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To R. W. Künneke,

who rightfully believes in the power of education.

“My heart beats for the German ports, but the Rhine flows down to Rotterdam and Antwerp.”
Erwin Frohnhäuser,
former director of the container terminal in Mannheim

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Contents

Abbreviations

ACTS	Afzet Container Transport Systeem
ARA	Antwerp –Rotterdam-Amsterdam
AVCT	Avelgem Container Terminal
BDF	Bundesverband des Deutschen Güterfernverkehrs
BIC	Bureau International des Containers
CBRB	Centraal Bureau voor de Rijn- & Binnenvaart
CBS	Dutch Statistical Bureau
CCES	Contargo Container Escaut Service
CCS	Combined Container Service
CCNR	Central Commission for Navigation on the Rhine
CEE	Central and Eastern Europe
CEMT	European Conference of Ministers of Transport
CMA	Compagnie Maritime d'Affrètement
COG	Commissie Overleg voor het Goederenvervoer
CTD	Container Terminal Dortmund
CTG	Container Terminal Germersheim
CTN	Container Terminal Nijmegen
CTN	Container Train Nederland
CTP	Common European Transport Policy
CUP	Container Uitwisselpunt (Container Interchange Point)
DB	Deutsche Bahn
DBB	Deutsche Bundesbahn
DeCeTe	Duisburger Container-Terminalgesellschaft mbh
DIT	Duisburg Intermodal Terminal
DPI	Dubai Port International
ECE	Economic Commission for Europe
ECT	Europe Container Terminals
ECMT	European Coal and Steel Community
EDS	European Distribution Centre
EEC	European Economic Community
ERS	European Rail Shuttle
ETCS	European Train Control System
EU	European Union
EVO	Algemene Verladers Eigen Vervoer
FIT	Frankfurt am Main Intermodal Terminal

ICC	Interstate Commerce Commission
ICTG	Inland Container Terminal Germersheim
ISO	International Organisation for Standardisation
HRC	Holland Rail Container
JEIA	Joint Export-Import Agency
KAN	Knooppunt Arnhem Nijmegen
KNV	Koninklijk Nederlands Vervoer
LASH	Lighter Aboard Schip
MTC	Mulitimodal Transport Center
NECOSS	Neutral Container Shuttle System
NEG	New Economic Geography
NIWO	Nederlandse Internationale Wegtransport Organizatie
NRW	North Rhine Westphalia
NRZ	Nijmegen Zee BV
NS	Nederlandse Spoorwegen
NVOCC	Non Vessel Operating Common Carrier
OECD	Organisation for Economic Cooperation and Development
OOCL	Chinese Orient Overseas Container Line
RSC	Rail Service Centrer
RWT	Rhein Waal Terminal (Emmerich)
SBB	Schweizerische Bundesbahnen
SICON	Società Italiana Casse Mobili
UASC	United Arab Shipping Company
UIC	Union Internationale des Chemins de Fer
UIRR	Union internationale des sociétés de transport combiné Rail-Route
ULD	Unit Load Device
USL	United States Lines
VEBA	Vereinigte Elektrizität und Bergwerke A.G.
VGL	Van Gend en Loos
VZV	Vereniging Zeecontainer Vervoerders
WTAG	Westfälische Transport Aktiengesellschaft
WRR	Wetenschappelijke Raad voor het Regeringsbeleid
WTO	World Trade Organization

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Part I: Beginnings

Chapter 1
Introduction

The research presented in this work explores the importance of containerization to the economic links within the Lower Rhine region, which is a transnational economic region consisting of the Rotterdam and Ruhr areas and some other parts of North Rhine Westphalia. The economic integration between these two areas has a long tradition, as they are connected by the Rhine. In the first half of the 19th century, the emergence of the railways gave a boost to German industry and created a demand for coal, iron and steel. In the second half of the century, these goods were mostly supplied by rail. However, from the 1890s onwards, barge transport made a come-back and became the dominant transport mode. The Ruhr area used Rotterdam to supply its industry with coal, iron ore, mine wood and foodstuffs.[1] This relationship then continued, mainly consisting of bulk transport, and the competition between the rail and barge sectors kept prices low. In the 1920s, a new competing modality, road haulage, emerged, and started to be used for cross-border transport after World War II.[2]

In the post-war period, due to the energy transition from coal to oil, petrochemical products were added to the range of goods transported between Rotterdam and the Ruhr area.[3] In 1966, maritime containers were introduced to the Port of Rotterdam. The question thus arises: what effect did this new kind of transport have on economic relationships within the Lower Rhine region? Meanwhile, the research question is: how did containerization affect economic integration within the Lower Rhine region and what role did the liberalization of the European transport sector in the 1990s play in this? The answer to this question is based on an analysis of the hinterland of Rotterdam.

Hinterland, globalization and networks

This work has taken a number of ideas from the economic literature, namely hinterland, globalization and networks. These concepts are explained in this section. The notion of hinterland is widely discussed, and has been defined in a number of different ways. Herein, a short, and certainly not complete, overview is given of the available literature on this subject. The hinterland of ports was discussed as long ago as 1938 by the British economist A.J. Sargent, who defined the hinterland as an area that a port serves. He argued that it should be possible to approximately define the actual coherent hinterland area of a port.[4] Meanwhile, the British economic geographer F.W. Morgan distinguished

[1] H.A.M. Klemann and J. Schenk, 'Competition in the Rhine delta: waterways, railways and ports, 1870-1913', *The Economic History Review*, 66, 3 (2013) 226-227.
[2] 'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf, seen on 11-11-2013.
[3] M. Boon, 'Energy Transition and Port-Hinterland relations. The Rotterdam oil port and its transport relations to the West German hinterland, 1950–1975', *Jahrbuch für Wirtschaftsgeschichte / Economic History Yearbook*, 52, 2 (2012) 215.
[4] A. J. Sargent, *Seaports and hinterlands* (London 1938) 38.

import and export and primary and secondary hinterlands. He also addressed the problem of overlapping hinterlands within the context of port competition between North Sea ports.[5]

On the subject of port competition, the Dutch economist H.A. van Klink argued that ports tend to create networks with hinterland nodes in order to improve their competitive position.[6] In port economics, a distinction similar to Morgan's is made between captive and contestable hinterlands. The captive hinterland is the region where transport costs from one port are lower than from another. Such an area is generally served by the port with the cheapest transport connections. A contestable hinterland, meanwhile, is similar to Morgan's overlapping hinterlands. This area can be served by more ports with similar transport costs, and different ports compete for these hinterland areas.[7] According to the Greek economist Hercules Haralambides, the captive hinterlands of most ports tend to disappear, due to the growing competition between them.[8]

The hinterland is a geographical area which, according to the Flemish professor Theo Notteboom and the Canadian transport economist J.P. Rodrigue, has three interrelated aspects: macroeconomic, physical and logistic. The macroeconomic element is related to transport demand,[9] and there are a number of different activities that create such demand, for example, production or logistics. The macroeconomic hinterland consists of geographical patterns of economic activities, and shifts can occur therein, with an example being the transformation of Duisburg in the 1990s from primarily an industrial centre to a logistics hub, which had an effect on the logistical hinterland.

The physical hinterland, meanwhile, is connected to transport supply, and is determined by the available transport capacity and infrastructure. Changes in this type of hinterland, such as the construction in 2007 of the Betuwe Route, a dedicated rail freight connection between the Port of Rotterdam and its German hinterland, or the building of warehouses in the first few years of the new decennium, affect the logistical hinterland, which is where transport supply and demand meet the organization of transport flows. As a consequence, the logistical hinterland is defined by concrete transport flows.[10]

Herein, the logistical hinterland areas of the Port of Rotterdam are determined and their importance is explained by the economic activities that cause the transport demand. According to Notteboom and Rodrigue, each commodity can have its own hinterland. Notteboom notes that it is difficult to define the hinterland precisely, as it can be different in time, for each kind of cargo, and for

[5] W. Morgan, 'Observations on the study of hinterlands in Europe', *Tijdschrift sociale en economische geografie,* 42 (1951) 366-371.
[6] H.A. van Klink, *Towards the borderless main port Rotterdam: an analysis of functional, spatial and administrative dynamics in port systems* (Amsterdam 1995).
[7] P. W. de Langen and M. H. Nijdam, *Port economics, policy and management* (Rotterdam 2008) 43-44.
[8] H.E. Haralambides, 'Competition, access capacity and the pricing of port infrastructure', *International Journal of Maritime Economics,* 4 (2002) 323-347.
[9] Theo Notteboom and Jean-Paul Rodrigue, 'Re-Assessing Port-Hinterland Relationships in the Context of Global Commodity Chains', in James Wang, Daniel Olivier, Theo Notteboom and Brian Slack (eds.), *Inserting Port-Cities in Global Supply Chains* (London 2007) 57-59.
[10] Ibidem, 2.

each means of transport. It is therefore important to not have a static view of the hinterland, which can change abruptly as a result of natural phenomena, political events, exogenous economic factors or technological changes such as containerization.[11]

Containerization certainly had a major effect on the hinterland considered in this research, causing a growth in geographical reach and, consequently, competition between ports located in each other's proximity.[12] This work shares the optimism of Sargent that a hinterland can be determined. Herein, however, it is demonstrated that the hinterland of the Port of Rotterdam does not consist of a single coherent area, but a number of discrete areas. Indeed, as Notteboom has observed, the emergence of intermodal networks can form discontinuous hinterlands.[13] Nevertheless, for two reasons, the distinction that Morgan makes between an import and export hinterland will not be adopted here: there is not enough data available to elaborate on this issue for the entire research period, while for the period in which satisfactory data is available, the imbalance is not significant and it is impossible to draw conclusions from it.

Here, Van Klink's argument about the role of creating networks in port competition is supported. The rivalry between ports leads to competition between transport chains, meaning that hinterland connections assume major importance. Containerization reduced costs dramatically due to the intermodal transport that followed on from it, which meant that standardized transport units could be transported anonymously by a combination of different modalities. Initially, this required major adjustments to the transshipment and transport infrastructure of ports and their hinterlands. At first, Rotterdam had an advantage, but once the infrastructure was also in place in other ports, they could transship containers just as easily. It thus became possible for containerized goods to use alternative routes.

The notions of captive and contestable hinterlands are used in the analysis herein and the results support Haralambides's standpoint about the diminution of the former. Moreover, the physical, logistic and macroeconomic hinterlands from Notteboom's typology are utilized here. Containers are seen as a separate commodity, as this means of transport is highly standardized and the contact with the content is lost.[14] When possible, however, the content of the containers is considered, as this supplies valuable information about economic ties between the country of origin and destination. As a consequence, Notteboom's advice to conceive the hinterland as dynamic is taken seriously, particularly because of the historical nature of this research, which focuses on the dynamic character of the hinterland. The hinterland is thus defined here on the basis of the definitions of De Goey and

[11] Theo Notteboom, *The relationship between seaports and their intermodal hinterland in light of global supply chains,* (2008) 4.
[12] Y. Hayuth, 'Intermodal transportation and the hinterland concept', *Tijdschrift voor economische en sociale geografie,* 73 (1982) 13.
[13] Theo Notteboom, *The relationship between seaports and their intermodal hinterland in light of global supply chains,* (2008) 4.
[14] P.W. de. Langen, *Port Economics, policy and management,* 41.

Van Driel as an area that is supplied by a port,[15] as well as Notteboom's view that it is 'the area over which a port draws the majority of its business.'[16] Hinterland here means the area to and from which the majority of containers were transported from and to the Port of Rotterdam. As much of the data is only available on a national level, different hinterland areas are identified first per country before the major hinterland regions are determined. In spite of the focus on the Lower Rhine region, this work explores the hinterland areas of Antwerp, Rotterdam, Bremen and Hamburg, reaching from the north of France to Central and Eastern European countries and from Britain to the north of Italy. This is necessary for two reasons: it enables a comparison to be made of the relative importance of the transport flows within the Lower Rhine region to the rest of the hinterland; and it makes it possible to study port competition in detail.

Containerization, along with the development of information and communication technology in the 20th century, is strongly connected to globalization. Globalization is a broad notion, and there have been two waves since the 19th century. The first took place between 1870 and World War I, while the second started in the 1980s.[17] In this research, the notion of globalization is used in accordance with the views of the British political theorist David Held, who identifies it as a growing worldwide interconnectedness. These connections are created by flows of goods, people and information, which form networks.[18] For the Port of Rotterdam, globalization meant that it was included in a growing worldwide transport network. Meanwhile, the crescent flows of maritime containers had to be channelled through to the hinterland, and this push factor led to the extension of the Rotterdam hinterland.

The opposite of globalization is regionalization, which is defined here as narrowing and intensifying network connections within a region more than between the region and the outside world. These network connections are institutional, for example integration by rules and regulations, flows of capital such as ownership structures and transport flows, and concrete container flows.

Historiography

Here, the historical and economic literature on the topic of the thesis will be analyzed and the sources used will be explained. There is rich literature available on different aspects of the subject of this work. Indeed, even though this research takes a completely new perspective, it is nevertheless important to review the historical debate on closely related subjects in order to position the study within the context of previous work. As economic ties that transcend national borders are discussed in

[15] Ferry de Goey and Driel Hugo van, 'Rotterdam und das Hinterland (1920-1995)'. in H. A. M. Klemann and Friso Wielenga (eds.), *Deutsland und die Niederlande Wirtschaftsbeziehungen im 19. und 20. Jahrhundert* (Münster New York München Berlin 2009) 127-151.
[16] Theo Notteboom, *Re-Assessing Port-Hinterland Relationships in the Context of Global Commodity Chains*, 4.
[17] Keetie Sluyterman and Ben Wubs (eds.), *Over grenzen multinationals en de Nederlandse markteconomie* (Amsterdam 2009) 218-219 and 279.
[18] David Held, Anthony McGrew, David Goldblatt and Jonathan Perraton, *Global transformations* (Oxford 2001).

this research, the issue of how to write transnational history emerges. Moreover, the historiography on the transnational economic unit of the Lower Rhine economy is discussed. Finally, the most important literature on containerization is inventoried and scrutinized.

Containerization, which is the introduction of standardized transport units that can be conveyed by different modes of transport, is an important part of the logistic revolution of the second half of the 20th century. Even so, in Europe, the early history of containerization dates back to the end of the 19th century. There have been numerous publications on container transport in general as well as on its specific aspects, for example the work by A. Donnovan, and J. Bonney, *The Box that changed the world: Fifty years of container shipping*. This is a richly illustrated book that narrates the history of container transport in the United States and connects it to globalization.[19] The American side of the history of maritime containers is also featured in Marc Levinson's book *The Box: How the shipping container made the world smaller and the world economy bigger*[20] in which he concentrates on the global aspects of transcontinental maritime container transport within the triangle consisting of the US, Europe and Asia. With its focus on hinterland transport, the analysis in this thesis forms the European counterpart to Levinson's *Box*, and corrects the misunderstanding that all containers originate from the United States.

The current work also examines European economic connections, with a focus on economic bonds between areas on different sides of national borders. This approach follows a relatively new tendency in history, economics and economic geography. According to some historians, history has focused too much on national states. Patricia Clavin, for example, believes that history writing on a national basis is inadequate when it comes to capturing the economic history of transnational regions that are demarcated by natural rather than artificial borders.[21] The Dutch economic historians Johan Schot and Jan-Pieter Smits emphasize the role of this transnational turn in economic geography. According to these authors, transnational economic areas are logical units of analysis, as successful nations tend to trade with their neighbours.[22] In 1990, the economist Michael Porter in his book *The Comparative Advantage of Nations* identified nation as the unit of analysis.[23] However, in his later work in the 2000s, he changed his mind about the subject, claiming that economists have concentrated too much on national states when studying competitiveness, while drivers of economic development are to be found on a regional level. Porter identifies clusters, which consist of firms and related industries, a concentration of which forms an agglomeration. The performances of regions within a

[19] A. Donnovan, J. Bonney, *The box that changed the world: Fifty years of container shipping* (Chicago 2006). H.J. Witthöft, *Container: Transportrevolution unseres Jahrhundreds* (Hertford 1977), R. Pearson, *Container ships and shipping* (London 1988), B.J. Cudahy, *Box boats: How container ships changed the world* (New York 2006), O. Preuß, *Eine Kiste erobert die Welt* (Hamburg 2010).
[20] Marc Levinson, *The Box: How the shipping container made the world smaller and the world economy bigger* (Princeton 2006).
[21] P. Clavin, 'Defining Transnationalism', *Contemporary European History*, 14 (2005) 3-14.
[22] Ibidem, 3-14
[23] M. E. Porter, *The Competitive Advantage of Nations* (New York 1998).

country often differ and affect the overall performance of the national economy.[24] With this view, Porter agrees with New Economic Geography (NEG), which also strives to determine cases of the geographical distraction of economic activities and their changes.[25] The most important representative of this economic trend was Paul Krugman. According to Krugman, a region is a geographically consistent area with a few million inhabitants and a manifest economic identity.[26] Krugman identifies two determinants of the productivity of regions, the fundamentals, which are inherent in the region, and the external economies, which are the spill-overs of clusters that are in turn the result of the development of the region.[27]

Thus far, a self-reinforcing mechanism that leads to continuous growth has been described. However, a fundamental technological change, such as an energy transition or a change in transport costs due to innovation, can undermine the economic growth of a region. Indeed, in this way, many regions turned into problem areas, as their comparative advantage was lost in the new circumstances.[28] An example of this is the decline of the Ruhr area in the second half of the 20th century.[29]

At the same time, as a result of change, new clusters can emerge.[30] Such a cluster was born in Southern Germany in the 1950s with the relocation of companies from East Germany and the Sudetenland to Munich, the most important of which was Siemens.[31] The main focus herein is an economic region, which is somewhat determined by a fixed geographical factor, the Rhine, rather than national borders that depend on political developments. This transnational economic unit is described herein as the Lower Rhine economy.

The Dutch economist Kees van Paridon likewise emphasizes the importance of the economic integration between Germany and the Netherlands. He illustrates this with two examples, first observing that the economic relationship between the two countries had been so close that even their economic growth and inflation rates correlated. He also demonstrates that the Port of Rotterdam undertook more German than Dutch transport, with more of this transport having its final destination in Germany than goods coming from any German port.[32] A 1982 report of the *Wetenschappelijk Raad voor het Regeringsbeleid* (WRR) –(Dutch Academic Board for Government Policy) discussing the economic relationships between Germany and the Netherlands stated that the German and Dutch

[24] M.E. Porter, 'The Economic Performance of Regions', *Regional Studies*, 37 (2003) 549-578.
[25] A. Schmutzler, 'The New Economic Geography', *Journal of Economic Surveys*, 13, 4 (1999) 355
[26] Paul R. Krugman, *Growth on the periphery Second winds for industrial regions?* (Strathclyde 2003) 12-13.
[27] Ibidem, 23-24.
[28] Ibidem, 27-28.
[29] H.A.M. Klemann and Dirk Koppenol, 'Port competition. Rotterdam within the Le Havre-Hamburg range (1850-2013)', in Bart Kuipers and Rob Zuidwijk (eds.), *Smart Port Perspectives Essays in honour of Hans Smits* (Rotterdam 2013) 74.
[30] Paul R. Krugman, *Growth on the periphery. Second winds for industrial regions?* (Strathclyde 2003) 27-28.
[31] Onno Möller, *Nederlands-Duitse handel op de helling? De verschuiving van het economisch zwaartepunt in de Bondsrepubliek en de ontwikkelingen in de goederenstroom tussen Nederland en de Bondsrepubliek* (Utrecht 1991)15.
[32] Kees van Paridon, 'Geht es noch enger? Die Wirtschaftsbeziehungen zwissen Deutschland und die Niederlanden nach 1945'. In H. A. M. Klemann and Friso Wielenga (eds.), *Deutschland und die Niederlande Wirtschaftsbeziehungen im 19. und 20. Jahrhundert* (Münster New York München Berlin 2009) 87-126.

economies were highly interdependent, interwoven and complementary. Interdependence is defined based on O.R. Young's description of it as two or more countries reacting to external impulses in a similar way.[33] Meanwhile, to describe the term interwoven, the authors of the report used Kees van Paridon's research results, which calculated that, based on trade, the Dutch economy was three times more intertwined with its German counterpart than the other way round. The report demonstrates the interweaving and complementarity of the two countries based on trade patterns and direct financial investments.[34] The current work focuses on the economically intertwined Lower Rhine economy observed by Klemann, and examines the role of container transportation in establishing, sustaining, strengthening or loosening economic bonds within the region.

The Rhine as a transport channel has intensified transport flows between Rotterdam and the Ruhr area. From the 19th century, barge transport provided the Ruhr area with raw materials, mine wood and cheap food, while also supplying the Netherlands with coal. Based on macroeconomic data, the Dutch historian H.A.M. Klemann demonstrates that the Netherlands had been a part of an economic unit consisting of the Rotterdam and Ruhr areas, which can be described as the Lower-Rhine economy, for 150 years. Indeed, according to Klemann, in some aspects North Rhine Westphalia was economically more integrated with the Rotterdam area than with other parts of Germany.[35] The historical analysis of a transnational economic unit is a new trend in economic history that has been practiced with respect to the Transnational Rhine Network.[36] This resulted in several publications, among which was that by H.A.M Klemann and J. Schenk, which discusses the competitiveness of Rhine shipping compared to rail transport in the period 1830-1913.[37]

There is abundant historical literature available about both the Port of Rotterdam and the Ruhr economy, but the only major post-war publications about Rotterdam and its hinterland are: the PhD effort by Renate Laspreyes: *Rotterdam und das Ruhrgebiet – Rotterdam and the Ruhr Area*, which dates from 1969; and the work by J.F.E. Bläsing, *Das goldene Delta und sein eisernes Hinterland 1815-1851 Von Niederländisch-preußischen zu deutsch-niederländischen Wirtschaftsbeziehungen - The Golden Delta and its iron hinterland 1815-1851 from Dutch-Prussian to the Dutch-German Economic Relations* from 1973.[38] Bläsing's publication deals with the first half of the 19th century, and, while Laspreyes's was written in the early days of containerization, it nevertheless ignores this

[33] O.R. Young, *Power and Interdependence* (Boston 1977) 11-19.

[34] Wetenschappelijk Raad voor het Regeringsbeleid, *Onder invloed van Duitsland: een onderzoek naar de gevoeligheid en kwetsbaarheid in de betrekkingen tussen Nederland en de Bundesrepubliek,* (1982) 8-9.

[35] H.A.M. Klemann and Friso Wielenga, 'Die Niederlande und Deutschland, oder verschwindet die nationale Ökonomie? Eine Einleitung'. in H. A. M. Klemann and Friso Wielenga (eds.), *Deutschland und die Niederlande Wirtschaftsbeziehungen im 19. und 20. Jahrhundert* (Münster New York München Berlin 2009) 7-17.

[36] http://www.eshcc.eur.nl/english/rhineeconomy/subprojects/transnational/, seen on 10-11-2013.

[37] H.A.M. Klemann and J. Schenk, 'Competition in the Rhine Delta. Waterways and ports, 1870-1913', *Economic History Review,* (2012).

[38] Renate Laspeyres, *Rotterdam und das Ruhrgebiet* (Marburg 1969), J. F. E. Bläsing, *Das goldene Delta und sein eisernes Hinterland 1815-1851 Von Niederländisch-preußischen zu deutsch-niederländischen Wirtschaftsbeziehungen* (Leiden 1973) 1-276.

subject. Containerization is, however, popular in the academic literature, although most publications about this topic are written from an economic perspective. Consequently, they were produced with the intention to predict future developments and influence policy choices. There are two exceptions to this: the work of the Flemish economist Theo Notteboom and that of the Dutch business historian Hugo van Driel, both of whom pay attention to the history of containerization on the Rhine and Scheldt rivers. Notteboom wrote several publications about the hinterland, concentrating on barge transport using a comparative perspective between the ports of Antwerp and Rotterdam. The most important work for the empirical part of the current research is his article *Inland waterway transport of containerized cargo: From infancy to a fully-fledged transport mode*[39] and the book chapter *Thirty-five years of containerization in Antwerp and Rotterdam: structural changes in the container handling market.*[40] In these publications, Notteboom writes the history of barge container transport, discussing transported volumes, the emergence of Rhine container terminals and the role of major barge companies in the development of barge container transport. Notteboom's findings are important for this research, and the parts treating barge container transport and the macroeconomic hinterland rely particularly heavily on his work.

Hugo van Driel wrote three major publications about the history of container transport. Two of these appear in his PhD work, *Samenwerking in haven en vervoer in het containertijdperk – Cooperation in the port and transport in the container era* - which he later summarized in an article.[41] In these two publications, he concentrated on liner shipping, stevedoring and road haulage. Then, in 1993, Van Driel extended his research to include Rhine shipping in his book: *Kooperation im Rhein-Containerverkehr: Eine historische Analyse – Cooperation in Rhine container transport: A historical analysis* in which he examines co-operation in the container transport sector based on an economic model.[42] Van Driel's work is important and relevant for this research, as it describes in detail the Rhine shipping industry in the period 1966-1993. In particular, it makes clear how containerization helped to intertwine the Rotterdam port area with the Ruhr area by enabling there to be cargo flows in both directions on the river. To earn money in river shipping, which was a sector with low profits and significant competition, it was necessary to have good contacts at both ends of the transport chain. These contacts became increasingly important in the period when shipping companies started to offer door-to-door transport solutions. It was thus easier to establish a barge container connection between two Rhine terminals than to arrange the last mile in the hinterland.

[39] Theo Notteboom, 'Thirty-five years of containerisation in Antwerp and Rotterdam: structural changes in the container handling market', in Reginald Loyen, Erik Buyst and Greta Devos (eds.), *Struggling for Leadership: Antwerp-Rotterdam Port Competition between 1870-2000* (Antwerpen 2000) 117-142.
[40] T. Notteboom, 'Inland waterway transport of containerised cargo: From infancy to a fully-fledged transport mode', *Journal of Maritime Research*, IV (2007) 63-80.
[41] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk* (Rotterdam 1990). Hugo van Driel, 'Co-operation in the Dutch container transport industry', *The Service Industries Journal*, 12 (1992) 512-532.
[42] Hugo van Driel, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse* (Rotterdam 1993) 1-165.

However, Van Driel's research dates from 1993, which is before the liberalization of the European transport sector. Consequently, it does not cover the last 17 years of the research period of the current work, which was when the process of containerization accelerated and major changes took place in, for example, the ownership structures of the companies involved in containerization. As a result, it is important to view Van Driel's research results from a new perspective, seen from the period after liberalization. Van Driel made use of several sources for his research. In particular, he accessed a number of company archives that are unfortunately no longer accessible. Furthermore, he used both statistical material and oral sources. It is admirable that based on limited numbers he was able to write a solid history of hinterland barge container transport, which is used herein extensively.

Method

The analysis in this work is based on a combination of quantitative and qualitative data. Three levels are described to which the transnational economic region is connected. On the institution level, qualitative data was used to explore rules and regulations that affected container transport flows between Rotterdam and its hinterland. On the concrete level, the examination of network connections – the container flows themselves – is based on quantitative data.

In this analysis, the development of container flows between Rotterdam and different hinterland countries and regions are studied and compared to each other. As data is collected on a national level, it was relatively easy to use. On the regional level, however, things were more complicated, and the most feasible division of the hinterland areas from the available data was as follows: North-West France, Antwerp, the Dutch domestic market, German ports, the Lower, Middle and Upper Rhine regions, Northern Italy, Southern Germany, and Central and Eastern European countries. Most of these areas are situated on two axes, one that is parallel with the coastline of Northern Europe and the other that runs alongside the Rhine to Northern Italy. Southern Germany and the Central and Eastern European countries are two exceptions, as they are not situated on either axis. North-West France includes the surroundings of Lille and Valenciennes; Antwerp means the Port of Antwerp and its surroundings; the Dutch domestic market designates the whole of the Netherlands, with the exception of the Port of Rotterdam; the German ports include the port areas of Hamburg and Bremen; and the Lower Rhine region stretches along the Lower Rhine in Germany from the Dutch border to Cologne, and includes the surroundings of the river within a radius of 50-60km, which is the average reach of a barge terminal by truck.[43] This can be seen as the primary coverage area of barge terminals.

[43] Interviews with: Jasmin Daum, manager Contargo Terminal Germersheim, 07-06-2012; Konrad Fischer, Contargo, managing director Terminal Ludwigshafen, 06-06-2012; Andreas Mager terminal manager Contargo Terminal Frankfurt am Main, 05-06-2012; Michael Mies, managing director, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012; Arndt Puderbach, terminal manager Contargo Rhein-Main Terminal Koblenz, former terminal manager Contargo Terminal Aschaffenburg, 05-06-2012; Christian Riegel, Contargo, company management Container Terminal Dortmund, 11-04-2012; Wolfgang Schlegel, Manager Contargo Terminal Wörth, 08-06-2012; and Heiko Vollmer sales manager, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012.

The first terminal on the Rhine in Germany is Emmerich, which is situated approximately 150km from Rotterdam, while the final one on the Lower Rhine is Cologne, which is 250km way from the Dutch port. This chunk of the Rhine is approximately 100km long. The Lower Rhine region includes parts of the Ruhr area and North Rhine Westphalia. The Middle Rhine area, meanwhile, stretches from Cologne to Karlsruhe, and includes the area within a range of 50-60km. As rail terminals were also situated along the Rhine, this definition of the area includes them. This interpretation does, however, cause a problem, as Stuttgart, which is almost 90km away from the Rhine, is not considered to be part of the Middle Rhine region, while the province of Baden Württemberg, which includes Stuttgart, is considered to be part of this area. As some statistics were only available on the province level, this was unavoidable.

The Upper Rhine stretches from Karlsruhe to Basel, and includes the French part of the Rhine, with the terminals of Strasbourg and Ottmarsheim. However, because of a lack of data and the focus of this research, these terminals are not included in the definition. There is also a terminal just across the German border in Weill, while there is a cluster of terminals situated in Basel, which is the highest point of the Rhine that can be navigated by larger barges. The discussion of the Upper Rhine as a hinterland area concentrates on Switzerland. Meanwhile, the region of Northern Italy is understood herein as the area formed by Milan, Padua, Verona and Bologna, while Southern Germany is defined as Bavaria and Baden Wurttemberg, excluding the part belonging to the Middle Rhine region. Finally, the Central and Eastern European countries considered are Poland, the Czech Republic, Slovakia and Hungary (Figure 1.1).

Figure 1.1 *The hinterland regions defined for the analysis of container transport flows between the Port of Rotterdam and its hinterland*

On the company level, single and multiple case studies are used to retrieve both quantitative and qualitative data. The use of this method was necessary as many companies were active in the container transport sector in Germany and the Netherlands between 1966 and 2010, meaning that it would have been impossible to research them all. The case study method therefore made it possible to create a sample that was both feasible to research and provides an indicative view of the sector.

Case studies are considered to be good tools for research in social sciences.[44] Nevertheless, authors disagree on the value of single or multiple case studies. R. K. Yin has the most optimistic view of the value of the generalizations that arise from this form of research, whereas R.E. Stake is of the opinion that the particularity of the singular case disappears when generalizing from case studies.[45] Case studies that connect ordinary facts with academic knowledge can help to test data or theories and illustrate the information that is retrieved using other methods.[46] Certain precautions need to be taken, however, when applying the case study method. Conducting case studies is bound by practical restrictions, as only a limited number can be researched. As a result, per definition, the sample available is always too small.[47] As a consequence, it is important to highlight the weak points of the research.

There are several possible criteria when it comes to selecting cases; they can be chosen because they represent the average, or because there are no major differences between them, or because they are thought to be relevant. In the case of a small domain, it is acceptable to only choose one case.[48] However, there are three requirements that case studies have to meet: they need to have conceptual validity, meaning that they should supply the information that is needed for the analysis; they need to be trustworthy, meaning that the data retrieved should be stable and independent; and, finally, they need to have external validity, which means that generalizations can be made from them.[49] During the current research, careful attention is paid to all of these aspects, the most important of which is external validity. According to P.G. Swanborn, the external validity of research can be enhanced by submitting the results to stakeholders and comparing them with other sources.[50] Both of these precautions were taken here. Finally, the combination of different research methods, known as triangulation, ensures that the research is sufficiently reliable.[51]

In the case studies herein, three kinds of firm were researched, rail, barge and road haulage. In the case of rail companies, two single case studies were conducted. The first involved the freight department of the Dutch rail company, Nederlandse Spoorwegen (NS), and the second concerned European Rail Shuttles (ERS). These companies were chosen because, before the liberalization of the Dutch rail market in the 1990s, this state-owned firm monopolized the Dutch rail transport market, while ERS was the largest new entrant after liberalization and has been proven to have a major impact on container transport between Rotterdam and its hinterland. The choice of a barge company was more

[44] Robert K. Yin, *Case Study Research Design and Methods* (London 2003); Peter G. Swanborn, *Case studies: wat, wanneer en hoe?* (Den Haag 2013) 1-271; Robert E. Stake, *Multiple case study analysis* (London 2006).
[45] Stake, *Multiple case study analysis*, 8;, Yin, *Case Study Research Design and Methods*, 32.
[46] Peter G. Swanborn, *Case studies: wat, wanneer en hoe?* (Den Haag 2013) 1-271, Robert E. Stake, *Multiple case study analysis*, 56 and 63.
[47] Swanborn, *Case studies: wat, wanneer en hoe*, 79 and 144.
[48] Ibidem, 79-81 and 100.
[49] Ibidem, 127-128.
[50] Ibidem, 146 and 169
[51] Ibidem, 169.

complicated because more firms were active in that sector. However, the decision was made to choose the largest player, Combined Container Services (CCS), which later became Contargo and had been dominating the barge market between the 1970s and 2010. These case studies are not compared to each other, and nor are they combined as they serve to support and illustrate the results of the numerical analysis.

In the road haulage sector, the choice of a case study was even more complicated as, although there were hundreds of companies active in the container transport market, there were no large firms that would have operated dozens of trucks in the hinterland between 1966 and 2010. Accordingly, the decision was made to use a multiple case study of a group of companies. Due to the lack of written sources, this case study was conducted by holding interviews with directors or other influential people from the chosen firms. The results of the different case studies were combined to support and illustrate the findings of the numerical analysis. The quality of the research is guaranteed by the combination of the different research methods and the carefully applied triangulation both within and between them.

Sources and their limitations

Quantitative and qualitative data from archives, transport statistics, transport journals, secondary literature and interviews are used herein. In the *Nationaal Archief* in The Hague, research was conducted on the transport policies of the Netherlands and Germany. *Het Utrechts Archief* provided the archive of the Dutch Railways until their privatization, and it turned out to be a rich resource. Another major source was diverse transport statistics. Indeed, new container transport series of data were made available in 2011 by the *Centraal Bureau voor de Statistiek (CBS)* (Dutch Statistical Office).[52] Unfortunately, these data were only available for 1997-2010, and the CBS did not have any reliable statistics for all of the three transport modalities for the previous period. More detailed information was provided by the *Deutsches Statistisches Bundesamt* (German Statistical Office) in its series of publications on combined transport, which unfortunately only cover the period 2004-2010.[53] The lacunas in these statistics were, as far as possible, filled with data from the Dutch Railways, different transport agencies, consultants' reports, archival sources, transport journals and interviews. As even this was not enough to provide all of the information required for all of the years of the research period, benchmark years were chosen. The choice of these years is explained in Appendix A. Meanwhile, *Nieuwsblad Transport* (Transport news) and some other journals that recorded many events of the transport sector and which are available and searchable online were helpful in producing statistics.

One other series of reports is worth mentioning. The Dutch consultancy agency *NEA Transportonderzoek en opleiding* (NEA) (NEA transport research and training) has produced numerous studies on the determination of the hinterland of freight transport, some of which concerned

[52] Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).
[53] Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

containers.[54] Even though they present a snapshot of the hinterland in a particular year, these studies are nevertheless relevant to this work. The *NEA* mainly presents its results using maps with coloured areas. The unavailability of the underlying data does, however, reduce their value.

Finally, part of the research is based on interviews with people who were active in logistics between 1966 and 2010. This was done because of the lack of archival material. Most transport companies either did not keep archives, or keep this information private, which meant that apart from those of NS, no other company had archives available. Furthermore, from the mid-1990s onwards, most data was produced and stored in computers, and in time became unintelligible as a result of changing hardware and software.

When using oral sources, one has to consider two factors, the reliability and the validity of the method. Reliability means that the information retrieved from different interviews needs to be consistent. Consistency designates the verification of the results with other sources.[55] Here, careful attention was paid to both aspects. When dealing with the issue of reliability and the problem of the interviewer and interviewee having an influence on results, the choice of respondents and their memory limitations are carefully weighed.[56] The effect of the interviewer on the interviewee was negligible, as the research subject, transport connections, was a matter of professional, not personal, interest. Nevertheless, when using the data from the interviews, the potential for bias was considered. The personal role of the interviewee was also not relevant for the research.

The choice of respondents can also lead to bias in the results, especially if they are selected by the snowball method, which involves asking a particular group of people about who they believe possesses knowledge of the studied phenomenon. This can lead to bias, as the respondents tend to suggest people from their own circles.[57] The choice of interviewees was primarily determined by their availability, as they were mostly managers and directors with a high work load. When approached directly, they often refused to cooperate. A recommendation by a colleague increased the willingness to get involved. This led automatically to the snowball method. This was not a problem for the research on the rail and barge modalities, as all of the available people from the major companies - NS, Deutsche Bahn, ERS and Contargo - were interviewed. A problem did emerge with the road haulage sector, where numerous companies were active. As a consequence, a handful of firms that were involved in the cooperation One Way Trucking were chosen as a case study.

The limitations of the memory of the interviewees also had to be taken into account. Accordingly, to refresh the memory of the respondents during the interviews, details were connected to well-known events that were relevant to the sector, such as oil crises and the different steps in taken

[54] NEA Transportonderzoek en opleiding, *Kaarten achterland Scheldebekken,* (2006) 1-45, NEA Transportonderzoek en opleiding, *Analyse goederenstromen op de corridor Rotterdam-Antwerpen* (Rijswijk 1993) 1-57 http://www.nea.nl/, seen on 30-12-2013.
[55] Ibidem, 93.
[56] Paul E. Werkman, *Uitgesproken geschiedenis Oral history in geschiedenis en journalistiek* (Zwolle 2001).
[57] Ibidem, 33.

to liberalize transport. Data from the interviews were checked in different ways, again and again. In terms of consistency, the results of the interviews were validated with transport journals, especially *Nieuwsblad Transport*, and with secondary literature. In the case of any discrepancy between the literature and the interviews, the interviewee was contacted to seek clarification. If there was a total mismatch for which no explanation could be found, the results were excluded. In this way, the professional approach of oral sources guarantees maximum reliability and consistency.

Structure

This work consists of three parts. Part I, *Beginnings*, starts with the Introduction. Then, Chapter 2 is dedicated to the history of containerization in Europe. It begins with the early history of containerization, going back to the end of the 19th century, followed by the story of continental containers in Europe. This chapter also explores the difference between maritime and continental container flows.

Part II of the thesis, *Three modalities*, analyzes the development of container flows between Rotterdam and its hinterland. Chapter 3 explores the infrastructure of container transport and examines the rules and regulations concerning German-Dutch transport on the national, bilateral and European levels. This chapter focuses on the liberalization of the European transport sector and its influence on containerization. Then, in chapters 4, 5 and 6, each modality of container transport is analyzed. In these chapters, the changing patterns of hinterland container transport and the effects of liberalization on them are analyzed using the example of actual transport companies.

Part III, *Hinterland*, examines the macroeconomic hinterland and consists of two chapters. Chapter 7 aggregates the findings of the chapters in Part III using an inverse perspective. While in the previous chapters transport flows were described from the point of view of the Port of Rotterdam, in this chapter the identified hinterland areas are central. In particular, the sea ports from where these areas obtained their containers are identified. This approach makes it possible to connect the container flows with the macroeconomic hinterland of container transport, and to highlight the importance of competition between the ports of Le Havre, Antwerp, Rotterdam, Amsterdam, Hamburg and Bremen. Chapter 8 contains the conclusions.

Chapter 2
The History of Containerization

Ever since the publication of Marc Levinson's *Box*, many people consider containerization to be the personal achievement of Malcolm McLean.[1] This chapter places the advent of maritime container transport in a European historical perspective. In his book, Levinson assigned four pages to the early history of container transport, in which he pointed out the parallel development of containers in both the United States and Europe.[2] He concluded that before McLean's innovation of intermodal maritime containers, container transport was inefficient and did not manage to lower transport costs substantially. He also emphasized the inadequacies of transport systems, but paid little attention to the scale of transport demand, which determines the macroeconomic hinterland.[3]

Levinson mentions numerous initiatives with respect to intermodal transport in both Europe and the United States. These initiatives began in both continents at the end of the 19th century. Railways played an important role in this. It was mainly national rail companies that were in operation in Europe, while in the United States there tended to be privately owned regional rail companies. After World War I, road haulage in the US joined the experiment with intermodal container transport. Furthermore, coastal shipping with containers began in the 1950s in Denmark and north-west America. Levinson emphasizes the role of companies in these experiments. He also refers to three non-private organizations, the Bureau International des Containers (BIC), the US military and the Interstate Commerce Commission (ICC). The BIC, which was founded in Paris in 1933, was a European-based organization for the development of container transport. In the 1950s, the US military started to use so-called *Conex* boxes, which are small steel containers, for the transport of soldiers' personal belongings. However, the ICC, a US governmental body founded in 1887 to regulate transport within the country, played a restrictive role in the development of rail container transport. With its 1931 rule that railroads could not charge less for transporting a container than the price set per weight for the most costly commodity inside it, the ICC made it impossible for the railways to reduce container transport costs.[4] In addition, Levinson lists several other reasons why, in his view, early container transport could not generate cost advantages. In the main, he points to technical deficiencies, different materials used for the production of containers, each with their individual problems, the lack of standardization and weight regulations, and difficulties with handling. His most important point, however, was that the containers in existence were relatively small. In particular, in

[1] Levinson, *The Box*.
[2] Ibidem, 29-31, 138.
[3] Theo Notteboom and Jean-Paul Rodrigue, 'Re-Assessing Port-Hinterland Relationships in the Context of Global Commodity Chains', in James Wang, Daniel Olivier, Theo Notteboom and Brian Slack (eds.), *Inserting Port-Cities in Global Supply Chains* (London 2007) 85.
[4] Levinson, *The Box*, 29-32.

1955, there were more than 150,000 containers in use in non-communist countries, but more than half of them had a capacity of only 0.17m^3 or 170 litres.[5]

The history of the European continental container

In Europe, just as in the United States, intermodal container transport had its origins in the railways. As long ago as 1801, the Englishman James Anderson conceptualized a container as a standardized transport unit that could be placed on and removed from a train by crane.[6] In both the United Kingdom and Germany, there were experiments with the transport of detachable boxes, while the Rotterdam Tram Company[7] exploited special flat trains to convey standardized boxes in 1899 in the Netherlands. This transport was intermodal. The boxes were moved by train from Rotterdam to Hellevoetsluis, where they were then placed on a ferry to cross the stretch of water known as the Haringvliet. At the other end, they then continued their journey on a train to Goeree Overflakkee.[8]

In the second half of the 1920s, rail transport was increasingly confronted with new competition from the emerging truck industry. This forced the rail sector to innovate and rationalize, and it soon realized that the answer lay in door-to-door transport, which implies intermodal transport involving trains and trucks (Figure 2.1).[9] It was quickly understood that international cooperation and standardization were also preconditions for the feasibility of container transport. The road sector took the initiative, and in 1928 at the *Congrès Mondial des Transports Automobiles* in Rome, it was decided to organize a concourse for the best container design.[10] It became obvious after the concourse that there was a need for permanent action in the field of containerization. As a consequence, the *Comité International des Containers* was founded to continue the work of the conference. The organization thus initiated the standardization of intermodal containers by defining maximum sizes and weights. The commission distinguished large and small containers. The latter could be transported in rail wagons, and so were comparable with pallets, which were introduced in Europe later. The former could not be transported in wagons because of their size; they were individual transport units, just like the maritime containers emerging in the 1960s. Both types had an open and closed version[11] and, contrary to what Levinson wrote, regulations for the weight of containers were set by the *Comité International des Containers* (Table 2.1).

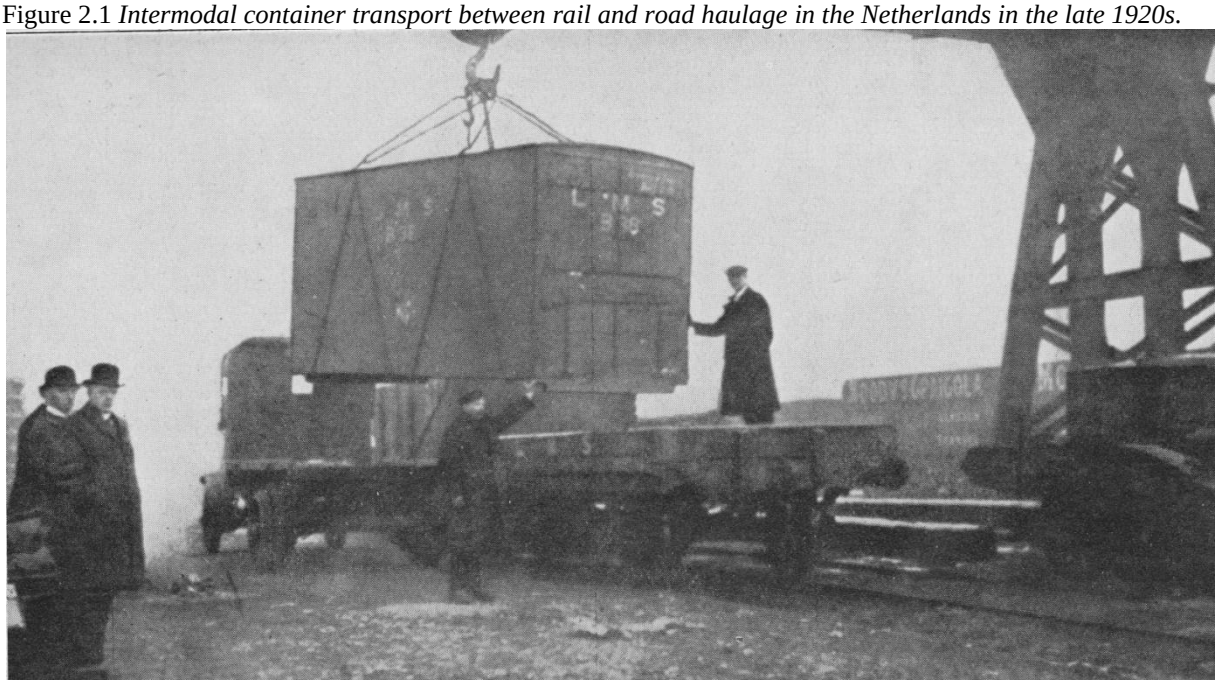
[5] Ibidem, 29-32.
[6] S. W. Verstegen and Y. Alkema, *Containerisatie in het Nederlandse transport* (Den Haag 1991) 9.
[7] Rotterdamse Tramwegmaatschappij
[8] Guus Veenendaal, *Spoorwegen in Nederland: van 1834 tot nu toe* (Amsterdam 2004) 285.
[9] H. Janssen van Raay, *Container-verkeer voor Nederland* (Amsterdam 1934) 1-45.
[10] Ibidem, 17-22.
[11] Ibidem, 7.

Table 2.1 *Maximum container sizes for international transport as defined by the Comité International des Containers in 1928.*

Category		Type	Maximum size in meters		
			Length	Width	Height
Large containers (Br. weight 5 tons)	Closed	82	4.35	2.15	2.2
		62	3.25	2.15	2.2
	Open	61	3.25	2.15	1.1
		41	2.15	2.15	1.1
Small containers (Br. weight 2.5 tons)	Closed	22	2.15	1.05	2.2
		201	2.15	1.05	11
	Open	21	2.15	1.05	1.1

Source: H. Janssen van Raay, *Container-verkeer voor Nederland* (Amsterdam 1934).

Figure 2.1 *Intermodal container transport between rail and road haulage in the Netherlands in the late 1920s.*



Source: M.H. Claringbould, *Spoorweg aanpassingsvermogen* (Purmerend 1929).

In 1933, the activities of the commission took on a more permanent form when the *Bureau International des Containers* was founded in Paris by the International Chamber of Commerce. Almost all of the rail companies in mid and Western Europe, a number of road haulage and barge

firms, and standardization agencies for trucks participated in this organization.[12] Meanwhile, the BIC set a target to deal with normalization, practical issues connected to containers, international cooperation, custom harmonization and the setting of tariffs.[13] Its activities also involved publishing a magazine entitled *Le Container*.[14]

In the 1930s, containers and intermodal transport played an important role in many European countries. In France, for example, containers were used for door-to-door transport to England and North Africa. In Italy, meanwhile, the *Società Italiana Casse Mobili* (SICON) was a company specializing in container transport.[15] Likewise, from 1930 onwards, tank containers of 20 to 35 hectoliters were used in Austria for the distribution of milk around Vienna. In Switzerland, small rolling containers were utilized for the transportation of chocolate, while in the Netherlands the Dutch railways had 600 small containers in operation to move butter, cheese, fruit, glass and iron products around the country.[16] Furthermore, the road haulage company *Van Gend & Loos*, a subsidiary of the Dutch Railways, used containers with a volume of $1m^3$ and rail transport units of $11\text{-}12m^3$, which were suitable for intermodal transport. Special rail wagons and trucks with particular loading units were built for these containers. Indeed, by 1928, these combinations were developed by the Dutch national rail wagon factory *Werkspoor* in cooperation with the Dutch factory DAF. After being licensed, this invention was also implemented before World War II by the Belgian, Swiss and Austrian railways. In the 1950s, *Van Gend en Loos* continued to use wooden containers, and had 3900 of them in 1955.[17] In Germany, meanwhile, the progress of truck transport triggered the development of another intermodal technique when, in 1930, the German engineer Johann Culemeyer, who became the director of *Deutsche Reichsbahn* (the German National Railroads) in 1936, developed the so-called Culemeyer heavy trailer. These trailers had both iron and solid rubber wheels, which enabled them to ride the last mile on the road on their way to a factory's yard pulled by tractors. In 1970, there were still 187,000 wagons being transported in this way. However, due to the damage they caused to the roads as a result of their weight, this method was soon abandoned.[18]

Containers were also widely used in overseas transport. In 1933, for example, there were 1,100 large containers transported from England to Rotterdam and 600 to Amsterdam, while 145 full containers were moved between England and France.[19] In the 1930s, the *Reichcuratorium für Wirtschaftlichkeit* (Governmental Board of Trustees for the Economy) published a comparative study on the difference in transport costs between containerized and uncontainerized goods, concluding that

[12] Hans Wenger, *Geschichte der UIRR und des Kombinierten Güterverkehrs Schiene-Strasse in Europa 1970-2000* (Brussels 2000) 265.
[13] H. Janssen van Raay, *Container-verkeer voor Nederland,* 23-25.
[14] Ibidem, 26.
[15] Ibidem, 32-33.
[16] Ibidem, 38-39.
[17] F. Oldendal, 'VGL kisten', *Rail Cargo Magazine,* 1994 Aug/Sep 4, 23.
[18] Georg-Wilhelm Schmidt-Sommerfeld, 'Großbehaltälter bleiben aktuell', in *Verkehrsmärkte der Bahn Probleme und Prognosen Ein Kompendium des Güterverkehrs* (Darmstadt 1972) 74.
[19] H. Janssen van Raay, *Container-verkeer voor Nederland,* 38-39.

in some cases intermodal container transport reduced transport costs by 38-48 percent.[20] This contradicts Levinson's finding that, before the development of intermodal maritime containers, container transport could not reduce transport costs substantially.[21] Indeed, although this percentage was lower than the transport cost reductions achieved by the later maritime containers, it was still a considerable sum.

As a result of World War II, the European market collapsed, and the advancement of utilization ended. However, in the 1950s, due to the growth in industrial production, utilization returned to the agenda. At this point, the answer to transport problems was pallets and containers. However, just as in the 1930s, it was clear that standardization was needed due to the growing production and transport volumes travelling between European countries. In 1958, the International Chamber of Commerce asked its members to decide which size of pallet should become the European standard, to be known as the Europallet. It was clear that there were two candidate sizes: 0.8m x 1.2m, which was more suitable for road haulage, or 1.2m x 1m, which suited rail transport the best. The *Union Internationale des Chemins de Fer* had already declared its preference for the latter. However, at a meeting with representatives from Belgium, Denmark, Germany, the Netherlands, the United Kingdom, France, Italy, Portugal, Switzerland and Sweden, all of the participants other than Germany and the Netherlands voted in favor of the 0.80m x 1.2m size. The reason for the latter two countries' position was that they already had a common pallet pool in their preferred size. Ultimately, however, the size chosen by the majority was selected as the standard, but the Netherlands and Germany were free to continue to use their preferred standard size in bilateral transport.[22]

A Europallet was thus 0.8m x 1.2m in size and could not be stacked, while the first maritime containers were 35 feet (10.587m) long and suitable for stacking. Influenced by the news on containerization in the United States, there was a push to develop standardized transport units, but Europe had a preference for pallets. In 1961, the European Pallet Pool was founded to improve the efficiency of Europallets in international transport.[23] As a solution, the measurements of European rail containers were set in such a way that they could be filled with pallets. Consequently, continental containers were designed for the optimal use of flat rail wagons and had the advantage that two rows of Europallets could be loaded into them.

[20] Publication nr. 77 Fritz Brauner, *Behälterverkehr,* H. Janssen van Raay, *Container-verkeer voor Nederland,* 27, 43.
[21] Marc Levinson, *The Box: How the shipping container made the world smaller and the world economy bigger* (Princeton 2006) 31.
[22]Nationaal Archief 2.19.054.01 Nederlandse Redersvereniging 279, International Chamber of shipping user-carrier consultation Palletisation Vergadering van 16/01/1958 in Parijs, International Chamber of Commerce meeting over palletisation 19/09/1957, Verslag van C. Storm, Chef Etablissementen der HAL.
[23] Utrechts Archief, Nederlandse Spoorwegen, 75 Beleidsnota Internationale zaken EP Januari 1977 1-63.

The history of the American maritime container

In 1917 in the United States, the first experiments with containers were carried out by the road haulage company Cincinnati Motor Terminal Co, which cooperated with seven different rail road firms that were transporting 225 containers which were 5.30 x 2.40 x 2.10m in size with a loading capacity of 4.5 tons. The development of these containers was made possible by the US Interstate Commerce Commission (ICC), a government body formed in 1887 by the Interstate Commerce Act to regulate transport in the country. In 1917, the ICC established transport prices based on the net weight of the containers, irrespective of their contents, which made this type of transport attractive. Container transport was suitable for the railway transport of break bulk, meaning the bundled transport of goods with different destinations. In this segment of the market, rail transport's most serious competitor was road haulage. In the late 1910s, 27 percent of all rail volumes were comprised of break bulk and only 5 percent were containerized. The last mile of rail transport was conducted by different individual road haulage firms. At the same time, other rail companies developed containers of different sizes and designs according to their needs; the only two features that these standards had in common was their weight, between 4.5 and 5.5 tons, and the fact that they were transshipped by cranes. The containers were slightly different sizes and some of them had wheels to be rolled on rails at the terminals.[24] This initial upsurge in the use of containers was crushed by the same event that gave a boost to them when, in 1931, the US Interstate Commerce Commission ruled that railroads should not charge less for transporting a container than the price set per weight for the most costly commodity that was inside them.[25] This made the transport of containers by rail unattractive.

