked to 'Proposal for a Regulation of the European Parliament and of the Council establishing a framework on the market access to port services and the financial transparency of ports'. The table includes the results of traffic projections made by IHS-Fairplay in 2010 and by PwC/NEA (2013). The forecasts are based on a scenario that assumes a status quo of existing policies and already planned policy reforms, but at the same time assumes that these policy reforms do not create a level playing field for all 319 TEN-T ports (of which 83 ports are part of the core network). Following the low growth scenario the cargo throughput in the ports of EU27 would grow from 3.6 billion tons in 2011 to 5.8 billion tons in 2030. The EC argues that this growth would cause capacity problems and an unbalanced use of the port system and associated network.

Table 1 EU 2030 port traffic by region of loading/unloading according to PWC (2013)

Region	Container	Dry Bulk	Liquid Bulk	Other Cargo	RoRo	Total
UK/Ireland	125.74	155.43	297.49	137.46	35.26	751.39
Nordic	50.53	187.66	240.30	122.01	81.87	682.37
South Baltic	19.91	158.09	88.92	17.68	39.39	323.98
Hamburg-France	595.58	434.53	571.20	186.83	138.26	1,926.40
Iberia	217.28	176.38	213.45	38.34	50.98	696.44
Italy/Malta	179.00	112.67	261.87	80.05	64.24	697.83
Balkan/Aegean	120.80	156.28	122.21	50.50	128.72	578.51
Black Sea	8.22	69.73	28.90	1.53	37.81	146.19
Total	1,317.06	1,450.77	1,824.34	634.40	576.53	5,803.11

Source: EC 2013

The forecasts were obtained by running a combination of several models namely a GDP growth model PRIMES (which calculated the long term average GDP growth rates in the EU of 1.4%) and the Trans-tool model. As mentioned in the original document these projections must be taken with caution because of the multiple underlying assumptions. Particular attention must be given to new developments, for example the introduction of new or raising trade barriers or further world trade liberalization. The scenario used as a baseline assumes that the current state of affairs will prevail; it does not consider a sensitive analysis about possible trade agreements.

The complexity of the complete model will be further explained based on the underlying methodology. At the core of the used scenario are multiple trends and assumptions, i.e.,

1. There is congestion in the port hinterlands, in particular the North Sea and Baltic Sea regions in the horizon 2020-2030. The congestion in their hinterland will cause longer delays at the access links to a number of major ports. Those delays will paradoxically increase the marginal transport costs of reaching the performing port regions. They will have a knock-on effect on

higher fuel costs and road transport externalities while increasing the transport cost for and to peripheral countries.

2. The current geographical polarisation of the EU trade flows to a limited number of major ports will be accentuated.
3. The congestion in the ports reaching their limit in several geographical areas and the low performance in others will undermine the shift of road freight transport to maritime links which need uncongested and performing ports at both ends.
4. Achieving the goals of the proposed EU legislation on LNG (deployment of alternative fuels infrastructure, adopted in 2013) will put additional investment pressure in the TEN-T core network ports.
5. An increased size and complexity of the fleet: in particular ultra-large container ships, but also new types of Ro/Ro ferries and gas-carriers. The bigger ships pose a challenge of high peak capacity when delivering more cargo/boxes or (dis)embarking a high number of passengers in a single visit.
6. The deployment of bigger vessels for short sea shipping and feeder services, with new needs in terms of energy efficiency, alternative bunkering fuels and environmental performance (LNG, cold ironing);
7. Trends in logistics and distribution systems that attract more value added services within port areas (relevant to the rules for competition within the port and for charging schemes).
8. Significant changes in the energy trades, with a shift from oil and oil refined products towards gas; need for significant gasification facilities in ports; potential volumes of dry biomass and CO2 transport and storage; shore-side electricity supply.
9. A status quo of existing policies and already planned policy reforms involving progressive changes both at EU level and in individual Member States, resulting inter alia, from past reforms at national level and possible further reforms resulting from the Country Specific Recommendations

However, the creation of Table 1 did not include all the trends listed above. The model calculating future port traffic assumptions of economic growth up to 2030 and 2050 have been applied to a base year traffic matrix, containing maritime flows. Assumptions of economic growth use current (2012) estimates from PRIMES/TREMOVE.

The key points of the model include:

- The model builds up a picture of port-related traffic using trade data and port throughput data;
- The only assumptions entered into the forecasting model are economic growth rates, based on current expectations (Trans-Scenario, 2012);
- The model does not shift traffic between ports – it is competition neutral;
- Differential growth rates according to coastline areas arise only from variations in regional economic growth and the mix of commodities; and
- The model calculates unconstrained demand – without capacity ceilings for transport infrastructure.

2.2 Recent developments in the European port system

In order to assess whether the traffic forecasts for 2030 need to be adjusted upward or downward, it is key to analyse:

- The recent traffic evolutions in the European port system. This analysis is provided in section 3.1 (up to Q3 2013);

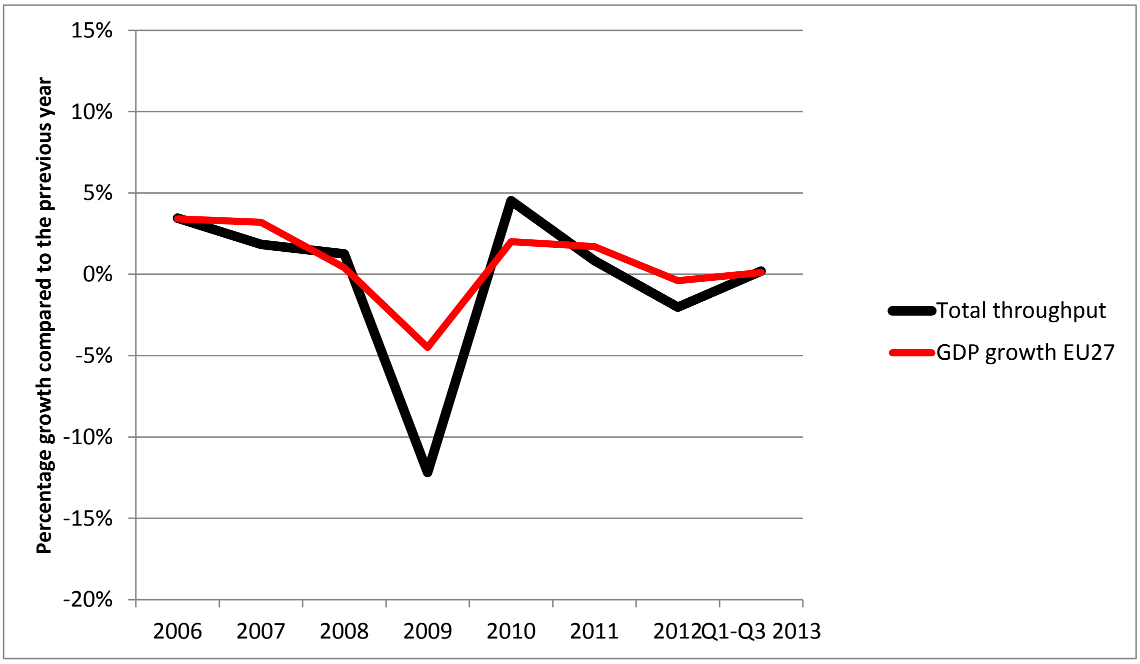
- Recent economic, political and market related developments that might have an effect on the trends outlined by the earlier traffic forecasts (see section 3.2.).

2.2.1 Recent traffic evolutions in the European port system

2.2.1.1 European port traffic and GDP growth

With a total throughput of an estimated 3.79 million tons in 2012, the European port system ranks among the busiest port systems in the world. Growth was particularly strong in the pre-crisis period between 2000 and 2008, partly driven by fast growing container throughput, i.e. an average annual growth rate of 10.5% in the period 2005-2008 and 7.7% in the period 2000-2005. The economic crisis, which started to have its full effect in late 2008, made an end to the healthy volume growth in the European seaport system. Total cargo volumes handled by European ports decreased 12.2% in 2009 corresponding to a decline from 4.18 billion tons in 2008 to 3.67 million tons in 2009. The throughput figures somewhat bounced back in 2010 to 3.84 billion tons (+4.5% compared to 2009), but more recent years did not bring further throughput recovery to pre-crisis levels (Figure 1). In 2011 growth was merely 0.8% and in 2012 the European port system recorded a mild drop of 2% in cargo handlings. Based on a sample of ports included in the Rapid Exchange System (RES), we can state that the first three quarters of 2013 brought a very modest growth of only 0.2% compared to the figures of the first nine months of 2012.

Figure 1 Year-on-year growth in total EU port traffic (basis = ton) and EU27 GDP

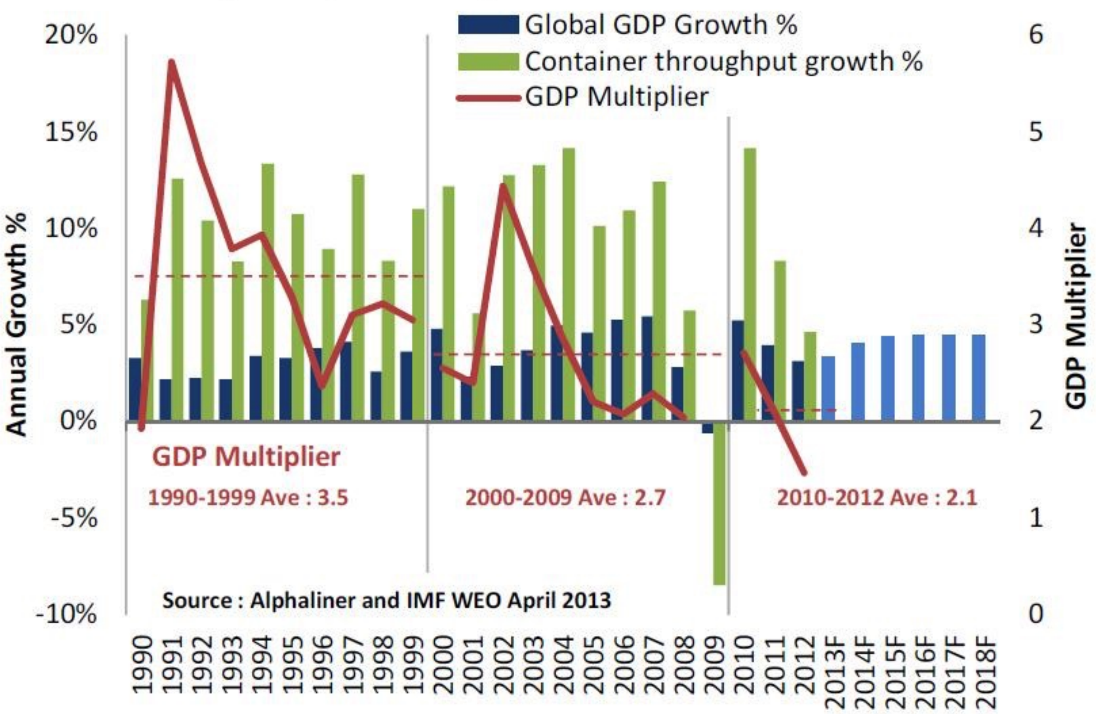


Note: growth figures for Q1-Q3 2013 are estimates based on a sample of about 60 European ports included in the Rapid Exchange System database

A comparison of the year-on-year growth figures in the European port system with the GDP growth figures for the EU27 reveals that ports continue to overreact to swings in economic growth (Figure 1). When the economy booms, seaports typically show high to very high growth figures. However, an economic crisis has a very pronounced negative effect on cargo volumes in seaports. The year 2013 seems to be a year of stabilization with almost zero growth in both GDP figures and cargo throughput.

The relation between GDP and port throughput has always attracted academic scholars, international organizations and maritime consultancy firms. Traditionally, GDP forecasts form one of the pillars in many port traffic forecasts. In one of its weekly newsletters (vol. 2013, issue 17, April 2013) Alphaliner argues that the global GDP multiplier, i.e. the ratio between world TEU growth and world GDP growth, is no longer stable (Figure 2). Alphaliner's findings show that the global GDP multiplier fell from an average of 3.5 in the 1990s to an average of 2.7 in the 2000s and 2.1 in the last few years. Figure 2 presents the GDP multiplier for the European container port system based on our calculations. The trend in Europe seems to be opposite to the global trend described by Alphaliner: the European GDP multiplier is on the rise, partly because of the recent trend toward lower GDP growth rates in the EU27.

Figure 2 The GDP multiplier between world container port throughput growth and world GPD growth - 2008-2012

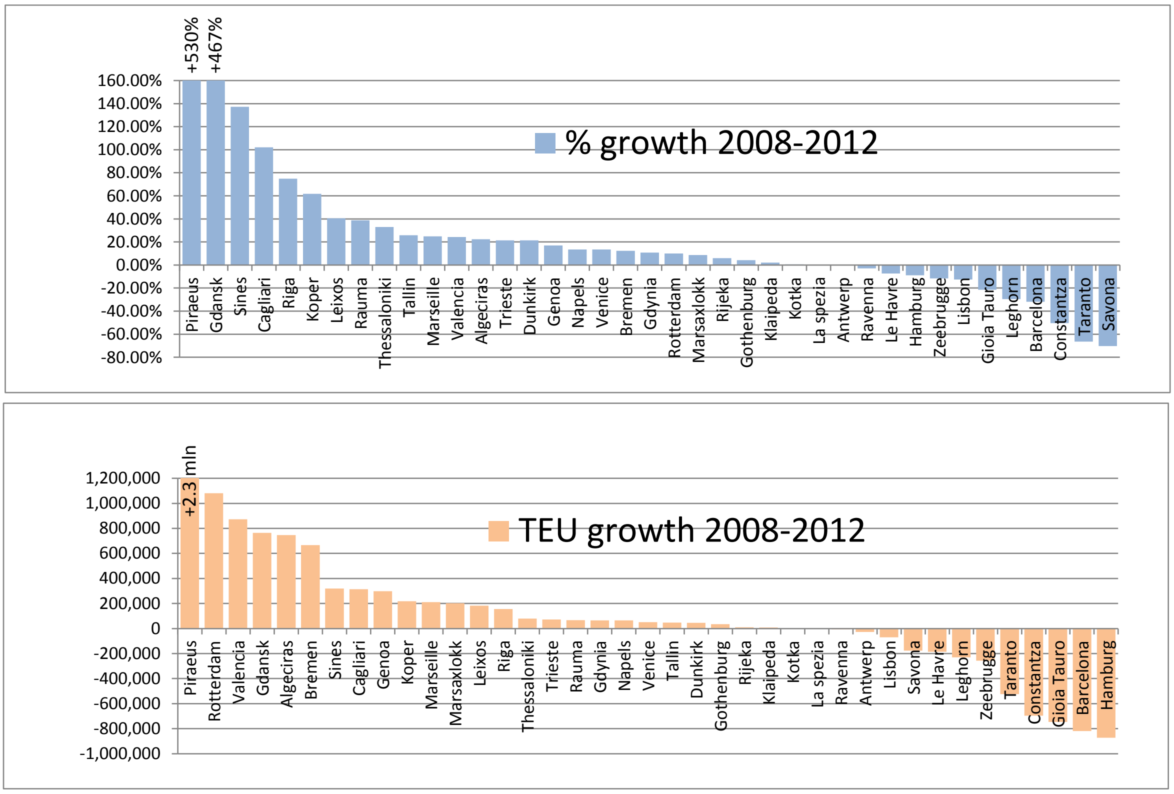


Source: Alphaliner, Weekly Newsletter (vol. 2013, issue 17, April 2013)

The evolution in the European GDP multiplier is a demonstration of the complex relationship between port traffic and economic growth. On the one hand, the nature of economic activities in many more mature economic regions in Europe is increasingly oriented toward the services sector, with agriculture and industrial/production activities (both strong port traffic generators) facing increasing pressure from international competition. On the other hand, the cargo base of many seaports has been greatly affected by the changing logistics function of seaports as turntables in global supply chains, but also by the setting of (European) distribution systems, the emergence of extensive intermodal transport systems/corridors and the growth of hub-feeder networks in liner shipping. These trends have made the relation between port volume and the economic situation in the immediate hinterland of the port more diffuse, particularly when considering the larger main ports and transshipment hubs.

This is illustrated in Figure 3, which shows the container growth in a number of container ports around Europe in the period 2008-2012. The highest growers can be found all over Europe, including countries such as Greece, Portugal, Spain and Italy which have been severely affected by the government debt crisis. The weakest performers in terms of growth are also found all over Europe, including in countries with the best economic status in the Eurozone (such as Germany). In other words, seaports in countries with the weakest economies of Europe do not necessarily underperform compared to seaports in stronger countries. This serves as another demonstration of the ever more complex relation between economic activity in the immediate hinterland and port traffic.

Figure 3 Strong growth differences between individual ports – TEU traffic



2.2.1.2 Traffic evolution per cargo group

Figure 4 and Figure 5 provide more detail on the traffic evolution for five cargo groups: liquid bulk (mainly oil and oil products), dry bulk (major bulks such as iron ore, coal and grain, but also minor bulks such as minerals and fertilizers), containers, roll-on/roll-off cargo and conventional general cargo (steel, forest products, heavy lift, etc.). The latter two cargo groups were initially affected the most by the crisis with a volume drop of nearly 20% in 2009. The recovery in 2010 was too weak to undo the 2009 effect. The year 2012 brought volume losses, after a stagnation in 2011. Container traffic was also heavily affected in 2009, but since 2010 the European container port system shows some growth again, be it at a much lower rate than before. Liquid bulk volumes initially recorded a rather modest decline in 2009, but growth figures have remained negative ever since. Also when looking at the different cargo groups, we can state that the year 2013 seems to be a year of overall stabilization with almost zero growth in all cargo groups.

Figure 4 Total traffic per cargo group for the EU27 port system

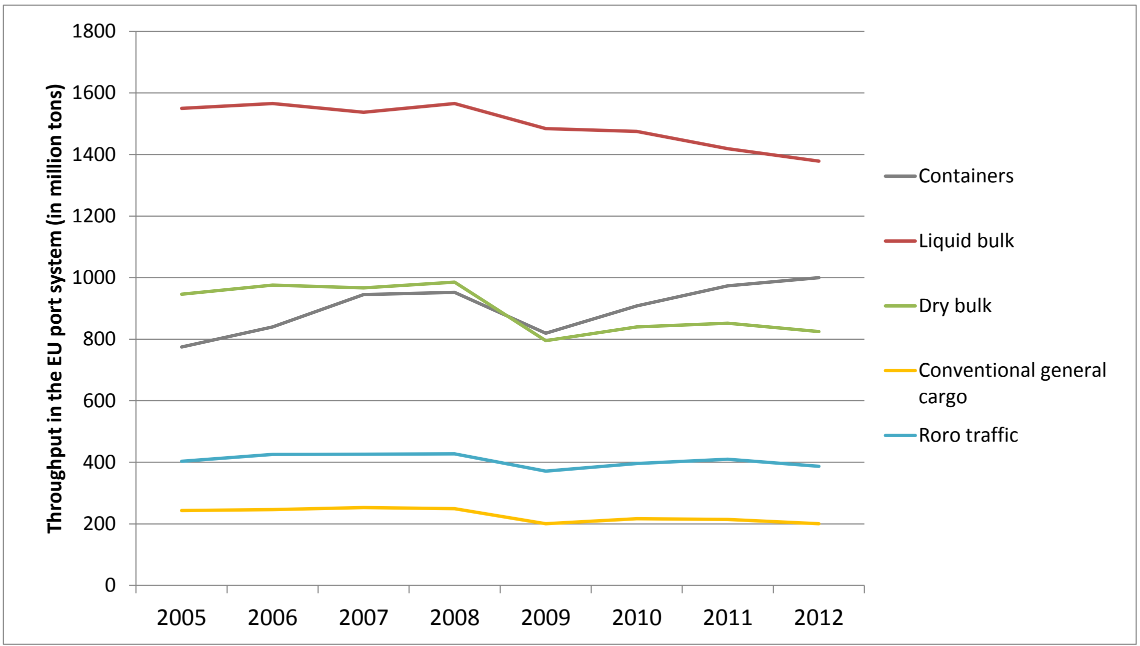
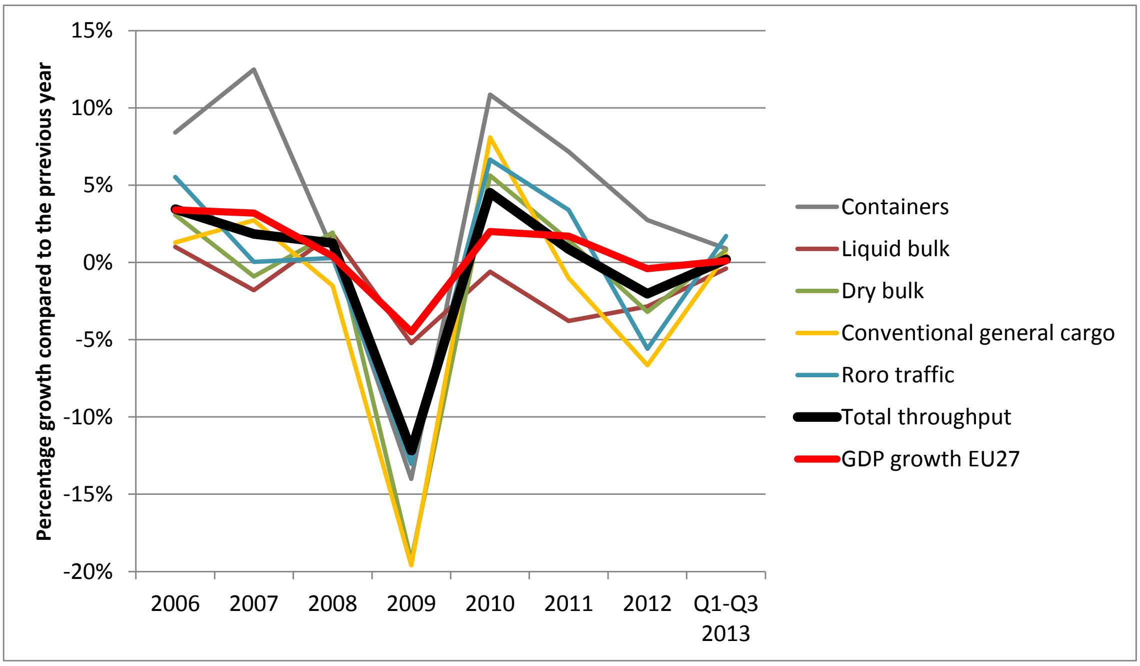


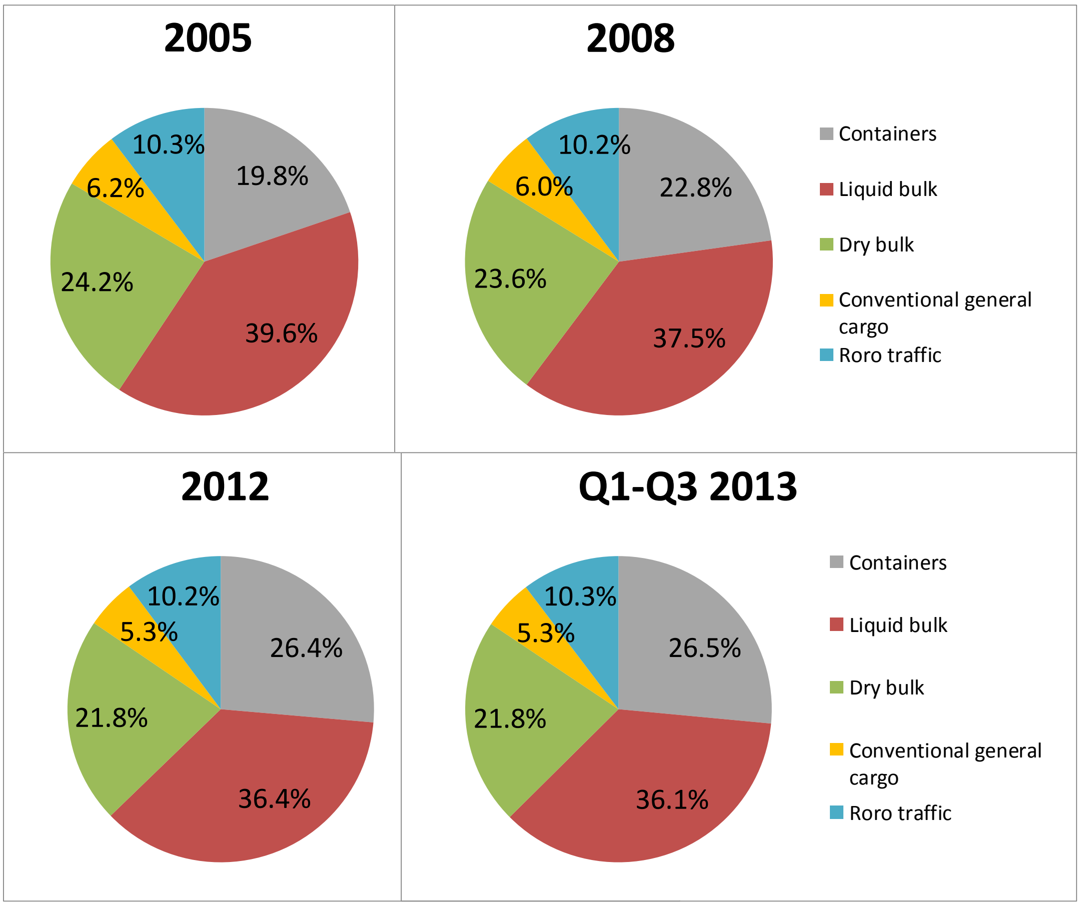
Figure 5 Year-on-year growth in total EU port traffic (basis = ton) for cargo groups



Once again it has to be underlined that the growth pattern per individual port can look very different from the overall pattern. For example, in the first nine months of 2013 liquid bulk volumes in the European port system decreased by an estimated 0.4% (based in the RES sample of ports) with quite diverging growth figures for some of the main liquid bulk ports. Rotterdam recorded a small decline of 2.4%, Antwerp showed a massive increase of 32% (mainly due to recent large scale investments in tank storage facilities) and Le Havre remained fairly stable at +0.8%. In the same period, Nantes-St-Nazaire saw a 13.3% drop in volumes and Marseille of -11.2%, while Sines grew by 20% and Bilbao by 14.7%.

The differences between the growth paths of the respective cargo groups changed the cargo type distribution in the European port system (Figure 6). Liquid bulk still accounts for the largest share, but its relative importance has dropped from about 40% in 2005 to 36.4% in 2012. Also dry bulk and conventional general cargo flows could not hold on to their respective shares. The position of Ro/Ro traffic in total European port throughput remained fairly stable. Containerization is still on the rise despite the observation that the crisis has lowered the 'container fetish' of many European seaports. Indeed, the modest growth figures in containerized trade in the past few years have given incentive to port authorities, market players and investors to rebalance their commercial interests to include a range of promising non-containerized commodity flows.

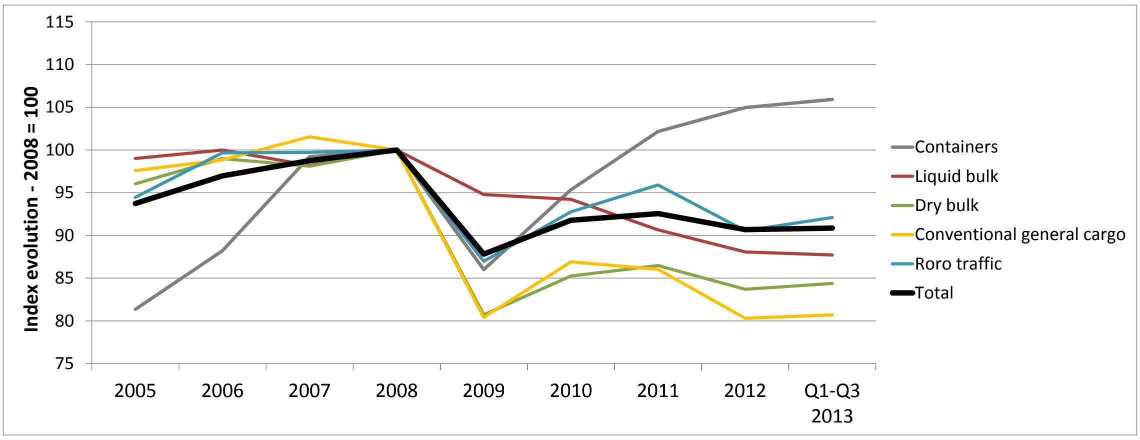
Figure 6 Distribution of cargo flows in the EU port system



Important to note is that we are still not back at pre-crisis cargo volumes. Total cargo throughput in European ports in 2012 was still 10% below the 2008 volumes (

Figure 7). 2013 points to a very small change compared to 2012. Next to dry bulk and conventional general cargo, liquid bulk flows seem to face a hard time to turn the tide. Only container traffic in European ports has managed to rise above the 2008 level.

Figure 7 Index evolution of throughput in the EU port system (2008=100)



2.2.1.3 Zooming in on recent regional dynamics in the European container port system

European container ports find themselves embedded in ever changing economic and logistics systems. The European container port system cannot be considered as a homogenous set of ports. It features established large ports as well as a whole series of medium-sized to smaller ports each with specific characteristics in terms of transhipment incidence (see Section 3), the hinterland markets served and the location qualities. This unique blend of different container port types and sizes combined with a vast economic hinterland shapes port competition in the region. This section discusses recent developments in the European container port system. We are particularly interested in the impact of the crisis on the port hierarchy in Europe. Are new container ports and port regions emerging as challengers of established ports and regions? Are some port regions in Europe gradually losing their significance? How is the balance between north and south evolving? How are new large-scale terminal capacity expansions affecting the competitive balance in the European container port system?

With a total maritime container throughput of an estimated 95.2 million TEU in 2012, the European container port system ranks among the busiest container port systems in the world. Growth has been particularly strong in the period 2005-2007 with an average annual growth rate of 10.5%, compared to 6.8% in the period 1985-1995, 8.9% in 1995-2000 and 7.7% in 2000-2005. The economic crisis, which started to have its full effect in late 2008, made an end to the steep growth curve. Total container throughput increased from 90.7 million TEU in 2008 to 95.2 million TEU in 2012 or an average annual growth of 'only' 1.26%. The year 2009 is at the root of this slow pace given a y-o-y drop in container volumes of about 14% in 2009. Between 2009 and 2012 traffic volumes have recovered at a rate of 6.87% per year. The Rapid Exchange System (RES) reports an overall growth of 0.9% in TEU for the first nine months of 2013. The RES sample includes 38 ports[1] that have reported TEU data for Q3 2013 in RES.

For 2014 most sources predict a revival of container volumes in Europe. For example, Drewry predicts that the global container trade will increase by 5.7% in 2014 to 684 million TEU. Terminals worldwide would handle 800 million TEU in 2017. The 'North

[1] These ports are Dunkerque, Le Havre, Rouen, Cherbourg, Aarhus, Stockholm, Bremen/Bremerhaven, Hamburg, Wilhelmshaven, Antwerp, Ghent, Rotterdam, Zeebrugge, Dublin, London, Nantes Saint-nazaire, La Rochelle, Bordeaux, Sines, Bilbao, Ferrol, Santa Cruz De Tenerife, Sète, Marseille, Algeciras, Huelva, Tarragona, Valencia, Genova, La Spezia, Ravenna, Venezia, Lemesos, Thessaloniki, Fredericia (og Shell-havnen), Helsinki, Klaipeda and Gdansk.

Europe Global Port Tracker' of Hacket Associates and the Institute of Shipping Economics and Logistics (ISL) in Bremen expects a growth for North-Europe in incoming container traffic of 16%. For the entire European port system import growth would reach 9%. At the export side, the forecasted growth in North Europe amounts to 11% (mainly driven by Asia and North America).

At present, the container ports in the Hamburg-Le Havre range (which includes all ports along the coastline between Le Havre in France and Hamburg in Germany) handle about half of the total European container throughput (Figure 8). The share of the Mediterranean ports grew significantly between the late 1980s and the late 1990s at the expense of the ports in the Hamburg-Le Havre range. The significant improvement of the share of the Med was mainly the result of the insertion of transhipment hubs in the region since the mid 1990s (Gioia Tauro, Marsaxlokk, Cagliari, Taranto to new but a few). At the start of the new millennium, the position of the northern range gradually improved while the Med ports and the UK port system lost ground. The crisis seems to have stopped this trend as from 2009 the traffic balance between the Med and the Hamburg-Le Havre range remained quite stable. However, the position of the UK ports (Southeast and South coast only) continued to weaken. The Baltic port region has clearly strengthened its traffic position in the past few years. The strong growth path of European ports in the Black Sea area (Romania and Bulgaria) suddenly stopped in crisis year 2009.

Figure 8 Traffic shares of port ranges in the European container port system

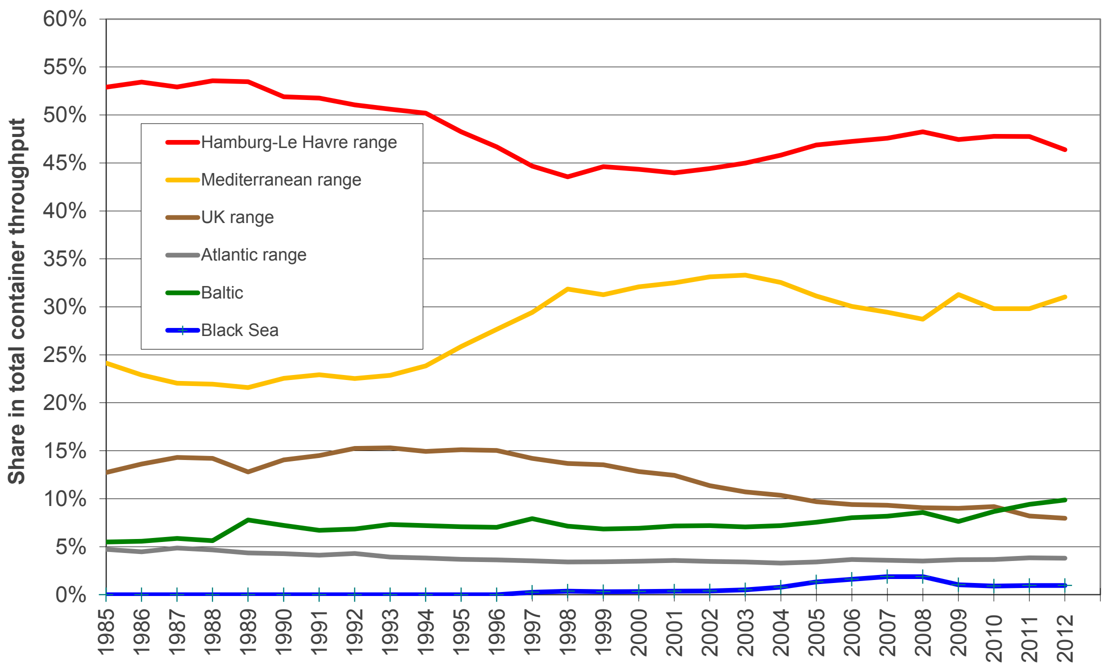


Table 2 provides an overview of the fifteen largest container ports in the European Union. Saint Petersburg, which handled 2.52 million TEU in 2012 and has witnessed strong growth in the past few years, is not included in the ranking. A number of the listed ports act as almost pure transhipment hubs with a transhipment incidence of 75% or more (i.e. Gioia Tauro, Marsaxlokk, Algeciras) while other load centres can be considered as almost pure gateways (e.g. Genoa and Barcelona to name but a few) or a combination of a dominant gateway function with sea-sea transhipment activities (e.g. Hamburg, Rotterdam, Le Havre, Antwerp).

Table 2 The top 15 European container ports (1985-2013, in 1000 TEU)

R		1985		1995		2005		2008		2009		2012	2013	%	Note 2013	R
1	Rotterdam	2655	Rotterdam	4787	Rotterdam	9287	Rotterdam	10784	Rotterdam	9743	Rotterdam	11866	11664	-1.7%	provisional	*1*
2	Antwerp	1243	Hamburg	2890	Hamburg	8088	Hamburg	9737	Antwerp	7310	Hamburg	8864	9183	3.6%	growth 9m	*2*
3	Hamburg	1159	Antwerp	2329	Antwerp	6488	Antwerp	8664	Hamburg	7008	Antwerp	8635	8575	-0.7%	provisional	*3*
4	Bremen	986	Felixstowe	1924	Bremen	3736	Bremen	5448	Bremen	4565	Bremen	6115	5785	-5.4%	provisional	*4*
5	Felixstowe	726	Bremen	1518	Gioia Tauro	3161	Valencia	3597	Valencia	3654	Valencia	4470	4311	-3.6%	growth 11m	*5*
6	Le Havre	566	Algeciras	1155	Algeciras	2937	Gioia Tauro	3468	Algeciras	3043	Algeciras	4071	4284	5.2%	growth 11m	*6*
7	Marseille	488	Le Havre	970	Felixstowe	2700	Algeciras	3324	Felixstowe (*)	3021	Felixstowe (*)	*3700*	-			*7*
8	Leghorn	475	La spezia	965	Le Havre	2287	Felixstowe (*)	3200	Gioia Tauro	2857	Piraeus	2734	-			*8*
9	Tilbury	387	Barcelona	689	Valencia	2100	Barcelona	2569	Marsaxlokk	2330	Gioia Tauro	2721	-			*9*
10	Barcelona	353	Southampton	683	Barcelona	2096	Le Havre	2502	Zeebrugge	2328	Marsaxlokk	2540	-			*10*
11	Algeciras	351	Valencia	672	Genoa	1625	Marsaxlokk	2337	Le Havre	2234	Le Havre	2304	2463	6.9%	growth 9m	*11*
12	Genoa	324	Genoa	615	Piraeus	1450	Zeebrugge	2210	Barcelona	1801	Genoa	2065	1999	-3.2%	growth 9m	*12*
13	Valencia	305	Piraeus	600	Marsaxlokk	1408	Genoa	1767	Southampton (*)	1600	Zeebrugge	1953	2000	2.4%	provisional	*13*
14	Zeebrugge	218	Zeebrugge	528	Southampton	1395	Southampton (*)	1710	Genoa	1534	Barcelona	1750	1687	-3.6%	growth 11m	*14*
15	Southhampton	214	Marsaxlokk	515	Zeebrugge	1309	Constanza	1380	La spezia	1046	Southamption (*)	*1600*	-			*15*
	TOP 15	10450	TOP 15	20841	TOP 15	50067	TOP 15	62697	TOP 15	54072	TOP 15	65388				
	TOTAL Europe	17172	TOTAL Europe	33280	TOTAL Europe	73729	TOTAL Europe	90710	TOTAL Europe	78011	TOTAL Europe (est.)	95220				
	Share R'dam	*15.5%*	*Share R'dam*	*14.4%*	*Share R'dam*	*12.6%*	*Share R'dam*	*11.9%*	*Share R'dam*	*12.5%*	*Share R'dam*	*12.5%*				
	Share top 3	*29.4%*	*Share top 3*	*30.1%*	*Share top 3*	*32.4%*	*Share top 3*	*32.2%*	*Share top 3*	*30.8%*	*Share top 3*	*30.8%*				
	Share top 10	*52.6%*	*Share top 10*	*53.8%*	*Share top 10*	*58.2%*	*Share top 10*	*58.8%*	*Share top 10*	*58.8%*	*Share top 10*	*58.5%*				
	Share top 15	*60.9%*	*Share top 15*	*62.6%*	*Share top 15*	*67.9%*	*Share top 15*	*69.1%*	*Share top 15*	*69.3%*	*Share top 15*	*68.7%*				

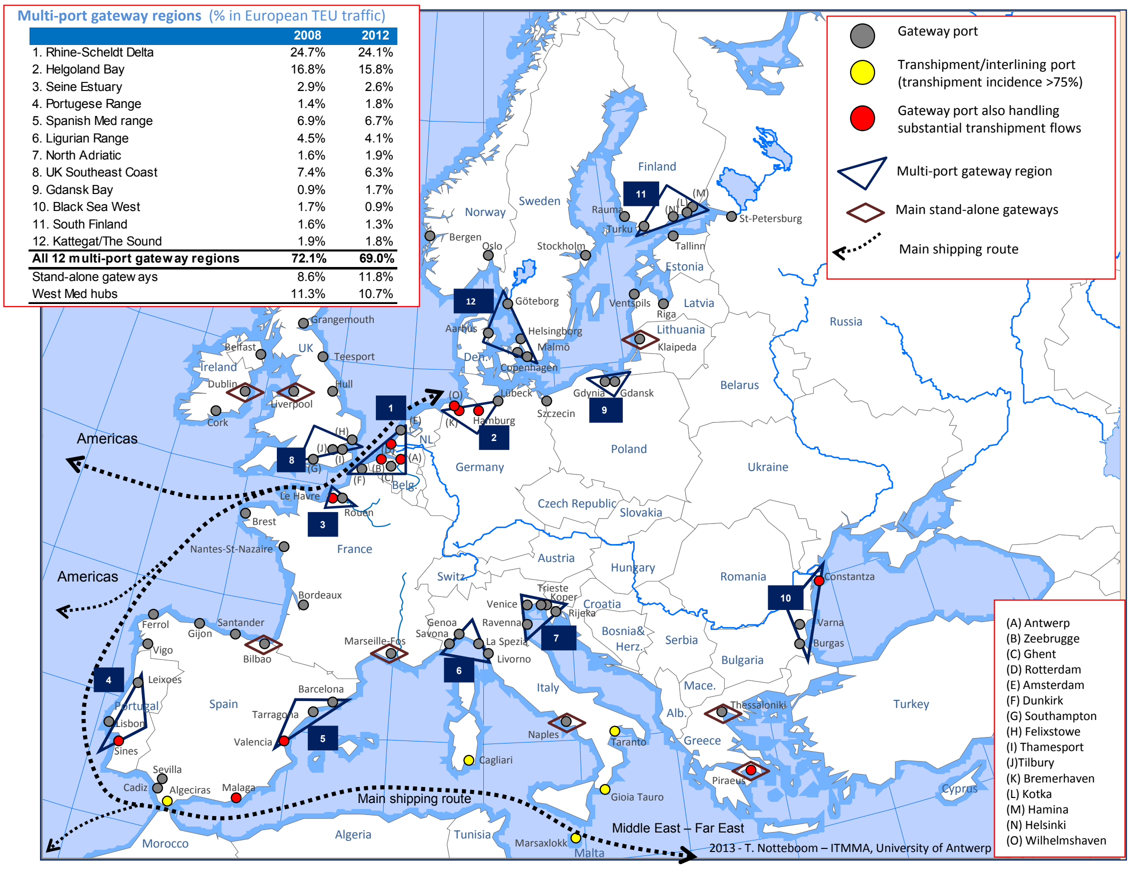
(*) Estimate

Source: updated from Notteboom (2013) based on statistics individual port authorities

About 68% of the total container throughput in the European port system passes through the top fifteen ports, compared to 61% in 1985. Since 2008 no major shifts have taken place in the traffic shares of the top 3, top 10 and top 15 ports, although the top 3 ports have lost some ground. Nearly one third of all containers is handled by the top three ports. Worth mentioning is that the dominance of market leader Rotterdam weakened in the late 1990s, but in the past decade the port's position has remained quite stable. Overall, the figures suggest a continued high concentration of cargo in only a dozen large container ports. While the crisis has not significantly altered the rankings, a number of ports lost some positions while others gained. For example, the Belgian port of Zeebrugge initially overcame the crisis very well by climbing to the ninth position in 2010 but afterwards booked traffic losses pushing the seaport back to position 13. The Greek port of Piraeus showed the most volatile traffic evolution. Piraeus' volume peaked at 1.6 million TEU in 2003, but strikes and unrest led to a throughput of only 433,000 TEU in 2008. In 2010, the container port started a remarkable recovery path partly pushed by the arrival of COSCO Pacific as operator of the Pier 2 facility. Piraeus reappeared in the top 15 ranking in 2011 and held position 8 in 2012 with a total volume of 2.7 million TEU. In 2013 COSCO Pacific has announced to further expand. Under the terms of the agreement, COSCO will spend 230 million euros to increase Piraeus's cargo handling capacity by two thirds over the next seven years to an annual capacity of 6.2 million TEU.