The next initiative for containerization only came about in the 1950s at the instigation of the United States military, which started using so-called *Conex* boxes, which were steel containers 8.5 feet (2.6m) by 6 feet 10.5 inches (4.5m) in size for the transport of soldiers' personal belongings.[26] The military had no problems with the Interstate Commerce Commission ruling, as it was mostly trucks that were used in the army for transport purposes. The military played an important role in the further development of the maritime container, and after Malcom McLean solved the logistical problems of the US army in the Vietnam War (1965-75), the military became an avid advocate of containerization.[27]

In 1934, McLean started a road haulage company with two trucks, expanding it to 617 trucks in 1954. McLean was a shrewd businessman and used all possible ideas to acquire permits from the ICC for new routes. He was also obsessed with cutting costs wherever possible.[28] In the 1950s, when the interstate highways started to get jammed up with traffic, he came up with the idea of transporting

[24] H. Janssen van Raay, *Container-verkeer voor Nederland*, 28-31.
[25] Marc Levinson, *The Box: How the shipping container made the world smaller and the world economy bigger* (Princeton 2006) 29-32.
[26] Ibidem, 29-32.
[27] Ibidem, 180-181.
[28] Ibidem, 37-42.

trucks on ships to avoid the congestion on the roads. As trucks would occupy a lot of space, McLean detached their chassis and tyres and loaded the remaining box on to a coaster. The ship would then transport the container to another port where the cargo would be reloaded on to another truck chassis before the box would be driven to its final destination. McLean successfully introduced his innovation to coastal shipping and later also to a transatlantic route. This was extended by McLean's major success in solving the congestion and supply problems of the US army in the Vietnam War in 1967 by containerizing the transport flows.[29] As a result, the army also started to containerize its cargo to European destinations. Indeed, much of the cargo carried by the first container ships to Europe consisted of military supplies. McLean's innovation became a major financial success. At the end of the 1970s, when containers became widely used, container transport reduced transport costs by up to 94 percent.[30] This was due to this method's large-scale, fast mechanized transshipment, the reduction in the damage caused to the transported goods and the elimination of theft during transshipment. This dramatic reduction in transport costs caused major changes to production and consumption patterns all over the world. Production was no longer tied to one location, and was now able to take place in different places and at different phases, including well away from consumers. Intermodality, however, required standardization to make the large-scale use of containers feasible. The boxes had to fit different transport means and had to be attached to them safely to make economies of scale possible.

In the 1950s in the United States, containers came in different types and sizes. Each company had its own standards, which meant that each standard needed to be handled with special equipment.[31] The sea shipping company Pan Atlantic had 35 foot (10.67m) containers because this was the maximum size allowed on highways in New Jersey. The competing Matson preferred smaller 24 foot (7.32m) containers as its cargo mainly consisted of canned pineapples, meaning that a larger container would soon become too heavy. The Grace Line company, meanwhile, wished to expand to Venezuela, and so had a preference for even smaller 17 foot (5.18) containers that would be easier to manage on mountain roads.[32] The United States Maritime Administration (Marad), which represented deep sea shippers, became concerned about multiple container sizes and started a standardization process in 1958. In the same year, a competing body, the American Standards Association (ASA), which represented trailer manufacturers, truck lines and railroads, began to interfere with Marad's activities.[33] Ultimately, in 1959, the National Defence Transportation Association, which represented companies handling military cargo, joined in with the standardization process. In 1959, the three organizations decided on a standard size of 20/40 feet (6.1/12.2m) long, 8 feet (2.44m) wide and 8 feet high.[34]

[29] Ibidem, 180-181.
[30] Ibidem, 135-149.
[31] Ibidem, 128.
[32] Ibidem, 130.
[33] Ibidem, 132.
[34] Ibidem, 134.

Continental containers versus maritime containers

In 1961, the International Organization for Standardization (ISO) started the tedious process of the international standardization of containers. Eleven countries were represented and 15 others sent observers. The participants were mainly appointed by their governments, except for the United States, which was represented by the ASA.[35] At the ISO meetings for Commission TC104, which was charged with the development of the container standard, both the American and European participants strived to get their own standards acknowledged. The meetings aimed to achieve interoperability, although this aspiration was hindered by the competing economic interests of those involved.[36] The American representatives were against the European standard as it was developed for European continental transport only. Ultimately, although the European representatives would have preferred their standard to be accepted, they eventually relented as the US was a major trading partner of a number of their countries.[37] In the end, the emerging standards were a political, operational and technical compromise.[38] The outcome had a modal bias towards deep sea transport, a geographical bias towards the United States, and an economic bias towards industrial countries.[39] The US's political and economic power made the difference. Accordingly, in 1965, the American standard of 8 foot (2.44m) wide and 10, 20, 30 and 40 foot (3.05, 6.1, 9.15 and 12.2m) long containers became the standard, while the European, slightly smaller, standard containers were recognized as Series 2 versions.[40]

From that point on, the existence of the two parallel container standards was formalized. The continental container emerged from European rail transport, while maritime containers originated from utilization in the road transport sector of the US. These transport units were incompatible. The two types of container had different widths, 2.44 and 2.55m (Table 2.2), and these were just the outside measurements; the inner space of a continental container was approximately 3cm narrower than that of its maritime counterpart. This meant that two rows of pallets could be placed next to each other in a continental container, while the maritime versions were just too narrow for this purpose. Moreover, continental containers did not fit into ocean going vessels, which carried maritime containers, and could not be handled with the same equipment.

A key element in containerization was the development of latches, which are the corner fittings that make it possible to grab containers quickly and without human interaction, and attach them to each other when stacked in a safe way. On the other hand, due to their relatively weaker

[35] Ibidem, 138.
[36] T. Egyedi, 'The standardized container: Gateway Technologies in Cargo Transportation', *Stockholm Papers in the History and Philosophy of Technology*, TRITA-HOT 96/2029 (1996) 8.
[37] Ibidem, 9.
[38] Ibidem, 14.
[39] Ibidem, 22.
[40] In order to measure volumes of containers of different sizes it is usual to recalculate their volume to a twenty feet equivalent (TEU).

construction, continental containers could not be stacked, instead having to be grabbed from below for transshipment.

Table 2.2 *Standard dimensions of ISO containers and continental containers*.

	Length		**Width**		**Height**	
Maritime containers	**Feet**	**Meters**	**Feet**	**Meters**	**Feet**	**Meters**
20 foot	20	6.10	8	2.44	8.5	2.59
30 foot	30	9.15	8	2.44	8.5	2.59
40 foot	40	12.20	8	2.44	8.5	2.59
40 foot high cube	40	12.20	8	2.44	9.5	2.89
Continental containers						
European 7m container	23.79*	7.15	8.37*	2.55	8.76-	2.67-2.90
Swap body for short coupling road	25.66*	7.82	8.37*	2.55	8.76-	2.67-2.90
Swap body for semi-trailers	44.29*	13.5	8.37*	2.55	8.76-	2.67-2.90
European 45ft container	45.01*	13.72	8.37*	2.55	9.51*	2.90

*Calculation from the metric measurements
Source: Hans Wenger, *Geschichte der UIRR und des Kombinierten Güterverkehrs Schiene-Strasse in Europa 1970-2000* (Brüssel 2000).

The two types of container generated parallel container flows, which were, in the beginning, transported by different rail companies.[41] Only road haulage could handle both sizes. Maritime containers were transported in the transcontinental flow by sea shipping firms and at the hinterland by individual rail companies. The international rail transport of these containers was arranged by Intercontainer, a firm founded in 1966 by national European railway companies, and this firm also set the price of maritime container transport. To transport maritime containers domestically by rail, the national railways founded subsidiaries. In the Netherlands, this was Holland Rail Container (HRC), while Transfracht took on this role in Germany. However, between 1966 and 2010, continental containers were rarely transported by barge, with rail or road haulage preferred. The rail transport of continental containers was, however, executed by other subsidiaries of the national railways; in the Netherlands, this was by Trailstar and in Germany, Kombiverkehr. As well as Deutsche Bahn, this company had numerous other shareholders from the road haulage sector.[42]

The activities of the national companies were coordinated by the Union Internationale des Sociétés de Transport Combiné Rail-Route (UIRR). In 1983 in France, the UIRR made a deal with Intercontainer, known as the Agreement of Montbazon, to keep the two markets separate. Maritime containers were thus only allowed to be handled by members of Intercontainer, and continental

[41] Hans Wenger, *Geschichte der UIRR und des Kombinierten Güterverkehrs Schiene-Strasse in Europa 1970-2000* (Brüssel 2000) 25-26.
[42] Ibidem, 35.

containers only by members of the UIRR. Price agreements were also made. Intercontainer's prices were related to rail transport, and those of UIRR to road transport, and these were lower. In this way, the competition between the two organizations was limited. This lasted until 1990, when the director of the EGG commission on competition found the Agreement of Montbazon to be a banned price agreement. Intercontainer and UIRR reacted in 1990 with the Brussels Convention.[43] Nevertheless, the transport of both types of container only became possible from 1991-1992.[44]

In summary, containerization started in Europe, just like in the United States, at the end of the 19th century. The basic elements of intermodal container transport were already there.[45] As H. Molenaar, the director of the Port Authority of Rotterdam put it in the early 1990s: 'A long time ago, when I was a rail student, I biked daily by the plant of *Van Gend & Loos* in Schiedam. There I saw every day the detachable boxes that fitted both on trains and trucks. If somebody had the idea to stack them and load them on to ships, the progress of containers could have started in the Netherlands.'[46] It was not, however, the technological knowledge that was missing, but the economies of scale.[47]

In his book, Levinson focuses on the role of companies, government agencies and technology when discussing the early history of containerization. He pays little attention to transport demand. However, from the examples referred to above, it is clear that containerization started in sectors where large volumes of cargo needed to be transported. For instance, milk, chocolate, and butter and milk were transported in containers in Austria, Switzerland and the Netherlands, respectively. Danish containers, meanwhile, transported beer from Carlsberg, and the Culemayer heavy trailer was developed for the transport of the products of the growing German industry and the military. Levinson's book is an ode to McLean, a typical American entrepreneur who introduced the pioneering innovation of intermodal transport. However, the actual achievement of McLean was that he took control of large transport flows, which made utilization on a larger scale than in Europe profitable. Containerization is a form of utilization that requires major cargo flows and a large liberalized transport market. The United States had both of these elements long before Europe. After World War II, the US had a strong economy, an advanced infrastructure and was used to low-cost, standardized, mass-market products. It also had a tradition of systematization and standardization, and was the world's largest centre of innovation.[48] It is therefore unsurprising that maritime containers were developed there. It took much longer to develop major cargo flows and an economically integrated

[43] Ibidem 102.
[44] Ibidem 102-104.
[45] Guus Veenendaal, *Spoorwegen in Nederland: van 1834 tot nu toe*, 285.
[46] 'Ontwikkelingen in gecombineerd vervoer gaan door, maar container is nog steeds het populairst', *Rail Cargo Magazine*, 10. "Vroeger reed ik als spoorstudent dagelijks langs Van Gend en Loos in Schiedam. Daar zag ik dus elke dag die laadkisten die zowel op de trein als vrachtauto's pasten. Had je toen het idee gehad om zulke dozen te stapelen en in schepen te stoppen, dan was de opmars van de container mogelijk vanuit Nederland gestart." (own translation)
[47] S. W. Verstegen, *Containerisatie in het Nederlandse transport*, 17.
[48] Michael E. Porter, *The Competitive Advantage of Nations* (New York 1998) 284, 297, 299, 300, 306.

market in Europe. The first wave of globalization took place in the period 1890-1914.[49] Due to liberalism and monetary stability, world trade was able to grow spectacularly. During World War I, the European economy became fragmented due to the war, nationalism and protectionism.[50] This made economies of scale impossible and hindered technology transfer. This fragmentation pertained long after World War II.[51] In the 1960s, the European transport market was preoccupied with the combination of pallets and continental containers, and was taken by surprise by the introduction of maritime containers.

The history of the maritime container in Rotterdam (1966-2010)

In the 1960s, before maritime containers were introduced to the Port of Rotterdam, the port was still busy palletizing, which is a form of utilization on a smaller scale. This happened despite the fact that continental containers were widely used in Europe, primarily by rail transport. Given that rail transport played a minor role in the port, which focussed on bulk cargo, a speciality of barge transport, it is unsurprising that containers were almost completely absent. Large transport flows were needed for profitable transport. Containerization, however, fit into the general tendency to look to increase economies of scale in the port.

The introduction of grain elevators in the 19th century, and technical changes in the 1950s, for example the development of more efficient oil pumps for tankers, increased productivity. The new pumps made the growth of tankers by a factor of 25 possible. Compared to this growth in scale, containerization was a modest development.[52] However, containers finally won the day over other forms of utilization, such as pallets. Most sea shipping companies skipped the palletization stage as the scale was large enough in sea transport. Maritime containers were introduced into Europe a decade later than in the United States, but once they were there their popularity grew quickly. This was for two reasons. Fierce competition meant that sea shipping companies felt compelled to introduce containers quickly. Secondly, the wave of publications in the 1960s on containers rapidly spread knowledge about them. This publication explosion was so intense that some called it *containeritis*.[53]

The introduction of maritime containers to Rotterdam was facilitated by the director of the Port Authority of Rotterdam, Frans Posthuma, a civil engineer who regarded containerization as a promising development. As a consequence, he had already contacted McLean in 1963 during one of his study trips to the US.[54] Posthuma managed to persuade McLean to start a container line to

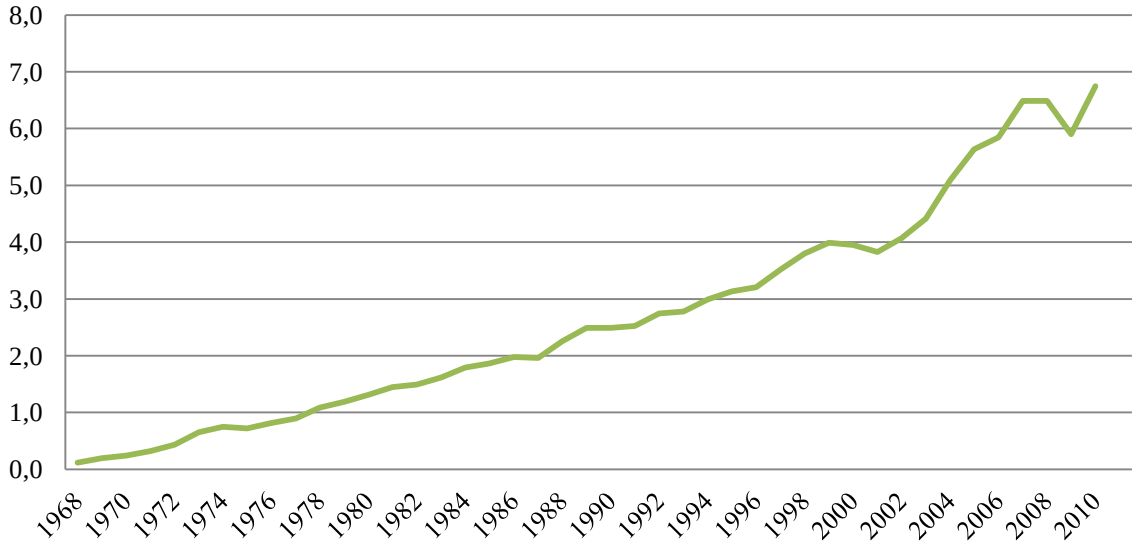
[49] Keetie Sluyterman and Ben Wubs (eds.), *Over grenzen multinationals en de Nederlandse markteconomie* (Amsterdam 2009) 278.
[50] Ibidem, 218-219 and 279.
[51] Ibidem 278.
[52] S. W. Verstegen, *Containerisatie in het Nederlandse transport*, 10-11.
[53] Ibidem, 17.
[54] Ferry de Goey and Driel Hugo van, 'Rotterdam und das Hinterland (1920-1995)'. in H.A.M. Klemann and Friso Wielenga (eds.), *Deutsland und die Niederlande Wirtschaftsbeziehungen im 19. und 20. Jahrhundert* (Münster New York München Berlin 2009) 127-151.

Rotterdam, leading to the arrival of the SS Fairland on 4 May 1966. However, the American Racer of United States Lines (USL) had already brought the first containers to Rotterdam on 29 March.[55] Nevertheless, these were not the first maritime containers in Europe, as a container ship had entered the Port of Bremen earlier in March of the same year.[56] When the first container ships arrived in Rotterdam, they were unloaded by Quick Dispatch at the Müller Progress Terminal in Prinses Beatrixhaven. In the same year, Rotterdam handled 60,000 TEU of containerized cargo, with this figure reaching one million TEU by 1971.[57] (It is customary to measure container volumes in TEU, which is a 20-foot equivalent unit. A container of 20 feet, 6.1m, is one TEU, while a container of 40 feet, 12.2m, is two TEU).

[55] Gerrit Nieuwenhuis, *De Betuweroute goederen sporen van zee naar Zevenaar* (Alkmaar 2012) 40.
[56] *Offizieller jubiläumsband der Deutschen Bundesbahn, 150 Jahre Deutsche Eisenbahn 1935-1985* (München 1985) 136-138.
[57] Stephan Vanfraechem, 'Why they are tall and we are small! Competition between Antwerp and Rotterdam in the twentieth century'. In Gelina Harlaftis, Stig Tenold and Jesus M. Valdaliso (eds.), *The world's key industry History and economics of international shipping* (London 2012) 277.

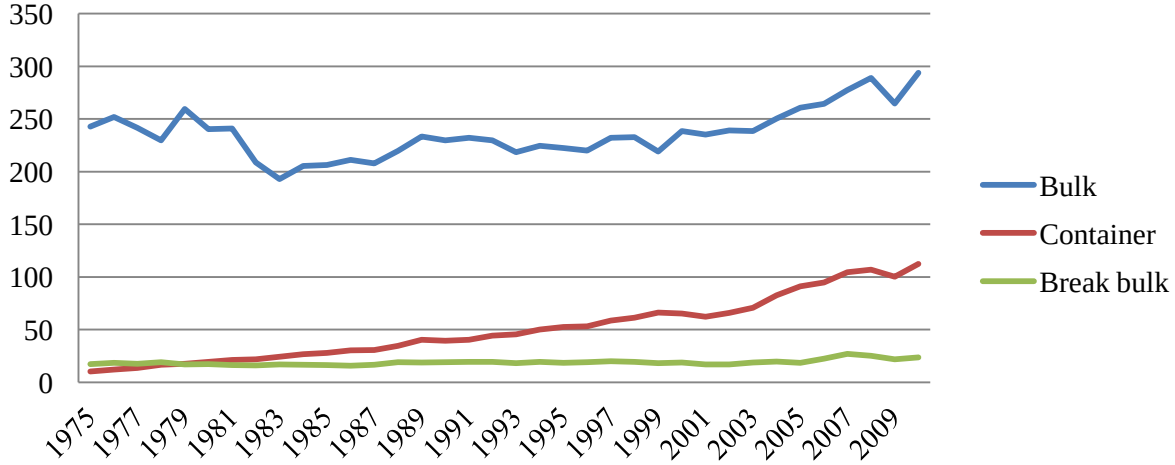
Figure **2.2** shows the explosive growth in container transshipment in the Port of Rotterdam. Rotterdam was traditionally strong in bulk transport and, despite the vigorous growth in container transshipment, bulk continued to be an important cargo. Meanwhile, Figure 2.3 shows that despite the steady growth in container handling, bulk formed the majority of the weight of transshipped goods. It is important to note that bulk goods such as sand, coal, ores, and oil are relatively heavier and cheaper compared to containerized goods, which means that the difference in weight is not the same as the difference in economic impact.

Figure 2.2 *Number of transshipped containers in the Port of Rotterdam per millions of containers (1968-2010).*



In the early years of containerization, containers were counted per piece. TEU data is only available since 1989.
Source: Port of Rotterdam
http://www.portofrotterdam.com/nl/Over-de-haven/havenstatistieken/Documents/Containers%20en%20TEU%27s%20tijdreeks.pdf, seen on 17-06-2013.

Figure 2.3 *Total transshipments of the Port of Rotterdam specified per millions of tons (1975-2010*)



Source: Port of Rotterdam, http://www.portofrotterdam.com/nl/Over-de-haven/havenstatistieken/Documents/Totale%20goederenoverslag%20tijdreeks.pdf, seen on 17-06-2013.

Posthuma wanted one major stevedore to handle all of the containers at the Port of Rotterdam, and so encouraged the stevedoring companies already in existence to merge. Indeed, according to legend, he locked the directors of the companies up in a room and would not let them out again until they reached an agreement. In 1966, the five biggest Rotterdam stevedores and the Dutch Railway company NS merged into Europe Container Terminus (ECT). The fast work of the stevedores was not, however, enough to solve all of the problems caused by the new type of cargo that the port had to process.

As a result of the spectacular growth in volumes, technical innovations, and increasing penetration in the hinterland, the history of containerization might appear to be a success story. However, it is also a tale of a struggle to match peaks in demand, overcapacity and cut throat competition between the three modalities of hinterland container transport.[58]

Hinterland transport and intermodal competition

Rotterdam barge and road haulage companies were not as enthusiastic about new maritime containers as the major stevedores that had merged into ECT.[59] Transport companies doubted whether container transport would be fast and profitable enough, and early container transport did indeed have numerous issues, for example cranes were expensive and transshipment was slow. As a consequence, container transport was thought to only be cost efficient when using containers for longer distances, for high volumes, and when transporting inferior goods that did not need to be delivered quickly.[60]

Rail transport had the highest expectations of the new cargo. Indeed, NS immediately invested in transshipment facilities, both in Rotterdam and Amsterdam, because its freight transport before containerization had faced many problems; the company's share of freight transport had been falling from the 1930s onwards. Prior to the 1930s, coal transport formed 70 per cent of NS's cargo, but the need to convey coal gradually diminished due to the energy transition from coal to oil after World War II.[61] As a result, transporting general cargo led to losses. Indeed, in 1967, for every guilder of gross earnings there was a cost of 1.60. Now, however, NS identified a good business opportunity in containers. Indeed, after its investments in the ports in 1966, it tried to increase its market share in 1982 by founding the subsidiary already referred to, HRC, which was responsible for domestic container transport and also acted as an agent of Intercontainer, the company arranging this form of transport internationally. Soon afterwards, NS also included the last mile by truck in its services.

The shuttle train that had been travelling between the ECT terminal and Venlo since 1982 also helped to increase NS's share of hinterland transport. The Dutch government also tried to help to

[58] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk* (Rotterdam 1990) 1.
[59] Hugo van Driel, 'Co-operation in the Dutch container transport Industry', *The Service Industries Journal*, 12 (1992) 25.
[60] Ibidem, 17-25.
[61] M. Boon, 'Energy Transition and Port-Hinterland relations. The Rotterdam oil port and its transport relations to the West German hinterland, 1950–1975', *Jahrbuch für Wirtschaftsgeschichte / Economic History Yearbook*, 52, 2 (2012) 215.

increase the railways' share of container transport with the construction of the Betuwe Route. This rail trajectory was built between 1995 and 2007 to connect Rotterdam with its German hinterland because, according to the decision-makers, other modalities did not offer enough growth capacity to make the transport of the amount of containers projected by the Rotterdam Port Authority feasible.[62] Furthermore, trucks caused congestion, barge transport was considered to be too slow and existing rail connections were jammed with passenger trains. It was often predicted that the role of rail in the modal split would increase, but its growth was never spectacular in the period 1966-2010.[63]

Barge was a late-comer to container transport and, at the start of containerization, had a minor share. One of the reasons for this was that McLean's Sea-Land was used to dealing with truckers. At the same time, barge companies in the 1960s only took care of transport on the waterways. Consequently, the last mile in the hinterland still had to be arranged. This meant that barge companies were less interesting partners when it came to transporting containers between the port and the final destination. Finally, however, the barge sector adjusted to the requirements of container transport and started to profit from the growing transshipment of containers in Rotterdam. In the 1980s, there were already 30 barge terminals along the Rhine and the branch started to worry about overcapacity. In the mid-1980s, a logistics transition took place with the introduction of the just-in-time principle, which meant that companies kept hold of their supplies instead of keeping them in their stores in the transport chain. This was feasible as long as the parts arrived on time, thus shifting the emphasis from speed to reliability. This favored barge transport, a modality that was known to be reliable as it had to deal with fewer physical obstructions than the other modalities, although it was slow. This form of transport also had other advantages, such as its regularity and its low prices for longer distances.[64]

Road haulage had the largest share of the modal split from the very start. It had three comparative advantages: it was flexible, as it could be hauled anywhere; it was fast, as truck transport did not need to be transshipped before reaching the final destination; and it was cheap over short distances. Speed did, however, become less important as the emphasis on regularity and reliability grew.

Container transport by road nevertheless had its own problems. Until the liberalization of the European transport market in the 1990s, a permit was needed for each trip across the German border.[65] Additionally, the introduction of the maritime container caused a shift of power from the trucker to the sea shipping company, with the former losing its old steady contacts, to the latter. Prior to the advent of containerization, prices were negotiated, but then the sea shipping company started to dictate the conditions. Moreover, instead of the customary prices per hour, the journey with a maritime container was paid by piece. The cargo was also distributed in that way. There was no

[62] Paul Pestman, *In het spoor van de Betuweroute* (Amsterdam 2001) 11-13.
[63] Guus Veenendaal, *Spoorwegen in Nederland: van 1834 tot nu toe,* 531-532, 544-555.
[64] Hugo van Driel, *Co-operation in the Dutch container transport Industry,* 43-47.
[65] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk,* 365-371.

guarantee that the same company could transport more containers from the same ship. Furthermore, the task of the truck drivers was simplified as they no longer had to load or unload the trucks, which needed a lot of experience. The driver's only task, therefore, was to drive the truck between two points without even touching the contents of the container. This was a process that attracted new competition, whether from: the sea shipping companies, which could arrange their own transport; foreign truckers; and other modalities.

After the first few years of containerization, when road haulage was responsible for 80 percent of hinterland transport, the share of this sector soon fell. Road haulage also did not attract major investment for bigger vehicles. In the first few years of maritime container transport, specialized chassis were available from American companies or rental services, but buying one increased a company's risk, as this equipment could not be used for any other form of transport.[66]

Once a deep sea container ship arrived at the port, the stevedores transshipped the cargo with a destination in the hinterland from the ship and loaded containers on to it with a transatlantic destination. Deep sea transport is one of the five modalities of container transport, the other four being short sea, rail, barge and road haulage. Deep sea means transatlantic transport, while short sea is sailing to the United Kingdom, Scandinavia or other European ports. These flows of goods belong to the outport, which is the sea side of the port. In this work, hinterland transport is discussed, including the three remaining modalities.

When the containers entered the port, the success story for large-scale transport ended, with the major transport flows then being fragmented into transport units of a much smaller scale to be conveyed through to the hinterland by three modalities: rail, barge and road haulage. A train could transport a maximum of 80 TEU, as its maximum size is 700m. Moreover, in the European rail system, passenger transport takes priority over freight transport. This means that when a passenger train needs to pass a freight train, the latter has to be parked and must wait its turn. These parking rails can be used by a train with a maximum length of 700m, which can consist of 35 container wagons with a capacity of three TEU.[67] At the start, barges had a 40 TEU capacity, which grew to 300 TEU by 2010. However, these large barges could only sail on major waterways like the Rhine. A truck, meanwhile, could carry two TEU, equating to one 40 foot or two 20 foot containers, but since the 2000s, a deep sea container ship has been able to easily carry as many as 10,000 TEU; at least 10 barges, 25 trains and approximately 3000 trucks were needed to transport to the hinterland the volumes of just one ocean going vessel.[68] This has created numerous problems in the hinterland, including congestion, pollution and price wars within and between the different transport modalities.

One of the consequences of the explosive growth in container transport that has had a major influence on hinterland transport was the 'main port' effect. The notion of the main port was

[66] Ibidem, 328-338.
[67] Simone Samuel, *Handboek railgoederenvervoer* (Utrecht 2011) 185.
[68] This calculation is based on the modal split 30 percent barge, 20 percent rail and 50 percent road transport.

introduced to Rotterdam in 1985 by two professors, G.G.J.M. Poeth and H. van Dongen, according to whom a few large ports should be designated as being where certain activities were concentrated. The Port of Rotterdam expected that it would become the main port for container transshipment in Europe.[69] Indeed, container transshipment in Rotterdam did grow quickly, with the port becoming the largest container port in Europe in the first few decades after its 1966 introduction of maritime containers. Since the 1990s, however, the container transshipments of the competing ports of Antwerp and Hamburg have also been growing quickly.[70] Accordingly, in the new century, Rotterdam is not the central container port in Europe.

Here, the main port effect played a major role in another sense. During their journey, large sea going vessels heading for Europe called at either Bremen or Hamburg and Rotterdam or Antwerp. Calling twice in each of these clusters of ports would have been too expensive, as a delay of just one day could cost as much as 60,000 USD.[71] Containers destined for a different port were thus redistributed, which can be seen as the replacement of a sea trajectory with a land trajectory. This redistribution of often empty containers has created major container flows that run parallel with the North European coastline.

Figure 2.4 *The container ship Harbour Bridge at the ECT terminal at the Maasvlakte*

[69] H.A.M. Klemann and Dirk Koppenol, 'Port competition. Rotterdam within the Le Havre-Hamburg range (1850-2013)'. In Bart Kuipers and Rob Zuidwijk (eds.), *Smart Port Perspectives. Essays in honour of Hans Smits* (Rotterdam 2013) 74.
[70] Iidem, 72.
[71] H.W. H. Welters, *Kleine gedachten over een grote haven* (Rotterdam 1991) 1-65.

The *Harbour Bridge* has a maximum capacity of 9040 TEU, which is less than half the maximum capacity of the largest container ships built in 2013.

The introduction of maritime containers has changed the port in many ways. As for the transshipment of containers, there were fewer people needed than for the transshipment of traditional general cargo. As a consequence, the workers in the port and their colourful social lives when waiting for ships to arrive disappeared and cranes increasingly came to dominate. Stacks of colourful containers filled the horizon with names painted on to them in huge letters like P&O, Evergreen, NedLloyd, Yang Min and Maersk that were well-known to everyone who ever drove a car within a 30km range around the port in the 2000s. Containers need space, so in the late 1980s stevedoring moved further away from the city, such as from the Princess Beatrixhaven, which was located close to the urban area of Waalhaven, to the newly acquired land of Maasvlakte I and, possibly in the future, to Maasvlakte II.

With the introduction of maritime containers to Rotterdam, the port became more closely involved in the emerging world economy. The first containers arriving from the United States contained jeans, tires, cotton and electrical appliances, which were typical US products in the 1960s.[72] Large volumes of military cargo also arrived for the American troops in Germany. However, from the 1990s, the gravity point of maritime container transport moved from the US to Asia.

In 1983, the Dutch minister of transport Neelie Smit-Kroes had written a report on the economic effects of transport flows between China, Taiwan and the Netherlands. Container transport is not mentioned at all, only traditional general cargo.[73] Seventeen years later, curiously on 31 December 2010, the Dutch newspaper NRC Handelsblad had the headline: *Everywhere in the Port the Chinese emerge*. This reflected the fact that by 2010, a quarter of the transshipped containers were coming from or going to China. The incoming containers were filled with computers, electronic appliances, car parts, unfinished products and other items from Asian industry. However, it was not only Chinese products, but also Chinese capital, that was gaining in influence in the port. Indeed, the Hutchinson Whampoa group has been an ECT shareholder since 2002.

At that point, the Port of Rotterdam was opened up to more competition to prevent Chinese interests from getting the upper hand. From 2008, the Chinese container lines Cosco and Yang Min also exploited a new hypermodern container terminal in the port.[74] These are all signs of the shift from the Atlantic to the Asiatic route taken by container transport, which had a major impact on

[72] M. van Baal, 'Containerrevolutie Hagiografie van een grote doos', *Maritieme historie,* (2007) 3.
[73] Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat-Generaal van het Verkeer, 585 Verslagen van overleg met de Vaste Kamercommissie voor Verkeer en Waterstaat inzake de algemene ontwikkeling van het internationale verkeer- en vervoerbeleid 1981-1984, from Neelie Smit-Kroes to voorzitter van de Vaste Commissie voor verkeer en Waterstaat DGV/IG-3/V 20374, 17 jan 1984.
[74] Marcel van de Brugh and Piet Depuydt, 'Overal in De Rotterdamse haven duiken Chinezen op', *NRC Handelsblad,* 31 December 2010, 18. (Own translation)

Rotterdam's hinterland. While the majority of the cargo transshipped in the Dutch port came from or went to the United States between 1966 and the late 1980s and consisted of a lot of military cargo, the lion's share of the contents of maritime containers from the 1990s onwards were products from Asia. Although the destination of the American military goods was the Middle Rhine area and could be transported best from Rotterdam in parallel with the Rhine, the Asiatic products went to various destinations in Europe and had no ties to the port. However, many of the Asiatic volumes transshipped in Rotterdam were destined for European distribution centres located in the Lower Rhine area and thus provided the port with transport activities generated by logistic processes.

Conclusion

The history of containerization in the Port of Rotterdam is also the history of the penetration of the effects of globalization through the port to the hinterland. The effects on the hinterland were, however, different from what might have been expected given the title of Levinson's book: *How the Shipping Container Made the World Smaller and the World Economy Bigger*. The current chapter explored the history of continental and maritime containers by elaborating on Levinson's findings. It is has thus been demonstrated that Europe had a strong tradition of containerization, especially in the rail sector, from which continental containers emerged after World War II.

The development of the continental container is closely connected to the development of pallets, which is a smaller scale of utilization than a maritime container. The reason for this is the disruption to production growth and European trade caused by the two world wars in Europe in the 20th century. Maritime containers were developed in the United States and were an extension of road transport. Levinson's focus on the technical aspects of the failure of containerization before the advent of the maritime container lacks explanatory power. Indeed, he should have paid more attention to transport demand, namely the macroeconomic hinterland, which provides a better explanation for the fact that maritime containers were introduced first in the US.

Levinson praises McLean's successful innovation of intermodal transport. This chapter, however, concludes that the main reason for McLean's success is not his unique way of cost cutting by introducing intermodal container transport, but the fact that he managed to generate a large enough transport flow to make container transport profitable. McLean had the advantage of being born in a country and a continent that could develop its industry and transport without having to experience the devastation of two world wars in its territory and which did not have a substantial number of relatively small national states all jealously defending their own interests.

With the parallel development of continental and maritime containers, two incompatible cargo flows emerged, cluttering the hinterland. Herein, these transport flows will be unravelled and their importance to the Port of Rotterdam will be explained.

Part II Three Modalities

Chapter 3
The Rhine versus Deutsche Bahn
German and Dutch Transport Policy and Liberalization (1966-2010)

In this second part of the research, hinterland container transportation by the three different modalities is discussed. However, before approaching these modalities individually, the wider context of cross-border container transport is explained. The transport policies of Germany and the Netherlands before and after the liberalization of the European transport sector are also analyzed, as is their influence on container transport to and from Rotterdam.

Intra- and intermodal competition, transport policy and liberalization

Cross-border container transport was carried out in both countries by three transport modalities: rail, barge and road haulage, and there was competition both within and between them. Intramodal competition was influenced by the company structure of the sector. For example, national rail firms had monopolies prior to the liberalization of the sector, while there were oligopolies in both countries in the barge sector. In particular, there were a few major players and numerous small family owned firms in this latter modality, which fought for the favors of the large companies that chartered their barges. The road haulage sector, meanwhile, was dominated by small, mainly family owned, firms. The intermodal competition was determined by the cost structures of the companies, which consisted of fuel costs, social costs, labor costs, labor productivity and the costs of building and sustaining the infrastructure.

There was company rivalry both within and between the two countries. Intramodal and intermodal competition within the nations was governed by national transport policy, while the competition between the modalities was regulated by bilateral agreements. An exception to this was the barge sector on the Rhine and its tributaries, which was regulated by the post-war interpretation of the 1868 Act of Mannheim.

The transport policies of both Germany and the Netherlands were greatly influenced by the emerging common transport policy of the European Union. A country's transport policy can be: liberal, meaning that the government allows free competition between the modalities and only interferes when there is a danger of market failure; or restrictive, which limits competition and aims to regulate the market. [1] The transport market can be regulated in different ways, by a government either applying measures to the separate modalities or dealing with them in an integral transport policy. Germany actually adopted the latter approach before World War II, but the Netherlands only became interested in integral transport in the 1980s when awareness of environmental issues and the negative externalities of transport grew.

The negative externalities of transport referred to involve the quantification of the strain that it puts on society by, for example, its pollution of water and air, the space it demands, and the accidents

[1] Johan W.D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 77.

that occur (Figure 3.1). These external costs are difficult to calculate as they greatly depend on the factors included. So, if the external costs of transport are not considered, road haulage is the cheapest over distances below 150km, followed by barge and rail. However, when including the negative externalities, road haulage is by far the most expensive modality.

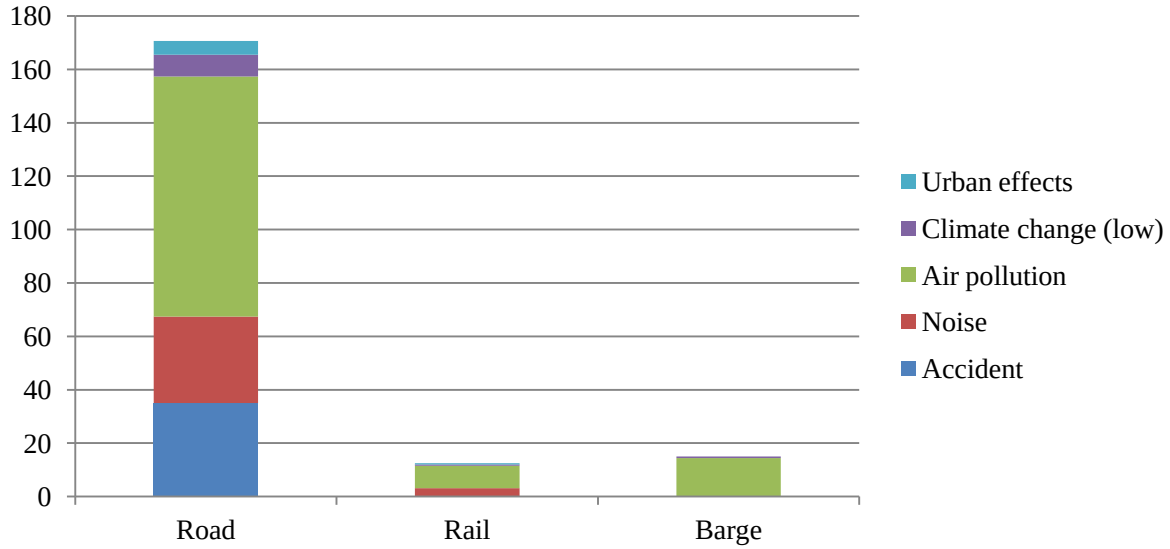
Nevertheless, this depends on the calculation. Rail transport, for example, can be very environmentally unfriendly if it uses electricity, which is generated by polluting power plants. At the same time, while barges are fuel efficient, their motors also produce a great deal of pollution. This means that policy-makers are faced with a serious dilemma, as including the external costs of transport as a factor when planning transport policy almost automatically means a preference for a modal shift from the dominant road haulage to the much more environmentally friendly barge and rail.

So, how could this be achieved? One option is for the government to penalize the polluter by imposing *Pigouvian* taxation and in this way internalizing external costs; in other words, make the polluter pay.[2] This would mean penalizing road haulage, but this was not politically feasible in either country in the period under study. In Germany, for example, the *Bundesverband des Deutschen Güterfernverkehrs* (BDF) – (Federal Association of the German Long-distance Transporters) - which represented 200,000 truckers had a strong lobby, while in the Netherlands the road haulage sector was very economically relevant. The two countries also had a truck industry (Mercedes and DAF) that had a major interest in a strong truck sector. [3]

The other option was to reward the environmentally friendly sectors, which was more politically acceptable. This led to a policy of diverse subsidies within the two countries, as well as European subsidies such as: the Marco Polo subsidy from the EU's Executive Agency for Competitiveness and Innovation (EACI) for projects promising to reduce truck transport on European highways; and Pilot Actions for Combined Transport (PACT), a financial support program that allocated subsidies to projects with the same aim.[4] National governments and the European Union both tried to encourage the growth of rail and barge transport. The most plausible way to do this was by subsidizing multimodal transport, namely using rail and barge for long-distance journeys and letting road haulage perform the last mile. This was not really a new approach; Seebohm and Leber had the same idea, but tried to achieve it using different methods.

[2] Named after the British economist Arthur Cecil Pigou (1877-1959), the author of: *The economics of welfare* (London 1932).
[3] John F. L. Ross, *Linking Europe Transport Policies and Politics in the European Union*, 104.
[4] The program started in 1992 and its second part lasted until 2013. Tilman E. Platz, *The efficient integration of inland shipping into continental intermodal transport chains* (Delft 2009) 87.

Figure 3.1 *Average external costs of transport in the 17 EU countries in 2000 in euros per 1000 tons/km exclusive of congestion costs per million euros per year.*



Source: INFRAS&IWW, External costs of transport (Zurich, Karlsruhe 2004).

Liberalization is discussed herein as it led to a major breach in the history of container transport between 1966 and 2010. The transport policies of Germany and the Netherlands were different before liberalization, but both underwent significant change due to the opening up of the European transport sector in the 1990s. The process of liberalization in a wider sense, meaning the lifting of obstacles to free transport within Europe, started after World War II due to the influence of the Allied Forces, but only seriously began in the 1990s and 2000s and is in fact still going strong.

Liberalization is used here in a more strict sense to mean the measures that were taken to create a free transport market in the European Economic Community (EEC) in the 1990s. Due to the focus of this work, the opening up of the transport markets of the Netherlands and Germany receives the most attention. Liberalization in this sense took place between 1991 and 1994; it began in the rail sector in 1991, on 1 January 1993 for road haulage, while the fixed transport tariffs of all three of the container transport modalities were abolished in Germany in 1994. In the years before and after this period, some other measures had been taken, but the most important were implemented between 1991 and 1994.

After World War II, European economic integration endeavours took the form of the creation of both the first European coal and steel agreement in 1951 and the EEC, which was founded by the Treaty of Rome in 1957. This treaty contained an ambitious plan to remove the obstacles to free trade by gradual tariff and quota reductions within 12 years. It also provided for a common transport policy

to be established within the same period.[5] After initial enthusiasm, there were a few setbacks for a number of reasons, including ambiguities, and procedural and organizational problems.

European transport policy was unclear about how the different modalities should be treated. Transport itself was not defined, and no operational guidelines or punitive measures were implemented. Furthermore, there was a procedural problem concerning decision-making, as unanimity was required within the common market, which led to smallest common denominator decisions. In practice, a common policy meant a collection of solutions to individual problems. Consequently, whenever individual economic interests were endangered, integration was hindered. Finally, there were also organizational problems, for example, the involvement at different levels of the heterogeneous transport sector of numerous regulatory and advisory bodies. Among these institutions, several had similar tasks, overlapping memberships and limited mandates. Moreover, as well as the EEC, numerous other international bodies were involved in producing a common transport policy. Important, for instance, were the Economic Commission for Europe (ECE), the Conférence Européenne des Ministres de Transport (CEMT), the Coal and Steel Community (ECMT), the Central Commission for the Navigation on the Rhine (CCNR), the Community of European Railways (CER) and the International Union of railways (UIC). As a consequence, the EEC was organizationally splintered and its treatment of transport inconsequential.[6]

In 1983, the establishment of a common European transport policy had still not made much progress. As a consequence, the European parliament filed an inactivity complaint at the European Court of Justice. According to Article 3 of the 1957 EEC treaty, a common transport policy was essential and had to be gradually effectuated by the member states. The Ministerial Council had failed to coordinate such efforts due to multiple conflicts within and between the transport sectors of the individual countries. Nevertheless, the court ruled that the council had failed to create the freedom of services in the area of EEC transport, as required by the treaty. According to the court ruling, national restrictions had to be gradually removed and national market structures had to be harmonized.[7] In 1989, after years of bickering, the EEC realized that it could not resolve the problem of the unequal intermodal competition of the member countries collectively, passing the matter back to national governments. As a consequence, governments were expected to both choose whether they wanted to internalize or divide infrastructural costs between them, and decide which costs were liable for compensation.[8]

A common transport policy had thus failed in its coordination measures in two ways: it was unable to increase coordination within the same modality in different countries, and had not succeeded in producing an integrated transport policy between the modalities. As a result, separate

[5] Articles 3 and 74 of the *Treaty of Rome*.
[6] John F. L. Ross, *Linking Europe Transport Policies and Politics in the European Union* (London 1998) 37-47.
[7] Ibidem, 32.
[8] N.V. Nederlandse Spoorwegen, *Jaarverslag 1989* (Utrecht 1990).

measures applied to the different modalities. After cautious developments in the 1960s, the EU unity idea suffered a major setback due to the diverse transport policies of the participating countries. In the 1980s, however, the need for cooperation was felt again. As a consequence, a white paper was produced in 1985 that led to an agreement with respect to a common transport market to be implemented on 1 January 1993. In 1986, the decision-making process was adjusted so that unanimity was no longer necessary, enabling decisions to be made more quickly; the votes of a majority of the member states were now enough to pass a decision. It is unclear how efficient the liberalization of European transport actually was, as only a minority of the proposed points in the white paper were put into practice.[9] Nevertheless, in the mid-1990s, under pressure from the European Union, serious efforts were made to liberalize the transport market in both Germany and the Netherlands.

The common transport policy was difficult to implement in a heterogeneous European transport market that consisted of different modalities in different countries with a different history. A comparison of the cost structure of the three modalities in Germany and the Netherlands, which was a major factor in intramodal competition within and between the two countries, illustrates this clearly. The cost structure of a modality was very much determined by fuel use and labor and infrastructure costs. Rail transport used both diesel and electricity efficiently and, due to the limited friction between the rails and the wagon wheels, only a fraction of the energy generated by the motor was lost and a relatively large amount remained for traction. Furthermore, trains were efficient as they were able to carry a maximum of 80 TEU. As a consequence, at times of energy crises, the political support for rail transport tended to rise.

Barge transport was also relatively efficient with respect to fuel; and it could carry large cargo volumes in comparison to its use of diesel. In the 1970s, barges had a capacity of 40-50 TEU, but in the 1980s surpassed the maximum capacity of trains on certain waterways, reaching 300 TEU in the 1990s. For this reason, the barge sector suffered less in periods of rising fuel prices than the other modalities. Trucks were the least efficient with fuel, because of the major friction between their tires and the surface of the road and the small scale of the transport. The fact that heavy trucks cause severe damage to asphalt is evidence of this. As a comparison, the New Orleans Port Authority calculated in the early 1980s that one liter of fuel could move a container by truck for 13km; this figure was 48km by train and 87km by barge, which is a ratio of approximately 1: 4: 7.[10]

When it comes to labor costs, there were also major differences between the modalities. In rail the companies, which were directly owned by the government in both countries before liberalization, salaries were relatively high and social regulations were retained and monitored regularly.[11] In the barge and truck sectors, however, which consisted of numerous small companies, it was impossible to

[9] NOB Wegtransport, *Ruime baan voor wegtransport* (Rijswijk 1988) 4-5.
[10] D. Blumenhagen, 'Containerization and hinterland traffic', *Maritime Policy & Management*, 8 (1981) 203.
[11] Utrechts Archief, Nederlandse Spoorwegen, 68 NS-DGV werkgroep goederenvervoer per spoor 1 September 1976, 19.

control social conditions to the same extent. The salaries of the personnel, who were often family members, were relatively low. Furthermore, prescribed working and rest hours were often ignored. In the barge sector, the registration of working times was hampered by the fact that sailing was a part of family life for small skippers,[12] while in the truck sector, drivers were almost forced by their low salaries to work overtime, which was better paid.[13] Indeed, after working eight hours, many office personnel climbed onboard a truck to earn extra money. In an attempt to regulate the sector, from 1974, all Dutch trucks with a capacity above 3.5 tons were compelled to have a tachograph fitted that registered the activities of the drivers. These devices could, however, be easily manipulated, which happened on a large scale throughout almost the entire research period,[14] although digital tachographs later put an end to this practice.[15]

All of these problems were due to the fact that the only way for a driver to increase his productivity was to work longer hours as the maximum capacity of trucks was just two TEU. The situation in Germany was similar to that in the Netherlands, with the difference being that German truck drivers earned more. Up until 1994 in Germany, truck and barge tariffs were related to rail tariffs, which kept German freight transport rates artificially high.[16] The differences in labor costs between the modalities meant that rail transport had no room to manoeuvre, while road and barge regularly undercut prices by taking advantage of the fact that it was impossible to impose permanent controls over their social conditions. Indeed, NS often complained about the differences in social conditions, which it believed led to unfair competition.[17]

Another important difference between the cost structures of the modalities was the degree to which they had to pay to use the infrastructure. The rail sector, for example, had to construct and sustain its highly expensive infrastructure from its own resources. Moreover, as governments considered rail transport to be a public service, they expected rail companies to maintain unprofitable connections in order to improve mobility in the country, even though this was against their commercial interests. At the same time, freight transport was delivering increasing losses. In the Netherlands, when distributing the costs of rail transport between freight and passenger transport, the latter was awarded more, because it received government subsidies. In this way, the government also automatically subsidized freight transport. Indeed, without subsidies, NS would have been unable to build and sustain its infrastructure.

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[12] Ibidem,19.
[13] Johan W.D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 159.
[14] Ibidem, 152, Interview with Henk van Ielen, director *Kieserling* 1990-1994, manager container transport at *Kleijn Transport* 1994-2010, 18-07-2013.
[15] Interview with Henk van Ielen, director *Kieserling* 1990-1994, manager container transport at *Kleijn Transport* 1994-2010, 18-07-2013.
[16] These are the so called "bracket tariffs". Haulers could set their prices for long distance transport within a margin of 8.5 per cent above or below the official tariff and for short distance transport 10 per cent above and 30 per cent below the official tariff.
[17] Utrechts Archief, Nederlandse Spoorwegen, 68 NS-DGV werkgroep goederenvervoer per spoor 1 September 1976, 19.

Barging was the modality that was charged less for the use of its infrastructure. Waterways were built and maintained by national governments, while on the Rhine and its tributaries, where most transport took place, infrastructure use could not be charged for because of the Act of Mannheim. The road haulage sector, however, had to pay road taxes to use roads, although these did not entirely cover costs due to the strong lobbying of the automobile industry.[18] In the 1980s, the Dutch Minister of Transport, Neelie Smit-Kroes, calculated the contribution of the three modalities to the costs of the country's infrastructure, concluding that rail transport paid 100 percent, heavy road transport 90 percent, and barge transport no more than 2 percent of infrastructural costs.[19]

The EEC believed that liberalization would solve the problems of the heterogeneous European transport market by allowing free competition. Herein, liberalization of the transport sector is understood as the concrete process undertaken by the German and Dutch governments in the mid-1990s, under pressure from the European Union, to free up competition in the transport sector. This liberalization process caused a rupture in the history of transport policy in the two countries.

German and Dutch transport policy from the 1960s to the mid-1990s

From the 1960s onwards, West Germany operated a restrictive and protectionist transport policy. This was reflected in the fact that both intramodal and intermodal competition was regulated by an integral transport policy, meaning that the three modalities were treated as parts of one transport system. Dutch transport policy was more liberal; the government only interfered in the case of market failure, for example overcapacity.[20] The difference between the policies of the two countries was partly a difference in tradition and a continuation of the situation from before World War II.

The national policies and their continuity were to a large extent due to geographical factors. The Port of Rotterdam had an all-year navigable waterway connection via the Rhine to Germany, France and Switzerland, which made cheap, large scale transport to these countries possible. In the 19th century, the emerging railways, especially the part running parallel with the Rhine, had to compete with barge transport, which kept prices low.[21] In the 1920s, a third competitor, road haulage, entered the scene, and also needed to maintain its position against rail and barge by offering competitive prices. The Dutch government did not interfere with this intermodal competition, as transport in the Netherlands was an important economic activity, and relatively low prices made the Dutch transport sector strong and competitive.[22]

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[18] John F. L. Ross, *Linking Europe Transport Policies and Politics in the European Union*, 104.
[19] Nederlandse Spoorwegen, *150 jaar spoorwegen 1839-1989* (Utrecht 1989) 25.
[20] Jan Brabers, 'Bonn, Den Haag und das Scheitern der europäischen Verkehrspolitik 1950-1962'. in Jac Bosmans (ed.), *Europagedanke, Europabewegung und Europapolitik in den Niederlanden und Deutschland seit dem Ersten Weltkrieg* (Münster 1996) 194.
[21] Klemann and Schenk, 'Competition in the Rhine delta: waterways, railways and ports, 1870-1913', *The Economic History Review*, (2013) 839-840.
[22] Johan W. D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 186.

In Germany, the opposite was the case. The major German ports of Hamburg and Bremen did not have waterways that would allow continuous large scale barge transport, and even less so to the country's major industrial centres. The rivers Weser and Elbe were smaller and shorter than the Rhine and suffered from physical obstructions due to changing water levels and freezing temperatures in the winter. With the arrival of railways, it became possible to connect the ports to the hinterland by a mode of transport that allowed major volumes to be transported regularly. However, as rail in Germany did not have a serious competitor, the prices were set relatively high. This went back to 1870, when Prussia needed the high profits made by the railways for its treasury.[23] This explains why, curiously in Germany, the tariffs were not based on transport costs. Indeed, in the 1930s, rail tariffs were set by the *Standige Tariffkommission* (Permanent Tariff Commission) based on weight, distance and point of departure and arrival.[24] Moreover, since that period, the country's rail sector had been dominated by the monopolistic Deutsche Bahn (DB), which benefitted from government protection and subsidies.

Rail transport in Germany also received preferential treatment at the expense of road haulage. This policy had a long tradition. The German government used the railways as a political instrument to help isolated industrial areas, underdeveloped peripheral territories, and German ports by issuing fixed preferential *Ausnahmetariefe* (special tariffs). [25] Consequently, the government protected Deutsche Bahn from the emerging road haulage sector by restricting truck transport and coupling road haulage prices to the company's rail freight tariffs. Barge prices were also subject to regulation.

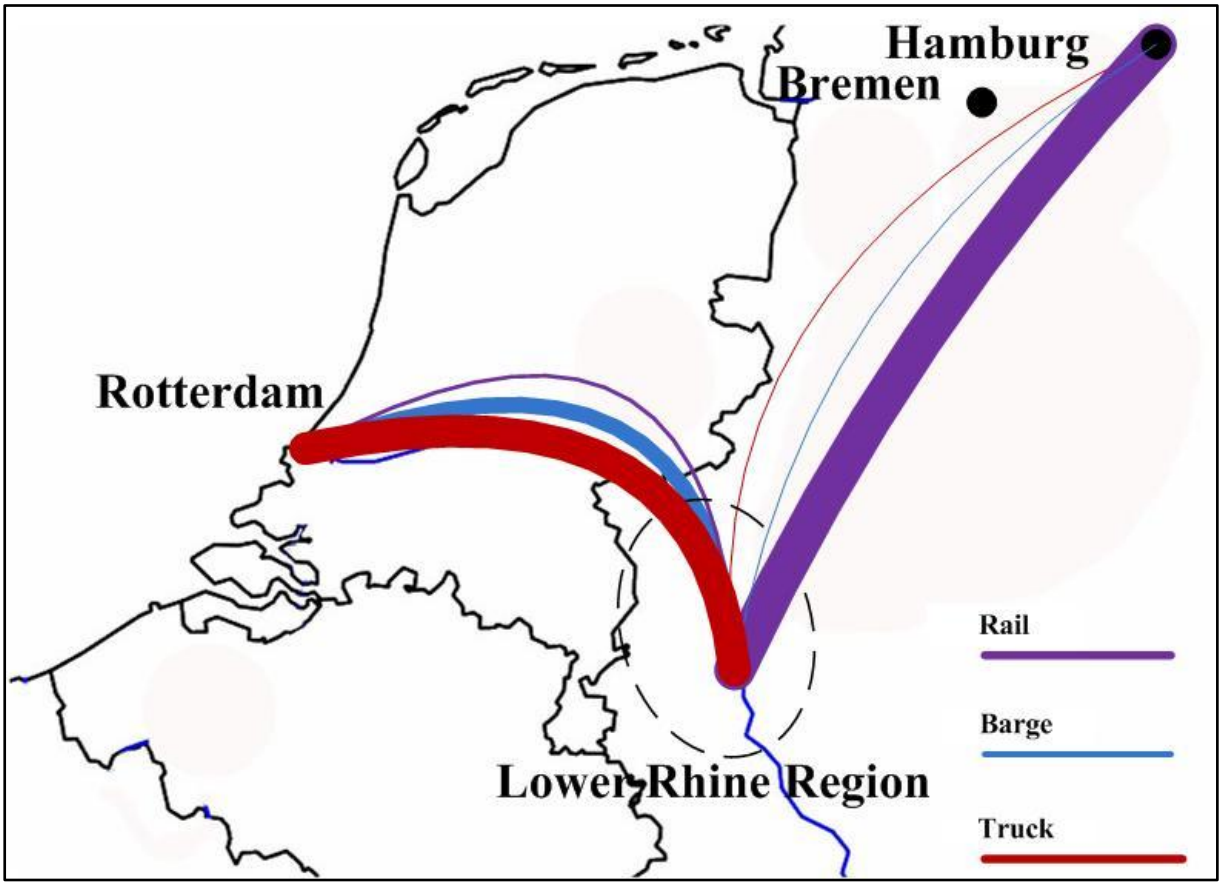
As a consequence of the restrictive German system, which did not allow competition, German transport prices were generally higher than Dutch ones. These differences had a major effect on the modal split in the two countries. In the Netherlands, rail was not the most important modality for hinterland transport, and until the transition in the energy market to oil and natural gas, the Dutch railway's main activity in the freight transport sector was the local distribution of coal. Indeed, an extensive infrastructure was built to enable NS to supply each coal merchant at each small charging station with enough coal for further distribution.[26] Meanwhile, barge transport to the hinterland was of major importance, especially for bulk, which was the strongest asset of the Port of Rotterdam.

After World War II, road haulage became an important modality in the Netherlands, and when the maritime container arrived in Rotterdam in 1966, this modality took the largest share of the modal split of hinterland transport. Meanwhile, in Germany the majority of the goods transported to and from the major ports in Germany travelled by rail. Barge had limited opportunities because of the numerous obstacles on the rivers. Furthermore, despite the fact that Germany had an elaborate system of internal waterways, barges could not transport as much volume as trains because of their low

[23] Rainer Fremdling, *Eisenbahnen und deutsches Wirtschaftswachstum 1840-1879* (Dortmund 1985) 59.
[24] Richard Vahrenkamp, *The logistic revolution The rise of logistics in the mass consumption society* (Koln 2012) 57-59.
[25] Jan Brabers, *Bonn, Den Haag und das Scheitern der europäischen Verkehrspolitik 1950-1962*, 190-191.
[26] Gerrit Nieuwenhuis, *Nieuw spoor De ontwikkelingen van de spoorwegen in Nederland na 1970,* 35.

capacity. This rail transport sector, represented by Deutsche Bahn, became the dominant modality with respect to transport between the German ports and their hinterland, while barge was the dominant form of transport between Rotterdam and its hinterland. This situation continued, with only minor changes, between 1966 and 2010. As a result, the most important intermodal competition was between the Rhine and Deutsche Bahn during the entire period under study (Figure 3.2).

Figure 3.2 *Overview of intramodal and intermodal competition between the German and the Dutch transport sectors between 1966 and 2010.*



This is only a visualization of the container flows and does not picture the actual ratio between the flows. If it did, the truck and barge container flows between the German ports and the Lower Rhine region would have been so thin that they would hardly be visible. There is not enough data available for an exact representation of the flows. Furthermore, the precise ratio changed slightly between 1966 and 2010.
Source: Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011) Theo Notteboom, *Thirty-five years of containerization in Antwerp and Rotterdam: structural changes in the container handling market*, from 2001: Ministerie van Verkeer en Waterstaat, *Binnenvaart en containerlogistiek* (Den Haag 2009), H. W. H. Welters, *Kleine gedachten over een grote haven* (Rotterdam 1991) 27-29.

The rail sector

In order to sustain its transport policy, Germany needed to protect its transport sector from its more competitive neighbour. If it did not, Dutch companies would offer lower prices in Germany and either conquer the market or force German transport firms to also lower their prices. As a consequence, to prevent this, different measures were applied in the three modalities. The rail sector was the easiest case; *Deutsche Reichsbahn* had been the only player in the market from 1920 onwards, monopolizing German rail transport under different names, the latest being Deutsche Bahn, until its liberalization in 1994.[27] According to the State Railways Act of 1951, DB was an ordinary company striving to make profits. However, it also had public service obligations. Furthermore, the German Ministry of Transport expected DB to support its transport, education, fiscal and social policy goals. Consequently, the company's freedom in terms of strategy-making was restricted, with government consent required for decisions about budgets, to determine salaries and to plan the closure of unprofitable tracks.

The decision-making process within Deutsche Bahn itself was also problematic; a number of political actors from outside the company who were on its executive board interfered, including trade unions, industry and agriculture associations, *Länder* (German states), and commercial competitors from inland shipping and road transport. The states, for example, had five seats out of 20 on the board of directors, which made it difficult to effect changes to the rail network at the expense of a particular state.[28] This arrangement was part of what is known as the Rhineland Model, and was problematic because the first priority of most of these actors was not the profitability of Deutsche Bahn. Consequently, conflicts were often resolved in a way that was disadvantageous to the rail company. The fact that conflicting political interests often interfered with the policy of Deutsche Bahn did not, however, stop actors from blaming the firm for its results. Nevertheless, DB's finances were not transparent, and the company did not fear bankruptcy as the state would self-evidently compensate it for its losses.[29] These losses were substantial. Indeed, by the 1980s, Deutsche Bahn was posting an annual loss of 14 billion DM. Different factors, including chronic overstaffing, significant research and development costs, and future projects, led to a major financial crisis within the company. Cumulative losses exceeded 70 billion DM, requiring some 12 billion in annual interest payments.[30] Deutsche Bahn could not cover these losses without receiving direct government subsidies.

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[27] The West German part of the company was renamed *Deutsche Bundesbahn* in 1948. The railways in East Germany kept the name *Deutsche Reichsbahn*. After reunification in 1991, the two rail companies were also reunified under the name *Deutsche Bahn*. In spite of all the name changes, for the sake of comprehensibility, the German national railways are referred to herein as *Deutche Bahn (DB)*. http://www.deutschebahn.com/en/group/history/chronology/1835_1994.html, seen on 17-12-2012.

[28] Richard Vahrenkamp, *The logistic revolution. The rise of logistics in the mass consumption society*, 168.

[29] Michael Teutsch, 'Regulatory reforms in the German transport sector: How to overcome multiple veto points'. in Adrienne Heritier, Dieter Kerwer, Christoph Knill, Dirk Lehmkuhl, Michael Teutsch and Anne-Cecile Douillet (eds.), *Differential Europe The European impact on national policy making* (New York 2001) 148-151.

[30] John F. L. Ross, *Linking Europe Transport Policies and Politics in the European Union*, 67-70.

The Dutch counterpart of Deutsche Bahn, Nederlandse Spoorwegen NV, was founded in 1938 by the merger of two rail companies, *Hollandse Ijzeren Spoorweg-Maatschappij* and *Maatschappij tot Exploitatie van Staatsspoorwegen*. Just like Deutsche Bahn, NS was in a hybrid position. On the one hand, its shares were owned by the government and it was under the control of the Ministry of Transport; on the other, it was expected to act as a commercial business. NS did make serious efforts to comply, but had a different perspective to that of the government. Nevertheless, the company tried to undertake long-term planning, while the government thought in four year periods and subsidies were negotiated accordingly. Furthermore, while the government had a national focus, the freight division of NS was internationally oriented, as its traditional domestic cargo, coal, had gradually become less important from the 1950s onwards, while the percentage of cross-border freight rose in the same decade.

In order to perform cross-border transport efficiently, cooperation with foreign rail companies was necessary. As NS came to realise that it was a minor player in the international rail freight sector, it looked to cooperate, or preferably merge, with foreign rail firms. To that end, it saw the 1956 emergence of Eurofirma, an international financing company for the rail sector, as a start. However, because of its entanglement with the Dutch government, these plans were unrealistic at that time.[31] Indeed, due to the ambiguous relationship NS had with the government, the company failed to prevent the steady decline of the share of rail freight transport in relation to its competitors.

At the same time, in the 1960s public transport losses were also accumulating.[32] Accordingly, in an attempt to resolve NS's financial problems, in 1967 the Dutch government promised to provide it with financial support, the extent of which was frequently renegotiated thereafter. NS received its subsidies in a number of different ways. First, there were direct subsidies, which were meant for passenger transport as compensation for its public transport obligations. However, the administration of passenger and freight transport was not completely separate until the 1980s, meaning that the latter partly profited from this subsidy. These subsidies increased in size between 1965 and 1998.[33] From the 1980s onwards, freight transport received separate subsidies as compensation for its unfavourable competitive position. Then, from 1989, freight transport subsidies were frozen and completely ended in 1998. In 1991, an agreement was negotiated with the government that, until 1993, it would finance future investments in advance, which amounted to 600 million euros.[34] Furthermore, the government raised the capital of NS several times to cover the cost of infrastructural investments.[35]

[31] NV Nederlandse Spoorwegen, *Jaarverslag 1968* (Utrecht 1969)
[32] Dirk Lehmkuhl, 'From regulation to stimulation: Dutch transport policy in Europe'. in Adrienne Heritier, Dieter Kerwer, Christoph Knill, Dirk Lehmkuhl, Michael Teutsch and Anne-Cecile Douillet (eds.), *Differential Europe The European impact on national policy making* (New York 2001) 147.
[33] NV Nederlandse Spoorwegen, *Jaarverslag 1975* (Utrecht 1976).
[34] NV Nederlandse Spoorwegen, *Jaarverslag 1991* (Utrecht 1992).
[35] For example, in 1972 and 1976, NS's capital was raised by 56 million guilders and in 1976 by 76 million guilders.

Due to the monopolistic position of the rail companies, there was no competition within the Netherlands and Germany in the rail sector. Likewise, there was no competition between the two national rail companies. The reason for this was that the firms could not operate on each other's rail network; instead, they had to cooperate in order to carry out cross-border transport, meaning that the cargo had to be transferred from one company to the other at the national border. Moreover, as a result of the different voltages of the networks, in practice this meant that the locomotives had to be changed.[36] Furthermore, as the drivers were not licensed to ride on a foreign network, they needed to make room for drivers with the right authorization. This gave an advantage to DB because, for the majority of its international rail transport, NS was dependent on its cooperation. German railways could thus intentionally thwart Dutch rail transport. Nevertheless, this seldom happened, as Deutsche Bahn also earned from the German element of rail hinterland transport from and to Rotterdam. However, every time DB cooperated with NS, it helped Rotterdam to compete with the German ports.

The barge sector

It was a lot more complicated to protect the German barge transport market from its Dutch counterpart, as international Rhine transport had been freed by the Act of Mannheim as early as 1868. Indeed, as long ago as 1815 at the Congress of Vienna, which marked the end of the Napoleonic Wars, the freedom to navigate on the Rhine was a topic of discussion. The congress also saw the establishment of the oldest intergovernmental organization still in existence, the Central Commission for Navigation on the Rhine. Barging on the Rhine was further liberalized in 1831, when Prussia, Hessen, Nassau, Baden, Bavaria, France and the Netherlands signed the Treaty of Mainz, which abolished many of the restrictions on Rhine transport.[37] Then, the 1968 Act of Mannheim freed Rhine shipping from almost all remaining obstacles, ordering freedom of transport on the Rhine and its tributaries, which included Lek, Waal, and the sea connection to Belgium.[38] Albeit with a few amendments, this act is still in force today.[39] The act's genesis was due to power politics on the part of the Prussian state, which wanted free access to the sea.[40] Intimidated by the aggressive expansion of Prussia, the Netherlands accepted the Prussian deal and signed up to the act's terms, as did all of the Rhine states save for Switzerland (at that time, the Rhine in Switzerland was not navigable).[41] The act went so far that Rhine shipping could no longer be subjected to any regulations unless it was necessary for safety reasons. Moreover, as Rhine states could not levy tolls or duties, they were required to pay for the maintenance and improvement of the waterway.[42]

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[36] Werkgroep hogesnelheidsspoorlijn Randstad Holland, *Rapport over de noodzaak een urgentie van een hogesnelheidsspoorlijn van de Randstad Holland - Rijn/Ruhr in het kader van de Rijnas,* (1988) 13.
[37] H.A.M. Klemann and J. Schenk, 'Competition in the Rhine Delta. Waterways and ports, 1870-1913', *Economic History Review,* (2012) 4.
[38] Henk van de Hoeven, *De Rijnvaartakten en de cabotage* (Rotterdam 1956) 2-3.
[39] H. A. M. Klemann and J. Schenk *Competition in the Rhine Delta.* 7.
[40] Ibidem, 3.
[41] Ibidem, 8.
[42] H. A. M. Klemann and J. Schenk, *Competition in the Rhine Delta. Waterways and ports, 1870-1913,* 8.

As a consequence of the Act of Mannheim, Rhine shipping enjoyed relative freedom until the 1930s. However, restrictive measures were imposed after the 1929 economic crisis in both the Netherlands and Germany. In 1933 in the Netherlands, for example, the *Wet op Evenredige Vrachtverdeling* (Law on Equal Distribution of Cargo) became law. This law did not, however, apply to the Rhine, but was intended to resolve the mismatch between supply and demand in the barge sector. Shippers with a license had to report their available transport capacity and received consignments in turn. The tariffs were set by the Dutch government, and the law applied to domestic irregular dry bulk transport on waterways other than the Rhine and played an important role in container transport in 1984 when the Rhine Scheldt Canal was constructed. The measure was intended to be a temporary emergency solution, but in 1938 its repeal was postponed and it was not until 1998 that the law was finally abolished.[43] The Dutch regulations strongly resembled the 1933 German *Anpassungsverordnungen* (adaptation regulations), which were replaced in the same year by the *Gesetz zur Bekämpfung der Notlage der Binnenschifffahrt* (law on fighting the plight of the barge sector). This law installed chartering commissions to regulate barge transport, but was replaced in 1953 by the *Gesetz über den gewerblichen Binnenschifffahrtsverkehr* (Law on Commercial Inland Waterways).[44]

It was not only the domestic market that became regulated in the two countries, as cabotage also became an issue. *Jus et Justitia* (literally right and righteousness), a German shippers' union, increasingly insisted that German goods should be transported in German vessels and started to discriminate against the Dutch fleet.[45] *Jus et Justitia* was a private organization, but from the early 1930s had in fact been controlled by the German National Socialist Party. Early in the same decade, Rhine barge transport grew as a result of economic growth in Germany.[46] Prior to 1940, the Dutch Rhine fleet played an important role in the domestic barge transport market between the German barge ports, not only on the Rhine, but also on the numerous other German waterways. In 1932 and 1937, Dutch barging had a 33 percent share of the German domestic barge sector. However, World War II led to a breach in Rhine barge transport, and in 1949, the share of Dutch barging on German waterways was only 15 percent, with this figure falling to 1.7 per cent in 1951.[47]

After World War II, the Allied Forces took control of transport on the Rhine. In the initial post-war years, German barges had no access to Dutch and Belgian waters. On the other hand, the German fleet had a preferential position on German waters. Indeed, it was only once in a while, when no German vessel was available, that Dutch barges were allowed to get involved in German domestic

[43] B. Wachter, *De beurtvaart,* 13.
[44] Ibidem, 19.
[45] Martijn Lak, *Because we need them... German-Dutch relations after the occupation: economic inevitability and political acceptance, 1945-1957* (Rotterdam 2011) 160.
[46] H.A.M. Klemann, *Tussen reich en empire de economische betrekkingen van Nederland met zijn belangrijkste handelspartners: Duitsland, Groot Brittannië en België en de Nederlandse handelspolitiek, 1929-1936* (Amsterdam 1990) 227-228, 131.
[47] Lak, *Because we need them...*,1-2.

transport. In 1948, an agreement was signed by an English-American delegation and the Benelux countries, which stated that if German vessels were allowed in the Benelux waterways, Dutch vessels would be permitted to perform cabotage in Germany, being subjected to the same rights and obligations as their German counterparts. This involved taking part in the German tour-de-role system. In practice, Dutch barges only received cargo when no German tonnage was available. This was in accordance with Instruction Nr. 10 issued by the American Joint Export-Import Agency (JEIA) of 1949, which ordered that foreign ships were only to be chartered when it was required by industry, as there was very little foreign currency available to pay for Dutch transport.[48] For the same reason, the allied troops preferred to use the German ports instead of Rotterdam.[49]

The German Minister of Foreign Affairs took advantage of the currency argument to exclude foreign ships from the German domestic market.[50] In 1950, German guideline nr. 1/50 was announced, which allowed cabotage licenses to be issued and break bulk to be exempted from the restrictions.[51] Tanker transport had already been exempted because of its strategic importance to Germany. The exemption of break bulk was probably due to the fact that it had very little impact, and it was thus not worthwhile to impose restrictive regulations on it. In 1953, the law on commercial inland waterway transport established that the distribution of cargo was to be determined by *Frachtenausschusse* (freight committees), with the relevant minister having an influence over the tariffs. These were not, however, in force for cross-border transport.[52] From 1955, Rhine transport was gradually liberated again, and several more steps were taken towards liberalization in the following year. For example, from 1956, it was possible to request a general currency license in order to use foreign vessels for foreign cargo in the area between the Rhine region and the German channels up to Dortmund Hamm.[53] These measures were probably related to the increasing transport demands of the recovering Ruhr industry, which needed the Dutch capacity to operate.[54]

German barge policy from the 1960s was simplified, but was still in conflict with the Act of Mannheim; internal German transport was still reserved for German skippers, and minimum tariffs were set for the internal market. Germany interpreted the Act of Mannheim as only being valid for cross-border transport, and Bonn preferred to have full control of its own waters, particularly because the barge sector had to constantly deal with the issue of overcapacity. This was due to the inflexibility of barge transport capacity; at times of growing transport demand, new vessels were built, but when cargo was scarce, these barges lay idle. Dutch skippers were thus keen to take on German domestic cargo to avoid losing money at quiet times. This was especially attractive as the minimum tariffs in Germany were higher than the average tariffs in the Netherlands. The exclusion from cabotage was

[48] Ibidem, 4-5.
[49] Ibidem,166.
[50] Ibidem, 179.
[51] Henk van de Hoeven, *De Rijnvaartakten en de cabotage,* 6.
[52] B. Wachter, *De beurtvaart,* 8.
[53] Ibidem 8.
[54] Lak, *Because we need them...* 168.

therefore seen as discrimination against the Dutch barge sector, in the same way that the *Seehafenausnahmetarife* was actually against the Act of Mannheim.

The problem of overcapacity was addressed in the Netherlands with two measures. First, domestic barge transport was strictly regulated with respect to equal freight distribution, which applied to transport from and to Belgium and France. Furthermore, scrapping measures were introduced in the 1970s and 1980s. Secondly, Dutch barge transport enjoyed the advantage of fuel tax exemptions.[55] Germany resented this measure, with Bonn seeing it as unfair competition for Deutsche Bahn, which had high sunk costs, and German road haulage, which did have to pay these taxes. As a consequence, in 1981, Germany unsuccessfully pleaded for the introduction of a fuel tax on diesel for barges in the Netherlands.[56] In the sector, the large companies competed with each other, while also cooperating to control the eventual damage caused by competition. After World War II, barging on the Rhine was increasingly internationalized. Due to the abolition of fixed tariffs and the decision to allow foreign companies to participate in the domestic market in Germany, competition no longer played along national lines; for example, large companies now fought each other by preventing other firms from using their terminals.

The road haulage sector

The transport policy of Germany was driven by the aims to protect Deutsche Bahn from cheaper road haulage and to keep the even cheaper Dutch road haulage out of the country. Indeed, the Netherlands was very competitive in the road haulage sector, with 40 percent of all truck transport between EEC countries undertaken by Dutch haulers in the 1950s.[57] In order to restrict this Dutch dominance, the German Minister of Transport, H.C. Seebohm (DP, German Party, later CDU, 1949-1966), imposed limitations on the road haulage sector. In particular, he reduced the availability of transport permits, increased technical restrictions on vehicles, and made the ministry directly responsible for setting tariffs. He also imposed new maximum vehicle sizes, which on the one hand restricted German domestic road haulage and on the other stopped foreign trucks from entering the country. Instead of the generally accepted 18m maximum length and 32 ton maximum weight, Seebohm reduced these figures to 13.5m and 24 tons. After fierce protests, the measurements were adjusted again to 16.6m and 32 tons. Nevertheless, Dutch road haulage companies needed to change the size of their vehicles to meet these requirements.[58] These measures were, unsurprisingly, highly controversial. Indeed, in this period, Deutsche Bahn was given the nickname the sick man of transport, and survived at the expense of road haulage.[59]

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[55] Wim Schook, *Vracht aan verleden lading voor de toekomst EVO 66 jaar* (Zoetermeer 2007) 32-34.
[56] Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, Codebericht 11655, 14/06/1981.
[57] Jan Brabers, *Bonn, Den Haag und das Scheitern der europäischen Verkehrspolitik 1950-1962*, 194.
[58] Johan W. D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 173-175.
[59] Ibidem, 192-193.

Seebohm's transport policy was carried on by his successor, Georg Leber (SPD, 1966-1972). However, despite all of the restrictive measures, road transport grew exponentially during Leber's term as transport minister. Indeed, between 1950 and 1966 in Germany, 88 billion DM were invested in roads. At the same time, Deutsche Bahn suffered losses, and needed three billion DM in government subsidies in 1967. Leber later decided that it was time for a serious, integrated approach, and therefore developed his own transport policy, which is remembered as the Leber Plan. This policy was intended to relieve the pressure on the road infrastructure and make better use of the railways. Within this context, it is clear that German policy was enthusiastically trying to stimulate multimodal transport, especially that involving the combination of road and rail from and to Rotterdam and, in particular, the German ports. Moreover, these policies attempted to redirect as much transport as possible from road to rail, which had a few advantages: there would be no need to build costly highways to facilitate road transport; it would prevent the Netherlands from increasing the export of its road haulage sector; and it would enable the German national champion, Deutsche Bahn, to profit from rail transport from and to the Dutch ports.

Seebohm set the tone for German transport policy, and his interventions had a long-lasting effect. Due to Germany's highly differential political system, involving corporatist agreements, coalition governments, and a specific form of federalism, German policy tended to be continuous. Deutsche Bahn remained the favoured modality, and there were heavy restrictions on road transport.[60] Until 1961, road haulage was compelled to use the same tariffs as Deutsche Bahn. Thereafter, a small diversification of tariffs was allowed, but completely free tariff negotiations only became possible in 1994 when price controls were abolished.[61] The need for road haulage licenses was finally ended in 1998 when internal German road haulage transport was also liberalized. Until 1995, Germany had only imposed vehicle excise duties and fuel taxes on companies registered in the country. There were no tolls, but the vehicle taxes were much higher than the European average, which meant that very low contributions were received from foreign infrastructure users to use the infrastructure in Germany.[62]

The German road haulage sector was protected from the Dutch by a permit system. The introduction of community licenses after World War II, which allowed the holder to undertake road transport freely within the EEC, was crippling for the Netherlands. In the beginning, the number of licenses was determined at 1200, with only 240 being allocated to the Netherlands, even though, according to its share of cross-border road haulage, it should have received twice that number. The quota allocated to the Netherlands remained dependent on bilateral agreements with Germany which,

[60] Michael Teutsch, *Regulatory reforms in the German transport sector: How to overcome multiple veto points,* 131.
[61] These are the socalled "bracket tariffs." Haulers could set their prices for long distance transport within a margin of 8.5 per cent above or below the officially set tariff. short distance transport 10 per cent above and 30 per cent below the official tariff.
[62] Ibidem.

under transport minister Leber, strictly regulated the road haulage sector. In 1968, Leber reduced the number of Dutch bilateral licenses issued. At that point, only 1950 Dutch trucks were allowed in to Germany per day. On top of that, in 1969, Leber introduced a new transport tax per tonnage kilometer, which became known as the Leber Pfenning. Furthermore, he banned trucks from the roads during five long weekends in the holiday season. In the same year, the number of licenses was increased slightly, but the real relief came in 1970 when the permit system was transformed to allow 550,000 three-monthly licenses to be issued. This number was further increased to 600,000 in 1973. By that time, the Leber Pfenning had also been abolished.[63]

The bilateral quotas were originally intended to restrict overcapacity, but their major effect was causing conflict between Germany and the Netherlands. Indeed, in 1968 and 1982, when Bonn refused to increase the number of available licences, there were heated conflicts between the two countries. In the Netherlands, companies and branch organizations urged the Dutch prime minister to convince the German chancellor to increase the number of licences, fearing that Dutch trucks would otherwise be unable to meet their obligations.[64] In 1968, when the lack of licences threatened, among others, the *Vereninging van Kamers van Koophandel en Fabrieken* (Dutch Chamber of Commerce), the body sent a letter to the prime minister, P.J.S. De Jong (KVP, 1967-1971), asking for help.[65] In 1982, the branch organizations *Commissie Overleg voor het Goederenvervoer, (COG)* (Commission deliberation for freight transport) and *Algemene Verladers Eigen Vervoer (EVO)* (General shippers own transport) asked the then prime minister, D. van Agt (CDA, 1971-1982), to convince the German Chancellor Helmut Schmidt (SPD, 1974-1978) to issue extra licences. The COG even contacted the German minister of transport, Werner Dollinger (CSU, 1982-1987), directly to explain its position.[66]

Dutch transport policy was quite liberal; the government's only interference with truck transport concerned its fight against overcapacity. Road freight transport in the country was regulated from 1951 by the *Wet Autovervoer Goederen* (Vehicle Freight Act). This law limited the opportunity to increase the transport capacity of road haulage companies. At the same time, this made it easy to obtain international permits. During the crisis in the 1970s, it became clear that the law was ineffective, as the sector suffered from cut throat competition and overcapacity. The government

[63] Johan W. D. Jongma, *Geschiedenis van het Nederlandse wegvervoer*, 179-180.
[64] Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Vervoer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, Commissie Overleg voor het Goederenvervoer to Dollinger 3/12/1984.
[65] Nationaal Archief, 2.03.01, Ministeries voor Algemene Oorlogvoering van het Koninkrijk en van Algemene Zaken, Kabinet van de Minister-President, Onderhandelingen met Duitsland 3125, Vereniging van kamers van Koophandel en Fabrieken in Nederland to minister president 12/09/1968.
[66] Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, from Commissie Overleg voor het Goederenvervoer to Van Agt, 30/06/1982, Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Vervoer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, from Algemene Verladers Eigen Vervoer to Van Agt, 1/06/1982, Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Vervoer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, Commissie Overleg voor het Goederenvervoer to Dollinger 3/12/1984.

reacted with a tonnage stop in 1975, fixing the maximum loading capacity of road haulage companies by limiting the number of trucks and the capacity of their loading units. Thereafter, it was only possible to extend capacity by buying a permit from another company. This system was not, however, flexible and was unable to react adequately to changes in demand. In 1984, the centre-right government (Lubbers I, CDA - VVD) decided to reform road freight transport legislation. The tonnage stop was therefore lifted in 1985 and, after a four year transitional period, a new *Wet Goederenvervoer over de Weg (WGW)* (Road Freight Act) was implemented in 1992.[67]

In 1966, with the arrival of maritime containers in Rotterdam, the road haulage sector had the least company-concentration of the three modalities, consisting mainly of small family businesses that generally only had one truck, although there were exceptions.[68] During the period 1966-2010, however, there was a process of concentration. In 1985, there were 627 road haulers in the Netherlands with 15 or more trucks, and these had 47 percent of the total capacity, while the 5,200 small companies with fewer than six trucks had less than a quarter of the total capacity.[69] In 1986, there were 7500 transport companies in the Netherlands, of which 2300 operated internationally. The total turnover of these firms was 10 billion guilders, which amounted to 1.5 percent of GDP and gave employment to 70,000 people. Based on weight, 80 percent of the transport was domestic and 20 percent international.[70] Road haulage achieved its strong market position by the flexibility of its door-to-door service. However, this branch also suffered from overcapacity, especially at times of negative economic trends, despite a permit system and tonnage stop, which were measures intended to produce a healthy sector.[71] There was fierce competition between truck companies within the Netherlands, leading to in many takeover attempts. This rivalry was also expressed by attracting each other's customers and offering lower prices than their competitors in order to acquire a larger market share.

Liberalization

In the mid-1980s, the focus of the EEC's attention shifted from intermodal to intramodal competition. After the publication of the 1985 white paper on the completion of the international market, which is known as the Single European Act, EEC transport ministers agreed to lift restrictions and liberalize the transport market in order to permit free competition by 1 January 1993.[72] In a sequence of directives, the EU ordered member states to implement liberalization policies, which affected all three of the modalities considered herein in a variety of ways because of the different issues that the sectors had to face. In the rail sector, the main concern was the inefficiency of the monopolistic national rail

[67] Dirk Lehmkuhl, *From regulation to stimulation: Dutch transport policy in Europe,* 220-223
[68] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk* (Rotterdam 1990) 337.
[69] Johan W. D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 102.
[70] NOB Wegtransport, *Ruime baan voor wegtransport,* 4-5
[71] Utrechts Archief, Nederlandse Spoorwegen, 68 NS-DGV werkgroep goederenvervoer per spoor 1 september 1976, 19.
[72] Economisch Bureau van de Amro Bank, *Op weg naar 1992 Binnenvaart, de gevolgen van de Europese integratie* (Amsterdam 1988) 7-8.

companies, while the key issues in the barge sector were overcapacity and price regulation and in the road haulage sector the restrictions on international transport and, like the barge sector, fixed German tariffs.

The rail sector

Liberalization of the European rail sector was intended to be a solution to the problems faced by the national rail companies in the 1960s. In order to help, in 1969 the European Commission decided that national governments had to compensate their rail companies for their losses. To prevent unfair competition, this government aid was to be reported to the EC within two months of its implementation, in accordance with Article 93, Section 3 of the Treaty of Rome.[73] The financial problems of the rail companies were, however, persistent. In the 1970s, partly caused by inflation, government subsidies to both the German and the Dutch railways skyrocketed. By the 1980s, there was growing pressure to liberalize rail transport, as financial aid was increasingly seen as unfair competition with respect to the other modalities, which were not subsidized.

The aim of liberalization was to ensure that rail companies operated in a commercial way by striving to cover all of their costs and allowing free competition.[74] In 1991, the EC's Directive 91/440 addressed the problems with four measures. National rail companies needed to become independent of national governments. This meant privatization, which would make the firms less dependent on national transport policy. The rail companies were also expected to separate their infrastructure from exploitation to clear the way for new entrants to the rail market. In this way, these new firms could pay a fee to use the infrastructure. Finally, the rail companies were to be reorganized financially, so that they could act commercially and cover their costs.[75]

In Germany, liberalization of the rail sector was combined with the unification of the railways of Western and Eastern Germany. The rail reform of 1993 arranged the merger of the West German Deutsche Bundesbahn with the former East German Deutsche Reichsbahn into a joint stock company, Deutsche Bahn AG. This rail reform clarified the relationship between Deutsche Bahn and the government, as it limited governmental influence on the company's decision-making processes. Even though the federal state was still its owner, Deutsche Bahn would depend less on the government because of its new management structure, which consisted of a management board, supervisory board and shareholders.[76] German rail reform also involved freeing Deutsche Bahn from all past financial burdens, with the German state taking over all of its pension and social insurance obligations. Furthermore, Berlin also volunteered to make the investment required to upgrade the former East

[73] Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, 593, Steunmaatregelen op het gebied van het vervoer in de landen van de Europese Economische Gemeenschap (EEG) 1980-1985, Verslag van de vergadering van de Financieel steun 592, 5/1/1977
[74] Guus Veenendaal, *Spoorwegen in Nederland: van 1834 tot nu toe* (Amsterdam 2008) 551.
[75] Handley Stevens, *Transport Policy in the European Union* (New York 2004) 94-95.
[76] Michael Teutsch, *Regulatory reforms in the German transport sector: How to overcome multiple veto points*, 148-151.

German rail infrastructure. This did not, however, make Deutsche Bahn completely financially independent from the German state, as the federal government still financed regional rail services. Moreover, after the *Bahnreform* (rail reform), Deutsche Bahn still received substantial government subsidies. Indeed, in 2004, this amounted to 3.41 billion euros.[77]

During the rail reform of 1993, Deutsche Bahn was split into different units. In Germany, the infrastructure was not completely separate from exploitation, as it remained one of the units within the Deutsche Bahn holding. According to the new railway legislation, the construction and maintenance of the new infrastructure was the responsibility of the federal government. The investments were financed by interest free loans, which the railways had to repay according to the annual depreciation of the value of the tracks. Consequently, the infrastructure operator was expected to cover its costs from its revenues, which partially paid for the use of the infrastructure.[78] The freight division of the German railways' cargo transport was removed from the holding and DB Cargo AG was created. In 2001, DB Cargo took over the freight division of NS and the two companies became Railion. NS had only a 6 percent interest in this joint venture, but even that was sold to DB in 2003.[79] After some reorganization, Railion joined DB Schenker, with this company developing into a leading vertically integrated logistics service that concentrated on rail cargo transport and had 2000 offices in 130 countries. In 2010, DB Schenker had revenues of almost 45 billion euros, suggesting that the detachment of the freight division of Deutsche Bahn was certainly successful, allowing the emerging company to develop into a profitable, multinational subsidiary of Deutsche Bahn AG. The rail reforms meant that there was formal open access to the German market for operators fulfilling the licensing criteria. Nevertheless, as the infrastructure was still in the hands of DB holding, which also owned the largest player by far, Deutsche Bahn Schenker, small new entrants were discriminated against because, unlike Deutsche Bahn, they were not subsidized.[80] The new entrants complained about high charges, and insufficient access to rail yards and physical and human resources.[81] The fact that the infrastructure was not completely separate from Deutsche Bahn holdings was seen as a major failure of German liberalization, which in other respects implemented, and even went beyond, the EU's liberalization policy. Financially, the solution was not perfect either; the tariffs covered only 56 percent of the transport costs, while one third of the railway tracks delivered losses and were threatened with closure.[82]

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[77] B. Slack and R. Visser, 'Challenges confronting new traction providers of rail freight in Germany', *Transport Policy,* 14 (2007) 400.
[78] Michael Teutsch, *Regulatory reforms in the German transport sector: How to overcome multiple veto points,* 153-154.
[79]Guus Veenendaal, *Spoorwegen in Nederland: van 1834 tot nu toe,*
[80] In 1997, Deutsche Bahn had a market share of 85 percent, Michael Teutsch, *Regulatory reforms in the German transport sector: How to overcome multiple veto points,* 151-153.
[81] Brian Slack, *Challenges confronting new traction providers of rail freight in Germany,* 399-409.
[82] http://www.dbschenker.com/site/logistics/dbschenker/com, seen on 22-09-2011, Michael Teutsch, *Regulatory reforms in the German transport sector: How to overcome multiple veto points,* 155-156.

The Netherlands, meanwhile, was implementing the EEC directives quickly, as it had much to gain from a liberal European transport market.[83] In 1991, the Wijffels commission was appointed to transform the directives into national policy.[84] In the Netherlands, new entrants were allowed to join the rail market as operators as early as 1993 and, in the same year, European Rail Shuttles and Afzet Container Transport System (ACTS) were the first non-NS subsidiaries to start to operate trains in the country. Their activities did not, however, yet involve traction. As a consequence of the recommendations of the commission, NS was privatized in 1994, and the property rights, with the exception of the infrastructure, were transferred to the company. Its activities were divided into two parts, one commissioned by the government and the other by NS. Infrastructure, capacity management, and licensing belonged to the government-commissioned part, and passenger and freight transport to NS.[85] When NS was split into different companies, it transpired that the freight transport branch, NS Cargo, was too small to survive on its own. Consequently, as negotiations with other rail companies failed, it was taken over by Deutsche Bahn. After the takeover, Deutsche Bahn did not organize container transport in the Netherlands, instead only serving as a traction provider. Shuttles and container trains that regularly travelled between two points were operated by the new entrants, which competed strongly against each other. New entrants like European Rail Shuttle and BoxXpress managed to offer lower prices and changed the previous pattern of container transport. The separation of NS into different companies was supposed to take place within five years, and was a tedious job as the common infrastructure had to be divided between the different firms. At the same time, government subsidies were reduced from 450 million guilders in 1995 to zero. Nevertheless, after the liberalization of the Dutch rail sector, the rail market was still subsidized by government investment in the infrastructure. As the newly formed company ProRail, which was responsible for the infrastructure, belonged to the government commissioned segment, The Hague was free to stimulate rail freight transport financially. Indeed, ProRail's costs were 85 percent financed by the government, with only 15 percent covered by the access charges paid by users. The Betuwe Route, which was built exclusively for freight, can be regarded as a major benefit for this form of transport, as it was fully financed by government funds.[86] In this way, the infrastructure was vertically separated from exploitation.

ProRail was responsible for executing government policy, facilitating the increase in passenger transport and simultaneously stimulating rail freight transport.[87] The process of the liberalization of the Dutch railway sector was completed by opening the market up to new entrants for traction, and, since that time, the Dutch rail market was open to licensed rail companies. The major

[83] Guus Veenendaal, *Spoorwegen in Nederland: van 1834 tot nu toe* (Amsterdam 2004) 246.
[84] Named after the leader of the commission, the Dutch economist and banker H.H.F. Wijffels (1942-)
[85] Ibidem, 236-237.
[86] D. Koster and E.d. Block, 'Stand van zaken augustus 2010 Goederenvervoer in Nederland', *Op de Rails,* Oktober (2010) 446.
[87] Michael Teutsch, *Regulatory reforms in the German transport sector: How to overcome multiple veto points,* 237-238.

players were ACTS, ERS Railways, ShortLines, the Swiss firm Hupac Intermodal, the Belgian Inter Ferry Boats, and the German Kombiverkehr.

The barge sector

The barge sector was the odd-man-out in the liberalization of the European transport sector, as transport on the Rhine, which formed the main part of European barge transport, had already been liberalized in the 19th century. As a result of the post-war interpretation of the Act of Mannheim, there were still a few restrictions on cross-border barge transport in Germany and the Netherlands. The European Union did not play a major role in removing these final obstacles from a free barge market. The same was true for the solution to the problem of possible new entrants to the Rhine transport sector from Central and Eastern European countries, which was made possible by the opening of the Rhine-Main-Danube Canal in 1992. This canal made it possible to sail from the Black Sea to the North Sea. At the same time, it meant that skippers from the Danube states, Bulgaria, Romania, Yugoslavia, Hungary and Czechoslovakia, could enter the Rhine transport sector. This was successfully counteracted by the Central Commission for Navigation on the Rhine, which added an amendment to the Act of Mannheim requiring companies to have their headquarters in one of the Rhine states if they wanted to enter the Rhine transport sector.[88] By taking this step, the CCNR de facto closed down the market for Central and Eastern European companies. The regulations that were intended to fight the most serious problem facing the barge sector, overcapacity, were equally illiberal.

Individual countries tried to solve this problem with scrapping, which allowed companies to take their barges out of service by subsidizing them for doing so. Initial efforts to coordinate scrapping between countries were unsuccessful. Consequently, it was agreed that member states should effectuate these measures on a voluntary basis.[89] In the 1980s, the EEC's coordination strategy was limited to ensuring that scrapping and financial aid was reported on a regular basis. However, in 1998, the ministers of transport of the Rhine countries finally agreed on an international coordinated scrapping measure to start on 1 January 1990. This was the result of 13 years of negotiations, and meant that coordinated scrapping measures started in Belgium, France, Luxembourg, Germany, Switzerland and the Netherlands. The aim was to restructure the barge sector and fight overcapacity at times of falling transport demand. Furthermore, the measures stimulated technical development. As barges had a long life, old vessels would have been used for longer periods without scrapping.[90]

[88] Economisch Bureau van de Amro Bank, *Op weg naar 1992 Binnenvaart, de gevolgen van de Europese integratie*, 17.
[89] Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Vervoer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, Codebericht 7447, 27/03/1984, 4.
[90] NEA Transportonderzoek en opleiding, *Haalbaarheid Initiatieven in het gecombineerd Weg-Watervervoer* (Rijswijk 1991) 85.

Overcapacity was thus addressed in the opposite way to the approach of the rail sector; instead of stopping subsidies, new subsidies were introduced.

An important element of the liberalization of the German barge sector was the abolition of fixed minimum tariffs. This took place in 1992 thanks to the *Tarifaufhebungsgesetz* (Tariff Abolition Act), which ordered the abolition of minimum tariffs for barge transport in Germany from 1 January 1994.[91] This measure had a major effect on the sector. Eleven months later, the German minister of transport, Matthias Wissman (CDU, 1993-1998), stated that the German economy had saved 2 billion DM on transport costs because of the measure. At the same time, the barge transport sector in Germany lost the same amount of transport revenues. However, the real winner was the Dutch barge sector, which, after cabotage was made possible in 1995, gained access to the German domestic market for similar prices as in the Netherlands.[92]

The road haulage sector

The liberalization of road haulage turned out to be the most troublesome. In 1977, 20 years after the Treaty of Rome, very little had been achieved, and the release of regulations on cross-border truck transport proceeded very slowly. In 1977, 94 percent of cross-border transport within the EEC was still subject to bilateral quotas.[93] After the inactivity complaint of 1983, the Netherlands seized the initiative to remove such obstacles. In 1986, under the EEC directorship of transport minister Neelie Smit-Kroes, the first steps were taken in the creation of a common transport market; for a transitory period (1987-1992), community licenses would be extended and bilateral quotas would be adjusted to meet existing demand. In practice, this proved to be somewhat complicated, as Germany continued to erect new obstacles. In 1988, for example, it announced the introduction of the *Strassenbenutzungsgebuhr*, a street use tax whereby access to German roads required the purchase of an annual 7000 DM permit for a truck of 40 tons. This measure hit cross-border transport disproportionately hard, because the majority of these trucks travelled within a range of 75km from the German-Dutch border,[94] and thus used very little German infrastructure. Nevertheless, with the intervention of the European Court of Justice, this measure was defeated.[95] Finally, in 1990, Dutch truckers gained limited access to the German domestic market when the Netherlands received 18,000 cabotage permits for a period of two months. Until 1998, when the internal German transport market

[91] 'Duitse verladers zijn niet bang van acties', *Nieuwsblad Transport*, (25 November 1993). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/19880/ArticleName/Duitseverladerszijnnietbangvooracties/Default.aspx, seen on 09-09-2013.
[92] Ibidem,'Gevolgen opheffing van cabotageverbod zouden meevallen', (15 December 1994). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/27793/ArticleName/Gevolgenopheffingvancabotageverbodzoudenmeevallen/Default.aspx, seen on 09-09-2013.
[93] Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, 167. Ontwikkeling van een gemeenschappelijke vervoerspolitiek vanuit de EEG Vervoerspolitiek II. 1976-1977, Memorandum William Rogers 24/06/1977.
[94] 'Die partner müssen einander zuhören', *Deutsche Verkehrs-Zeitung, Niederlande eine sonderbeilage*, Dienstag 10 November 1992, 26-27.
[95] Johan W. D. Jongma, *Geschiedenis van het Nederlandse wegvervoer*, 185.

was liberalized, this number was raised slightly each year.[96] However, from 1993 onwards, no permits were needed for cross-border road haulage to Germany. The fixed prices in the German domestic markets were also abolished in 1994.[97] (Table 3.1)

[96] 'Invoering vrije cabotage binnen EG nog ver weg', *Nieuwsblad Transport*, (23 juli 1992) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10363/ArticleName/InvoeringvrijecabotagebinnenEGnogverweg/Default.aspx, seen on 12-09-2013.
'Meeste cabotage in Duitsland gebruikt', *Nieuwsblad Transport* (23 augustus 1991) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/786/ArticleName/MeestecabotageinDuitslandgebruikt/Default.aspx, seen on 12-09-2013, 'Tarieven in Duitsland dramatisch onderuit', *Nieuwsblad Transport* (13 jan 1994). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/21343/ArticleName/Tarievenin Duitslanddramatischonderuit/Default.aspx, seen on 20-12-2013.
[97] Ibidem.

Table 3.1 *Overview of the most important steps in the liberalization of the German and Dutch transport markets.*

	EU	Rail	Barge	Road haulage
1868			Act of Mannheim (CCNR)	
1985	White Paper Single European Act			
1990			Coordinated scrapping (CCNR)	Limited cabotage (D)
1991	91/440 Directive Railway Liberalization			
1992			Opening Rhine-Main-Danube-Canal	
1993		Bahnreform (D) New entrants (operations NL)		Abolishing bilateral permits
1994		Privatization of NS (NL)	Abolishing fixed tariffs (D)	Abolishing fixed tariffs (D)
1998		New entrants (traction NL)		Free cabotage (D)

Conclusion: the effect of liberalization on intra- and intermodal competition

Liberalization affected both intra- and intermodal competition in Germany and the Netherlands. After NS was split up, the freight division of NS Cargo was too small to survive on its own and thus merged with Deutsche Bahn Schenker. After the liberalization of the German rail market, Deutsche Bahn in the Netherlands stopped acting as an operator of container transport, only serving as a traction provider, while container transport was performed by new entrants. This meant that the market structure of the rail sector became more like that of the other modalities: an oligopoly with one large company and a few smaller ones. Competition was thus introduced into the previously monopolistic market. New entrants like ERS Railways and BoxXpress broke the container shuttle market wide open. These were small commercial firms that could offer lower prices than the colossal former state-owned companies run by former government officials. ERS made cheaper connections possible to the Lower Rhine region, while BoxXpress helped to reduce rail container transport prices between the German ports and Southern Germany. As well as the competition of rail companies within Germany and the Netherlands, competition between the rail sectors of the two companies became possible. After liberalization, they were allowed to operate on each other's networks, as in the meantime locomotives were developed that could switch to the voltages of the two countries.

Liberalization did not have a major effect on the market structure of the other two modalities, where there was a scaling-up of companies. This was not directly caused by liberalization. Intramodal competition was strong within all of the modalities. The gradual freeing of cabotage gave Dutch companies access to the German market, while the lifting of the need for cross-border permits freed Dutch haulers from going through painstaking procedures to acquire enough permits to meet their transport assignments. The real breakthrough came, however, when the fixed tariffs were abolished. This also intensified the competition between German truckers, as the opportunity to undercut prices arose.

Liberalization caused changes to some of the major elements of intramodal competition, namely fuel costs, labour costs and infrastructural costs. It had no impact on fuel costs. Nevertheless, it did help to coordinate social costs, although the problem of ensuring compliance with the rules was still not resolved. The arrangements for the payment of infrastructural costs for rail and road haulage companies changed. In the Netherlands, the rail infrastructure was allocated to a government-financed segment, i.e. ProRail. The government thus partially financed the building and maintenance of the infrastructure, but there was growing pressure to make it cover its own costs from user fees. In Germany, the infrastructure remained a part of Deutsche Bahn, and the government not only paid for a large part of it, but also gave direct subsidies to rail transport. In 1995, to ease the pain of liberalization in the road haulage sector, the *Eurovignet* was introduced, which meant that in both Germany and the Netherlands, as well as in a few other countries like Denmark, separate permits had to be bought to enable the highway infrastructure to be used by heavy truck transport. This was a flexible system, which involved daily, weekend and monthly permits. Furthermore, the permits were available without limits and were a lot easier to obtain than the restrictive versions in use before the liberalization of the road haulage market. In this way, countries were compensated for the use of their infrastructure by foreign vehicles.[98]

Liberalization did not cause a major change to the modal split of container transport in either country. After liberalization, German hinterland transport was still dominated by rail, as the share of barge and truck transport did not change substantially. In the Netherlands, trucks still transported the majority of containers, followed by barge and rail. The reason for the resilience of the modal split was that it was determined by geographical and long-standing historical factors. What did, however, change was the geographical pattern of hinterland transport, which is discussed in the following chapters. These changes were partially caused by the liberalization of the transport sector. The largest effect was due to the new entrants to the rail sector mentioned earlier, ERS and BoxXpress. The removal of obstacles to cross-border transport would logically imply the deeper penetration of hinterland transport from Rotterdam to Germany, but in fact the opposite was true.

[98] 'Brochure KNV moet vragen over tolvignet beantwoorden', *Nieuwsblad Transport* (20 ecember 1994) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/27694/ArticleName/BrochureKNVmoetvragenovertolvignetbeantwoorden/Default.aspx, seen on 13-09-2013.

A major effect of liberalization was the harmonization of German and Dutch transport policies within a European context. Germany had already had an integral transport policy before World War II, while the Netherlands became conscious of the importance of an integrated approach in the 1980s when there was growing awareness that the cost to society of transport was greater than the actual transport costs incurred. The Netherlands employed an integrated transport policy by establishing the infrastructure fund in 1994. This fund was partly filled with returns from the transport sector, fuel taxes and infrastructure use payments. The government decided that it was a public responsibility to supply the infrastructure for all modalities, and with this decision stressed the importance of integrated transport policymaking.[99]

Applying an integrated transport policy was, nevertheless, problematic. In the Netherlands, NS demanded such an approach. However, this proved to be a difficult task because of the many differences between the modalities, especially as the Act of Mannheim strongly reduced the influence of governments in the barge sector by exempting the Rhine and its tributaries. Nonetheless, before the liberalization of the European transport sector, Germany was quite successful with its integral transport policy, subsidizing railways, imposing minimum tariffs for road haulage that were related to rail tariffs, and regulating the barge sector with measures that conflicted with the Act of Mannheim. After liberalization, this system collapsed, with all three modalities in Germany suffering as a consequence. Rail transport still needed subsidies, while the road haulage and barge sectors were forced to lower their tariffs as they were no longer protected from cheaper foreign competition. The German economy, however, profited from cheaper transport.

It is actually impossible to have a completely liberal transport policy, as this would lead to an invasion of trucks that would clog up the road infrastructure in Western Europe and cause unacceptable damage to the environment. This means that, in practice, the external costs of road transport would be paid for by society. At the same time, internalizing the external costs of transport by making the polluter pay would lead to the bankruptcy of hundreds of road haulage companies in both Germany and the Netherlands. What thus remains is the allocation of subsidies and the hope that the stubbornly resilient modal split would give in.

There is, however, another aspect to the intermodal competition of transport modalities in ports: as well as competing, they complement each other. So, all three modalities are essential for a competitive port. Rail and barge transport are efficient over longer distances, while trucks are essential for the last mile. When barging faces problems caused by high or low water levels or physical obstructions, or when transport has a time constraint, trucks are used. Within the context of port competition, it is necessary to have all three modalities in order to attract sea shipping companies with large volumes. From 1990, port competition intensified because of the explosive growth of

[99] Michael Teutsch, *Regulatory reforms in the German transport sector: How to overcome multiple veto points,* 237-238.

worldwide container transport, which meant that both German and Dutch ports were increasingly integrated into the globalizing world economy.

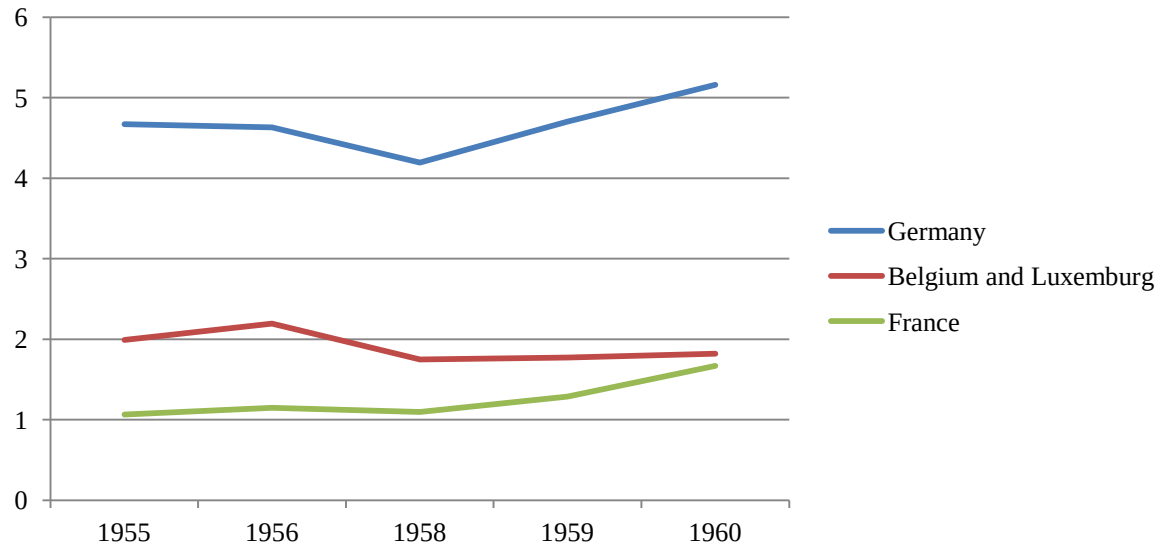
Chapter 4
Rail: The Stepchild of Container Transport

Rail container transport has always formed the smallest part of the modal split, never exceeding 20 percent of hinterland container transport. This is probably why the history of rail container transport has received so little attention in the literature. Nevertheless, an analysis of the sector is essential for a number of reasons. As mentioned in the previous chapter, both intra- and intermodal competition were important factors in port competition. Moreover, free competition in hinterland transport lowers transport costs and makes the port more attractive to sea shipping companies. Prior to the liberalization of the transport sector in Germany, there was no intermodal competition because of the restrictive national transport policy. In the Netherlands, meanwhile, intermodal competition was freer; the Dutch government only intervened when there was a danger of market failure, caused, for example, by overcapacity. There was no intramodal competition within the rail sector in either country, but this was introduced by liberalization. Similarly, before liberalization, there was no competition between the only two national rail companies, as they could not operate on each other's networks. Liberalization introduced competition here too. This chapter analyzes the changes in the geographical pattern of rail container shuttle transport between Rotterdam and its hinterland, and also explains the role of the liberalization of the German and Dutch rail sectors in this hinterland in the period 1966-2010.