When we group seaports within the same gateway region together to form so-called multi-port gateway regions some interesting intra- and inter-regional dynamics can be unveiled. The locational relationship to nearby identical traffic hinterlands is one of the criteria that can be used to cluster adjacent seaports. In cases there is no coordination between the ports concerned, the hinterland is highly contestable as several neighbouring gateways are vying for the same cargo flows. The relevance of the multi-port gateway level is supported by the liner shipping networks as developed by shipping lines and the communality in hinterland connectivity issues among ports of the same multi-port gateway region. Figure 9 provides an overview of the main multi-port gateway regions in Europe as well as transhipment hubs and stand-alone gateways. Stand-alone gateways are somewhat isolated in the broader port system, as they have less strong functional interactions with adjacent ports than ports of the same multi-port gateway region. In the next sections we will draw some conclusions based on the changing positions of the port regions between 2008 and 2012 and some preliminary figures for 2013.

Figure 9 *Multi-port gateway regions in the European container port system*



Source: updated from Notteboom (2009)

- **The Rhine-Scheldt Delta: the largest European container port region with ample capacity in place**

The Rhine-Scheldt Delta and the Helgoland Bay ports, both part of the Le Havre-Hamburg range, together represent some 40% of the total European container throughput in 2012. The market share of the Rhine-Scheldt Delta shows moderate fluctuations since 2008 with 24.7% in 2008, 25.5% in 2009, 26% in 2010, 25% in 2011 and 24.1% in 2012. In 2013 the Rhine-Scheldt Delta saw a TEU decline of 0.8% (Rotterdam: -1.7% and Antwerp: -0.7%). The year 2014 promises to be a key year to the ports given new capacity coming on stream (e.g. Maasvlakte 2) and the full impact of the schedules announced by the M2 Network (MSC, Maersk Line), the 3O Alliance (CMA CGM, China Shipping Container Lines and United Arab Shipping Company) and other shipping lines and groups. The Rhine-Scheldt Delta port region has one of the largest terminal capacity reserves in Europe. The massive Deurganck dock in the port of Antwerp, which opened in 2005, provides ample room for traffic growth. The PSA terminal and the Antwerp Gateway Terminal at the dock together handled less than 2 million TEU in 2012 while the design capacity of the dock amounts to some 9 million TEU. Recently a decision was taken to move MSC's volumes (some 4.5 million TEU per year) from the right bank to the Deurganckdock and to concentrate all future 2M Network traffic on the left bank. A deepening program of the river Scheldt was completed a few years ago in view of guaranteeing access to the largest container vessels such as the triple 'E' class within an acceptable tidal window. The current Maasvlakte 2 developments in Rotterdam include the construction of two large scale container facilities, each with a capacity of between 4 and 5 million TEU: a terminal for APM terminals and the Rotterdam World Gateway which will be operated by a consortium led by DP World. The first phases of both terminals will come on stream in 2014. ECT, part of Hong Kong based Hutchison Port Holdings, has room for further capacity growth by extending the current 1.5 km quay of its Euromax terminal. The terminal capacity in Zeebrugge includes PSA's new and still heavy underutilised Zeebrugge International Port (ZIP) facility and spare capacity at the APM Terminals facility in the outer harbour. The strong hinterland ambitions of the Rhine-Scheldt Delta ports are supported by a range of hinterland concepts and products such as a strong orientation on barge transport, a growing momentum for rail shuttles into the distant hinterland, ECT's European Gateway Services network and similar efforts by DP World, and a dense network of inland terminals and European distribution zones in or in the vicinity of the ports. To secure growth in the future, the ports are actively targeting transhipment markets in the Baltic, the UK and southern Europe and hinterland areas in southern Germany, Italy, South France (cf. Lyon area) and Eastern and Central Europe, next to a continued focus on their cargo rich core service areas (the Benelux, western Germany and northern France).

- **German ports back on their feet after a dramatic 2009**

The North-German ports in the Helgoland bay gained traffic share in Europe from 13% in the late 1990s to 16.8% in 2008. Bremerhaven's volume surge and Hamburg's pivotal role in feeder flows to the Baltic and rail-based flows to the developing economies in East and Central Europe were the main causes. However, sharp volume drops in 2009, i.e. minus 28% in Hamburg mainly due to a loss of transhipment flows to Rotterdam and minus 16% in Bremerhaven, brought the traffic share below 15%. In the past three years their position recovered to 15.8%. In the first nine months of 2013 Hamburg recorded a healthy growth of 3.6% (mainly attributed to the Baltic T/S market) while Bremerhaven witnessed a volume drop of 5.4%. The deepening of the Elbe river is high on the agenda in Hamburg as the port is currently facing some restrictions to accommodate the largest container vessels.

The region welcomed newcomer Wilhelmshaven in 2012 when the JadeWeserPort was opened for business. With a volume of about 24,000 TEU in 2012, the new large-scale terminal facility clearly has to make its mark. Newcomer Wilhelmshaven is actively pursuing transhipment business, given that it can yield volumes more quickly than gateway traffic, which is a much slower to attract to a new port. Note that rail services have been established primarily using in-house rail/intermodal firms, and prices to/from Wilhelmshaven and inland points have been matched with those to/from Hamburg and Bremerhaven to the same inland destinations.

- **'Renaissance' of the Seine Estuary**

The Seine Estuary, the third region in the Le Havre-Hamburg range, suffered from a gradual decline in its market share from 5.5% in 1989 to 2.9% in 2008. The 'Port 2000' terminals in Le Havre, a new hinterland strategy, the completed port reform process and the HAROPA initiative aimed at closer cooperation between Le Havre, Rouen and the inland port of Paris should support a 'renaissance' of Le Havre. These initiatives did not have their full effect in 2012 as the region's share in European container traffic declined further to 2.6%. However, the year 2013 reversed this trend with an impressive growth of 6.9% in the first nine months of 2013. Several shipping lines (such as MSC) and shippers have committed new volumes to this port area. The port also hopes to benefit from the 2M and O3 alliance.

- **The Portuguese port system aims for hub status**

Portuguese ports Lisbon, Leixoes and Sines are trying very hard to expand business by developing a transhipment role as well as tapping into the Spanish market (particularly the Madrid area) through rail corridor formation and dry port development. After a long period of declining market shares, the Portuguese port system succeeded to lift its European share to 1.8% in 2012. The port of Sines recorded the strongest traffic growth mainly due to increasing volume commitments of MSC and a further extension of the PSA/MSC operated terminal facility. Sines more than doubled throughput since 2008 to reach 553,063 TEU in 2012. In the first nine months of 2013 traffic grew by a staggering 76.5%, thereby surpassing the two other ports which each have a cargo base of around 500,000 to 600,000 TEU.

- **Spanish Med ports show a diverging growth path**

Among the major winners before the crisis, we find the Spanish Med ports with a growth of the European share from 4% in 1993 to 6.9% in 2008. While the share remained rather stable the past few years, the growth path of the individual ports is quite different. Barcelona was hit hard by the crisis with a volume drop from 2.57 million TEU in 2008 to 1.8 million TEU in 2009. Container activities (particularly sea-sea transhipment) did not recover after 2009 and the Catalan port closed 2012 at 1.75 million TEU. Also 2013 was closed with a volume loss of some 3.5%. At the other extreme, Valencia recorded a spectacular and consistent growth (also during 2009) from 3.6 million TEU in 2008 to 4.47 million TEU in 2012. However, the 2013 throughput saw a decline comparable to the situation in Barcelona. MSC's choice to use the port as a hub for the region, boosted transhipment volumes and consolidated the port's fifth position in the European ranking. While Tarragona remains a smaller player in the region, the port saw strong growth in 2008 when DP World and ZIM Lines took over the Contarsa terminal. Since then, throughput amounts to some 200,000 to 250,000 TEU.

- **Ligurian ports challenged to outgrow the Italian hinterland**

The Ligurian ports have difficulties in keeping up with other regions in Europe. The ports jointly represent some 4.5% of the total European port volume, a decline compared to 6-7% throughout the 1980s and 1990s. In the first nine months of 2013 Genoa recorded a traffic drop of 3.2% while La Spezia saw a growth of 2.6%. The Ligurian ports rely heavily on the cargo rich economic centres in northern Italy. While they also aim at attracting business from the Alpine region, the southeast of France and southern Germany, success in these areas has been limited so far partly because of intense competition from northern ports supported by a strong multimodal offer in terms of rail and barge shuttles.

- **The North Adriatic ports are determined to become a southern gateway to Europe**

Just like the Ligurian ports, the North-Adriatic ports have been facing lower than average growth rates. However, since the crisis year 2009 the tide seems to have turned. The recent cooperation agreement NAPA (North Adriatic Ports Association) underlines the ambition of the region to develop a gateway function to Eastern and Central Europe and the Alpine region. The strategy should also enable the region to develop larger scale container operations. The NAPA ports are determined to lure trade from northern ports via upgraded rail links and shorter transit times from Asia. For example, Trieste has a harbour that's 18 meters deep and able to handle the largest container ships at full load. The Italian port offers shuttle train services to destinations in Germany, Austria, Hungary, Slovakia and the Czech Republic, and is targeting countries as distant as Poland, one of the main markets for Hamburg. Still the Adriatic ports are facing scale differences with the northern hub ports, which affect the possibilities to develop a vast intermodal hinterland network. With 'only' 1.8 million TEU in 2012 the Adriatic ports only handle a fraction of the volumes of the two leading multi-port gateway regions of the Hamburg-Le Havre range (i.e. 22.9 million TEU in the Rhine-Scheldt Delta and 15.1 million TEU in northern Germany).

- **The direct call vs. feeder challenge in ports of the UK Southeast coast**

The UK ports witnessed a rather significant decrease in market share. Many of the load centres along the southeast coast of the United Kingdom faced capacity shortages in the early 2000s while new capacity became available only gradually. Quite a number of shipping lines opted for the transhipment of UK flows in mainland European ports (mainly Rhine-Scheldt Delta and Le Havre) instead of calling at UK ports directly. With the prospect of new capacity getting on stream there is hope for more direct calls and potentially an increase in market share.

Since mid-2013 the combination of bigger ships, larger alliances and the new London Gateway terminal are affecting the UK container port system. Thamesport has lost virtually all deep-sea services partly because of draft restrictions in the River Medway approach channel. Evergreen moved its UK cargo from Thamesport to Felixstowe while other lines such as Hapag-Lloyd, OOCL and NYK moved their transatlantic services from Thamesport to Southampton. The volume drop in Thamesport started already earlier with 'only' 300,000 TEU handled in 2012, compared to close to 800,000 TEU in 2008. Also Tilbury's traffic is likely to be affected negatively by larger ships sizes and the opening of DP World's London Gateway terminal. Thamesport and Tilbury, as well as other smaller container ports such as Great Yarmouth, will likely focus more on niche and short sea intra-European services.

The new London Gateway terminal complex will face competition from UK ports Felixstowe and Southampton, but also from mainland European ports such as Rotterdam, Zeebrugge, Antwerp and Le Havre which offer competitive feeder services to the UK. The large scale London Gateway terminal of DP World can be regarded as the embodiment of the UK ambitions to attract more direct calls. The terminal is being developed on an old Shell site along the Thames and should be open for business in late 2013. The port will add 3.5 million TEU to the UK's port capacity and will help to meet the demand for extra capacity in the UK. The full impact of London Gateway on competitive dynamics between mainland European ports and UK ports will become clear in the coming years. It remains to be seen how DP World is going to balance its many stakes in large scale terminals across the region: the company is investing heavily in the Rotterdam World Gateway facility on Maasvlakte 2 and has a vested interest in filling the Antwerp Gateway terminal. London Gateway received its first vessel in November 2013. The terminal can accommodate vessels with a draft of up to 17m at any state of the tide. Maersk, MOL and Deutsche Afrika Linien already decided to shift their UK port of call on the South Africa service from Tilbury to London Gateway. Rail links are already in place connecting the terminal with the big centres, with DB Schenker Rail UK taking a lead role in the provision of those services. In June 2013, Marks & Spencer confirmed to invest in a new distribution centre within the terminal area to open in 2016.

- **The Gdansk bay: attracting direct deep sea calls in the Baltic**

In the last couple of years, the ports in the Bay of Gdansk are witnessing a healthy growth and an increasing traffic share in Europe (now 1.7% compared to 0.9% in 2008 and 0.5% in 2004). For a long time, the Polish load centres were bound by their feeder port status, competing with main port Hamburg for the Polish hinterland. However, in the last decade the Polish port reform process gave impetus to the development of new container handling facilities. While Gdynia has benefited from volume gains, Gdansk attracted most attention as volumes increased from 163,704 TEU in 2008 to 928,905 TEU in 2012. Growth remained very strong in the first nine months of 2013, i.e. 30.2% more volume compared to the same period in 2012. The DCT facility in Gdansk serves as a port of call on one of the main Europe-Far East services of Maersk Line. Emma Maersk class vessels with a capacity of 15,500 TEU not only bring Asian cargo, but also pick up North American container flows via other European ports of call before heading to Gdansk. Since August 2013 the 18,000 TEU Triple E vessels of Maersk Line call at DCT Gdansk in Poland.

The Gdansk case provides empirical evidence that deep sea calls in the Baltic can be viable despite the existence of competitive hub-feeder networks linked to Hamburg and other major northern ports. The port is determined to become a hub for Central and Eastern Europe and Russia. With a throughput of well over 1 million TEU in 2013 (note that St-Petersburg remains the largest container port in the Baltic with 2.52 TEU handled in 2012), the port has ambitious plans to ultimately expand the terminal's annual capacity to around 4 million TEU by 2016. The port is even challenging the established notion of 'Hamburg-Le Havre range' by proposing the notion of 'Gdansk-Le Havre range'.

- **The rise and fall of European Black Sea ports?**

The Black Sea ports, Constantza in particular, were on the rise in the early 2000s from virtually no traffic to a European share of 1.7% in 2008. Constantza attracted terminal investments given its potential to serve as a gateway to Eastern Europe and a transhipment hub for the Black Sea area. The crisis abruptly ended this unfolding success story: Constantza's container throughput fell sharply from 1.38 million TEU in 2008 to 594,299 TEU in 2009. In the following years the port could only present a modest growth to reach 684,059 TEU in 2012, still far from the record of 1.4 million TEU in 2007. Early on in its development, Constanta was very much seen as the transhipment gateway for the Black Sea and reached a transhipment incidence of some 75% in 2008. However, times have changed quite significantly as traffic patterns in the region have evolved. When the crisis hit many container lines changed their liner services in search of cost-efficient logistic solutions. A number of direct services from the Far East into the Black Sea region were cancelled, negatively affecting transhipment volumes. As a result, in 2012 almost three-quarters of the volumes handled at the port consisted of local import and export containers, with the remaining quarter being transhipment. Still, Constanza handles the largest vessels operated in the Black Sea (some 8,000 TEU). Terminal productivity plays an important role in the future development of container terminals in the Black Sea region, where operators in both Ukraine and Russia such as Odessa and Novorossiysk are trying to attract both transhipment and import/export business. The Bulgarian ports of Varna and Burgas remain small players in the container market. The traffic decline in Black sea ports is in sharp contrast to strong growth witnessed by Piraeus and Turkish deep-sea ports near the Sea of Marmara. This development demonstrates shipping lines for the time being prefer a hub-feeder model in the Med to service the Black Sea area instead of direct deep sea calls in the Black Sea.

- **Scandinavian ports**

The ports at the entrance of the Baltic and South Finland show a moderate growth path, both losing some ground in a European context. However, the relative decline in their European shares is smaller than in the five years prior to the start of the economic crisis. Scandinavian ports remain highly dynamic players in the market and are European pioneers in far-reaching port cooperation schemes. The ports of Malmo in Sweden and Copenhagen in Denmark were merged in 2001 to form a single company, Copenhagen Malmö Port. It still serves as a successful case in cross-border mergers of two ports. In 2011, the City Councils in Kotka and Hamina on Finland's south coast approved a port merger. The port of Gothenburg in Sweden serves as a good practice in intermodal network development: half of the port's container volume is transported inland via an extensive domestic rail network of container shuttles. The rail network also extends to Norway.

Some of the ports in this region are gearing up to welcome more direct calls of mainline vessels. This is particularly felt in ports like Gothenburg and Aarhus, which are already acting as regular ports of call on quite a few intercontinental liner services. While these ports have a good position to act as turntables for the Baltic on many trade routes, the insertion of these ports as regular ports of call on the Europe-Far East trade remains uncertain. The large vessel sizes deployed on this route, the associated reduction in the number of ports of call and the additional diversion distance make regular direct calls to the multi-port gateway region Kattegat/The Sound less viable compared to other trade routes. The 2M Network, the alliance between Maersk Line, MSC plans to include Gdansk and Aarhus in its rotation for the SILK service while Gothenburg will act as a port of call in the SHOGUN service.

2.2.2 Recent economic, political and market related developments

2.2.2.1 Introduction

The European port scene is not only confronted with a changing environment in terms of traffic growth. It is also facing changing market conditions, which could affect the long-term outlook.

First, ports are challenged to cope with increased market uncertainty and volatility. Uncertainty is not a new phenomenon but the related intensity seems to be changing with the rise of non-linear developments, trend breaks and the so-called 'Black Swans'. It is important to underline that market volatility in ports has exogenous causes (such as economic cycles) and endogenous causes linked to the actions of market players. While the economic crisis caught the maritime industry and ports by surprise, one could argue that the current continued overcapacity situation in liner shipping is mainly the result of endogenous actions of shipping lines. Market uncertainty has quite a lot of consequences for ports. It strengthens the role of ports as buffers in supply chains. Under the motto "uncertainty is the mother of inventory" (Martin Christopher), the past few years have brought a remarkable investment wave in warehouses, tank farms and other storage facilities in port areas across Europe, often supported by an active commercial policy by port authorities and (local) governments (e.g. 'port-centric logistics' concept in the UK). Furthermore, market uncertainty challenges traditional forecasting techniques and port planning/investment tools. Port authorities are trying to respond to the increasing need for flexibility in port planning and development via the use of more adaptive planning tools.

Second, there is a strong downward pressure on profit margins in the port and shipping industry. Customers demand higher service levels for the same or even a lower price. Market players are trying to differentiate themselves from competitors and or are increasing the scale of operations through mergers and acquisitions or alliance formation and partnerships, which allow them to spread investment risks. Incumbent firms try to defend their market share by raising market-based barriers to entry. The high capital requirements in the port and maritime industry and the difficult access to capital enhance market consolidation and partnerships. Seaports are increasingly operating in a buyers' market. There are no signs that we will move to a sellers' market in the short or medium term. The buyers of port services look for supply chain solutions and develop a strong network focus. So, ports have to develop a stronger focus on how they can contribute to the supply chain excellence of the port users. Ports that do not respond adequately to the buyers' market imperatives will lose ground. In such a market environment, port throughput growth might no longer be the best indicator of success. It might be more a matter of binding supply chains to the port in a sustainable way based on a close partnership with the respective port users.

In the remainder of this section we describe some very recent developments in the economic, political and market-related sphere that might positively or negatively affect the long-term outlook and forecasts for the European port system.

2.2.2.2 Economic developments

The dramatic economic and financial crisis started in the late 2007 (and worsted after Lehman Brothers' crack s during 2008) seems to have reached the bottom and after along freeze, European economy is progressively experiencing a slight recovery. In 2013, EU-27 GDP at market prices stopped at 11,716 Billions of euro, still below the historical record of 11,876 Billions of euro experienced in 2008, but is expected to catch up this threshold in 2014 and exceed it in 2015 (12,102 Billions of euro). Therefore, the measures decided on by the ECB (fixed rate full allotment, LTROs, OMTs, assessment and quality of collateral, etc.) have started to given a return.

EU-27 real GDP stagnated in 2013 (

Table 3), after the negative performance of 2012 and is supposed to expand by 1.4% in 2014 and by 1.9% in 2015, according to the updated forecast of the European Commission (January 16th 2014).

Table 3 Real GDP growth rate in European countries (2006-2015)

	2006	2007	2008	2009	2010	2011	2012	2013 (f)	2014 (f)	2015 (f)
EU (28 countries)	3.4	3.2	0.4	-4.5	2	1.6	-0.4	0	1.4	1.9
EU (27 countries)	3.4	3.2	0.4	-4.5	2	1.7	-0.4	0	1.4	1.9
Austria	3.7	3.7	1.4	-3.8	1.8	2.8	0.9	0.4	1.6	1.8
Belgium	2.7	2.9	1	-2.8	2.3	1.8	-0.1	0.1	1.1	1.4
Bulgaria	6.5	6.4	6.2	-5.5	0.4	1.8	0.8	0.5	1.5	1.8
Croatia	4.9	5.1	2.1	-6.9	-2.3	0 (p)	-2 (p)	-0.7	0.5	1.2
Cyprus	4.1	5.1	3.6	-1.9	1.3	0.4	-2.4	-8.7	-3.9	1.1
Czech Republic	7	5.7	3.1	-4.5	2.5	1.8	-1	-1	1.8	2.2
Denmark	3.4	1.6	-0.8	-5.7	1.4	1.1	-0.4	0.3	1.7	1.8
Estonia	10.1	7.5	-4.2	-14.1	2.6	9.6	3.9	1.3	3	3.9
Finland	4.4	5.3	0.3	-8.5	3.4	2.7	-0.8	-0.6	0.6	1.6
France	2.5	2.3	-0.1	-3.1	1.7	2	0	0.2	0.9	1.7
Germany	3.7	3.3	1.1	-5.1	4	3.3	0.7	0.4	1.7	1.9
Greece	5.5	3.5	-0.2	-3.1	-4.9	-7.1	-6.4	-4	0.6	2.9
Hungary	3.9	0.1	0.9	-6.8	1.1	1.6	-1.7	0.7	1.8	2.1
Ireland	5.5	5	-2.2	-6.4	-1.1	2.2	0.2	0.3	1.7	2.5
Italy	2.2	1.7	-1.2	-5.5	1.7	0.5	-2.5	-1.8	0.7	1.2
Latvia	11	10	-2.8	-17.7	-1.3	5.3	5.2	4	4.1	4.2
Lithuania	7.8	9.8	2.9	-14.8	1.6	6	3.7	3.4	3.6	3.9
Luxembourg	4.9	6.6	-0.7	-5.6	3.1	1.9	-0.2	1.9	1.8	1.1
Malta	2.6	4.1	3.9	-2.8	3.3	1.7	0.9	1.8	1.9	2
Netherlands	3.4	3.9	1.8	-3.7	1.5	0.9	-1.2	-1	0.2	1.2
Poland	6.2	6.8	5.1	1.6	3.9	4.5	1.9	1.3	2.5	2.9
Portugal	1.4	2.4	0	-2.9	1.9	-1.3 (p)	-3.2 (p)	-1.8	0.8	1.5
Romania	7.9	6.3	7.3	-6.6	-1.1	2.2	0.7	2.2	2.1	2.4
Slovakia	8.3	10.5	5.8	-4.9	4.4	3	1.8	0.9	2.1	2.9
Slovenia	5.8	7	3.4	-7.9	1.3	0.7	-2.5	-2.7	-1	0.7
Spain	4.1	3.5	0.9	-3.8	-0.2	0.1	-1.6	-1.3	0.5	1.7
Sweden	4.3	3.3	-0.6	-5	6.6	2.9	0.9	1.1	2.8	3.5
United Kingdom	2.8	3.4	-0.8	-5.2	1.7	1.1	0.3	1.3	2.2	2.4

f=forecast b=break in time series p=provisional

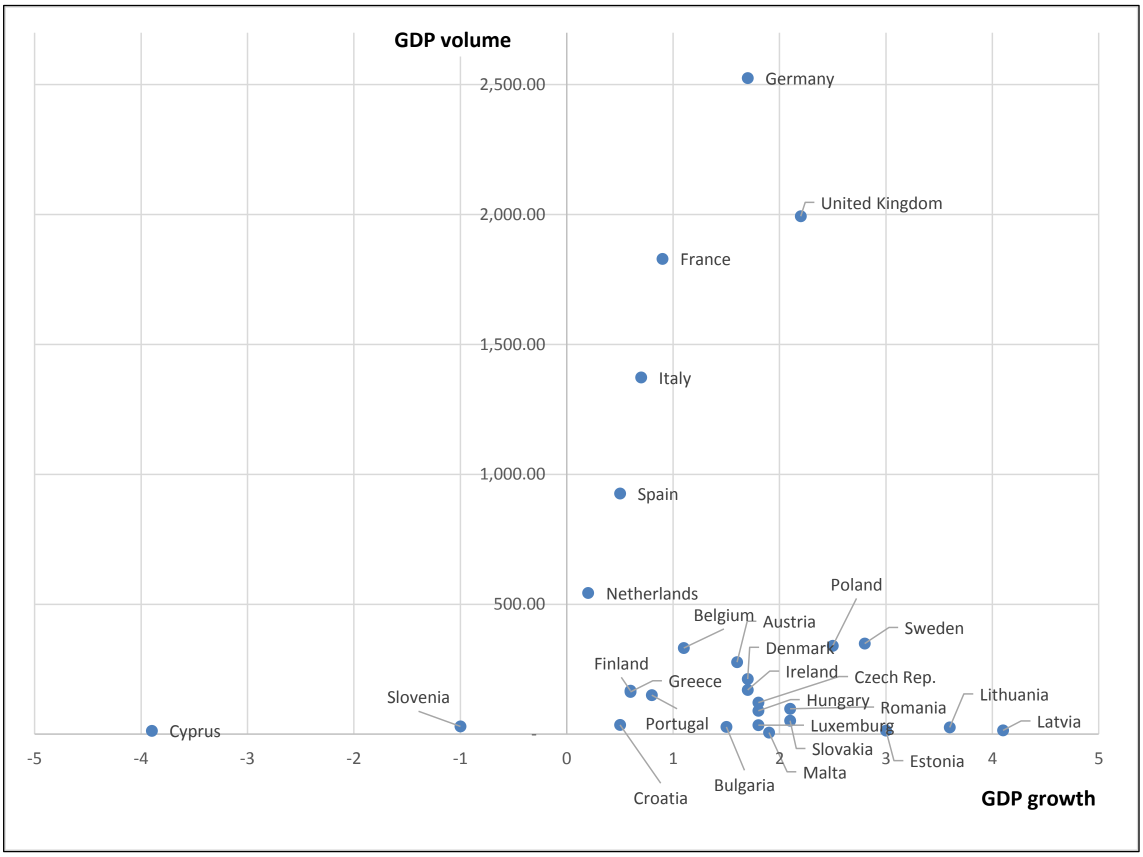
Source: authors' elaborations from Eurostat, last updated 16.01.2014

The overall 2013 performance is the result of considerably different national economic positions and trends. In 2013, Baltic states, e.g. Latvia, Lithuania and Estonia were among best performers, with a real GDP growth rate (percentage change on previous year) equivalent to +4%, +3.4% and +1.3%, respectively. Luxembourg and Malta, also, were among progressing countries in the same year (+1.8% and 1.9%, respectively). Conversely, the worst performances have been experience by Cyprus (-8.7%), Greece (-4%), Slovenia (2.7%), Italy (-1.8%) and Portugal (-1.8%). As for 2013, in 2014 economic growth will be strongest for Baltic States (over 3% for each of the three nation), but also Sweden, United Kingdom, Romania and Slovakia are expected to over-perform (above 2.1%). As suggested by the most updated report of the European Commission, the recovery will be supported by the joint effect of both German growth (1.7%) and the slight return to growth in Italy and Spain (which represent the third and fourth biggest economies, respectively).

By combining GDP expected volumes and growth rates for 2014,

Figure 10 provides sound information to assess the contribution of each member state to the recovery.

Figure 10 Expected contribution by member state to GDP recovery in 2014



Source: authors' elaborations from Eurostat, last updated 16.01.2014

Data suggest that for the next two-year period the economic growth of some big countries such as Germany and United Kingdom, Sweden and Poland, as well as of some small but growing up members (e.g. Lithuania, Latvia, Estonia and Romania) will further contribute to generate additional traffics flow, probably higher than expected. The expected recovery should predominantly support Northern Range ports. Conversely, the drivers behind traffic growth in the Mediterranean area will be a combination of a modest return to growth in Italy, France and Spain, the growth of Balkan region and trade growth with some European member candidates (especially, Turkey).

In relation to the overall economic development, also demographic trends should be considered acting as predictors of port traffic. Population size and structure, in fact, are key factors in determining the evolution of the demand for goods and services as well as, for estimating the dynamics of traffic flows.

In terms of demographics, the European Union unveils highly populated areas within a rather heterogeneous picture. According to Eurostat data, as of 1 January 2013, the population of EU-27 is about 501.5 million people (EU-28; 505.7 million people). The contribution of diverse member states to the overall population is highly top-heavy (

Table 4). The most populous member state, indeed, is Germany, with about 80.5 million people, followed by France (65.6), United Kingdom (63.9), Italy (59.7), and Spain (46.7). Member states such as Malta, Luxembourg, Cyprus and Estonia, on the contrary, do account for less than 0.5% of the overall population.

Table 4 EU-27 population projection (2013-2060).

	Area km^2	Area km^2 of EU 27	2013		2035 (e)			2060 (e)		
			Population (000)	Polutation % of EU-27	Population (000)	Polutation % of EU-27	2035-2013 (% change)	Population (000)	Polutation % of EU-27	2060-2035 (% change)
EU-27	4,324,782	100.0%	501,439	100.0%	520,654	100.0%	3.8%	505,719	100.0%	-3.0%
Austria	83,858	1.9%	8,452	1.7%	9,075	1.7%	7.4%	9,037	1.8%	-0.4%
Belgium	30,510	0.7%	11,162	2.2%	11,906	2.3%	6.7%	12,295	2.4%	3.2%
Bulgaria	110,912	2.6%	7,285	1.5%	6,535	1.3%	-10.3%	5,485	1.1%	-19.1%
Cyprus	9,250	0.2%	866	0.2%	1,121	0.2%	29.5%	1,320	0.3%	15.1%
Czech Republic	78,866	1.8%	10,516	2.1%	10,288	2.0%	-2.2%	9,514	1.9%	-8.1%
Denmark	43,094	1.0%	5,603	1.1%	5,858	1.1%	4.6%	5,920	1.2%	1.0%
Estonia	45,226	1.0%	1,325	0.3%	1,243	0.2%	-6.2%	1,132	0.2%	-9.8%
Finland	337,030	7.8%	5,427	1.1%	5,557	1.1%	2.4%	5,402	1.1%	-2.9%
France	643,548	14.9%	65,633	13.1%	69,021	13.3%	5.2%	71,800	14.2%	3.9%
Germany	357,021	8.3%	80,524	16.1%	79,150	15.2%	-1.7%	70,759	14.0%	-11.9%
Greece	131,957	3.1%	11,063	2.2%	11,575	2.2%	4.6%	11,118	2.2%	-4.1%
Hungary	93,030	2.2%	9,909	2.0%	9,501	1.8%	-4.1%	8,717	1.7%	-9.0%
Ireland	70,280	1.6%	4,591	0.9%	6,057	1.2%	31.9%	6,752	1.3%	10.3%
Italy	301,320	7.0%	59,685	11.9%	61,995	11.9%	3.9%	59,390	11.7%	-4.4%
Latvia	64,589	1.5%	2,024	0.4%	1,970	0.4%	-2.7%	1,682	0.3%	-17.1%
Lithuania	65,200	1.5%	2,972	0.6%	2,998	0.6%	0.9%	2,548	0.5%	-17.7%
Luxembourg	2,586	0.1%	537	0.1%	633	0.1%	17.9%	732	0.1%	13.5%
Malta	316	0.0%	421.364	0.1%	429	0.1%	1.8%	405	0.1%	-5.9%
Netherlands	41,526	1.0%	16,780	3.3%	17,271	3.3%	2.9%	16,596	3.3%	-4.1%
Poland	312,685	7.2%	38,533	7.7%	36,141	6.9%	-6.2%	31,139	6.2%	-16.1%
Portugal	92,931	2.1%	10,487	2.1%	11,395	2.2%	8.7%	11,265	2.2%	-1.2%
Romania	238,391	5.5%	20,020	4.0%	19,619	3.8%	-2.0%	16,921	3.3%	-15.9%
Slovakia	48,845	1.1%	5,411	1.1%	5,231	1.0%	-3.3%	4,547	0.9%	-15.0%
Slovenia	20,253	0.5%	2,059	0.4%	1,992	0.4%	-3.2%	1,779	0.4%	-12.0%
Spain	504,782	11.7%	46,704	9.3%	53,027	10.2%	13.5%	51,913	10.3%	-2.1%
Sweden	449,964	10.4%	9,556	1.9%	10,382	2.0%	8.6%	10,875	2.2%	4.5%
United Kingdom	244,820	5.7%	63,896	12.7%	70,685	13.6%	10.6%	76,677	15.2%	7.8%

(e): estimate

Source: Authors' own elaboration from Eurostat

According to official European Commission data, the EU27 population is expected to grow from 501.5 million on 1 January 2013 to around 521 million in 2035, and thereafter progressively decline to about 506 million in 2060. These forecasts are the result of a number of challenges the EU-27 has to dwell with on its demographic future, i.e. an ageing population, significant immigrant flows and growing life expectancy. In particular, the number of births is estimated to fall in the selected timeframe, while at the same time the annual number of deaths will continue to rise. As a result, from 2015 onwards population growth due to natural increase would stop, whereas positive net migration would be the only population growth factor. Forecast shows that from 2035 the positive net migration would no longer counterbalance the negative natural change, and the population will begin to fall.

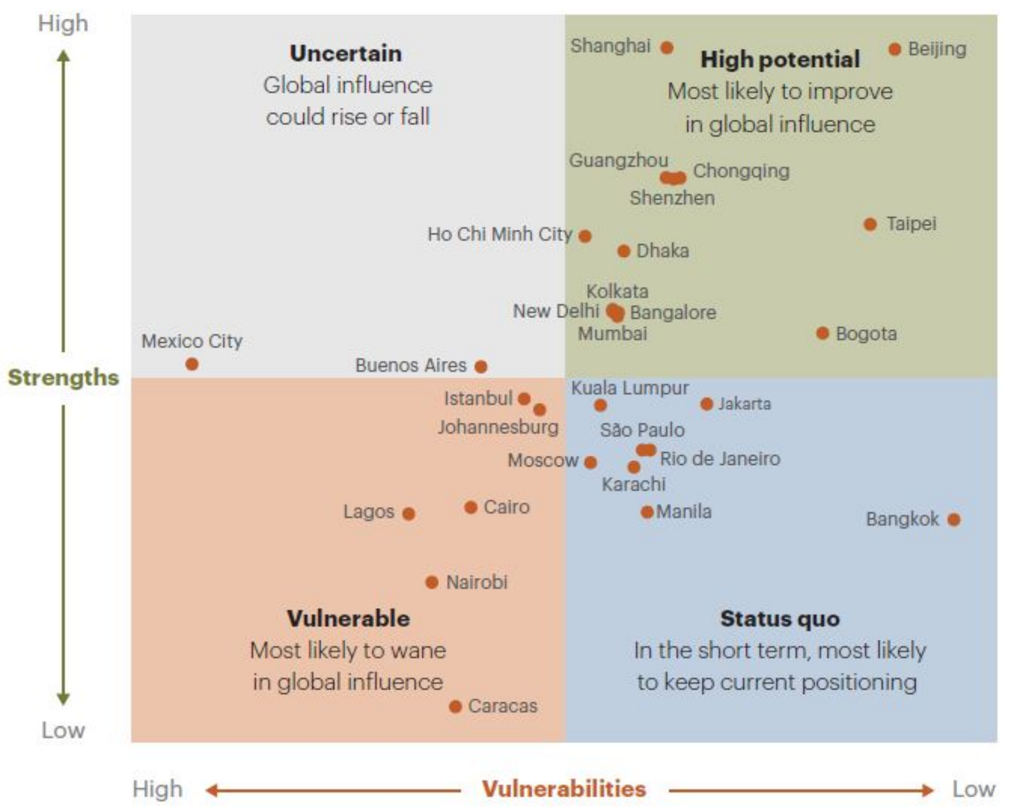
The overall estimated demographic trend, indeed, originates from the combination of opposite movement in national population. In particular, the strongest population growth will be found in Cyprus, Ireland, Luxembourg, the United Kingdom and Sweden, whereas the sharpest declines will be found in Bulgaria, Latvia, Lithuania, and Romania. In 2035 United Kingdom will become the second largest member state, surpassing France and in 2060 it will become the largest at all (77 million people).

In addition, also population density (actual and expected) is required to be addressed, due to its potential impact on long-term outlook and forecasts for the European port system. The population density characterizing the hinterland of each port, in fact, shapes the type of treats and opportunities a port has to face with, within the global supply chain. Highly populated areas in fact require well-developed, efficient and flexible transport structures to ensure materials, energy, and nutrient flows, and support the growing metabolism of cities. Economies of scale, therefore, are a viable and necessary option for highly dense urban areas and cities. On the contrary, countries and geographic areas where the population is rather fragmented have to find alternative solutions for guarantee and secure a proper connectivity with other production and consumption centres.

In this context, mega-cities, i.e. metropolitan agglomerations which concentrate more than 10 million of inhabitants (EURAMET, January 2013) and large urban agglomerations, i.e. geographic areas including a central city and neighbouring communities linked to it, are expected to play a growingly critical role in shaping and determining goods and services inbound and outbound flows. Mega-cities and large urban agglomeration, in fact, have been recognized to face social, economic and ecological challenges. As concern transport systems, this type of urban agglomeration imposes the development of improved infrastructure, higher transportation efficiency and technological enhancement, to enhance an adequate management of transport and reduce transport externalities.

As of 2013, there are 24 megacities in existence according to the Population Reference Bureau, while other statistics (Brinkhoff, The Principal Agglomerations of the World, 2013) indicate 29 urban agglomerations, which have excessed 10 million inhabitants, worldwide. Among them, only two mega-cities (i.e. London, Paris), and one agglomeration (Rein-Ruhr) are in EU-27 member states. Forecasts and projections, on the contrary, indicate that all urban growth over the next 25 years will be in developing countries and by 2025, Asia alone will account for at least 10 megacities (Far Eastern Economic Review). Figure 11 lists the main emerging megacities based on the dimensions 'vulnerabilities' and 'strengths' as presented by The Chicago Council for Global Affairs and AT Kearney.

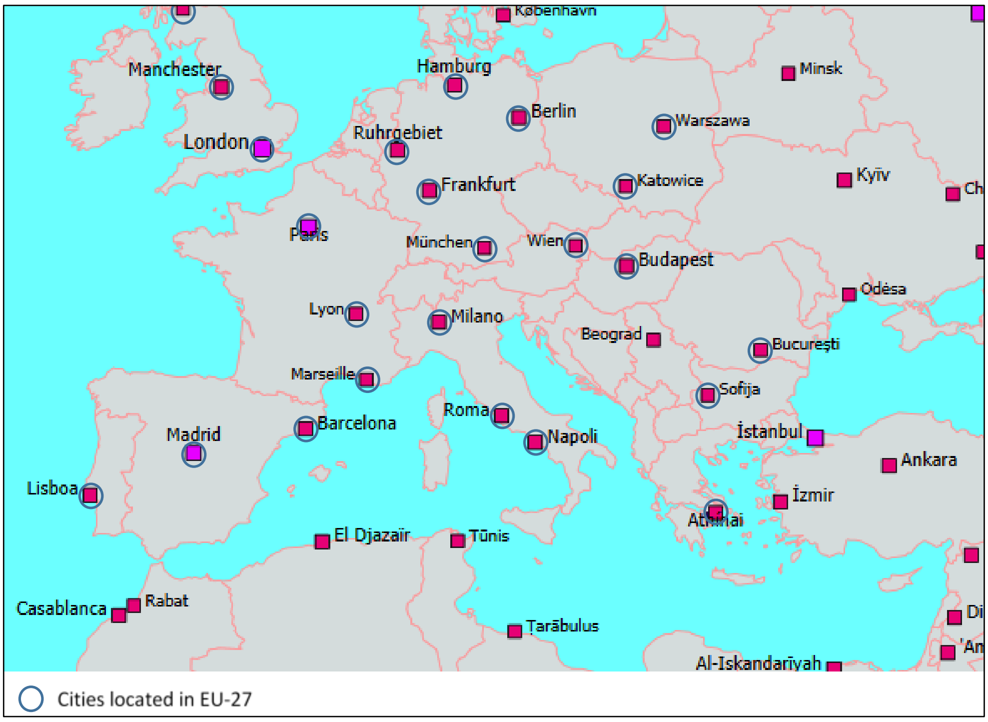
Figure 11 2012 Global Cities Index – future position of emerging cities



Source: The Chicago Council for Global Affairs and AT Kearney

The EU-27 appears slightly better positioned in relation to agglomerations with a population of 1 million inhabitants or more (Figure 12). Cities such as Hamburg, Berlin, Manchester, London and Paris in the north as well as Milan, Rome, Naples, Marseilles and Barcelona in the south are expected to increase their role as key hinterlands for Northern Range ports and Southern Range ports, respectively, by generating additional traffic flows in the future.