Dutch rail freight transport before the advent of maritime containers

Prior to the advent of maritime containers, Dutch cross-border transport was mainly oriented towards Germany. Indeed, in the second half of the 1950s, Germany was the major hinterland for rail freight transport in the Netherlands, and its share had been rising since 1958. In 1960, more than half of all cross-border rail freight transport had Germany as a final destination, followed by Belgium, Luxemburg and France, which had 19 and 17 percent shares, respectively. The share of the four countries together accounted for 90 percent of total volumes. Switzerland, Italy and Czechoslovakia played a minor role, with a total share of 10 percent. (Figure 4.1 and Figure 4.2)

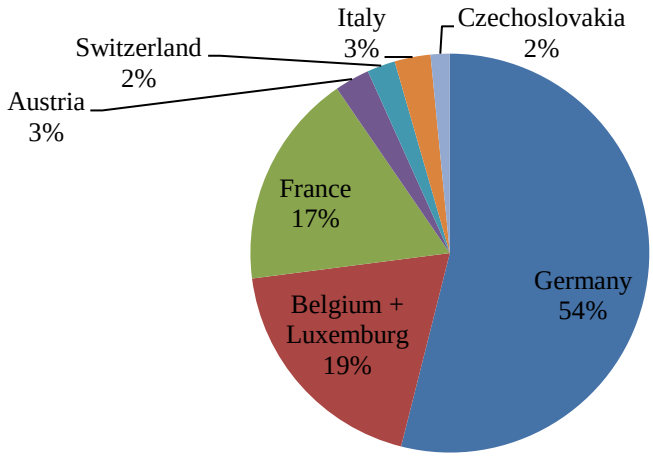
Figure 4.1 *Cross-border freight transport of Nederlandse Spoorwegen per million tons* (1955-1960).



Source: NV Nederlandse Spoorwegen, *Jaarverslag 1955* (Utrecht 1956), NV Nederlandse Spoorwegen, *Jaarverslag 1956* (Utrecht 1957), NV Nederlandse Spoorwegen, *Jaarverslag 1957* (Utrecht 1958), NV Nederlandse Spoorwegen, *Jaarverslag 1958* (Utrecht 1959), NV Nederlandse Spoorwegen, *Jaarverslag 1959* (Utrecht 1960), NV Nederlandse Spoorwegen, *Jaarverslag 1960* (Utrecht 1961).

Containerization, which shifted transport from raw materials worldwide towards unfinished goods, changed this pattern. Nevertheless, before assessing this change, it must be noted that this cross-border freight is not directly comparable with containers. Indeed, containers are the heirs of general cargo, which has never been NS's or the Port of Rotterdam's strongest sector. The Dutch railways and the Dutch port were traditionally strong in bulk transport, which was typically transported from and to Germany. General cargo, meanwhile, went to Antwerp, and was transported by Belgian railways to Germany. Bulk remained dominant in the Dutch railway sector, even after the transport of maritime containers by rail began in 1966.

Figure 4.2 *Share of different countries in the cross-border freight transport of Nederlandse Spoorwegen in percentage terms in 1960.*



Source: NV Nederlandse Spoorwegen, *Jaarverslag 1960* (Utrecht 1961).

Combined transport, maritime containers and continental containers

Before starting to discuss the history of container transport between Rotterdam and its hinterland, it is necessary to describe the different types of this form of transport and define what is meant here by combined and multimodal transport. In principle, all rail container transport was combined transport, as very few companies had a rail terminal in their backyard, and the same was true for their customers. Rail freight transport thus hardly ever went from door to door, and almost always involved an additional mode of transport, mainly road haulage. Nevertheless, at the start of containerization, only the transport of continental containers, entire trucks or parts of trucks by the combination of rail and truck transport was called combined transport. However, since the 2000s, the meaning of the term was extended to cover all rail container transport, including the transport of maritime containers.

As a consequence, combined transport could refer to the transport of maritime containers, an entire truck (*Ro-ro, Rollende Landstrasse*), or part of a truck (*Cangaroo, Huckepack, Piggy-back, swap body*). Ro-ro simply means roll on – roll off, and describes the transport of an entire vehicle, which is rode on and off a rail wagon using a small ramp. *Ro-ro* included *Rollende Landstrasse*, which meant the transport of entire adjusted truck combinations on adjusted wagons. In the transport of entire vehicles, a distinction was made between accompanied and unaccompanied transport, depending on whether the driver was travelling on the same train as the vehicle or not. Part of the combination was transported in the case of *Cangaroo*, *Huckepack* or *Piggy-back* transport, which meant the transport of a semi-trailer on an adjusted pocket rail wagon. Another form of combined transport involved moving the transport unit of the truck, which was called a swap body or continental

container[1] (Figure 4.3). Herein, all of these forms of transport are described as continental container transport, as opposed to maritime container transport.

Figure 4.3 *Different types of continental container transport.*

Rollende Landstrasse

This system reduces the height of both the truck, by fitting extremely small wheels, and the wagon, by having a low loading area. For this form of transport, a row of trucks needs to drive on to the train via a ramp to adjust the height and be attached to the wagon.

Cangaroo Wagon

In this case, a semi-trailer is transported on a pocket wagon, where there is room for the running gear of the truck between the rail axles, low above the rails. In order to use this transport technique, the semi-trailers need to be lifted on to the train by a crane.

Swap body

This is a standardized detachable transport unit of a truck, which mostly has its own support of foldable feet, which makes it possible for a truck to ride under it with its chassis while it is standing. The measurements of this transport unit do not cause difficulties with tunnels, as a swap body is only 2.7 to 3.2m high.

Source: Christoph Seidelmann, *40 years of Road-Rail Combined Transport in Europe* (Frankfurt am Main 2010)

[1] Christoph Seidelmann, *40 years of Road-Rail Combined Transport in Europe* (Frankfurt am Main 2010) 19-28.

These different forms of land container transport are discussed here at length for a number of reasons. Continental container transport was a predecessor of maritime container transport in Europe, which meant that the latter could use the expertise developed by intermodal transport as well as the routes used for the transport of continental containers. Furthermore, this type of transport cannot be ignored, as it is often included in the statistics used herein. Moreover, continental container flows were a strong indicator of economic bonds, as the transported goods did not, in the main, leave Europe, as they were both produced and consumed on the continent.

The history of these forms of continental transport started in the 1960s, when a number of European railways sought a new market that would include short distance truck and long distance rail transport. This service had already been used in the United States for customers with no connection to railway lines. However, the introduction of this system to Europe had to overcome some technical obstacles. Most European semi-trailers were 4m high, while the loading area of a normal flat wagon was just 1m in height. This adds up to a total height of 5.1m, which exceeded the height of most European railway tunnels. As a result, several techniques were used to reduce this combined height.

Herein, all of these forms of transport are described as continental container transport to distinguish them from maritime containers. Continental containers were in use in Europe, including the United Kingdom and Scandinavia, and so were often transported over water, but only within Europe, as they did not fit into ocean-going container ships. Furthermore, unlike maritime containers, these containers could not be stacked. Maritime containers transported in Europe during the continental part of their journey are still designated as maritime containers; the term combined transport is not used because of its ambiguity, with the phrase multimodal transport being utilized instead. During the entire research period, multimodal transport was favored in regional, national and bilateral transport policies, and numerous plans were made to encourage it in The Hague, Bonn/Berlin and Brussels. Nevertheless, the fact that transport by truck was generally cheaper without the involvement of rail transport meant that the development of multimodal transport had to overcome several obstacles.

The introduction of maritime containers at Nederlandse Spoorwegen

NS reacted enthusiastically to the arrival of maritime containers, and saw in the new market a replacement for its disappearing cargo, namely coal. Nevertheless, in the beginning, there were major problems with the rail transport of containers: there were not enough special container wagons, meaning that normal wagons had to be adjusted. These wagons had different charging profiles, sizes and constructions. An additional problem was that, in order to transport containers safely, they needed to be placed symmetrically, exactly in the middle of the flat wagon, and this had to be measured separately in each case. The containers also had to be stabilized by nailing small wooden pieces on to the wagon, which was a major disadvantage compared to road haulage, where the containers could be attached to the trailer in a matter of minutes.

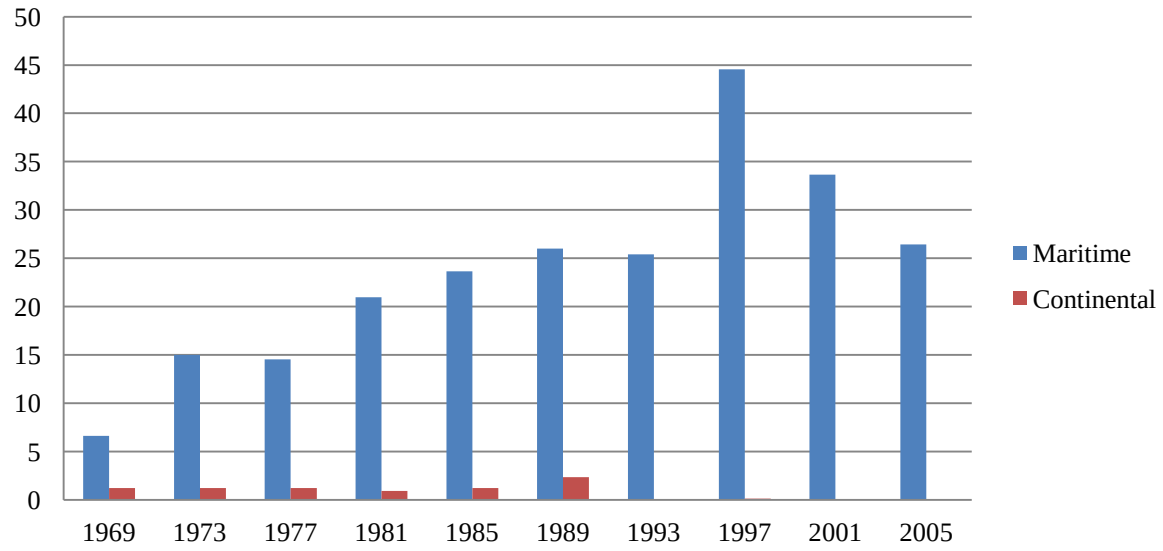
The transport of containers by rail was made more expensive by the fact that the journey almost always included a truck ride for the last mile, and even customers with their own rail connection had problems when moving the containers because of a lack of adequate cranes.[2] These issues completely eliminated the advantages resulting from the standardization of containers. NS tried to tackle these problems by establishing a working group for the development of semi-permanent constructions with which to adjust the containers to the wagons. Moreover, the company was concerned that these issues would jeopardize its chances in container transport, and therefore wanted to purchase wagons that were specifically developed for this purpose, with the hope being that they could be bought collectively by the different European rail companies through Intercontainer.[3]

Nevertheless, a few problems remained. NS carried out container transport through two different subsidiaries, Trailstar for continental containers and Holland Rail Container for the maritime versions. The transport of the two container types with different measurements was strictly separate, which was disadvantageous for the development of economies of scale. After the Brussels Convention of 1990, transporting the two types of container by the two companies became possible, but now containers and rail wagons came in different sizes and had different owners, creating problems at rail terminals. When a fully loaded container train entered a terminal, it could be unloaded by a crane, but not reloaded. It thus had to be removed and a new train shunted into position with wagons of the right size, owned by right company, and in the right sequence for the transport of the individual containers that were to be loaded on to them. This caused major losses and delays. Accordingly, the standardization caused by containerization should not be overestimated. Indeed, even though the sizes of the maritime and continental containers were standardized, this was not enough, and it took some time until the entire transport chain was adjusted to the needs of the former.[4]

In spite of all of these problems, NS saw containerization as an opportunity. At first, these expectations seemed to be justified given the exponential growth of the transported containers (Figure 4.4). Indeed, this growth continued to be spectacular, albeit with two minor interruptions in the mid-1970s and at the start of the 1990s. However, after sudden growth in the late 1990s, decline set in the 2000s as a result of the competition posed by the other two modalities.

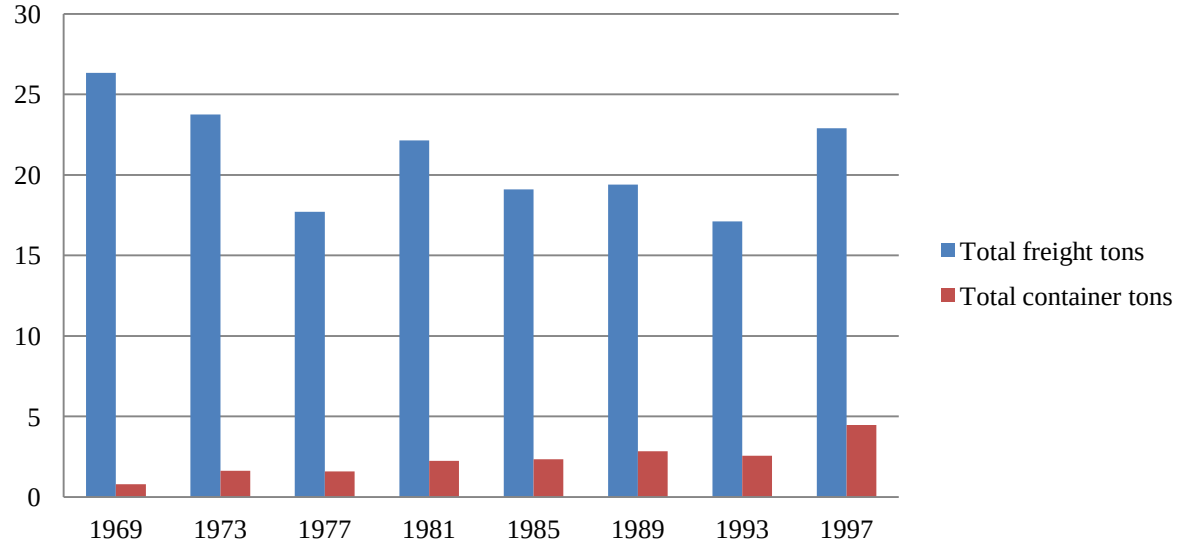
[2] Nationaal Archief, 2.21.245 Collectie 463 PH Bosboom 19, NS Dienst van exploitatie over containervervoer 4 pril 1968.
[3] Nationaal Archief, 2.21.245 Collectie 463 PH Bosboom 19, Commissie goederenvervoer vergadering 8 April 1968.
[4] Interview with Harry Welters, former sales director of NS Cargo, former director SVZ, 14-12-2011.

Figure 4.4 *Number of transported containers by rail per millions of containers (1969-2005).*



Source: N.V. Nederlandse Spoorwegen, *Jaarverslagen (1969-1997)*, Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Figure 4.5 *Weight of container transport compared to the total transport volume of Nederlandse Spoorwegen per million tons (1969-1977).*

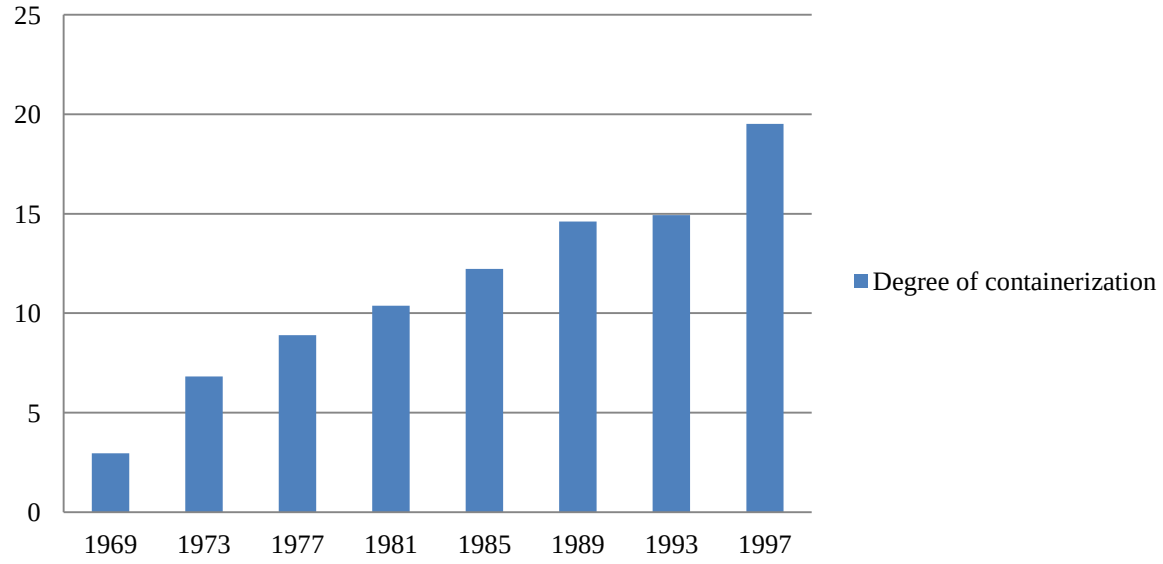


Source: N.V. Nederlandse Spoorwegen, *Jaarverslagen (1969-1997).*

Despite the great enthusiasm about containers, they amounted to less than 5 percent of the total transported weight by NS Spoorwegen in 1997 (Figure 4.5). There are no data for the years 2001 and 2005, as the last year for which the total transported container weight is available is 1997, and the CBS statistics from which the data for Figure 4.4 is derived excludes the total container weight. This

low share is partly due to the fact that containers weigh less, if compared to their volumes, than, for example, iron ore, which is often transported by rail. At the same time, the total freight transported by NS was falling. However, because of the combination of growing container volumes and falling total transport, the degree of containerization of the cargo transported by NS was rising. In 1997, the share of the weight of containers in terms of the total weight of NS's freight transport did not reach 20 percent (Figure 4.6).

Figure 4.6 *Degree of containerization of the total transport undertaken by Nederlandse Spoorwegen in percentage terms of the total transported weight (1969-1997).*



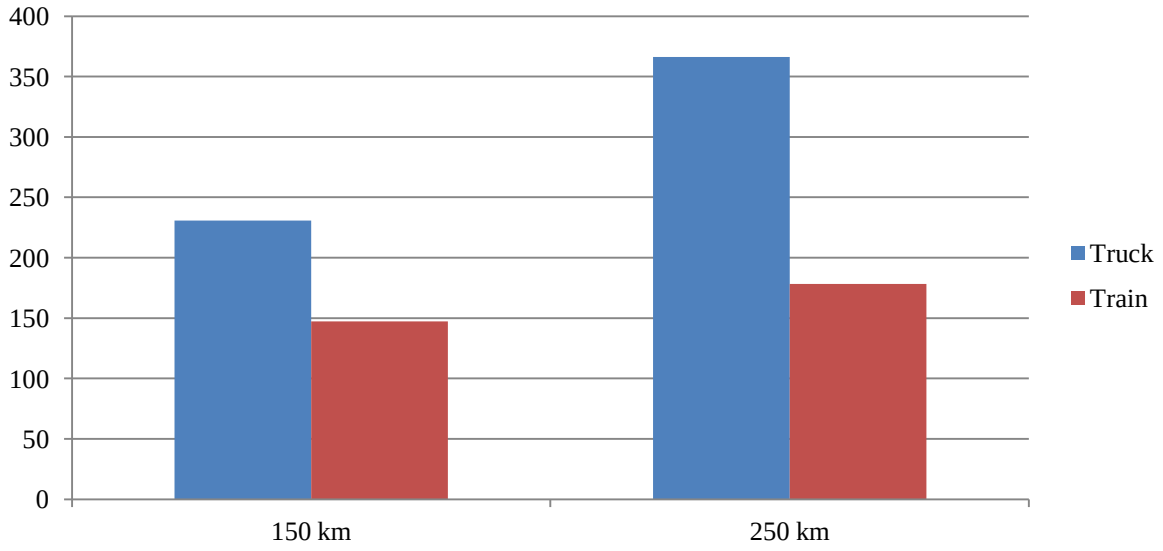
Source: N.V. Nederlandse Spoorwegen, *Jaarverslagen (1969-1997)* (Utrecht).

Accordingly, NS entered the container market by making investments, creating subsidiaries and trying to resolve the initial physical problems caused by container transport. The hope that this form of transport would provide a solution to the company's problems was partially justified, as the container market was indeed growing. Nevertheless, this market was difficult to conquer for NS due to the high costs of rail transport; below distances of 150km, road haulage was cheaper than rail. Rail transport, nevertheless, had a stronger market position over longer distances.[5] In 1973, its cost advantages started at distances over 150km, growing spectacularly over 250km[6] (Figure 4.7). There are no similar data for other years, but from diverse sources it is nonetheless clear that the differences between the freight rates and railways did not change substantially. However, in the Netherlands,

[5] Utrechts Archief, Nederlandse Spoorwegen, 68 NS-DGV werkgroep goederenvervoer per spoor 19.
[6] Utrechts Archief, Nederlandse Spoorwegen, 127 Gecombineerd Weg/ Rail Vervoer G.W.R.V., mei 1974, 10.

which is 200km wide and 300km long, such distances were rare; most cross-border transport needed to be transferred to Deutsche Bahn at the national border, and tariffs were set by the companies jointly. This meant that Deutsche Bahn received a major share of the yields when cargo was transported over a long distance.

Figure 4.7 *Average transport costs for containers by truck and train over distances of 150 and 250km (35 wagons) in guilders in 1973.*



Source: NS archive Utrecht, 127 Gecombineerd Weg/ Rail Vervoer G.W.R.V., mei 1974.

The growth of container transport networks before the liberalization of rail freight transport (1964-1993)

In the early stages of containerization, many containers were transported among other cargo in a system of spread transport, which meant that containers with different destinations were shunted together into a train. These individual transported volumes are impossible to trace, because of the lack of records. Spread transport required, relatively, a great deal of shunting, which was expensive and time-consuming. A more efficient transport method was closed transport using block trains, which consisted of wagons going to the same destination, preferably over longer distances. From the very start, it was clear that container transport could only be made profitable when, instead of spread transport, it was moved by way of closed transport, in particular shuttles, which are block trains that operate regularly between two locations.

Herein, shuttle connections are analyzed to both determine the hinterland of the Port of Rotterdam in terms of rail container transport and draw conclusions about the economic bonds

between Rotterdam and its hinterland. There is a good reason for this choice. The transport data of all of the containers specified from terminal to terminal are unavailable, but data about shuttle networks are a valuable indicator of economic bonds. In order to establish a shuttle network, steady transport flows were necessary in both directions. Moreover, as a consequence of the small profit margins available in container transport, a shuttle was only profitable when at least 80-90 percent of the wagons were loaded. When a shuttle did not reach the desired loading percentage, the connection was terminated. This is one of the reasons for the volatility of the data. The loss of a customer to barge or road haulage at either end of the shuttle connection could also result in the elimination of the shuttle.

The first step in building a regular train connection network had been taken in 1964 when NS's subsidiary for combined transport, Trailstar, was established. Trailstar carried out Kangaroo transport from the charging station of Rotterdam Noord to Paris.[7] Soon, combined transport connections emerged to Basel, Chiasso and Milan.[8] Accordingly, when maritime containers arrived in Rotterdam, NS already had experience with intermodal transport, as opposed to barge transport, which was only used with pallets as the largest utilization unit. In 1967-1968, regular connections for maritime containers were established. These were not, however, known as shuttles at that time.

Container transport was performed along two axes: the Transcontainer Express Zeehavens connected the ARA ports of Antwerp, Zeebrugge, Rotterdam and Amsterdam, and there was also a connection with major rail terminals in Germany (Frankfurt am Main, Mannheim, Ludwigshafen, and Duisburg); along the second axis, regular connections also ran to Milan. The Transcontainer Express helped to redistribute the containers destined for one of the other ports, while the German connection targeted locations in the traditional hinterland of Rotterdam, and the North Italian link exploited contacts established by combined transport before the advent of maritime containers.

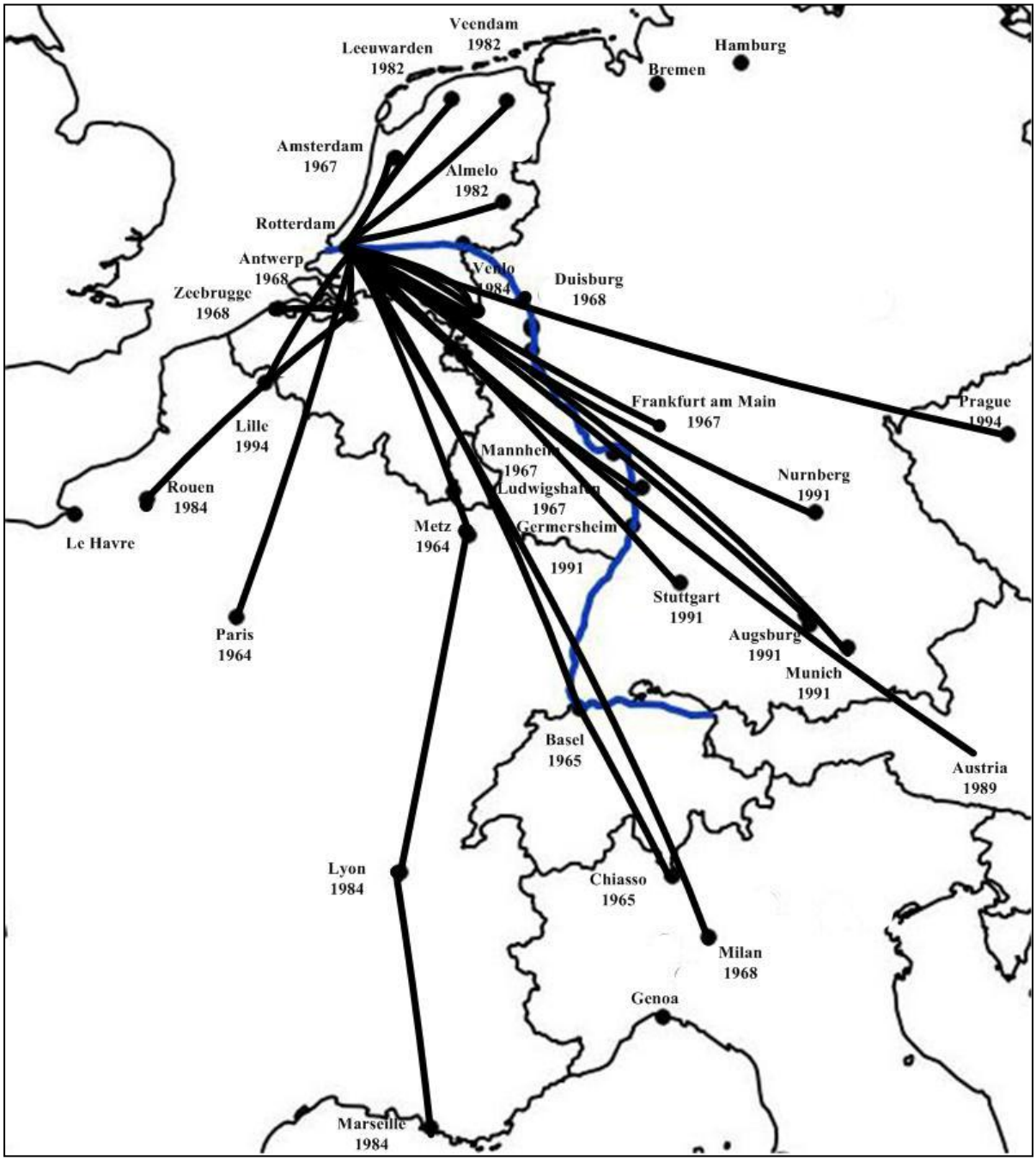
The next step was taken in 1973, when a multimodal transport connection was established for Huckepack transport to Germany (the transport of a truck's loading units by a combination of rail and road transport), with transfer possibilities to Austria and Switzerland. In 1982, Holland Rail Container started a domestic network of container transport between Rotterdam and Leeuwarden, and Venlo and Heerlen. NS tried to acquire its own terminal in Duisburg in 1984, but because of the lack of cooperation by Deutsche Bahn, instead established one on the Dutch side of the border in Venlo in the same year.

The Interdelta Shuttle was also introduced in 1984, and extended the range of container transport through Antwerp towards Rouen, Marseille and Lyon. At the same time, the connections to Italy grew remarkably. In 1989, a new concept, EurailCargo, was introduced. These were trains with fast direct connections within Europe. The first was the Delta Danube shuttle, which connected 25 charging stations with 50 destinations in Austria. This shuttle was followed in 1991 by the Delta

[7] N.V. Nederlandse Spoorwegen, *Jaarverslag 1968* (Utrecht 1970).
[8] N.V. Nederlandse Spoorwegen, *Jaarverslag 1963* (Utrecht 1964), N.V. Nederlandse Spoorwegen, *Jaarverslag 1964* (Utrecht 1965).

Bayern Express, which connected the Dutch port and industrial areas with Mannheim, Stuttgart, Nurnberg, Augsburg and Munich, and from there with 50 other destinations in Southern Germany. This connection had two parts, one of which started from a charging station close to Rotterdam, Kijfhoek, and carried maritime containers, while the other started from Amersfoort and was loaded with continental containers. In 1991, the Germersheim shuttle was introduced, which rode twice a day with a capacity of 40 TEU. This connection was operated jointly by Netrail, NS Goederenvervoer, Intercontainer and Container Terminal Germersheim. Then, in 1994, the first destination from the other side of the Iron Curtain was set up in Prague (Figure 4.8).

Figure 4.8 *Map of rail container transport connections between 1965 and 1994, including the year of their establishment.*



Source: N.V. Nederlandse Spoorwegen, *Jaarverslagen (1964-1994)* (Utrecht).

After liberalization: the shuttle era

From 1994 onwards, a decreasing number of containers were transported in spread transport, instead almost exclusively travelling in shuttles. In the same year, the Rail Service Centre at the Port of Rotterdam opened its doors, and was where containers for rail transport were collected from all parts of the port for transshipment to rail shuttles. The share of the transported volumes by shuttles between

Rotterdam and different hinterland countries highlights that Austria, Switzerland, Poland, the Czech Republic, Hungary, Russia, Slovakia, Luxemburg and Denmark, which never reached a 20 percent share, did not belong to the hinterland as defined in this thesis (Table 4.1). Consequently, with the exception of Czechoslovakia, which had a special transport relationship with the Netherlands, these countries are not included in the analysis. What remains are the major hinterland nations, identified here as the Netherlands, Italy, Belgium, France and Germany.

Table 4.1 *Share of rail container shuttles between Rotterdam and European countries in percentage terms (1994-2010).*

	1994	1997	2000	2004*	2007	2010
The Netherlands	37	29	21	19	17	25
Germany	7	6	15	16	32	33
Italy	10	36	20	15	15	25
Belgium	7	0	24	23	4	1
France	11	0	0	0	4	0
Austria	0	16	3	0	11	5
Switzerland	0	6	7	0	4	5
Poland	0	3	3	5	3	3
Czech Republic	0	2	3	9	8	2
Other	0	2	3	12	3	0
Legenda	>12 %	>20 %	<=20% in at least one benchmark year			

* There was no data available from shuttle timetables for 2004, and so for this year calculations were based on the CBS statistics. The data for that year must be seen as a rough indication, as the CBS statistics deal with the total transported volumes, not just shuttles, and not only to and from Rotterdam. As a result, the absolute values may be too high. However, it is expected that by that year, hardly any spread transport took place because of the high costs. Moreover, the CBS data do not contain details of the domestic market. To put the numbers in the right perspective, the average size of the domestic market in the benchmark years before and after 2004 was used.

Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 Juni/ Juli 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information, Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

The share of the container shuttles going to the Dutch domestic market was relatively steady, fluctuating between 20 and 30 percent, save for in 1994, when NS Cargo first set up the domestic shuttle network. The domestic captive hinterland consisted of a network between the major inland terminals of Almelo, Ede, Leeuwarden, Venlo and Veendam. Leeuwarden and Heerlen were Holland Rail Container's first inland terminals, which were all founded in 1982, followed by Almelo in 1985. These terminals transshipped maritime containers, while Veendam was a terminal for continental containers, and was established in 1988 by Trailstar. A continental container terminal received

continental containers for local consumption, filled them with products from Dutch industry, and then transported them either to another domestic destination or to Rotterdam, where they were put on a long distance shuttle. Another option was for the goods to be loaded on to a truck and transported directly to another destination, which was often in Germany, as three of the five inland terminals were strategically situated on the German border. This meant that many of the goods counted as domestic transport still had a final destination in Germany.

The fall in domestic shuttle connections in 1994, 1997 and 2000 did not mean that the domestic market became less important. Indeed, after 1994, new inland terminals were built and those already in existence, which used to belong to NS subsidiaries, were taken over by privately owned enterprises, some of which started their own shuttle services to cross-border destinations. This meant that not all containers were distributed from Rotterdam. As a consequence, containers were moved around less within the country. The shuttle connections involved the already existing Venlo, Groningen Railport, which was the product of a merger of the old Holland Rail Container terminals of Leeuwarden and Veendam, and the new inland terminals of Tilburg, Eindhoven, Coevorden and Stein.

New rail terminals, which combined the advantages of the different modalities, were set up with partners from the road haulage sector, while others were created by adding a rail connection to an already existing barge terminal: Rail Terminal Eindhoven was founded in 2001 and since then has been connected to Rotterdam by a daily shuttle;[9] Terminal Coevorden, which opened in 2002, was the first Dutch inland terminal to be connected to a foreign rail company, Bentheimer Eisenbahn AG;[10] Rail terminal Tilburg came into being in 2005 as a result of a merger of the already existing barge terminal of Tilburg and the road transport company Gebr. Versteijnen Transport;[11] Container Terminal Stein was originally a bulk barge terminal, just like Tilburg, and merged in 2004 with the road hauler Meulenberg Transport, which was engaged in the haulage of maritime containers and warehousing;[12] and Groningen Railport came into being as a result of the combination of the old Holland Rail Container terminal Leuwarden and Veendam. Groningen Railport was connected to Rotterdam by a daily shuttle, and also offered weekly services to Bremen and Hamburg.[13] Two terminals, the old Holland Rail Container terminal of Almelo and the old Trailstar terminal in Ede, have disappeared from the shuttle timetable. Almelo had a daily container shuttle to Rotterdam between 1985 and 1997, but this connection was too expensive to run and was closed down after NS

[9] http://www.vanrooijen.nl/rail-terminal-nl, seen on 21-02-2012.
[10] http://www.europark-terminal.de/leistungen/bahn/, seen on 21-02-2012.
[11] http://www.railcargo.nl/actueel/nieuws/nieuws_item/t/rail_terminal_tilburg seen on 21-02-2012.
[12] http://www.logistiek.nl/dossierartikelen/did976-Container_Terminal_Stein_groeit_hard.html, seen on 21-02-2012.
[13] http://www.groningen-railport.com/containershuttle.php, seen on 21-02-2012.

Cargo was separated from NS.[14] Meanwhile, the terminal in Ede was closed down because its location close to the centre of the town meant that it had no future.

Table 4.2 *Share of rail shuttle volumes between Rotterdam and the Dutch domestic container terminals in percentage terms, 1994-2010.*

	1994	1997	2000	2010
Almelo	17	0	0	0
Heerlen	17	0	0	0
Leeuwarden	17	20	0	9
Veendam	33	40	0	15
Venlo	17	40	100	40
Tilburg	0	0	0	11
Coevorden	0	0	0	9
Eindhoven	0	0	0	9
Stein	0	0	0	7

Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/July 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

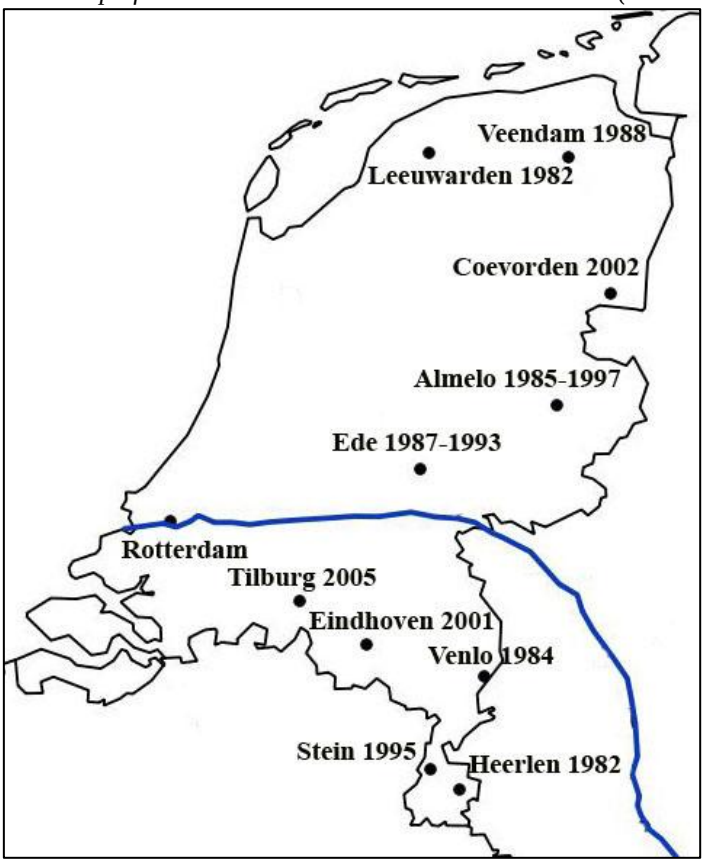
Looking at the distribution and importance of the Dutch domestic container terminals, it is clear that they were not evenly distributed throughout the country, but were instead mainly situated close to the border. This was for a number of reasons. Due to the small size of the country, the terminals were set up as far away as possible from Rotterdam in order to optimize transport costs. They were also situated close to the industries upon which they depended. Save for the Holland Rail Container terminals, they all had a major shipper to rely on. In turn, the relevant industries were probably located close enough to the border to enable exports to be easily conveyed to neighboring countries. This could be advantageous when rail transport was carried out in the same country, in this way circumventing the need for complicated deals with other railways and the requirement to arrange the last mile by truck. Moreover, cross-border truck transport in the border region within a radius of a maximum of 25km was exempt from German regulations, which meant that containers could be transported to Germany from the terminals close to the border without a license. In these ways, entire logistics centers could be set up close to the national border.

Table 4.2 shows the importance of different domestic terminals for container shuttles. In 1994, NS Cargo tried to achieve equal distribution between the Holland Rail Container terminals,

[14] http://www.ctt-twente.nl/gecombineerd-vervoer/?PHPSESSID=92f633743293a4d47c792d6bfb635373, seen on 22-02-2012.

which obviously did not last. In the transport of continental containers, the Veendam terminal was successful, but Venlo distinguished itself in dealing with maritime containers, processing by far the largest number thereof. Most of the containers handled there reached their final destination in Germany by truck. Figure 4.9 provides an overview of the rail terminals in the Netherlands.

Figure 4.9 *Map of the inland rail terminals in the Netherlands (1982-2010).*



Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/July 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

The next hinterland area to be discussed is Italy. The country's share started in 1994 at around 15 percent, later fluctuating between 20 and 30 percent, representing another major hinterland nation with respect to rail container transport. Almost all shuttles in Italy went to or came from the north of the country; only European Rail Terminus offered a service to the middle of Italy in 1977. The first six terminals mentioned in Table 4.3 were all located within a range of 150km. Most containers travelled to three different terminals in Milan: Smistamento, Busto-Arsizio and Melzo, some of which

were originally built to handle continental containers. Then, from these destinations, some of the volumes were forwarded by road haulage. Figure 4.10 provides an overview of the rail terminals in Italy.

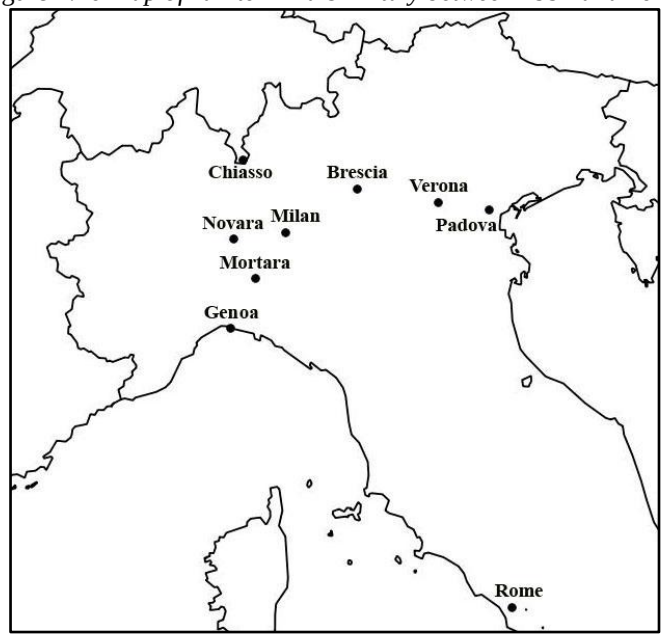
Table 4.3 *Share of rail shuttle volumes between Rotterdam and the Italian container terminals in percentage terms in 1994, 1997, 2000 and 2010.*

	1994	1997	2000	2010
Milan	100	19	34	35
Novara	0	39	44	44
Padova	0	6	2	5
Verona	0	16	0	9
Brescia	0	0	20	0
Mortara	0	0	0	7
Rome	0	19	0	0

Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/ July 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information , Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

At first glance, Northern Italy is an unlikely part of the hinterland, because of its approximate 1000km distance from Rotterdam and the barrier formed by the Alps between the two Dutch ports and the north of the Italian peninsula. Indeed, it seems more logical to supply Milan from the Port of Genoa, which is approximately 150km away and is situated on the same side of the Alps. Nevertheless, some of the maritime containers were transported to and from the north of Italy from the North Sea ports. There are a number of reasons why major volumes were sent between Italy and Rotterdam. First, with respect to maritime container flows, major volumes with an Italian destination arrived in Rotterdam because of the main port effect and the better services on offer at the Dutch North Sea port. Furthermore, there were also large continental container transport flows between Northwest Europe and Italy containing industrial products and foodstuffs, while, because of the restrictive regulations imposed on trucks crossing the Alps, this cargo could be transported by rail more efficiently. The Northern Italian hinterland was certainly competitive; Rotterdam had to share this part of the market with the port at Antwerp, the German ports and even Le Havre.

Figure 4.10 *Map of rail terminals in Italy between 1994 and 2010.*



Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/July 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information, Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

In terms of the Belgian hinterland, the share of container flows travelling between Belgium and Rotterdam started at around 10 percent and, after growing to approximately 30 percent in 2000, was reduced to less than 5 percent in 2004 (Table 4.4). The reason for the growth between 1994 and 2004 was due to the fact that rail was able to increasingly profit from the growing container flows between Rotterdam and Antwerp as a result of the main port effect. Due to the proximity of Antwerp's port (100km; the competitive advantage of rail transport started to show at distances greater than 150km), the only good reason for using this modality was the availability of major flows of goods. On the other hand, Antwerp was known to have lower fees for port costs and stevedoring and offered added-value operations. Many sea shipping companies found those advantages to be satisfactory compensation for the longer journey and so used the Belgian port. Numerous containers travelled between Rotterdam and Antwerp. This was either because they were transshipped in Rotterdam, but were to be stripped and filled in Antwerp, or because they were transshipped more cheaply in Antwerp, but had Rotterdam as their destination.

Table 4.4 *Share of rail shuttle volumes between Rotterdam and the Belgian container terminals in percentage terms in 1994, 2000 and 2010.*

	1994	2000	2010
Antwerp	67	79	100
Muizen	33	2	0
Athus	0	7	0
Mouscron	0	13	0

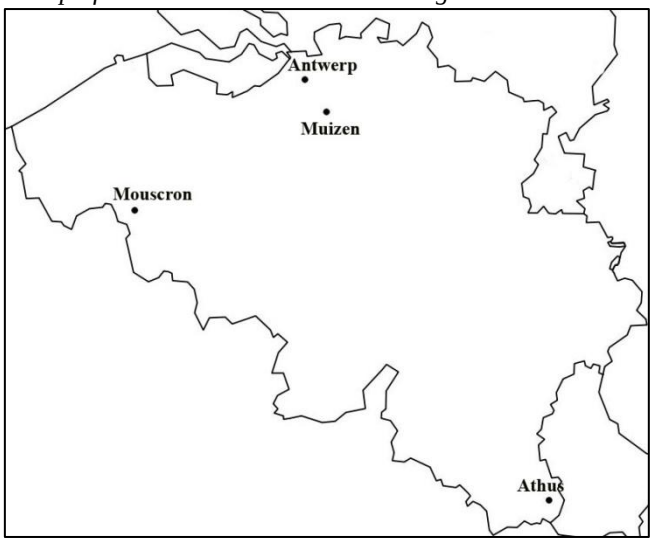
Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/July 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information , Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

The choice of port made by the sea shipping companies was not always determined by economic considerations; it could also be based on personal preferences or the business relationships of those involved. In the 1990s, for example, the US-based sea shipping company Sea-Land had a strong preference for Rotterdam. As a result, three trains per week had to transport its containers with a Belgian destination to Antwerp. The Italian MSC, on the other hand, preferred to do business with Antwerp, as it was in conflict with the Port of Rotterdam. These flows were produced by the redistribution of containers, which were transshipped in Antwerp, but had a destination of Rotterdam, or vice versa. The reduction in the number of shuttles after 2004 was due to the fact that this flow was increasingly being taken over by barge transport.[15]

The majority of the volumes moving between the Port of Rotterdam and Belgium were transported to and from Antwerp, followed by Muizen, Athus and Mouscron. Given that two of the three terminals were close to a border, it is probable that part of the volumes were transit goods to France, Germany and Luxembourg. Nevertheless, it is clear that the major hinterland area in Belgium was the Port of Antwerp, and that the container flows were composed of the redistribution of – often empty – containers. Figure 4.11 provides an illustration of the geographical position of the inland rail terminals in Belgium.

[15] Interview with Harry Welters, former sales director of NS Cargo, former director SVZ, 14-12-2011.

Figure 4.11 *Map of the inland rail terminals in Belgium between 1994 and 2010*.



Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/July 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information, Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

The share of shuttles going between Rotterdam and France started at 11 percent in 1994, but France later became much less important. The French hinterland, represented by the Metz junction, was promising in the early days. However, organizing container transport to France was a tiresome process and major obstacles had to be faced. This was less to do with port competition with Le Havre than with the lack of interest and willingness of the French Railways to cooperate with NS.

Ever since the building of rail tracks began in the 19th century, there has been a division in terms of rail transport between the French and German areas of influence, with the Netherlands belonging to the latter.[16] In 1994, there was great enthusiasm about container transport between Rotterdam and France, probably because of the success of *Kangaroo* transport before the advent of maritime containers. However, after a few debacles, the Metz shuttle, which was established in 1994, stopped running in 1998 as it was loss-making.[17] After the liberalization of the European rail sector, there was a gentlemen's agreement between the German and French areas of influence, with Deutsche Bahn Schenker buying up all possible freight companies, while the French railway firm concentrated

[16] Interview with Cor Hoenders, director of the Rail Service Centre, Rotterdam, 02-11-2011, 07-02-2012.07-02-2012.

[17] Eric Trappen, 'Intermodaal vervoer alleen nog maar met shuttle treinen', *Rail Cargo Magazine*, (1994) June/July 6-10.

on passenger transport in its acquisition strategy.[18] Nevertheless, there were some initiatives in place with a view to starting shuttle services to France. The already-mentioned Metz connection, however, could not be operated efficiently as it was difficult to get the French railways to cooperate in terms of forwarding the containers. Finally, this shuttle was terminated in 1998. In 2006-2007, a new shuttle service was started from Pernis to Lyon, with a connection to Rouen. This had a low loading percentage and did not travel regularly, thus being another example of a failed rail shuttle connection to France.[19] This does not of course mean that no containers from Rotterdam ever reached France; it is probable that some were forwarded from the Belgian Mouscron and Athus terminals to the minor French hinterland, as these were situated close to the French border.

A few words need to be said about Czechoslovakia, which was the only Central and Eastern European country to already be part of the hinterland of Dutch rail transport before the introduction of maritime containers. Furthermore, it is an important case that demonstrates how a new shuttle was established. As has been mentioned before, the first shuttle to Prague was put into operation in 1994. After the fall of the Iron Curtain in 1989, ports and rail companies became increasingly interested in the Central and Eastern European market. The German ports had an advantage here, as they were closer to this part of Europe. NS, however, was determined to conquer this market. Nevertheless, due to the major competition and the problem of the availability of cargo, especially for the journey back, it was difficult to establish shuttle routes to Central and Eastern European countries. This was certainly the case with shuttles to Prague and Sopron and Gyor, the latter two of which are in Hungary.

The later connections to Poland were less problematic. It was expected that it would take two and a half years for the Bohemia Express to Prague route to break even, which was not unusual as new shuttles often needed time to turn a profit. This shuttle, with a capacity of 60 TEU, had a loading percentage of 55-60 in 1994.[20] Indeed, in this period, the shuttle did not operate regularly, and its existence was not secure. In 2004, ERS finally succeeded in securing the shuttle to Prague by combining maritime and continental volumes, which meant that it could operate six times a week.[21]

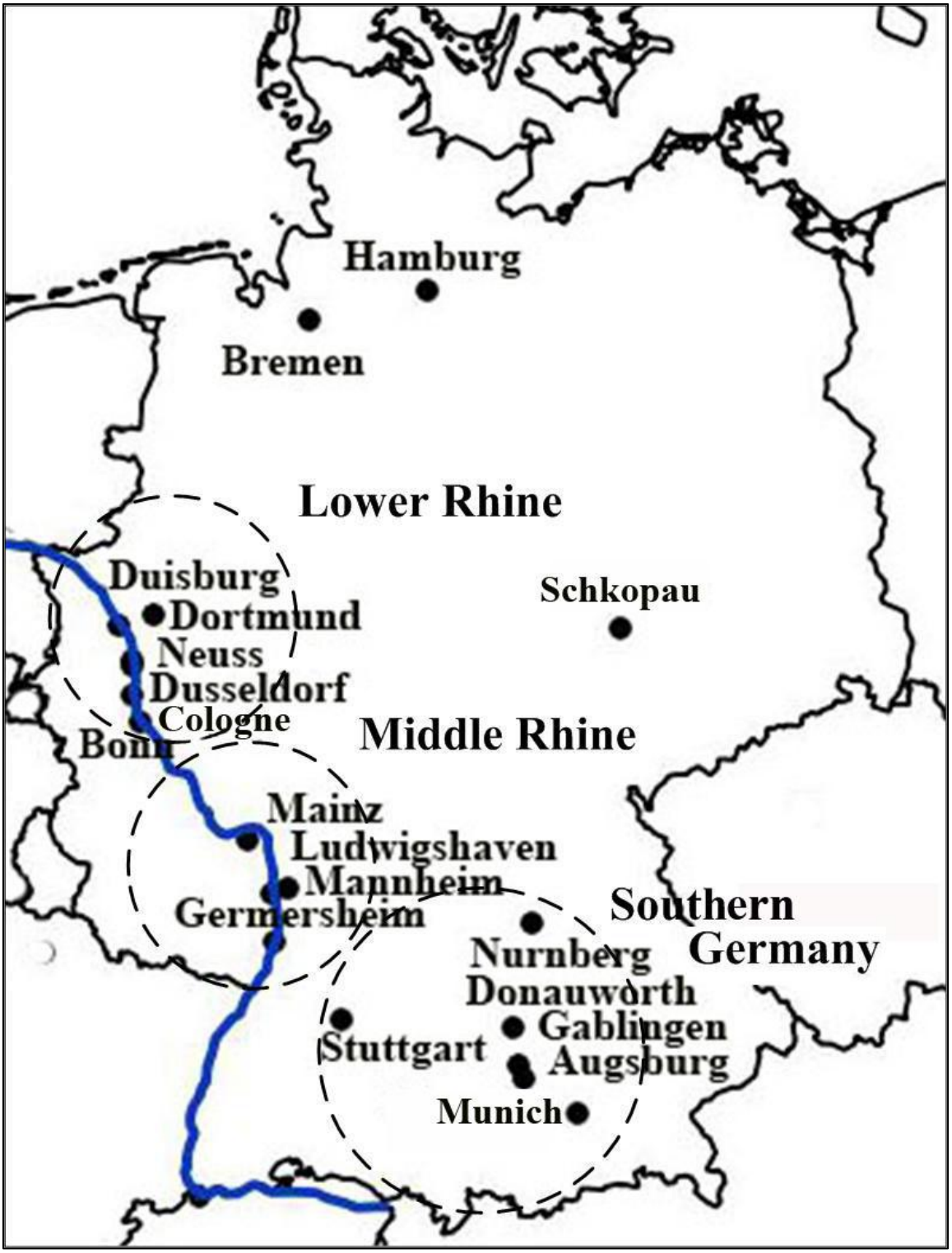
The shuttles running between Rotterdam and Germany were the most volatile (Table 4.5). In 1994 and 1997, the share of Rotterdam shuttle connections going to Germany remained below 10 percent, but this figure doubled twice in 2000 and 2007. The breakthrough in 2000 was due to the fact that the newcomer, ERS Railways, split the market wide open.

[18] Interview with Cor Hoenders, director of the Rail Service Centre, Rotterdam, 02-11-2011, 07-02-2012.07-02-2012.
[19] L. Cuijpers and R. Meijer, 'Cargo per Spoor', (2008) 103.
[20] Karin Kosmeijer, 'CTN meer shuttles naar Oost Europa', *Rail Cargo Magazine*, 18-21.
[21] ERS maakt het traditionele spoorwegen moeilijk, *Nieuwsblad Transport*, 16 Maart 2004. http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/88846/ArticleName/ERSmaakthettraditionelespoorwegenmoeilijk/Default.aspx, Seen on 19-09-2013.

The distribution of destinations in Germany requires special attention because of the scope of this work. Three clusters can be identified. The first is in North Rhine Westphalia in the Lower Rhine region, with the exception of Bonn, which is situated in the lower part of the Middle Rhine. The second cluster is near Frankfurt am Main and Mainz in the Middle Rhine and the third is in Southern Germany with an outlier in Schkopau, near to Leipzig.[22] A peculiarity of the pattern of the rail terminals is that 10 of the 17 are situated on the Rhine, which shows how much Rotterdam's hinterland transport depends on it. Cheap transport from and to Rotterdam was created by the competition between parallel barge and rail transport flows as long ago as the 19th century. This connection between rail and barge transport makes a comparison between the container flows transported by the two modalities possible (Figure 4.12).