Figure 12 EU-27 urban agglomerations exceeding 1 million inhabitants (2013)

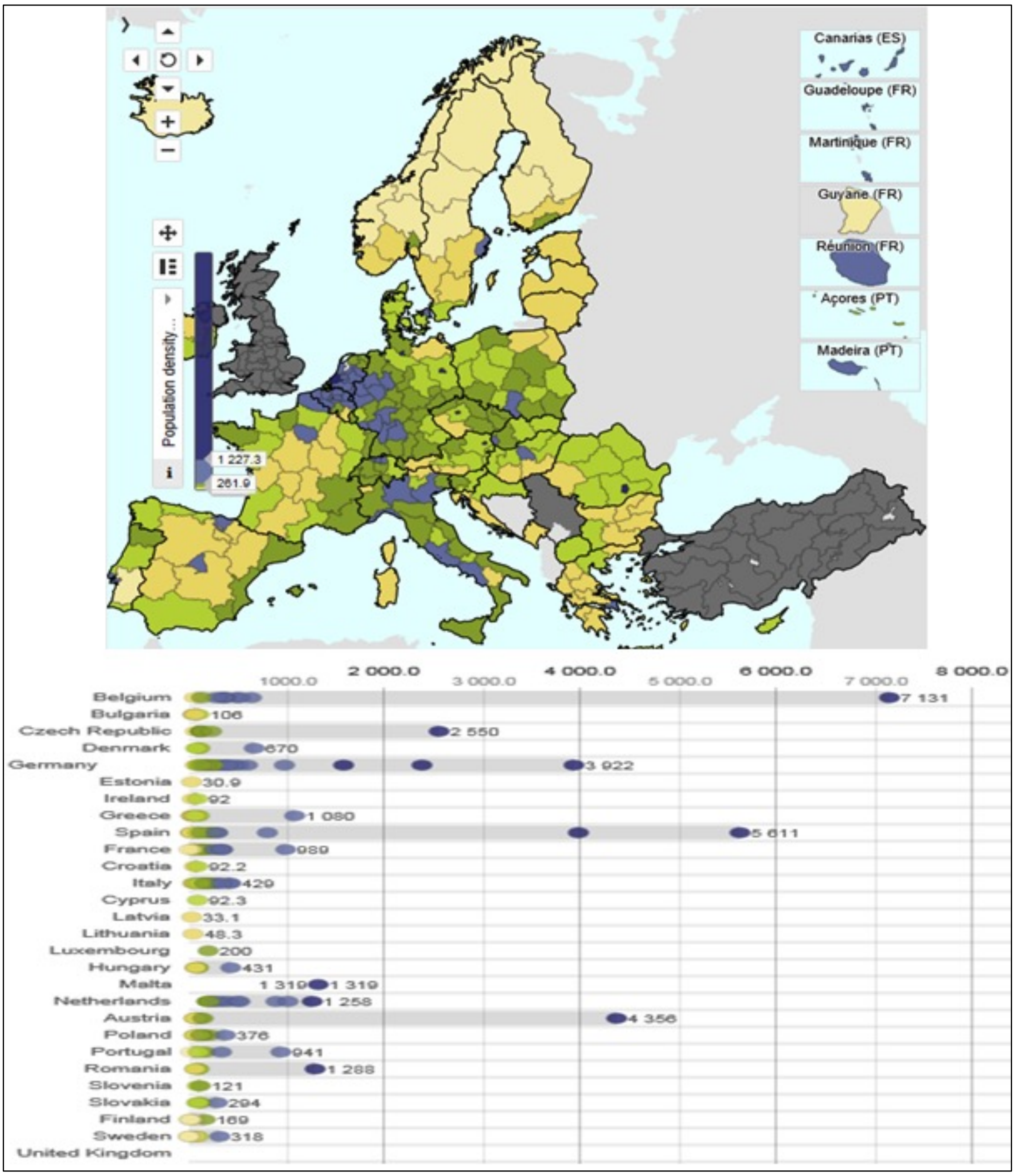


Source: Authors' own elaboration on Brinkhoff (2013)

A more articulated analysis of population density in the EU-27 Member States, indeed, provides further valuable information about the distribution of people in this geographic region.

Figure 13, in particular, suggests that NUTS level 2 regions including a capital city and neighbouring regions are the most densely populated areas. The capital city regions tend to report the higher level of population density in each EU-27 Member State, except for Germany (where München, Kreisfreie Stadt has the highest density), Italy (Napoli), Spain (the Ciudad Autónoma de Melilla) and Portugal (Grande Porto). On the contrary, the least densely populated NUTS level 2 regions are generally located in the periphery. In several regions, inhabitants per km^2 are below 10 (see some regions in Sweden, Finland, in the north-west of the United Kingdom, but also in French and Spain), raising several challenges for the transport systems, which are called to respond to the transportation needs of the citizens living in those geographic remote areas.

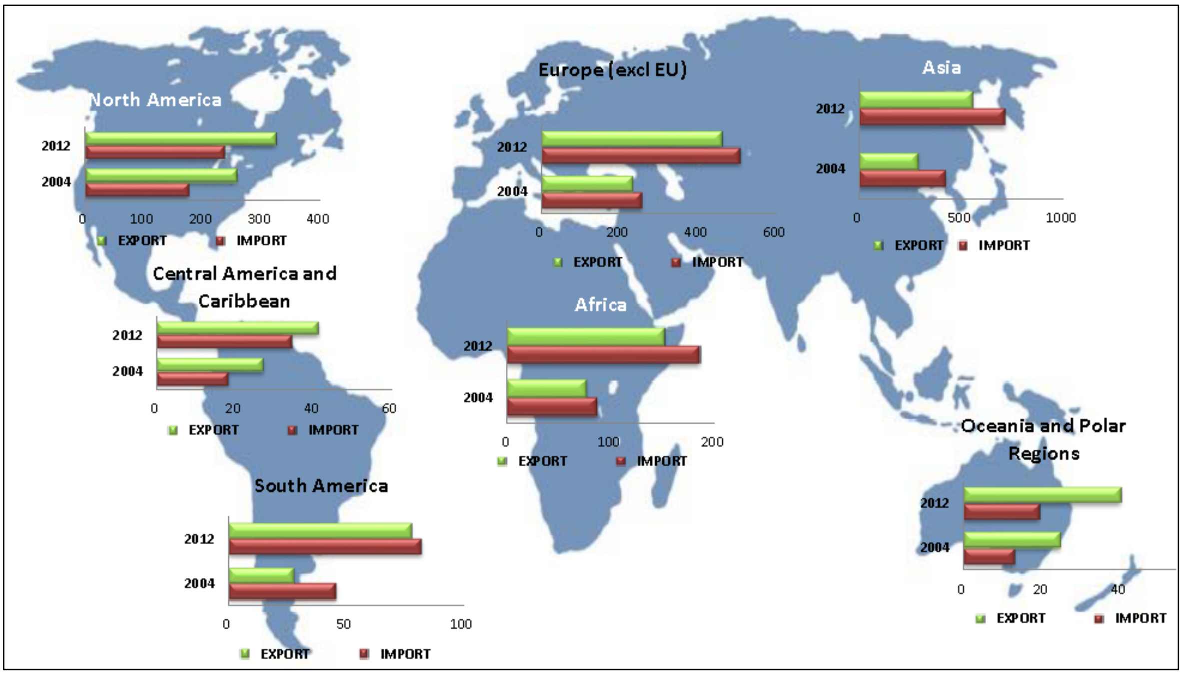
Figure 13 Population densities by NUTS 2 regions: EU-27, 2011



Finally, the recent developments in international trade flows are expected to significantly affect the long-term forecasts for the European port system. In fact, while volumes in world merchandise trade have recorded a positive growth since the 2009 economic crisis, (but with rates steadily declining), EU-27 trade experienced lower performance. In particular, according to WTO data, international merchandise trade has progressively grown both in 2011 and 2012 due to positive performance both in terms of exports and imports, whereas the EU-27 imports of goods from extra EU countries started to decline already in 2012 (-2.0%) and the EU-27 exports annual growth rate dropped down to 0.5%.

In 2012 USA was still the first client of EU goods (292.2 euro billion, equivalent to 17.3% of EU exports) and services (156.8 euro billion, equivalent to 26.3% in EU exports), but the Asia has grown fast and has become the leading regional area as importer for EU-27 merchandise trade (Figure 14). In the same year, in fact, EU-27 Member States exported above 143.8 euro billion of goods (8.5%) and 29.9 euro billion of services (4.0%) in China, alone. As concern the EU-27 imports, Asia confirmed to be the most relevant regional area. Among the suppliers of EU-27 member states, the first five ranks are occupied by China (290.0 euro billion), Russia (213.0), USA (205.4), Switzerland (104.6) and Norway (100.8) for goods and USA (145.6), Switzerland (60.4), China (20.0), Japan (15.3) and Turkey (14.7) for services.

Figure 14 EU-27 Merchandise Trade (euro billion)

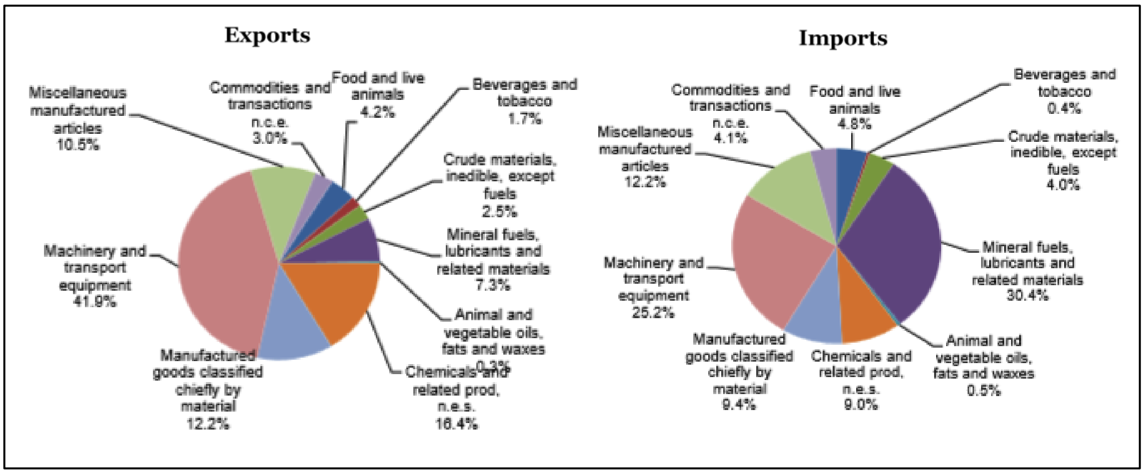


Source: Eurostat (Comext Statistical Regime 4), 2013

Focusing on the sectorial split (

Figure 15), three categories dominate exports of EU-27 merchandise trade with extra EU: “machinery and transport equipment” (41.9%), “chemicals and related products” (16.4%) and “manufactured goods” (12.2%). Relatedly, “machinery and transport equipment” and “mineral fuels, lubricant and related materials” account for more than 55.6% of total imports, alone (30.4% and 25.2%, respectively).

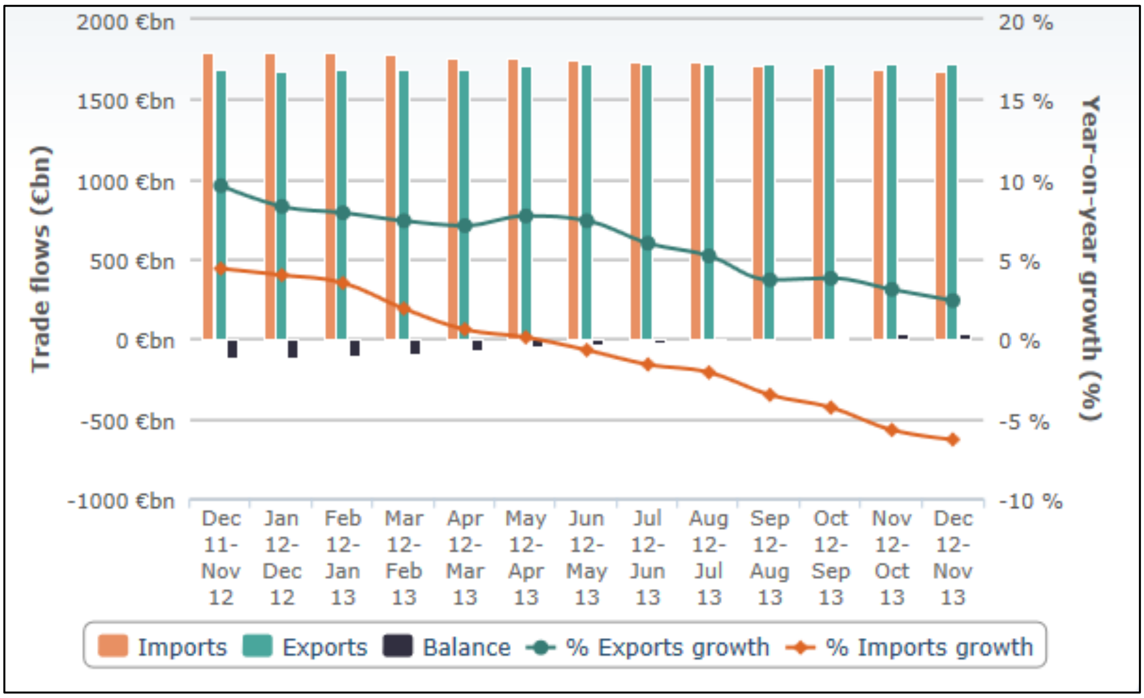
Figure 15 EU-27 Merchandise Trade (euro billion)



Source: Eurostat (Comext Statistical Regime 4), 2013

In the last year (2013), the over-performance of exports respect to imports continued (Figure 16). As a result, since August 2013, EU-27 reached a positive commercial balance with extra EU countries. The positive trend of exports respect to imports is expected to reasonably carry on in the next years. This shift in the morphology of EU trade flows with other economies should provoke several adjustments in the volumes and the types of merchandises transiting within European ports.

Figure 16 EU-27 merchandise trade with extra EU countries



Source: Eurostat, DG Trade (2013)

Besides, further expectations for international trade (and consequently for port traffics) originate from the progressive launch of new trade negotiations aiming to further liberalize trade and facilitate the integration of developing countries, as well as new bilateral trade agreements.

In this perspective, the recent events related to the Doha Development Agenda should provide new opportunities for EU trade policy. By lowering tariffs on industrial goods in developed countries and in emerging economies, such as Brazil, Russia, India and China (BRIC) EU policy makers want to generate additional opportunities of trade. Next negotiations on a number of issues (e.g. WTO rulebook on subsides, the extension of unlimited market access to all Least Developed Countries, a global rule package on aid for trade, etc.) are forecasted and could be help EU trade to grow up in the 2014-2016 period. In addition, the 9th Ministerial Conference in Bali (Indonesia) held in December 2013, a particular focus has been awarded to Trade Facilitation agreements.

In addition, EU's bilateral trade and investment agreements, by opening up more market opportunities for European business, are also argued to generate additional traffic opportunities for EU ports. By negotiating new Free Trade Agreements with key countries, European Commission has estimate a potential increment of around 275 euro billions, equivalent to 2.2%. Traffic flows in EU ports, therefore, will be intensively influenced by the results of the most important on going and concluded (but not yet applied) free trade negotiations.

Within the 2014-2016 period, valuable insights will be originated by the on-going negotiations summarized below:

- *United States of America*: The Transatlantic Trade and Investment Partnership (TTIP) talks started with a round held on July 2013 in Washington, D.C., focusing on several areas such as custom duties and technical standards for goods produced on both sides of Atlantic. The overall impact for EU member states originating from a comprehensive trans-Atlantic trade and investment partnership has been estimated in 119 euro billion a year after the implementation.
- *Agreement on investment with China*: Investment negotiations were officially launched on the occasion of the EU-China Summit held in Beijing on 21 November 2013. The negotiations aim to progressively eliminate restrictions on trade and foreign direct investment between EU and China.
- *Canada*: On 18 October 2013, a political agreement on the main elements of a Comprehensive Economic and Trade Agreement (CETA) between EU and Canada has been reached. It is expected to remove over 99% of tariffs between the two economies and create sizeable new market access opportunities in services and investment.
- *Association of Southeast Asian Nations (ASEAN)*: The EU negotiates currently with four countries of the ASEAN region. The negotiations for a Free Trade Agreement with Singapore, has been initialled on 20 September 2013. Moreover, the negotiations for a Free Trade Agreement continue with Malaysia and Vietnam. These agreements represent valuable opportunities for EU ports, as ASEAN is the EU's third largest trading partner outside Europe, after the US and China and well ahead of other partners (191 euro billion of trade in goods in 2012).
- *Southern Mediterranean*: Two rounds of negotiations for a Deep and Comprehensive Free Trade Agreement (DCFTA) with Morocco have been completed and a third is expected in 2014. These agreements will significantly strengthen traffic flows in Southern Mediterranean ports.
- *African, Caribbean and Pacific countries (ACP)*: Economic Partnership Agreements (EPAs) are trade and development partnerships between the EU

and African, Caribbean and Pacific countries (ACP), based on the Cotonou Agreement concluded in 2000. In 2013, EU Trade Commissioner Karel De Gucht travelled to four African countries (Kenya, Namibia, Botswana and South Africa) in order to strengthen commercial relations and future benefits are reasonably expected for EU member states.

- Finally, other relevant opportunities will originate in the 2014-2016 period from the negotiations with Mercosur Association, whereas negotiations for a free trade agreement with Gulf countries still remain suspended (by the Gulf Cooperation Council) since 2008.

At the same time additional opportunities but also potential treats should derive from Free Trade Agreements finished but not yet applied, including: the Deep and Comprehensive Free Trade Area (DCFTA) with Moldova, Armenia and Georgia (so called Eastern Neighbourhood); the DCFTA Ukraine, concluded in December 2011 and temporarily suspended in 2013; the negotiations for a Free Trade Agreement (FTA) between the European Union and Singapore (i.e. the largest EU trading partner in the South-East Asia, accounting for about a third of EU-ASEAN trade in goods and services) concluded in December 2012 but not yet applied.

2.2.2.3 Political developments

Political instability is traditionally assumed as one of the major variables capable of affecting trade, economic development and, ultimately, the shipping and port businesses. Europe, in particular, is now a relatively stable region despite the potential treats of terroristic events, as well as the emergence of breeding grounds of local wars/insurrections in neighbouring areas/states over the last decades. Specifically, some major factors that may influence the growth of EU port in a future (also long-term) perspective are the following:

- The instability of the North Africa area and of the Middle east; an eventual exacerbation of the conflicts (whose trend originate from the Arab Spring) may compromise the regularity of shipping services (transiting from Suez) and could drive to the collapse of East-West trade. As a result both Mediterranean and Northern Range ports would experience a profound traffic slowdown;
- The further expansion of EU towards East could generate further opportunities for the current member states, and could involve much more profoundly Black sea ports into oceanic shipping services. In particular, Turkey and Ukraine are two countries with a very big potential that could either join the EU (Turkey) or accelerate on the way of commercial and economic cooperation (Ukraine);

The political (in)stability and the degree of EU integration of Russia and former Soviet Union states is another key point on the agenda; this is even more relevant because of the recent entry of the Russian Federation in the WTO (August 2012).

2.2.2.4 Market-related developments

Over the last few years liner shipping and port industries experienced some important market transformations generated by the strategies of the main players, in response to demand and environmental changes. Some of these transformations are expected to produce an impact on the evolution of the European port throughput, especially in relation to the distribution of traffic across different ranges (e.g., Hamburg - Le Havre, Mediterranean range, Black sea, etc.).

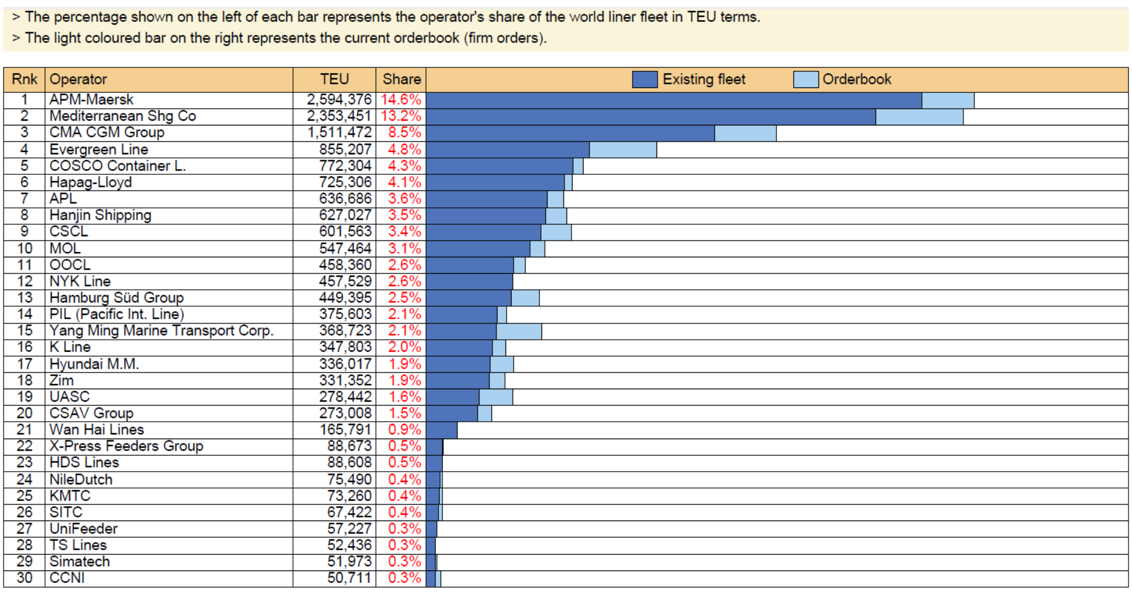
a) Consortia and alliances: background and evolution

The liner shipping sector is traditionally characterized by a profound inclination to cooperation. This trend has been accelerating in recent years and has been leading to the stipulation of new partnerships among carriers as well as to the reshuffling of (even big) existing alliances, which demonstrates the instability of the industry.

Indeed, intrinsic market characteristics have been exacerbated by the fundamental changes imposed by the recent crisis (Notteboom and Rodrigue, 2010). In fact, there is growing recognition among experts in the maritime industry that the economic downturn, which has determined a significant decrease in freight rates as well as a chronic overcapacity, has also brought about an increase in cooperation among container shipping carriers (Hoffmann, 2010).

The container shipping industry, as in many other service industries, has increasingly introduced cooperative schemes into its organisation, thus resulting in a growing market concentration (Lorange, 2001); for instance, six major ocean carriers (Maersk, MSC, CMA CGM, Evergreen Line, and COSCO) now operate about 45% of the cellular fleet (Figure 17).

Figure 17 The operated fleet capacity of the top 30 ocean carriers



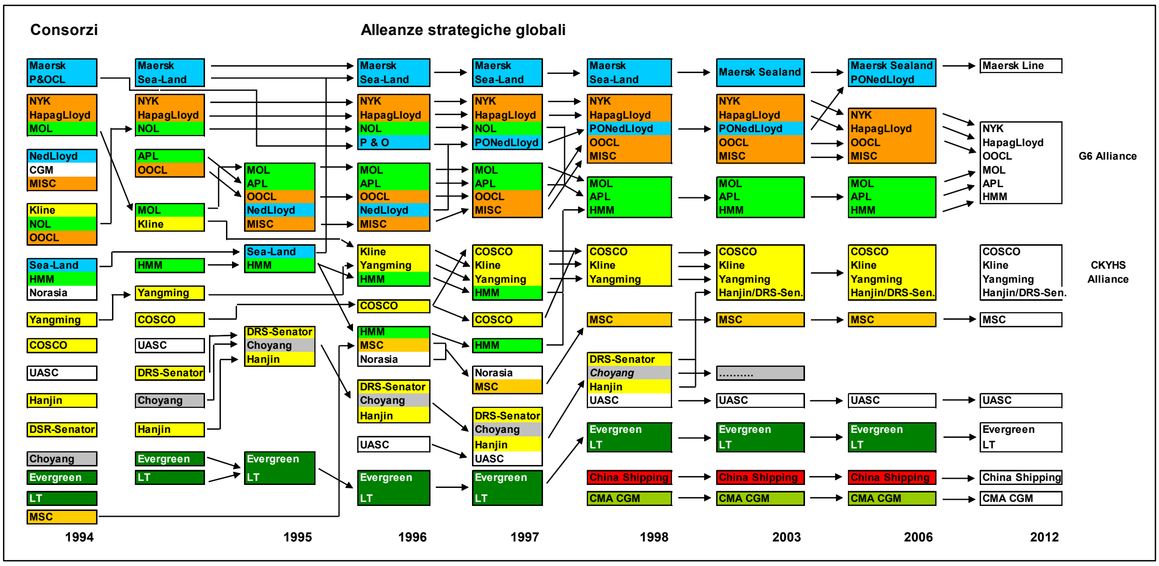
Source: Alphaliner (Jan. 2014)

If traditionally, shipping companies would have entered into the market largely alone, in recent years companies have adopted more cooperative schemes (Rimmer, 1998; Alix et al., 1999; Lorange, 2001). The rise in this type of management strategy has occurred for several reasons, including risk reduction (Brooks et al., 1993), global, vertical (Soppé et al., 2009) and/or horizontal integration (Midoro and Pitto, 2000; Panayides and Cullinane, 2002; Ferrari et al., 2008) and technological factors such as the deployment of mega-vessels in order to reduce cost per slot and achieve efficiency in the production cycle (Drewry Shipping Consultants, 2005; Imai et al., 2006).

Cooperative schemes based on operating agreements had already been developed by the 1960s, and only by the mid-1990s did the major ocean carriers decide to establish more formal contractual agreements (Rimmer, 1998). Several types of cooperative strategies, from informal consortia to formal strategic alliances, are present in the maritime market. Strategic alliances are agreements where carriers manage several joint shipping services worldwide, and by so doing, alliance members also share the investment risks. Two major strategic alliances now operate in the market: G6 Alliance (derived from the merger between Grand Alliance and New World Alliance) and CKYH Alliance; it is noteworthy that these two alliances involve many of the world's leading carriers. Moreover, in these days (post 2014) a new agreement, called 2M, among Maersk and MSC has been announced concerning the Far East-Europe route. Since it involves the "big two" shipping companies it is subject to the approval of the antitrust agencies of Asia, Europe and US. Specific terminals are not included in the pro-forma schedules – suggesting either that stevedoring contracts have yet to be finalised, or that Maersk and MSC do not want to antagonise regulators by assuming 2M's approval.

In particular, Figure 18 shows the evolution of main alliances (before 1995 consortia) among leading ocean carriers, until these days (2013), without taking into account yet the entry of the new 2M alliance.

Figure 18 The evolution and the instability of main consortia and alliances



Source: Authors' elaborations from Drewy, corporate websites and specialized press

The 2M3 network will operate a capacity of 2.1 million TEU (initially 185 vessels on 22 loops) on three trade lanes: Asia – Europe, Trans-Pacific and Trans-Atlantic. The aim is to improve and optimize operations and service offerings.

- **The 2M Network** will based on existing capacities of each member, initially operate a capacity of 2.1 million TEU (185 vessels)
- Vessels contributed to the 2M Network will continue to be owned and/or chartered by the lines.

More specifically, looking at the European port system, the on-going changes will provoke a large further consolidation of the demand for container handling services, increasing the bargaining power of major alliances/consortia towards ports and terminal operators. In particular, on the port side, the partners of such agreements can potentially reduce the number of terminal calls per port. This is especially true in 'smaller' ports, where concentration on one terminal may lead to more efficient terminal operations and better deals with terminal operators.

However, doing this goes beyond operational decisions, and assumes a more "strategic" impact. Reducing the number of terminals per port has huge consequences for the associated terminal operators: APM Terminals, Terminal Link and TIL. Furthermore, such choices have important consequences for feeder and intermodal operations, both beyond the scope of 2M cooperation.

With the concentration of alliances, it is evident that there is a surfeit of hub ports in the West Mediterranean. Transit volumes at Taranto nosedived from 511,000 TEU in 2011 to 196,000 TEU last year, primarily because Evergreen's closer association with the CKYH grouping is steering more transit cargo over the port of Piraeus. Exchanges at Cagliari are doing no more than treading water, and 2013 transit volumes at Malaga have tumbled (down by 62% in the first half) after Maersk withdrew its transhipment business.

It is reasonable to expect that there will soon be two leagues of hub ports in the West Mediterranean. Facilities at Marsaxlokk, Algeciras and Valencia will service more the super-highway loops provided by the ultra-large containerships, while the likes of Cagliari, Taranto, Malaga and Tangiers Med will support the secondary trades such as South America and Oceania. At present, Gioia Tauro straddles both camps, but may find itself relegated in time to the latter.

Looking at Northern Range, the announced schedules of 2M on the Europe-Far East is likely to strengthen the position of Antwerp (3-6 calls) at the expense of both Rotterdam (from 8 to 6 calls) and Zeebrugge (from 4 to 0 calls). On the other hand in the O3 network Zeebrugge has 6 calls, Rotterdam 12 calls and Antwerp only 2 calls. Note that there are less loops but using larger vessels typically between 11,000 and 18,000 TEU. In Antwerp, the new schedules have given rise to a massive move of MSC's business from the right bank to the left bank where all 2M business will be consolidated at the Deurganckdock. The 2M alliance's choice of terminal at Rotterdam will no doubt arouse interest in the months to come. APMT is currently constructing a new terminal at the Maasvlakte II site, which will be able to handle the 18,000 TEU Triple-E vessels. This terminal should start operations during the first half of next year when another terminal within this complex will open, namely DP World's Rotterdam Gateway, in which CMA CGM has a share along with the New World Alliance partners. In the meantime, down at the Maasvlakte I berths, MSC – through its TIL subsidiary – has recently put funds into a refurbished facility, named Delta MSC Terminal.

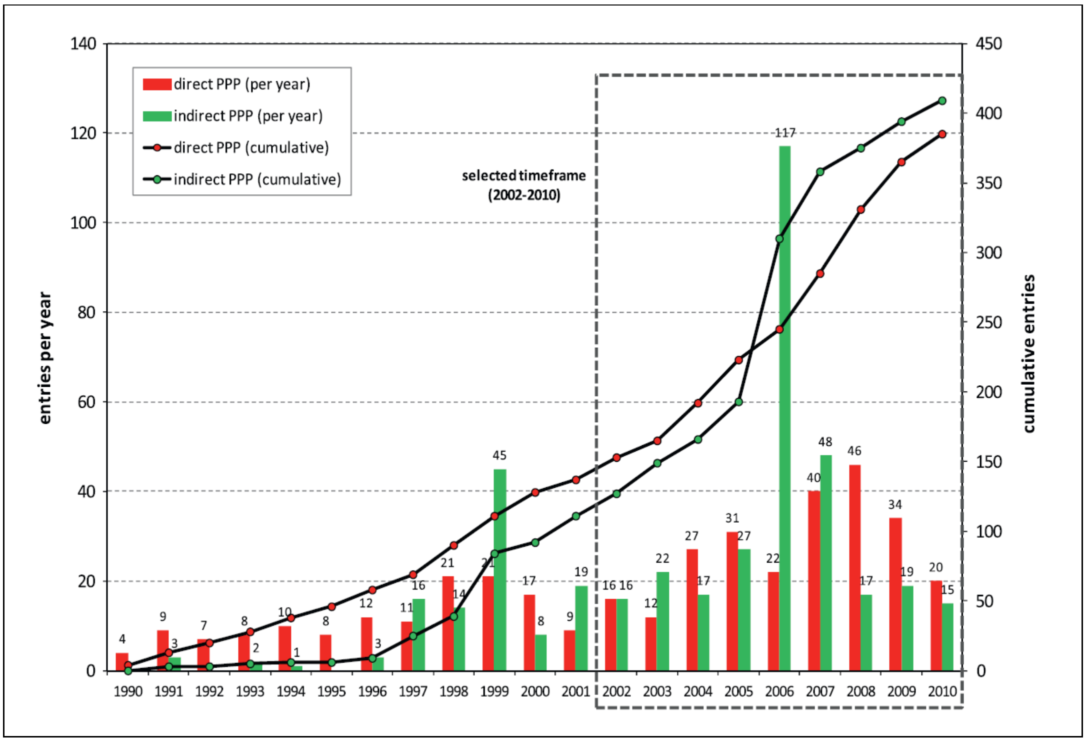
b) International terminal operators: consolidation and equity agreements

As widely acknowledged by scholars and practitioners, international terminal operators (ITOs) have profoundly accelerated their process of overseas expansion in many geographic regions. Beside pure stevedores, which started to outgrow their respective homeports since the late-1980s, also ocean carriers and hybrid operators are now very active in developing new projects and/or taking over shares in existing facilities. In addition, recently we also experienced the dramatic rise of some financial groups (Goldman Sachs, which are interested in the diversification of their assets in high-growth businesses.

As a result, a handful of players take the lead of this market, provoking an increasing consolidation from the supply side. Currently, the top 5 ITOs approximately control over the 40% of the overall port throughput worldwide. This gave much more bargaining power to main operators, in opposition to their already powerful customers, i.e. ocean carriers (often organized in consortia and/or alliances).

In order to show the aggressiveness of the ITO's growth strategy in recent years, Figure 19 depicts the relative importance and evolution of the two PPP foreign entry strategies in the container port industry during the 1990–2010 periods. Empirical evidence underlines the dominant role of "direct PPP" entry strategy[2] until the late 1990s, following the early phases of port privatization. Then, from the early 2000s financial transactions became a more common choice, in response to the changing competitive environment. Indirect PPPs (acquisitions[3]) have two peaks in 1999 and in 2006, which coincide with two major transactions. In 1999, the AP Moller Maersk group acquired 29 Sea-Land terminals for USD 800 million while in 2006 DP World acquired the assets (33 terminals) of P&O Ports.

Figure 19 The evolution of PPP foreign entry strategies in the container port industry (1990–2010)



Source: Parola et al. (2013)

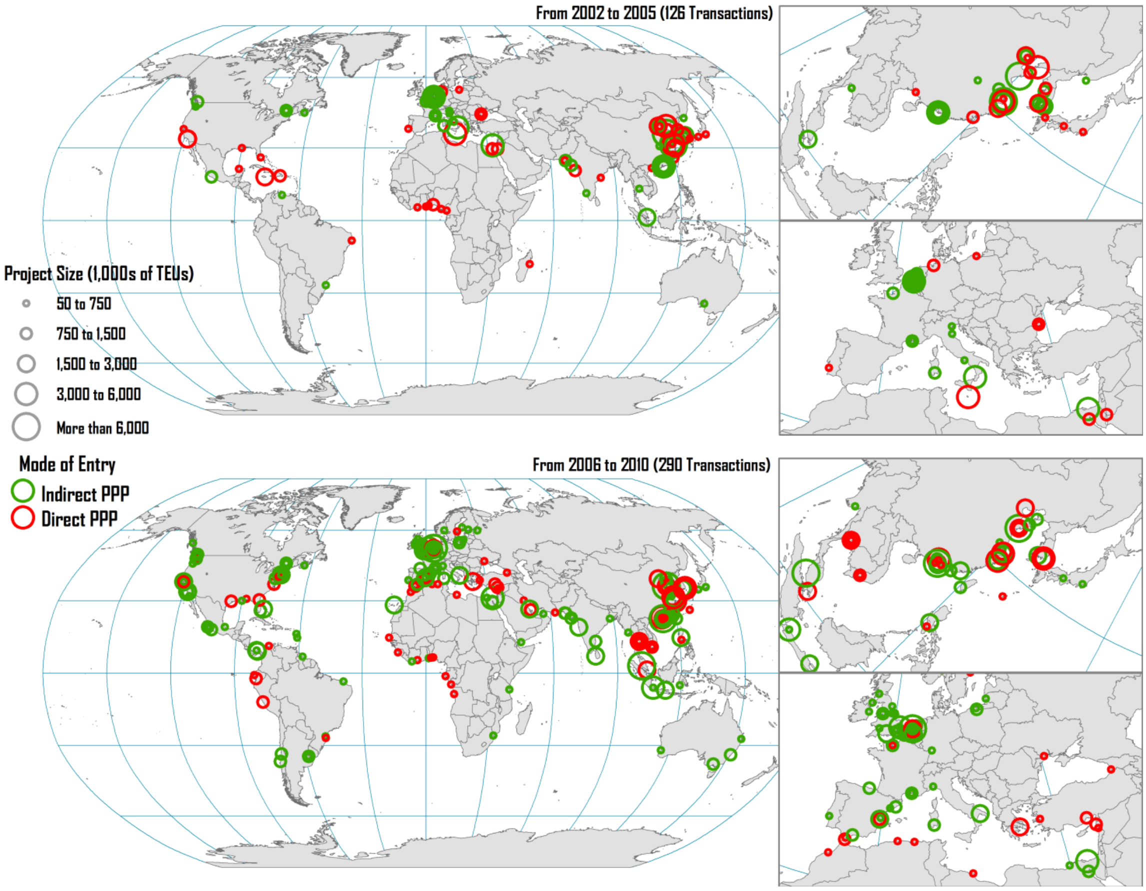
In addition, Figure 20 provides the geographic spread of the sample PPP projects, in accordance with the adopted entry strategy and the investment size with the selected timeframe split into two sub-periods, 2002–2005 vs. 2006–2010. In addition to the

[2] "Direct PPP": it means stepping into a new PPP arrangement, which typically demands the active participation to the different phases of the overall terminal awarding process, including negotiations with public parties and other private bidders if a partnership is involved (Pallis et al., 2010; De Langen et al., 2012).

[3] "Indirect PPP" refers to firms that are be induced or even forced to adopt more aggressive entry strategies in order to leapfrog entry barriers and capture market opportunities (De Langen and Pallis, 2007; Olivier et al., 2007). This means that, in the presence of already established (and operational) PPP agreements, enterprises may resort to financial transactions to handover an equity share within an existing PPP arrangement. This is defined as an "indirect PPP" entry strategy (Parola et al., 2013).

doubling of the number of deals, the transactions have expanded geographically from East Asia and Western Europe to a much more extensive market range. The entry to smaller markets is usually done through direct PPPs (e.g. Africa, Latin America) while for larger markets indirect PPPs are more prevalent. In particular, Northern Europe is a geographic area that has witnessed a lot of new projects (greenfield) but, above all, also many acquisitions, especially in the top ports like Rotterdam, Antwerp, Le Havre, Zeebrugge, Bremerhaven, etc. This is clearly a "symptom" of the high entry barriers (e.g., institutional, market-related, etc.) that characterize those areas and, therefore, the new entrants had to resort to such aggressive forms of investment ("indirect PPP") for breaking the local resistance. Indeed, following the numerous investments undertaken by some ITOs in Northern Europe, the market is now much more concentrated than in the recent past. Just a few players controlled the key entry points in the whole area.

Figure 20 Direct and indirect PPP transactions by foreign entry strategy in main port regions



Source: Parola et al. (2013). Drawn by J-P Rodrigue

The Mediterranean basin is also attracting the interest of ITOs, for taking the control of key hubs and entering the major gateway ports (mostly in Spain and Italy). However, the momentum of this trend seems to be strongest in North Europe where some big projects are still under development and both carriers and terminal operators seem to be more proactive and dynamic.

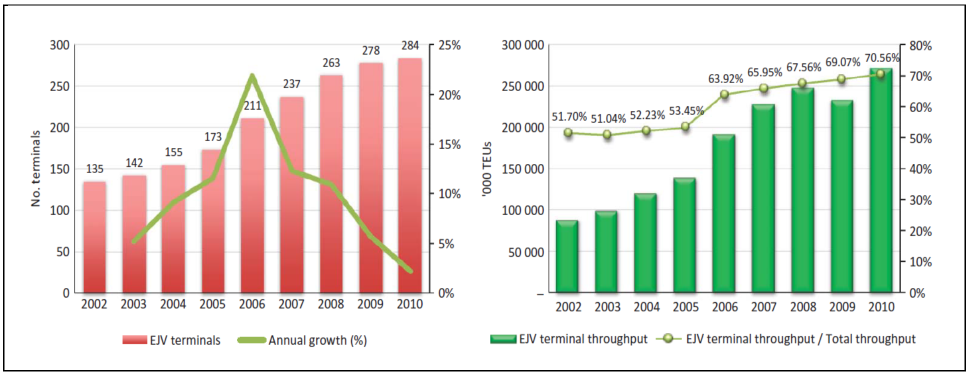
Another key trend that deserves attention in the container port industry is the development of equity partnerships. In recent years, in fact, a number of factors such as the progressive scarcity of available port spaces for greenfield projects, the end of the 'privatization window' (between the early 1990s and early 2000s), the enormous financial resources required for infrastructural investments and the variety of skills required for realizing modern terminal facilities, have induced ITOs to experiment with various forms of co-operation (e.g. Van De Voorde 2005; Soppé, Parola, and Frémont 2009).

In particular, over the last decade, ITOs have recourse to equity joint-ventures (EJVs) to enter new foreign markets and develop new terminal projects. These co-operation agreements include both traditional EJVs (i.e. a separate jointly owned firm created by two or more parties which assign their own resources to the new entity) and direct minority equity investments, which take shape when a party acquires an equity stake in a partner firm (Pisano, 1989).

The relevance of partnerships in the container port industry is growing, in terms of both the number of jointly owned infrastructures and the total container throughput handled by EJV terminals. In fact, between 2002 and 2010, the number of EJV container facilities involving at least an ITO experienced a compounded annual growth rate equal to 9.74%, going from 135 (2002) to 284 (2010). In the same period, the number of partners involved in EJV facilities (including an ITO) increased from 171 to 250, equal to a 46% increase.

Finally, the container throughput generated by EJV terminals (involving almost one ITO) rose from 87.7 (i.e. 51.70% of the ITOs' total throughput) to 271.69 million Twenty-foot Equivalent Unit (TEU), corresponding to 70.56% of the overall throughput handled by ITOs (Figure 21).

Figure 21 The growing relevance of equity joint venture agreements in the container port industry



Source: Authors' elaborations from Drewry (various years), corporate websites and specialized press

In Europe this global trend appears particularly remarkable. The ports which are characterized by big projects show the presence of important equity-joint ventures where pure stevedores, carriers and hybrid operators which share the commercial risk and the resources to be committed. For instance, in the Deurgandock area (Antwerp, Belgium), the Antwerp Gateway Terminal includes as shareholders the stevedores DPW and Yilderim, and the carriers CMA-CGM, Cosco Group, and Zim Ports. Also the Antwerp International Terminal (AIT) is managed by a consortium of international players, such as Hanjin, K-Line, PSA and Yang Ming Line. In Rotterdam, the Euromax Terminal is composed by five shareholders, Cosco Lines, Hanjin, HPH, K-Line, and Yang Ming Line. Analogous patterns of cooperation emerge in Bremerhaven, Zeebrugge, Le Havre. Also in the Mediterranean countries we find similar arrangements (in Valencia, Naples, La Spezia, etc.), but they are less numerous and normally involved a more limited number of ITOs. Table 5 shows the involvement of carriers and hybrids operators (like APM Terminals, the port division of the Maersk Group) in container terminal activities in European ports.

Table 5 The equity throughput ('000) handled by carriers and hybrid operators in European ports (2011)

Country	Port name	APMT	Bolloré Group	CMA-CGM	Cosco CLines	Cosco Group	Evergreen	Hanjin	Hapag-Lloyd	K-line	MSC	NYK	YML	Zim Ports
Belgium	Antwerp			95		238		66		66	2,302		66	238
	Zeebrugge	432		188										
Denmark	Aarhus	255												
Egypt	Suez	1,786				649								
France	Dunkirk			202										
	Fos (Marseilles)			189	15									
	La Rochelle		57											
	Le Havre	135		529										
	Marseilles			75										
	Nantes		68	138										
	Rouen		62											
Georgia	Poti	142												
Germany	Bremerhaven	1,717									850			
	Hamburg								693					
Greece	Piraeus					1,188								
Italy	Gioia Tauro	754												
	La Spezia										428			
	Leghorn										84			
	Naples				223						223			
	Ravenna										24			
	Taranto						245							
	Venice										83			
Jordan	Aqaba	360												
Libya	Misurata		290											
Malta	Marsaxlokk			948										
Morocco	Casablanca			236										
	Tangier	1,057		288							180			
Netherlands	Amsterdam											12		
	Rotterdam	2,371			234			234		234	400		234	
Norway	Oslo	48												
Portugal	Sines										222			
Spain	Algeciras	3,096						612						
	Las Palmas										278			
	Tarragona													96
	Valencia										1,558			
Syria	Lattakia			214										
Turkey	Ambarli										786			
Ukraine	Odessa			55										

Source: Authors' elaborations from Drewry (2013), corporate website and specialized press.

In conclusion, we can state that the above trends are affecting and will continue to influence the European port dynamics, in relation to most cargo types. Carriers' decisions to consolidate their capacity into consortia and alliances may deviate or attract demand cargo flows from/in one port or a region. Analogously, the investments of terminal operators in newly reformed ports will raise both productivity and reliability of the facilities and, therefore, will be able to attract additional traffic flows in that area. Within this picture, the strategies of shipping lines willing to deploy giant vessels (18,000 TEU) and the capacity of terminal operators to deal with such challenges (e.g., more profound draft, increased performance, higher reliability, empowered inland infrastructures, etc.) will deeply determine the future trade patterns and port of call selection.

c) Liquid bulk: boom in tank storage facilities in major industrial ports

Referring to liquid bulk storages market what we can say is that the market showed a strong growth in the last decade. With the increasing volume coming from the refineries and with the high demand rate in clean and dirty petroleum products the storage demand increased too. A lot of specialized players invested in storages facilities in order to meet local and international demand. Looking at the main drivers we can sum up these briefly:

- Increasing crude oil and oil products demand worldwide during last decades both in EU and especially in the developing countries. This phenomenon lasted up to 2008 after that EU started to face a crisis period which is still lasting and which affects the refining system. On the contrary developing countries are still increasing their GDP and consequently their oil demand;

- EU countries: refining closures increase; crude oil demand decreases in favour of an increasing demand of clean products. To manage this switch, EU countries increased storages capacities (even though in this last years specialised reviews highlighted over capacity problems with high spare capacity and reduced ROI). Huge investments have been made especially in North-West Europe (NWE) and in West and East Med (Spain and Turkey);
- Which are the reasons of NWE and EMED investment choices? First, one is that NWE has a land that allows building easily tank farms (permitting process are smart and fast) local community believes that tank farms represent powerful investments. Secondly, NWE has a strategic position: it is in the middle of the cross way from Russia, Europe and USA markets, and has an immediate connection to European canals system (for oil distribution through barges) for a capillary hinterland distribution. Thirdly, NWE since decades ago specialised its oil sector in building bulk, breaking bulk, blending procedures, which drove NWE to be the first key role player worldwide in this activity. Fourth, NWE attracts oil flows from: Baltic Russia (which according to the new national refining sector expansion process) is going to reach the first step of the podium in oil exports especially for diesel ULSD 10 ppm, fuel oil and crudes from Primorsk and Ust Luga ports. But since Baltic due to difficult transit requires small vessels, a lot of them depart from above ports to reach NWE and to build bulk in larger crude or cleaned oil carrier (VLCC for naphtha, fuel oil - Suezmax for crude - Aframax for naphtha, fuel oil, Ultra-low-sulphur diesel). Fifth, oil logistic in Europe is going to substitute refineries. Refining process has been shifted towards developing countries, but distribution and storages have to be developed in order to meet local demand (EU) for clean products.

Millions of cubic meters have been built by a lot of specialised storage companies (e.g., VTTI, Oil Tanking, Vopak, Nedstore, Odjfield, Rubis, Sea-Invest, etc.), especially in the clean oil products. In this last year we are seeing an increase in LPG and LNG storages but the impact on the whole capacity volumes is still small. It's necessary to highlight that these tank farms are hubs to break or build or com mingle or prepare ad hoc gasoline. Also in Spain we are seeing a storage capacity increase; Barcelona port in these last years developed new capacity with players such as Meroil, Tepsa, Decal, Tradebe, Litasco even though the capacity due to EU crisis is still spare. In East Med we see an increase capacity in the Iskenderun gulf (Ceyhan) since turkey is and emerging economies and since it is the access to Middle East oil productions. So these farms can attract oil flows.

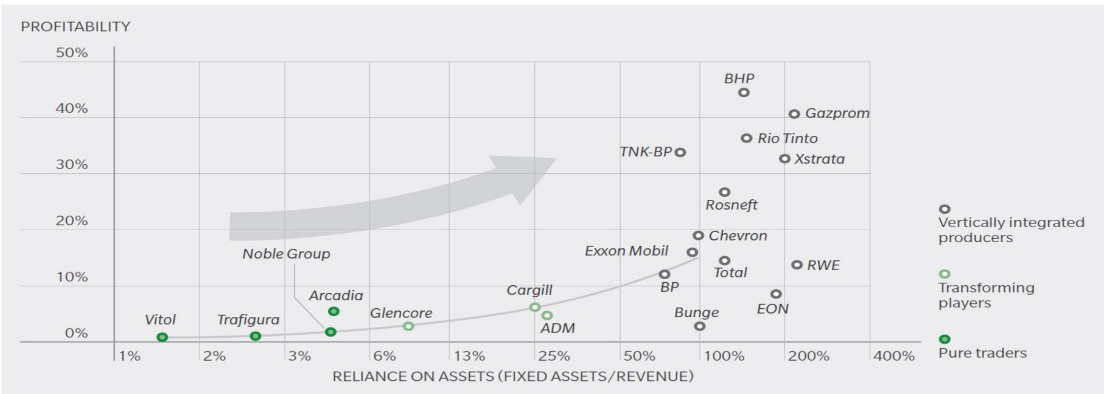
As we can see huge tank farm hubs are placed in strategic areas in order to catch the biggest oil flows. But do not forget that minor tank farms are localised in every EU country because they are fundamentals for oil logistic but their role is different: they are focused for inland distribution. Today revenues for the tank companies are low, capacity is spare, flows in EU are reduced due to crisis, and so today we can state that the market is facing an overcapacity.

As discussed earlier in this document, the investments in tank storage facilities have resulted in a recent boom of liquid bulk flows in a number of ports. For example, Antwerp saw a massive increase of 32% in liquid bulk flows, mainly due to recent large-scale investments in tank storage facilities by the Belgian company Sea-Invest (i.e. Sea-Tank Terminal Antwerp).

d) The increasing role of "traders"

The commodity trading landscape has changed extensively over the past years. After WW2 large trading companies, which used to dominate primary commodity trade throughout the 20th century, have undergone vast structural changes. They have dropped in numbers and are not nearly as huge as they used to be. Also the size of the assets and diversified sales of the more hardened survivors have increased prodigiously. At the same time a parallel shift was the mutation of largely single-line commodity traders into multi-commodity traders spanning the entire spectrum of commodities that enter world trade. Today growing global profit pools, rising profiles of industry leaders and lower entry barriers have attracted a large number of players to the commodity trading market. In Geneva alone the number of trading companies increased from 200 to 400 in 2011. The traditional picture of the landscape with a small number of professional traders and the abundance of customers is under pressure with an increased number of actors acquiring trading skills. Figure 22 provides an overview of the reliance on assets of some of the most important traders: while there is still a significant group of pure traders, quite a few traders have vertically integrated their activities and became asset-based, even controlling key storage facilities and assets.

Figure 22 Profitability and reliance on assets for selected commodity traders (average 2008-2011)

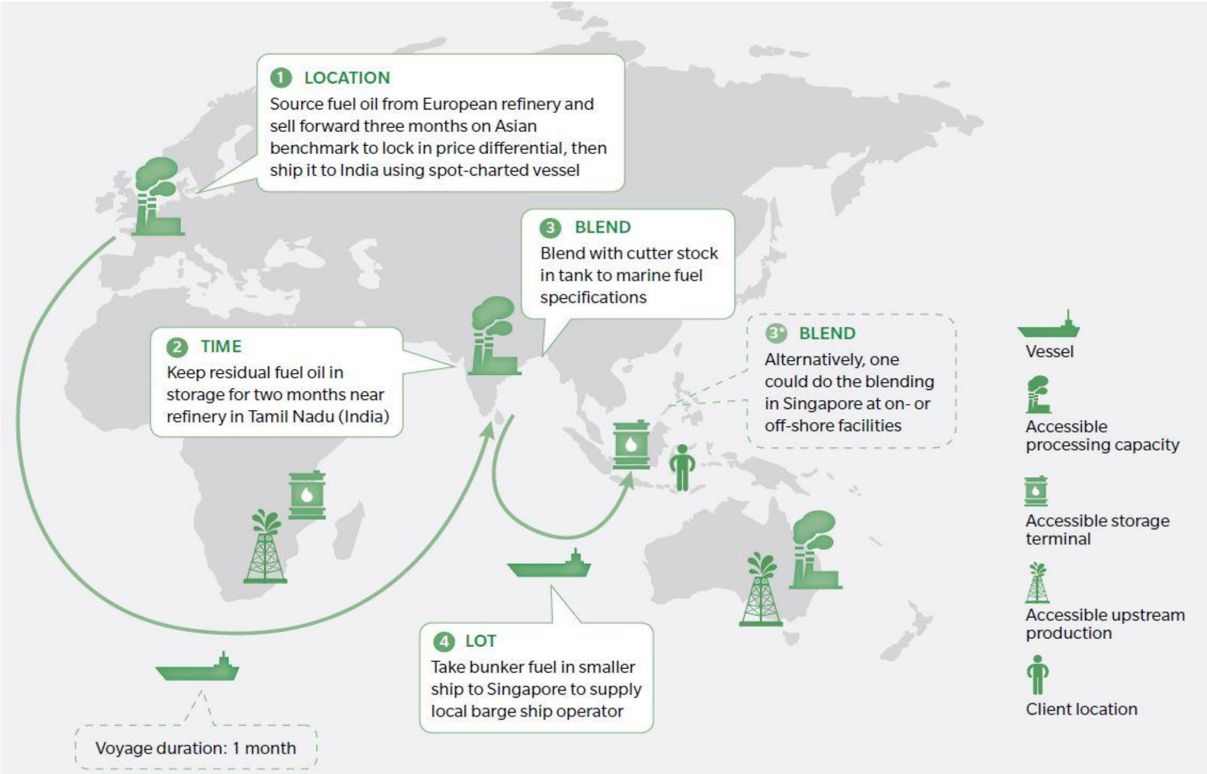


Source: Meersman, Rechtsteiner and Sharp (2013)

Traders are playing a key role in all the stages of process, which relate to the entire liquid bulk supply chain (see example in

Figure 23). They manage the highest crude and clean petroleum products. They have share participation in tank farms with the above-mentioned companies. Or sometimes they hire capacity on yearly basis. Why? To have high flexibility in the trading process (to have assets where discharge their products), to catch the “contango” market letting them to speculate on physical and paper market, to bound the risk of volatile prices. Gunvor Glencore, Trafigura, Vitol, Mercuria, and investment banks such as Morgan Stanley, JP Morgan have shares or hire storage farms. Also minor traders have quotas in storages.

Figure 23 The strategic role of traders in cargo routing and port traffic - example for oil products



Source: Meersman, Rechtsteiner and Sharp (2013)

Having storage capacity gives to a player flexibility to discharge a product when the market is getting down. In this way it protects itself against market volatility. Storages represent also a direct access to inland market. Traders are purchasing also the retail network. So they can control all the distribution chain.

The impact of the traders in the flows of oil products through EU ports surely will depend on the internal oil demand and if EU will overcome the crisis. If the EU won't recover the EU flows will be small and maybe tank storages will be still in overcapacity. But the activity won't be deleted due to worldwide demand of crude or clean products. Some analysts expect that, if USA will start (2015?) to export their crude shale oil, the world oil flows could change, changing also the dynamic flows of everything.

2.3 TRAFFIC FORECAST UPDATE

In the last section of this report, we aim to assess the validity of the traffic forecasts made by PwC/NEA (2013) in light of the above discussion on recent dynamics in the European port system and the economic, political and market environment. In other words, are there reasons to assume a deviation from the reported forecasts?

Before doing so, we recapitulate some of the models underlying the forecasts. As mentioned in section 2, the figures resulting from the TRANStools and Primes/Tremove models were used for the traffic forecast analysis conducted for the preparation of the White Paper on EU Transport Policy in 2011. At the time of the PwC/NEA study on ports (2013), the EC felt important to ensure some consistency with those traffic forecasts.

The forecasts would have been calculated in mid/late 2012, and were calculated as part of an exercise to estimate a reference scenario for EU transport to 2030. They have then been used as a baseline for studies, including impact assessment. The methodology was to use the trade model from TRANStools (the first version or v1). This method uses elasticities applied to various economic indicators (GDP, GVA per sector etc.). In turn the economic forecasts came from the Primes/Tremove models that the EC is using for e.g. White paper estimates. The model forecasts growth in trade, and these trade flows are converted into port volumes, based on an initial estimate of hinterlands. The baseline forecast allows the geographical distribution of trade to change, but it does not contain any assumptions about competition between ports. The idea was to make a neutral forecast of traffic growth and to assign it to ports on the basis of current routings. If a particular port range grows faster than another, it is because the underlying trade flows are estimated to grow faster.

The particular (annual) values/figures are subject to a confidentiality agreement with the EC. The project team has been in contact with the relevant people at the EC to get access to the raw forecasting data, but at the time of writing this report these detailed annual forecasted figures were not in our possession. Further steps are now being taken in coordination with the "Economic Analysis and Impact Assessment" Unit of DG MOVE which has an extensive knowledge of TRANStools and Primes/Tremove models and of the general state of play of the transport forecasting exercise. The aim of this exercise is to assess the changes in the forecasting models that have taken place since the PwC/NEA study[4] and to ensure that the our work in PORTOPIA (particularly task 1.3 of WP1 on forecasts) takes account of the more up-to-date transport forecast figures used in the EC.

To get back to the main question of this concluding section: are there reasons to assume a deviation from the reported forecasts?

First of all, the forecasting exercise of PwC/NEA (2013) constitutes a long-term forecast calculated as recent as mid/late 2012. Adjusting long-term forecasts based on short-term changes never is an easy exercise as these long-term forecasts are based on long-term trends. So, an update of the long-term forecasts can only be justified if it is based on trend breaks or major changes in assumed future patterns. In other words, the development trends described in earlier sections will only have an upward or downward impact on the long-term forecasts if we can reasonably assume we are dealing with a clear trend break or so-called 'game changer' and if these trend breaks can in some way be captured by the forecasting methodology.

Second, the PORTOPIA project team has engaged itself to develop an in-depth discussion on traffic forecasts for the European port system. Indeed task 1.3 of WP1 concerns the estimation of future traffic flows in the European port system (in the short, medium and long term). This task focuses on the development and implementation of a range of methods to increase insight in the expected future (traffic) outlook for the European port system in the short, medium and long term. Besides an update of the traffic forecast and analysis of the impact assessment of the

---

[4] TRANStools is a model with a long history (led first by TNO in the Netherlands, and then - until today with v3 - by DTU in Denmark). The EC is only using one specific method - the version 1 trade model, which was revived for version 2.6 in the TenConnect project. The new version of Transtools (v3) does not use the older trade forecasting method. Since then, there have been significant changes in the versions of the model.

EC's Ports Policy Proposal (as contained in this report), three sub-tasks will contribute to this objective:

- Task 1.3.1: Explore time-series based forecasting techniques. A first sub-task will explore and apply a range of time-series based forecasting techniques in order to generate aggregated and top-down forecasts on the maritime traffic evolution of the entire European port system and significant parts thereof (Med ports, Hamburg-Le Havre range, Baltic, etc.).
- Task 1.3.2: Develop a forecasting meta-system. A second sub-task aims to develop a forecasting meta-system which groups data and expert information on medium (1 to 5 years) and long term (> 5 years) developments in port activities in Europe.
- Task 1.3.3: Survey drafting to measure short-term traffic expectations. The third sub-task is focused on the short-term development of the European port system. It involves the drafting of a survey that will measure short-term traffic expectations (next quarters up to a year) of relevant stakeholders in the European port business, with a main focus on port authorities.

The above tasks will lead to a port traffic-forecasting tool to be presented in month 18 of the project (i.e. deliverable D1.3). Hence, the traffic forecasting discussion in this report serves as a broad analysis and first step towards a more comprehensive traffic forecasting system for the short, medium and long term.

Third, many of the trends described in this report have a direct impact on port competition and possible traffic shifts between ports because of competitive pressures. However, the forecasting methodology used by PwC/NEA does not take into account competitive cargo shifts between ports. The baseline forecast only allows mapping the geographical distribution of trade to change, but it does not contain any assumptions about competition between ports. As indicated earlier, if a particular port or port range grows faster than another, it is because the underlying trade flows are estimated to grow faster, not because of effects related to inter-port competition. This simplification in the forecasting methodology makes it difficult to capture the effects of major trends in shipping, logistics and port competition (cf. alliance formation/consolidation, scale increases in vessel size, etc.) on the volumes per port range. Also, the focus on presenting forecasts per port range seems to indicate that competition is considered to take place only between ports of the same range. However, earlier studies (see e.g. Notteboom, 2009; Notteboom, 2010) and this report have demonstrated that port competition is expanding across ranges (e.g. Med ports competing with northern ports).

Finally, the forecasting method relies a lot on elasticities applied to various economic indicators (GDP, GVA per sector, etc.) to forecast growth in trade, and to convert trade flows into port volumes. The analysis in this report has shown that the relationship between economic growth indicators such as GDP and port traffic growth might be becoming more spurious.

Based on the above discussion, the project team argues that, when staying loyal to the methodology used, there are no reasons to revise the presented forecast upwards or downwards. However, we believe more analysis is needed on the effect of the underlying assumptions and simplifications in the forecasting methodology on the validity of the forecasts. More in particular, we will further explore the role of port competition effects and the changing link (or maybe even disconnection) between economic growth and port traffic growth. These discussions will be part of task 1.3 of

WP1 which concerns the estimation of future traffic flows in the European port system (in the short, medium and long term).

3 SYNTHESIS OF THE INFORMATION REGARDING THE CONTAINER TRANSSHIPMENT VOLUMES

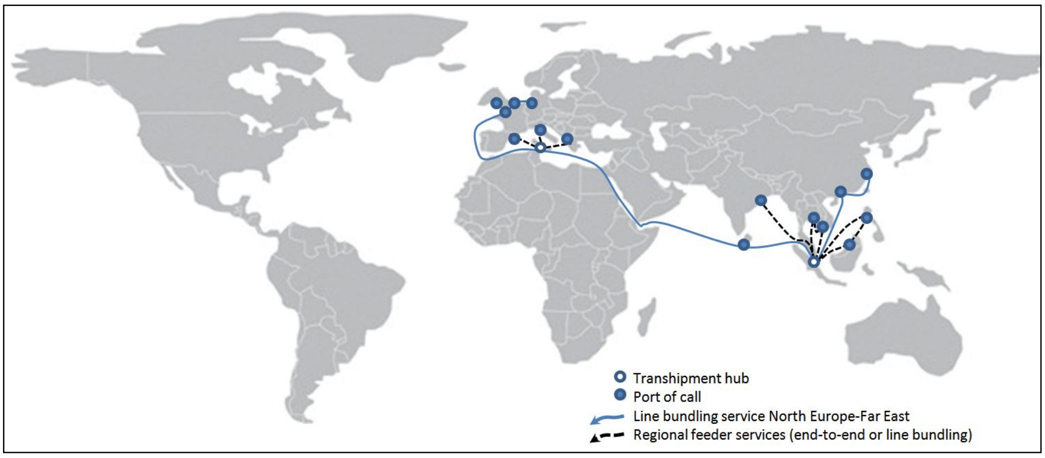
3.1 Definition of transshipment

From a network perspective, the location and function of container terminal facilities is not always guided by the proximity of the terminal/port toward a local/regional hinterland region. Also in Europe, the cargo distribution patterns of container ports not only rely on connecting maritime flows to inland transport modes (road haulage, rail and barge). In a growing number of ports, container shipping lines send their deep sea vessels to intermediate locations between origins and destinations where containers are transhipped between vessels. Thus, container cargo is transshipped by combining/linking two or more liner services. These intermediate nodes are added to a network when considered appropriate by the network operators in view of overall performance of the network. Shipping lines, in fact, aims at increasing the average utilization rate of vessels (i.e. to minimize empty slots on-board), in order to achieve economies of scale and go to break-even.

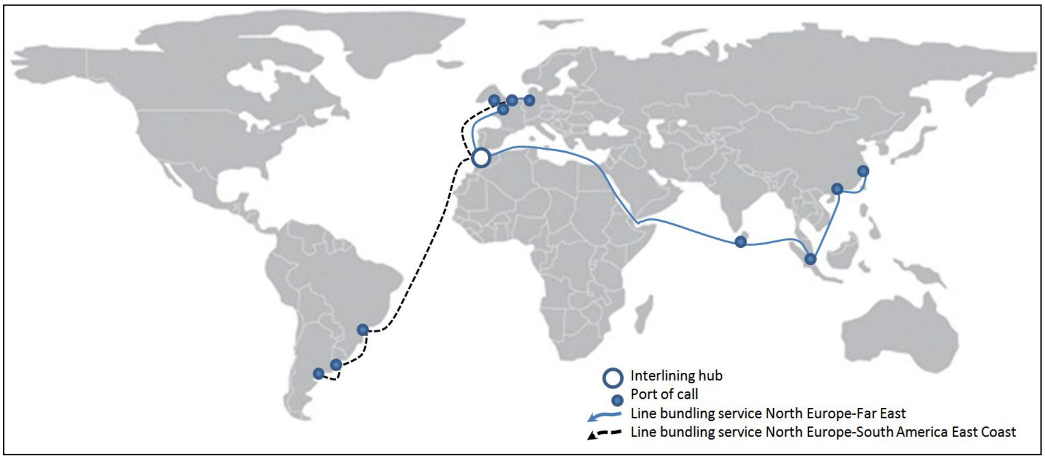
Three forms of sea-sea transshipment exist: hub-and-spoke (hub/feeder), interlining and relay (Figure 24). In all three cases deepsea vessel discharges containers in the transshipment terminal that is later on (typically 1 to 3 days) picked up by a smaller container ship (feeder) or another large deepsea vessel (relay and interlining). Drewry (2010) estimates that 85% of the global transshipment market is connected to hub-and-spoke operations and 15% to relay/interlining. As we will discuss later in this report, these figures can vary significantly between individual transshipment ports, also within Europe. Originally, transshipment operations were introduced by shipping lines by adopting the above mentioned hub-and-spoke scheme, for serving small ports holding an insufficient nautical accessibility (e.g., river and/or terminal depth, canal and tidal constraints, etc.) and/or endowment of infra- (e.g., quay length, yard space, etc.) and supra-structures (number and type of cranes, warehouses, rail marshalling yards, etc.). Later on, given the increasing feedering costs, shipping lines progressively introduced other forms of transshipment, i.e. relay and interlining, which do allow to “multiply” the destinations (ports) served, without necessitating the deployment of additional (small) vessels.

Figure 24 Types of sea-sea transshipment (Source: Ducruet and Notteboom, 2012)

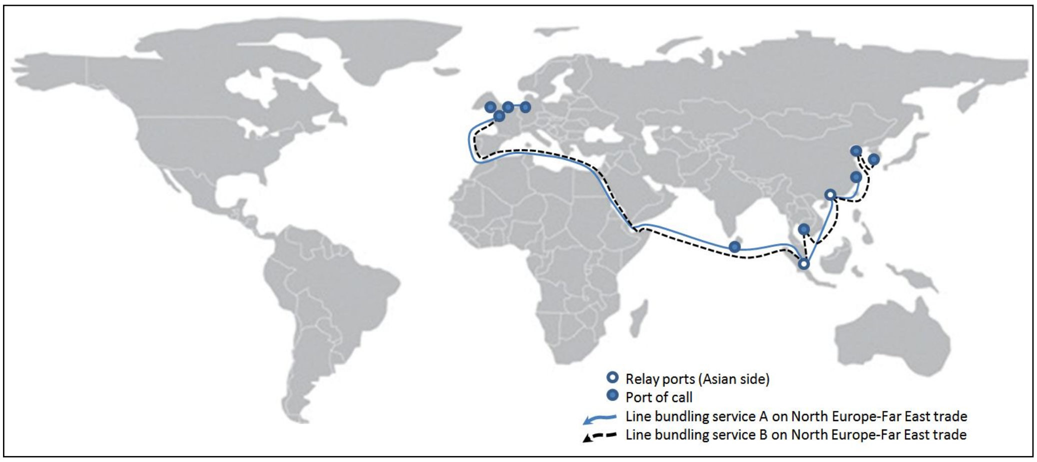
Hub/feeder (hub-and-spoke) network



Interlining



Relay



Source: Ducruet and Notteboom, 2012

The early transshipment ports started developing in the Far-East since the 1970s/1980s for connecting those countries and regions not directly served by main-haul shipping services. Singapore, Kaohsiung (Taiwan), Busan (South Korea) and, to a lesser extent, Hong Kong (China SAR) were the pioneering ports extensively used by major ocean carriers for transshipping containers. Later on, almost pure transshipment terminals/ports (i.e. with a transshipment incidence of 75% or more) emerged primarily since the mid-1990s within many global port systems: Freeport (Bahamas), Salalah (Oman), Tanjung Pelepas (Malaysia), Gioia Tauro, Algeciras, Taranto, Cagliari, Damietta and Malta in the Mediterranean, to name but a few.

These transshipment hubs have a range of common characteristics in terms of nautical accessibility, proximity to main shipping lanes (i.e. low diversion distance from the trunk routes) and ownership, in whole or in part, by carriers or international terminal operators. These nodes multiply shipping options and improve connectivity within the network through their pivotal role in regional hub-and-spoke networks and in cargo relay and interlining operations between the carriers' east–west services and other inter- and intra-regional services. Next to the 'pure' transshipment hubs, there are many ports combining significant gateway cargo flows with a hinterland orientation with transshipment flows. The situation and figures for the European port system will be provided later in this report.

3.2 A global perspective of the transshipment market

The shipping industry has witnessed spectacular growth in container trade, fuelled by the globalization process and the large-scale adoption of the container. Worldwide container port throughput increased from 36 million TEU in 1980 and 88 million TEU in 1990 to about 528 million TEU in 2008 and 623 million TEU in 2012. Around 79% of the world port throughput involved laden containers, about 21% are empty containers. In addition, about 28% of the total throughput consists of transshipped containers. Sea-sea transshipment shows the strongest growth and more than tripled in the last 15 years (Table 6).

Table 6 World container port throughput and its components (million TEU)

Year	Total port throughput	Port-to-port full	Port-to-port empty	Transshipment	Port-to-port full (% share)	Port-to-port empty (% share)	Transshipment (% share)
1990	87.9	70.3	17.8	15.5	80.0%	20.3%	17.6%
1995	145.2	118.8	26.8	31.2	81.8%	18.5%	21.5%
2000	235.4	185.0	50.4	57.9	78.6%	21.4%	24.6%
2005	400.3	319.0	81.3	106.4	79.7%	20.3%	26.6%
2009	481.8	376.9	104.9	137.0	78.2%	21.8%	28.4%
2012	622.6	493.1	129.5	174.6	79.2%	20.8%	28.0%
Incremental growth 2012 vs 1995	328.8%	315.1%	383.2%	459.6%			
Incremental growth 2012 vs 2005	55.5%	54.6%	59.3%	64.1%			

Source: Drewry (2006 and 2013), ITMMA/ESPO (2007).

In particular, South East Asia, Far East, Mid East, Latin America, and North and South Europe appear the most dynamic geographic areas where transshipment operations take place (

Table 7).

Table 7 Estimated container transshipment activity by region (transshipment volumes and incidence)

Region	2000		2007		2012	
	000 TEU	%	000 TEU	%	000 TEU	%
North America	1,908	3.3%	2,774	2.0%	2,670	1.5%
North Europe	6,376	11.0%	13,276	9.6%	14,739	8.4%
South Europe	7,071	12.2%	15,525	11.3%	18,956	10.9%
Far East	14,405	24.9%	37,917	27.5%	48,917	28.0%
South East Asia	16,413	28.4%	35,217	25.5%	44,107	25.3%
Mid East	4,653	8.0%	12,794	9.3%	16,761	9.6%
Latin America	3,970	6.9%	10,926	7.9%	15,181	8.7%
Oceania	160	0.3%	469	0.3%	542	0.3%
South Asia	1,186	2.0%	2,816	2.0%	3,560	2.0%
Africa	1,716	3.0%	4,896	3.6%	8,199	4.7%
Eastern Europe	7	0.0%	1,283	0.9%	1,016	0.6%
World	57,865		137,893		174,648	

Source: authors' own elaborations from Drewry (2008 and 2013).

Container shipping lines have been the key players in setting up liner services centred on transshipment hubs. Liner shipping networks are developed to meet the growing demand in global supply chains. Shippers demand direct services between their preferred ports of loading and discharge. The demand side thus exerts a strong pressure on the service schedules, port rotations and feeder linkages. Shipping lines, however, have to design their liner services and networks in order to optimize ship utilization and benefit the most from scale economies in vessel size. Their objective is to optimize their shipping networks by rationalizing coverage of ports, shipping routes and transit time. Shipping lines may direct flows along paths that are optimal for the system, with the lowest cost for the entire network being achieved by using transshipment nodes in the network.

The establishment of global networks has thus given rise to hub port development at the crossing points of trade lanes. Most of the pure transshipment hubs are located along the global beltway or equatorial round-the-world route (i.e. the Caribbean, Southeast and East Asia, the Middle East and the Mediterranean), see Figure 25.

Figure 25 Global transshipment markets in 2008

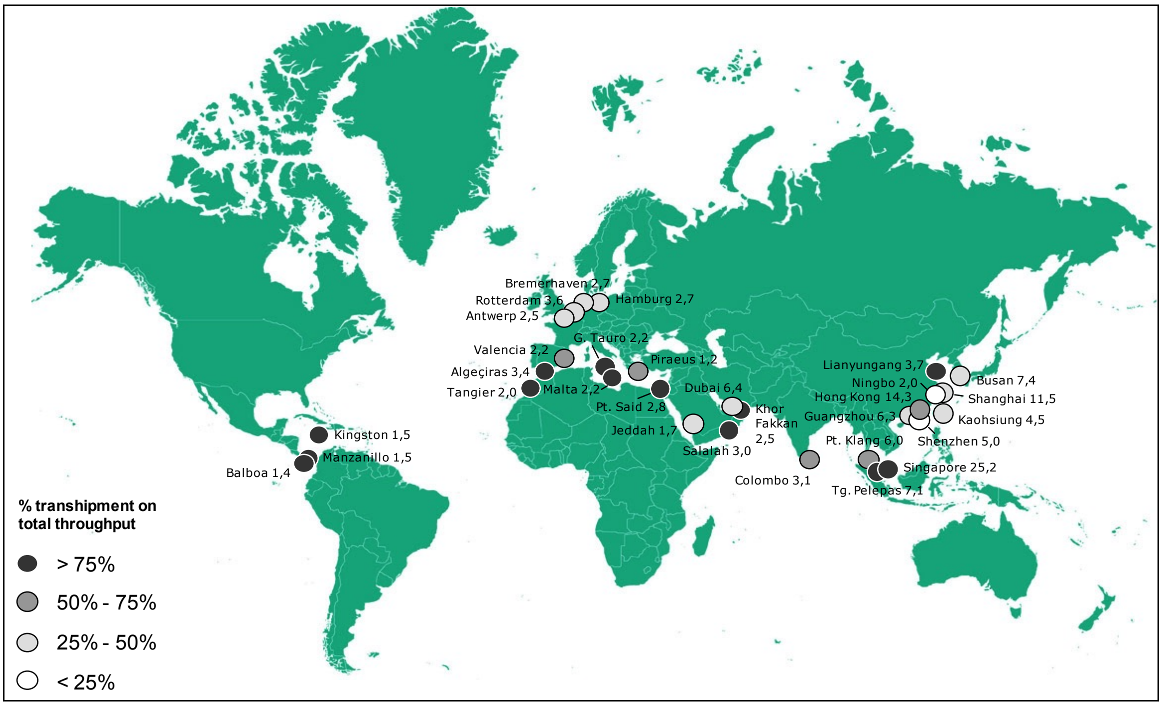
Source: Rodrigue and Notteboom, 2010

Port sites situated close to strategic passageways such as the Straits of Gibraltar, the Suez Canal, the Panama Canal and the Malacca Straits act as magnets on the development of transshipment, relay and interlining activities. The creation of transshipment hubs does not occur in all port systems, but around specific regions ideally suited for maritime hub-and-spoke distribution patterns, thanks to geographical, nautical and market-related advantages.

Some markets seem to offer the right conditions for the emergence of more than one transshipment hub (like the Mediterranean), while other port systems do not feature any transshipment. For example, the port region near the Malacca Straits (Singapore, Port Klang, Tanjung Pelepas) primarily acts as a sea-sea transshipment platform (i.e. mainly hub function not gateway function), whereas for instance the seaport system in the Yangtze Delta (Shanghai, Ningbo, etc.) is a gateway region giving access to vast service areas in the Delta and along the Yangtze River and with a long transshipment incidence. In the US, many impediments in American shipping regulations gravitating around the Jones Act have favoured a process of port system development with limited (feeder) services between American ports and the absence of US-based transshipment hubs (Freeport and other ports in the Caribbean to a limited extent take up this role), see Brooks (2009). The hubs have a range of common characteristics in terms of nautical accessibility, proximity to main shipping lanes and ownership, in whole or in part, by carriers or multinational terminal operators.

Most of these intermediate hubs are located along the global beltway or equatorial round-the-world route (i.e. the Caribbean, Southeast and East Asia, the Middle East and the Mediterranean). These nodes multiply shipping options and improve connectivity within the network through their pivotal role in regional hub-and-spoke networks and in cargo relay and interlining operations between the carriers' east-west services and other inter- and intra-regional services. Figure 26 clearly shows the positioning of major hubs along East-West services in the major port regions across the globe.

Figure 26 Main transshipment hubs worldwide: container volumes transshipped in 2011



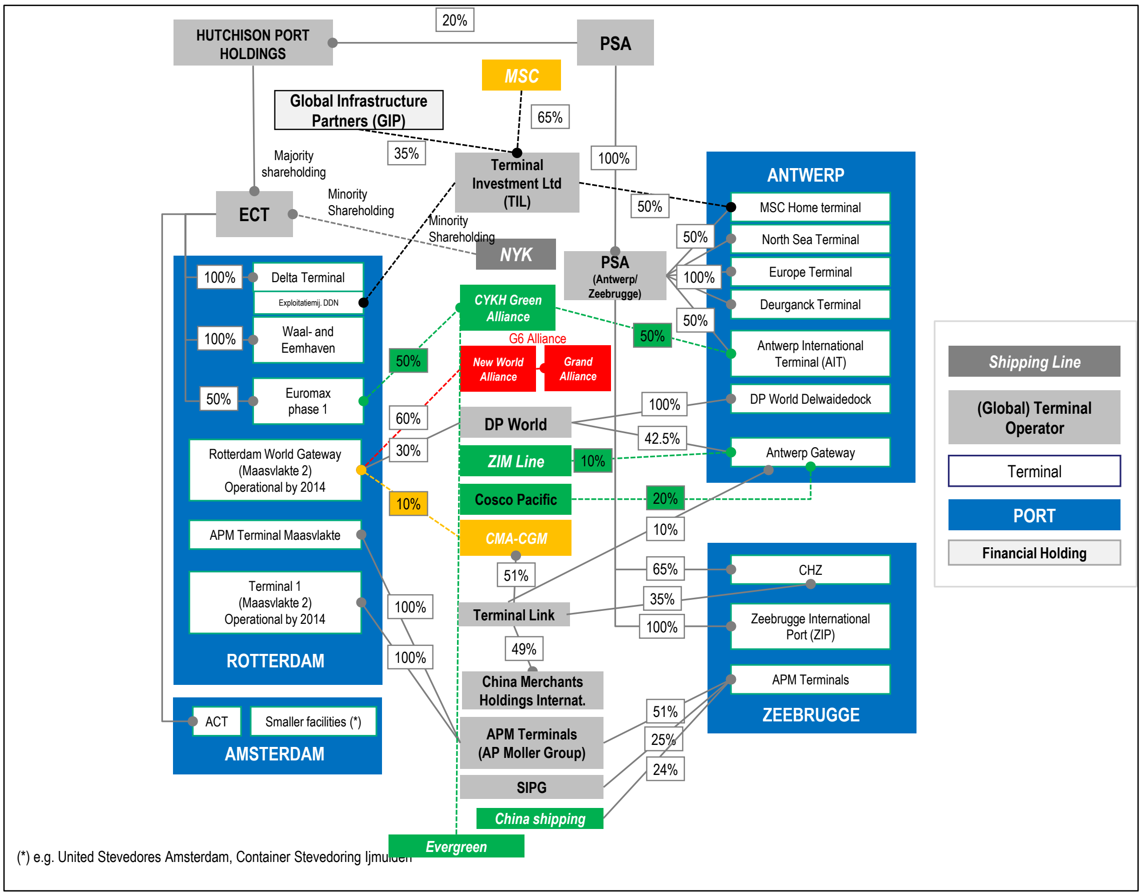
Source: authors' own elaborations from Drewry (2012).

The black dots refer to pure transshipment hubs (transshipment incidence above 75%); the dark grey refers to mixed ports, whereas the other symbols indicate gateway ports having a considerable portion of transshipment traffic. In this regard, in Asia clearly emerge the dominant position of some important gateway ports holding a strong transshipment share (in most cases below 50%), such as Hong Kong (SAR), Mainland Chinese ports, besides Pusan (South Korea), Kaohsiung (Taiwan).

Analogously, in North Europe, "historical" load centres like Rotterdam, Antwerp, Bremerhaven and Hamburg hold a key role in transshipment operations for serving UK, Baltic, and Scandinavia. Finally, we find pure transshipment ports, which are strategically located along the trunk routes and therefore minimize the diversion distance: Kingston, Manzanillo and Balboa in Central America, Tangier, Algeciras, Gioia Tauro, Piraeus and Port Said in the Mediterranean, Salalah, and Khor Fakkan in Mid East, and Singapore, Tanjung Pelepas in South East Asia. Some of these pure transshipment hubs were realized as Greenfield projects (e.g. Tanjung Pelepas, Salalah, for satisfying the growing demand of container handling in specific geographic areas).

To support the development of transshipment activities in liner service networks the top tier container shipping lines have shown a keen interest in developing dedicated terminal capacity. These dedicated facilities help to better control costs and operational performance and as a measure to remedy against poor vessel schedule integrity (see Notteboom, 2006 and Dullaert et al., 2007 for a discussion on schedule unreliability). Maersk Line's parent company, AP Moller-Maersk, operates a large number of container terminals in Europe (and abroad) through its subsidiary APM Terminals. CMA-CGM (via its 51% share in Terminal Link), MSC (via its 65% stake in Terminal International Ltd), Evergreen, Cosco and Hanjin are among the shipping lines fully or partly controlling terminal capacity around the world. Global terminal operators such as Hutchison Port Holdings, PSA and DP World are increasingly hedging the risks by setting up dedicated terminal joint ventures in cooperation with shipping lines and strategic alliances. Terminal operators also seek long-term contracts with shipping lines using gain-sharing clauses. The above developments gave rise to a growing complexity in terminal ownership structures and partnership arrangements as demonstrated in Figure 27 for the Rhine-Scheldt Delta.

Figure 27 Terminal ownership in the Rhine-Scheldt Delta



Source: Notteboom (2013).

In academic literature it is often argued that the position of pure transshipment/interlining hubs is vulnerable and that the transshipment market is highly dynamics. First of all, the insertion of hubs often represents a temporary phase in connecting a region to global shipping networks. Hub-and-spoke networks would allow considerable economies of scale of equipment, but the cost efficiency of larger ships might be not sufficient to offset the extra feeder costs and container lift charges involved. Once traffic volumes for the gateway ports are sufficient, hubs are bypassed and become redundant (see also Wilmsmeier and Notteboom, 2010). Secondly, transshipment cargo can easily be moved to new hub terminals that emerge along the long distance shipping lanes. The combination of these factors makes that seaports which are able to combine a transshipment function with gateway cargo typically obtain a less vulnerable and thus more sustainable position in shipping networks than the pure transshipment hubs.

3.3 Data collection on transshipment activities in European ports

How can container transshipment data (T/S data) be collected in a meaningful way? During the PORTOPIA workshop with ESPO in Rome on 30 October 2013 it became clear that a number of ports collect transshipment data but long time series are hard to find and methodologies might differ. At a more aggregated level, transshipment data is available via estimates included in studies developed by consultancy firms (cf. Drewry, Dynamar, etc.). Transshipment data per port are rarely ever publicly available per transshipment market (cf. East Med, West Med, UK, Baltic, etc.) and, if figures are available, methodologies (e.g. aggregation of countries) might differ substantially. Also, transshipment data per shipping line are not public. Only liner service routing patterns (supply side) can offer some insight on the relative position of a specific shipping line in the transshipment business of a port.