[22] This intriguing outlier has an interesting history. *Schkopau Works* was located in Schkopau (former East Germany). The history of this company starts in 1937 when Buna Werke GmdH was founded to produce synthetic rubber. In 1997, the company was taken over by the American Dow Chemicals. After the takeover, two of the three directors were Dutch, which is probably why they had good connections in Rotterdam; Rainer Karlsch and Raymond Stokes, *The Chemistry Must Be Right The privatization of Buna Sow Leuna Olefinverbund GmbH* (Leipzig 2001) 18.145.

Figure 4.12 *The geographical pattern of rail destinations in Germany (1994-2010)*



Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/ July 1ste jaargang nr. 3, Railion, *Intermodal Shuttles* (Utrecht 2000), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information, Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

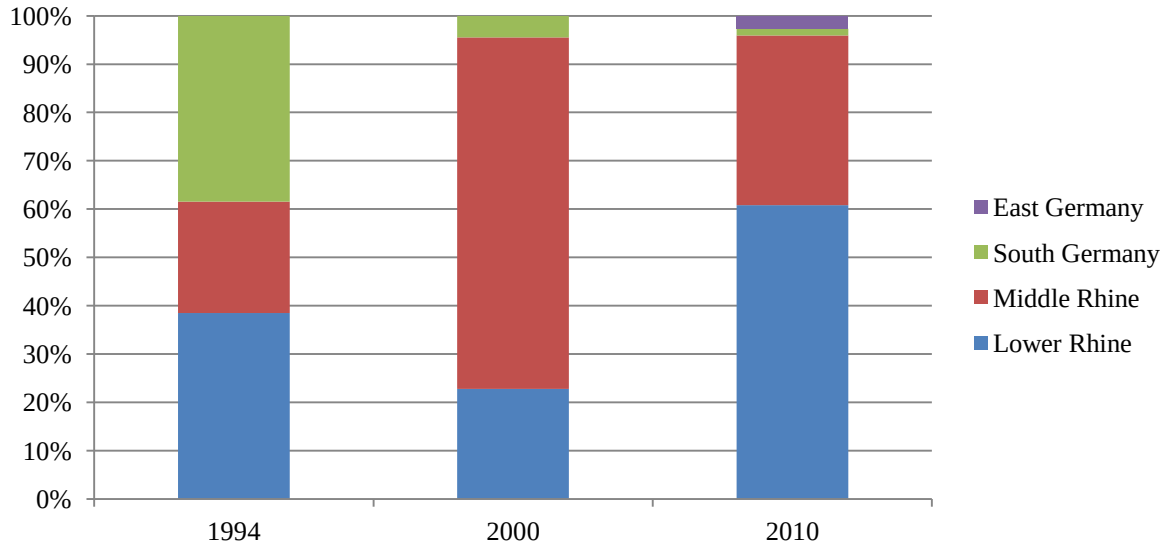
From the aggregated share of Rotterdam rail shuttles going to and coming from German rail terminals identified per hinterland area, it is clear that: the role of the North Rhine Westphalia cluster became more important; the Middle Rhine area was volatile; and the importance of destinations that were further away fell between 1994 and 2010. In general, it can be concluded that the geographical reach of shuttle connections in Germany was falling (Table 4.5 and Figure 4.13).

Table 4.5 *Share of rail shuttles between Rotterdam and German rail terminals in percentage terms in 1994, 2000 and 2010.*

		1994	2000	2010
Lower Rhine	Duisburg	38	0	38
	Neuss	0	23	9
	Dortmund	0	0	7
	Cologne	0	0	7
Middle Rhine	Mainz	0	23	1
	Bonn	0	0	0
	Mannheim	23	23	8
	Germersheim	0	27	5
	Ludwigshafen	0	0	20
Southern Germany	Donauworth	38	0	0
	Nurnberg	0	4	0
	Gablingen	0	0	1
Schkopau	Schkopau	0	0	3

Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/July 1ste jaargang nr. 3, Railion, *Intermodal Shuttles* (Utrecht 2000), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information, Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

Figure 4.13 *Share of Rotterdam shuttle connections between Rotterdam and the identified hinterland areas in Germany in percentage terms in 1994, 2000 and 2010.*



Source: *Overzicht internationale en nationale shuttles* Rail Cargo Magazine 1994 June/July 1ste jaargang nr. 3, Europe Container Terminals N.V., *Jaarverslag 1997* (Rotterdam 1998), Railion, *Intermodal Shuttles* (Utrecht 2000), Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008), Rail Cargo Information, Shuttle Timetable http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

This phenomenon is consistent with the fact that, due to rising port competition, the contested hinterland of the Port of Rotterdam was growing, meaning that a larger share thereof also had cargo flows coming from and going to competing ports, while the captive hinterland was diminishing. The share of destinations closer to Rotterdam grew significantly, while that of those located further away fell in the period between 2000 and 2010 (Table 4.6). Rotterdam became increasingly dependent on its domestic hinterland and the geographically closer areas in North Rhine Westphalia. The geographical reach of the Port of Rotterdam in terms of shuttle container transport fell, while the intensity of the rail shuttle connections within the Lower Rhine region increased. According to the definition used here, this indicated growing economic integration and regionalization within the Lower Rhine region.

Table 4.6 *Geographical reach of deep sea maritime units per 1000 TEU.*

Distance	2000	percent	2010	percent
<250 km	230	63%	310	78%
250-750km	75	20%	45	11%
>750 km	60	16%	40	10%

Source: Company presentation Rail Service Centre Rotterdam, acquired from Cor Hoenders, director of the *Rail Service Centre Rotterdam* on 07-02-2012.

Rail container transport and port competition

The regionalization tendency described above can be explained by growing port competition, and this section analyzes the different factors that played a role in this. In the first part, Deutsche Bahn and the German government's lack of cooperation with cross-border rail transport is described based on four events: Deutsche Bahn's refusal to connect to the German rail system in Duisburg in the 1980s; the struggle to end the tariff discriminations of Deutsche Bahn towards Rotterdam and Antwerp in the late 1980s; the reluctance of Transfracht to cooperate with ERS in establishing a rail shuttle from Rotterdam to Southern Germany in the late 1990s; and the postponement of the construction of the third track for the Betuwe Route in Germany in the 2000s. The final part explains the reduction in the geographical reach of the Port of Rotterdam with respect to rail container transport. In particular, as a result of port competition, rail container transport to regions that are relatively further away, such as Italy, the Central and Eastern European countries and Southern Germany, fell, while that to a comparatively closer area, the Lower Rhine region, rose.

Lack of cooperation by Deutsche Bahn and Germany

A major impediment to cross-border rail transport was the unwillingness of Deutsche Bahn to connect the Dutch railways to the German rail network in Duisburg in the 1980s. The German network had an efficient level of coverage of the country via a system called *Flächendeckung* (area coverage), meaning a dense network that made even minor cities accessible for container transport purposes. In the early 1980s, NS tried to negotiate with Deutsche Bahn with a view to acquiring its own rail container terminal in Duisburg, which was the major German barge port, the largest inland port in Europe, and a place that is central in Rotterdam's hinterland. Such an acquisition would enable NS to connect to the German network, and a combination of an NS shuttle service and the German system would have made an efficient container transport system possible over relatively shorter distances. However, Deutsche Bahn refused to cooperate,[23] and from the terminal in Venlo, which was built instead, goods were transported further by road haulage. For this reason, it was logical to allocate value added operations in this area. As a consequence, the municipality of Venlo welcomed the arrival of a logistics centre in the region, which would create employment. In 1984, NS founded a shuttle service from Rotterdam to Venlo, which operated three times per day.[24] The lack of a good connection to the German *Flächendeckung* was especially disadvantageous for rail transport over relatively short distances.

Ever since the 19th century, a major source of conflict between Dutch and German railroads, as well as governments, was rail tariffs. These tariffs had a preferential effect for German ports and

[23] Interview with Harry Welters, former sales director of *NS Cargo*, former director *SVZ*, 14-12-2011.
[24] T. Konings, 'Terminals over de grens in tel bij Nederlandse spoorexpediteurs', *Nieuwsblad Transport*, (19 July 1997).
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/48270/ArticleName/TerminalsoverdegrensintelbijNederlandsespoorexpediteurs/Default.aspx, Seen on 19-09-2013.

were put in place to secure the position of Hamburg and Bremen.[25] The INGRID rail freight tariff system divided Germany into 144 areas. The tariffs to and from specific areas were calculated according to their strategic importance for the German ports. The Port of Rotterdam considered this to be unfair competition, and often protested against it. In 1984, the Dutch, Belgian and German railways, including Transfracht, the subsidiary of Deutsche Bahn for maritime container transport, and Intercontainer, began negotiations about the extension of INGRID tariffs to Rotterdam and Antwerp. However, at that point, the German government interfered and forced Deutsche Bahn to negotiate first with the ports of Hamburg and Bremen. The Dutch and Belgian parties reacted strongly to this setback and, after considerable pressure was exerted on Deutsche Bahn, the Germans finally made some concessions. The ports of Rotterdam and Antwerp used the argument that Deutsche Bahn had more to gain in the Dutch and Belgian ports than in Hamburg and Bremen, with the claim being made that it would be easier for Deutsche Bahn to triple its interests there rather than increasing its share in Hamburg and Bremen by one percent.

Deutsche Bahn was more receptive to these arguments than the German government, and the result of these negotiations was the 1998 *Hamburger Abkommen* (Treaty of Hamburg), which was a much compromised form of the original plans that aimed to limit unnecessary competition between the rail companies performing container transport from and to ports. Apart from this illiberal starting point, the treaty had some other shortcomings, as it included opportunities to circumvent the rules, which Transfracht did efficiently. The AT 489 tariff was set with respect to the transport of fully loaded containers, which meant that empty containers could be transported at a lower rate. Furthermore, Deutsche Bahn had different tariffs for different types of product, which could be applied if these rates were cheaper than those prescribed by AT 489. Moreover, the last mile was not included in the treaty, which also left room for tariff manipulations.[26] In other words, the problem of tariff discrimination remained unresolved because of the many ways available to get around the rules. This affected Dutch hinterland transport, but hit long distance journeys even harder because a larger percentage of the tariff was determined by Deutsche Bahn for that kind of transport. In the early 1990s, the fight began again when NS filed a complaint with the European Commission, claiming that Deutsche Bahn was abusing its dominant position by utilizing tariff discriminations. Deutsche Bahn duly lost the case and was fined 11 million ECU. This caused Deutsche Bahn to adjust its strategy towards Rotterdam, but price discrimination did not disappear entirely.[27]

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[25] J.P.D. Jonker, "Koopman op een dwaalspoor. De Seehafenausnahmetarife in de betrekkingen tussen Nederland en Duitsland aan het begin van de jaren twintig.", *Jaarboek Buitenlandse Zaken 1988-1989*, (1989) 181-190.
[26] H. W. H. Welters, *Kleine gedachten over een grote haven*,(Rotterdam 1991) 27-29.
[27] 'SVZ wil opheldering', *Nieuwsblad Transport*, (31 augustus 1996) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/39811/ArticleName/SVZwilopheldering/Default.aspx, seen on 21-11-2013.

Maersk and ERS Railways

After liberalization, the geographical pattern of rail shuttle transport was changed by of one of the new entrants to the rail market, European Rail Shuttle Railways, which managed to break the rail container shuttle market wide open for relatively closer destinations. Nevertheless, it experienced problems when it wanted to establish a shuttle connection to the south of Germany. ERS's history started in the early 1990s when sea shipping companies became increasingly dissatisfied with the services of NS Cargo, which was a small monopolistic company that depended heavily on Deutsche Bahn: for its foreign transport for traction, to acquire slots, and to set tariffs.[28] The sea shipping companies thought that tariffs could be reduced substantially by both circumventing the bureaucracy of NS Cargo and its intermediaries and founding a lean, private company for which large volumes were available. The arrangements of Intercontainer did have the advantage that containers could be booked individually, but the sea shipping companies thought that lowering the tariffs was more important, and ERS Railways was created in an attempt to achieve this.

ERS was established by four sea shipping companies, the American firm Sea-Land, which was the initiator, the British P&O, the Dutch NedLloyd, the Danish Maersk and NS Cargo, which had a minor share.[29] ERS succeeded in running shuttle trains on routes that had failed previously for other operators, especially over shorter distances. There were a number of reasons for this. ERS was a flexible, commercial private company, unlike the bureaucratic NS, which made it easier to provide transport services at lower tariffs. Indeed, even though container transport was only profitable for ERS over longer distances, it was able to use the higher profits from the Italian connection to cover the incidental losses of the shuttles going to relatively closer areas. Moreover, because of its special position, ERS did not need to make a profit; as long as it could offer transport services for lower tariffs than its competitors, owning a cheap rail connection had enough advantages for the sea shipping companies who held the shares. Furthermore, the shuttles established by ERS were guaranteed work due to the major volumes supplied by its shareholders. Its maritime cargo was more reliable than the continental flows, as the time that the containers spent on board the deep sea vessel could be used to arrange inland transport. Continental cargo on the other hand was a lot more unpredictable, as it depended on production and suffered more as a result of the competition provided by road haulage. Ultimately, ERS deliberately combined maritime and continental containers in order to generate major volumes that would fill its shuttles. The combination of these factors made it possible for ERS to break the container market wide open. Indeed, its connections to the Lower and

[28] 'ERS maakt het traditionele spoorwegen moeilijk', *Nieuwsblad Transport,* (16 maart 2004) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/88846/ArticleName/ERSmaakthettraditionelespoorwegenmoeilijk/Default.aspx, Seen on 19-09-2013.

[29] Interview with Cees van Altena, interim manager *Rail Cargo Information,* former manager *ERS, Maersk* 23-04-2013.

Middle Rhine areas in particular were responsible for the growing importance of Germany and the Lower Rhine region to Rotterdam container transport to and from the hinterland.[30]

After NS left ERS, all of the participants in the joint venture had a share of 25 percent. However, in 2005, Maersk bought P&O and NedlLoyd, giving it an absolute majority. At the same time, Maersk's network had grown to enormous proportions; it was a partner in APM Terminals, which owns 50 worldwide, including in Rotterdam, Algeciras, Gioia Tauro, Bremerhaven and Le Havre.[31] In 2004, ERS was transporting 420,000 TEU and operating 280 trains, which made it the largest rail operator in Rotterdam. The company had more than 60 employees, 12 locomotives and 500 container wagons. Furthermore, due to the growing supply of volumes, ERS contemplated offering more services to Germany.[32] Indeed, in 2005, it was already transporting more than 500,000 TEU per year, 70 percent of which came from Maersk and 30 percent from other customers.[33]

After a successful start in 1998, ERS started to operate a shuttle to Mainz and Mannheim with the cooperation of Transfracht, the Deutsche Bahn subsidiary for container transport, which had an office in Rotterdam. However, this venture ended after two years because of a disagreement: Transfracht wanted to extend the Mainz/Mannheim shuttle service to Southern Germany, but Deutsche Bahn did not approve as it feared that ERS would gain access to information about its customers in Mannheim. Transfracht had thus developed trust in the Port of Rotterdam, but the mother company was still suspicious of ERS. Accordingly, Deutsche Bahn decided to end the cooperation, meaning that this otherwise successful rail company failed to establish a shuttle connection to the south of Germany, and instead continued to operate the shuttle to Mainz on its own.[34] As a consequence, ERS played an important role in the reduction of the geographical range of the Port of Rotterdam with respect to rail container shuttle transport. In particular, after successfully creating new shuttle routes to relatively closer destinations, its endeavors to conquer the relatively further South German market at the same time failed.

The fiasco of the Betuwe Route

Another reason for the reduction of the geographic range of the Port of Rotterdam for rail container transport was the fiasco of the Betuwe Route, a dedicated freight line from Rotterdam to the German hinterland and the German rail network. The Betuwe Route was built by the Dutch government between 2000 and 2007 at a cost of 4.7 billion euros to facilitate hinterland transport to Germany. At the end of 2010, the route was still debouching into a German rail trajectory that was congested with

[30] Interview with Cees van Altena, interim manager *Rail Cargo Information*, former manager *ERS*, *Maersk* 23-04-2013.
[31] http://www.apmterminals.com/ seen on 01-05-2013.
[32] Ibidem,
[33] Ibidem, 'ERS doet het zelf', (31 Augustus 2005) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/96445/ArticleName/ERSdoethetzelf/Default.aspx, seen on 19-09-2009.
[34] Interview with Cees van Altena, interim manager *Rail Cargo Information*, former manager *ERS*, *Maersk* 23-04-2013.

passenger transport. The Port of Rotterdam had lobbied for this new connection, as it was concerned about the quality and capacity of those already in existence. Furthermore, it was thought that the choice of specific ports by sea shipping companies depended on the quality of the rail connections. As the old director of ECT, Ruud P.A. Hoorweg (1983-1995), put it: "When I tried to market Rotterdam through ECT in the Far East, I got the reaction that the only disadvantage of Rotterdam was the lack of good rail connections."[35]

The province of Gelderland and the chambers of commerce of a number of municipalities along the yet to be built trajectory also expressed an interest, believing that the connection would be beneficial for their regional economies. In 1989, Neelie Smit-Kroes, the outgoing Dutch minister of transport, appointed a transport commission under the directorship of A. van de Plas to research the opportunities for rail. The members of the commission all had a major interest in high quality hinterland connections, which made the result predictable.[36] In 1991, the initial plan was issued, which was followed by the establishment of the Betuwe route Steering Group consisting of the ministry of transport, the ministry of spatial construction and NS.[37]

However, right from the start of the 1990s, there was major controversy about the economic goals of the project.[38] Indeed, despite the frequently voiced objections against the construction of the route, the decision-making process could be compared to a fast train: once it was put on the rails, it thundered through.[39] Ministers were put under pressure to not interfere with the process, and there was also pressure from abroad, especially Germany and the European Union. Germany in particular had suffered the effects of the truck transit flows from Rotterdam through the country coming from and going to the Port of Rotterdam, and the bundesminister of transport advised his Dutch counterpart to improve its rail network.[40] In the European Union, the Netherlands was known as the country with

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[35] Own translation, "Als ik met ECT Rotterdam probeerde te verkopen in het Verre Oosten, werd me te verstaan gegeven dat het enige nadeel van Rotterdam was dat er geen goede spooraansluiting was." Michel Gonlag, 'Shuttle Rotterdam Duisburg moet beter aansluiten op Duits spoor', *Nieuwsblad Transport* (16 September 1995) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/33314/ArticleName/SHUTTLEROTTERDAMDUISBURGMOETBETERAANSLUITENOPDUITSSPOORHavenswillensamenwerkingtussenspoorenbinnenvaart/Default.aspx

[36] Van der Plas, a former director of the Municipality of Rotterdam; H. Molenaar, the director of the Port Authority; G. Wormmeester of ECT; H.E. Portheine, who held a high position in NS, ECT and the Nationale Havenraad; and representatives of Hoogovens and Shell; Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met Neelie Smit-Kroes,* (2004) 94-95.

[37] Startnotitie, Ministerie van Verkeer en Waterstaat, Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer.

[38] Paul Pestman, *In het spoor van de Betuweroute* (Amsterdam 2001) 11-13.

[39] Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met J.D. Blaauw,* (2004) 248-249.

[40] Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met P.J.L. Verbugt,* (2004) 276.

the largest port, but badly organized hinterland transport. Moreover, polluting Dutch trucks were the talk of the town. In the discussions, the Netherlands was advised to follow the example of the German ports, which arranged their hinterland transport almost exclusively by rail.[41]

In order to construct a cross-border connection, arrangements had to be made with Germany about the trajectory on the other side of the border. In 1990-1991, the Netherlands made prognoses about the expected transport volumes, while the German consultants Kessel und Partner also made calculations for both freight and passenger transport, since, in addition to the Betuwe freight route, there were also plans to create a high speed connection between Amsterdam and Cologne. Based on these reports, the German party concluded that it was essential to construct the Betuwe Route to keep pace with the growth of freight transport. Moreover, German investment was needed for the Emmerich-Oberhausen-Cologne trajectory.

In its final report, the German-Dutch working group agreed that Germany would invest 2 billion and the Netherlands 3 billion DM in the Amsterdam–Utrecht–Arnhem connection. Finally, in 1992, the transport ministers of both countries, G. Krause (CDU, 1991-1993) and J.R.H. Maij-Weggen (CDA, 1989-1994), signed the Agreement of Warnemunde, which provided for the two nations to coordinate their efforts to build the route.[42] In 1996, the ministry of spatial planning (Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer) established the precise location of the connection, which would run from Maasvlakte to the German border at Zevenaar. The project originally also included a southern and a northern connection to the German railway system, as well as one to Amsterdam (Figure 4.14). These three connections were not, however, built because of budget restrictions. The route, as it was constructed, followed the traditional trajectory along the Rhine. It was possible that the other two branches would have opened up new transport axes.[43] At the same time, a multimodal rail terminal, Container Uitwisselpunt (CUP), was to be built in Valburg, which is near Arnhem and close to the German border.[44]

[41] Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met J.H.R. Maij Weggen*, (2004) 612.
[42] Gerrit Nieuwenhuis, *De Betuweroute goederen sporen van zee naar Zevenaar* (Alkmaar 2012) 56.
[43] Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met J.D. Blaauw*, 252-253
[44] Paul Pestman, *In het spoor van de Betuweroute,* 11-13.

Figure 4.14 *Original trajectory of the Betuwe Route.*

Source: Gerrit Nieuwenhuis, De Betuweroute goederen sporen van zee naar Zevenaar (Alkmaar 2012).

In the Agreement of Warnemunde, Germany, among others, agreed to update the connection through Emmerich to Oberhausen by adding a new, third track. This track would have been used by high speed trains for passenger transport, leaving the remaining two tracks for freight. The German part of the Betuwe Route, however, was never built. Although this could be seen as a breach of the Warnemunde agreement, it was actually only a declaration of intent. Moreover, even though the Germans often promised to stick to their part of the agreement, when the Dutch started to cut costs by cancelling connections, German priorities changed.

On the Dutch side, the construction was also delayed, which was a period during which Germany incurred huge costs in order to reconnect the railway lines between East and West Germany after the reunification. The Netherlands likewise did not meet its obligations, and of the promised connections, three were not realized, and the northern branch, the southern branch and the construction overall was postponed a number of times. The government of North Rhine Westphalia would even have preferred to postpone the construction until 2025.[45] Moreover, local German

[45] T. Heerschop, 'Geen geld voor aansluiting op Betuwelijn', *Schuttevaer*, (19 November 2010).

pressure groups protested against the damage that the building work would cause to the environment, especially in the form of noise. After an initial halting of activities, it was difficult to reanimate the project and convince the local German authorities to start the construction work. In the meantime, the environmental lobby groups grew stronger. Furthermore, the municipality of Emmerich did not have the resources to compensate the people whose houses would have to be demolished to make room for the construction.[46]

Initially, the German government showed more good will, but it nevertheless represented national interests. This included those of the German ports, which were clearly against building a good hinterland connection for the Port of Rotterdam with German money that would make container transport less dependent on the geographically fixed Rhine. In the Netherlands, meanwhile, there was a strong suspicion that the German lobby was blocking decisions. As Machiel Roelofsen, one of the directors of the Dutch road hauler Rotra Transport put it: "… we here in the Netherlands were not capable of convincing the Germans to construct a short rail track here close to the border at Arnhem. … Now Germany says, Netherlands, reconstruct the Iron Rhine and load it with containers. The reaction of The Hague was predictable, because then we would be helping Antwerp directly and we shouldn't do that. What you see is that the Germans push us down and we push the Belgians down. Who prospers? Hamburg. It's as simple as that."[47]

At the end of 2010, there were still no definitive plans to complete the third track. Furthermore, the terminal in Valburg, which despite previous plans to develop it into a major logistics centre remained a simple emplacement location where container shuttles could be parked, was waiting for a slot on the overcrowded German railway network. The bottleneck formed by the lack of the third track was especially disadvantageous for the Port of Rotterdam's shuttle connections coming from and going to destinations that were relatively far away, which were contested by German ports, such as those in the south of the country, and Central and Eastern European nations. Relatively small numbers of containers were going to these locations, which made it difficult to run regular shuttles. Moreover, because of the bad connection, the time advantage that Rotterdam had as the first port of call could not be exploited enough. This gave an advantage to the hinterland transport of German ports to these areas.

[46] Michael Mies, managing director, *Contargo, Rhein Waal Terminal Emmerich*, 02-05-2012.

[47] '…Nu zegt Duitsland: 'Nederland, maak lekker die IJzeren Rijn en stop daar die containers op. De reactie van Den Haag is dan voorspelbaar, Want dan helpen wij Antwerpen direct en dat moeten wij niet doen. Wat je dus ziet is dat de Duitsers ons naar beneden schuiven en wij schuiven die Belgen er weer van af en wie floreert er uiteindelijk: Hamburg. Het is zo simpel.' (own translation) 'Locale expediteurs vinden Betuwelijn vooral dom', *Nieuwsblad Transport*, (4 September 2009). http://www.nieuwsbladtransport.nl/?TabId=101&ArticleID=519&ArticleName=LokaleexpediteursvindenBetuwelijnvooraldom, Seen on 19-09-2013.(own translation)

North Italy, Central and Eastern Europe, Southern Germany and the Lower Rhine Region

After the liberalization of the German and Dutch rail sectors, the geographical reach of rail container transport from and to Rotterdam decreased. On the one hand, the volume of shuttles to relatively far away distances fell, while, on the other, those to relatively close-by destinations rose. The former were Italy, Central and Eastern European countries and the south of Germany. The fall in maritime container transport to all three areas was caused by port competition; in the case of Central and Eastern Europe and Southern Germany, this came from the German ports, while in the case of Italy it came from the Port of Genoa, the upcoming Gioa Tauro in the south of Italy and Algeciras in the south of Spain.

In the period 1996-2010, the amount of rail shuttle transport between Rotterdam and North Italy grew from 20 to 25 percent of rail shuttle transport overall. However, this rise was not caused by growth in the transport of maritime containers. On the contrary, by 2012, hardly any of these containers were transported between the two areas.[48] This is because, in the 1990s, due to the main port effect, many containers were transshipped in Rotterdam rather than in, for example, Genoa, while in the 2000s major changes took place in the Italian ports.

Mediterranean ports grew as a result of the rise of container transport around the world and the growth of the Italian hinterland towards Bavaria and Hungary. Furthermore, the Italian ports were privatized, which weakened the position of the local labour unions. Moreover, the emergence of Mediterranean hubs for overseas container shipping, such as Gioia Tauro for the Asiatic and Algeciras for North Atlantic container flows, made it cheaper to arrange distribution from there instead of Rotterdam. The Italian ports thus won the battle with Rotterdam with respect to maritime containers.

Table 4.7 shows the volumes that were transported to Italy through North Italian ports as opposed to those that travelled through the North Sea ports. Meanwhile, Table 4.8 specifies the volumes to each major North Sea port. These tables demonstrate that, while the absolute volume of transport to Italy was growing, it formed a decreasing percentage of the total transported volumes. For Rotterdam, even the absolute number of maritime containers did not grow. Indeed, the Dutch port was not only facing competition from the Italian ports, but also from Antwerp and the ports in Germany. Nevertheless, the data presented in the two tables only refers to maritime containers, while land containers played an increasing role in container transport between Rotterdam, Milan and, especially, Verona, where continental containers were almost exclusively transported by rail. Rotterdam's falling share with respect to maritime container transport continued, and in 2010 virtually no such containers

[48] Interview with Cor Hoenders, director of the *Rail Service Centre Rotterdam*, 02-11-2011, 07-02-2012.07-02-2012.

were transshipped by rail from the port to Italy. Meanwhile, the majority of the containerized goods still transported on this track were produced in Europe and conveyed in continental containers.[49]

Table 4.7 *Maritime container flows to Italy through North Italian ports (Genoa, La Spezia, Leghorn, Trieste, Venice, Ravenna) versus North Sea ports (Antwerp, Rotterdam, Bremen, Hamburg) per 1000 TEU.*

	1990	1995	1998	1999	2000	2001
Via North Italian ports	2212	3684	4832	5655	5989	6354
Via North Sea ports	498	653	764	792	820	800
Share North Sea ports	23%	18%	16 %	14 %	15 %	13%

Source: Dionisia Francesetti and Alga D. Foschi, Mediterranean versus Northern Range Ports. Why do Italian containers still prefer routing via the Northern Range Ports? Advice for a new policy, IAMA Conference proceeding (Panama City 2002).

Table 4.8 *Flow of maritime containers from the North Sea ports to the north of Italy per 1000 TEU.*

	1990	1995	1998	1999	2000	2001
Antwerp	16	68	74	84	107	115
Rotterdam	146	114	150	148	145	135
Bremen	0	21	31	35	40	45
Hamburg	87	124	128	130	118	105
Total	249	327	382	396	410	400

Source: Dionisia Francesetti and Alga D. Foschi, Mediterranean versus Northern Range Ports. Why do Italian containers still prefer routing via the Northern Range Ports? Advice for a new policy, IAMA Conference proceeding (Panama City 2002).

After the fall of the Iron Curtain in 1989, NS Cargo set its sight on Central and Eastern Europe as a possible hinterland area. Traditionally, this area belonged to the hinterland of the German ports as they were located closer to it, but Rotterdam had the advantage of being the first port of call on both the transatlantic and Asiatic routes; containers arrived in Rotterdam at least 24 hours prior to reaching the German ports. Rapid transshipment and a good rail connection made transport through Rotterdam attractive, and ERS played an important role in the development of container transport to Central and Eastern Europe.

A subsidiary of NS Cargo, PolTrain, established rail container shuttles running to Poznan and Prague. The Poznan shuttle departed from Coevorden loaded with continental containers, but had a low loading percentage. In 1996, at the request of NS, ERS took over PolTrain, which was on the verge of bankruptcy. ERS moved the shuttle's starting point to Rotterdam in order to add maritime

[49] Interview with Cor Hoenders, director of the *Rail Service Centre Rotterdam*, 02-11-2011, 07-02-2012.07-02-2012.

containers to the continental flow and, due to these extra volumes, the shuttle became viable again.[50] In 1999, ERS took over Container Train Nederland's (CTN) connection to Prague. CTN had transported land containers from the Rotterdam area and the United Kingdom. It officially had a shuttle service three times a week, but in practice the company was often unable to fill the trains to the extent required for a regular service. Consequently, the connection was about to be terminated. However, when the service was taken over by ERS, the shuttle was able to operate seven or eight times a week because of the combination of CTN's continental containers and the maritime containers of the sea shipping companies.[51] Nevertheless, by that time, there were already other shuttles running seven times a week between Prague and the German ports.[52]

Meanwhile, the shuttle connections between Rotterdam and Central and Eastern Europe depended heavily on the volumes that sea shipping companies, in particular Maersk, supplied. However, this firm's willingness to use Rotterdam to transship to countries in Central and Eastern Europe decreased.[53] This led to a reduction in the number of shuttles going to Central and Eastern European destinations and gave the German ports a chance to reconquer this hinterland area.

One of the relatively further away destinations to which the level of transport decreased was Southern Germany, and a lack of cooperation between Deutsche Bahn and ERS was the main cause as they refused to cooperate in establishing a shuttle to Southern Germany. On the other hand, a new entrant, BoxXpress, also played an important role. Until 2000, ERS only operated shuttles; it did not supply the traction. Its first experiment with traction was made with BoxXpress in a joint venture between the German operator Eurogate Intermodal, the Dutch logistics provider Netlog, and ERS. BoxXpress was set up to operate container shuttles between the German ports and Southern Germany, and was officially presented in 2000 at the Exhibition of Munich. Deutsche Bahn reacted furiously to the arrival of a competitor, as ERS operated daily shuttles between the German ports and Southern Germany for lower tariffs. However, before the arrival of new entrants, rail transport to Southern Germany was relatively expensive, because of the lack of competition. Indeed, Deutsche Bahn had a monopoly over this trajectory because, before liberalization, it was the only rail company in Germany. Furthermore, it did not need to fear competition from the road haulage sector, as the distance of approximately 600km between the German ports and Southern Germany was beyond the reach of truck transport. Moreover, there was no waterway connection. As a consequence, Deutsche Bahn

[50] Interview with Cees van Altena, interim manager Rail Cargo Information, former manager ERS, Maersk 23-04-2013.
[51] Interview with Cees van Altena, interim manager Rail Cargo Information, former manager ERS, Maersk 23-04-2013.
[52] ERS maakt het traditionele spoorwegen moeilijk, *Nieuwsblad Transport*, 16 Maart 2004. http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/88846/ArticleName/ERSmaakthettraditionelespoorwegenmoeilijk/Default.aspx, Seen on 19-09-2013.
[53] Interview with Cees van Altena, interim manager Rail Cargo Information, former manager ERS, Maersk 23-04-2013.

could keep its tariffs relatively high. However, the new entrant broke up the monopoly and managed to push down prices.[54] Ultimately, therefore, Deutsche Bahn began to cooperate with the new venture.

The missing connection between the Betuwe Route and the German rail network had the greatest impact on shuttles going to destinations that were relatively far away like Southern Germany, as these were vulnerable because they transported less cargo. This gave an advantage to the German ports, which had better rail connections to this area. BoxXpress did, however, manage to lower the tariffs. Furthermore, in 1992, a rail terminal was built in Riem, close to Munich, with a capacity of 250,000 TEU. This capacity was raised to 400,000 in 2012 with an investment of 16 million euros and a daily connection to Hamburg and Bremen was established. The combination of the bottleneck faced by Dutch rail container transport at the German border and the emergence of cheap and frequent connections for the German ports to a state-of-the-art terminal in Southern Germany reduced the opportunities for Rotterdam in this hinterland area and increased those of Hamburg and Bremen.

At the same time as the reduction in the number of long distance connections, there was a rise in the short distance connections going to the Lower Rhine region. ERS played an important part in this, making frequent shuttles possible between Rotterdam and this area as it had major volumes to transport because its largest shareholder was Maersk. In 1996, after establishing the profitable connection to Italy, ERS started a shuttle to the Ruhr area with a capacity of 80 TEU. The trains were split into two during the journey, with one part going to Duisburg and the other to Neuss. Then, on the way back, the two trains were coupled again. Maersk had a great deal of cargo for Neuss, which was where the distribution centers of Japanese companies were located. The German connection grew rapidly. Indeed, at a certain point, it had 180 trains a week running between Rotterdam, Neuss and Duisburg.[55] Just like the shuttles to Central and Eastern Europe, ERS combined major maritime volumes with continental containers, in this way succeeding in intensifying the rail container streams between the Port of Rotterdam and the Lower Rhine region.[56]

Conclusion

Before the advent of maritime containers, Dutch cross-border transport was mainly oriented towards Germany. At that time, the majority of the cargo consisted of bulk, especially mineral oil, coal, cereals and iron ore. Container transport was the heir to general cargo, which had not been the strongest aspect of Dutch rail transport for the Port of Rotterdam before the introduction of containers. Container transport can be divided into continental flows and maritime flows. The former were

[54] Interview with Cees van Altena, interim manager Rail Cargo Information, former manager ERS, Maersk 23-04-2013.
[55] Interview with Wout van de Heuvel, Policy advisor at *Transport and Logistiek Nederland* 2008- diverse positions related to intermodal container transport at *Maersk*, 08-12-2013.
[56] Interview with Cees van Altena, interim manager *Rail Cargo Information*, former manager *ERS, Maersk* 23-04-2013.

introduced earlier than the latter, and rail transport was able to profit from the expertise acquired from this form of transport.

In the period 1964-1993, NS built up a wide network of container transport reaching as far as Southern France, Northern Italy and Central and Eastern Europe. After 1994, container transport from Rotterdam had four major hinterland areas: the Dutch domestic market, Germany, Italy and Belgium. Of the four countries, Germany proved to be the most important, even more so than the home market. The connections between Rotterdam and Germany grew spectacularly after a brief period of stagnation. There was a clear pattern of rail terminals within Germany, which partly coincided with the pattern of barge terminals on the Rhine. Three clusters of terminals were identified, the Lower Rhine and Middle Rhine areas and Southern Germany. The shift of the share of transport to and from the different areas between 1993 and 2010 shows that the share of shuttle connections to a relatively close area, the Lower Rhine, grew, while that to relatively distant areas like the Middle Rhine and Southern Germany fell. In other words, the geographic reach of rail container transport between Rotterdam and its hinterland decreased. This meant that the transport connections between Rotterdam and the Lower Rhine region intensified, indicating regionalization and growing economic integration within the Lower Rhine economy. Rail container transport increased the size of the potential hinterland of the Port of Rotterdam due to falling transport costs and the introduction of regular bundled train services, although the same applied to the other European ports. The rail networks of the different European ports met in Central Europe and there was fierce port competition, with the aim being to conquer the hinterland areas of rivals. This shrunk the captive hinterland of rail container transport and reduced Rotterdam's backyard to the Lower Rhine region.

Germany had a strong weapon in terms of port competition: cross-border transport towards Germany depended on the cooperation of the German government and Deutsche Bahn. The refusal of the latter to connect the Dutch rail system to the German network in Duisburg in the 1980s particularly hit transport to relatively closer areas, while the failed struggle to stop the tariff discriminations imposed by Deutsche Bahn on Rotterdam and Antwerp affected long distance transport the most. The tariffs for this transport were primarily influenced by German pricing strategies. The reluctance of Transfracht to cooperate with ERS in establishing a rail shuttle from Rotterdam to Southern Germany in the late 1990s played a major part in the reduction in the number of rail shuttles travelling to these relatively distant areas. Meanwhile, the failure to construct a third track for the Betuwe Route in Germany in the 2000s had a negative effect on the rail shuttle transport of lower volumes to relatively further away destinations.

The reduction in the geographical reach of the Port of Rotterdam with respect to rail container transport was due to two factors: the cutting of transport to the relatively further away regions of Italy, Central and Eastern Europe, and Southern Germany, and the growth of rail shuttle transport to a relatively closer area, the Lower Rhine region. Container transport to Italy continued to grow, but the container flows increasingly consisted of continental containers until, finally, virtually no maritime

containers for Italy were transshipped in Rotterdam in 2010. The Italian hinterland for maritime containers transported by rail was lost to the Port of Genoa, the upcoming Gioia Tauro, and Algeciras. Meanwhile, Eastern Europe and Southern Germany were increasingly served by the German ports. The spectacular growth of rail shuttle connections between Rotterdam and the Lower Rhine region could largely be attributed to ERS Railways, which created frequent shuttle connections between the two areas. ERS was able to do this as it was a small, commercial enterprise with shareholders, most importantly Maersk, which guaranteed major volumes to fill the shuttles.

Liberalization had a major impact on the geographical pattern of rail container transport, and did not simply lead to competition between the diverse European ports for the best connection to their particular hinterland. Due to the privatization of the rail companies, NS Cargo was sold to Deutsche Bahn Schenker. This new company did not play a major role in container transport in the Netherlands, mainly acting as a traction provider and leaving the operation of shuttles to the new entrants, which had new opportunities because of liberalization. The way to this had been paved by the separation of exploitation from infrastructure. Such new entrants were ERS railways and BoxXpress. ERS made frequent shuttles possible between Rotterdam and the Lower Rhine region, while BoxXpress made transport between the German ports and Southern Germany cheaper. Liberalization was intended to remove obstacles from the path to free transport, which would encourage the growth of the Port of Rotterdam's hinterland. At the same time, the effects of liberalization were partly mitigated by the continuous postponement of the construction of the third track for the Betuwe Route.

After liberalization, Deutsche Bahn officially lost its monopoly with respect to setting tariffs for rail container transport. However, by not building the third track from the German border to the German rail network, decisions about infrastructure remained with the state and, in Germany, the national railway company Deutsche Bahn. This did not produce free transport markets, as the German authorities could still obstruct Dutch cross-border hinterland transport. One might have expected that liberalization would result in a widening of the network, not regionalization, but this did not occur because port competition counteracted the effects of liberalization.

Port competition was enhanced by globalization, and German ports and Rotterdam were increasingly involved in worldwide container transport. This meant that they had to fight for the business of the sea shipping companies in order to attract deep sea ships of growing sizes. The largest sea shipping company was Maersk, which was ubiquitous in the history of rail container transport in Rotterdam. It eventually came to own the majority of ERS shares and, as a result, was one of the shareholders of BoxXpress. Furthermore, it owned the ports of Gioia Tauro and Algeciras and had a vested interest in the German ports as well as Rotterdam. Maersk was an important vessel of globalization that greatly influenced the geographical pattern of container transport in the triangle formed by Rotterdam, the German ports and the Lower Rhine region. This was made possible by the liberalization of the German and Dutch rail sectors, which allowed new entrants, thus reshaping the pattern of rail shuttle container transport in the hinterland of the ports in Western Europe.

Chapter 5
Barge, a Latecomer with Golden Opportunities

As Rhine transport, which formed the majority of barge transport in Germany and the Netherlands, had been liberalized in the 19th century, the effect on barge transport of freeing European transport in the 1990s was not as spectacular as the impact on rail transport. Until World War II, Rhine transport remained free, but was influenced by German restrictions on international financial transactions and trade. After World War II, Rhine transport was re-regulated in both countries. The most important restrictions, which remained until the mid-1990s, were the prohibition of cabotage (access to the domestic market) in both Germany and the Netherlands and the fixed minimum tariffs in Germany. The rescinding of these regulations after the mid-1990s affected the geographical pattern of both barge and barge container transport. Furthermore, as barge transport almost always involved a last mile by truck, the liberalization of the road haulage sector also influenced the geographical pattern of barge container transport.

The companies carrying out barge transport consisted of a large number of small family enterprises and a few large ones. The skipper's family often lived on the ship, which was a rather isolated way of life. Barge owners were mostly relatively conservative, and were not organized efficiently. Skippers' associations were arranged according to religious affiliations, geographical location and various other criteria, inevitably leading to fragmentation. This lack of organization made skippers vulnerable to the large companies that chartered their barges, but rarely had any of their own. This gave the large firms the flexibility needed to adjust their business to market demands, transferring the risks to the small companies that were heavily dependent on them, especially at times of low transport demand. On the other hand, at times of high demand, the small companies were able to plot against the large firms. However, the market structure of the barge sector did not change substantially, as it was an oligopoly before liberalization and stayed that way thereafter.[1] The only change was that the large companies scaled up, but this was not so much due to the effect of liberalization as it was to the concentration of sea shipping companies that was caused by globalization.

This chapter analyzes the effects of liberalization on the changing pattern of hinterland barge container transport. As an example, the history of the largest Rhine barge container shipping company, Combined Container Service (later Contargo), is discussed. This company was chosen to enable as much of the market as possible to be examined. Contargo is especially suitable for these purposes as it was a product of the merger of two companies that aimed to combine their contacts in Rotterdam and the German hinterland.

[1] Hugo v. Driel, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse* (Rotterdam 1993) 1-165. , Harry Geerlings, Martijn van der Horst, Michiel Kort, and Bart Kuipers, *Beschrijving huidige binnenvaart en eerste probleemanalyse Eindrapportage* (Rotterdam, Zoutermeer 2012) 27-28.

The chapter also discusses the history of one of the founders of Combined Container Terminals, Kieserling. This is followed by consideration of the history of the containerization of Rhine barge transport. Thereafter, the history of Rhine container transport is analyzed, with Combined Container Service/Contargo as an example. The section that follows contains a numerical analysis of the changing geographical pattern of barge container transport. The last section prior to the conclusion examines the different hinterland areas of barge container transport and the dynamics of their individual value to the Port of Rotterdam.

The origins of Combined Container Service

The history of Combined Container Service started in the early 20th century in the Ruhr area.[2] In 1927, Erich Kieserling and his brothers founded a truck company to transport goods for the steel industry and later for highway construction in Hamm, which became North Rhine Westphalia. In 1945, Kieserling opened an office in Bremen, which later became the company Kieserling GmbH & Co.[3] This firm expanded rapidly, and by 1970 already owned 150 trucks for the transport of chemicals, general cargo and containers.

In the 1970s, the transport of maritime containers in the German ports expanded rapidly, with deep sea ships of growing sizes calling at Hamburg, Bremen or Bremerhaven. This triangle was also referred to as the *Nasse Dreieck* (wet triangle). When containers arrived in one of these ports, but had their final destination in another, they needed to be redistributed, as was also the case with respect to Rotterdam and Antwerp. This took place either via short sea journeys, rail or road haulage. In the first few decades of maritime container transport, the volumes were not large enough to be transported by short sea and rail, leaving road haulage and barge as the remaining options.

The problem for road haulage was the fact that the distance between the three ports was more than the maximum distance permitted with a *Nahverkehr* (short distance) license. Consequently, a road hauler needed a *Fernverkehr* (long distance) license to truck containers between the German ports. In 1971, not only were such licenses difficult to acquire, but they also cost 10,000 DM per year for each truck. This was too expensive for Kieserling, and he therefore decided to reduce costs by conducting multimodal transport. Accordingly, containers would be transported for most of the journey by barge, and only the last mile would be carried out by trucks with a short distance license.[4]

The barge part of the transport process happened on the Weser, the *Mittellandkanal* and the Elbe (Figure 5.1). Kieserling also planned to operate container transport between the German ports and Berlin.[5] In order to achieve this, in 1972 he commissioned the construction of two barges with a capacity of 52 TEU, the *Erna Kieserling* and the *Erich Kieserling*. Due to problems of changing water

[2] Hugo van Driel, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse* (Rotterdam 1993) 58-59.
[3] http://www.ekb-kieserling.de/herkunft-und-philosophie.php, seen on 05-10-2011.
[4] From Henk van Ielen, director Kieserling 1990-1994, manager of Container Transport at Kleijn Transport 1994-2010, 01-10-2113, electronic correspondence, personal archive of the author.
[5] Ibidem, 56.

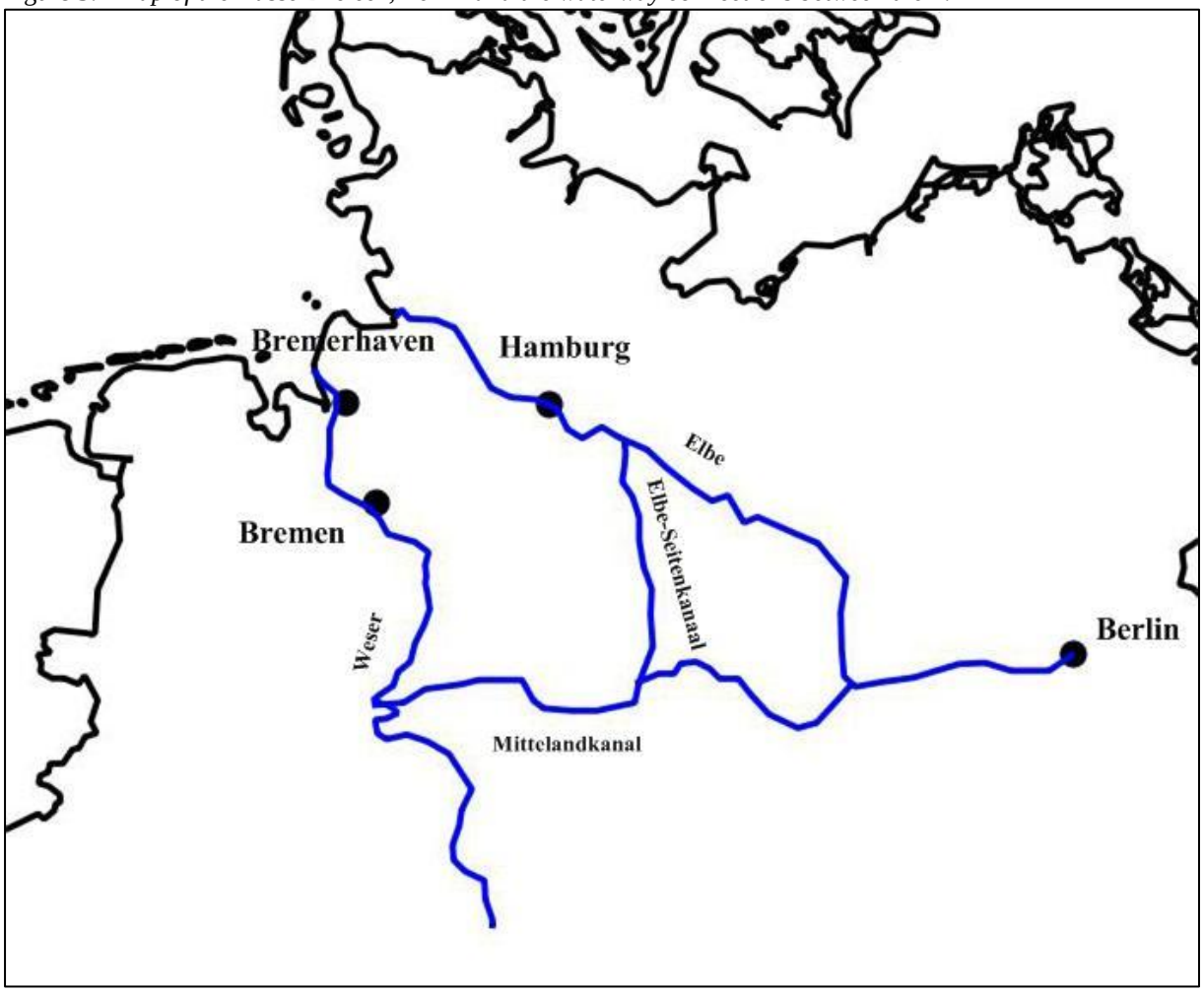
levels, ice, and delays caused by the numerous locks on the German waterways, Kieserling did not succeed in operating his barges profitably. Nevertheless, so as to not waste his investment, he relocated his barging activities to the Rhine, which had fewer issues.

Kieserling saw major opportunities in barge container transport, especially in the redistribution of empty containers, which, because of fewer time pressures, were often transported by barge. As a result of Kieserling's lack of experience in barge transport and his hesitation with respect to buying his own fleet, he was eager to cooperate with a barge company, finding a partner in Stinnes Reederei, a subsidiary of Westfälische Transport Aktiengesellschaft (WTAG).[6] This firm was also determined to set up its own container service, but was lacking contacts in the hinterland to arrange transport for the last mile, which was seen as a major problem. The directors of the two companies met by chance in Duisburg in 1975 and realized that their wishes were complementary, with WTAG in particular attaching great value to Kieserling's contacts with Hapag Lloyd and Sea-Land. As a consequence, they decided to merge and Combined Container Service was thus established.[7]

[6] The history of Stinnes Reederei goes back to Vereinigte Elektrizität und Bergwerke A.G. (VEBA), a state-owned energy cartel that was founded in 1929 by the Prussian government to attract foreign capital investments. [6] Westfälische Transport Aktiengesellschaft was a subsidiary of Vereinigte Elektrizität und Bergwerke and, in turn, the owner of Stinnes Reederei. It mainly specialized in sailing on canals, but also performed barge transport on the Rhine. In 1965, its subsidiary, Westfalia also started stevedoring, performing road transport and acting as a skipper. Westfalia was a specialized break bulk company, which started losing volumes when containers gained ground. Consequently, it decided to enter the container shipping business. It started in 1972 by establishing a Rhine-sea line under the flag of Geest Container Line. WTAG came into existence with the merger of Westfalia and Fendel Stinnes. Ibidem, 56-58.

[7] Ibidem, 59.

Figure 5.1 *Map of the Nasse Dreieck, Berlin and the waterway connections between them*.



The containerization of Rhine barge transport

When it came to the containerization of barge transport, no major technical adjustments were necessary. Containers could be transported on a normal barge without problems, even in the middle of other cargo. The increase in scale of the transport volumes did, nevertheless, create a problem, as the view of the steersman was blocked on a ship fully loaded with barge containers. The solution was a height-adjustable steering cabin. There was, however, an additional problem of cranes, as barge transport suffered because it was served in the port by the same cranes used for the deep sea ships, which took priority. Consequently, stevedores charged relatively high prices for transshipment. This meant that barge transport had a disadvantage compared to road haulage and rail, which both operated at the berth and could pick up their containers more cheaply.[8]

The barge sector had little experience with utilization. There were technical innovations in bulk transport, such as high performance pumps for the transport of oil. Nevertheless, until the mid-

[8] 'Containervervoer op de Rijn gebeurt op allerlei manieren', *Rotterdam Europoort Delta,* (1980) 16-20.

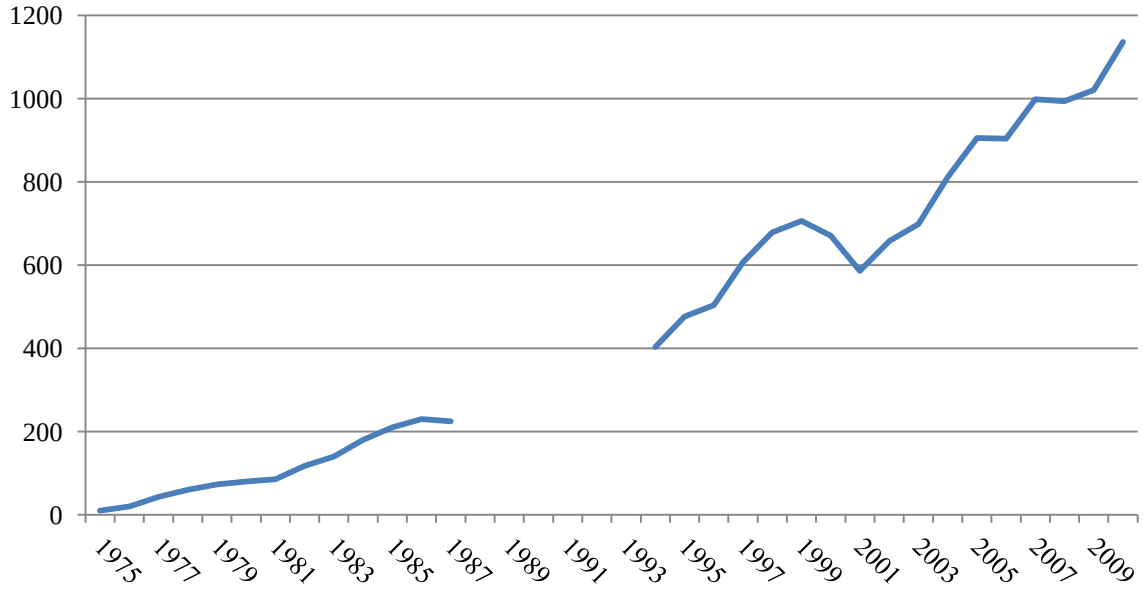
1960s, general cargo was conveyed packed in crates, sacks and barrels and was lifted on and off board in nets by cranes.[9] This was a labor intensive process, as small objects of different shapes had to be fitted into a ship as efficiently as possible, filling all irregular spaces and nooks and crannies. Very experienced workers were therefore needed, but these workmen had a great deal of physical contact with the cargo, and theft was widespread. Indeed, it was common practice for foremen to open a package from which the workers could steal, in order to prevent them from opening packs randomly.[10]

An obvious way to utilize this type of transport would have been palletization, but pallets were moved by forklifts and there was not enough room to maneuver on the deck of a barge. Furthermore, using pallets would mean losing room, as it was not possible to fill irregularly shaped spaces, meaning that the nooks and crannies would be unused. As a result, and despite the fact that barges were traditionally strong in bulk transport, it took some time until the sector started to believe in container transport.