Participants to the workshop in Rome further made the following observations:

- Terminal operators collect sea-sea transshipment data. Most port authorities depend on information from terminal operators to publish T/S data;
- Some port authorities or port organizations publish T/S data on a regular interval. This is for instance the case for Puertos del Estado in Spain;
- The question was raised whether FEPORT could assist in collecting T/S data;
- In general it would be very difficult to get T/S data for hub-feeder and relay operations separately;
- Some workshop participants questioned the relevance of having T/S data: it might be more relevant to collect data on intra-European container flows as a percentage of the total container throughput of a port;
- It was stressed that next to total T/S data you also need to collect data on import, export flows and loaded/empties. The Rapid Exchange System would provide a good basis for the collection of such data;
- It will be very difficult to have a complete picture of the T/S market in the Med as many of the T/S ports are not in a EU member state (Tanger Med, Port Said, Damietta, Ambarli, etc.). This problem would not occur for North European T/S flows;
- Some participants underlined that it would also be useful to collect data on T/S in other cargo groups such as new cars and oil products;
- Data on T/S typically focus on ports that serve as transshipment point. This leads to double counting as each T/S container is counted twice. For many ports it would be interesting to know whether the import or export containers they handle are originating from a transshipment hub or, alternatively, are brought to the port via a direct call. Today these figures are difficult to gather;

- During the discussions it became clear that the e-manifest (linked to the use of Port Community Systems or PCS) could be a great source for getting more information on T/S data.

Based on the above observations, the research team decided to provide a comprehensive picture of the T/S market in the European port system by collecting data from various sources:

- Reports by consultancy firms (Drewry, Dynamar, etc.);
- Academic papers dealing with the T/S market and the role of intermediate locations;
- Data publicly available on websites or publications of port authorities or port organizations.

3.4 An overview of the T/S market in Europe and in European ports

In Europe, hubs with a transshipment incidence of 85% to 95% can only be found in the Med. Northern Europe does not count any pure transshipment hub. Gateway traffic always goes hand in hand with transshipment activity as the two are combined in each vessel call.

None of the players can look for transshipment in isolation, therefore. Hamburg, one of the North-European leader in terms of sea-sea flows, has a transshipment incidence of about 30% (figure 2012), far below the elevated transshipment shares in the main south European transshipment hubs. Barcelona and Valencia are among the large Med ports combining an important gateway function with significant transshipment flows. According to MDS Transmodal (2006), sea-sea transshipment in UK ports represented only 7% of total lolo throughput in 2004. All Scottish ports together only handle about 300,000 TEU, a situation leading to significant container flows by truck and rail coming from gateway ports in the south and southeast of the United Kingdom.

3.4.1 The environmental and business transformations

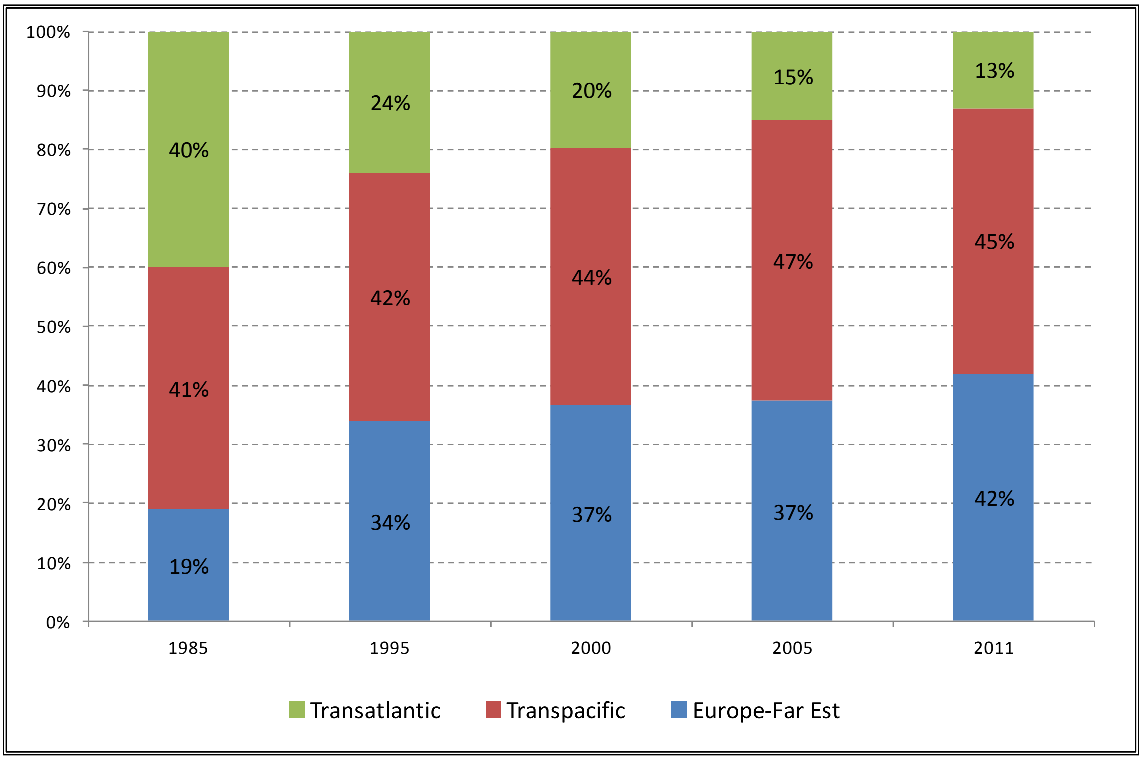
The last few decades have been characterized by profound transformations in the container shipping business as well as in port governance settings and operations. In addition, the changes occurring in the economic environment and in world trade dynamics determined a repositioning of traffic flows and imposed a "re-tuning" of carriers' strategies, in terms of geographic deployment of vessels, achievement of increasing economies of scale, and resort to inter-firm cooperative schemes.

In particular, the transshipment business in Europe has been subject to numerous factors, which progressively changed the geography of trade and provoked new operational and organizational challenges to shipping lines. In essence, the main transformations affecting the transshipment business in North and South Europe can be summarized as follows:

Dramatic traffic growth along the Europe-Far East trade lane; over the last 20 years the economic growth of Far East and the delocalization of production processes in those countries, triggered the growth of trade flows from China, South Korea, Japan, Taiwan, etc. to major European countries. Within the three main deep sea East-West shipping services the Europe-Far East progressively gained traffic raising its share from 18% in 1985 to 42% in 2011 (Figure 28). In 2012 the Europe-Far East and the Transpacific are definitely the two biggest trade lanes, accounting for 20 and 22 million

TEUs of traffic (full containers) respectively. As a result of this growth, the Mediterranean basin and its ports recovered their own "centrality" within deep-sea trade patterns, thanks to the transit of (almost) all mother vessels via the route Suez/Gibraltar. In this regard, since the late 1980s-early 1990s the development of transshipment operations (and the rise of new hubs like Gioia Tauro and Taranto) had the objective to capture a portion of the growing traffic flow coming from Asia and directed to North European markets.

Figure 28 The emergence of Europe-Far East long-haul shipping services: New "centrality" of the Mediterranean



Source: authors' own elaboration from Containerisation International, Drewry (various years).

Expansion of the European (hinterland) market; the progressive enlargement of the EU to other countries and in particular towards East favoured the entry of new markets within international trade lanes. The scarce infrastructural endowment in the ports of those emerging EU countries (e.g., Romania, Bulgaria, Poland, etc.) and in bordering countries (Russia, Ukraine, Turkey, etc.), and the relatively lower (international) trade volumes generated in the initial stages of development in such nations, required the massive introduction of transshipment operations by shipping lines in order to be able to serve the rising markets. Constantza in Romania, Ambarli in Turkey, Gdynia in Poland are just some examples of the greenfield ports acting as transshipment hubs for connecting via feedering a number of minor ports with major deep sea service.

Emergence of North African ports; differently from gateway port operations (i.e. import/export), which strongly reply on hinterland transportation and the effectiveness of inland transport modes (road, rail and barge) and, ultimately, of the overall transport chain, transshipment volumes present a much higher degree of "contestability". In other terms, a hub port can base its own competitiveness just on a few critical factors, e.g. the geographical position, the operational performance (fast and reliable) and pricing strategy. This is why transshipment volumes can be "delocalized" by shipping lines rather easily from one port to another, even 500/1,000 nautical miles away. More specifically, looking at the situation in the Mediterranean Sea, the pure transshipment hubs are those, which are much more exposed to the volatility of traffic (transshipment) flows, which in turn derives from the potentially easy delocalization of transshipment operations elsewhere. In this regard, since a few years, the hub ports of EU countries in the Mediterranean are experiencing the fierce competition of newcomers located in North Africa, which found their competitive advantage on the following factors: a) cost advantages (lower cost of space and very low wages); b) "legislative" advantages (simplified administrative procedures for FDIs, governmental incentives, etc.); c) geographical position advantages (lower diversion distance respect to the trunk route Suez/Gibraltar); d) physical advantages (deep-water terminals with large backyard spaces). Table 8 provides more details on the major new hub terminals arising in North Africa. Some of them are already fully operational (Tangier), while others are under construction or just in planning (Enfidha). The emergence of these African hubs, of course, is determining a restructuring of transshipment flows within the Mediterranean and it is feeding an "inter-generational" competition between the traditional hubs (born in the 1980s and 1990s) and the latecomers, which recently entered into the market (

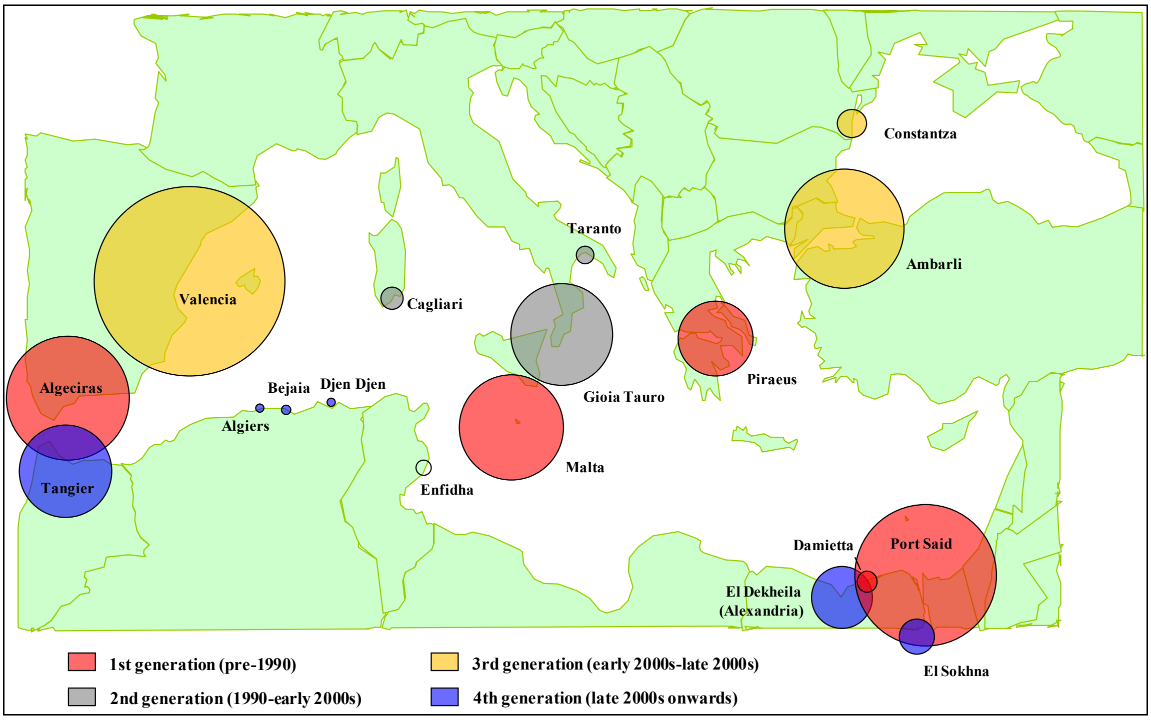
Figure 29).

Table 8 The delocalization of transshipment in North Africa: the building of "competing" port capacity

Ports	Terminal Projects	Shareholders	Opening year	Capacity ('000)
Tangier	APM Terminals (T1)	APTM (90%), Akwa (10%)	Sept 2007	1300
	APM Terminals (T3)		>2012	3000
	Eurogate Tanger (T2)	Eurogate (50%), CMA-CGM (30%), MSC (20%)	Oct 2008	1300
	PSA Terminal (T4)	PSA (50%), Marsa Maroc, SNI	>2012	2000
Algiers	DP World Djazair	DPW (100%)	2009	700
Djen Djen	DP World Djazair	DPW (100%)	2009	1500
Port Said	Suez Canal Container Terminal	APTM (55%), Cosco Pacific (45%)	Oct 2004	3000
	SCCT – Phase 2		>2012	3000
	Port Said Container Terminal	Port Said Container and Cargo Handling Company (100%)	1988	900
Enfidha	Container Terminal	Phase 1 (HPH)	2011-2015	2500-4000
		Phase 2	2016-2021	1100
		Phase 3	2022-2030	2000
El Sokhna	El Sokhna Container Terminal	DPW (90%), Amiral Holdings (10%)	Feb 2008	900
Alexandria (El Dhekila)	Alexandria International Container Terminal	HPH (50%), Alexandria PA (50%)	2007	500
Damietta	Damietta Container Terminal	Damietta Container & Cargo Handling Co (100%)	1986	1500
	Phase 2	China Shipping (20%), CMA-CGM (20%), others	>2013	2500

Source: Ferrari et al. (2011).

Figure 29 The generations of hubs in the Mediterranean basin



Source: Parola (2013).

Growing resort to economies of scale by carriers; as widely known major carriers, given the instability of freight rates and the scarce financial margins, undertook aggressive cost leadership strategies, in order to minimize the average cost per slot on-board. This choice led to the increase of the maximum vessel size on the mainhaul services: in 1996 the biggest container vessel had a capacity around 6,500 TEUs, in 2003 over 8,000 TEUs, in 2006 around 15,000, and since 2013 even 18,000. As economies of scale can be better exploited on the most crowded (in terms of traffic volumes) and longest (in terms of total distance) shipping trade lanes, i.e. East-West deep sea services. In particular, Europe-Far East services (as "end-to-end" services) are much longer of Transatlantic and Transpacific one and, therefore, Mediterranean and Northern European ports are called (at least potentially) by the biggest vessels in operation. This now offers strong opportunities in South and North European markets, as the deployment of bigger vessels increases the need of transshipment operations both in pure hub ports (in the Mediterranean) and large gateway ports (mostly in Northern Europe).

Growing resort to consortia and strategic alliances by carriers; for smoothing the effects of a potentially dangerous and destructive competition, since the mid-1990s the major shipping line strengthened their involvement in consortia and strategic alliances. The resort to cooperative agreements represents a key building block within the overall strategic framework of carriers. Thanks to consortia and alliances, in fact, shipping lines aim at aggregating demand flows (and reduce investments in mega vessels), with the ultimate objective of maximizing ship saturation and go to break even. The development of a multitude of consortia and the building of 2/3 big and rather "stable" strategic alliances (the 2M Alliance, composed by the two giants Maersk, MSC, is becoming operational right now (2015)) produced a strong concentration of the demand of container handling in a handful of players. These big players, indeed, massively resorted to transshipment operations (for filling in their big vessels) in the

Mediterranean and in North Europe (as well as in Asia and Central America) and frequently (co-)invested in (hub) terminals for better controlling the ports phase. In Europe, as we will see later, we find many examples of carriers which vertically integrate their activities in ports, by taking stakes in some port facilities.

Economic and trade crisis; as commonly acknowledged the year 2009 was the first "crisis" year within the overall history of the containerization. In 2009 the world throughput collapsed by almost 9%. The weakening of traffic volumes from Far East to Europe (even 20% less) provoked a restructuring of shipping services by carriers in the Mediterranean and in North Europe. As a result, in some cases, direct services (for instance from China to Black Sea) were replaced by indirect services via transshipment hub, thus determining an increase of transshipment activity in some ports. At the same time, however, ocean carriers, because of the strong pressure on their cost structure (which lower profit margins), started to be much more "severe" in the selection of their transshipment hubs. This strategic turn drove some ports to lose important traffic shares (e.g. Gioia Tauro, etc.), suggesting the risk of a progressive marginalization in the long term, also because of the emerging competition from Africa (see Point 3).

3.4.2 The evolution of transshipment operations in North and South Europe

The transshipment incidence for a sample of European container ports for the years 2004, 2008 and 2012 is depicted in Table 5. In the present report we collected data on the major container ports in each EU country, limiting our analysis to those ports showing a substantial and regular transshipment activity over time. As a result, we excluded from the study the ports, which, despite the relevant throughput figures, presented negligible transshipment volumes. Overall, we gathered information (i.e. diversion distance, transshipment incidence, total throughput, transshipment volumes) regarding the main sample of European ports (see Table 9). In a second stage, for performing deeper and more specific analyses, we defined a smaller sample (27 ports), taking into account only the container ports showing a transshipment share above 5% for at least one of the three considered years.

Table 9 Transshipment incidence in European container ports (based on throughput in TEU)

Port name	Port range	Diversion distance (nm)	Total TEU 2004	T/S TEU 2004	T/S %	Total TEU 2008	T/S TEU 2008	T/S %	Total TEU 2012	T/S TEU 2012	T/S %
Antwerp	Hamburg-Le Havre Range	135	6063747	1393509	23.0%	8662891	2887881	33.3%	8635169	2504000	29.0%
Zeebrugge	Hamburg-Le Havre Range	65	1196755	293205	24.5%	2209713	575000	26.0%	1953170	490000	25.1%
Rotterdam	Hamburg-Le Havre Range	67	8281000	3296400	39.8%	10783825	2588000	24.0%	11865916	4265000	35.9%
Amsterdam	Hamburg-Le Havre Range	73	51924			436074			68933		
Hamburg	Hamburg-Le Havre Range	85	7003479	2299085	32.8%	9737110	3298000	33.9%	8863896	2659000	30.0%
Bremerhaven	Hamburg-Le Havre Range	10	3469104	1056394	30.5%	5448189	2765000	50.8%	6115211	2750000	45.0%
Wilhelmshaven	Hamburg-Le Havre Range	10	43032			0			23888		
Le Havre	Hamburg-Le Havre Range	95	2131833	645000	30.3%	2488654	750000	30.1%	2303750	390000	16.9%
Dunkirk	Hamburg-Le Havre Range	38	200399			214485			260283		
Rouen	Hamburg-Le Havre Range	215	139200			142035			127528		
St-Nazaire	Atlantic range	330	138854			149281			184838		
Leixos	Atlantic range	65	349495			450026			632673		
Lisbon	Atlantic range	66	514769			556062			485761		
Sines	Atlantic range	66	19211	0	0.0%	233118	115000	49.3%	553063	359491	65.0%
Bilbao	Mediterranean	485	468953	6800	1.5%	557355	13853	2.5%	610131	1134	0.2%
Malaga	Mediterranean	60	245000	225000	91.8%	428623	409759	95.6%	336265	300443	89.3%
Vigo	Atlantic range	100	197269	3700	1.9%	247873	3371	1.4%	198517	8390	4.2%
Sevilla	Mediterranean	167	111092	36	0.0%	130452	0	0.0%	156193	0	0.0%
Bahia de Cadiz	Mediterranean	70	114549	16700	14.6%	126408	1093	0.9%	96215	916	1.0%
Algeciras	Mediterranean	18	2937381	2487609	84.7%	3324364	3164696	95.2%	4070791	3707953	91.1%
Tarragona	Mediterranean	490	17214	1450	8.4%	47415	875	1.8%	188851	102083	54.1%
Barcelona	Mediterranean	555	1910723	571306	29.9%	2569572	997588	38.8%	1749974	435817	24.9%
Valencia	Mediterranean	320	2137137	393921	18.4%	3597215	1578482	43.9%	4469754	2280701	51.0%
Marsaxlokk	Mediterranean	75	1461174	1382819	94.6%	2337000	2174000	93.0%	2540000	2425000	95.5%
Marseille	Mediterranean	650	916277	87000	9.5%	851425	0	0.0%	1062408		0.0%
Genoa	Mediterranean	767	1628594	127030	7.8%	1766605	169560	9.6%	2064806	181128	8.8%
Leghorn	Mediterranean	680	638586	36500	5.7%	778864	41000	5.3%	549047	26506	4.8%
Naples	Mediterranean	463	347500	0	0.0%	481521	0	0.0%	546818	0	0.0%
Ravenna	Mediterranean	1190	169432	0	0.0%	212324	0	0.0%	208162	0	0.0%
Savona	Mediterranean	745	83891	0	0.0%	252837	0	0.0%	75282	0	0.0%
Trieste	Mediterranean	1270	174729	0	0.0%	335943	0	0.0%	408023	0	0.0%
Venice	Mediterranean	1250	290898	0	0.0%	379072	0	0.0%	429893	0	0.0%
Koper	Mediterranean	1270	153347	0	0.0%	353880	0	0.0%	572263	0	0.0%
La Spezia	Mediterranean	730	1040438	72831	7.0%	1246139	85000	6.8%	1247218	91111	7.3%
Gioia Tauro	Mediterranean	473	3261034	2724580	83.5%	3467772	3221000	92.9%	2721000	2548000	93.6%
Taranto	Mediterranean	477	763318	613708	80.4%	786655	677000	86.1%	263461	196398	74.5%
Cagliari	Mediterranean	176	494766	450900	91.1%	307527	217000	70.6%	621536	568705	91.5%
Piraeus	Mediterranean	445	1541563	790822	51.3%	433582	35554	8.2%	2734004	2187000	80.0%
Thessaloniki	Mediterranean	910	336069			238940			317751		
Felixstowe	UK/Ireland	45	2717000	561031	20.6%	3132000	269000	8.6%	3700000	305000	8.2%
Southampton	UK/Ireland	47	1441012	86461	6.0%	1617000	100000	6.2%	1600000	88000	5.5%
Tilbury	UK/Ireland	67	656783			962000			650000		
Thamesport	UK/Ireland	62	632000	34760	5.5%	773000	50000	6.5%	350000	28500	8.1%
Hull	UK/Ireland	290	310000			262000			230000		
Teesport	UK/Ireland	495	133000			155000			260000		
Liverpool	UK/Ireland	640	603000	37386	6.2%	672000	50000	7.4%	650000	52000	8.0%
Aarhus	Scandinavia/Baltic	776	400000			458000			404287		
Gdynia	Scandinavia/Baltic	1340	377236			610767			676349		
Gdansk	Scandinavia/Baltic	1340	43739	2186.95	5.0%	163704	50748	31.0%	928905	560000	60.3%
Szczecin	Scandinavia/Baltic		27680			62913			60000		
Riga	Scandinavia/Baltic	1685	150000			207122			362297		
Tallin	Scandinavia/Baltic	1860	111599			180927			227809		
St-Petersburg	Scandinavia/Baltic	2175	776576			1983110			2524680		
Helsinki	Scandinavia/Baltic	1900	500000			419809			404895		
Kotka (incl. Hamina)	Scandinavia/Baltic	1990	325730			627765			631042		
Gothenburg	Scandinavia/Baltic	660	713439			863881			899628		
Oslo	Scandinavia/Baltic	772	177019			190307			202791		
Constantza	Black Sea	1452	386368	154547	40.0%	1380935	1036000	75.0%	684059	170000	24.9%
Las Palmas	Atlantic range	850	1215277	650000	53.5%	1311745	835094	63.7%	1207962	790232	65.4%

Notes: T/S = transshipment, T/S % = transshipment incidence (share of transshipment in total TEU throughput), diversion distance = one-way distance between main shipping route and port of call

Figures highlighted in red are not confirmed estimates; figures highlighted in yellow are based on secondary sources but not confirmed by the respective ports.

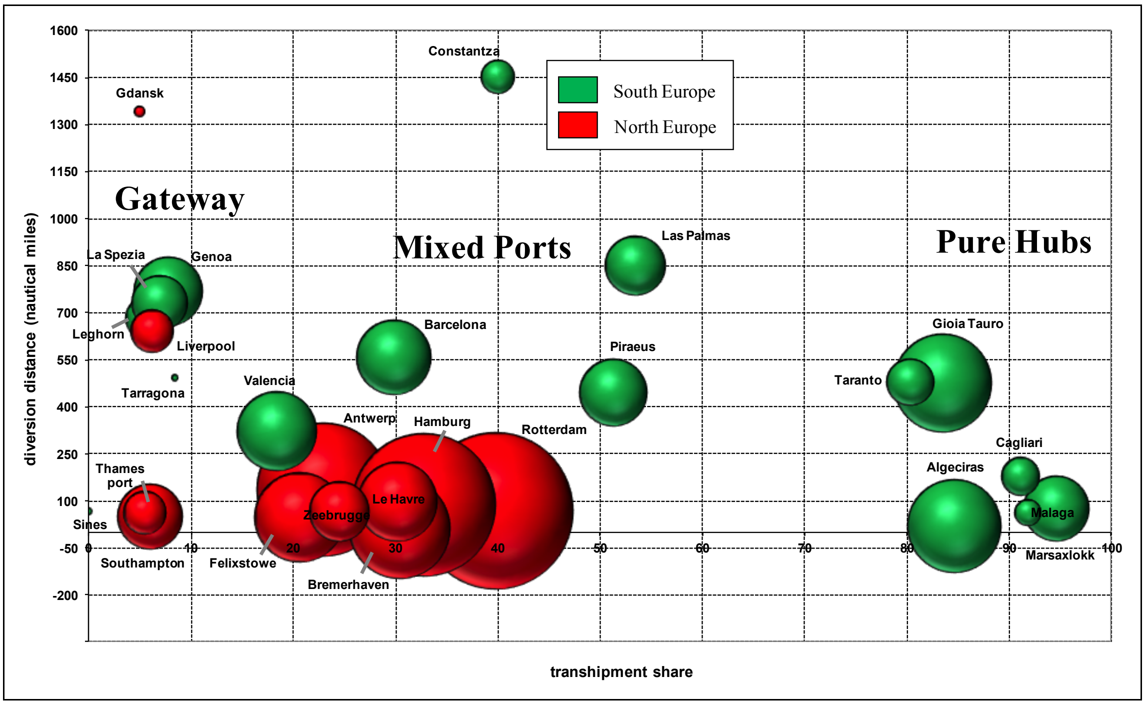
Source: authors' own compilation based on port authority websites, press releases and various specialized reports from Drewry, ITMMA, ISL and Dynamar.

Figure 30,

Figure 31, and Figure 32 provide a graphical presentation of the relation between transshipment incidence and the one-way ship diversion distance from the main shipping route to the ports of call in 2004, 2008 and 2012 respectively. First, the analysis of this sub-sample of ports (27) allowed to define a taxonomy based on the distinctions emerging combining the diversion distance of each port with the transshipment incidence. Basically, we defined three types of ports:

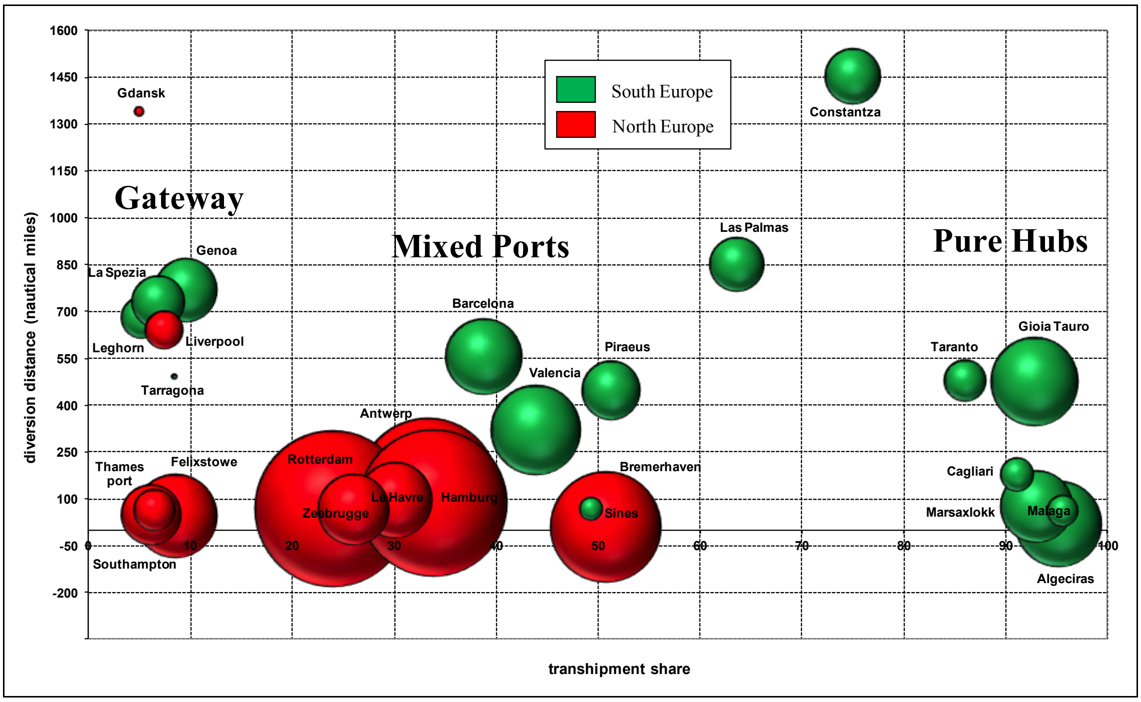
(1) The "gateway ports", which regardless the amount of total throughput values, present a very low transshipment incidence and therefore based almost all their competitiveness on import/export cargo and the commercial relations with the hinterland;
(2) The "mixed ports", which often unveil rather high throughput volumes (in this category, in fact, we also include the big load centres located in Northern Europe) and present a valuable, although not dominant, incidence of transshipment activities on the total;
(3) The "pure transshipment hubs", which found almost all their success on sea-to-sea handling operations. Besides, this latter category includes offshore facilities recently constructed in remote and low-cost areas, faraway from populated cities, as for the pure hubs of course there is no need to be connected with a commercial backyard (hinterland).

Figure 30 Transshipment incidences vs. diversion distance for a sample of European container ports - year 2004



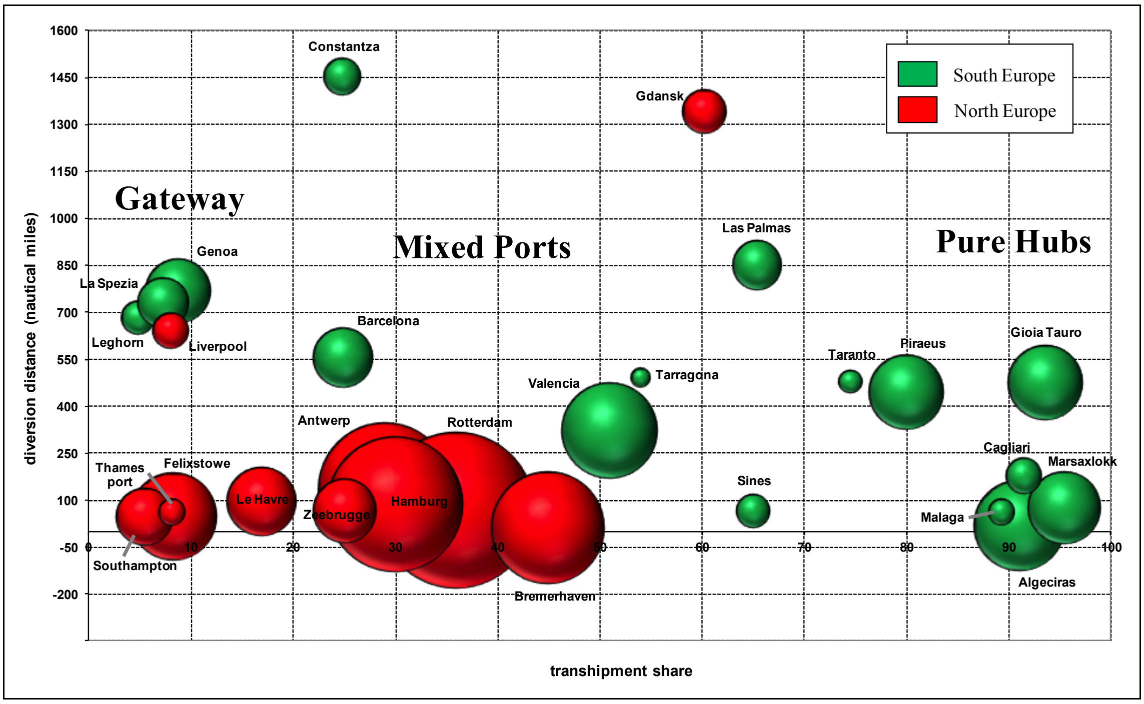
Source: authors' own elaborations from Drewry (2005), Containerization International, port authority websites and specialized press.

Figure 31 Transshipment incidence vs. diversion distance for a sample of European container ports - year 2008



Source: authors' own elaborations from Drewry (2009), Containerization International, port authority websites and specialized press.

Figure 32 Transshipment incidence vs. diversion distance for a sample of European container ports - year 2012



Source: authors' own elaborations from Drewry (2013), Containerization International, port authority websites and specialized press.

More specifically, looking at Figure 30,

Figure 31, and Figure 32, North Italian ports and UK ports are predominantly involved in gateway functions. For these ports became therefore critical to achieve a high level of synchronization with the respective hinterland, which may be reached improving and fostering the capacity of inland infrastructure and corridors.

The load centres in the Hamburg-Le Havre range; Barcelona and Valencia act as mixed ports. For this nodes traditional gateway functions did not exclude the development of transshipment activities, which provide further business opportunities for increasing total throughput volumes and provide bundled services (combining gateway handling with transshipment) to main customers. Also in this case, of course, a critical success factor is represented by the availability of reliable and high capacity inland connections, preferably via rail or barge.

Pure hubs emerge in those places where the hub and spoke and interlining/relay solution ensure competitive advantages respect to direct port calls at mainland ports. In particular, they are located along the trunk route between Suez and Gibraltar, minimizing the diversion distance. Examples of pure hubs in the Mediterranean are Marsaxlokk, Algeciras and Piraeus (started before 1990), Gioia Tauro, Cagliari and Taranto (started in the mid/late 1990s).

The simultaneous analysis of Figure 30,

Figure 31, and Figure 32 allows investigating the phenomenon assuming a longitudinal perspective, also evaluating main treats and opportunities originating from the transshipment business. Basically, the ports protagonist of transshipment in Europe remain the same within the overall period. Nevertheless, some interesting "shifts" emerge highlighting the active behaviour of some new entrants such as Tarragona and Malaga in the South and Gdansk in the North. Transshipment activities, indeed, are proved to be a valuable business opportunities for fostering container traffic and attract additional customers. In this sense, the case of Piraeus is definitely an interesting one. Piraeus' traffic volumes (mostly ensured by transshipment) were decimated by labour disputes over privatisation during 2008, with total throughput falls of 938,000 and 208,000 TEU respectively and an almost total loss of transshipment at Piraeus. Piraeus handled over 900,000 TEU of transshipment traffic in 2003 and over half a million TEU as recently as 2007, but in 2008 that business virtually evaporated. Recovery has been ensured by the privatization of the main container terminal (which opened in October 2009) awarded to Cosco Pacific. In such a way, most transshipment operations of Cosco Container Lines and its partners have been moved to Piraeus. In 2012 the port of Piraeus handled over 2.7 million TEUs, showing a transshipment incidence above 80%.

Main data provided in this study, indeed, demonstrate how ports relying on a dominant transshipment share seem to be affected by a higher volatility, which originates from "up and down" trends of container growth/decline (2009 trade crisis) as well as the emergence of new entrants to the transshipment market, especially in North Africa (Rodrigue and Notteboom, 2010). See also Section 5.1, Points 3 and 6.

In fact, as the container port system may be triggered to support direct and end-to-end or line bundling service that bypass transshipment hubs the insertion of specific hubs into the overall network may just constitute a provisional stage. In other terms, in specific environmental contexts a hub can even become a redundant node in the network. In addition, transshipment hubs are exposed to changes in traffic volumes, originating from new entrants in the market that inevitably lead to transformations in the distribution of transshipment volumes among an increasing number of players and nodes. Under this perspective, some Italian ports such as Gioia Tauro and Taranto and other ports like Constantza experienced some commercial troubles with major customers and this has been translated into traffic loss, also accelerated by to the new competing hubs from North Africa.

Overall, the main conclusion is that the market is very different in North and South Europe: in the North in fact, transshipment is organized in a different way respect to Mediterranean Sea. In Northern Europe, in particular, no real transshipment hubs exist in the Hamburg-Le Havre range. The main ports of the area, in fact, although they handle very significant transshipment volumes (in TEU terms), they primarily act as load centres. They unveil a lower transshipment incidence respect to the high transshipment share characterizing main South European hubs (Rodrigue and Notteboom, 2010).

Table 10 identifies the main markets served and the main shipping lines involved in the transshipment business in each port (situation 2012). According to their geographic position within global shipping services transshipment ports have diverse foreland markets to be served. Offshore ports, which do not have any substantial gateway traffic component, are often devoted to relay and interlining operations. Las Palmas, Algeciras and Malta are good examples in that respect, although they still perform important hub-and-spoke operations via feedering services. In North Europe, load centres like Antwerp, Rotterdam, Hamburg and Bremerhaven traditionally have an important hub-and-spoke function in serving a lot of countries, e.g. UK, Baltic and Scandinavia. Conversely, the (smaller) gateway ports located in the Mediterranean Sea, e.g. Genoa, La Spezia, Barcelona serve much more limited and specific geographic areas via feedering and handle modest transshipment volumes. Analogous comments can be made for UK ports, such as Southampton, Liverpool and Felixstowe, whose transshipment function is basically limited to their own country.

Table 10 Main markets served and shipping lines involved in the transshipment business in the major ports.

Port	Range	Transshipment incidence on overall container traffics	Main markets served	Main players involved in transshipment operations
Las Palmas	Atlantic range	65.4%	Relay and interlining	MSC
Sines	Atlantic range	65.0%	Relay and interlining	MSC
Constantza	Black Sea	24.9%	Black Sea	#N/A
Antwerp	Hamburg-Le Havre Range	29.0%	UK and Baltic / Scandinavia	MSC, CMA-CGM, Cosco Lines, Hanjin, K-Line, Yang Ming Line, Zim
Bremerhaven	Hamburg-Le Havre Range	45.0%	Baltic / Scandinavia	Maersk, MSC
Hamburg	Hamburg-Le Havre Range	30.0%	Baltic / Scandinavia	Hapag-Lloyd
Le Havre	Hamburg-Le Havre Range	16.9%	UK	Maersk, CMA-CGM
Rotterdam	Hamburg-Le Havre Range	35.9%	UK and Baltic / Scandinavia	Maersk, Cosco Lines, Hanjin, K-Line, MSC, Yang Ming Line
Zeebrugge	Hamburg-Le Havre Range	25.1%	UK	Maersk, CMA-CGM
Algeciras	Mediterranean	91.1%	Relay and interlining	Maersk, Hanjin
Barcelona	Mediterranean	24.9%	West Mediterranean	#N/A
Cagliari	Mediterranean	91.5%	Central and East Mediterranean	#N/A
Genoa	Mediterranean	8.8%	Central Mediterranean	#N/A
Gioia Tauro	Mediterranean	93.6%	Central and East Mediterranean	Maersk
La Spezia	Mediterranean	7.3%	Central Mediterranean	MSC
Leghorn	Mediterranean	4.8%	Central Mediterranean	MSC
Malaga	Mediterranean	89.3%	Relay and interlining	#N/A
Marsaxlokk	Mediterranean	95.5%	West Mediterranean, interlining	CMA-CGM
Piraeus	Mediterranean	80.0%	East Mediterranean	Cosco Group
Taranto	Mediterranean	74.5%	Central and East Mediterranean	Evergreen
Tarragona	Mediterranean	54.1%	Relay and interlining	ZIM
Valencia	Mediterranean	51.0%	West Mediterranean	MSC
Gdansk	Scandinavia/Baltic	60.3%	Baltic / Scandinavia	Maersk Line
Felixstowe	UK/Ireland	8.2%	UK	#N/A
Liverpool	UK/Ireland	8.0%	UK	#N/A
Southampton	UK/Ireland	5.5%	UK	#N/A
Thamesport	UK/Ireland	8.1%	UK	#N/A

Note: #N/A = no data available or no specific main player in the port's T/S business

Source: authors' elaboration from Drewry (2013), corporate and port authority websites, and specialized press.

The analysis of the main shipping lines calling transshipment ports reveals a certain degree of "specialization" and "fidelization". In other terms, carriers seems to carefully select their "pivot" points along main shipping services and calibrate their effort (e.g. number of calls per week, average vessel size, etc.) in the reason of the relative importance of each specific hinterland market to be served. Maersk Line, for instance, is based in Algeciras, Rotterdam, Bremerhaven, Le Havre and Zeebrugge and therefore shows a highly diversified approach. MSC operates, among others, in Antwerp (which "de facto" is the operational main headquarters of MSC worldwide) and Bremerhaven in North Europe, and in Valencia, Leghorn, La Spezia in the Mediterranean. Evergreen operates in Taranto, Cosco in Piraeus, while CMA-CGM in Malta, Marseille, Le Havre and Antwerp.

Table 11 includes data on carriers' investments in hub terminals, showing the entry patterns in each port (year of entry) and the equity throughput currently (2011) handled by each shareholder (i.e. a carrier) in its own terminals.

Table 11 Carriers' investments in hub terminals in Europe.

Ports	Country	Total throughput (2012)	Transshipment incidence (2012)	Entry patterns (carriers investment year)	Current investors (carriers) and equity throughput in '000 TEU (2011)
Algeciras	Spain	4,070,791	91.1%	Sealand (1975), Maersk (1986) and Hanjin (2010)	APM Terminals (3.096); Hanjin (612)
Antwerp	Belgium	8,635,169	29.0%	MSC (2004), APM Terminals (2005), CMA-CGM (2005), Cosco Group (2005), Hanjin (2006), K-Line (2006), P&O Nedlloyd (2005), Yang Ming Line (2006), Zim Ports (2008)	MSC (2.302), CMA-CGM (95), Cosco Group (238), Hanjin (66), K-Line (66), Yang Ming Line (66), Zim Ports (238)
Bremerhaven	Germany	6,115,211	45.0%	Maersk (1999), MSC (2005)	APM Terminals (1.717), MSC (850)
Gioia Tauro	Italy	2,721,000	93.6%	APM Terminals (2002)	APM Terminals (754)
Hamburg	Germany	8,863,896	30.0%	Hapag-Lloyd (2001)	Hapag-Lloyd (693)
La Spezia	Italy	1,247,218	7.3%	MSC (2000)	MSC (428)
Las Palmas	Spain	1,207,962	65.4%	MSC (2000)	MSC (278)
Le Havre	France	2,303,750	16.9%	MSC (2001), CMA-CGM (2003), APM Terminals (2007)	APM Terminals (135), CMA-CGM (529)
Leghorn	Italy	549,047	4.8%	MSC (2001)	MSC (84)
Marsaxlokk	Malta	2,540,000	95.5%	CMA-CGM (2004)	CMA-CGM (984)
Piraeus	Greece	2,734,004	80.0%	Cosco Group (2009)	Cosco Group (1.188)
Rotterdam	Netherlands	11,865,916	35.9%	Sealand (1993), Maersk (1999), Cosco Container Lines (2008), Hanjin (2008), YML (2008), K-Line (2008), NYK (2009), MSC (2011)	APM Terminals (2.371), Cosco Container Lines (234), Hanjin (234), K-Line (234), MSC (400), Yang Ming Line (234)
Sines	Portugal	553,063	65.0%	MSC (2011)	MSC (222)
Taranto	Italy	263,461	74.5%	Evergreen (2001)	Evergreen (245)
Tarragona	Spain	188,851	54.1%	ZIM Ports (2008)	ZIM Ports (96)
Valencia	Spain	4,469,754	51.0%	MSC (2006)	MSC (1.558)
Zeebrugge	Belgium	1,953,170	25.1%	CMA-CGM (2005), APM Terminals (2006)	APM Terminals (432), CMA-CGM (188)

Source: authors' elaboration from Drewry (2012), corporate and port authority websites, and specialized press.

The outcomes unveil a massive presence of Maersk Line, through the sister company APM Terminals (commonly considered a hybrid operator, because it looks for third-party traffic as well), MSC, CMA-CGM and Cosco (either through Cosco Lines or Cosco Pacific). In the Mediterranean Sea carriers mostly invest in terminals for controlling pure transshipment hubs, often via wholly owned subsidiaries (WOS) or partially owned subsidiaries: CMA-CGM in Malta (100% share), Cosco in Piraeus (100% share), Evergreen in Taranto (initially 66% share, later increased up to 90%, and finally progressively reduced to around 40% share), APM Terminals in Algeciras (100% share).

In North Europe, as already mentioned, carriers mostly utilize big gateway ports for transshipment operations as well. In this regard, mega terminals requiring enormous investments are often involved in such kind of "mixed" activities. Indeed, in North Europe the need for handling capacity is much bigger and the space available is scarce, as it is difficult to get offshore areas. As a result, carriers given the above constraints are forced to share the terminal capacity, by co-investing in the same facility. The "consortium" formula (composed by one top pure stevedore plus a handful of carriers) is becoming very common in North Europe for managing big port infrastructures: the Deurgangdock terminals and the new facilities at the Maasvlakte II are clearly an example of the joint commitment of shipping lines in terminal equity and management.

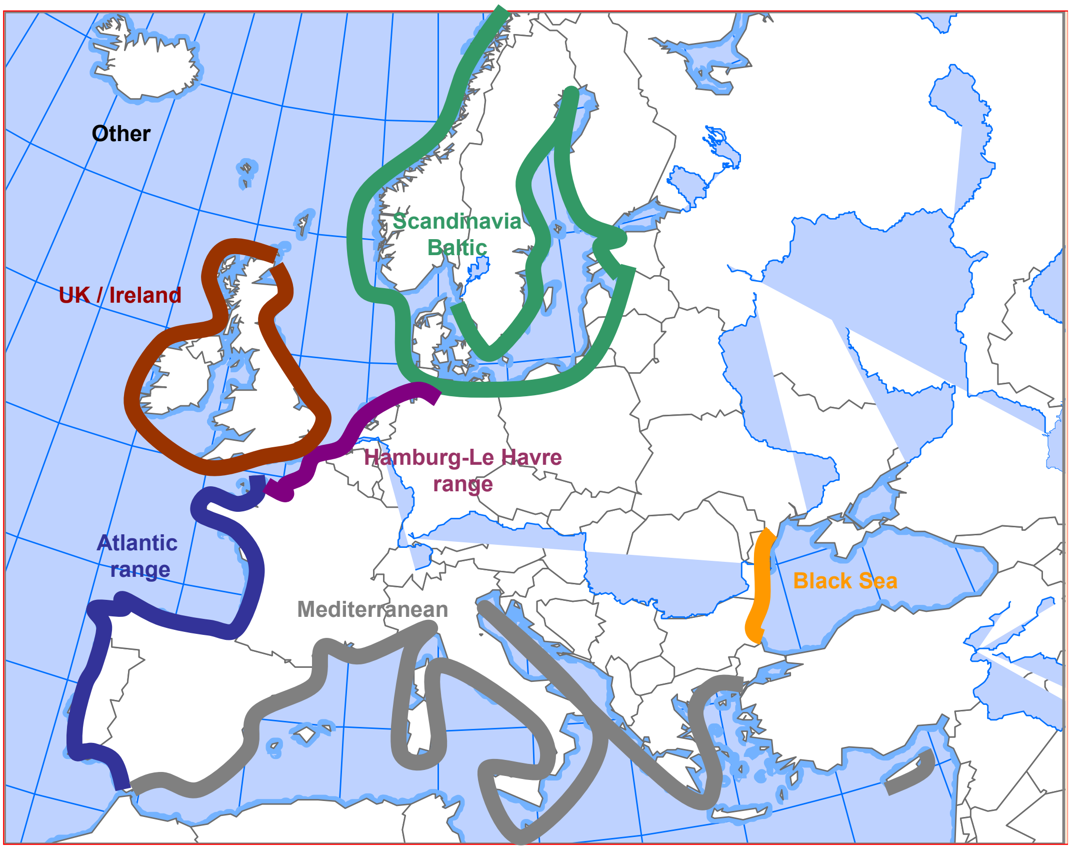
3.5 Discussion and expectations for the future

3.5.1 Overall transshipment incidence in Europe and European port ranges

In this section we present overall estimates of the transshipment incidence in Europe and European port ranges based on the data gathered and presented in Table 9. The base years are 2004, 2008 and 2012. The figures are somewhat different from the figures presented by Drewry (see

Table 7) as we only focus on EU ports. Figure 33 presents the port ranges considered.

Figure 33 European port ranges

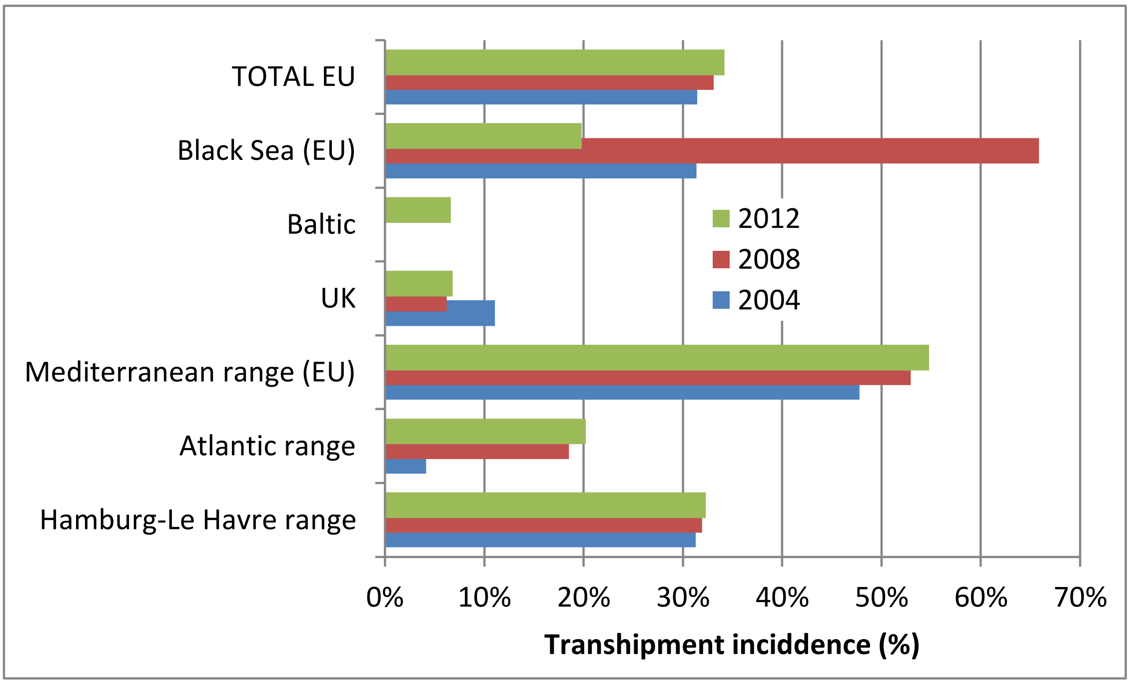


Source: authors.

The total transshipment incidence in the EU port system reached 34.2% in 2012 compared to 31.4% in 2004.

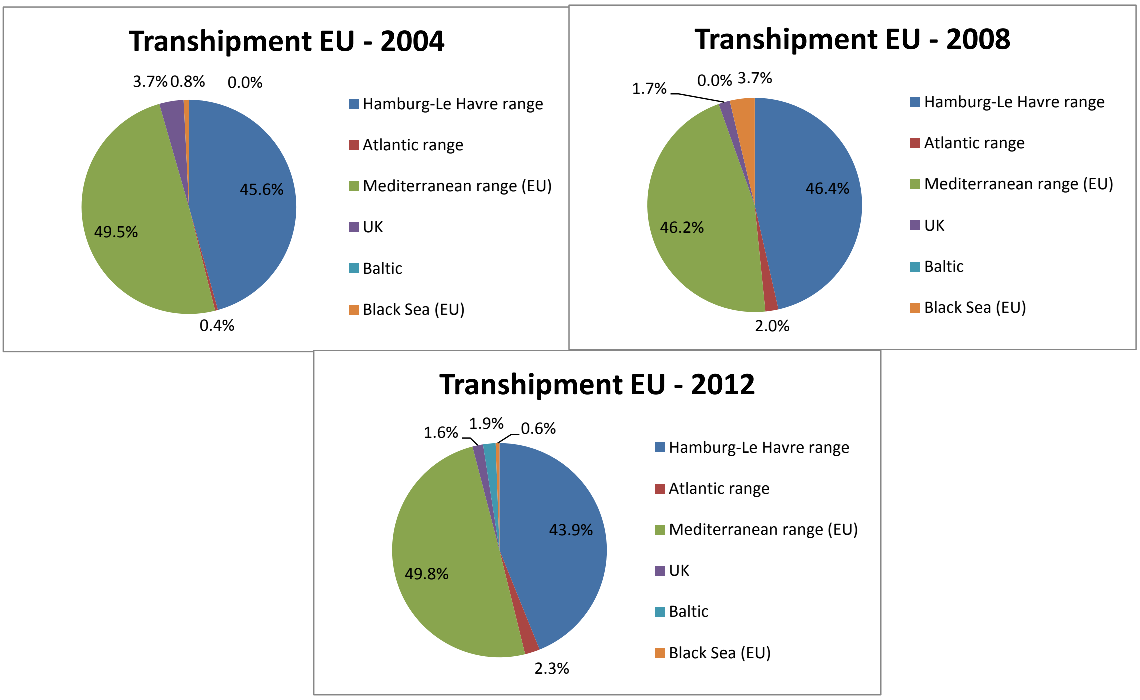
Figure 34 confirms the earlier main conclusion that the market is different in North and South Europe. The Med range (we only consider EU ports) has the highest transshipment incidence, i.e. 54.8% in 2012, mainly due to the existence of almost pure transshipment hubs. The transshipment flows in the Hamburg-Le Havre range are generated by ports with very substantial gateway flows. The other port ranges in the EU have a much lower transshipment incidence. The transshipment incidence is growing in all port ranges, except for the UK. The most remarkable growth is observed in the Baltic: the transshipment incidence reached 6.6% in 2012 (almost as high as in the UK), mainly due to the Gdansk effect. Figure 35 presents the shares of the port ranges in total EU transshipment flows. The Med range (EU ports only) is the largest transshipment market in Europe closely followed by the Hamburg-Le Havre range.

Figure 34 Transshipment incidence in European port ranges, 2004 - 2008 - 2012



Source: authors.

Figure 35 Share of port ranges in transshipment flows of the European port system, 2004 - 2008 - 2012



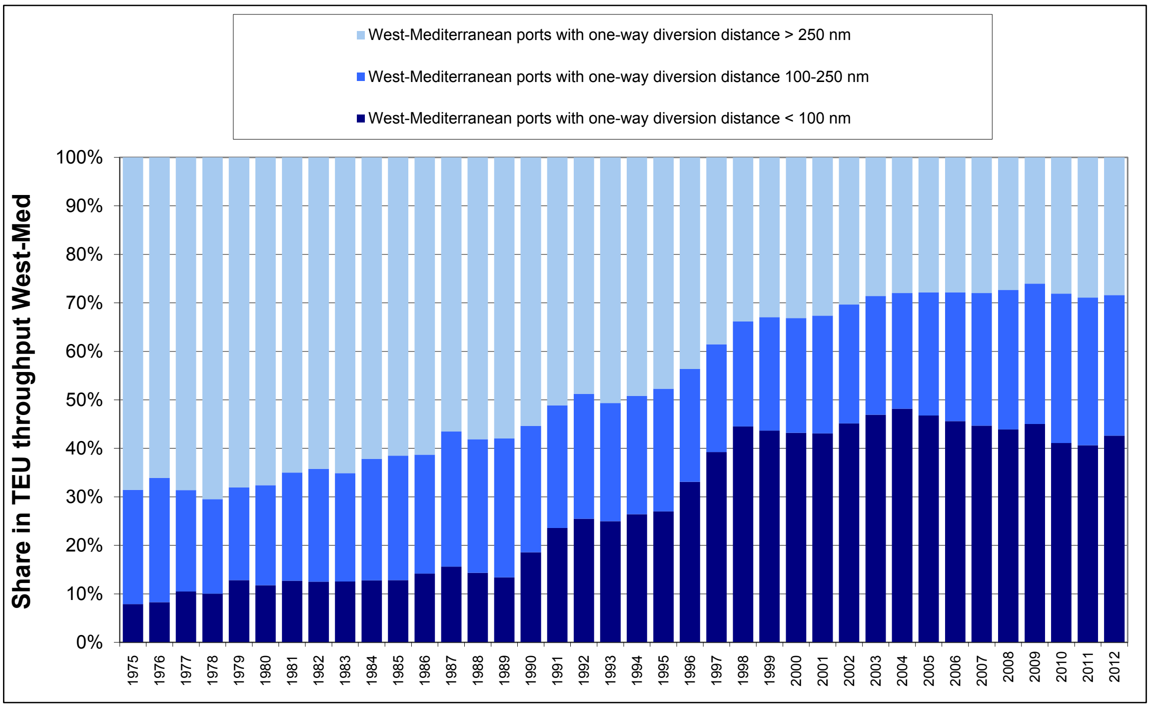
Source: authors.

3.5.2 The Mediterranean and Black Sea

In the Mediterranean, extensive hub-feeder container systems and short sea shipping networks emerged since the mid-1990s to cope with the increasing volumes and to connect to other European port regions. Before that time, Mediterranean ports were typically bypassed by vessels operating on liner services between the Far East and Europe. Terminals at the transshipment hubs are typically owned, in whole or in part, by carriers, which are efficiently using these facilities. Marsaxlokk on Malta, Gioia Tauro, Cagliari and Taranto in Italy and Algeciras in Spain act as turntables in a growing sea-sea transshipment business in the region.

While quite a number of shipping lines still rely on the hub-and-spoke configuration in the Med, others decided to add new liner services calling at mainland ports directly. In reaction, mainly Italian transshipment hubs have reoriented their focus a bit, now also serving Central and East Med regions. The net result of the above developments has been a slight decrease in the market share of the West Med hubs in recent years and a growth in the market share of mainland ports located between 100 and 250 nautical miles from the main maritime route (Figure 36). The transshipment business remains a highly footloose business. This has led some transshipment hubs such as Gioia Tauro and Algeciras to develop inland rail services to capture and serve the economic centres in the distant hinterlands directly, while at the same time trying to attract logistics sites to the ports.

Figure 36 The market shares of container ports in the West Mediterranean. Ports grouped according to the diversion distance from the main shipping route (1975-2012)



Source: updated from Notteboom (2009) based on aggregation of statistics of the respective port authorities.

Non-European ports have an increasing impact on the European container port system. The non-European competitors of the Italian transshipment hubs (Gioia Tauro, Taranto, Cagliari), Marsaxlokk on Malta and Piraeus in Greece are mainly found in Turkey (Ambarli, Mersin, etc.) and close to the entrance of the Suez Canal in Egypt (Port Said, Alessandria, Damietta). These ports have developed a strong market position to serve the East Med and increasingly act as turntables for the Black Sea at the expense of Black Sea ports, such as Constantza.

The port of Constantza recorded a throughput of 684,059 TEU in 2012, still far from the record of 1.4 million TEU in 2007. Early on in its development, Constantza was very much seen as the transshipment gateway for the Black Sea and reached a transshipment incidence of some 75% in 2008. However, times have changed quite significantly as traffic patterns in the region have evolved. When the crisis hit, many container lines changed their liner services in search of cost-efficient logistic solutions. A number of direct services from the Far East into the Black Sea region were cancelled, negatively affecting transshipment volumes. As a result, in 2012 almost three-quarters of the volumes handled at the port consisted of local import and export containers, with the remaining quarter being transshipment. Still, Constantza handles the largest vessels operated in the Black Sea (some 8,000 TEU). Terminal productivity plays an important role in the future development of container terminals in the Black Sea region, where operators in both Ukraine and Russia such as Odessa and Novorossiysk are trying to attract both transshipment and import/export business.

The growing container terminal market in the Maghreb countries increases competition in the Med region, but at the same time opens new growth opportunities for existing European transshipment hubs and gateway ports in the Med. Algeciras (stronghold of APM Terminals of the AP Moller Group) relies a lot on east-west and north-south interlining and is facing competition from Tanger Med where APM Terminals has also set up business. Tanger Med is hoping to bring in dividends from factory delocalization movements to Maghreb countries, particularly to Morocco. Other major port developments are planned in Algeria and Tunisia. Cargo activity in the port of Algiers has strongly increased in recent years in line with Algeria's strong oil revenue figures. The Algerian government has developed a policy to upgrade the Algerian ports and improve terminal performance. The port of Djendjen is being positioned as a deep-water port for large container ships. The management of the Port of Algiers and that of Djendjen has been privatized allowing a strong involvement of DP World. There are still plans being implemented to transform the deep-water port of Enfidha in Tunisia into a major Central Mediterranean transshipment hub and a prime economic and logistics activity zone. Construction would be phased. Libya has no ports with dedicated container handling facilities yet. There were some initial ideas to develop a deep-water container terminal in Misurata but these have been halted during the Arab Spring.

As mentioned earlier, North African countries are trying to step in the transshipment business for progressively being an active player in international trade networks. Like what happened in Italy from the mid-1990s thanks to the development of Gioia Tauro, Taranto and Cagliari, the objective is to start "stopping" vessels from Asia for attracting cargo and partially deviating container volumes from traditional European ports. In addition, the launching of Free Trade Zones (FTZ) initiatives like in Tangier (Morocco) might stimulate local economic growth and attract foreign direct investments, thus boosting additional traffic growth. In this respect the aggressive strategic behaviour of North African countries seems to go in contrast with the expectations of European gateway ports, which prefer direct calls from Asia instead of indirect services via (foreign) hub. Relatedly, we also have to recognize that the privatization of most ports in the Mediterranean (turning to the landlord system) coupled with the large involvement of carriers in such "low cost" facilities, seems to reasonably reduce to bargaining power of European Port Authorities in affecting the geography of trade and container shipping flows.

3.5.3 The Baltic

Major ports in the Hamburg-Le Havre range such as Rotterdam, Hamburg, Bremerhaven, Antwerp and Zeebrugge are not only competing amongst themselves to attract Baltic container transshipment volumes. They are increasingly facing competition from Scandinavian and Baltic ports that want to attract more direct mainline ships calls even on the Europe-Far East route. The competition for Baltic transshipment cargo is likely to increase given the moderate growth prospects for the direct hinterlands of the ports in the Hamburg-Le Havre range and significant port capacity additions (Maasvlakte II in Rotterdam, JadeWeserPort in Wilhelmshaven and planned extensions in the port of Gdansk, to name but a few). The transshipment business is a key component of ports' and terminal operators' strategies to fill capacity.

The connectivity of the Baltic region to overseas trading areas still primarily relies on feeder services to hub ports in the Le Havre-Hamburg range. The existing symbiotic relationship between the Baltic port system and the main ports in the Le Havre-Hamburg range (Hamburg, Rotterdam and Bremerhaven in particular) is a prime example of how ports in different regions can actively deploy their mutual dependence. In the last couple of years, terminal development in the Baltic Sea is characterized by scale increases in terminal surfaces and equipment. For example, the port of Gdansk in Poland is equipped to handle large container vessels and receives calls from Maersk Line using 14,000 TEU vessels, notwithstanding the fact that a very substantial share of the ports' container volumes is feedered from the Le Havre-Hamburg range. Also other Baltic ports are gearing up to welcome more direct calls of mainline vessels. This is particularly felt in the port system at the entrance of the Baltic (Kattegat/The Sound) and in St-Petersburg (i.e. the largest and fast growing container port in the Baltic with 2.52 million TEU handled in 2012). Ports like Gothenburg and Aarhus are already acting as regular ports of call on quite a few intercontinental liner services. While these ports have a good position to act as turntables for the Baltic on many trade routes, the insertion of these ports as regular ports of call on the Europe-Far East trade remains uncertain. The large vessel sizes deployed on this route, the associated reduction in the number of ports of call and the additional diversion distance make regular direct calls to the multi-port gateway region Kattegat/The Sound less viable compared to other trade routes. The 2M Network, the alliance between Maersk Line, MSC plans to include Gdansk and Aarhus in its rotation for the SILK service while Gothenburg will act as a port of call in the SHOGUN service. Since August 2013 the 18,000 TEU Triple E vessels of Maersk Line call at DCT Gdansk in Poland. With a throughput of over 1 million TEU in 2013, the port has ambitious plans to ultimately expand the terminal's annual capacity to around 4 million TEU. The port is even challenging the established notion of 'Hamburg-Le Havre range' by proposing the notion of 'Gdansk-Le Havre range'. Also smaller ports in the region are participating in the competitive game: e.g. TIL, partly owned by MSC, recently opened a new deep-water facility in the port of Klaipeda in Lithuania.

Quite a few ports in the Hamburg-Le Havre range continue to focus on the Baltic as a key market for the future. The healthy projected volume growth in Eastern Europe and the increasingly important Russian markets attract the attention from these ports. Hamburg remains the undisputed leader in transshipment flows to/from the Baltic with more than 150 sailings a week. However, Hamburg faced a difficult situation at the start of the global crisis as cargo volumes to the Baltic declined steeply due to a partial move of these feeder volumes to the western ports in the range, such as Zeebrugge and Rotterdam. This partly contributed to Hamburg's container cargo decline of 28% in 2009. Hamburg reacted in early 2010 by introducing a new pricing system, which rewards carriers with large transshipment volumes. Gradually transshipment volumes moved back to Hamburg, supporting the volume recovery in the port.

Newcomer Wilhelmshaven is actively pursuing transshipment business, given that it can yield volumes more quickly than gateway traffic, which is a much slower to attract to a new port. Note that rail services have been established primarily using in-house rail/intermodal firms, and prices to/from Wilhelmshaven and inland points have been matched with those to/from Hamburg and Bremerhaven to the same inland destinations. The P3 Network has announced that Wilhelmshaven will be served directly on two Europe-Asia loops: the ALBATROS service (vessels of 18,000 TEU) and the SHOGUN service (13,000 TEU). Not only newcomers such as Wilhelmshaven are shaping the competitive battleground for transshipment cargo in North Europe. Massive capacity reserves and extensions in Rotterdam (i.e. two new terminals at Maasvlakte II to come on stream in 2014), Zeebrugge (i.e. PSA's ZIP terminal open since 2012 while APM Terminals still has a lot of capacity available on its facility) and other ports in the region will lead to a strong buyers' market in the foreseeable future with a pressure on transshipment cargo handling rates and high requirements on terminal productivity and vessel turnaround time.

3.5.4 The UK/Ireland

The above discussion on the hub-feeder option versus the direct call option also applies to the UK port system. The mainland European ports active in this market segment are primarily Rotterdam, Zeebrugge, Antwerp and Le Havre, while Dunkirk and the North German ports play a more modest role. Most shipping lines and strategic alliances among them serve the south-eastern part of the UK directly via the ports of Felixstowe, Southampton, Thamesport and Tilbury while Liverpool plays a role in trans-Atlantic services. The rest of the UK including Scotland is mainly served via feeders and intra-European services. Since mid-2013 the combination of bigger ships, larger alliances and the new London Gateway terminal are affecting the UK container port system.

Thamesport has lost virtually all deepsea services partly because of draft restrictions in the River Medway approach channel. Evergreen moved its UK cargo from Thamesport to Felixstowe while other lines such as Hapag-Lloyd, OOCL and NYK moved their transatlantic services from Thamesport to Southampton. The volume drop in Thamesport started already earlier with 'only' 300,000 TEU handled in 2012, compared to close to 800,000 TEU in 2008. Also Tilbury's traffic is likely to be affected negatively by larger ships sizes and the opening of DP World's London Gateway terminal. Thamesport and Tilbury, as well as other smaller container ports such as Great Yarmouth, will likely focus more on niche and short sea intra-European services.

The new London Gateway terminal complex will face competition from UK ports Felixstowe and Southampton, but also from mainland European ports such as Rotterdam, Zeebrugge, Antwerp and Le Havre which offer competitive feeder services to the UK. London Gateway received its first vessel in November 2013. The terminal can accommodate vessels with a draft of up to 17m at any state of the tide. Maersk, MOL and Deutsche Afrika Linien already decided to shift their UK port of call on the South Africa service from Tilbury to London Gateway. Rail links are already in place connecting the terminal with the big centres, with DB Schenker Rail UK taking a lead role in the provision of those services. In June 2013, Marks & Spencer confirmed to invest in a new distribution centre within the terminal area to open in 2016.

3.6 Conclusions and recommendations

The dynamics in the transshipment (T/S) business has implications on freight distribution patterns in Europe. A hub-and-spoke based network means less cargo concentration in mainland destination ports and as such a more dispersed or fragmented inland transport system. Alternatively, traffic growth can lead to an undermining of the position of transshipment hubs in favour of a limited number of large-scale mainland ports, each connected to intermodal corridors.

Based on this report and taking into account the scope and objectives of the PORTOPIA project and WP1 in particular, we make the following recommendations:

- Given the importance of the transshipment market to many container ports in Europe, it is to be explored whether data gathering on transshipment flows can be integrated in the Rapid Exchange System (RES);
- Data gathering on the European transshipment market should also include key ports in non-EU countries of Northern Africa and Turkey;
- It is recommended that T/S data is collected on a continuous basis to monitor the tensions between T/S and direct calls for the Baltic, the UK/Ireland and the Med, but also to assess the vulnerability of ports and port regions to changes in the transshipment market.

In light of the above it might be relevant to consider the ‘transshipment incidence or T/S %’ as a relevant and meaningful indicator in the category of ‘market trends and market structure’.

4 THE MODAL SPLIT FIGURES OF THE CORE TEN-T PORTS

4.1 Modal split in the European Union

Goods, which are discharged from a seagoing vessel, have to be handled within a port. At first glance this process would seem simple to map and describe. When trying to make an assessment of intermodal split, which is the modal distribution of cargo over the possible transport modes, being road, rail and barge, a uniform way of measurement has to be applied. However, when we look at all the possible movements in detail, we see that the real situation is much more complex and renders statistical assessment quite difficult. For the calculation of modal split and the insight in which origin and destination the cargo has a multitude of sources can be questioned, there are two main possibilities for data gathering:

- Top down: based on available statistics which allow for an overview of the hinterland traffic from and to ports;
- Bottom up: by looking at the level of terminals and using interviews and surveys in other to create a custom database.

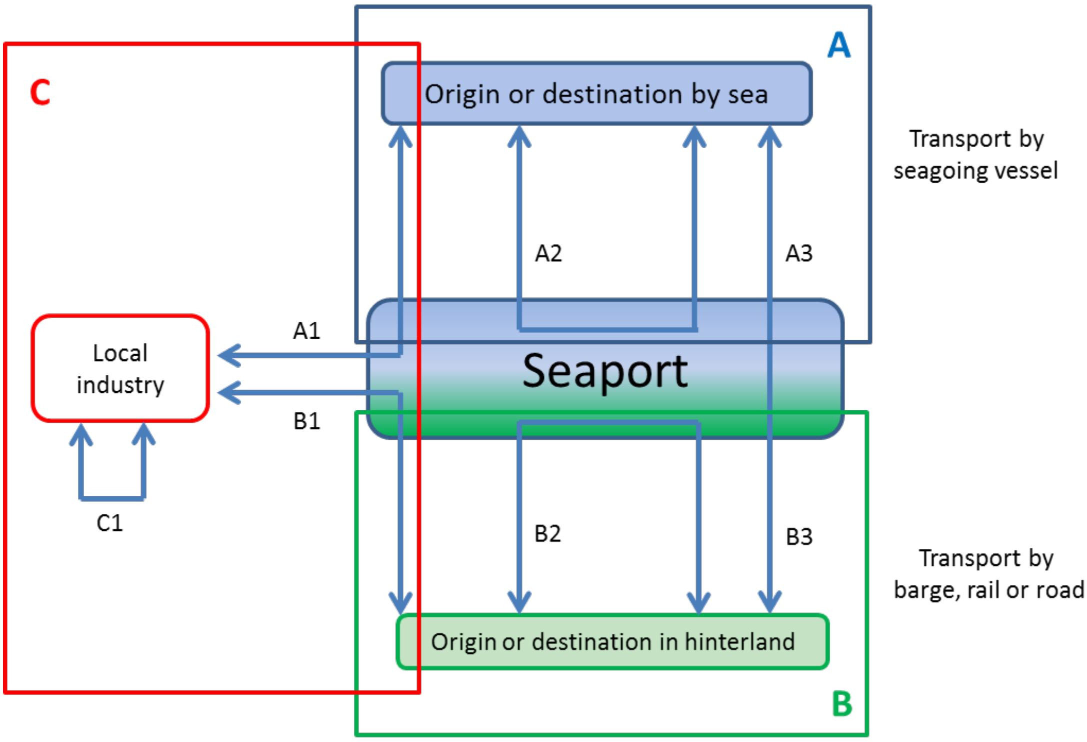
Both approaches have their value but the second methodology is far more intensive and requires extensive contact with companies, making it impossible for short-term investigations.

Goods, which are shipped through seaports, have a multitude of possible destinations:

- **The port area itself:** the industry within ports has products goods and transports these towards the destination;
- **The hinterland:** the hinterland is the area outside of the ports. Transport is possible via an array of modes including truck barge rail or pipe;
- **The sea vessel:** the movement where goods are transported into the port via vessel and then directly exported through another vessel is called transshipment, this movement can be divided into 3 sub-types:
    - o Direct transshipment where goods are directly loaded from one vessel to the other;
    - o Sea-sea transshipment via the quay with possible storage;
    - o Sea-sea transshipment with added value activities during storage.

Figure 37 below shows a simplified version of these different possibilities of cargo transport linked to ports. All flows encased in box A (the blue flows) have in common that they are subject to sea going traffic. A1 links the sea to the local industry, A2 depicts the transshipment streams with possible storage and A3 shows the 'classic' cargo throughput from an overseas destination towards the hinterland. The same image is depicted in box B for all hinterland related traffic. B1 represents cargo originating from the hinterland and being processed within the port industry before being sent back. B2 shows cargo, which is handled in the port but not processed, and B3 is the same flow as A3 depicting the hinterland-sea flow. Finally we have the goods, which are handled within the port internally and are shipped from one industry to the other. These flows are shown in C and expressed by C1. Together with A1 and B1 all industrial port related traffic is listed.

Figure 37 Simplified view of cargo flows



Source: based on Statistische analyse van de goederenstromen aan de hinterlandzijde van de Vlaamse Havens 1999

The diversity of cargo flows is even more complex than shown in Figure 37, a more detailed figure can be found in the Appendix. The modal split can be calculated for the entire port, per cargo group, for load and discharge separately, for intra-European traffic, all export traffic, all import traffic, etc. It becomes even more complex if you take into account that some calculations don't include pipe traffic, others include or exclude transshipment and some only focus on the maritime flows or hinterland flows, which include the flows from and to the industrial area in the port. The calculations of modal split figures of seaports are therefore strongly dependent on the definition used. A complete comparison is only possible wen all variables included are exactly the same.

4.1.1 Eurostat figures[5]

One of the international databases about intermodal spread is the Eurostat database. Statistical data have been reported to Eurostat by EU Member States and a number of other countries in the framework of various EU legal acts:

- Road: Regulation 70/2012 (recast);
- Rail: Regulation 91/2003;
- Inland waterways: Regulation 1365/2006.

When analysing the data we see that the majority of cargo transport is still done by roads. Road transport accounted for 74.9 % of the total inland freight transport (expressed in tonne-kilometres). Its share was slightly lower compared to the previous

5 Eurostat website [http://ec.europa.eu/**eurostat**](http://ec.europa.eu/eurostat) 23/01/14

years, essentially to the advantage of rail transport, whose share had increased to almost 19%. The use of inland waterways for EU freight transport slightly decreased in 2011, but was still above the level recorded in 2008. At country level, there were noticeable changes in the modal split of Romania, Slovenia, Estonia, Denmark and Hungary (Eurostat 2012).

Eurostat and the EC have encountered similar problems as the other local and regional statistical centres when trying to map the intermodal splits within Europe. In order to introduce a certain level of uniformity Member States have agreed during the CGST meeting at the end of 2011 to investigate the possibility to compile intermodal statistics and to identify main transport corridors, using essentially statistical datasets reported in the framework of existing EU legal acts. A taskforce on InterModal Transport Statistics selected the 'German approach' on the intermodal transport statistics in order to compile intermodal freight transport statistics at EU level. The added value of this approach was that no new data would be required but rather an assessment would be made of the use of existing statistics + identification of transhipment terminals. An introduction of the German approach can be found below.

4.1.2 Uniformity using the German approach

The 'German approach' was devised by the federal German Ministry of Transport an later used as a basis within the compilation of intermodal statistics aimed at identifying main transport corridors. The methodology uses statistical datasets reported in the framework of existing EU legal acts. It uses empirical elements and the available data material to map the intermodal transport chains between major freight transfer points, and, with certain compromises, outlining origin-destination patterns. A major added value lies in the fact that it does not require new data collection procedures but builds on existing databases and procedures used both on a trans-European level and respective national levels. The goal of the commission is to use this approach in order to provide a framework for a European Intermodal Network, to be established by 2020, as has been stated by the White Paper. The end-game of Eurostat is explaining how countries may proceed in identifying and quantifying intermodal transport and the main transport corridors of their own country. This in order to draw a European picture enabling a better vision of the transport corridors and nodes.

German approach Methodology

All measurements of intermodal cargo are aimed at identifying transport chains. Due to the definition of a transport chain the performance of a given journey will be between transshipment points. This means that for a pan-European approach railway terminals and ports do not constitute the origin or destination of goods, only a transit point. Therefore this methodology hinges on the concept of 'what comes in must go out'. In other words: containers/swap bodies arrive in a NUTS region (or any other type of defined region, see later), and are forwarded onwards.

With regards to the types of monitored vehicles, the compilation of information on intermodal transport statistics is limited to the transport of containers, swap-bodies, road goods vehicles and trailers of road goods vehicles. The description of these transport modes is linked to the various reporting characteristics laid down in the transport-related EU legal acts.

The spatial dimension of measurement is based on the NUTS system the largest common denominator for intermodal monitoring is NUTS level 2 as can be deduced from the information below. More precise information is often available and will be used for quality checks. An important issue rendered mute with the usage of the wider NUTS 2 level is the problem linked to confidentiality as which would occur with individual ports or privately run cargo nodes and corridors.

Nuts overview of the intermodal monitoring[6]:

- Maritime transport: The NUTS codes of the loading and unloading regions should be known, i.e. the NUTS code the maritime port is located in. As ports are normally identified, their NUTS level 3 code can be easily retrieved;
- Road transport: The NUTS code of the location of loading and location of unloading is normally known as the dataset is based on a sample survey that asks for the exact location. It may be supposed that the road transport part in an intermodal chain remains short and will primarily be performed within the same NUTS region. This assumption is handled by Germany but should be critically investigated. Also, Germany supposes that freight loaded on Eurostat /E-6 -5- foreign lorries (i.e. registered in another country) will go abroad. Countries are invited to evaluate if this is indeed the case;
- Rail: declaration of reception and dispatches by region, according to NUTS level 2;
- Inland waterways: loading and unloading region, according to NUTS level 2.

The specific data gathering process depends on the type of modality investigated. The German Approach uses segmentation of maritime transport, rail freight transport, Inland waterway transport and road freight transport.

For maritime transport the German Approach requires is a list of the most important container ports. The numbers provided for each of these ports should include a split between short sea shipping and deep-sea shipping for number, weight of the empty container or TEU. The rationale behind this is that according to Eurostat it entails the difference between transshipment to another sea-going vessel. Since the maritime data collection procedure is fairly detailed Eurostat does not expect any difficulties in this gathering process.

The data gathering issues for rail transport are more complex, this mainly due to the fact that the link between the type of cargo and NUTS is missing. An initial investigation has shown that more detailed information is indeed often available. Should more detailed be available at country level, attention should be paid to the measurement unit (tonnage as gross weight or gross-gross-weight).

Not all countries have inland waterways so this paragraph only applies to the relevant countries. The available information is good since it responds to the basic requirements for the combination of modal statistics. Data are collected for tonnes, tonne-kilometres and number of TEU by kind of ITU.

The biggest issue with data gathering lies within the road freight category. Eurostat and German Statistical Office consider it as the weak point in the exercise of compiling intermodal statistics. This is due to the fact that that the first and last leg of intermodal transport is relatively short and that containers (at least those forwarded by hauliers registered in Germany) are in most of the cases hauled within the region in which the first/last transshipment takes place. Furthermore, information related to combined transport implying foreign hauliers can only be retrieved for the transport leg between

[6] Based on Reference Manual on Maritime Transport Statistics (2011)

transshipment points using other transport modes (such as rail). No information is available on the initial leg and the final leg of foreign hauliers. In addition the road freight data are collected on the basis of sample surveys. Therefore, an exact image on the role of road transport as first or last leg of the transport chain remains difficult.

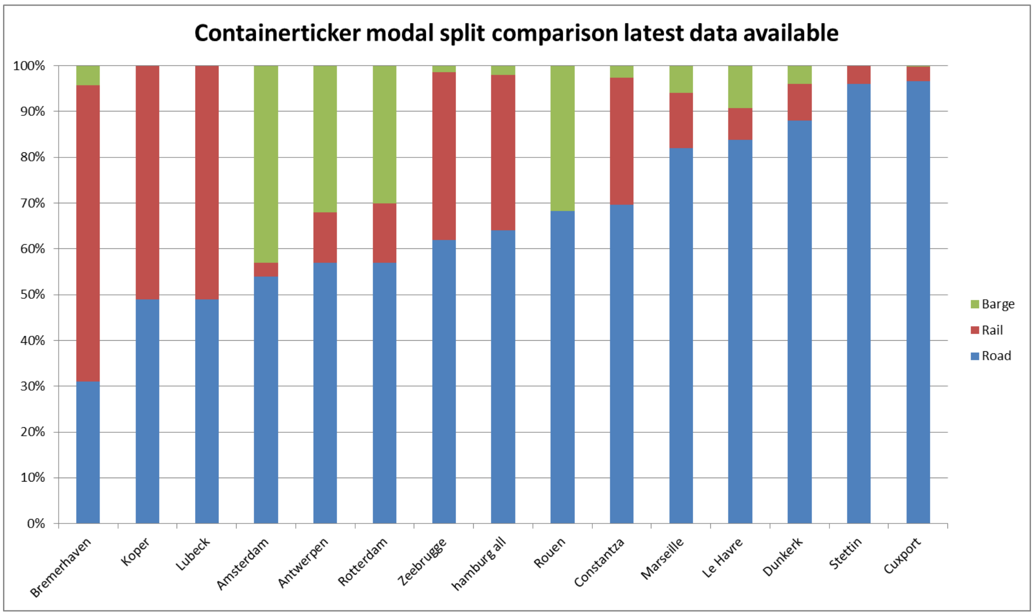
Finally the combining of all this data into a national transport chain model should happen by looking at the arrival and departure of containers/ITUs in the individual NUTS 2 regions reported in the various modal statistics. It is important that the principle of 'what comes in must go out' is remembered in order to identify the relations/freight corridors and to quantify their importance within the trans-European system.

4.2 Intermodal transport in member states

4.2.1 An attempt to uniformity

An early attempt to introduce a uniform way of measurement as made by the German containerticker. The difficulties of introducing a uniform measurement system are once again shown in their attempt to map all the intermodal splits of seaports and inland ports. Figure 38 below shows the respective results of the last available year for each seaport. The problem remains that the dataset is inherently incomplete. Of the 30 ports listed in the ticker only 16 have data, which is not uniform in dates or amount (some ports have only 2 data entries, other 4 with years ranging randomly from 1990 to 2010). A full comparison of the data is therefore impossible. The table can also not be completed with data provided from the respective port authorities because of the mismatch in data compiling.

Figure 38 Containerticker data



Source: Schiffahrt hafen bahn und technik 2010

Since all uniform pan-European databases have incomplete data or offer limited vision on the actual intermodal operations at ports we will continue this document with a bottom-up approach discussing the data provided on port or country level. Each country and dataset listed in this document will include a short summary of the peculiarities linked to that set, and the lessons to take away in order to integrate the separate figures into a fully homogenous database. In order to stay aligned with the 'German approach' we will list both the national aggregate statistics as were available on 01/04/2014 and the statistics made available by the intermodal terminals or nodes.