In contrast with the other two modalities, the barge sector did not have high expectations of container transport in the late 1960s. However, in spite of the initial pessimism in the sector, from the late 1970s onwards, barge container transport started to grow and, after a breakthrough in the 1980s, played a major role in hinterland container transport (Figure 5.2). In barge transport, containers gradually replaced general cargo, although bulk goods like sand and coal were still important.

[9] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk* (Rotterdam 1990) 50.
[10] Interview with Frans Kool, Bibliotheek Maritiem Museum, former employee in the general cargo sector, 02-11-11.

Figure 5.2 *Number of containers transported on the Rhine in 1000s (1975-2010).*



The Port of Rotterdam started to count containers in TEU in 1989. As there is no reliable way to convert the number of containers into TEU, the time series that start before then are presented per number of containers.
Source: Hugo van Driel, *Kooperation im Rhein-Containerverkehr: Eine historische analyse* (Rotterdam 1993) rough estimations, Rotterdam Port Authority, own calculations combining time series and modal split.
http://www.portofrotterdam.com/en/Port/port-statistics/Pages/containers.aspx.

From humble beginnings to liner services (1966-late 1970s)

The first containers were mainly transported by barge when there was no truck available. When this was necessary, they were simply placed between other cargo and moved to a conventional port.[11] Prior to the construction of the first specialized barge container terminal in Mannheim in 1968, such transport was incidental. The decision to locate the first such terminal in Mannheim was due to two main factors. Firstly, in the early days, barge transport was only thought to be profitable above a distance of 500-700km, when the final destination was no further than 50km from the river. Mannheim, which was nearly 500km from Rotterdam, was almost the ideal location. Secondly, the majority of the distribution of US military supplies took place in the Mannheim area and the chemical concerns of BASF and Hoechst in Frankfurt am Main generated major cargo flows there. Nonetheless, the next terminals built were in Strasbourg and Basel, which were between 600 and almost 800km from Rotterdam, respectively. (Figure 5.3).

The energy crisis in 1973-74 gave an impetus to the sector, as the higher fuel efficiency of barge transport became relevant. The increase in fuel prices was not as decisive a factor with respect

[11] T. Notteboom, 'Inland waterway transport of containerized cargo: From infancy to a fully-fledged transport mode', *Journal of Maritime Research*, IV (2007) 63-80.

to barge freight rates as was the case for road haulage.[12] Nevertheless, due to the rising energy prices, the geographical range of profitable barge transport fell from 400km to a radius of 100km from Rotterdam.[13] This meant that the Lower Rhine region came within the reach of barge container transport from and to Rotterdam.

One of the reasons for the slow recognition of the opportunities of container transport in the barge sector was that barge companies were used to dumping their bulk goods at a port without being concerned about the last mile. Containers were not, however, like bulk. Customers, which were mostly sea shipping companies, did not wish to organize this last part of the transport in the hinterland themselves, instead preferring to book the entire hinterland transport journey at once from door to door.[14] At that point, Kieserling, with his extensive experience of door-to-door transport, came onto the scene, relocating his barges to the Rhine, starting to offer Rhine barge services and performing the last mile with his own trucks.

Kieserling had already become an expert in circumventing the restrictions on the road haulage sector in Bremen, and in his new field applied the same principles, letting most of the transport take place by barge, so that he would not need long distance truck licences. In 1974, he established a barge service between Rotterdam and Hoechst Frankfurt am Main, transporting containers for Hapag Lloyd, which had already been a customer in Bremen. He also used Hapag Lloyd's terminal in Dusseldorf for transshipment, as from there he could truck containers to the Netherlands with a long distance license.[15] At the same time, he started to transport military goods for Sea-Land, which gradually relocated from the German ports to Rotterdam.[16] In 1976, after Combined Container Service was founded, the firm soon opened an office in Rotterdam.[17] In the same year, it opened its first terminal in Ginsheim Gustavsburg, close to Mainz on the opposite side of the Rhine. The new company made losses initially, but by the rapid expansion of its chartered barge business and aggressive market competition had become the market leader by the end of the 1970s.

In 1977, Combined Container Service was already sailing five barges with a total capacity of 321 TEU. The company tried to make optimal use of its capacity by having each barge make at least one trip a week. Nonetheless, in the beginning, the services were highly irregular. However, in 1978, after its competitor Rhinecontainer started to sail according to fixed schedules in a manner that was similar to the railways, Combined Container Service followed its example. This strategy seemed to work because, in 1978, its volumes had grown by more than 50 percent from 18,119 to 27,884 TEU.

[12] Ibidem.
[13] 'Containervervoer op de Rijn gebeurt op allerlei manieren', *Rotterdam Europoort Delta*, (1980) 16-20.
[14] T. Notteboom, 'Inland waterway transport of containerized cargo: From infancy to a fully-fledged transport mode', *Journal of Maritime Research*, IV (2007) 63-80.
[15] From Henk van Ielen, director Kieserling 1990-1994, manager Container Transport at Kleijn Transport 1994-2010, 01-10-2113, From Jos Denis, director Combined Container Service 1991-2000, 01-10-2013, electronic correspondence, personal archive of the author.
[16] Hugo van Driel, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse*, 56-58.
[17] Interview with Jos Denis, director Combined Container Service 1991-2000, 06-09-2012.

The strength of the company was that Kieserling had good contacts with sea container lines, which supplied the necessary volumes to start up the service. Military goods in particular were important, comprising 65 percent of the cargo, with 25 percent being chemicals.[18] The introduction of regular liner services, which meant a bundling of container volumes that was comparable to rail shuttles, made Rhine barge container transport popular and efficient, giving a boost to the transported volumes.[19]

[18] Ibidem, 60-62

[19] T. Notteboom, 'Inland waterway transport of containerised cargo: From infancy to a fully-fledged transport mode', *Journal of Maritime Research*, IV (2007) 63-80.

Figure 5.3 *Rhine barge terminals between 1968 and 1980*.

Breaking through (1980s to the mid-1990s)

In the 1980s, barge container transport definitively broke through. Indeed, in 1980, 60,000 TEU were transported on the Rhine, growing to 200,000 TEU in 1985, which is an average annual growth rate of 27 percent.[20] In 1982, the sector was responsible for 34 percent of cross-border container transport from and to Rotterdam. With growing volumes, peaks in demand also rose, which could only be matched by increasing the size of barges. As a consequence, average barge capacity grew from 50 TEU in 1976-78 to 90 TEU in 1980 and 200 TEU in 1990, which is growth of 300 percent. Initially, existing barges were converted for container transport, but special versions were later built that required a high level of investment.[21]

One of the causes of the boom in barge container transport was the logistical transition that took place in the mid-1980s with the introduction of the just-in-time delivery principle. This change, which had a similar effect to the sudden rise in fuel prices in the early 1970s, stimulated barge container transport by shifting the emphasis from speed to reliability. This favored the barge, which was known to be reliable on the Rhine, as it faced fewer physical obstructions than other modalities, although it was slow.

Once the transportation of containers by barge proved to be viable, the number of container terminals on the Rhine started to grow significantly. Indeed, 20 new Rhine terminals were opened in the period 1980-1987.[22] By the end of the 1980s, there were already 30 terminals and the sector started to worry about overcapacity. Nevertheless, growth was encouraged by local, regional and national authorities with subsidies. Indeed, many municipalities wished to enter the new market and planned container facilities in their ports, even if they could not generate enough volumes to operate them profitably.[23] In this period, Combined Container Terminals acquired three terminals along the Rhine; in 1983, it bought a terminal in Ludwigshafen that was situated on the opposite side of the Rhine to Mannheim, enabling it to have a presence in the area with its major transport volumes. Indeed, having a terminal close to the military bases and chemical industry that supplied much of its cargo was important. Then, in 1986, the company bought shares in a container terminal in Koblenz, the municipality of which wished to establish container services in the area and Combined Container Service willingly filled this empty spot on the terminal map.[24] Finally, in 1989, Combined Container Service moved down the Rhine, following the general tendency of Rhine transport to do so, and bought shares in the Dortmund terminal in the Ruhr area.

During the 1980s, Combined Container Service continued to be successful, sharing its leading role with Rhinecontainer and Frankenbach. Indeed, in 1985, these three companies together had a 91

[20] a&s management DLD and Stichting Projecten Binnenvaart, *Basisdocument Containervaart*, (2003) 3.
[21] Hugo van Driel, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse*, 43-53.
[22] Theo Notteboom, *Inland waterway transport of containerised cargo: From infancy to a fully-fledged transport mode*, 65.
[23] Ibidem, 66.
[24] Interview with Arndt Puderbach, terminal manager *Contargo Rhein-Main Terminal Koblenz*, former terminal manager *Contargo Terminal Aschaffenburg*, 05-06-2012.

percent share of the market: Combined Container Service had 48 percent, Rhinecontainer 31 percent and Frankenbach 12 percent. In 1986, the largest companies transporting containers divided the Rhine between them, thus forming a geographic cartel. Combined Container Service and Rhinecontainer got the Lower and Middle Rhine and, to secure their market position, tried to ensure that the market was as inaccessible as possible for their competitors by way of their terminal politics, only allowing their own barges at their own terminals.[25]

Barge sector, liberalized (mid-1990s to the late-1990s)

In the early 1990s, the EEC aimed to free European transport. For the barge sector, this liberalization process meant an increase in both intramodal and intermodal competition. Germany's abolition of minimum tariffs led to an increase in the former, which occurred between both the market leaders and the small companies in the barge sector. For the larger firms, the consequences of the growth in competition were not as dramatic, as most of them were German businesses operating under similar conditions and were actually already dividing the market. While in the 1980s competing large barge companies limited the extent of their cooperation to dividing the Rhine between them, in the 1990s they went further and started capacity cooperation. In 1992, Combined Container Service, Rhinecontainer, Haniel, and Haeger & Schmidt entered into a cooperation agreement on the Lower Rhine under the name *Fahrgemeinschaft Niederrhein* (barge pool), and agreed to transport the volumes they acquired by exclusively using these barges.[26] At the same time, competition between small skippers from the two countries intensified, as they were allowed to perform cabotage on each other's waters and freight rates fell because of the abolition of minimum tariffs in Germany.

Liberalization also intensified intermodal competition. Indeed, the freeing of the road haulage market had major effects on the sector, as barge transport almost always involved a truck ride for the last mile. The abolition of cross-border short and long distance licenses changed the competitive position of the barge companies. In particular, the combination of the abolition of long distance licenses and the freeing of cabotage in Germany meant that barge transport had to deal with increasing competition from the road haulage sector both there and in the Netherlands. At the same time, intermodal competition increased due to new, cheaper shuttles operated by new entrants to the rail market, a few of which were running services parallel to the Rhine.

In this period of growing intermodal and intramodal competition, Combined Container Service expanded its geographical reach dramatically; while its barge container transport up to the 1990s mainly took place on the Rhine and between Germany, the Netherlands, Switzerland and, to a limited extent, France, the company extended its services to Central and Eastern Europe and Northern

[25] Hugo van Driel, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse*, 62
[26] 'Nieuwe dienst op de Danube', *Nieuwsblad Transport*, (24 maart 1994). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/22206/ArticleName/NieuwedienstopdeDanube/Default.aspx , seen on 02-10-2013.

France in the 1990s using a combination of barge and road transport. At the same time, the firm ventured off the Rhine to Aschaffenburg on the Main, and to the Dutch domestic barge market on smaller waterways. In 1994, when the Rhine-Main-Danube Canal was opened, Combined Container Service and the German barge company Bayerische Lloyd and the Austrian DDSG Cargo started a new container service called Rhein-Danube-Container Linie between the North Sea and the Black Sea.[27] This connection was not a major success, as extra transshipment was necessary because the maximum size of barge allowed on the canal was 100 TEU, making it expensive, while the 59 locks slowed journeys down. Combined Container Service had already contemplated starting up a rail shuttle between Ludwigshafen and Regensburg when the connection opened in order to shorten the transit time to Vienna by two days. These plans were not, however, realized.[28]

As the number of Rhine terminals started to rise, including along the Lower Rhine, in 1995 Combined Container Service established a container terminal on the German-Dutch border in Emmerich. Three years later, it moved its Ginsheim-Gustavsburg terminal to Frankfurt am Main Hoechst, which was situated in the industrial park of this chemical giant. This step was taken to move closer to the chemical industry. Then, in 1996, the firm made its first move in the north of France, where, together with a French company Escofi, it started a container service between Antwerp and the barge terminal in Valenciennes.[29] In the second half of the 1990s, Combined Container Service ventured into the Dutch domestic market on minor waterways. Since the container terminal at Nijmegen, which was the first barge container terminal in the Netherlands other than Rotterdam in the late 1980s, proved to be viable, the sector started to believe that even short distance barge container transport could be profitable. In 1996, Combined Container Service challenged Dutch domestic rail transport by establishing a container service from Almelo, the old Holland Rail Container terminal, to Rotterdam. This replaced the rail shuttle that NS Cargo had terminated with a barge service.[30] The new barge shuttle service made a good start, but had to be closed in 1997 because of nautical restrictions on the waterway, which did not allow there to be increases in scale in the form of larger barges.[31] Later, the

[27] 'Spooralternatief voor 't Main-Danube-kanaal', *Nieuwsblad Transport* (7 December 1996). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/43360/ArticleName/SpooralternatiefvoortMainDanubekanaal/Default.aspx, seen on 20-06-2013.

[28] 'Nieuwe dienst op de Danube' *Nieuwsblad Transport* (24 maart 1994) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/22206/ArticleName/NieuwedienstopdeDanube/Default.aspx, seen on 20-06-2013

[29] 'Start containerdienst van Antwerpen naar Valenciennes', *Nieuwsblad Transport* (8 oktober 1996). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/41742/ArticleName/StartcontainerdienstvanAntwerpennaarValenciennes/Default.aspx, seen on 28-10-2013.

[30] 'Bolk begint binnenvaartdienst tussen Almelo en Rotterdam', (17 mei 1996), http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/38113/ArticleName/BolkbegintbinnenvaartdiensttussenAlmeloenRotterdam/Default.aspx, seen on 28-10-2013.

[31] 'Succesvolle start voor de 'natte' shuttle op Almelo', *Nieuwsblad Transport* (4 juni 1996) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/39096/ArticleName/SuccesvollestartvoordenatteshuttleopAlmelo/Default.aspx, seen on 28-10-2013, 'Nautische beperkingen te groot Einde voor shuttle op Almelo', *Nieuwsblad Transport*, (7 juni 1997) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/47811/ArticleName/NautischebeperkingentegrootEindevoorshuttleopAlmelo/Default.aspx, seen on 28-10-2013.

company challenged the road haulage sector in the Netherlands by creating a firm called WaterNet, which transported containers by so-called WaterTrucks, which were 63 meter Kempenaars that, because of their size, could easily operate on small waterways.[32] WaterTrucks were used in a service for the redistribution of empty containers between Rotterdam, Harlingen, Zaandam, and IJmuiden.[33] Finally, in 1998, the Aschaffenburg terminal on the River Main was opened, although it did not have a long life as its cargo mainly came from a single shipper (Figure 5.4).

Figure 5.4 *The network of Combined Container Terminals in the 1990s*

[32] A barge for transport on smaller channels. Its name originates from the fact that the first prototypes were developed for the Kempisch Kanaal in Belgium. They can transport 400-600 tons of cargo and have a maximum water gauge of 2.5 metres.

[33] 'Burger en CCS samen in netwerk binnenvaart', *Nieuwsblad Transport* (10 juli 1999) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/100977/ArticleName/BurgerenCCSsameninnetwerkbinnenvaart/Default.aspx, seen on 18-06-3013.

Logistic integration (2000s)

Barge container transport in the 2000s was characterized by concentration and integration tendencies. The scaling-up was due to the increasing concentration of power by the sea shipping companies.[34] Leading barge container carriers were striving for functional vertical integration in order to be able to offer door-to door services from the port to a customer's doorstep within their own organization.[35] In this period, numerous joint ventures were entered into and there were many mergers and takeovers, with the aim being to widen the geographical scope of the services on offer and develop their own barge transport networks.[36] Container transport became increasingly intermodal in this period, and there was a wave of investment in new terminals in Northern France, the Netherlands and Belgium. In the first decade of the new century, the Netherlands, Belgium and France had more than 30 barge container terminals, which represented tremendous growth compared to the six in existence in the 1990s.[37] The majority of a terminal's volumes often came from just a few large shippers, which secured the basic volumes for a terminal and made transport flows repetitive and homogeneous. Moreover, a terminal close to a major shipper often played an important role as a depot for just-in-time deliveries.[38]

In the 2000s, Combined Container Service joined in with the scaling up that was characteristic of this period. The Krefeld terminal, for example, was founded in 2000, but soon moved to a more pivotal location in Duisburg. This was followed by the company's sudden expansion when it joined forces with Contargo in 2004. Contargo was formed by the merger of four partners: the terminal operator Unikai Agenturen, the barge company Rhenus, the rail company Neutral Container Shuttle System (NeCoss), and Combined Container Service. As a result of the merger with Unikai and Rhenus, their terminals, as well as those owned by Combined Container Service, came into the possession of Contargo, which thus acquired Unikai's two container terminals in Strasbourg and Ottmarsheim in France, and Rhenus's previously acquired container terminals in Worth on the highest point of the Middle Rhine and Alpina Basel in Switzerland. At the same time, Contargo gained a rail connection from NeCoss to the German ports. The main activity of this rail company was operating trains from and to the German ports, which made transshipment possible between the Rhine terminals and Hamburg and Bremen[39] (Table 5.1).

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[34] T. Notteboom, 'Inland waterway transport of containerised cargo: From infancy to a fully-fledged transport mode', *Journal of Maritime Research,* IV (2007) 63-80.
[35] Ibidem, 71.
[36] Ibidem, 70.
[37] Theo Notteboom, 'Thirty-five years of containerization in Antwerp and Rotterdam: structural changes in the container handling market', in Reginald Loyen, Erik Buyst and Greta Devos (eds.), *Struggling for Leadership: Antwerp-Rotterdam Port Competition between 1870-2000* (Antwerpen 2000) 137-138.
[38] Ibidem, 76.
[39] Contargo, 'History' http://www.contargo.net/index.php?option=com_content&task=view&id=149&Itemid=228, seen on 05-10-2011.

Table 5.1 *Participants in the 2004 merger that formed Contargo with the terminals and connections that these companies brought with them.*

Contargo			
Unikai Agenturen	Rhenus	NeCoss	CCS
Strasbourg Ottmarsheim	Worth Alpina Basel	Rail connection to Hamburg and Bremen	Ludwigshafen Frankfurt am Main Koblenz Dortmund Duisburg Emmerich

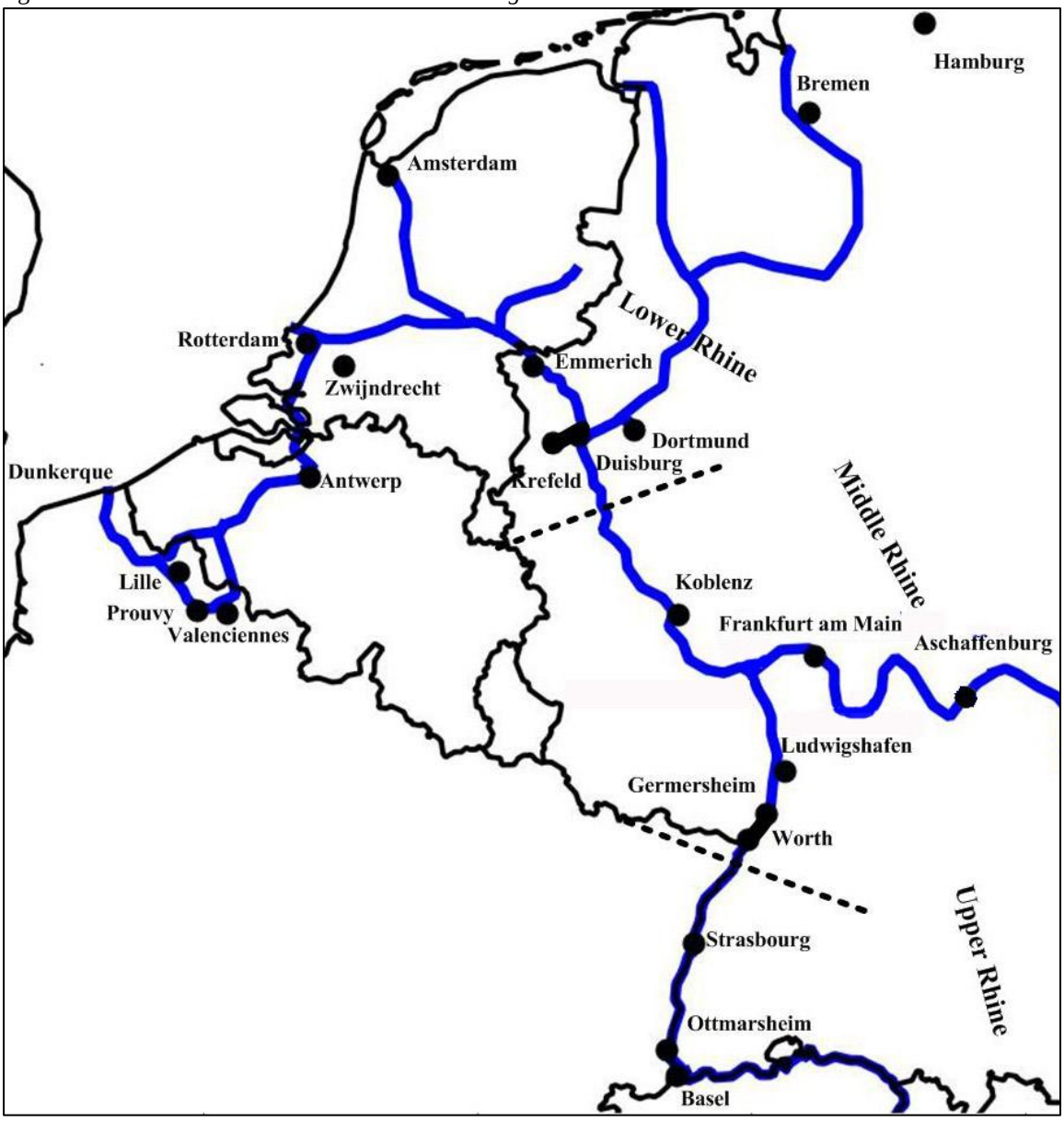
Contargo, 'History' http://www.contargo.net/index.php?option=com_content&task=view&id=149&Itemid=228, seen on 05-10-2011.

In the second part of the 2000s, Contargo extended its network in France by acquiring Interfeeder Ducotra BV in Dordrecht in 2006. Contargo needed this company to strengthen its position on the Upper Rhine, where it already had a few terminals. Interfeeder Ducotra was renamed Contargo Zwijndrecht and was given the function of planning and exploiting barge liner services. This meant that the terminals' staff no longer needed to worry about planning, but could instead concentrate on cargo acquisition.[40] With the opening of its Japanese office in 2009, Contargo established itself as an important player in an increasingly globalized world. The final addition to the Contargo network was the Germersheim terminal in 2010, which was used as an overflow port for Ludwigshafen.[41]

By 2010, Contargo was a major logistics service provider specializing in trimodal hinterland transport and value added activities, such as stuffing, stripping and handling flexi tanks, and bottling wine. The company had four shipping lines and three rail connections and was also involved in road haulage.[42] Nevertheless, barging remained its most important activity. In 2010, Contargo had a throughput of approximately 1 million TEU (Figure 5.5).[43]

[40] Interview with Vinke Cok, managing director *Contargo Zwijndrecht*, 8-10-2012
[41] Contargo, 'History' http://www.contargo.net/index.php?option=com_content&task=view&id=149&Itemid=228, seen on 05-10-2011.
[42] http://www.contargo.net, seen on 05-10-2011.
[43] Interview with Heinrich Kerstgens, director *Contargo*, 04-10-2011.

Figure 5.5 *The Combined Container Service/Contargo network in the 2000s.*



Determining the hinterland of barge container transport – the numbers

From the distribution of barge container transport between Rotterdam and other countries, it is clear that the major hinterland nations were the Dutch domestic market, Belgium and Germany (Figure 5.6). The remaining possible hinterland countries of Slovakia, Poland, Hungary, the Czech Republic and Austria, all of which could be reached by the Rhine-Main-Danube Canal, amounted to a fraction of one percent of the total barge container transport. Consequently, they do not qualify as hinterland countries. France, meanwhile, with a share of between one and three percent also played a minor role.

Until 1994, when the Rhine-Main-Danube Canal was opened, it was impossible to reach Central and Eastern European countries by barge, although some container terminals on the Rhine did

have a rail connection to this area. This means that minor maritime container flows transshipped in Rotterdam and transported on the Rhine did travel to Central and Eastern European countries, but these volumes were insubstantial. When the Rhine-Main-Danube Canal created a waterway connection between the North Sea and the Black Sea in 1994, the Rhine barge container transporters jumped at the new opportunity. However, the new market proved to be disappointing, as rail connections were faster and cheaper over such distances. The market was also fragmented. All of the transshipments taking place at the Nurnberg barge container terminal in 2010, namely 264 TEU, could have been transported by the barges that Combined Container Service operated on this trajectory in three turns.[44] Consequently, the role of the Central and Eastern European countries as a hinterland area for barge container transport from and to Rotterdam was negligible.

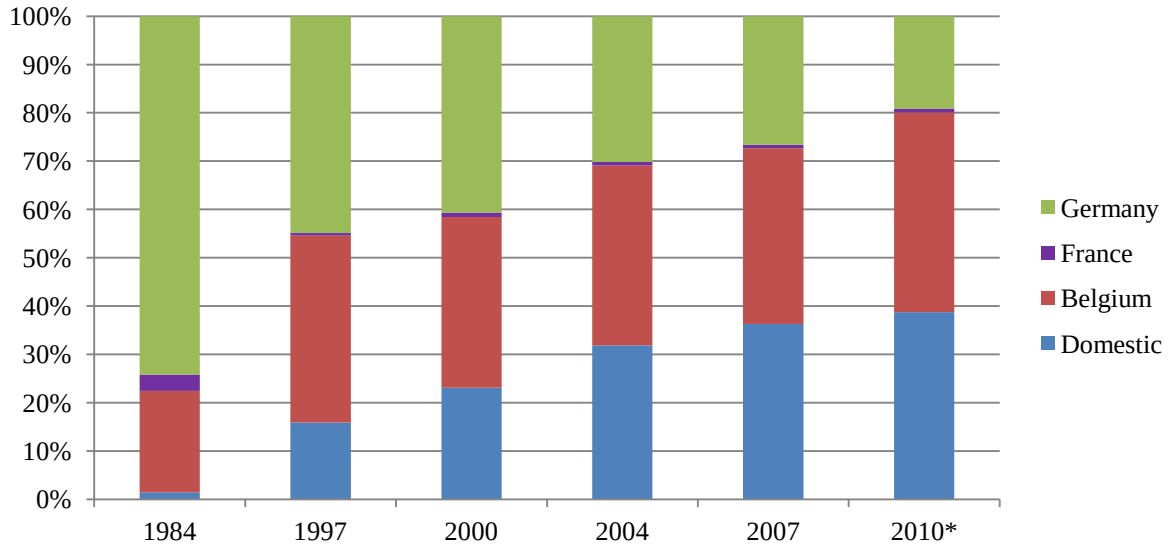
Containers transshipped in Rotterdam could arrive in France in three ways: by sailing to one of the French terminals on the Rhine; reaching the country via the Belgian canal system; or being transshipped in Belgium and transported to France by another modality. The route through Belgium only became accessible after the opening of the Rhine-Scheldt Canal. Meanwhile, the two largest Rhine terminals in France were Strasbourg and Ottmarsheim, with a total transshipment of barge containers of almost 180,000 TEU in 2010.[45] The major barge container terminals in the north of France were Lille, which transshipped almost 50,000 TEU, and Valenciennes, which transshipped 120,000 containers. Accordingly, in the French terminals that could be reached from Rotterdam in 2010, a total of approximately 300,000 TEU was transshipped, although between the Netherlands and France this figure was only about 17,000 TEU. This means that Rotterdam had less than a six percent share of the French container transshipments carried out by barge. The Rotterdam minor hinterland was mainly served by other ports, for the most part by Antwerp and to a lesser extent by Dunkerque and Le Havre. The fact that the amount of transported volumes to France did not grow substantially after the opening of the Rhine-Scheldt Canal means that Rotterdam did not manage to conquer the northern French hinterland from Antwerp.

Combined Container Service played an important role in both the north of France and on the French part of the Rhine. In 1996, the company entered the northern French market when it set up a barge container terminal in Prouvy, close to Valenciennes. Contargo was also active in the French part of the Upper Rhine, where it acquired the French Rhine terminal Ottmarsheim in 2004. In 2008, in the neighbourhood of Valenciennes, Contargo created CCES Combined Container Escaut Service in cooperation with a French company in order to perform logistics activities in Provy and St. Saulve. The area around Valenciennes supplied relatively low volumes. However, the presence of a malt factory there was why locating logistics activities there was still worthwhile.[46] Later, companies were

[44] 'Containerticker', *Schiffahrt Haven Bahn und Technik,* 2 (2012) 75-77.
[45] 'Containerticker', *Schiffahrt Haven Bahn und Technik,* 2 (2012) 75-77.
[46] Interview with Leo Roelofs, sales and intermodal products, *Contargo, DIT Duisburg Intermodal Terminal GmbH,* 13-04-2012, 26-06-2012.

attracted by the cheap transport opportunities on offer after a Toyota plant was constructed close to the terminal. Contargo barge services connected the surroundings of Valenciennes with Dunkerque, Antwerp and Rotterdam through canals in Belgium and France. Furthermore, CCES also participated in the Lille-Dourges container terminal.[47]

Figure 5.6 *Share of different hinterland countries in container barge transport in percentage terms in the years 1997, 2000, and 2004.*



Source: Containervervoer in de grensoverschrijdende binnenvaart, in *CBS Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011), a&s management DLD, Basisdocument containervaart (Rotterdam 2003), Joost Kolkman, *Binnenvaart en containerlogistiek Leerervaringen uit het buitenland en van andere modaliteiten voor afhandelingsproblematiek in de zeehaven* (Den Haag 2009).

Until the second half of the 1980s, the Dutch domestic barge container market was insignificant, as the only Dutch barge container terminal was situated in Rotterdam. The geographical reach of Rotterdam's barge container transport moved down the Rhine after the first Rhine container terminals were established in the late 1960s in Mannheim, Strasbourg and Basel. In 1987, this cumulated in the construction of Container Terminal Nijmegen at a distance of only 100km from Rotterdam. This terminal showed spectacular growth, rising from the transshipment of zero TEU in 1987 to approximately 14,000 TEU in 1990.[48] As a result, the domestic barge terminal network also started to

[47] Gilbert Bredel has been in charge at Contargo Container Escaut Service, CCES in Valenciennes for three years http://www.contargo.net/index.php/en/press-archives/press-2011/455-the-captain, seen on 22-02-2013.
[48] 'Containerterminals van Nijmegen en Emmerich willen samenwerken', *Nieuwsblad Transport* (17 oktober 1991).

grow. The initiators of the terminals were often major truck companies, which turned to barge transport as a solution to road congestion.[49]

Domestic container transport by barge grew throughout the benchmark years from 21 percent in 1987 to 39 percent in 2010. The share of the Belgian hinterland grew from 21 percent in 1984 to 33 percent in 2010, with some fluctuations between the two years. The German hinterland, meanwhile, shrank from 74 percent in 1984 to 23 percent in 2004, before growing again to 44 percent in 2010. The growth of the domestic market was due to the fact that the barge market increasingly discovered the opportunities provided by barge transport over shorter distances. This tendency was encouraged by government policy aimed at supporting environmentally friendly barge transport. Furthermore, the number of Dutch inland barge terminals was growing exponentially. Municipalities tried to attract terminals to their backyards to create employment and economic opportunities for their residents. Major companies like the beer producer Heineken played an important role in this process, with the firm making increasing use of barges loaded with continental containers for inland transport. However, because of the huge volumes involved, only large companies could afford to do this.

Combined Container Service entered the Dutch domestic market after liberalization, and tried to open up new opportunities in short distance transport. In 1996, it established a container service from the old Holland Rail Container terminal in Almelo, replacing the shuttle that NS Cargo had terminated. Combined Container Service cooperated with a local road hauler, Bolk Transport, for this connection, setting up a new company, Combi Terminal Twente. Although it had a longer transit time, barge transport was deemed to be competitive as it could offer prices that were 10 percent lower than those of NS Cargo's old rail shuttle.[50] The new barge shuttle made a decent start, having a good loading percentage even in its first year.[51] Nevertheless, the service had to be stopped in 1997, because of the nautical limitations of the waterway. In particular, the service was operated by three small ships, and when the scale of the transport grew, these vessels could not be replaced by one larger barge because of the 28 bridges that had to be passed on the route. The service was thus moved to Emmerich, from where the containers were forwarded by truck to their final destination.[52] In the same year, Combined Container Service tried to establish a service between Amsterdam and the German hinterland which was to include cargo from Rotterdam. The barge *Theodorus Johan* was

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http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/4769/ArticleName/ContainerterminalsvanNijmegenenEmmerichwillensamenwerken/Default.aspx, seen on 27-12-2013.

[49] Rijkswaterstaat Dienst Verkeer en Scheepvaart, *Containervervoer per binnenschip beschrijving van een transportrevolutie te water*, 17.

[50] 'Bolk begint binnenvaartdienst tussen Almelo en Rotterdam', *Nieuwsblad Transport*, (17 mei 1996) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/38113/ArticleName/BolkbegintbinnenvaartdiensttussenAlmeloenRotterdam/Default.aspx, seen on 27-12-2013.

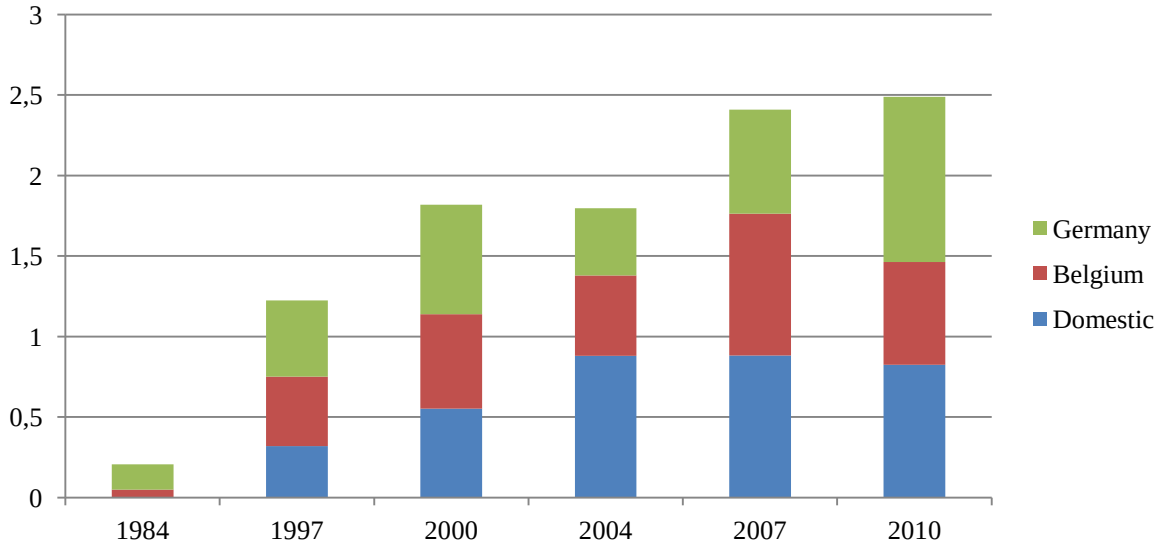
[51] 'Succesvolle start voor de 'natte' shuttle op Almelo', *Nieuwsblad Transport* (4 juni 1996) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/39096/ArticleName/SuccesvollestartvoordenatteshuttleopAlmelo/Default.aspx, seen on 27-12-2013.

[52] 'Nautische beperkingen te groot Einde voor shuttle op Almelo', *Nieuwsblad Transport* (7 juni 1997) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/47811/ArticleName/NautischebeperkingentegrootEindevoorshuttleopAlmelo/Default.aspx, seen on 27-12-2013.

chartered for this service of approximately 40 containers. It had a capacity of 192 TEU, although this could only be loaded to a maximum of 100 TEU because of the nautical restrictions of the Amsterdam-Rhine Canal.[53] Neither of Combined Container Service's initiatives on the minor Dutch waterways proved to be successful. Nevertheless, the company's expansion into the Dutch domestic market highlights the growing interest in short distance barge services. Indeed, during the entire research period, the number of domestic barge terminals was growing, illustrating the tendency indicated in the analysis.

The absolute numbers, however (Figure 5.7), paint a slightly different picture, as barge transport had been growing exponentially from the 1980s onwards. The reduction of the German share in 1997 was for a number of reasons. The share of the Belgian hinterland, for example, grew because barge transport on the Rhine-Scheldt Canal was no longer hindered by tidal movements after 1986. Moreover, when the Dutch domestic market started to grow, Germany's share contracted, although the German market did still expand. Indeed, it was only in 2000 that there was a set-back in barge transport to and from Germany. Then, in 2004, the Dutch domestic market was boosted again and the German hinterland became less important. After 2004, however, the domestic market in the Netherlands no longer grew substantially, while the shares of Germany and Belgium again gained in importance.

Figure 5.7 *Number of containers transported between Rotterdam and its major hinterland countries by barge per million TEU (1987-2010).*



Source: 'Containervervoer in de grensoverschrijdende binnenvaart', CBS *Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken, 59-71, Centraal Bureau voor de Statistiek, *Binnenvaart; goederenvervoer binnenlandse en internationale binnenvaart* (Heerlen 2013).

[53] 'Binnenkort shuttletrein Amsterdam-Rotterdam', *Nieuwsblad Transport*, (13 mei 1993), http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/16481/ArticleName/BinnenkortshuttletreinAmsterdamRotterdam/Default.aspx, seen on 27-12-2013.

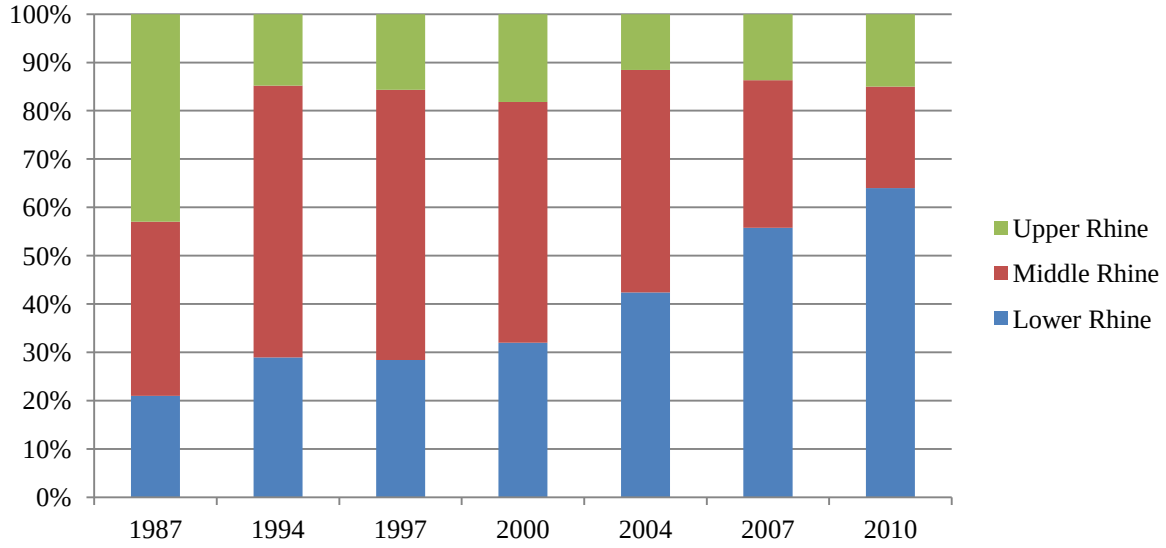
Belgium was an increasingly important hinterland country for Rotterdam barge container transport, with the majority of the volumes in Belgium travelling between Rotterdam and Antwerp. This was due to the concentration of container volumes in a few seaports as a result of a huge rise in deep sea transport.[54] Consequently, because of the main port effect, increasing volumes needed to be redistributed between the two ports. Accordingly, in order to profit from these container flows, Combined Container Service started a feeder line on the route in 1977. Nevertheless, by 1983, the connection came to an end, as this market had special requirements that the service could not satisfy. In particular, as the Rhine-Scheldt Canal was not finished, barges had to sail through the North Sea and, as a consequence, were often delayed. For this reason, deep sea ships had no room in their schedules. However, after 1986 and the completion of the Rhine-Scheldt Canal, which was a shortcut between Rotterdam and Antwerp, the services were restarted.

This connection was successful, because of the intensive container flows. Indeed, barge transport was not the only modality to be attracted by this flow, which witnessed cut throat competition between all of the modalities on the route. After the opening of the Rhine-Scheldt Canal, barge transport gradually gained ground from rail transport, especially for the movement of empty containers, which had less of a need for speed than the full ones. The Antwerp connection was based on logistics relationships, not local production, and the container flows were a side-effect of a change in the former.

Figure 5.8 provides insight into the development of the German hinterland according to the separation of the Rhine into the Lower Rhine, Middle Rhine and Upper Rhine. The share of transport between Rotterdam and the German Lower Rhine region increased gradually, from 21 percent to 64 percent; that of the Middle Rhine fell from an initial 36 percent to 21 percent, after growth to 56 percent in 1994; and that of the Upper Rhine shrunk from 43 percent in 1987 to just 15 percent in 2010. These numbers lead us to a conclusion that is similar to that reached with respect to rail transport, as they demonstrate the shrinking of container transport's geographical range. Just as with rail container transport, barge container shipping from and to Rotterdam was more concentrated on the Dutch home market, Belgium and parts of Germany that were just across the border. While the geographical reach of rail container transport fell both absolutely and relatively, in the case of barge transport this was only relative. Transport on the Rhine from and to Rotterdam was growing on all three parts of the Rhine, but was growing faster on the Lower Rhine than the other two areas.

[54] T. Notteboom, 'Inland waterway transport of containerised cargo: From infancy to a fully-fledged transport mode', *Journal of Maritime Research*, IV (2007) 63-80.

Figure 5.8 *Relative importance of the Lower, Middle and Upper Rhine in percentage terms (1987-2010).*



Source: 'Containervervoer in de grensoverschrijdende binnenvaart', CBS *Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken, 59-71, Centrale Commissie voor de Rijnvaart, *Economische ontwikkeling van de Rijnvaart Statistieken* (Straatsburg 1996-2001), Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Accordingly, Rotterdam's most important hinterland countries for the transport of containers by barge were the domestic market, Belgium and Germany. Prior to the completion of the Rhine-Scheldt Canal, Belgium could only be reached from Rotterdam by sea. Consequently, until the end of the 1990s, Belgium was less important than Germany. In the 2000s, the tide turned and Germany became less important than Belgium. At the same time, the Dutch domestic market was growing steadily. German container transport, meanwhile, was growing on all of the three parts of the Rhine, but the largest growth was experienced on the Lower Rhine. This indicates a shift in the gravity point of Rotterdam-related barge container transport down the Rhine, meaning that there was an intensification of the transport links within the Lower Rhine region. In terms of the domestic market, which was growing even more than transport from and to the Lower Rhine region, regionalization within the Lower Rhine area can be observed in terms of Rhine barge container transport.

Lower Rhine

The transport of containers along the Rhine by barge started on the Middle and Upper Rhine, with the Lower Rhine region joining in relatively late. Even in the early 1990s, when Rhine container transport had already proved to be a fully-fledged competitor to the other two modalities, there was still a limited supply of maritime containers for barges along the Lower Rhine. In these years, 80,000 TEU were transported along the Lower Rhine annually, which was less than a fifth of the total transport along the river. The fact that there were not enough volumes of containers on all parts of the river to guarantee profitable transport worried barge companies. Accordingly, in order to increase the loading percentages

of its barges, Combined Container Service, together with Rhinecontainer, Haniel and Haeger & Schmidt, entered into a cooperation agreement in 1992 called *Fahrgemeinschaft Niederrhein*.[55] The reason for this was that on the Middle Rhine, in contrast with the Lower Rhine, there was an abundance of cargo that could be containerized, such as semi-finished industrial products, chemicals and military cargo. On the other hand, in the Lower Rhine region, the majority of the transported cargo was bulk, coal and iron ore for Ruhr industry. The local ports were originally built for the transshipment of this cargo. When employment in the coal and steel industry fell, logistics activities were attracted to the area to create employment. Examples of the diminishing heavy industry in the Ruhr area are the fate of the Krupp factory in Duisburg and *Westfalehutte* in Dortmund.

In Duisburg in the mid-1990s, an industrial area that used to belong to the Krupp factory was made suitable for container transshipments with the financial support of the European Union. Duisburg had a particular need to create employment opportunities as the closure of the Krupp factory led to 15,000 people losing their job.[56] Meanwhile, in 2004, *Westfalenhutte* was moved from Dortmund, with its iron work disassembled and transported in containers along the Rhine by Contargo's Rhine Westfalen shuttle service to Rotterdam. From there, the disassembled factory was shipped to China by the steel producer the Jiangsu Shangang Group. Once in China, the factory was reassembled and started to operate again.[57]

The local municipalities tried to resolve the problems caused by unemployment by creating jobs in logistics. Their strategy involved building container terminals in their ports so that they did not depend too much on the transshipment of bulk, which was expected to become less important in the long run. The efforts of the local authorities, which were backed by regional policy, were fruitful, with numerous companies settling in the Lower Rhine region such as IKEA's European distribution centre, Konica Minolta, and a well-known department store. These were the terminals' customers, together with forwarders like Kühne & Nagel, DB Schenker and diverse warehouses. The only two local shippers were Bayer and a food processing factory.[58]

There were numerous container terminals in the Lower Rhine region, three of which were acquired by Combined Container Service before 2010: Dortmund (1989), Emmerich (1996) and Duisburg (2003). The terminals on the Lower Rhine were owned by the local municipalities, from where Combined Container Service bought its shares. The transport connections and orientation of the

[55] Hugo van Driel, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse* (Rotterdam 1993) 116-123.
[56] Interview with Leo Roelofs, sales and intermodal products, Contargo, DIT Duisburg Intermodal Terminal GmbH, 13-04-2012, 26-06-2012.
[57] Interview with Christian Riegel, Contargo, company management Container Terminal Dortmund, 11-04-2012.
[58] Interview with Leo Roelofs, sales and intermodal products, Contargo, DIT Duisburg Intermodal Terminal GmbH, 13-04-2012, 26-06-2012, Interview with Christian Riegel, Contargo, company management Container Terminal Dortmund, 11-04-2012. Interview with Michael Mies, managing director, Contargo, Rhein Waal Terminal Emmerich and Heiko Vollmer, sales manager, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012.

terminals provide important insights into the importance of the logistic hinterland in port competition. Dortmund occupied a special position, as it had a favorable geographic location; situated approximately 250km from Rotterdam and 300 from the German ports, transport costs between them and Dortmund were almost equal.[59] This raised the question of which ports the terminal was oriented towards. The answer lies in its transport connections, as the city is situated along the Dortmund-Ems Canal. This connected it to Emden, and it was also possible to reach Bremen from there. This route was, however, long and slow, and was made worse by the numerous bridges and locks. There were plans to establish a barge service to Bremen, but this proved be too expensive.[60] Until 2007, Dortmund had a barge connection to Duisburg, the main Rhine port, with a 54 TEU capacity that was adjusted to the canal. The trajectory included five locks and 99 bridges. As a result, barges could only be loaded with two layers of containers and carry a maximum of 60 TEU. Moreover, as Rhine barges grew in size, a connection with such low volumes was no longer considered to be efficient. Therefore, in 2007, the Dortmund barge shuttle to Duisburg was terminated. This meant that Dortmund lost its barge connection to Rotterdam and Antwerp, and its terminal thus became increasingly oriented towards the German ports with which it had a good rail connection.[61]

Emmerich had a different position in the logistical hinterland, with its container terminal being the lowest German barge terminal along the Rhine, just next to the Dutch border. Being situated less than 200km from the North Sea, this container terminal carried out transshipment for short sea transport to Britain, which was performed by Geest Container Lines from the 1970s. In 1990, when Geest left the scene, the terminal lost the majority of its transshipments. In 1992, however, it attracted the newly founded *Farhrgemeinschaft Niederhine*, which started regular barge line services between Emmerich, Rotterdam and Antwerp. Transshipments then increased steadily, growing from approximately 10,000 to 22,000 TEU in 1994.

In 1996, Combined Container Service acquired 37.6 percent of the Emmerich terminal's shares. Emmerich, which was primarily a barge terminal, was oriented towards the North Sea ports and, because of its rail connection, ran a shuttle to Basel.[62] In 2003, the Duisburg terminal was constructed in the logistics cluster in the newly built industrial area of Logport, which was equally oriented towards Antwerp and Rotterdam. At the same time, as it had access to the rail terminal in Duisburg, it was well connected by rail to Rotterdam, Italy and the German captive hinterland in the Central and Eastern European countries.[63]

[59] Interview with Heinrich Kerstgens, director *Contargo*, 04-10-2011.
[60] Interview with Christian Riegel, *Contargo*, company management *Container Terminal Dortmund*, 11-04-2012.
[61] Ibidem.
[62] Interview with Michael Mies, managing director, Contargo, Rhein Waal Terminal Emmerich and Heiko Vollmer, sales manager, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012.
[63] Interview with Leo Roelofs, sales and intermodal products, Contargo, DIT Duisburg Intermodal Terminal GmbH, 13-04-2012, 26-06-2012.

Middle Rhine

Barge container transport on the Rhine started in the Middle Rhine region, as the first containers to arrive at the Port of Rotterdam mainly contained military cargo destined for the Middle Rhine area. The Rhine was used to form a border in the war, which is why army depots were situated there. Later, the US army was also supplied from these depots during the Gulf War (1990-1991) and the Iraq War (2003-2011). The biggest depot belonged to Good Year,[64] and the availability of containerizable automobile, machine and chemical industry products increased the attractiveness of this region to those involved in container transport. Indeed, there were several major industry representatives located in the area, including BASF, Mercedes/Daimler, Roche and Boring.

In 2010, *Contargo* had six terminals in the Middle Rhine: Koblenz (1986), Frankfurt am Main (1998), Aschaffenburg (1999), Ludwigshafen (2004), Worth (2004) and Germersheim (2007). All of these had barge connections to Rotterdam and Antwerp that ran equally as often, with only the Worth terminal having an extra ro-ro barge connection to Rotterdam that was filled entirely with trucks.[65] There was a major difference between the Combined Container Service terminals on the Lower and Middle Rhine. In contrast to the terminals on the former, those on the latter were not owned by municipalities but by subsidiaries of shippers. For example, the Frankfurt am Main terminal belonged to Infraserf, a subsidiary of Hoechst.[66] While the terminals on the Lower Rhine mainly did business with companies involved in logistics, those on the Middle Rhine generally had at least one large shipper in their backyard. Most of these shippers were active in the machine industry. They also guaranteed the majority of the volumes, which the terminals could supplement with other cargo. In some cases, the shippers even required the terminal to also transship other cargo, which made the transportation of their volumes cheaper.[67] The terminals with such major shippers were Frankfurt am Main, Ludwigshafen and Worth. The first of these was situated in the Hoechst Industry Park, from where it not only transported containerized cargo from and to the chemical cluster, but also did so for customers from outside. This terminal also had a rail connection, and so transported containers to the hinterland areas of both the Port of Rotterdam and the German ports.[68]

The Worth terminal was situated close to the truck plant of Daimler Benz. Indeed, in 1965, the state of Rheinland Pfalz built the port especially for the company when it moved its production from Stuttgart to Worth to benefit from cheap barge transport. In the 1960s and 1970s, car parts were transported in boxes of different sizes. However, in 1977, when Unikai Hafenbetrieb Worth GmbH took over the port, it introduced standardized containers for the export of car parts to Saudi Arabia and South Africa. In the same year, Daimler, which was the terminal's only shipper, transported 2000-3000 containers. In 2008, through a merger with Unikai, Contargo became the owner of the terminal.

[64] Interview with Konrad Fischer, Contargo, managing director Terminal Ludwigshafen, 06-06-2012.
[65] Interview with Wolfgang Schlegel, manager Contargo Terminal Worth, 08-06-2012.
[66] Interview with Andreas Mager, terminal manager Contargo Terminal Frankfurt am Main, 05-06-2012.
[67] Ibidem.
[68] Ibidem.