4.2.2 Belgium

For all the Flemish ports it is known how many goods are transported per seagoing vessel and all the accompanying details. The hinterland traffic flows are less documented and the information, which is available, is in many cases out-dated or incomplete (Vlaamse Havencomissie 1998).

4.2.2.1 Port statistics

The ports of Antwerp, Ghent, Zeebrugge and Ostend each have their own statistical methods without any uniform way of registration. The port of Antwerp published data according to an own classification system, which is not compatible with NSTR norms. This methodology is used to emphases the roll of containers within the Antwerp throughput in a correct way. Most statistics are available on monthly basis and are compiled by the study department of the port of Antwerp (GHA). The port uses a bottom up approach based on data provided by terminal operators.

The port of Ghent has details data about maritime traffic and barge traffic. This data is compiles within the NVS standards and separated into the 5 classic cargo groups (dry bulk, liquid bulk, containers, Roro and general cargo). The most recent data available is 2011, which has been collected during the summer of 2012 with 72 companies, following the bottom up approach.

The port of Zeebrugge has detailed data about the modal split figures. Also uses NVS nomenclature. For each of the cargo groups data is available based on the modality used for hinterland traffic. It defers from the others ports by adding other modalities in the calculation like transshipment and estuary cargo.

Ostend uses statistical data based on modal type of traffic; this data is based on the aggregation per cargo group. The port does not possess any data about origin or destination but had an estimate on the modal split values across the hinterland connections.

4.2.2.2 Intermodal figures of Belgian ports

Figure 39 is compiled of the most recent data made available by the Belgian port authorities:

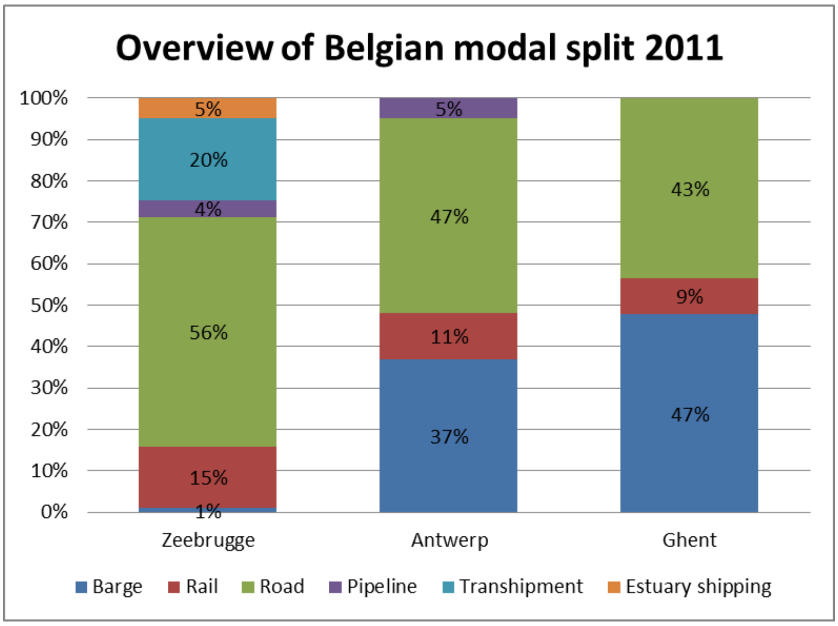
Within the port of Antwerp the combined volume of Barge and Rail is almost equal to the total road traffic. The remaining 5% are accounted for by pipeline. This high volume is mainly due to the connection between Antwerp and Rotterdam, two major chemical clusters.

The port of Ghent has a high barge volume within its modal figures. This is caused by the inland position of Ghent between Antwerp and Zeebrugge. Most cargo used for industrial purpose within the port is transported there via barge. Road transport takes up the majority of the remaining cargo. In comparison with 2010 we see an increase in the tendency to favour barge and road over rail.

Over 50% of all cargo is transported via road in Zeebrugge. The combination of barge, transshipment and estuary traffic makes up for another 26%. Only 1% of the total split is attributed to barge, this is caused by the bad inland waterway connection, estuary shipping is a way of levelling these cargos. Also here we see a large amount of pipeline traffic, mainly due to the presence of the LNG terminal within the port area. Rail cargo within Zeebrugge is rather big with one fifth of all cargo transported towards the hinterland.

The port of Ostend is almost totally serviced by road. Only a small percentage of the cargo is transported via barge on its way to the hinterland destination.

Figure 39 Belgian modal split figures in major ports



Note: Figures not comparable due to statistical differences

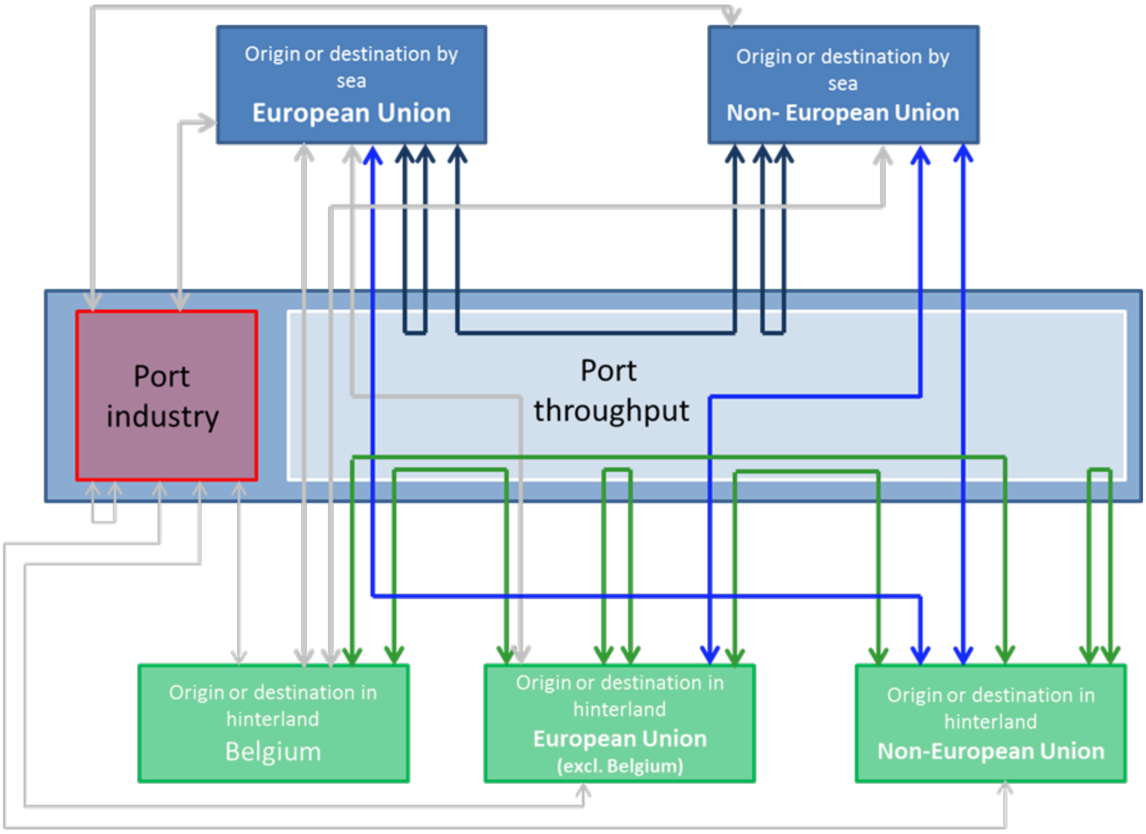
4.2.2.3 Statistics Belgium

The national institute that is responsible for the gathering of statistics in Belgium (Algemene Directie Statistiek en Economische Informatie, ADSEI) has annual statistics on ports since 1952. These statistics are created base on customs declarations linked to import, export and transshipment. The data is not coherent with the data provided with the ports themselves due to the following reasons:

- All ADSEI statistics are net values; this means that container loads and lorry loads are not included in the statistics. The values of the ASDEI will therefore be lower than the respective port values since they don't include all cargo transported by Roro or container.
- The ADSEI only includes the international traffic namely with foreign origin or destination since all data gathering is based on customs level
- Due to the customs declarations not all goods are declared where they physically enter the country
- The figures are registered after completion of the transaction, not during the physical movement creating an important delay in data gathering

Figure 40 shows the data the ADSEI includes in its calculations of the yearly figures. As we can see an important part is not included due to the specific type of data gathering.

Figure 40 Data included by ADSEI



Within a recent document the federal plan bureau has released a forecast for the transport demand within Belgium. There are eight different vehicles analysed: the lorry (light road traffic), truck (heavy road traffic), train, barge (IWT), the ship (Short Sea Shipping (SSS) and Deep Sea Shipping (DSS)), plane and finally the pipeline. All data used provided by the plan bureau is linked to the 2008 dataset, the only full statistical countrywide set currently in existence. All cargo groups are linked to the NST2007 model, which has been renewed to match the NACE model more closely. All data has been gathered top down via Algemene Directie Statistiek en Economische Informatie (ADSEI) for road and water transport, and Nationale Maatschappij der Belgische Spoorwegen (NMBS) and EUROSTAT for rail transport. [7]

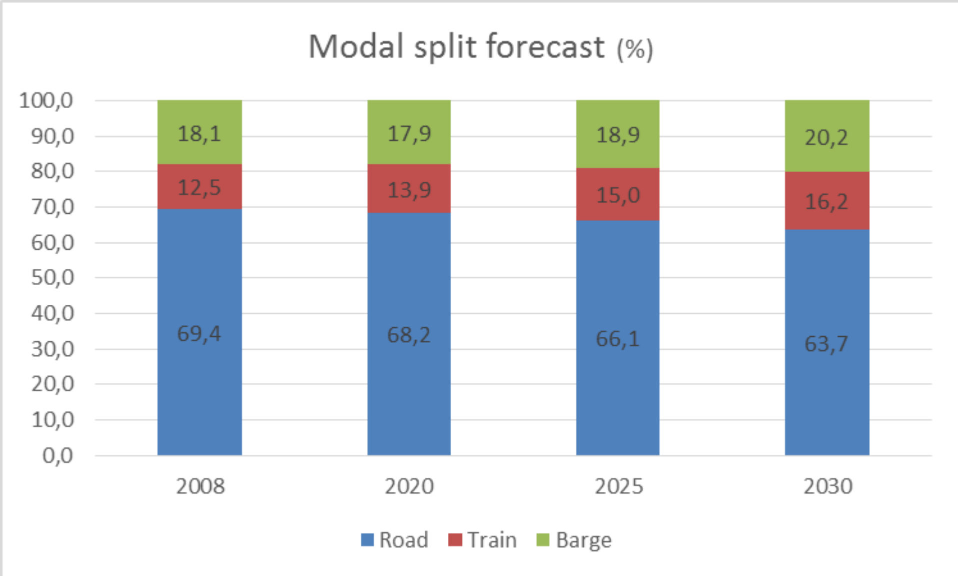
If we look at the figure 41 we see that the 2008 snapshot (excluding SSS) shows a predominance of the road transport at almost 70% of all tonnage km in Belgium. Barge and rail are both within the 10-20% range with a slight advantage for the barge industry. This is mainly due to the uncompetitive position of the Belgian railway system. Here we can once again see the clear difference between the top down method of the statistical institutions and the bottom up methods of the logistics nodes. The Belgian level figures are much more prone to favour road traffic that the port figures (see figure 41).

Looking at the forecast, depicted in Figure 41 we see that this figure remains rather stable with a slow decrease in the road share of about 6%. Most off this share is

[7] Vooruitzichten van de transportvraag in België tegen 2030; planbureau 2012

expected to go to the rail system (4%) and the remainder to the barge system. These forecasts are updated on an annual basis (with the same base year of 2008 for underlining values).

Figure 41 Belgian model split forecast

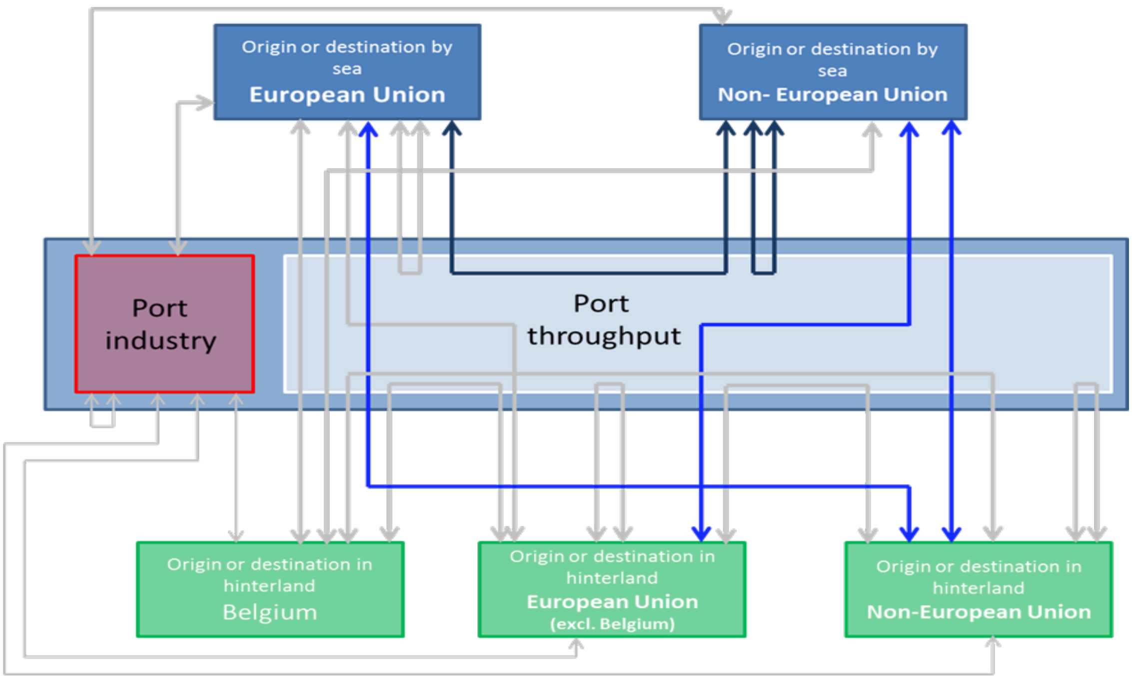


4.2.2.4 Statistics Belgium National Bank

The figures provided by the National Bank of Belgium show the extra -EU maritime traffic (for an overview see

Figure 42). This definition is importance since it limits the data to traffic, which is done by ship. All goods, which have been transported via hinterland, are not noted in the figure. As an added distortion only the goods are noted which land of origin or destination is outside of the European union. For example: a shipment from Spain to the Netherlands via Antwerp is not logged.

Figure 42 Data included by the National Bank of Belgium



The dataset is compiled with customs information and uses a sampling method in order to limit data entries. The sample data is extrapolated in order to create a complete overview of the situation. This data allows an insight in the throughput figures of the national Belgian ports. However, it is impossible to use this data for hinterland analysis since no hinterland flows are included. An overview is provided in Figure 42, showing the data included in the database of the National Bank of Belgium.

4.2.3 Italy

4.2.3.1 Rail transportation in Italian ports: background and evolution

In Italy, railway transport and intermodality have experienced different phases over the last 50 years within the entire logistics system. Until the early-1960s, in fact, rail transport represented a viable solution for transporting freight (and passengers) along the country and also abroad. In those years, the post-WW2 reconstruction was mainly devoted to build motorways, given the enormous diffusion of private cars within most social classes. From then, instead, rail started to be considered as a growingly expensive and rigid transport mode, which encountered the fierce competition of trucks, acting as more flexible and economic solution. In the 25 years ranging from the 1960s to the mid-1980s the rail modal share collapsed from over 40% to around 5%.

From the early-1980s the national government became conscious of the need of a profound renovation of the rail system. The progressive liberalization and privatization of rail services (still monopolistic until the late-1990s), the rationalization of existing infrastructures and the investments in new (high-speed/capacity) lines constituted the pillars of the reform of the rail system. Thanks to this process, the modal split at national level started to improve a bit, reaching around the 7-8% of the overall goods transported in the country (road was over 85%) in the late-1990s. Limiting the analysis just to mid- and long-range traffic flows the share of rail even surpassed 12%.

Finally, in recent years, the rail sector is experiencing a new period of crisis. Basically, this is ascribable to the difficulty in adopting effective incentives for shifting cargo from road to rail as well as to the growing interest awarded to passenger high-speed services by the managers of the Italian Railway group. The top management of Trenitalia, in fact, decided to focus its financial and organizational efforts for taking care of the richest passengers' route, i.e. the mainline Turin-Milan-Bologna-Florence-Rome-Naples-Salerno. Moreover, the liberalization process in Italy encountered some problems of persisting "entry barriers", which still relate, among others, to the scarce transparency of the awarding procedure concerning the licence to operate as newcomer Railroad Company. As a result, the weak traffic volumes and the difficulties in entering the market made the Italian rail sector not so attractive for domestic and foreign newcomers.

Within this picture, ports experienced a peculiar trend because of the pivotal role played by them in transport chains and, above all, because of the large economies of scale which are potentially achievable in the handling of such a big traffic volumes (per vessel call). As vessels show an increasing size (especially containerships), inland transport modes like trains (and in Northern European countries, also barges) can more easily get large amounts of cargo and operate under favourable conditions (respect to land-to-land traffic flows), thus going to break even.

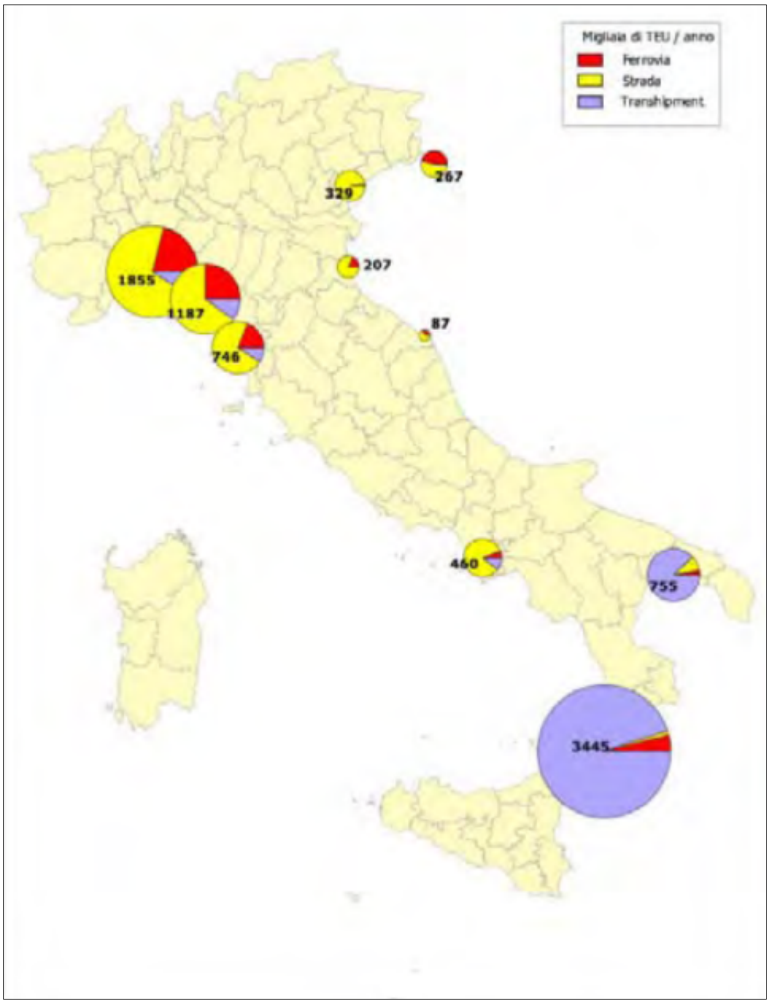
Despite the traditional large use of rail in Italian ports, after WW2 the rail share in ports dramatically collapsed. In the port of Genoa, the biggest of the country, the rail share was over 88% in 1933, still around 65% in 1953 and only 18% in 1984. This profound crisis has been experienced by all the main ports in the country, and led to the dismantlement of most tracks located in various terminals and common port areas. Trucks quickly became the most widespread modal option in all Italian ports.

Like in the rest of the country, ports started to improve their modal split in favour of rail since the late-1980s. In addition, a few years later, the introduction of the national law (law no. 84, 1994) reforming ports accelerated the process of port "renaissance", not only in relation to the provision of much more efficient (and cheaper) terminal handling services but also as regard the exploitation of rail marshalling yards and the launch of new rail services. As a result, some Italian ports improved their rail modal share, even reaching beyond 30-35% of the overall container volumes.

Again, after the year 2000 or so, the system encountered new troubles, which basically related to the port development itself, i.e. the implementation of the new projects decided in the approved Master Plans. Within this negative picture, logistics operators turned to a more flexible inland option (road), because of the irregularity (and decline) of maritime volumes as well as the problems often arising for manoeuvring rail wagons inside the port area (a very expensive and inefficient segment of the overall transport chain). In addition, the scarce interest demonstrated by Italian Railways (Cargo division of Trenitalia) for freight services since the 2000s, inevitably reduced the quantity and variety of services offered and therefore the competitiveness of the overall rail network. The recent trade crisis (2009), moreover, represented a further (negative) breakthrough for Italian ports. Indeed, the quick reduction of the maritime traffic drove operators to refocus most of their inland services to road. In essence, from 2000 onwards the main ports progressively reduced the rail share. In

Figure 43, we provide some further information about Genoa, La Spezia, Trieste and Naples as regard maritime container flows.

Figure 43 Model split figures in main Italian container ports (data in '000 TEUs)



Source: National Transport Plan, 2012; data year 2007

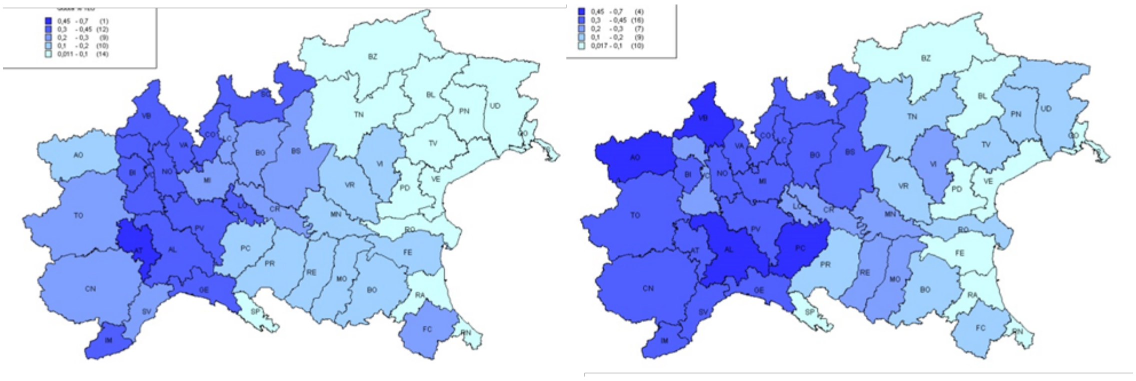
4.2.3.2 Some case studies

The port of Genoa

The port of Genoa stretches uninterruptedly for 22 miles along a coastline in the upper part of the Ligurian Sea and it serves the Northern part of the country as main hinterland. The port handles over 50 million cargo tonnes and over 2 million TEUs per year. Basically, it manages a highly diversified portfolio of shipping businesses, including: containers, general cargo, perishable products, metals, forestry products, solid and liquid bulk, petroleum products and passengers.

Genoa is since many centuries the main port of the country and presents a relevant international exposure. In terms of hinterland penetration capacity, however, the port presents some important limitations, which geographically bound the port inside the national borders (see Figure 44). As regard the modal split, the port of Genoa experienced a profound period of crisis during the big dockworkers strikes of the 1970s and early-1980s (rail share below 20%), but also had a recovery in the late-1990s after the introduction of the port reform law (rail share over 30% in 2000). Over the last decade, instead, another profound depression characterized the port in terms of rail services. Currently, the average rail share is just the 15% of the inland volumes, whereas the rest is managed via road. In this regard, however, some differences persist among various terminals. The big PSA terminal (located in the new port area of "Voltri") performs a bit better (rail 18%) than the old port area, where the terminal size and traffic volumes are much smaller (making rail less attractive). A positive exception is represented by the Messina terminal (owned and managed by Messina Line), where the rail share is still over 40%, and, in the past, even reached peaks above 60%.

Figure 44 The container traffic share of the old (left) and new (right) port of Genoa in the main hinterland provinces (2007).



Source: CIELI-Unige elaborations from Italian Customs data.

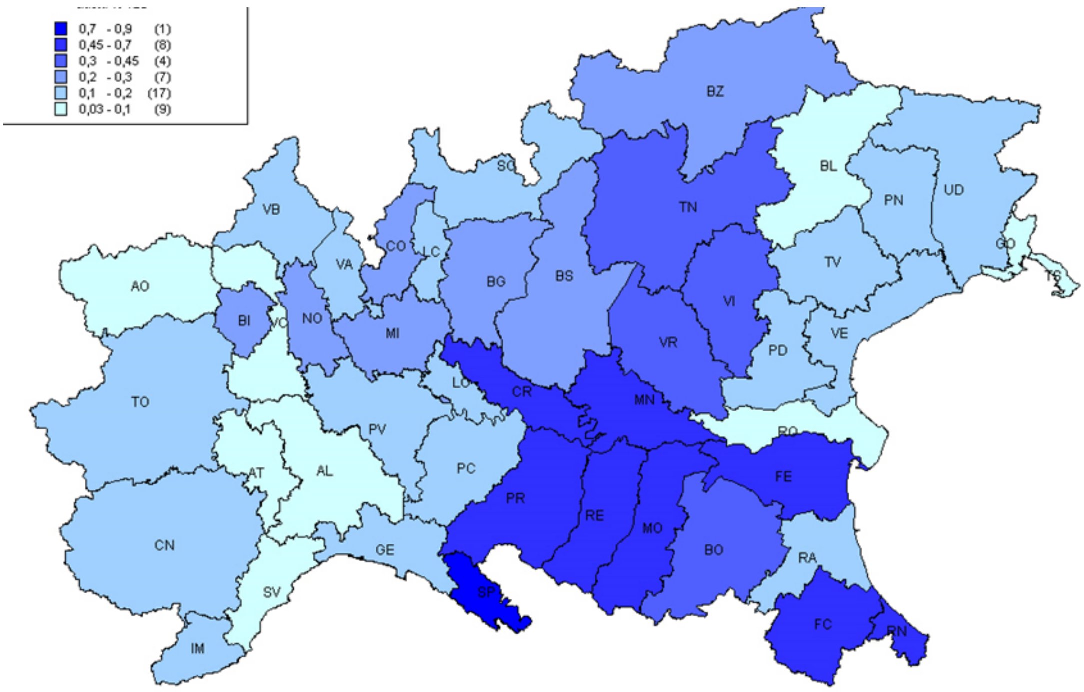
The main drawbacks of the port of Genoa, which limit its rail performance and ultimately its capacity of enlarging the hinterland beyond the national borders, can be briefly summarized as follows. First, the geographical constraints. Apennines and Alps represent, in fact, two major natural barriers to cross, and necessitate suitable rail (and road) infrastructures with reasonable gradients, cruising speed, and a sufficient number of slots available for the transit of cargo trains. In Italy, it is worth to remember, that all main railway lines are utilized "wantonly" by cargo and passenger trains. This operational strategy increases, of course, the average utilization rate of the line but, at the same time, augments the possibility of congestion and delay for cargo trains, which have lower priority in the circulation. Second, the "core" of the inland market of the port of Genoa is relatively close (Milan is around 150 km away), and this makes difficult to achieve economies of scales in rail transport, given the short travel distance. Third, the management of wagons inside the port area is obsolete, time-consuming and too expensive. Fourth, the rail traffic flows are often too fragmented across the different terminals and it emerges the necessity to aggregate demand flows, also relying on shuttle services from/to dry ports across the Apennines.

The future development of rail in the port of Genoa may be fostered undertaking the following "innovative" steps: i) realization of a new (high capacity) railway line connecting the port to the Po Valley (currently under the early stages of construction); ii) rationalization of rail marshalling yards and simplification of the manoeuvring operations inside the port area; iii) development of off-dock shuttle services from the port to some selected dry ports in the Po Valley, for decongesting port areas and aggregating traffic flows (thus achieving economies of scale). Within this picture, the progressive opening of the new Alpine passes in the years to come (Gothard and Simplon, in particular) has to be seen both as threat and opportunity. In fact, these new infrastructures will reduce some of the "frictions" (e.g., cost, time, unreliability, etc.), which typically characterize the Alpine crossing and provide an opportunity to Genoa for enlarging its hinterland to Switzerland, South Germany, etc. At the same time, we also have to recognize that these new Alpine passes will give the possibility to Northern European ports to "go south" and catch additional cargo volumes from Mediterranean ports.

The port of La Spezia

The Port of La Spezia is one the major Italian commercial ports and it is located in a strategic position respect to the industrial areas of Northern Italy. Thanks to its direct link with the Tyrrhenian-Brenner corridor and coastal motorways, the port is able serves the different regional markets in the Po Valley (Figure 45). So far, the inland traffic relations with Switzerland, Austria and Bavaria are still very limited. Indeed, the port of La Spezia was really a forerunner in the creation of private terminals, even preceding the effects of the Reform Law of 1994. Today, the main container terminal, La Spezia Container Terminal (LSCT), jointly controlled by Contship (Eurogate Group) and the leading ocean carrier MSC, is one of the most efficient terminals in Italy. In fact, despite the limited yard area available it is capable to handle around 1 million TEUs per year, thanks to the massive use of rail (30% share) and the exploitation of a remote yard area a few kilometres away.

Figure 45 The container traffic share of port of La Spezia in the main hinterland provinces (2007).



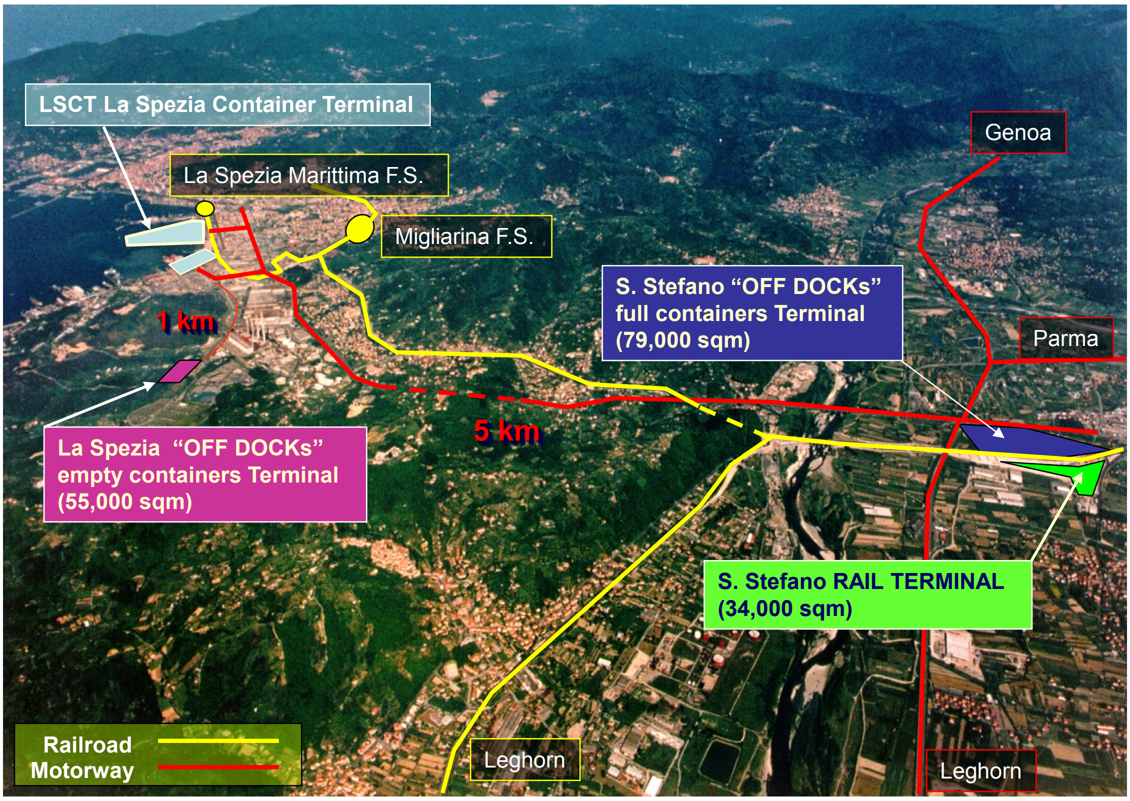
Source: CIELI-Unige elaborations from Italian Customs data.

Overall, the port of La Spezia shows a rather diversified portfolio of business and, in spite of some operational limits (draft, scarce yard surface, obsolete layout design of the many terminals), it handles around 20 million tonnes and 1.3 million TEUs per year.

Among the major container ports in the country, La Spezia traditionally shows the highest modal split in terms of rail share (around 24% in 2012). In 2012 the port surpassed the 100,000 rail wagons handled (almost 280,000 TEUs). In the past, indeed, the rail share was even much higher, accounting for almost 40% of the inland container traffic (2000). Later on, following the above mentioned negative trend at national level, the rail share slightly decreased year by year until these days.

The rail success of the Port of La Spezia is ascribable to a number of factors. First, the strong intermodal ambitions of the main terminal operator (LSCT, a JV between Contship and MSC), which is willing to exploit the "pros" of rail services for decongesting the limited yard terminal areas, reaching hinterland regions located at a growing distance, and improving operational efficiency (e.g., more flexible management of yard operations, massive "housekeeping" over night, etc.). Second, the strong integration and cooperation among the key actors. It is worth to note that within the Contiship Group there is an intermodal company (Sogemar), which is entrusted to organize the rail services between the LSCT and the different inland destinations. So, vertical integration seems here to be a key success factor. Another point which is relevant, is the close cooperation between the LSCT management and the Port Authority of La Spezia, in view of a common (public-private) objective: improve the modal split and utilize rail as much as possible. Finally, the presence of a "close" (see classification proposed by Roso, 2008) dry port in Santo Stefano Magra (Figure 46) allows to virtually "multiply" the space available in the port, as well as to aggregate demand flows (coming/going from/to various terminals) towards the different rail destinations (economies of scale).

Figure 46 The off-dock system between the port of La Spezia and the "close dry port" of Santo Stefano Magra (5 km away).



4.2.3.3 Other ports

The above two examples probably represent the most important ones in terms of rail services development. However, there are also some minor ports that, despite the relatively modest maritime volumes, unveil a good rail traffic share. Trieste, which is located in the North Eastern part of the country, is strategically positioned at the border with Slovenia and not far as well from Austria. In proportion with the overall (low) container volumes, the Port of Trieste extensively resorts to rail for reaching faraway inland markets, even located in other countries (Austria, Germany, Czeck Republic, etc.). From this viewpoint, Trieste is definitely an "exception" in Italy, as it serves (in proportion to the overall maritime volumes, not in absolute terms) many foreign inland destinations. As a result, its rail share is traditionally very high and now is around 40%.

Conversely, the Port of Naples, the main gateway port in the South of the country, experienced a dramatic decline in rail volumes. In early-2000s around 10% of inland container traffic was managed via rail whereas, in these days, this share is negligible (close to zero). Therefore, despite the presence of two dry ports (Nola and Marcianise), situated a few tens of kilometres from the port, Naples progressively ran out the existing rail services and now entirely relies on trucks.

Some methodological concerns

The calculation of the modal split in each port it is only apparently an easy exercise. Many factors and criteria, in fact, can influence the data collection procedure and, above all, their elaboration.

As premises, we have to highlight that in Italy the system of calculation of modal split data is managed in a rather fragmented way. This means that each port (i.e. Port Authority) is allowed to adopt its own procedures for gathering data and then to select criteria for making elaborations. The absence of a unique protocol defined at ministerial level inevitably drives to the adoption of very diverse "statistical" practices.

Currently, the main Port Authorities often resort to "mixed- data sources" for collecting rail data and calculating modal split ratios. First, Port Authorities are used to gather data (more or less on a regular basis) from the main concessionaires (i.e. terminal operators). Besides, the (primary) data (if any) provided by the railway companies (usually related to various marshalling yards) can be used to confirm the figures released (at terminal level) by concessionaires. We need to keep in mind that concessionaires are more interested (and so collect) in rail data expressed in TEUs (laden or empty container) or tonnes (for bulk cargoes), whereas railway companies are more focused on the number of wagons and/or (block) trains processed. As a result, railway companies may not know if the containers loaded onto wagons are laden or empty, thus generating a potential misperception between the number of load units (containers or TEUs) and the quantity of cargo (really) transported in tonnes.

Traditionally in Italy the most important intermodal cargo units (related to maritime traffic) are containers. As a result, Port Authorities, in the calculation of modal split ratios, often (just) refer to container terminal activities or container traffic in multipurpose facilities. Indeed, most modal split figures in Italian ports neglect the rail traffic component deriving from dry bulk, liquid bulk, cars, etc. This approach is commonly adopted because is much easier to collect data just on containers, thus avoiding methodological concerns related to other cargo types and their comparability and integration (in combined ratios). In addition, in the calculation of the rail share for container flows, Port Authorities have to take into account only gateway volumes (which represent the denominator of the ratio), thus eliminating transshipment operations. As mentioned in the transshipment report, Port Authorities themselves can find difficulties in getting reliable data on transshipment flows from terminal operators. As a result, indeed, a correct calculation of the modal split ratio can be really difficult, because of lack or unreliability of data concerning container transshipment.

Other issues, which may generate potential bias in the measurement of rail traffic and modal split ratios (at port, regional or national level), can be briefly summarized as follows. In particular, we need to raise some concerns, which derive from collection and elaboration procedures:

- A right calculation of the modal split ratio should take into account the diverse cargo flows (not only containers, but also, dry bulk, general cargoes, cars, etc.); more specifically, in relation to container flows we should keep in mind the relevance of empty containers (distinguishing between laden and empty containers), which generate "negative externalities" but not real trade;

- An important point to be addressed is related to "where" the modal split has to be measured. The term "where" means at which stage of the transport chain we need to evaluate the incidence of rail traffic on total inland flows. Some bias, in fact, may emerge for instance in presence of a close dry port, which is connected to the marine terminal via road but connected to the hinterland mostly via rail. If the modal split ratio is measured at the "port border", in fact, all the traffic (via road) between the marine terminal and the dry port should not be included in the calculation of the rail share. Conversely, if the modal split is measured (just) from the dry port to the final inland destination, the (rail) traffic from the dry port to the final destination has to be computed in the rail share;

- The above mentioned potential heterogeneity of data and criteria in the measurement of modal split ratios among various port authorities may easily lead to some bias as soon as ministerial or regional public bodies try to calculate aggregate ratios; so, by definition, some compensations and adaptations need to be applied;

- For getting reliable modal split shares, in the denominator of the ratio (i.e. the total inland traffic) all those traffic components that do not have to undertake any (substantial) modal choice should be excluded from calculations. For instance, we refer to liquid bulks (oil and derivatives), which go via pipeline, general cargoes, which are often transported via road, and reefer cargoes (including reefer containers), which must be transported (in Italy) only via road (because no rail wagons are available with plugs), etc.

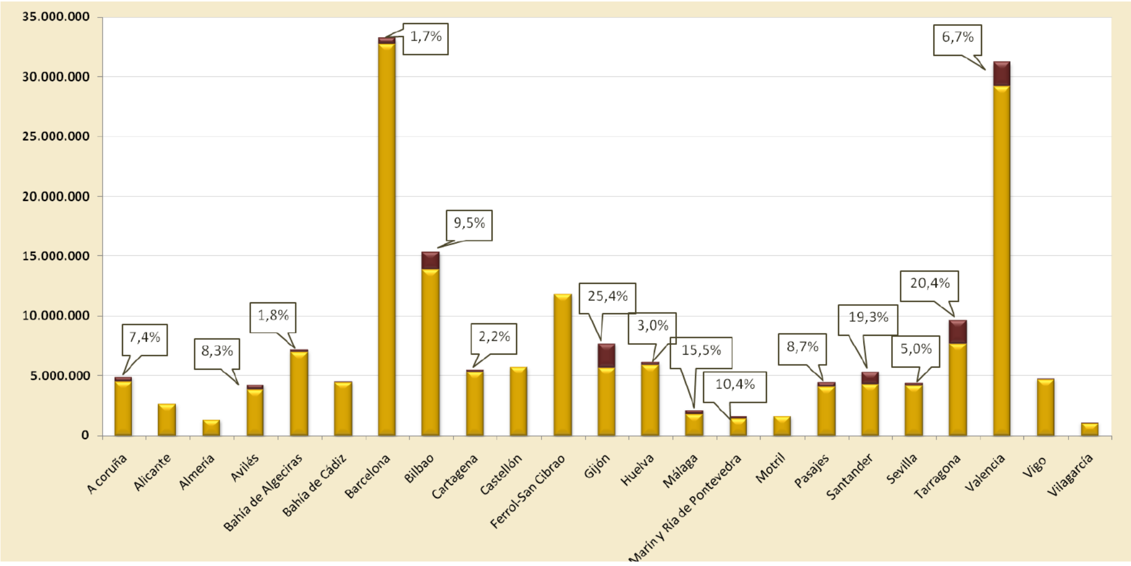
4.2.4 Spain

In Spain the rail freight levels declined significantly in favour of the road over the last years. In Spain, this decrease was more prominent than in most EU countries. As a matter of fact, road has experienced the highest growth in volume and market share of inland freight transport. Between 2003 and 2008 the road has increased by 28%. On the contrary, railways' market share has experienced a continuous decline, from 10.3% in 1997 to 4.1% in 2008 (tonnes-km).

In particular, only about 6-7% of land traffic in ports is transported by rail. Over 90% is transported by road. Relatedly,

Figure 47 provides more insights on the modal split ratio (all cargo types) in major Spanish ports. The port that receives or distributes the highest percentage of rail freight is Gijón, followed by Tarragona and Santander. In absolute terms, Valencia is the port unveiling the largest volume transported by rail, followed by Tarragona and Gijón.

Figure 47 The modal split in major Spanish ports (all cargoes). Rail share in red, road share in yellow (data refer to 2008).



Source: Source: Puertos del Estado.

The main drivers of this negative performance of rail services in Spain can be summarised as follows:

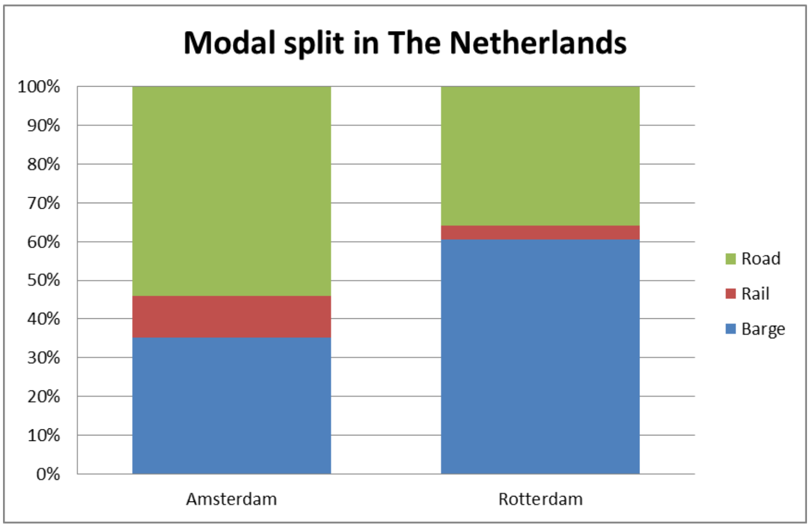
- Lack of economic competitiveness; for medium and long distances (over 600km) the unit cost per ton transported by rail is often higher than the cost of road transport; this is mainly due to operational deficiencies with negative impacts on productivity, or extra-costs that contribute to inefficiency of the rail system, as costs of unnecessary manoeuvres terminal, gauge changing, etc.
- The lack of quality/reliability of service; this is reflected in the decline of rail and in the opinions of users and it is mainly due to the rigidity and scarce responsiveness to market needs;
- Slow implementation of changes resulting from EU (and Spanish) policy for freight rail transport, particularly the slow progress of the process of market opening;
- The traditional subordination of freight to passenger services (in terms of operations and planning);
- Lack of specific investments for rail freight infrastructures;
- The low interoperability with the rest of European rail network;
- Specifically, in ports; i) inefficient rail access infrastructures; ii) operational problems in rail infrastructures within the port areas; iii) inefficient service scheme entailing extra-cost for railway undertakings.

Over the last 15 years, however, consistent with the initiatives of the European Union, which launched some strategies for revitalizing rail freight transport (e.g., market opening, interoperability, TEN-T programmes, etc.), the Spanish Government tried to promote rail freight transport, for reducing external costs and improving the competitiveness of the Spanish economy.

4.2.5 The Netherlands

The port of Rotterdam has a fairly detailed modal split overview. It is calculated on the basis of statements of shipbrokers and transhipment figures for different areas within the port, including the recently built Maasvlakte 1 & 2. The port aims for better and sustainable access by shifting transport away from the most polluting modes like road transport towards water, rail and pipeline. This is a joint effort of Port of Rotterdam, government bodies, local communities, customers and other stakeholders. One example is the development of an inland transfer point at Alblasserdam. From the Maasvlakte, barges transport containers to the dry port from which the further transport is done by road. This will not only benefit the environment but also, the internal and external congestion surrounding the port will go down. Furthermore contractual arrangements are made by barge and rail transport operators and the port authorities setting minimum levels of intermodal transport in order to meet the set goals for the future. These goals include a shift from 12% away from road towards water and rail.

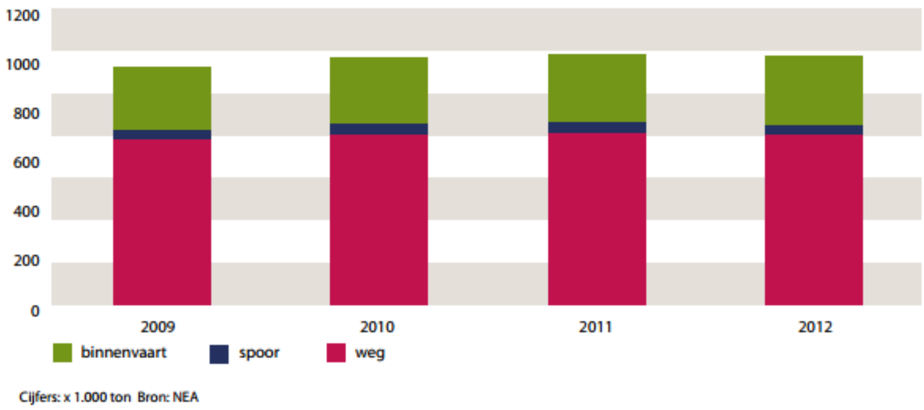
Figure 48 Modal split in the main Dutch ports



The port of Amsterdam has basically the same prospects as the rest of the Netherlands when aiming to improve the modal split situation. At the basis lies a shift from road to barge and rail. A small emphasis lies on the shift towards barge (PA Amsterdam 2012), which is planned to take the majority of the break-bulk and container flows that are aimed to be reduced from 53% to 45% on the respective road networks. Like Rotterdam, Amsterdam also includes certain traffic limitations and splits within the tender agreements for port areas.

The NEA is a Dutch governmental agency responsible for monitoring the emissions of exhaust gasses. It has multiple studies surrounding hinterland and port environments, aimed at improving the position of the Netherlands as logistics network (NEA, 2010; NEA 2013). In one of the more recent studies it published the nationwide figures for intermodal split within the Netherlands. As we can see from the graph below, the modal split has remained rather stable over the past few years. The total amount of rail cargo transported remains fairly low due to the extended barge network present in the Netherlands, we see this trend reflected within the port figures. The dominance of road cargo is explained by the short haul small cargo distribution, which is still primarily done by road. It must however be mentioned that even for short haul cargo traffic barge and rail are used, depending on the volume of the cargo flow, but even here barge is favoured due to the increase in rail related costs, putting the margins for inland traffic under even more pressure. The figures in Figure 49 are presented in absolute numbers to show the national traffic growth. When investigating the split on a relative level we see that it remained fairly constant fluctuating with 1-2 points around the marks of 80% road traffic, 15% barge traffic and 5% rail traffic.

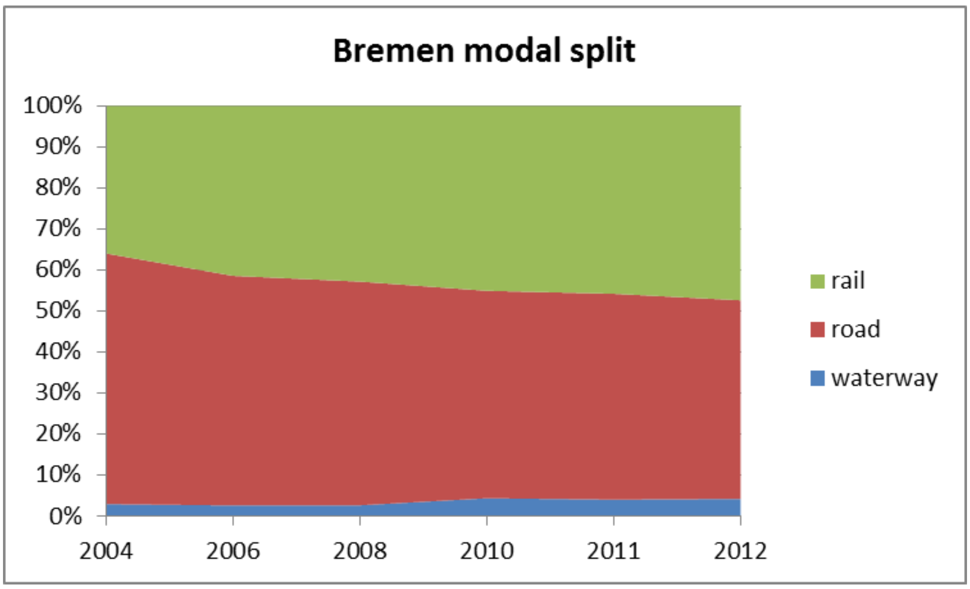
Figure 49 Modal split Netherlands (absolute amount)



4.2.6 Germany

The port of Bremen offers an extensive overview of its intermodal activities. From the graph in Figure 50 we can deduce that rail has been gaining a fairly large percentage of cargo. In 2012 levels reached 45% of all traffic originating from Bremen destined for hinterland transport. This figure is up around 10% from the Early 2004 data. Also barge has been on the rise with almost a 50% increase over the past 9 years from 2.5 to 5% in relative cargo share. It must be noted that these figures only include container traffic, which is about 75% of the total throughput of Bremen.

Figure 50 Modal split Bremen containers



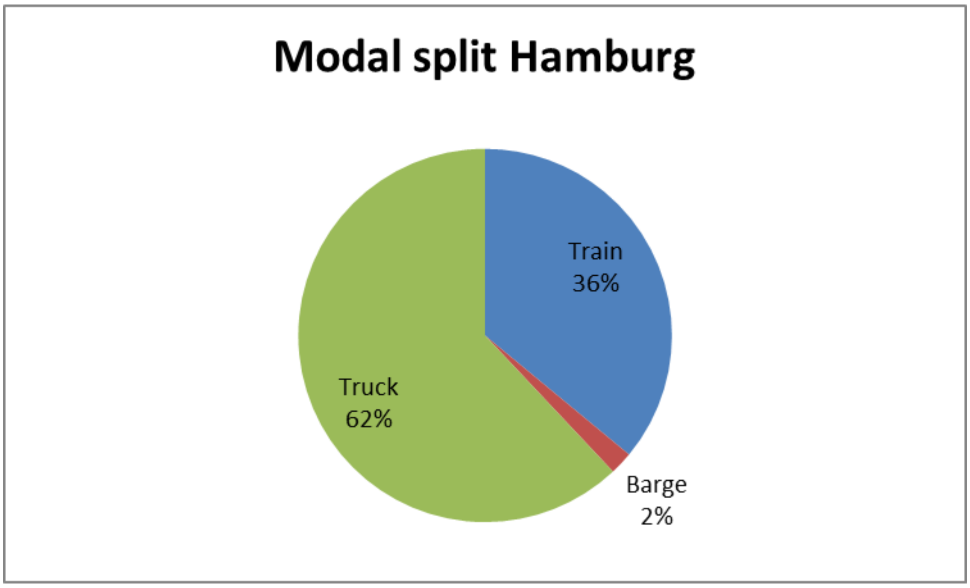
Source: PA Bremen

The figures are compiled by the statistics bureau of Bremen, which is responsible for all statistics across the Bremen area. Since the port itself is actively trying to reduce the carbon footprints, upgrading the middle Weser which link µs Bremen and Bremerhaven with the Mittelland canal is a priority project. The federal government has reacted and is preparing this stretch of the river for use by large self-propelled barges. Most of the current traffic is destined for the harbours in the city of Bremen itself (70%) followed by the national hinterland ports.

The increase in rail share can be contributed to the goal of reaching the deeper hinterlands (area of e.g., Ukraine, Slovakia). In order to make these destinations profitable larger volumes are required and rail cargo becomes a more interesting mode of transport.

The port of Hamburg Hamburg (as illustrated in Figure 51) faces the same evolution as Bremen, however there are some differences in future prospects, as Bremen tries to improve barge, Hamburg aims at increasing real transport (by 5%). The PA believes that intermodal, optimised transport chains will ensure the success of the port in the future. Also, the share of transports by inland waterway vessels as a part of the Port of Hamburg's container hinterland traffic is still rather low. For now, the River Elbe, the Elbe Lateral Canal and the Mittelland Canal are the most important waterways.

Figure 51 Modal split of the port of Hamburg



The modal split in a port of Hamburg is mainly determined by its economic and geographic location. Ports with a high proportion of locally generated cargo naturally have a higher share of truck traffic as in short-distance traffic the truck still beats all other modes of transport. In ports such as Amsterdam, Rotterdam and Antwerp, which are all close to the River Rhine, the modal split share of the important inland waterway vessel is 50%.

More in depth data is available, also on a national basis proved by ISL statistics, these statistics are split up in subcategories. For general cargo this means 40% road transported by road and 60 by rail, liquid bulk has an even split over all modes, dry bulk manages a 64 rail and an even split over both other modes.

4.2.7 France

The DGITM established a way to track the market share of non-road modes for routes to and from ports. The analysis takes into account the modes rail and river excluding goods by pipeline (mainly petroleum products).

The following five indicators are used within the calculation providing a common methodology to all ports:

- The market share of non-road modes for routing of bulk solids in and from ports,
- The market share of non-road modes for routing liquid bulk (excluding pipelines) to and from ports,
- The market share of non-road modes for routing of goods off Roro and containers to and from various ports,
- The market share of non-road modes for container transport to and from ports.

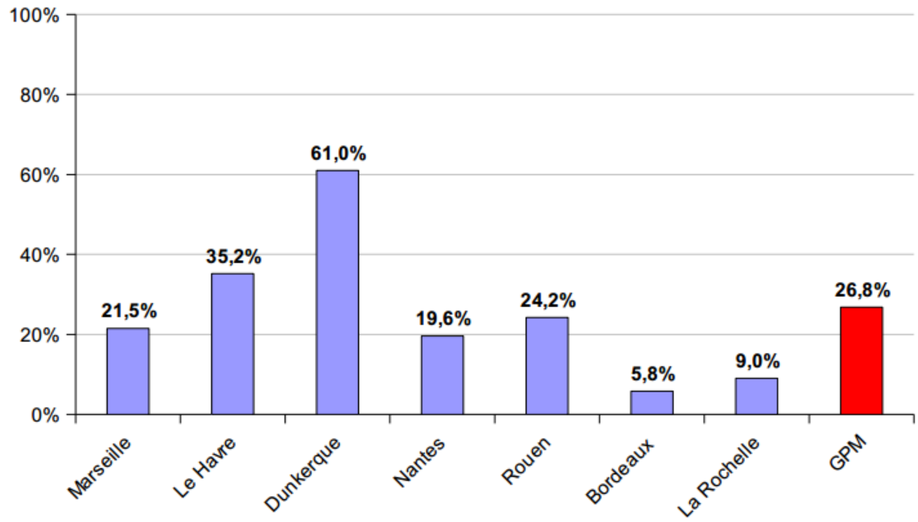
The market share of non-road modes for routing of dry bulk, bulk liquids (excluding pipelines), containers and general cargo (excluding Roro).

As we can see in Figure 52 and

Figure 53 the data is only provided for road and non-road cargo. The full report includes data on the modal split per mode for the entire port set of France and an older report[8] provides the intermodal figures of the three biggest ports which are shown in Figure 54.

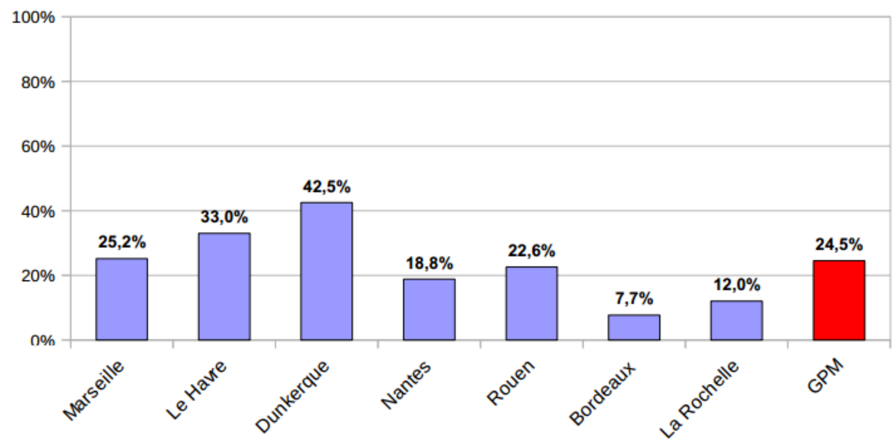
Figure 52 Percentage of non-road traffic in French ports 2007

[8] La desserte ferroviaire et fluviale des grands ports maritimes 2010



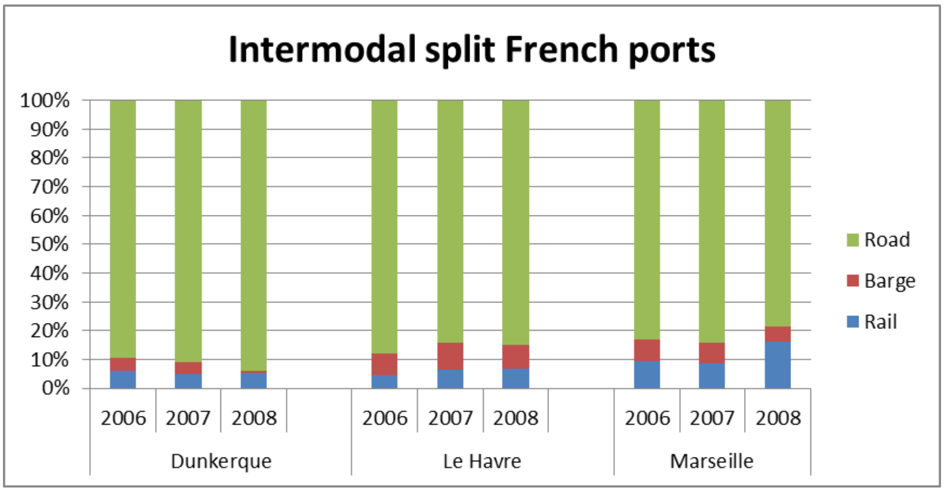
Source: DGITM/DST/PTF4

Figure 53 Percentage of non-road traffic in French ports 2012



Source: DGITM/DST/PTF4

Figure 54 Intermodal split in French ports



Source: DGITM/DST/PTF4

4.3 Methodology outline for intermodal data gathering

As mentioned in the previous part of this document, all gathered data should be comparable and measurable. However it has been previously assessed by both the Commission and different field experts that the standardization of data dissemination by ports and statistical offices, by for e.g. a directive from the EC, is not a viable solution. Within the PORTOPIA project, one of the goals is to incorporate intermodal data into a benchmarking exercise. We propose to give every stakeholder the possibility to upload its own particularities within the system after which we will offer a benchmarking perspective allowing for any discrepancies. We believe that by using techniques such as error margins and omitting certain 'incomparable ports' from the set, viable conclusions can be drafted from the provided statistical information.

The following and final part of the deliverable describes the first version of the intermodal dashboard, which we propose. This dashboard is still prone to change after discussion with stakeholders in the coming weeks.

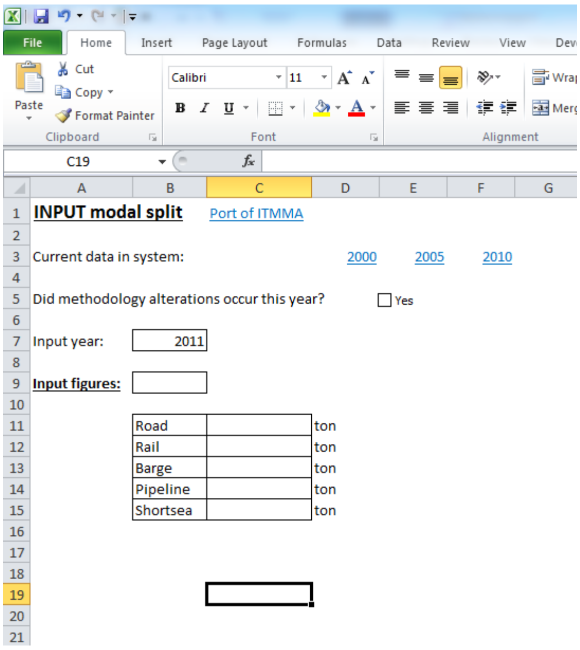
4.1 General overview

The dashboard consists of three main sections, inputs, methodology and output. The input section is rather generic for every ports and changes slightly depending on the methodology applied. Methodology sections can be altered if any particular alterations have occurred during the input year and the output section provides an overview of the situation. For now the output section is rather limited but this will be expanded upon in the coming weeks. For this example the imaginary port of ITMMA is used.

4.3.1 4.2 Input section

The goal of the input section (as illustrated in Figure 55) is to offer ports a quick and easy access point for the provision of intermodal data. As we can see the name of the ports and past reporting years are presented. These are the years used in the analysis of the output section and were previously inputted by the user. Below this we find the tick box linked to any methodological change. If this box is not ticked the user can simply input the data as with the previous years, if it is ticked he will be redirected to the methodology section of the dashboard. Once the input year is provided (drop down menu) the user can input the data for that given year. He has the option of inputting containers or general tons based data (ton, ton/km altered in the methodology section).

Figure 55 Input section of intermodal dashboard

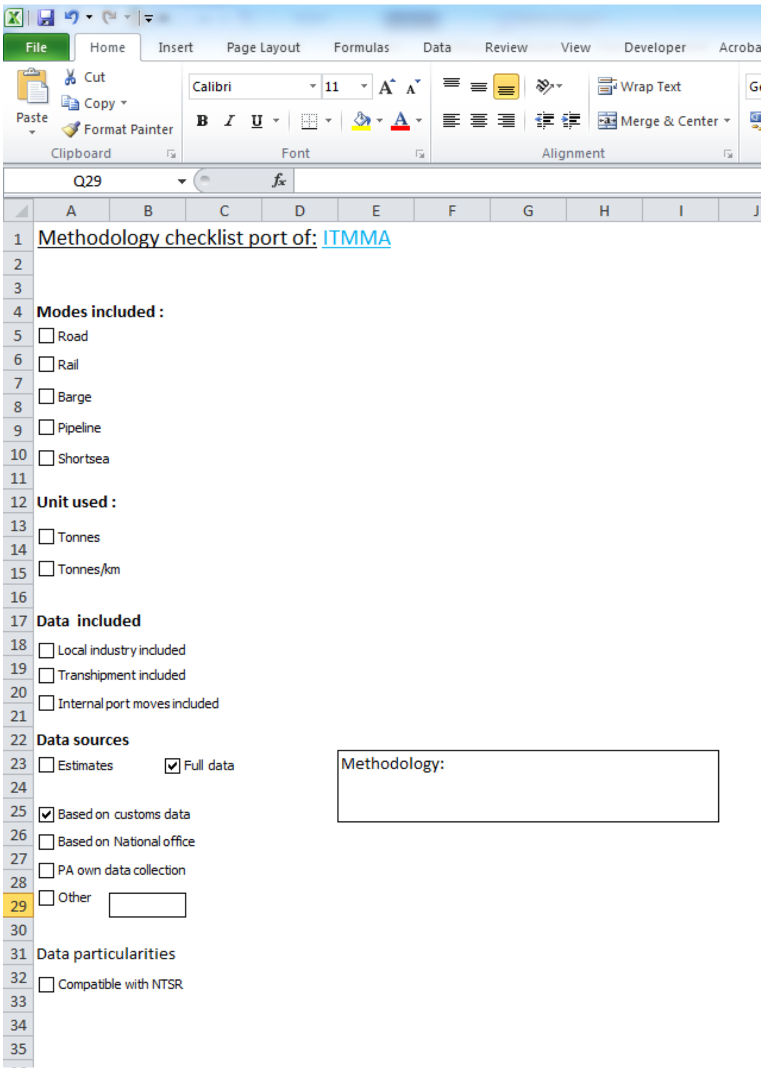


4.3.2 Methodology section

The methodology section (as depicted in Figure 56) outlines the complexity of the applied statistical measures. All aspects mentioned are linked to the comparability of the different values across ports and will be used for later benchmarking purposes. This section can be increased if any new specific facets are discovered within a certain procedure. In its current version (09/09/2014) it contains:

- Modes included: if a port only uses a specific set of modes it can be altered in this section
- Units used: intermodal data is provided in a variety of units
  - Tonnes
  - Tonnes/km
  - Others can be included
- Data included: all ports have different inclusions in their dataset. Some of these particularities are already mentioned in this version of the dashboard
  - Local industry included
  - Transshipment included
  - Internal port moves included
- Data sources: deals with the origin of the data
  - Full data or estimates: important for comparability issues
  - Real origin of data
    - Customs, national office, own collection or other
- Data particularities: allows for future optimization of the data with further segmentation using different international norms
  - Compatible with NTSR: data is compatible with NTSR statistical norms

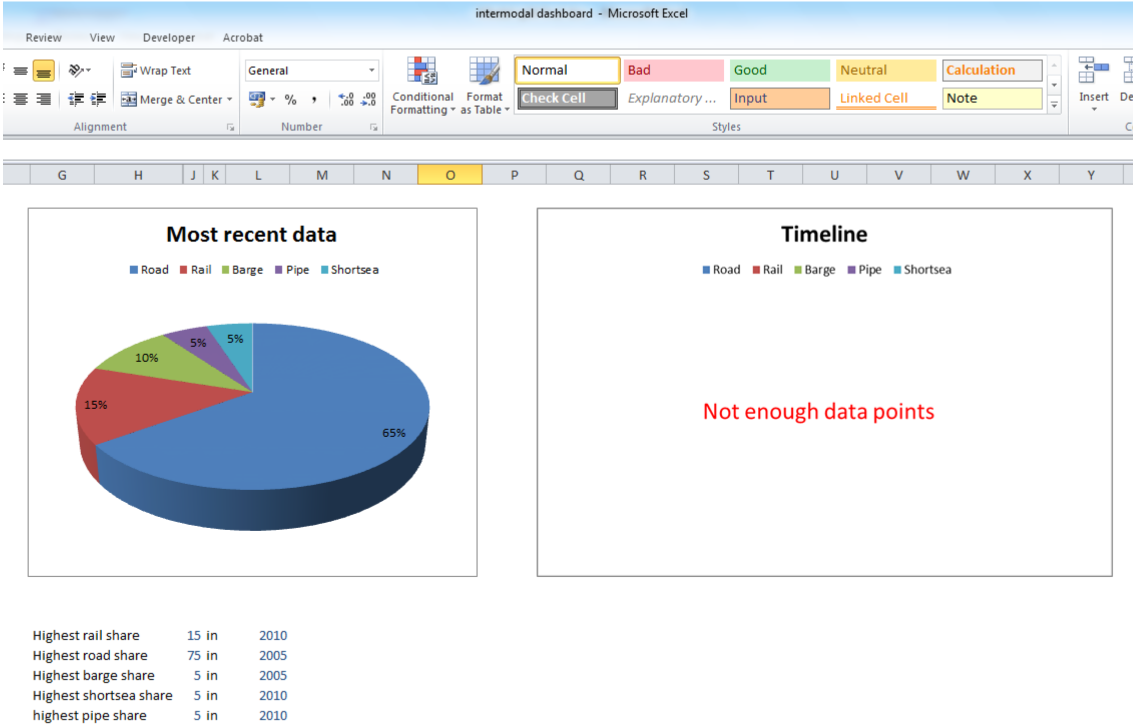
Figure 56 Methodology dashboard overview



4.3.3 Output section

The output section (as illustrated in Figure 57) is comparable to previously developed dashboards. In this version we have included two simple graphs for visibility purposes. This section is to be altered in accordance with the benchmarking deliverable in WP9.

Figure 57 Output section of dashboard



5 INTRA-EUROPEAN DIMENSION

5.1 CONCEPT OF INDICATORS ON INTRA-EUROPEAN DYNAMICS

Intra-European dynamics have a key impact on port activity in Europe. Therefore, it is essential to consider whether the group of indicators focusing on 'Market Trends and Structure' (WP1) can reflect some of these intra-European dynamics. After an exploration of possible ways of dealing with this question, the research team came up with a number of possible indicators that are introduced later in this document.

The starting position is that indicators related to the intra-European dynamics in ports have to be transparent and simple to understand and should not monitor the same operations or provide results that are also interpreted by other indicators. The list of indicators presented below is a pre-selection of indicators initiated by the research team involved in the project. The effort has been to only consider indicators that fulfil all of the following criteria (see also procedure followed in the PPRISM project):

P: Policy relevance - Monitor the key outcomes of strategies, policies and legislation and measure progress towards policy goals. Provides information to a level appropriate for policy decision-making.

I: Informative – Supplies relevant information with respect to the port's activities.

M: Measurable – Is readily available or made available at a response cost/benefit ratio. Updated at regular intervals in accordance with reliable procedures.

R: Representative - Gives clear information and is simple to interpret. Indicators must be accessible, publicly appealing and therefore likely to meet acceptance.

F: Feasible / Practical - Requires limited numbers of parameters to be established. Use existing data and information wherever possible. Simple to monitor.

In a later stage the actual stakeholders (users of the indicators) can be involved in the selection process taking into account the feasibility, transparency, comparability and acceptability of the proposed indicators also in comparison to other indicators on "market trends and structure" that will emerge from WP1.

5.1.1 'European traffic dependency index' or 'Intra-European traffic incidence'

This indicator can be calculated for each port and group of ports. It reflects the share of total port traffic that is related to European origins and destinations. In other words, this indicator would make it possible to assess to what extent a port or group of ports is dependent on intra-European traffic flows. The lower the value of this indicator the more the port is exposed to inter-continental trade with non-European countries or regions. A time series approach would allow monitoring changes over time.

The indicator can be calculated for the total port traffic and for specific traffic segments such as liquid bulk, dry bulk, Ro/Ro, container and conventional general cargo.

Many port authorities publish data on maritime traffic flows per continent, region or even individual countries. When publicly available, such statistics typically relate to the total throughput of the port and in some cases also the port's container throughput. Calculating a European traffic dependency index or Intra-European traffic incidence for other specific traffic flows will most likely prove to be very challenging given data availability and comparability issues.

Eurostat might provide a good basis for uniform data analysis in view of calculating a European traffic dependency index or Intra-European traffic incidence indicator per cargo group (liquid bulk, dry bulk, non-containerized general cargo and containerized general cargo).

5.1.2 'Transshipment incidence'

This indicator can be calculated for each container port and group of container ports. It reflects the share of sea-sea transshipment in total container traffic. This indicator provides more insight in the intermediate position of a European container port vis-à-vis other European container ports and could be combined with other indicators such as liner or maritime connectivity indices. A more detailed discussion on transshipment data is included in the report on task 2 of D1.1 'a synthesis of the information regarding container transshipment volumes'.

5.1.3 'Motorways of the Seas incidence'

Notably, the concept of the "Motorways of the Seas" (MoS) is willing to introduce an intermodal system based on efficient sea-land interfaces in Europe, which should extend the use of sea transport as a partial substitute of road, for making logistics chains more green and efficient (

Figure 58).

Figure 58 The main corridors of the Motorways of the seas in Europe.

Source: European Commission.

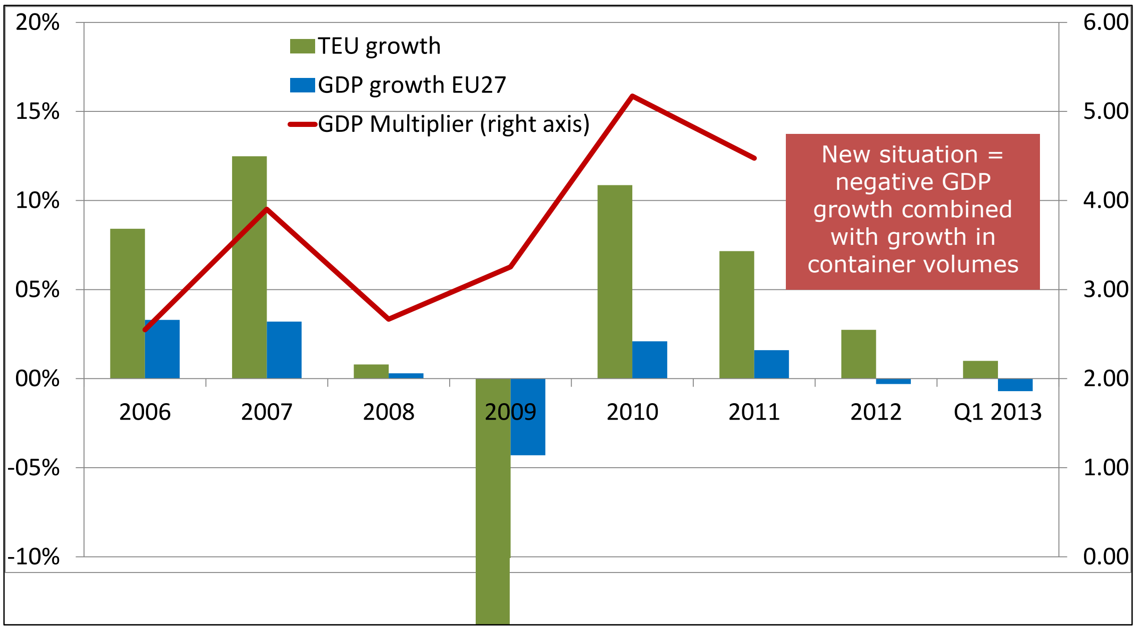
This indicator can be calculated for each port and group of ports. It reflects the share of the MoS traffic on the total traffic of each port. This indicator can provide a sound measure of the contribution given by each port to the reduction of road traffic and therefore of negative externalities. In particular, this indicator should be calculated for the countries located along the four main corridors designated by EU (i.e., Motorway of the Baltic Sea, Motorway of the Sea of western Europe, Motorway of the Sea of south-east Europe, and Motorway of the Sea of south-west Europe). Moreover, consistent with EU objectives, this indicator could provide insights in order to improve port communications with peripheral regions of the European continent, thus strengthening the networks between the EU candidate countries and those countries already part of the European Union.

5.1.4 'GDP multiplier'

This indicator can best be calculated for the entire European port system or for large parts thereof (e.g. Mediterranean region). The GDP multiplier is the ratio between port traffic growth in Europe or a large part thereof and GDP growth in Europe or a corresponding European region. The relation between GDP and port throughput has always attracted the interest from academic scholars, international organizations and maritime consultancy firms. Traditionally, GDP forecasts form one of the pillars in many port traffic forecasts while others have argued that the relation between port traffic and GDP has become more spurious in recent times.

For illustration purposes Figure 59 presents the GDP multiplier for the European container port system based on our calculations. The evolution in the European GDP multiplier demonstrates the complex relationship between port traffic and economic growth. On the one hand, the nature of economic activities in many more mature economic regions in Europe is increasingly oriented toward the services sector, with agriculture and industrial/production activities (both strong port traffic generators) facing increasing pressure from international competition. On the other hand, the cargo base of many seaports has been greatly affected by the changing logistics function of seaports as turntables in global supply chains, but also by the setting of (European) distribution systems, the emergence of extensive intermodal transport systems/corridors and the growth of hub-feeder networks in liner shipping. These trends have made the relation between port volume and the economic situation in the immediate hinterland of the port more diffuse, particularly when considering the larger main ports and transshipment hubs.

Figure 59 *The GDP multiplier in the EU container port system*



Source: Notteboom (2013)

The necessary data to calculate the GDP multiplier are relatively easy to collect. Traffic volumes are reported by port authorities individually, or collectively (for example via the Rapid Exchange System) and also by Eurostat. Eurostat publishes GDP figures for the EU up to the NUTS III level. Still, some methodological challenges remain. First, GDP growth might not be the best variable to compare to port growth as GDP covers much more than activities that are linked to physical trade flows. Second, calculating a meaningful GDP multiplier for a specific port range in Europe might be quite troublesome, as it would require the selection of relevant countries or even NUTS II regions for that specific port region. This would require extensive insight into the hinterland capture areas of the respective ports. Third, as illustrated in Figure 59, a GDP multiplier cannot be calculated when GDP growth and TEU growth have an opposite sign. Also when GDP growth is close to zero (say 0.1%) the GDP multiplier can easily become very large.

Notwithstanding these concerns, it is worthwhile to consider the development of an indicator that shows the relationship or absence of relationship between traffic growth in a port area and the economic growth in the surrounding region. Such an indicator would enable individual ports, market players and policy makers at various governmental levels to assess any discrepancies between port growth and the economic situation of the corresponding (hinterland) region. The development of such an indicator not only concerns the group of indicators on 'market trends and structure', but also relates to the group of indicators on the socio-economic importance of ports. Also other relationships can be considered to validate the results: e.g. the relationship or absence of relationship between traffic growth in a port area and GPD per capita or population of the surrounding region.

6 REFERENCES

Alix, Y., Slack, B., Comtois, C. (1999), Alliance or acquisition? Strategies for growth in the container shipping industry, Journal of Transport Geography, 7(3), 203-208

Brinkhoff (2013), The Principal Agglomerations of the World

De Langen, P., Pallis, A.A. (2005), Entry barriers in seaports, Maritime Policy and Management, 34(5), 427–440

De Langen, P., Van Den Berg, R., Willeumier, A. (2012), A new approach to granting terminal concessions: the case of the Rotterdam World Gateway terminal, Maritime Policy & Management , 39 (1), 79-90

Ferrari, C., Parola, F., Benacchio, M. (2008), Network economies in liner shipping: the role of home markets, Maritime Policy & Management, 35(2), 127-143

Imai, A., Nishimura, E., Papadimitriou, S., Liu, M. (2006), The economic viability of container megaships, Transportation Research Part E-logistics, 42(1), 21-41

Lorange, P. (2005), Shipping company strategies: global management under turbulent conditions, Elsevier, 196 p.

Meersman, S., Rechtsteiner, R., Sharp, G. (2013), The dawn of a new order in commodity trading: the industry is about to undergo its largest transformation in 30 years, Risk Journal, vol. 2

Midoro, R., Pitto, A. (2000), A Critical Evaluation of Strategic Alliances in Liner Shipping, Maritime Policy and Management, 27, 31-40

Notteboom, T. (2009), Economic analysis of the European seaport system, ITMMA/ESPO: Antwerp/Brussels, 64 p.

Notteboom, T. (2010), Concentration and the formation of multi-port gateway regions in the European container port system: an update, Journal of Transport Geography, 18(4), 567-583

Notteboom, T., Rodrigue, J.-P. (2010), The Future of Containerization: Perspectives from Maritime andInland Freight Distribution, Geojournal, 74 (1), 7-22

Notteboom, T. (2013), Outlook for European ports, presentation at ESPO Annual Conference, European Sea Ports Organization, Varna (Bulgaria), May 30-31, 2013

Olivier, D., Parola, F., Slack, B., Wang, J. (2007), The time scale of internationalisation: the case of the container port industry, Maritime Economics and Logistics, 9, 1-34

Pallis, A.A., Vitsounis, T., De Langen, P. (2010), Port Economics, Policy and Management: Review of an Emerging Research Field, Transport Reviews, 30(1), 115 161

Panayides, Ph., Cullinane, K. (2002), Competitive Advantage in Liner Shipping: A Review and Research Agenda, International Journal of Maritime Economics, 4(3), 189-209

Parola, F., Notteboom, T., Satta, G., Rodrigue, J.-P. (2013), Analysis of factors underlying foreign entry strategies of terminal operators in container ports, Journal of Transport Geography, 33, 72–84

Rimmer, P. (1998), Ocean liner shipping services: corporate restructuring and port selection/competition, Asia Pacific Viewpoint, 39(2), 193-208

Soppé, M., Parola, F., Frémont, A. (2009), Emerging inter-industry partnerships between shipping lines and stevedores: From rivalry to cooperation? Journal of Transport Geography, 17(1), 10-20.

Van De Voorde, E. (2005), What Future the Maritime Sector?: Some Considerations on Globalisation, Co-Operation and Market, Research in Transportation Economics, 13, 253-277

Vlaamse havencommissie 1999, Statistische analyse van de goederenstromen aan de hinterlandzijde van de Vlaamse havens

Roland Blum 2010,La desserte ferroviaire et fluviale des grands ports maritimes,

Eurostat 2014 Reference Manual on Maritime Transport Statistics

Eurostat 2011 Reference Manual on Maritime Transport Statistics

Inros lackner 2010, Schiffahrt hafen bahn und technik

PA Antwerp, 2014. http://www.portofantwerp.com/en. [Online] [Accessed 1 September 2014].

Eurostat, 2014. http://ec.europa.eu/eurostat. [Online] [Accessed 1 September 2014].

PA Ghent, 2014. http://www.portofghent.be/. [Online] [Accessed 1 September 2014].

PA Zeebrugge, 2014. http://www.portofzeebrugge.be/. [Online] [Accessed 1 September 2014].

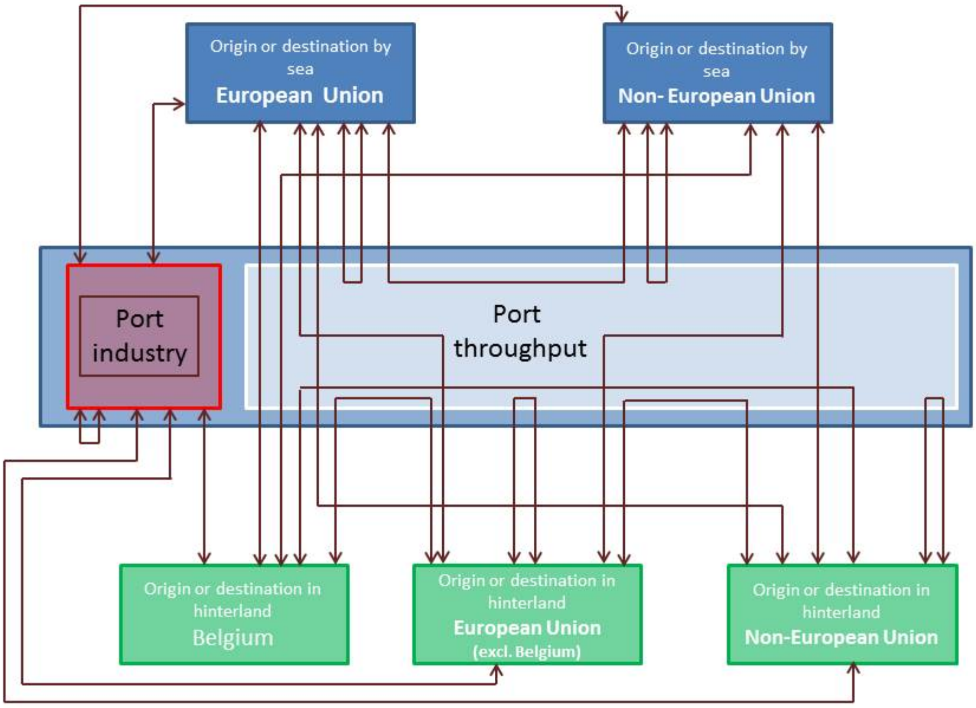
PA Rotterdam, 2014. http://www.portofrotterdam.com/. [Online] [Accessed 1 September 2014].

PA Amsterdam, 2014. http://www.portofamsterdam.com/. [Online] [Accessed 1 September 2014].

PA Hamburg, 2014. http://www.hafen-hamburg.de/en. [Online] [Accessed 1 September 2014].

Alphaliner (2013), Weekly Newsletter, vol. 2013, issue 17, April 2013

7 APPENDIX


Origin or destination by sea
European Union
Origin or destination by sea
Non- European Union
Port industry
Port throughput
Origin or destination in hinterland
Belgium
Origin or destination in hinterland
European Union
(excl. Belgium)
Origin or destination in hinterland
Non-European Union