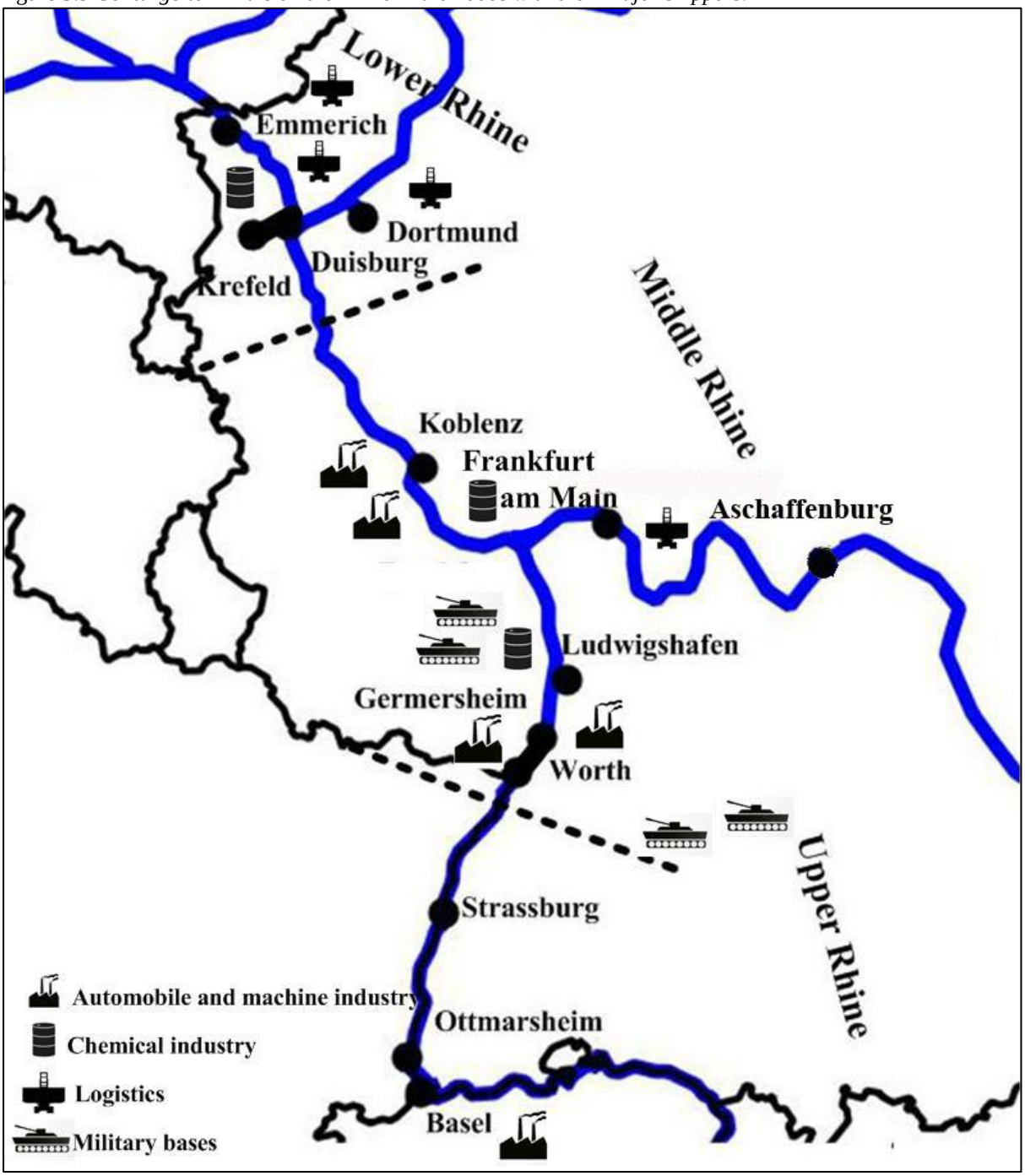
By that time, apart from car parts, the transshipments consisted of raw materials and unfinished goods for the paper and machine industries in the surrounding areas, for example Stuttgart.[69] TriPort in Ludwigshafen, which Contargo acquired in 2004, was located close to the chemical giant BASF in Mannheim, which was situated just across the Rhine, and so transshipped major chemical volumes. Next to this, the Ludwigshafen terminal transshipped containers for the local machine industry and military supplies for the American troops in the neighbourhood.[70]

Koblenz and Germersheim did not have a major shipper, instead transshipping diverse products. Koblenz was a transitory terminal between the Lower and the Middle Rhine, and bulk was originally also transshipped there, just as in the terminals along the Lower Rhine. However, this bulk was not coal and ore, but construction materials and items for recycling. From 1986, when the container terminal was founded, it transshipped a wide range of agriculture, light industry (tiles) and heavy industry products.[71] The volumes transshipped in Germersheim were equally diverse, because it was the overflow port of Ludwigshafen and Worth and transshipped different types of containerized cargo such as furniture, tires, agricultural machines for John Deere, paper, wood, cellulose, machine parts and old clothes for Pakistan. Military goods were also important to Germersheim, as numerous American military bases were situated in the neighbourhood: Kindsbach, Kaiserlautern, Kirchheimbolanden, Stuttgart, Boblingen and Rahmstein.[72]

The container terminal in Aschaffenburg was in an exceptional position, as it was the only Contargo terminal along the Middle Rhine to rely almost exclusively on logistics activities. Its fate as a one-day-fly did, however, prove how volatile such connections could be. The terminal was established because the local EON power plant stopped operating, which meant that it no longer needed to be supplied with coal. In order to keep employment in the area, the municipality of Aschaffenburg invested 7 million DM in a container facility.[73] A customer of the Koblenz terminal, the Japanese sea shipping company Nippon Yusen Kaisha, (NYK), had a contract with Nintendo, the producer of (among other products) computer games, and decided to channel this transport flow of imported games from Hamburg through Aschaffenburg. After the crisis of 2007-2008, the trajectory of the Nintendo games was changed, and the terminal gradually lost its volumes. As a result, in 2011, Contargo ended its involvement with the terminal.[74]

[69] Interview with Wolfgang Schlegel, manager Contargo Terminal Wörth, 08-06-2012.
[70] Interview with Konrad Fischer, Contargo, managing director Terminal Ludwigshafen, 06-06-2012.
[71] Interview with Arndt Puderbach, terminal manager Contargo Rhein-Main Terminal Koblenz, former terminal manager Contargo Terminal Aschaffenburg, 05-06-2012.
[72] Interview with Jasmin Daum, manager Contargo Terminal Germersheim, 07-06-2012.
[73] 'CCS biedt dienst naar Aschaffenburg', *Nieuwsblad Transport* (18 november 1999), http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/104220/ArticleName/CCSbiedtdienstnaarAschaffenburg/Default.aspx, seen on 27-06-2013.
[74] Interview with Arndt Puderbach, terminal manager Contargo Rhein-Main Terminal Koblenz, former terminal manager Contargo Terminal Aschaffenburg, 05-06-2012.

Figure 5.9 *Contargo terminals on the Rhine in the 2000s with their major shippers*.



Interview with Leo Roelofs, sales and intermodal products, Contargo, DIT Duisburg Intermodal Terminal GmbH, 13-04-2012, 26-06-2012; Christian Riegel, Contargo, company management Container Terminal Dortmund, 11-04-2012; Michael Mies, managing director, Contargo, Rhein Waal Terminal Emmerich and Heiko Vollmer, sales manager, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012; Konrad Fischer, Contargo, managing director Terminal Ludwigshafen, 06-06-2012; Wolfgang Schlegel, manager Contargo Terminal Worth, 08-06-2012; Andreas Mager, terminal manager Contargo Terminal Frankfurt am Main, 05-06-2012; Arndt Puderbach, terminal manager Contargo Rhein-Main Terminal Koblenz, former terminal manager Contargo Terminal Aschaffenburg, 05-06-2012; and Jasmin Daum, manager Contargo Terminal Germersheim, 07-06-2012.

Lower Rhine, Middle Rhine and Upper Rhine

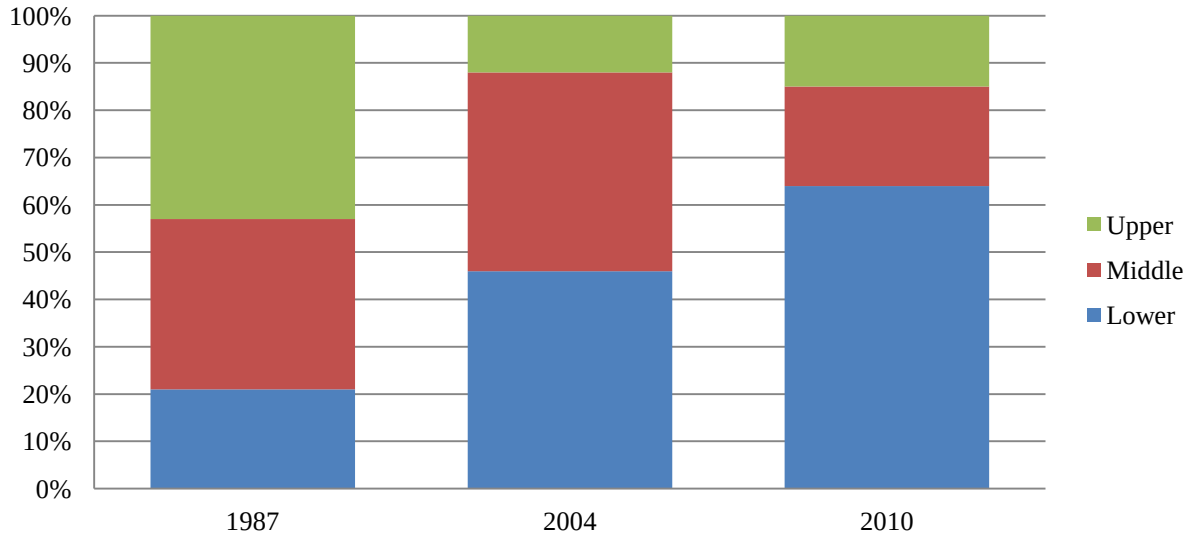
Two differences between the terminals on the Lower and the Middle Rhine have already been mentioned, but there is also a third, namely that, with the exception of Worth, the terminals with the largest transshipments were situated on the Lower Rhine. The size of the ports also depended on the kind of connections the terminals had. All of them forwarded their transshipments by truck within a radius of approximately 50km. At the same time, those with a rail connection were relatively large in size, and also had different distribution areas than those with only a barge connection.

Orientation, namely the share of transport connections to and from different areas of the Rhine terminals, is essential when it comes to understanding the importance of the Port of Rotterdam. Rotterdam was known as an import port, while Antwerp was an export port. German industry produced major volumes of general cargo for export, which was mainly transshipped in Antwerp. Indeed, Antwerp specialized in the export of German products. Within this context, it would have been understandable if maritime containers arrived at Antwerp first, as they originated from general cargo. Rotterdam, however, also attracted maritime containers, which led to more imports than exports. Meanwhile, military cargo and the later Asiatic transport consisted of more imports than exports.

Emmerich, with a limited number of rail connections, was oriented towards Rotterdam and Antwerp during its existence. Due to the importance of logistics activities to Emmerich, Rotterdam, which was strong in Asiatic imports, was more valuable to it than Antwerp, which is traditionally stronger in industrial exports. Like the other ports on the Lower Rhine, Duisburg was also involved in distribution. As it was situated close to a major rail terminal, it was able to profit from good rail connections. As a result, it had frequent connections to both the south of Germany and Italy. Dortmund, meanwhile, no longer had a barge connection, and was therefore increasingly oriented towards the German ports because of its rail connections. Consequently, it had also a good connection to Southern Germany. Koblenz, which had no rail connections, was strongly oriented towards Antwerp and Rotterdam. This was partly due to its balance between imports and exports. The terminal Frankfurt am Main, which had a lot of chemical cargo and a rail connection, had frequent services to Central and Eastern European countries and Italy, to which the transport of chemicals was traditionally important. Aschaffenburg, which had a distribution function, had rail connections to German ports, South Germany and Central and Eastern European countries. Ludwigshafen, meanwhile, which was a terminal with diverse volumes, had a good barge connection to Rotterdam and Antwerp as well as a good connection to the German ports by rail. Germersheim was only an overflow port, so it did not have any connections other than those to the other Contargo terminals. Finally, Worth, which mainly transshipped trucks and truck parts, was connected to both major North Sea ports and the German ports. This shows that the Contargo terminals along the Rhine had specific characters depending on their size, kind of transshipments and connections, which makes it difficult to identify a general pattern in their orientation with respect to the port competition between Antwerp,

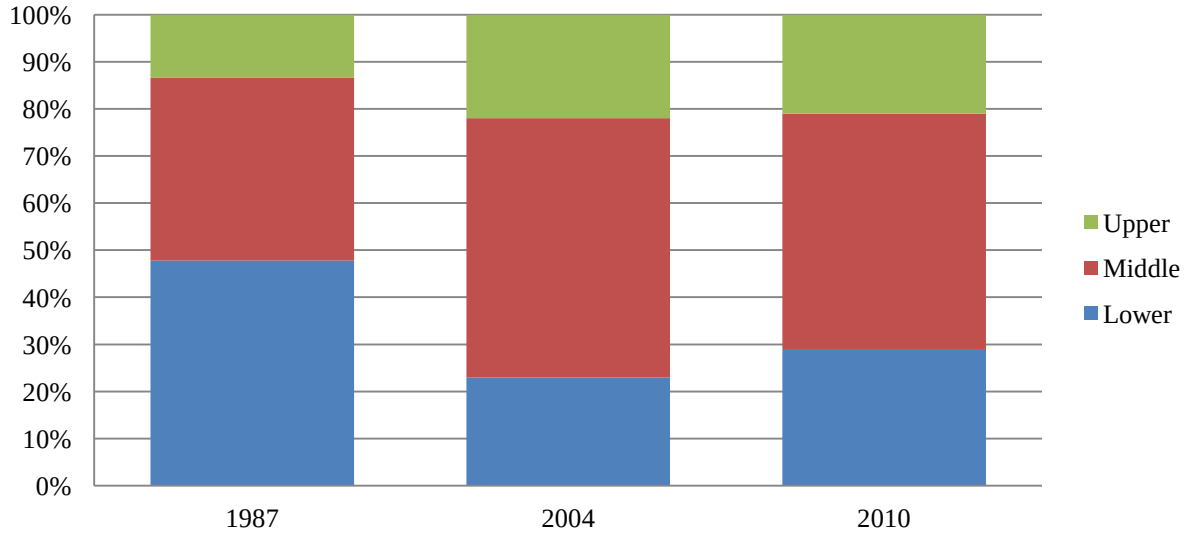
Rotterdam and the German ports. Comparing the share of Rotterdam and Antwerp in container transshipment on the Lower, Middle and Upper Rhine provides a clearer picture. (Figure 5.10 and Figure 5.11)

Figure 5.10 *Share of container transport between Rotterdam and the Lower Rhine, the Middle Rhine and the Upper Rhine in percentage terms in the years 1987, 2004 and 2010.*



Source: Containervervoer in de grensoverschrijdende binnenvaart, in CBS *Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken, 59-71, Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Figure 5.11 *The share of container transport between Antwerp and the Lower Rhine, the Middle Rhine and the Upper Rhine in percentage terms in the years 1987, 2004 and 2010.*



Source: Containervervoer in de grensoverschrijdende binnenvaart, in CBS *Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken, 59-71, Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Rotterdam's share of container transshipments grew on the Lower Rhine and fell on the Middle and Upper Rhine, while the opposite was the case for the Port of Antwerp; Antwerp's share on the Lower Rhine fell, but rose along the Middle and Upper Rhine in particular. The reason for this was that the terminals on the Lower Rhine were increasingly involved in logistics, transporting goods that were produced elsewhere. Rotterdam, as an import port and strong in terms of Asiatic transport, could facilitate these processes well. At the same time, in the Middle Rhine, much of the cargo consisted of exports for the German automobile and machine industries and could be better performed by Antwerp, an industrial port strong in exports. From the late 1980s to 2010, the gravity point of Rotterdam, which was oriented towards barge container transport, moved down the Rhine, while Antwerp gained shares from Rotterdam on the Middle and Upper Rhine, where the majority of products were industrial items.

Conclusions

Even though it was unnecessary to make many technical adjustments in order to transport containers by barge, the containerization of this form of transportation started later than in the other modalities. This was due to, among other things, the barge sector's lack of experience with utilization, and the fact that in the early years of the containerization of barge transport, companies only arranged the waterway part of the journey and neglected the last mile. Indeed, it took until the second half of the 1970s for the sector to organize the last mile, in this way offering an entire package to customers as well as regular liner services that were comparable to rail shuttles.

Two developments provided a major stimulus to barge transport. First, the energy crises in the 1970s hit the barge sector less than the road haulage sector, as the former had relatively high energy efficiency. This meant that transport lower down the Rhine than to Mannheim, which was the cradle of Rhine container transport, became possible. Indeed, even the Ruhr area came within reach of profitable container transport by barge on this waterway. Second, in the 1980s, the emergence of the just-in-time delivery principle again gave a boost to barge container transport by making reliability more important than speed. Then, the liberalization of the European transport market in the 1990s caused the growth of intramodal and intermodal competition by lifting transport restrictions both within and between Germany and the Netherlands. This also made it easier for companies to expand their network to other European Union countries. In the 2000s, there was concentration and integration in the barge container market. Barge companies scaled up by way of both horizontal and vertical integration in order to be able to extend their networks and perform the entire transport journey, including the last mile, within their own company.

Minor hinterland nations for barge transport were those in Central and Eastern Europe and France. Countries situated on the Danube became accessible from the Rhine from 1994, when the Rhine-Main-Danube Canal was opened. This market did not, however, meet expectations, because the route was long and slow and the maximum allowed barge sizes were much smaller than in Rhine

transport. France could, nevertheless, be reached on the Rhine and, from 1986, also via the Belgian canal system to Lille and Valenciennes. This transport overall nevertheless formed a minor share of the barge container transport taking place to and from Rotterdam.

In the period 1966-2010, the major hinterland areas of the Port of Rotterdam with respect to barge container transport were the Dutch domestic market, Belgium and Germany. The transport flows within the first of these had been growing since the discovery of its opportunities in the 1980s. The Belgian hinterland had also grown after the opening of the Rhine-Scheldt Canal, which supplied a safe shortcut to Antwerp, where most of the volumes were either going to or coming from. Container transport between Rotterdam and Antwerp formed a logistical relationship between the two locations that was unrelated to production. These transport flows were required to redistribute containers, and this was increasingly done by the barge sector. The share of container flows by barge between Rotterdam and Germany fell between the late 1980s and 2010, which was partly the result of increasing intermodal competition because, after liberalization, it was a lot easier for road haulage to compete with barges.

Between the late 1980s and 2010 within the German hinterland, Rotterdam's share of oriented barge container transport along the Lower Rhine increased, while that of the Middle Rhine decreased. The same fall could be seen in the Upper Rhine. This, together with the fact that the Dutch domestic hinterland was growing, means that the geographical gravity point of barge container transport between Rotterdam and its German hinterland moved down the Rhine. In other words, the average radius of barge container transport fell. This form of transport, just like its rail counterpart, increasingly depended on areas that were relatively close by. The growing transport links indicated regionalization within the Lower Rhine region. Nevertheless, a comparison of the share of Rotterdam with that of Antwerp shows that for the latter, the opposite was true; while its share in the Lower Rhine decreased, it increased in the Middle and Upper Rhine.

A study of Contargo's container terminals on the Lower and Middle Rhine were able to offer a plausible explanation for this phenomenon. The Contargo terminals on the Lower Rhine were established by local municipalities to replace diminishing industrial activities with logistics. On the Middle Rhine, the initiators of new terminals were mostly barge company shippers or terminal operators. Accordingly, on the Lower Rhine, municipalities created the supply of transshipment capacity to attract demand, while on the Middle Rhine the opposite was the case. The terminals on the Lower Rhine were increasingly oriented towards Rotterdam, which was strong in Asiatic imports destined for European distribution centers located in the area, while the terminals on the Middle Rhine were increasingly served by the industrial Port of Antwerp, which traditionally had good relations with the German export industry.

Liberalization had two major effects on barge container transport. As a result of the lifting of restrictions on barge and road haulage transport, intra and intermodal competition increased both within Germany and the Netherlands and between the two countries. This in turn increased port

competition, which became a contest between different logistics chains. Ports tried to encourage sea shipping companies to use them for their hinterland transport, as footloose containers had multiple potential routes to their final destinations. With the growth of cheap barge container transport, Rotterdam had an increasing advantage, while at the same time the new entrants, which were allowed on the railways because of liberalization, broke the rail shuttle market wide open and made tariffs lower. Road haulage no longer needed to play tricks, as Kieserling had done, to circumvent restrictions, and increasingly became serious competition to the barge sector.

The other effect of liberalization was that it made it possible for barge companies to extend their network geographically by entering new markets like Northern France and the Dutch domestic barge container market. In addition, it also became easier to make investments in other countries, for example in foreign terminals. Contargo extended its network in the hinterland of Dunkerque, Antwerp, Rotterdam, Hamburg and Bremen from Valenciennes to the Upper Rhine, the German ports, Central and Eastern European countries, Southern Germany and Italy. While ports were under pressure due to increasing competition, Contargo thrived and created a position as the spider in a web in the hinterland of Western European ports. This meant that it could react quickly and easily to changes in the hinterland. Moreover, being integrated in the logistics chain meant that it could serve Antwerp's extending and Rotterdam's shrinking barge hinterland. At the same time, it could exploit the rail connections to and from the German ports, which became cheaper as result of liberalization.

Chapter 6
Road Haulage, the King of the Modal Split
Maritime Containers and Land Containers, *One Way Truckers* versus Rotra Transport

This chapter explores road haulage, which formed the major part of the modal spilt between 1966 and 2010. The sector continued to dominate despite government policy directed towards a modal shift to more environmentally friendly forms of transport, namely rail and barge, from the 1980s onwards. The road haulage sector consisted of numerous small family-owned firms, and a few medium-sized ones. Large companies were rare, but during the research period a concentration and integration tendency could be observed. The liberalization of the European transport market had a major influence on road haulage. This was especially true for German-Dutch cross-border road haulage transport, as strict regulations concerning the German truck sector were lifted and cross-border transport became license-free. This chapter analyzes the changes in the geographical pattern of container transport by road, and also explains the role of the liberalization of the German and Dutch road haulage sector.

The history of container transport by road has received little attention in the literature, probably due to the lack and limited reliability of relevant statistics. There are several reasons for this. The road haulage sector mainly consisted of small family firms, which fought for their existence in a sector with low profits and cut-throat competition. Consequently, truthfully answering the inquiries upon which available statistics are based was not a priority. Furthermore, the companies only reported their transport activities for a single week per annum, with the results being extrapolated for the entire year. In many cases, this may not have been illustrative of the activities of a company over the course of a year. Moreover, due to the growing scale of deep sea container transport, road haulage had to deal with increasing peaks and troughs in volumes. As a consequence of its unreliability, the quantitative data used here should only be regarded as an indication of what was happening, which this chapter combines with qualitative information acquired by interviews held with representatives of the companies active in the road haulage sector.

In the Netherlands, hundreds of companies were involved in the transport of maritime containers by road. As a consequence, to ensure that the research was feasible, a relatively small selection of firms was examined. As a result of this focus, companies that were in some way involved in *one way trucking* were chosen. This term has been used in a number of different ways throughout the history of container transport. Among others, it was chosen as the name of a company that offered a container transport service between Germany and Rotterdam for which the customer only needed to pay the tariff for one way, with the firm arranging the cargo for the way back from its office in Mannheim, hence the choice of name. As the majority of the transport flows of such a firm ran parallel with the Rhine, this approach makes comparisons possible with barge and rail transport, which also used this trajectory. As well as the four companies that founded *One Way Trucking*, three other road haulage firms are considered here that were one way truckers in the wider sense of the

term, meaning that they tried to reduce transport tariffs by finding cargo for both parts of the journey. These companies were Kieserling, Kleijn Transport and Koolwijk Transport. Finally, research was conducted into Rotra Transport, a company that was mainly involved in the conveyance of continental flows. This firm was chosen because, as well as performing maritime container transport from and to Rotterdam, it focused on the transport of *Less than Truck Loads (LTL)*, meaning that the contents of the containers were collected from different places and could have different destinations. The cargo consisted of both goods arriving from overseas and products of European industry, and was transported in continental, pallet-wide loading units. While the rest of this work emphasizes the importance of the transport of maritime containers with anonymous contents, the case of Rotra shows that there was still a profit to be made by conveying land containers filled with break bulk cargo. A comparison between the geographic pattern of Rotra Transport's work and that of the one way truckers reveals that the geographical reach of the transport of continental containers is not influenced by port competition, unlike the transport of maritime containers. The history of container transport by road will be analyzed here mostly based on the development of these eight companies. This may seem to be a small sample, but while most of these firms started out small, they grew to become medium-sized businesses with a company and transport network that is highly relevant.

Road haulage before 1966

Trucking made its entrance in the Netherlands in the period 1923-1925 with the arrival of American trucks. Rotra Transport, for example, bought its first truck in this period. This was a major investment, and most haulers replaced their horses with trucks much later, around 1939, when they became more affordable.[1] Their introduction led to major changes in the transport sector, and due to their speed and reliability, trucks started to pose serious competition for rail and barge transport.[2] In the years 1910-1965, road haulage's share of total transport grew steadily; while in 1910 it only had three percent of the total transport share within the Netherlands, this grew to 38 percent in 1938 and 44 percent in 1965, just before the advent of maritime containers.[3] After World War II, there was huge demand for transport, but it was difficult to acquire a truck. Indeed, most transport was carried out by military trucks, the so-called dumpers, which were left behind by the US army after the war as it would have cost more to transport them back to the United States than their actual value.[4] As a consequence, thousands of these trucks were renovated and distributed from the Allied Army dump in Deelen in Enschende. Soon afterwards, the importation of British trucks commenced. In the 1950s, along with

[1] 'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf, seen on 11-11-2013.
[2] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk* (Rotterdam 1990) 79.
[3] Ibidem, 80.
[4] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.

the truck manufacturer *Kromhout*, which had been making trucks since the 1930s, DAF also started the production of these vehicles'[5]

The majority of post-war road haulage transport was domestic. In 1945, the largest cross-border road haulage flows were between the Netherlands and Czechoslovakia.[6] This transport was not, however, well organized, and the regulation of the sector was required. In 1946, at the request of the later minister of transport Th.S.G.J.M. Van Schaik (KVP, Katholic Peoples Party, 1948-52), the Dutch International Road Haulage Organization (Nederlandse Internationale Wegtransport Organizatie, NIWO) was founded to coordinate cross-border transport. Accordingly, from 1946, a permit was required from the NIWO to perform cross-border road transport. These were difficult to obtain, because of their numerous conditions. Permit holders were compelled to report on the volumes they transported and to use prescribed tariffs. Nevertheless by 1947, cross-border road haulage transport volumes had reached the pre-war level. This was extraordinary, as cross-border transport overall only reached the pre-war level by 1955, which meant that road transport was growing faster than transport by other modalities.[7]

The majority of the companies studied started their business after World War II with a single American truck in a region to the south east of the Port of Rotterdam (Figure 6.4). This was originally an agricultural area. The farmers worked hard during the agricultural season, but in the winter, when there was less to do on the farm, they often earned extra money by offering transport services with their horse and carriage. Then, with the gradual loss of agricultural work, it became customary for a farmer's son to try his fortune in the road haulage sector. The majority of the transported goods were agricultural products, especially milk, which had to be collected from farms (Figure 6.1). Almost all companies had an agricultural origin.[8] There were two exceptions, Kieserling, which came from Germany and originally transported construction materials and chemical products, and Stuij and the Man, which started by transporting break bulk in the Port of Rotterdam in 1945.[9] At the same time, manufacturing activities in the area related to the Port of Rotterdam like, for example, ship building, generated transport flows with its supplies and products.[10]

[5] Johan W.D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 71-72.
[6] Ibidem, 171.
[7] Ibidem, 173-175.
[8] The founder of Winterswijk BV was the son of a horse salesman, which can be viewed as an agricultural activity in the wide sense of the term. Interview with Gijs Winterswijk, commercial director/owner Winterswijk BV (1975-1999), 29-10-2013.
[9] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.
[10] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.

Figure 6.1 *The founder of Winterswijk BV, Geert Winterswijk, with his horse and carriage making his rounds to collect milk, Rotterdam Overschie, 1935/1940.*

Inscription: milk, eggs, cheese
Courtesy of Gijs Winterswijk.

Figure 6.2 *The Founder of Winterswijk, BV Geert Winterswijk, with his GMC dump truck just loaded with straw in Rotterdam, Overschie, 1947.*

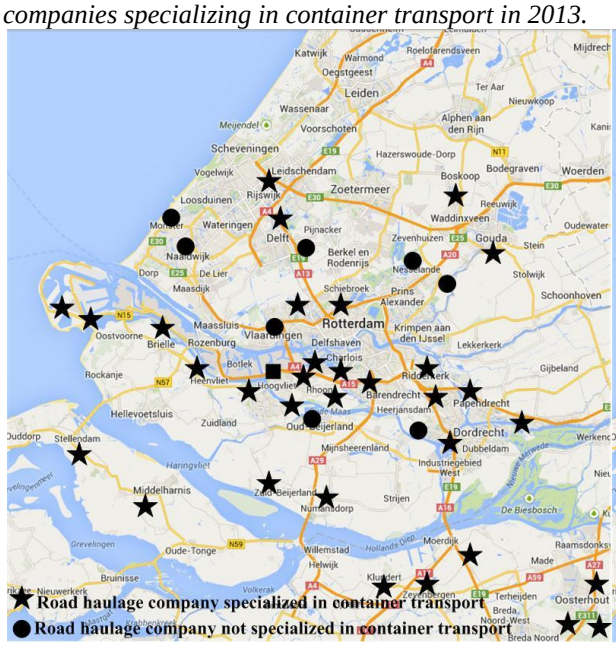
Courtesy of Gijs Winterswijk.

Situated on the other side of the Maas, to the north, Westland was also traditionally an agricultural area, and numerous men there with an agricultural background started truck companies in the same way after the war. Nevertheless, very few of these firms switched to transporting maritime containers, as this area of the country provided enough general cargo. From 1970 onwards, there was a demand to transport vegetables and flowers to Rotterdam and Schiphol airport.[11] Indeed, road haulage was the ideal transport modality because of its speed and flexibility, as these products decayed quickly. Much of the transported fruit and vegetable volumes were taken to Rotterdam where they were often loaded on to maritime containers at Merwehaven. In this way, there was a division of activities carried out by the truck companies above and below the Maas; above the Maas, most transport companies specialized in general cargo, consisting of agricultural products (Figure 6.3), while below the Maas many truck firms switched from general cargo to containers (Figure 6.4).

The concentration of the truck companies in the south east of Rotterdam had a cluster effect, which coincided with the geographic range of supplying industries for the port. After the war, these industries gradually disappeared, but the road haulage cluster was strengthened by, among things, improvements made to the A15 highway that connected this area to the port. Furthermore, the area was situated on the route from Rotterdam to Antwerp and Germany, which were the major hinterland areas of maritime container transport.

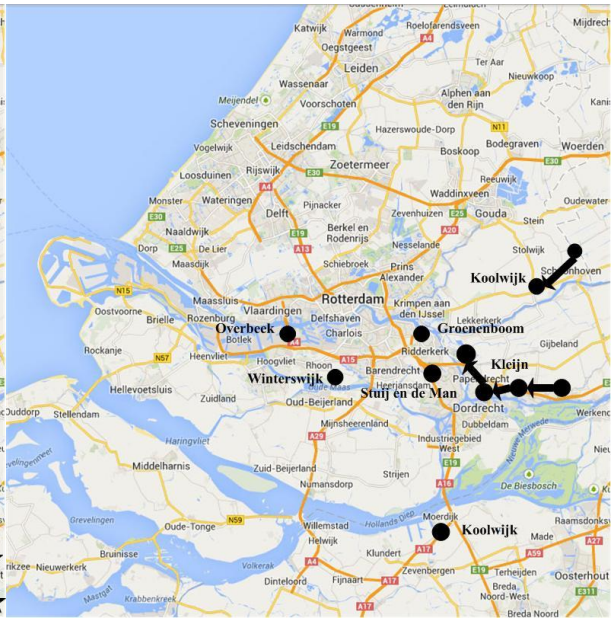
[11] Johan W. D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 91.

Figure 6.3 *The geographical positions of road haulage companies specializing in container transport in 2013.*



Source: Google Maps https://maps.google.nl/maps?ie=UTF-8&q=Container+transport&fb=1&gl=nl&hq=Container+transport&hnear=0x47c5b5c3515f58fd:0x89b05ca3c54bd43d,Delft&ei=oaVbUq7tBsnL0AWao4DADA&ved=0CO0BELYD, seen on 14-10-2013. https://maps.google.nl/maps?ie=UTF-8&q=truck+transport&fb=1&gl=nl&hq=truck+transport&hnear=0x47c5b5c3515f58fd:0x89b05ca3c54bd43d,Delft&ei=IHpeUoimKsyKswaCiYDwCw&ved=0CIQCELYD, seen on 15-10-2013.

Figure 6.4 *The geographical positions of the one way truckers.*



Source: Interview with Kees Overbeek jr., Gijs Winterswijk, Arie Koolwijk, Frans van den Boom, Kees Kleijn and Tom Stuij.

There were three hinterland countries that played an important role after the war before the arrival of maritime containers: Czechoslovakia, Germany and Britain. In the 1950s, cross-border truck transport mainly had Czechoslovakia as a destination, but this country was replaced as the major hinterland by Germany in the 1960s. Cross-border transport was important for the Netherlands and grew exponentially. In 1956, 1.8 million tons of cargo were transported abroad by truck, with this figure growing to 14.5 million tons in 1969, an annual growth of 17.5 percent. In 1956, the total volumes transported by truck between Germany and the Netherlands amounted to 0.9 million tons, which was 31 percent of the total road haulage transport in Germany. Meanwhile, in 1968 the volumes decreased to 8.4 million tons, which is 47.4 percent of the total truck transport in Germany. This means that despite the reduction in volumes, the market share of the Netherlands in the German market grew.[12] Much of these volumes must have consisted of maritime containers. Sea-Land, for example, ran a

[12] 'Rede van de staatssecretaris M.J. Keyzer gehouden voor de jaarvergadering van de stichting N.I.W.O. te Arnhem op 10 september 1969'.

weekly service primarily consisting of military cargo transported by truck to Mannheim, which must have amounted to 100,000 tons in the late 1960s.

The third most important hinterland country was Britain, and there were major flows of goods between it and Italy, both of which were situated on the prolongation of the two ends of the Rhine region. The transport between these two countries took place by short sea, including ro-ro transport. Entire trucks, or a part of them, were put on a ferry and, after crossing the channel, were driven away, mainly by Dutch trucks. As continental containers were already in use, a few companies had experience with intermodal transport before the arrival of maritime containers in Rotterdam.[13] Of the firms considered herein, Overbeek, Kleijn, Winterswijk and Stuij en de Man were involved in this type of transport.[14]

The arrival of maritime containers

The arrival of maritime containers in 1966 led to major changes in the road haulage sector. The first such containers in Rotterdam belonged to Sea-Land, which imported special chassis that haulers possessing a compatible truck had to rent to transport the containers further. The containers were lifted off a ship by a crane and put on the chassis, which was attached to the truck. The driver's task was simple, as he was not required to stuff and strip the loading unit, as training and experience was needed for this work; his only task was to drive the truck from one place to another without even touching the contents of the container. This made it easier for newcomers to enter the market, leading to fierce competition and falling freight rates.[15] Road haulers were also afraid that there was more competition to come from sea shipping companies that could have arranged their own transport, foreign truckers, or transport companies from the other modalities.[16]

In fact, containers increased the importance of road transport. The first container ships had a capacity of 226 TEU and, after transshipment, the containers had to be taken to the hinterland as quickly as possible. The majority of this transport was carried out by truck. Indeed, in 1966, 90 percent of all hinterland transport of containerized cargo was executed by road haulage; this percentage even rose as high as 95 percent in 1967.[17] This attracted new companies to the container market, which pushed prices down even further, particularly because many of the newcomers were one-man businesses that were prepared to work below cost price if necessary; as long as they earned more than the additional costs they incurred, it was better than being idle.[18] Not only did the position of truckers within the market change, but their position towards their consigner also became different.

[13] Interview with Jan Minnaard, former director Vereeniging van Zeecontainer Vervoerders, former director Spronssen Transport, 23-07-2013.
[14] Interview with Kees Overbeek jr., director/owner, Intern. Transportbedrijf Overbeek bv 24-09-2013, Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013, Interview with Gijs Winterswijk, commercial director/owner Winterswijk BV (1975-1999), 29-10-2013.
[15] S. W. Verstegen and Y. Alkema, *Containerisatie in het Nederlandse transport* (Den Haag 1991) 36.
[16] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk,* 327.
[17] S. W. Verstegen, *Containerisatie in het Nederlandse transport,* 33-35.
[18] Ibidem, 37.

Prior to the advent of maritime containers, truckers were mainly consigned by the shipper, sometimes with the help of a forwarder. However, the sea shipping companies that owned the containers now got involved and wanted to arrange transport to the hinterland via their agents. As a result, the road hauler lost the steady personal contact with the shipper and became dependent on the whims of the sea shipping companies. Sea-Land in particular was disloyal to its contacts, often changing its choice of transporter, which was a shock for the truckers.[19] The sector was also afraid that sea shipping companies would create their own truck services, forcing the existing container haulers out of the market.[20] Forwarders, however, also wished to earn money from container transport, offering their services to arrange hinterland transport for sea shipping companies. These sea shipping companies were large, had major volumes to distribute, and played the small road haulers off against each other. This became increasingly easy, as more and more transporters were attracted to Rotterdam by the opportunities of container transport and so relocated to be physically closer to the port (Figure 6.4).

In the 1960s, there was a concentration tendency in road haulage.[21] This started in 1965, prior to the introduction of maritime containers. Approximately 40 percent of truckers in the sixties belonged to a larger organization. Containerization attracted growing attention to the road haulage sector, making it profitable for family businesses to sell their firms.[22] Major shippers also started to acquire large haulers in order to perform their own transport. Shipping agents felt threatened by this, and so also started to buy road haulage companies. There were 38 major haulers in 1968, which were owned by large domestic or foreign sea shipping companies or shipping agents. While the number of haulers fell, investment in the sector was growing along with outputs. In 1965, 85 percent of companies had only one truck,[23] but in 1982, 400 companies were involved in the transport of maritime containers by road haulage, which was 5 percent of the total number of road haulage companies in the Netherlands.[24]

An example of a company involved in the transport of maritime containers was Schouten Transport, which, prior to the arrival of these containers, conveyed live animals, concrete, and wooden poles for construction, initially in the Netherlands and later also abroad. Through a mediation agency, the firm came into contact with Sea-Land and United States Lines, the first two pioneers in transatlantic container transport. Schouten started by transporting containers from Rotterdam to Mannheim. As a dedicated transporter for United States Lines, it was not allowed to offer its services to other customers. With its 20 trucks, Schouten had to transport the 250 containers that arrived at the

[19] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk,* 330-331.
[20] S. W. Verstegen, *Containerisatie in het Nederlandse transport,* 42.
[21] Hugo van Driel, *Samenwerking in haven en vervoer in het containertijdperk,* 342 According to Verstegen et al. this concentration cannot be directly attributed to containerization, but this is contested here. The 226 containers that were available at the same time and needed to be transported within a short period invited the increase of scale.
[22] Ibidem, 328-329.
[23] S. W. Verstegen, *Containerisatie in het Nederlandse transport,* 41.
[24] Ibidem, 42.

same time as the first container ships to the hinterland. These containers were filled with military cargo for the American troops in Germany. Then, from Germany, the trucks came back with return cargo, which was loaded in the containers at the army depots and consisted of, for example, wine and sports clothing.[25]

One Way Trucking (1970s-1980s)

Not all companies were as fortunate as Schouten Transport to have guaranteed return cargo, and the empty journeys back from the hinterland were increasingly considered to be a problem. Road haulers were not free to fill the containers with any cargo in the hinterland, as they were owned by the sea shipping companies, which did not want other firms' products in them. Nevertheless, the fact that filling a container with other companies' goods was forbidden did not mean that it never happened, with resourceful truck drivers acquiring products for the journey back to earn some extra money without the knowledge of the sea shipping companies. This happened even if it sometimes meant loading only one row of pallets into a maritime container as they could not hold two.[26] In some cases, leaving the empty containers in Germany and riding back with a full one was allowed, but compensation had to be paid.[27] As sea shipping companies paid per round trip, in the early days the empty ride back was not seen as a problem. Notwithstanding this, the growing competition in tariffs created real pressure, and truckers longed to transport full containers both ways.

One way trucking is a transport term, to which different meanings have been attributed during the history of container transport. Originally, in the 1960s-1970s, it related to a trick that some firms used to circumvent the transport regulations executed by the German minister of transport Georg Leber (SPD, 1966-1972). Leber introduced two kinds of permit for truck transport, one for long distances and another for the last mile. A long distance permit was expensive and difficult to acquire. Furthermore, long distance transport was taxed heavily in the form of the so-called *Leber Pfenning*. These regulations led to cooperation agreements between the owners of short and long distance permits. Truckers with the former deposited their containers for long distance destinations at terminals where they were transshipped to trucks with the latter permits. Then, from there, they were able to pick up their colleagues' short distance cargo.[28]

One way trucking was introduced to the Netherlands by Erich Kieserling who, after forming Combined Container Service in 1976, started container trucking with his company in Rotterdam. By offering truck services, Kieserling provided flexibility for hinterland transport. When there were

[25] Interview with Jan Niehof, account manager CARU Containers, former managing director Schouten Containers, Schouten Transport, 10-06-2013. In 1975, Schouten Transport fully specialized in the transport of maritime containers.
[26] Interview with Arie Koolwijk, director Koolwijk Transport, Minnaard, J., former director Vereeniging van Zeecontainer Vervoerders, former director Spronssen Transport, 23-07-2013.
[27] Interview with Henk van Ielen, director Kieserling 1990-1994, manager of container transport at Kleijn Transport 1994-2010, 18-07-2013.
[28] Interview with Henk van Ielen, director Kieserling 1990-1994, manager container transport at Kleijn Transport 1994-2010, 18-07-2013.

obstacles in the way of barge transport, such as low or high water, or when there was a need for haste, he could exploit the speed of road haulage. Kieserling also used one way trucking in a new way. After a journey from Rotterdam to Germany, he left his trucks and chassis at a terminal where they waited for possible return cargo to the Netherlands; he only hauled them back to Rotterdam empty when they were needed, which reduced the frequency of empty rides.[29]

In the 1980s, one way trucking came to mean securing return cargo by establishing depots in the hinterland or making use of the facilities already in existence that belonged to the forwarders there. A stimulus for this development came from the Rotterdam Port Authority through Vereniging Zeecontainer Vervoerders (VZV, Organization of Sea Container Transporters). VZV was founded in 1983, and was the first organization to transcend the small Dutch company organizations, which were arranged by religious denomination. The aim of VZV was to solve the common problems of the sector collectively. One of these issues was waiting times at the port, which meant that truckers had to wait until their containers were delivered or until it was their turn to be unloaded. In the meantime, the trucker was officially working, thus reducing the number of hours available for him to drive. This idle time cost the truck companies a lot of money.[30] VZV had good contacts with the Rotterdam Port Authority, which was increasingly worried about competition with Antwerp. In particular, the Belgian port was situated approximately 50km closer to the German hinterland, which automatically meant that truck tariffs for hinterland transport were lower. This was an issue, as the port authority was well aware that the choice of port made by the sea shipping companies was partially determined by the cost of hinterland transport. As a result, an attempt was made to put pressure on the road haulage sector to reduce its tariffs, for example by ensuring that it transported full containers in both directions.[31]

One way trucking could certainly do the trick; for a return trip with an empty container, a trucker could charge 1600 guilders, but with full containers both ways he could charge 1200 guilders for the trip to Germany and 900 to 950 for the journey back. As a consequence, one way trucking could raise a company's turnover by 30 percent.[32] This was, however, easier said than done, as there were peaks and falls in the demand for transport. Each trucking company had a sea shipping firm as its customer, with a two-weekly service to Rotterdam. The export containers had to be transported to the port within three days before the arrival of the ship, while the import containers had to be transported within three days to the hinterland. This meant intensive work for six days and eight days idle. Four family-owned companies of approximately the same size, which knew each other from VZV, decided to tackle this problem by combining their customers, thus spreading their work[33]

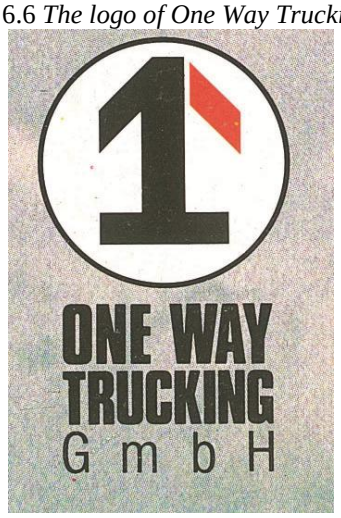
[29] Interview with Henk van Ielen, director Kieserling 1990-1994, manager container transport at Kleijn Transport 1994-2010, 18-07-2013.
[30] Interview with Tom Stuij, owner/ director Stuij en de Man 1973-1999, 15-10-2013.
[31] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013
[32] Ted Konings, "One way truckers' niet onverdeeld optimistisch', *Nieuwsblad Transport, (*4 juli1995), http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/32281/ArticleName/Onewaytruckersnietonverdeeldoptimistisch/Default.aspx, seen on 18-05-2013.
[33] Ibidem.

(Figure 6.5 and Figure 6.6). Stuij en de Man was a dedicated transporter for ZIM, an Israeli sea shipping company that exported sugar from Europe. The export of sugar was profitable because there was large demand for it in Israel for the conservation of fruit, while in Europe the export of sugar was subsidized. The majority of the return cargo was thus fruit. The company also transported diverse other products, including exports of artificial yarn from the Enka factory near Arnhem and chemical products from BASF in Ludwigshafen, near Mannheim. Winterswijk's major customer was Hapag Lloyd. This sea shipping company had German origins and also had major volumes going to Germany, especially to the Mannheim region. The Chinese Orient Overseas Container Line (OOCL) was a major customer of Overbeek, while Groenenboom transported goods for the United Arab Shipping Company (UASC). Taken together, the four firms had some 100 trucks between them.[34]

Figure 6.5 *The four founders of One Way Trucking*.

From right to left, Gijs Winterswijk, Kees Groenenboom, Tom Stuij, Kees Overbeek.
Source: *One Way Trucking: the right way to save container trucking costs* (Rotterdam 1986).

Figure 6.6 *The logo of One Way Trucking*.



Source: *One Way Trucking: the right way to save container trucking costs* (Rotterdam 1986).

To ensure that they had return cargo, the four partners decided to establish an office and a depot in the hinterland, with Tom Stuij and Gijs Winterswijk travelling together to Germany to identify a suitable place to store the containers, preferably at a barge terminal close to Mannheim. They could have hired facilities at the Frankenbach terminal in Mainz, but at just over 400km from the port, it was too close to Rotterdam. Finally, in an industrial area in Mannheim, they contacted the company Wohlfahrt Gmbh Co, which was willing to rent a warehouse and an office to *One Way Trucking* and even bought a crane for it.[35]

[34] Interview with Tom Stuij, owner/ director Stuij en de Man 1973-1999, 15-10-2013.
[35] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.

Mannheim was a logical location, as there were major volumes of containers available in the form of products from the local chemical and machine industries, as well as military cargo. Freight was forwarded from this central location to other destinations; goods were transported between Mannheim and the ARA ports of Antwerp, Rotterdam and Amsterdam. *One Way Trucking* divided the map of Europe into spheres with different tariffs and operated from its Mannheim base.[36] For example, to calculate the transport costs to Stuttgart, it calculated the distance from Rotterdam to Stuttgart and from there to Mannheim. This enabled the firm to offer a relatively low price, because the customer did not need to pay for the journey back from Mannheim to Rotterdam if there was return cargo. [37]

The office in Mannheim gained a spectacular order for the company from the US military. In 1991, during the Gulf War's Operation Desert Storm, the US army hired 50 trucks for three weeks to transport military goods from the depots in the neighbourhood to a Rhine terminal to be loaded on a barge. The US military paid the unusually high tariff of 1500 guilders per 24 hours.[38] Unfortunately, this was the only assignment from the army.[39]

In the early days, *One Way Trucking* moved 1500 containers per year. However, in 1994, only 400 containers were transported and, due to increasing intermodal competition, it was becoming more difficult to acquire enough containers for the journey back. Another problem was *One Way Trucking's* guarantee of a fixed price for trips to Germany. This meant that a truck had to work for this price even if there was no cargo available for the way back. As a result, *One Way Trucking* put an end to the guaranteed price system in 1995. Moreover, before cargo was accepted, the firm made sure that there was return cargo available.[40] This led to the fall of the company before its tenth anniversary, with its existence being ended by a letter from Tom Stuij to the Chamber of Commerce in Germany.[41]

Nevertheless, this did not end the cooperation between the four partners, who bought a barge terminal in Avelgem, Belgium in 1990. The reason for this modality jump was the growth in intermodal competition in the 1980s. Indeed, from the end of the 1980s, Overbeek lost 15 percent of its international transport to the rail and barge sectors. According to its director, this was due to improvements in the shuttle concept, which made rail transport more reliable and an increasingly agile competitor to road haulage.[42] As the 1980s was also the decade of the breakthrough of barge transport, road haulage companies saw that to survive they needed to offer the services of other modalities and

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[36] *One Way Trucking: The right way to save container trucking costs* (Rotterdam 1986) 1-4.
[37] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013
[38] Interview with Frans van den Boom, sales manager *Groenenboom Containertransferium Ridderkerk*, 03-09-2013.
[39] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.
[40] Ted Konings, 'One way truckers' niet onverdeeld optimistisch, *Nieuwsblad Transport*, (4 juli 1995). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/32281/ArticleName/Onewaytruckersnietonverdeeldoptimistisch/Default.aspx, seen on 18-05-2013.
[41] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.
[42] 'Wegvervoerder ziet grote toekomst in combivervoer', *Nieuwsvlad Transport* (23 Jan 1993). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/14079/ArticleName/Wegvervoerderzietgrotetoekomstincombivervoer/Default.aspx, seen on 23-07-2013.

reserve trucking for the last mile. As a consequence, the competition was felt more keenly than ever in the 1990s.

The liberalization of the road haulage sector (1990s)

After the 1970s and 1980s, when the Dutch road haulage sector was strong and Dutch truckers were known as the cowboys of the road, liberalization brought an end to this success story.[43] European road haulage transport was liberalized on 1 January 1993, from when cabotage was free and cross-border licenses were no longer required. One might think that this was a major relief for all road haulage companies, who no longer needed to attend at the Nederlandse Internationale Wegtransport Organizatie in The Hague to beg for cross-border licenses. However, this was not the case, as companies that were active in cross-border transport between Germany and the Netherlands were used to the restrictions and had learned to work around them. Stuij en de Man, for example, transported ferry goods from Rotterdam and Antwerp via France to Italy, so that German cross-border licenses were not needed. Indeed, the company found it easier to apply for permits in France, via its subsidiary in Belgium. Companies also learned to get relatively easy access to permits via conscientious bookkeeping. Furthermore, the lucky owners of permits before liberalization encouraged their drivers to avoid getting their licenses stamped at the border, offering a bonus of 10 guilders per unstamped license so that they could be reused.[44] Liberalization thus made this resourcefulness superfluous and opened the market up to competition from (inexperienced) newcomers.

Moreover, for some companies, the liberalization of the European road haulage sector had disastrous effects. An example is Stuij en de Man. During the second half of the 1980s, the firm bought the Belgian company Ferry Master Europe Express (thereafter Europe Express), which transported conventional goods in pallet wide containers through Belgium and France to Italy. The company developed a pattern of taking five days between the two countries. However, in 1993, as a result of liberalization, the exclusivity of this service disappeared and competing firms managed to offer similar services for lower tariffs. Furthermore, because of the easing of the controls at the national borders, some companies managed to perform the same service in four days. As a consequence, due to the combination of growing competition and the inflexibility of its drivers, who resented doing the same journey in less time, the company soon went bankrupt and almost dragged the Dutch part of Stuij en de Man with it. [45]

The increasing intermodal competition caused by liberalization also affected the activities of *One Way Trucking* in the Lower and Middle Rhine, leading to the company focusing on intermodal transport. As the Rhine was already crowded with barge terminals, the firm turned its attention to the Scheldt. Moreover, the company that leased trucks for Europe Express in Belgium tipped Tom Stuij

[43] Interview with Gijs Winterswijk, commercial director/owner Winterswijk BV (1975-1999), 29-10-2013.
[44] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.
[45] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.

off that Avelgem's barge container terminal, which was an initiative of the municipality, was heading for a fall.

The Wallonian city of Escanaffles was situated on the opposite side of the Scheldt, and a bridge between the two cities was used by Flemish workers to go to work in the sugar factory on the Wallonian side. When the sugar factory closed down, the mayor of Avelgem was worried about employment and decided to build a terminal in the hope that this would attract industry. The town was a suitable spot for a container terminal, as the bridge only permitted a barge to pass under it with two layers of containers instead of three. As a result, the river was made broader, so that barges could turn round. A Flemish entrepreneur, Louis de Zuther, started to exploit the terminal with two barges and five leased trucks.[46] However, as foreseen by the director of the company from which he leased his trucks (the same one that supplied trucks to Europe Express), de Zuther soon went bankrupt because of bad management.

In 1990, the four *One Way Truckers* decided to buy the terminal.[47] The idea was to reload the containers coming from Rotterdam or Antwerp by barge on to trucks and drive them to Paris, which was a comfortable distance of 250km. By performing part of the journey by barge, the service was able to offer a 300 euros lower tariff than when it was performed entirely by truck. [48] At that point, the only competition on the Scheldt was the terminal at Lille, which was situated 28km further in to France, but could only be reached by barges carrying a maximum of two layers of containers because of the bridge in Avelgem. Indeed, barges often left the third layer of containers in Avelgem and sailed on with two.[49] The terminal depended on barge transport from and to Rotterdam, as Antwerp was too close for it to make a profit. In the 1990s, there was a continuous 192 TEU barge service between Rotterdam and Avelgem, which sailed day and night with the exception of Sunday. Later, the terminal chartered more barges. This transport was submitted to the Scheldt tour de role system, which meant that the volumes had to be offered at the skippers exchange every three months. This not only meant extra costs for mediation, but also that skippers on the Scheldt who had little or no experience with container transport had to be trained over and over again. Luckily, the terminal built up a pool of skippers with whom it could cooperate well. These skippers even skipped other assignments to be able to work for the terminal. Nevertheless, it was a great relief when the tour de role system was abolished in 1998 as a result of liberalization. This solved many problems, including the fact that the terminal no longer needed to pay the shippers in exchange for mediation, resulting in more flexibility in the tariffs.[50]

[46] Marijke Groeneboom-Droge, *De aanhouder wint!* (Rotterdam 2011) 65.
[47] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.
[48] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.
[49] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.
[50] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.

At the end of the 1990s, the nature of *One Way Trucking* changed, as the majority of the shares fell into the hands of Groenenboom. In 1997, Winterswijk was taken over by the road hauler P.D. Albers BV, while in 1998, Stuij en de Man was sold to the major German road hauler Willi Betz.[51] Overbeek stayed in the joint venture for the longest time, with only a minority share of 25 percent.[52] At the same time, *One Way Trucking* turned into an informal group of road haulers, who emphasized the importance of finding return cargo and had good contact with each other.

Overall, the growth of container transport volumes to the Middle Rhine area in the 1990s attracted *One Way Trucking* to Mannheim. In the second half of the decade, the increasing intermodal competition caused by liberalization, especially with the barge sector that built terminal after terminal in the Middle Rhine area, drove the firm to a modality leap; they entered the barge sector in an area where there was less competition and the advantages of barge transport had not yet been fully exploited.

Integration and intermodality (2000s)

After this growth period for road haulage volumes in the late 1990s, which was followed by a dip between 2003 and 2004, container transport by road boomed between 2004 and the 2008 crisis. In the crisis, Kleijn Transport, for example, lost 25 percent of its turnover, and only recovered in 2013.[53] As a result of the crisis, there were numerous bankruptcies in the sector, meaning that the volumes grew for the companies that survived and there was rescaling in the road haulage sector.[54] The scaling-up of the sea shipping companies also influenced road haulage. In 2009, Maersk started tendering for the transport of its volumes every three months, which meant that it could easily play the competing road haulage companies off against each other.[55]

In the 2000s, truck transport was becoming increasingly peak sensitive. Due to the growing sizes of deep sea ships, the volumes were concentrated on the days that the ships arrived and the goods were transshipped, while on the other days there was no work to be done.[56] The competition from rail and barge transport was increasing because of the introduction of extra safety measures for transport with US destinations; as a consequence of the terrorist attack of 11 September 2001, goods to the country had to be registered two days before departure from Rotterdam. This gave the competing modalities enough time to organize transport. Consequently, the speed of truck transport was no longer an asset. [57]

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[51] 'Albers koopt Winterswijk', *Nieuwsblad Transport*, (10 juli 1997). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/48464/ArticleName/AlberskooptWinterswijk/Default.aspx, seen on 04-09-2013.
[52] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.
[53] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[54] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[55] Interview with Kees Overbeek jr., director/owner, intern. Transportbedrijf Overbeek bv 24-09-2013.
[56] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[57] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.

To escape the ever-growing intermodal competition, Groenenboom ventured further into barge transport. This time, he started barging closer to Rotterdam. In 2007, with an investment of three million euros, the barge terminal Container Transferium Ridderkerk was opened. With the transport of containers from Rotterdam to Ridderkerk by barge, the firm reduced transport costs substantially. Using road haulage, the transport of a container cost 145 euros. This was because of the waiting time at the port, the time that the driver spent on the road during transport, and fuel costs. Meanwhile, by barge, goods could be transported from Rotterdam to Ridderkerk for a price of 20 to 40 euros because of this modality's larger containers.[58]

By the end of the 2000s, all of the companies mentioned scaled-up through both horizontal and vertical integration. Groenenboom owned a garage and a container repair company next to barge terminals, Kleijn Transport had offices in Italy, Portugal and Germany, and Koolwijk had two premises, one in Bergambacht and one in Moerdijk. The companies that did not scale-up either went bankrupt or were taken over. Winterswijk, for example, was taken over by P.D. Albers BV, which became a part of Samskip, a logistics giant that offered services in all three hinterland container transport modalities, as well as short sea. Stuij en de Man, meanwhile, was taken over by a large German road hauler, Willi Betz, that owned 800 trucks. This is the same scaling-up that can be observed in the companies involved in the other two modalities.

The hinterland of the transport of maritime containers by road haulage before liberalization, 1985

Prior to the liberalization of the road haulage sector in 1993, statistics were only available for this research for one year, 1985, which was when a survey was conducted among container truck drivers at two locations, the ECT home terminal and the multi-terminal of Unitcentre in Rotterdam. This represented approximately 50 percent of the entire road haulage transport taking place on one day.[59] The representativeness of this survey is questionable, but as there are no other data available its results are treated and scrutinized here.

According to this survey: 72 percent of the containers transported to and from Rotterdam came from or were going to the Netherlands; 30 percent came from Rotterdam, probably from different warehouses; six percent came from the close neighborhood of Rijnmond; and the remaining 64 percent were from other places in the Netherlands (Figure 6.8). At that time, 28 percent of the containers being transported involved cross-border transport, 16 percent were coming from or going to Germany, 10 percent to Belgium and only two percent from other countries, specifically France and Austria. (Figure 6.7)

[58] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.

[59] T. van Vuren and G. R. M. van Jansen, *De verkeersafwikkeling van het container-wegvervoer van en naar de Rotterdamse haven* (Delft 1986, Rapport 86.1) 33-35.

Figure 6.7 *Origin and destination of all containers transported by truck from and to Rotterdam according to the survey in 1985.*

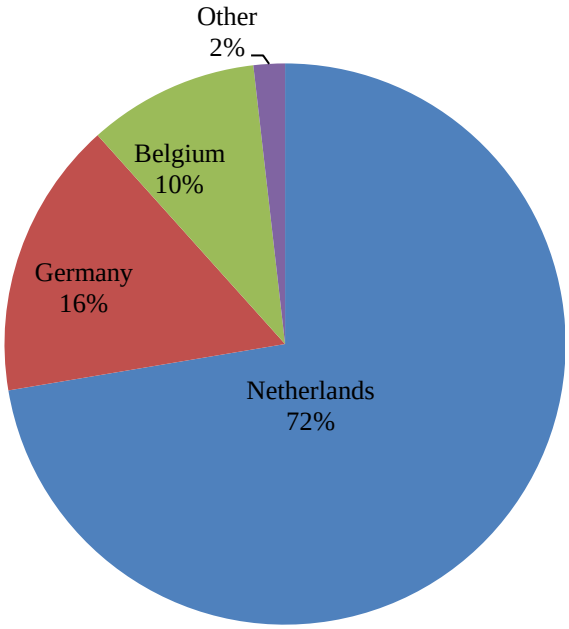
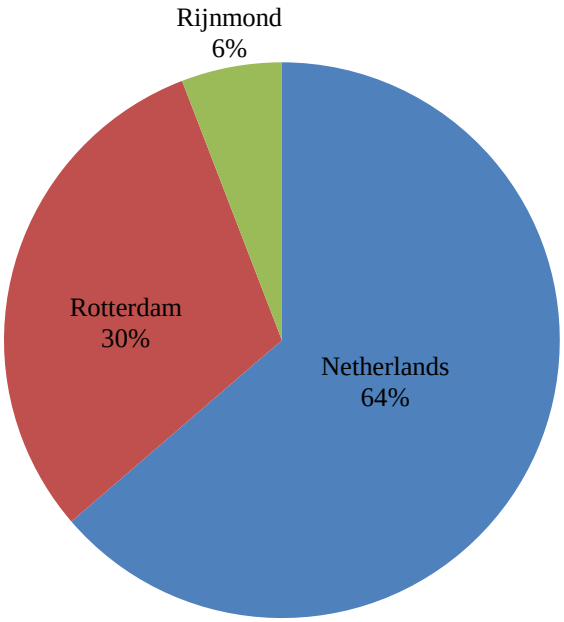


Figure 6.8. *Origin and destination of all containers transported by truck between Rotterdam and domestic destinations according to the survey in 1985.*



Source: T van Vuren and G.R.M. van Jansen, *De verkeersafwikkeling van het container-wegvervoer van en naar de Rotterdamse haven* (Delft 1986).

The report noted that 31.2 percent of journeys shorter than 20km came from Rotterdam, 17 percent were between 75 and 100km, 18 percent were further than 200km, and only seven percent were further than 300km[60] (Figure 6.9). This is consistent with the fact that road haulage was most profitable over relatively short distances. It also explains the importance of the Dutch domestic market which, for road haulage in the 1980s, had a competitive advantage because, at that time, barge and rail transport were not thought to be profitable for such short distances. Over further distances, however, barge and rail had an advantage, which is why such a low percentage of containers from Rotterdam were transported over distances above 300km. When speed mattered, however, trucks were used for longer distances too.

[60] Ibidem, 38.

Figure 6.9 *Percentage of transported containers going to different distance categories in 1985.*

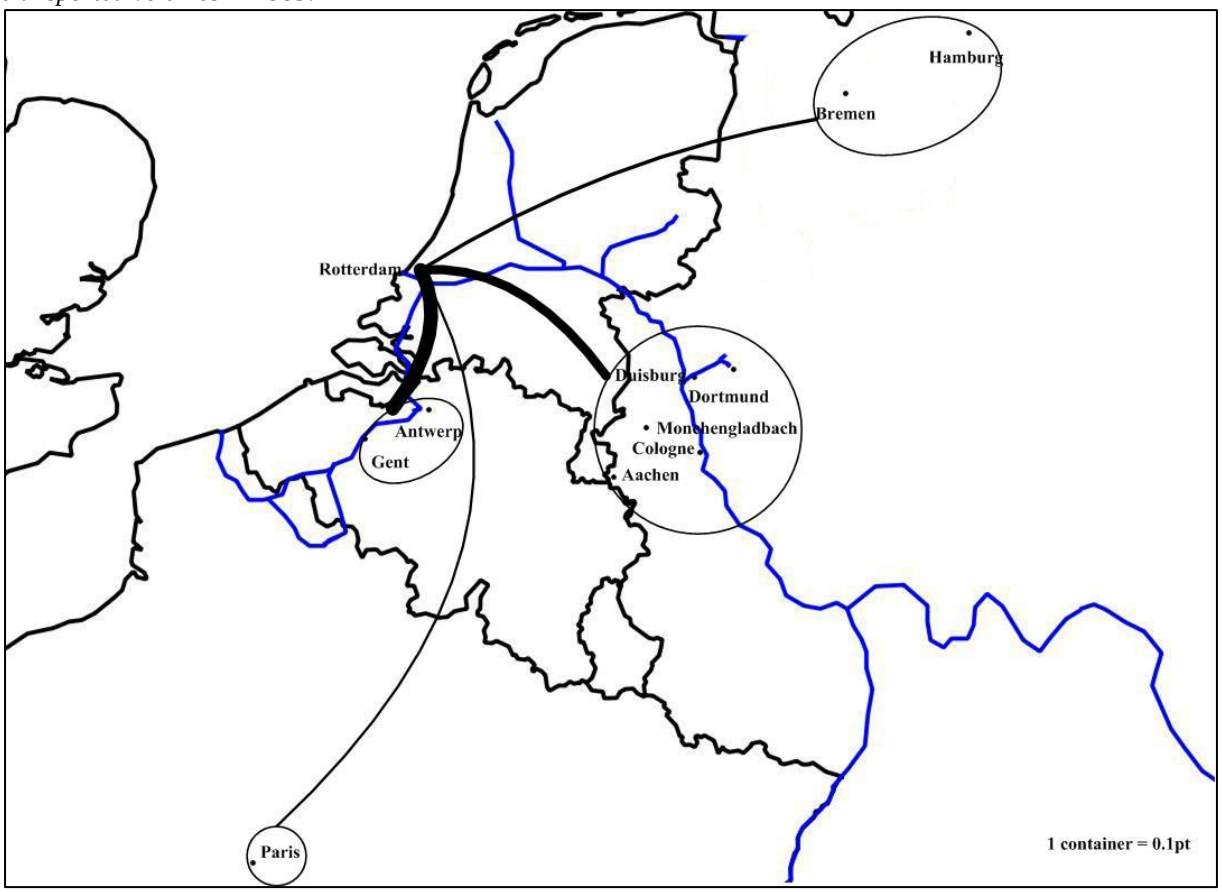
Source: T. van Vuren and G.R.M. van Jansen, *De verkeersafwikkeling van het container-wegvervoer van en naar de Rotterdamse haven* (Delft 1986).

The distribution of truck rides (Figure 6.10) shows that the transport of maritime containers by road haulage happened along two axes. One was the redistribution of containers, which arrived at a different port to that of their final destination.[61] An additional cause could be that there was speed involved, for example in the case of perishable goods transported in a reefer. There was a minor redistribution flow between Rotterdam and the German ports, and an intensive one between Antwerp and Gent, of which 80 percent went to Antwerp. Road haulage could then still profit from this

[61] Interview with Kees Overbeek, jr., director/owner Intern. Transportbedrijf Overbeek bv 24-09-2013.

intensive transport flow at a favourable distance of approximately 100km. After the opening of the Rhine-Scheldt Canal in the following year, road haulage increasingly had to face competition from the barge sector. The minor flow going to and coming from Paris can be seen as redistribution between ports. Paris was the major hinterland of the Port of Le Havre. Meanwhile, from Rotterdam, it is probable that maritime containers, which arrived by deep sea ships and did not stop in Le Havre for the transshipment of a few containers, were transported by truck to Paris.

Figure 6.10 *Areas where maritime containers were going to or coming from including the ratio of the transported volumes in 1985.*



Source: T. van Vuren and G.R.M. van Jansen, *De verkeersafwikkeling van het container-wegvervoer van en naar de Rotterdamse haven* (Delft 1986).

The other axis along which maritime container volumes were transported from and to Rotterdam was along the Rhine to the Lower Rhine region. The reason why this area was important for road haulage was that this distance, between 200 and 250km, could be driven in one day in both directions, and there was not much intermodal competition in the region at that time. Indeed, the rail shuttle system was not yet fully developed, and rail transport at that point concentrated on distances above 300km. Barge transport, meanwhile, was busy moving down the Rhine, and there were still only a handful of terminals on the Lower Rhine. Moreover, barge companies had problems collecting enough volumes

for regular liner services on the Lower Rhine. This fragmented market was thus better suited to truck transport, which could take one or two containers per truck, than to the barge and rail modalities, both of which needed continuous volumes to sustain their services.

Until now, the numbers derived from the survey seemed to be realistic and explainable. There is, however, one exception: it is curious that not a single truck was mentioned as going to or coming from the Middle Rhine area, even though major volumes were available. This could be because on the day that the inquiries were made no deep sea ship arrived at, was loaded or unloaded, or left Rotterdam. Moreover, container transport from and to the Middle Rhine area was at that point mostly performed by barge, which concentrated its activities on the Mannheim area and the Upper Rhine. It was only two years later, in 1987, that *One Way Trucking* started its activities in the same German centre.

In conclusion, before the liberalization of the truck sector, the road haulage of maritime containers concentrated on the domestic market of Germany and Belgium and, to a lesser extent, France. There were two axes along which transport took place: the redistribution of containers between ports, and transport between Rotterdam and the Lower Rhine region. Furthermore, it is worth mentioning that no other countries were noted as being the origin and destination of maritime containers other than those already mentioned, namely Luxemburg and Austria. This was, however, about to change after liberalization.

The hinterland of the transport of maritime containers by road haulage after liberalization (1993-2010)

Here, the geographic reach of container transport by road after liberalization is analyzed based on CBS statistics. Unfortunately, these are only available between 1997 and 2009. The statistics mention 19 European countries where the transported container volumes never reached one percent of transport overall. As a consequence, these nations were not major hinterland countries for Rotterdam.[62] Moreover, with the exception of Luxembourg, they were mentioned in the 1985 survey. It should be mentioned that these countries, to where a fraction of the total volumes travelled, were very likely to be have been missed by the inquiry in 1985, which covered only one day in a limited number of terminals. France, which had a share of around three percent, was also a minor hinterland country.

The major hinterland nations for the road haulage transport of maritime containers from and to Rotterdam were the Dutch domestic market, Belgium and Germany. According to the CBS statistics, approximately 50 percent of the total transported containers went to the Dutch domestic hinterland between 1997 and 2007 (Figure 6.11). This percentage was possibly higher, as the interviews conducted for this research suggest that the share of the domestic volumes was growing during the

[62] Luxemburg, Austria, England, Czech Republic, Italy, Spain, Poland, Denmark, Slovenia, Sweden, Greece, Lithuania, Hungary, Ireland, Portugal, Slovakia, Romania, Finland, and Bulgaria.

research period not only in absolute terms, but also in the relative sense. The absolute transported TEU was indeed growing between 1997 and 2007, but according to the central actors in the field, the same should have been true for the relative numbers. (Figure 6.12)

Figure 6.11 *Share of the major hinterland countries of container transport by road haulage in percentage terms in the years 1997, 2000, 2004, 2007 and 2009.*

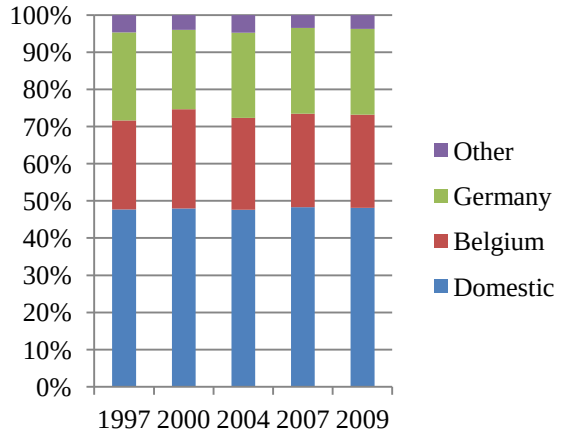
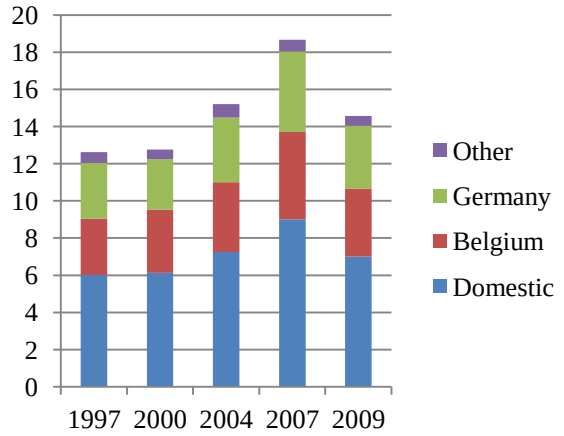


Figure 6.12 *Distribution of hinterland container truck transport between Rotterdam and its hinterland countries per million TEU in the years 1997, 2000, 2004, 2007 and 2009.*



Source: Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011)

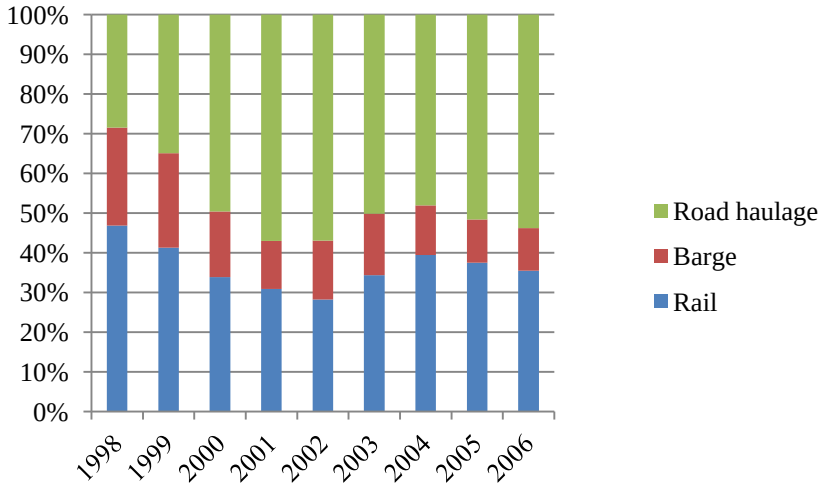
The reason for this is probably the method by which the statistics were constructed. Those for rail transport could be retrieved from rail companies, which were relatively organized as they had to obtain permits to ride on the Dutch or German rail network. Barge transport statistics, meanwhile, could be obtained from the Central Commission on Navigation on the Rhine and the Dutch ministry of transport. The statistics on road haulage, however, had to be retrieved from a large number of companies of different sizes. In the Netherlands, road haulage firms were asked to register their transported container volumes during one week a year. In a sector with small companies, low profit margins and cut throat competition it is hard to imagine that filling in the survey truthfully was a priority.

There is an easy way to demonstrate how little one can trust the CBS statistics: comparing them to the modal split derived from them (Figure 6.13) to the modal split produced by Theo Notteboom and to that of the Dutch ministry of transport[63] (Figure 6.14). These figures show that the share of rail transport in the CBS statistics is possibly too high, while that of barge and road haulage transport is too low. A possible reason for the former may be that the CBS numbers include all rail

[63] Theo Notteboom, *Thirty-five years of containerization in Antwerp and Rotterdam: structural changes in the container handling market*, 117-142, Ministerie van Verkeer en Waterstaat, *Binnenvaart en containerlogistiek* (Den Haag 2009) 1-82.

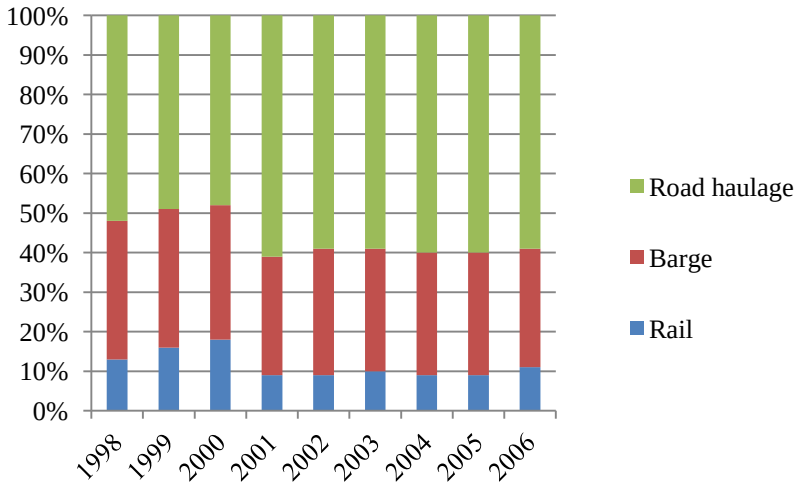
container transport, not just hinterland transport from and to Rotterdam. On the other hand, they exclude the domestic market. Consequently, here, the CBS statistics are only used as a rough indication of what actually happened.

Figure 6.13 *Modal split calculated from the CBS data*.



Source: Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Figure 6.14 *Modal split of container transport*



Theo Notteboom, *Thirty-five years of containerization in Antwerp and Rotterdam: structural changes in the container handling market*, from 2001: Ministerie van Verkeer en Waterstaat, *Binnenvaart en containerlogistiek* (Den Haag 2009).

Apart from the domestic hinterland, the two other hinterland countries were Germany and Belgium. These nations had approximately the same share during the entire period, around 25 percent. Due to the already mentioned doubts about the reliability of the CBS statistics, comparing the fluctuations of their shares seems pointless. Accordingly, at this point, it appears that the most important hinterland country for container transport by road haulage was the Dutch domestic hinterland, with Germany and Belgium coming in second position. Unfortunately, there are no statistics available for the regional distribution of the transported volumes for the period 1993-2010. This is therefore discussed in the next section based on the transport streams of both the companies that participated in the firm *One Way Trucking* and the informal group of one way truckers.

The hinterland of one way trucking versus Rotra Transport

In this section, the transport patterns of the one way truckers to and from the different hinterland areas, and changes to them, are discussed. Furthermore, they are compared to Rotra Transport, the road hauler from Doesburg, which mainly transported break bulk cargo that was packed or palletized in continental loading units. The hinterland areas are discussed here along the two already mentioned axes, one of which is the redistribution between the Northern European ports while the other runs parallel with the Rhine. Furthermore, there is a remaining category that consists of more or less incidental transport to relatively further away destinations, namely Southern Germany, Central and Eastern European countries, Southern Europe and the Middle East.

Redistribution took place between the ports in the Le Havre-Hamburg range, while transport to the north of France and Paris can also be seen as the redistribution of maritime containers. Containers that had this area as their final destination often arrived in Rotterdam instead of Le Havre. They were then transported to their destinations in Northern France. Further redistributions took place from Rotterdam to Antwerp and Hamburg.

France emerges as a minor hinterland area for both the one way truckers and Rotra Transport. For example, Kleijn Transport performed incidental redistribution between Rotterdam and Le Havre for the sea shipping company Compagnie Maritime d'Affrètement (CMA).[64] Overbeek, Koolwijk, Winterswijk and Groenenboom, meanwhile, had minor volumes going to this hinterland area over a longer period of time. In 1986, when United States Lines, which was a customer of Overbeek, went bankrupt, Overbeek took over many of its generator sets. These generators could run the refrigerators in special reefer containers, which made it possible to transport perishable food products, mostly fish and exotic fruit, to Boulogne-sur-Mer, which is close to Calais at the Channel, and the central marketplace in Paris.[65] In the 1990s and 2000s, Overbeek continued to transport these agricultural

[64] Interview with Kees Kleijn, Director Kleijn Transport, 03-07-2013.
[65] This was the period of the introduction of mangos in Europe. Because of the lack of experience with this perishable fruit, it often arrived decayed, which led to damage claims. Interview with Ingrid de Winter, planner, Intern. Transportbedrijf Overbeek bv, 24-09-2013, Interview with Kees Overbeek, jr., director/owner, Intern. Transportbedrijf Overbeek bv 24-09-2013.

products to Paris, and as return cargo transported French wines to Rotterdam with a final destination of Australia;[66] Koolwijk transported non-food products of well-known European supermarket chains from Rotterdam to France;[67] Winterswijk had volumes to Lille consisting of raw materials for a crystal factory and as return cargo the products of this shipper; Winterswijk transported wool originating from Australia from Rotterdam to a carpet factory in Northern France; [68] and Groenenboom transported containers that arrived from Rotterdam by barge to its own container terminal in Avelgem, from where they went to Paris by truck.[69] The French hinterland, however, was never very important for the one way truckers and, in the 2000s, became ever less important, probably as a result of port competition with Le Havre.[70] The transport volumes of Rotra Transport were influenced less by this, and in the 2000s the company still had 500-600 loading units going to and coming from the French hinterland.

Belgium, and especially Antwerp, has always been an important hinterland area for the road haulage of maritime containers, and there were trucks running between Antwerp and Rotterdam every day for the different sea shipping companies.[71] Empty containers could be transported best by barge, because of the low prices and the lack of time constraints. The redistribution of empty containers in the 2000s was increasingly taken over by specialist firms, which made use of different modalities such as CARU containers. These companies redistributed containers on a large scale between European ports. As a result, they were able to offer relatively low tariffs. As this flow consisted of maritime containers, Rotra Transport did not have a major share in this particular market. Nevertheless, it transported continental volumes to numerous other destinations within the Benelux countries. In spite of the intermodal competition, the maritime volumes were important for road haulage, and this transport modality was still growing in the 2000s.[72]

Apart from the redistribution of containers between Rotterdam and Antwerp, there was a minor flow of redistribution between Rotterdam and Hamburg. One of the reasons for this was the fact that Rotterdam was the first port of call. This meant that a sea shipping company could gain two or three days by choosing it, which could be important for perishable reefer transport. Kleijn Transport, for example, took meat arriving from the United States to Rotterdam to the North German market. By truck, the 500km distance could be covered in a day, which meant that meat arrived sooner on the market than when it was transported through the German ports. This was clearly an advantage, especially before holidays like Christmas. These transport flows decreased in number in 2000, when stricter health inspections were introduced in Rotterdam and the container flows moved to

[66] Interview with Ingrid de Winter, planner, Intern. Transportbedrijf Overbeek bv, 24-09-2013.
[67] Interview with Arie Koolwijk, director Koolwijk Transport, 23-07-2013.
[68] Interview with Gijs Winterswijk, commercial director/owner Winterswijk BV (1975-1999), 29-10-2013.
[69] Interview with Kees Overbeek, jr., director/owner, Intern. Transportbedrijf Overbeek bv 24-09-2013.
[70] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[71] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[72] Interview with Ingrid de Winter, planner, Intern. Transportbedrijf Overbeek bv, 24-09-2013.

the German ports where the health regulations were less restrictive.[73] Another reason for the transport flows between Rotterdam and Hamburg was the opportunity to return empty containers to the deep sea ship between its arrival in Rotterdam and its departure a few days later from Hamburg. In this way, Stuij and de Man transported frozen fish for Samband Lines, a sea shipping company from Iceland, which changed its name to Samskip in 1991.[74] After the distribution of the reefers in the hinterland, the empty containers were returned to the ship in Hamburg. As a consequence, the sea shipping company from New Zealand did not need to leave behind in Europe any specialized containers that could only be used for the transport of fish.[75] Although this redistribution flow had some value for individual companies, it was not really important overall. This is one of the reasons why it took place by road haulage, which could transport lower volumes than barge or rail. Along with these regular streams were the incidental rides for when something went wrong in the logistics chain, for example when a container missed a ship in Rotterdam.

Transport parallel with the Rhine and the prolongation of the Rhine region

There was intensive contact between Britain and the Rhine region from the Netherlands to Switzerland and the north of Italy. This was an important transport axis for the transport of maritime containers by road. Britain played an important role as a hinterland area, as there had already been the transport of standardized units between England and Rotterdam before the introduction of maritime containers. Ferry transport was a stepping stone to the conveyance of maritime containers for a few one way truckers. Winterswijk, for example, was active in this market (Figure 6.15). It also remained an important market for Rotra Transport, which moved large volumes in continental loading units.

[73] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[74] 'Samskip wil oogsten na schaalvergroting', *Nieuwsblad Transport*, (13 okt 2000) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/65801/ArticleName/Samskipwiloogstennaschaalvergroting/Default.aspx, seen on 01-11-2013.
[75] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.

Figure 6.15 *A Winterswijk truck with a pallet wide container for ferry transport from one of its major clients, HAKO transport, Waalhaven/ Eemshaven 1970.*

HAKO specialized in ferry transport between England and Rotterdam.
Courtesy of Gijs Winterswijk.

As most container transport by road to and from Rotterdam took place within the Netherlands, most companies were active on the domestic market. Many of the journeys consisted of inter-terminal transport and the distribution of maritime containers within Rotterdam. Furthermore, the containers then needed to be distributed within the Netherlands. Kleijn Transport, for example, transported containers filled with cacao to the Welter wharf in Amsterdam.[76] Until the 1980s, there had been very little competition for road haulage from other modalities with domestic destinations. The domestic container terminals of Holland Rail Container were only opened in 1982, and the first domestic barge terminal in Nijmegen started its operations in 1987. Thereafter, both intra- and intermodal competition grew rapidly, and the road haulage companies performing container transport became increasingly involved in the transport of the other two modalities. Despite this growing competition, domestic transport increased throughout the research period. For Groenenboom, for example, the ratio between domestic and international transport was 80-20 before the 2008 crisis and 90-10 thereafter.

Rotra Transport was also active on the domestic market, even though the company was located close to the German border in Doesburg. In 1982, which was the year it started transporting

[76] Interview with Kees Kleijn, director *Kleijn Transport*, 03-07-2013, http://www.railgoed.nl/welter.html, seen on 10-01-2014.

maritime containers in Rotterdam, the company opened a forwarding office at Schiphol International Airport. The Schiphol office organized the transport of break bulk and full container loads by cargo plane.[77] These so-called Unit Load Devices (ULDs) were different from the maritime loads and had two standards: the container type, which had a volume between 4.90 and 7.16m^3; and the pallet type, with a volume that varied between 6.88 and 10.8m^3. The largest of these loading units was almost a quarter of the volume of a maritime container, which had a volume of 38.5m^3. The scale of the transport was small, because of the limited space in the cargo planes. Air transport was also many times more expensive than any other modality, but, when there were time constraints (for example, the introduction of new IPhones), this modality was used on a large scale. This transport segment was available for Rotra because it was involved in the conveyance of *Less than Truck Loads*. Both the one way truckers and Rotra Transport were active in the growing domestic hinterland. For Rotra, however, because of its smaller transport units and the large demand for express delivery worldwide, air freight through Schiphol became increasingly important.[78]

The journey from Rotterdam to the German Lower Rhine region and back was a one day ride by truck. The problem, however, was that the areas were too close together to compensate for the waiting times at the terminal, as many companies did not believe that the three hours spent at a terminal for a ride of 200km was worthwhile.[79] The Lower Rhine region was not the focus of the one way truckers, as they concentrated their activities on the Middle Rhine. The *One Way Trucking* firm calculated transport costs for its customers from Rotterdam to their destination and back to Mannheim. As a result, destinations in the Lower Rhine region had relatively high tariffs (Figure 6.16). One way truckers, however, performed container transport to the Lower Rhine region on their own account using their own tariffs. This region was only important for Overbeek, and it stayed that way during the entire research period as Bayer in Krefeld was its major customer.[80] Kleijn Transport, meanwhile, transported tools for the Makita Corporation to the Ruhr area.[81] Furthermore, the major share of its volumes was generated by the American toy manufacturer Hasbro, which established one of its distribution centres in Soest, Germany, close to Dortmund.[82] Indeed, 25 containers full of toys arrived daily from China for this warehouse.[83] Another major client was a crane manufacturer in the

[77] 'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf, seen on 11-11-2013.
[78] With Gerard J. B. Roelofsen and Harm Roelofsen, directors of Rotra Transport, 17-01-2013.
[79] Ted Konings, 'One way truckers' niet onverdeeld optimistisch, *Nieuwsblad Transport* (4 juli 1995). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/32281/ArticleName/Onewaytruckersnietonverdeeldoptimistisch/Default.aspx, seen on 18-05-2013.
[80] Interview with Kees Overbeek jr., director/owner, Intern. Transportbedrijf Overbeek bv 24-09-2013.
[81] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[82] Soest was the largest distribution centre in Germany. In 1996, its distribution centres in Europe were located in Newport, Ter Apel, Soest, Dusseldorf, Creutzwald, Lyon, Milan and Valencia. All of these centres, except for the one in Valencia, were situated in the extended Rhine region. [82] David Taylor, 'Case 4 hasbro Europe', in 'Case 4 hasbro Europe', in *Global cases in logistics and supply chain management* (Tunbridge Wells 1997) 48-60.
[83] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.

Ruhr area, which exported crane accessories in containers.[84] Stuij en de Man incidentally also transported goods to this area, but it was not its most important destination.[85] Koolwijk at times also transported containers with a destination in the Lower Rhine region via Venlo by rail, where German drivers picked them up.[86] The company also had a depot in Hilden in the Ruhr area.[87] Winterswijk, meanwhile, transported milk powder for a milk processing company situated close to the Dutch border in Appeldorn between Emmerich and Wesel. Indeed, 10 to 20 loaded containers per week came from there and then returned empty to the plant.[88]

The Lower Rhine region was relatively more important than the French redistribution area and Hamburg. According to the interviews conducted for this thesis, its importance grew during the research period. Indeed, after the liberalization of the road haulage sector, cross-border transport between the Netherlands and Germany became easier. At the same time, as a result of the growth of intramodal and intermodal competition, some truckers got involved in barge transport and fled from the rivalry by relocating their activities to Avelgem in Belgium. For Rotra Transport, which was situated close to the border, the Lower Rhine region was and remained an important outlet area.

Figure 6.16 *The spheres of the transport destinations of One Way Tucking GmbH with the transport costs per sphere in 1986*

Colour	Guilders per km per container
Yellow	2.05
Blue	2.50
Orange	2.75
Green	3.00

Source: *One Way Trucking. The right way to save trucking costs* (Rotterdam 1986).

[84] Ted Konings, 'One way truckers' niet onverdeeld optimistisch', *Nieuwsblad Transport* (4 juli 1995), http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/32281/ArticleName/Onewaytruckersnietonverdeeldoptimistisch/Default.aspx, seen on 18-05-2013.
[85] Interview with Tom Stuij, owner/director Stuij en de Man 1973-1999, 15-10-2013.
[86] Interview with Arie Koolwijk, director Koolwijk Transport, 23-07-2013.
[87] Interview with Arie Koolwijk, director Koolwijk Transport, 23-07-2013.
[88] Interview with Gijs winterswijk, commercial director/owner Winterswijk BV (1975-1999), 29-10-2013.

The Middle Rhine area was the focus of the activities of *One Way Trucking*. Indeed, there were major volumes there, mostly military and chemical cargo, including dangerous goods and food stuffs in reefers[89] (Figure 6.17). Most of the volumes were coming from or going to the Mannheim area, but Koolwijk also had a customer close to Koblenz, the chemical plant Zschimmer & Schwarz in Lahnstein.[90] Later, however, the competition from rail and barge increased and only the less appealing weekend rides were left for road transport. Groenenboom concluded that he would be better concentrating on barge transport on the Scheldt.[91] The Middle Rhine could be regarded as a major hinterland area for the road haulage transport of containers from and to Rotterdam for the one way truckers. The region supplied and produced major volumes for the American military and chemical and other industries. After the 1990s, however, the increasing competition led to a setback in the area, and by then only incidental transport happened between Rotterdam and this hinterland. The Middle Rhine region did, however, remain important for Rotra Transport.[92]

Figure 6.17 *Two Winterswijk trucks transporting the containers of two sea shipping companies, Hapag Lloyd and Sea-Land, which had major volumes going to the Middle Rhine area.*

Rotterdam, Vondelingenweg 1975 Rhoon, the location of Winterswijk BV in 1994

The majority of Hapag Lloyd's cargo consisted of chemicals, while Sea-Land mainly transported military cargo. Courtesy of Gijs Winterswijk.

The Upper Rhine area was not important for most of the one way truckers, and Switzerland was also not an obvious country for truck transport as it imposed very restrictive regulations on road haulage for environmental reasons. Furthermore, transport by truck to a destination 700km away was too

[89] Interview with Kees Overbeek, jr., director/owner, Intern. Transportbedrijf Overbeek bv 24-09-2013.
[90] Interview with Arie Koolwijk, director Koolwijk Transport, 23-07-2013.
http://www.zschimmer-schwarz.com/1-71.History.html, seen on 06-11-2013.
[91] Interview with Frans van den Boom, sales manager Groenenboom Containertransferium Ridderkerk, 03-09-2013.
[92] Interview with Gerard J. B. Roelofsen and Harm Roelofsen, directors of Rotra Transport, 17-01-2013.

expensive. Indeed, at that distance, rail and barge had a competitive advantage and trucks were only used if there were time constraints. This was certainly the case with Kleijn Transport's consignments from the American pharmaceutical industry. As retrieving blood plasma from volunteers on a commercial basis was permissible in the US (this was forbidden in Europe), this product arrived on a large scale from overseas in reefers to be used as a raw material for the production of medicines by the Swiss pharmaceutical industry. As blood decays quickly, speed was of the essence, which meant that the option of transporting it by barge was impracticable. At the same time, as the temperature of the cargo needed to be strictly controlled, the consignor trusted drivers who remained in the vicinity of their containers throughout the transport period, which was not the case with rail, which moved large volumes anonymously.[93] Apart from these volumes, one way truckers seldom travelled to the Upper Rhine region. Rotra Transport did, however, have volumes going to Switzerland, as the firm worked for a Swiss agent and its trucks had to cross the country to reach their main final destination, Italy.[94]

Italy, being more than 1000km from Rotterdam, was not an important destination for one way truckers, not only because of the distance, but because it was necessary to cross the Alps to reach it. The restrictive regulations on road transport while passing through Switzerland also had to be faced. When these regulations were introduced in the 1990s, truckers started to drive through Austria instead, but the rules were later harmonized between the two countries, meaning that there was no way to avoid them. By barge it was impossible to transport goods from Rotterdam to Italy directly, as the Alps form a barrier. As a consequence, it is probable that numerous maritime containers arrived in Italy after being transshipped at a Rhine terminal on to trains, as rail was the best way to transport maritime containers to the country by land.

Koolwijk was the only one way trucker with a minor interest in Italy, and as long ago as the 1960s had already transported 30 foot containers filled with chemicals to the Rovereto Container Terminal in the north of the country. Furthermore, until the 2000s, when the transshipment of goods moved from Rotterdam to Trieste, Koolwijk transported volumes to Italy for its major customer, a well-known European supermarket chain.[95] The other one way truckers, however, only transported containers to Italy on an incidental basis, and this minor hinterland area seemed to become even less important because of port competition.

For Rotra Transport, the opposite was the case, with Italy being one of its major destinations. As long ago as 1970, H.W. Roelofsen started transporting continental trucks and trailers from the Netherlands to Germany and Verona in Italy. For this reason, a joint venture was set up Italy in which

[93] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[94] 'Groupage en luchtvracht', *Nieuwsblad Transport*, (8 april 1995) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/30398/ArticleName/Groupageenluchtvracht/Default.aspx, seen on 08-11-2013.
[95] Interview with Arie Koolwijk, director Koolwijk Transport, Minnaard, J., former director Vereeniging van Zeecontainer Vervoerders, former director Spronssen Transport, 23-07-2013.

Rotra had an interest of 50 percent. Later, Busto Arzicio was added as a destination. In 1995, there were 30 to 40 trucks leaving to and arriving from Italy each week.[96] The loading units were transshipped on trains in Emmerich.[97] In 1990, Rotra closed its premises in Italy and started cooperating with two offices of the agency Albatros Vidale in Brescia and Vicenza.[98] The cooperation was later extended to Vivatrans in Montecchio and STM in Coreggio. The reason for this was that the destinations in Italy were spread around so much that it became impossible to coordinate the transport from a single office in Verona.[99] Rotra Transport was also involved in the multimodal conveyance of continental loading units by rail and truck – Huckepack - to Italy. The company's major customers were the Dutch department store chain HEMA, which imported textile products from Italy, and the steel producer Corus, for which Rotra transported containers full of steel using Huckepack transport to Verona on a daily basis.[100]

It is clear that while Italy was a destination of minor importance for the one way truckers, which became even less valuable due to port competition, Rotra considered it to be one of its major markets. This is because the north of the country is part of the extended Rhine region. There had already been intensive cargo flows within this region before the arrival of maritime containers, and they retained their importance thereafter. These continental cargo streams were barely influenced by port competition.

Far away destinations: Southern Germany, Central and Eastern Europe, Southern Europe and the Middle East

Finally, the more distant hinterland regions are examined here. These areas - Southern Germany, Central and Eastern Europe, Iberian countries and the Middle East - are situated relatively far away from Rotterdam and do not belong to the extended Rhine region. Southern Germany was of minor importance to the one way truckers, most of whom performed transport to this area at best on an incidental basis because, at a distance above 600km from Rotterdam, rail had a major competitive advantage. Furthermore, volumes could travel from Rotterdam to the south of Germany by barge if they were transshipped at a barge terminal on the Rhine. Additionally, the German ports had a good rail connection to this area, and considered Southern Germany to be their hinterland. Nevertheless,

[96] Ibidem, 'Rotra neemt belang in H.T. Airfreight', *Nieuwsblad Transport* (16 mei 1998). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/55299/ArticleName/RotraneemtbelanginHTAirfreight/Default.aspx, seen on 08-11-2013.
[97] 'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf
[98] 'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf
[99] 'Drie nieuwe partners voor Rotra op Italie', *Nieuwsblad Transport*, (14 mei 1994) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/23638/ArticleName/DrienieuwepartnersvoorRotraopItalie/Default.aspx, seen on 08-11-2013.
[100] 'Groupage and luchtvracht', *Nieuwsblad Transport*, (8 April 1995) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/30398/ArticleName/Groupageenluchtvracht/Default.aspx, seen on 08-11-2013.

Overbeek and Kleijn Transport only had minor volumes going to or coming from the area.[101] The goods destined for the south of Germany consisted of hydraulic pumps, solar cells, raw materials and car parts for the automobile industry, while the exports were comprised of perfumes, deodorants, medicines and automobile products.[102] Nevertheless, the one way truckers felt that Southern Germany was lost as a result of intermodal and port competition.

The Central and Eastern European countries likewise did not form an important hinterland area for the one way truckers, as most of them were not interested in the market because their customers seldom had volumes going to these destinations. Nevertheless, after the implosion of the Soviet system in the late 1980s, some companies did explore the new opportunities in the region. Overbeek, for example, transported reefers to East Germany in the early 1990s, while Kleijn Transport had vodka as its cargo in continental units destined for Russia and Lithuania in the same period.[103] Rotra Transport, meanwhile, which was again not particularly affected by port competition, had intensive transport streams coming from and going to Central and Eastern European countries from 2007 onwards, with the majority of its cargo being chemical products; prior to then, corruption and restrictive regulations kept the company from entering this emerging market.[104]

Meanwhile, Portugal and Spain were only important for Koolwijk Transport, which had transport streams travelling there to distribute non-food products from China and Taiwan for a well-known European supermarket chain. This hinterland was, however, soon taken over by other ports.[105] Rotra Transport entered the Southern European market in 1990 when it opened an office in Lisbon, but these premises were closed after just a year when the company started to work with a local partner, as it had done in Italy.[106] Rotra was also active in Spain, and in 1995 there were 20-25 trucks a week going to or coming from this destination.[107] For Koolwijk, which was the only one way trucker active in the Iberian market, the importance of Portugal and Spain diminished because of growing port competition. At the same time, the importance of these countries for Rotra Transport, which was concentrating on continental flows, increased.

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[101] Interview with Kees Overbeek jr., director/ owner, Intern. Transportbedrijf Overbeek bv 24-09-2013.
[102] Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[103] Interview with Kees Overbeek, jr., director/owner, Intern. Transportbedrijf Overbeek bv 24-09-2013. Interview with Kees Kleijn, director Kleijn Transport, 03-07-2013.
[104] Interview with Gerard J. B. Roelofsen and Harm Roelofsen, directors of Rotra Transport, 17-01-2013.
[105] Interview with Arie Koolwijk, director Koolwijk Transport, 23-07-2013.
[106] 'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf, 'Wim Bosman werkt samen met Fornesa', *Nieuwsblad Transport*, (30 mei 1992) . http://www.nieuwsbladtransport.nl/gsearchresults.aspx?cx=011312353602961451014%3Ach35zk3qbju&cof=FORID%3A10%3BNB%3A1&ie=UTF-8&q=Wim+Bosman+werkt+samen+met+Fornesa&sa=Search, seen on 08-11-2013.
[107] 'Rotra neemt belang in H.T. Airfreight', *Nieuwsblad Transport* (16 mei 1998) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/55299/ArticleName/RotraneemtbelanginHTAirfreight/Default.aspx, seen on 08-11-2013.

Finally, there is one last flow almost 5000km away that has not been mentioned, and which certainly qualifies as a distant destination: the Middle East in the 1970s, as a result of the two oil crises that hit the road haulage sector hard, some Dutch truckers tried their luck in the Middle East. The crisis certainly led to a growth in transport demand, especially in Iran, with the high oil prices making it cheap for the oil producing countries to buy European consumer goods.[108] Between 1975 and 1980, during the civil war in Lebanon (1975-1990), Winterswijk transported 15 trucks per week with a Middle East destination for the major German road haulage company Willi Betz. These containers arrived by ferry from Britain to Rotterdam, instead of going directly to the Middle East, because the ports were in the hands of Lebanon and Israel. The loading units were then detached from the English trucks in Rotterdam and attached to Dutch versions. These were then driven to the Austrian border from where they were replaced by other trucks. The journey to Bagdad took two-three weeks, and the containers were filled with materials to build oil refineries. The return cargo was comprised of Persian carpets.[109]

Conclusion

This chapter has explored the history of road haulage container transport, analyzing how the liberalization of the European transport market influenced the geographic pattern of container transport between Rotterdam and its hinterland. The history of road haulage goes back to the 1920s when transport was performed by horse and carriage. After World War II, renovated trucks that the US army left behind were used for road haulage. As transport in the Netherlands was strongly connected to the agricultural sector, and as there was increasing demand for transport in the Rotterdam area, growing numbers of farmers' sons tried their luck in road haulage. From the 1960s, there was a division between the area to the south of the Maas, where numerous road haulers specialized in container transport, and the north of the river, where most firms specialized in the transport of vegetables and fruit, much of which went to the Port of Rotterdam and Schiphol. In the same decade, the ferry transport of standardized loading units between Britain and Rotterdam began, enabling a few of the companies studied here to gain experience of container transport. The 1966 arrival of maritime containers in Rotterdam caused major changes in the sector. As there was less experience and training needed for the transport of these containers than for the traditional break bulk, sea shipping companies took control of assignments and there was a concentration tendency in the sector.

This chapter focused on a group of road haulage companies that were in some way connected to one way trucking. One way trucking was introduced to Germany in the 1960s, and initially designated a method by which German truckers could make the best of strict German regulations, which divided transport into long distance and local, for which different licences were required. The

[108] Johan W.D. Jongma, *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992) 180-183.
[109] Interview with Gijs winterswijk, commercial director/owner Winterswijk BV (1975-1999), 29-10-2013.

principle of one way trucking, namely trying to make sure that trucks transported full containers in both directions, was introduced to Rotterdam by Erich Kieserling, a road hauler from Bremen with extensive experience of transport licences. He used the principle to keep the number of empty rides to a minimum by hauling his trucks back from Germany only when they were needed. In 1987, a group of four truckers set up a company, *One Way Trucking GmbH*, to combine their rides and secure return cargo from a warehouse they hired in Mannheim. The firm did not, however, have a long history, surviving for less than 10 years, as its efforts to secure return cargo in the long-term was unsuccessful. Nevertheless, the individual companies participating in the venture continued on their own after it was brought to an end.

In 1993, road haulage transport was liberalized, which meant that many of the restrictions on the German form of this transport were lifted. As a consequence, it became a lot easier to carry out cross-border road haulage between EEC member countries. One might expect that this would have increased the geographical range of container transport, and this was initially indeed the case. However, this started to change in the 2000s, and the opening up of the market as a result of liberalization was not beneficial for experienced companies, which had refined strategies to work around the rules. This had a similar effect as the arrival of maritime containers: it made the experience of stuffing and stripping containers redundant. The market opened up to new entrants, which increased intramodal competition. Intermodal competition grew as well because, in the 1990s, the quality of rail transport improved with the development of rail shuttles and the maturing of barge container transport, with growing volumes moved by liner services. Driven by the increased competition from the barge sector in the Lower and Middle Rhine, *One Way Trucking* entered the barging modality and tried its luck in combined transport on the Scheldt, where there was not yet much competition. Accordingly, due to the combination of rising competition and the liberalization of the other modalities, the competitive advantage of road haulage was back to under 250km.

The geographic analysis, which was based on data that had limited reliability for the year 1985 and the period 1997-2009, delivered the following results. In 1985, many of the transported containers from and to Rotterdam stayed in the Netherlands. The other two major hinterland areas were Antwerp and the Lower Rhine region. Surprisingly, according to the numbers, not a single truck had a destination in the Middle Rhine or in any of the other nations mentioned earlier, excluding France. In the period 1997-2009, 16 other countries made an entrance as origins and destinations for the containers to and from Rotterdam by road haulage. The share of these countries of the total number of containers hauled from and to Rotterdam was not, however, substantial, as neither of them achieved one percent. In contrast to the results of the interviews conducted for this research, the share of the domestic market in these statistics was relatively low, at about 45 percent. The shares of Belgium and Germany, the other two hinterland countries, stayed approximately the same at around 25 percent during the entire period.

As there were no figures available about the distribution of the volumes within the major hinterland countries, all of the information on this was derived from interviews conducted for the research. In the chapter on the hinterland areas, those of the one way truckers were compared to the target areas of Rotra Transport, which primarily transported continental volumes. In the same way as in the numerical analysis, it can be seen that the transport was performed along two axes. One of these was the redistribution of containers that arrived at the wrong port and was comprised of the north of France, Antwerp, Rotterdam and Hamburg. There were minor flows going to France and Hamburg, but those travelling to Antwerp proved to be more substantial. The other axis started in Britain, before traversing the Netherlands, the Lower, Middle and Upper Rhine area and ending in the north of Italy. Of these locations, the Dutch domestic market and the Middle Rhine were the major hinterland areas for the one way truckers. Just as with barging and rail transport, road haulage from and to Rotterdam increasingly concentrated on the home market and nearby Germany. A category of relatively distant destinations remained that did not belong to the extended Rhine area, namely Southern Germany, the Central and Eastern European countries, the southern European countries of Spain and Portugal, and the Middle East. These nations were not very important for the one way truckers, but were, along with Italy, Rotra Transport's main target areas. Liberalization made it possible to extend the geographical reach of container transport by road haulage, but after an initial expansion, this was not maintained in the long-term. Transport to relatively closer regions grew, while that to more distant destinations fell. This is supported by the observation of Kleijn Transport's representative, namely that the average transport reach of the company in 1994 was 650km, but this was reduced to 500km by 2010.[110]

Two forces counteracted the effect of liberalization. The first was the growth of intermodal competition, which reduced the average geographical range of container transport by road haulage to a distance where it had a competitive advantage, namely below 250km, although volumes were still transported to much further destinations. In these cases, the modality could exploit its advantage of being fast and flexible. Indeed, when speed was required, road haulage transport was used when the issue of price was not particularly important. The second force was port competition, with the development of Le Havre influencing the transport range in the north of France. Furthermore, the development of good rail connections by (among others) BoxXpress from Hamburg to Central and Eastern European countries and Southern Germany reduced the opportunities for trucks to travel from Rotterdam to these nations. The number of Southern European destinations serviced by road haulage also fell as a result of competition with the Mediterranean ports and Trieste. Rotra Transport was not, however, affected. Indeed, instead of shrinking, its transport network grew. The reason for this is that the products it transported were mostly continental goods, namely products of European industry that were conveyed in continental loading units. These products were not as footloose as maritime

[110] Interview with Henk van Ielen, director Kieserling 1990-1994, manager container transport at Kleijn Transport 1994-2010, 18-07-2013.

containers, which had alternative routes with little difference in price. Rotra's transport flows were also based on more stable relationships that were connected to production and consumption in Europe.

In 1985, the majority of the transport of maritime containers by road from and to Rotterdam took place within the triangle of Rotterdam, Antwerp, and the Lower Rhine region. The liberalization of the European road haulage market in 1993 made it easier to perform cross-border truck transport, and made truck transport possible to numerous countries. In the 2000s, however, the geographical reach of the road haulage transport of maritime containers shrank and the majority of volumes travelled again within the triangle mentioned above. The container flows between Rotterdam and Antwerp were mostly a byproduct of logistics. The contraction of the geographical reach on the axis formed by the extended Rhine region meant an intensification of the flows of maritime containers by road between Rotterdam and the Lower Rhine region. These flows were increasingly generated by the distribution centers of multinationals, as in the case of Hasbro. This growing transport relationship within the Lower Rhine region indicates regionalization and increasing economic integration.

Part III Hinterland

Chapter 7
The Hinterland: The Other Side of the Coin (1966-2010)

After analyzing the effect of liberalization on the dynamics of the geographical reach of container transport for the Port of Rotterdam per modality, the results should be aggregated to paint the complete picture. The findings of the transport chapters are based on incomplete data sequences, numerous calculations and estimations. These have a high indication power on the level of the individual modalities, but when simply aggregated might produce a skewed picture. As a consequence, Rotterdam's container transport is analyzed in this chapter from the perspective of the different hinterland areas that were identified in the transport chapters. Most of these areas can be grouped around two axes: one is formed by a curved line connecting the Western European ports in Germany as well as those in Le Havre, Antwerp and Rotterdam, while the other goes along another curved line, stretching to the north of Italy from the United Kingdom through the Netherlands and the German Lower, Middle and Upper Rhine area. There is a third category consisting of relatively distant areas that are not situated along this curved line, namely Southern Germany and Central and Eastern European countries. This chapter summarizes the results of the transport chapters in terms of the dynamics of the geographical pattern of container transport by all three of the modalities before and after the liberalization of the European transport sector per identified hinterland area.

Due to the availability of data, the accent of the analysis lies in the period after liberalization, especially after 2004, which was characterized by a fall in the geographical reach of container transport from and to the Port of Rotterdam. In the preceding period, however, in particular between 1966 and the 1990s, container transport's network was extending. Indeed, the option of cheap intermodal transport led to the expansion of Rotterdam's hinterland in all three container transport modalities. NS created a rail container transport network that covered a large part of Europe. From 1968 onwards, barge transport from Rotterdam focused on the Middle Rhine, and numerous containers travelled as far as the Upper Rhine, while in the period before the advent of maritime containers, the major target area for barge transport was the Ruhr. The transport of containers by truck also ventured further in the second half of the 1970s, with some one way truckers transporting containers to the Austrian border in Southern Germany with a Middle East destination. Meanwhile, in the late 1980s, the vehicles of *One Way Trucking* targeted the Middle Rhine region. It is probable that the gradual liberalization of the road haulage sector in the 1990s initially led to the extension of the container transport network of the Port of Rotterdam. However, because of the lack of statistics from the period before 1997, this is impossible to prove. From the data available from *Deutsches Historisches Bundesamt* (the German Federal Statistical Office), it is nevertheless clear that in the first decade of the new century the geographical reach of the Port of Rotterdam's container transport shrank.

The chapter positions the different areas within port competition by demonstrating from which ports the areas discussed received their maritime containers and how this changed during the research period. For this purpose, data retrieved from *Deutsches Statistisches Bundesamt* for the period 2004-2010 are added to the statistics already discussed. Moreover, the chapter connects the transport activities of the different areas to the macroeconomic hinterland. Therefore, the question is: what caused the transport demand: logistics, production or consumption based activities? In this way, the chapter paints an elaborate picture of the hinterland of Rotterdam, Antwerp and the German ports.

Redistribution between the North European ports

The first axis discussed here runs parallel with the coastline of Western Europe, starting from west to east, and from Le Havre to Antwerp, Rotterdam, Bremen and Hamburg. The ports along this axis competed with each other and attempted to conquer as much of the hinterland as possible by attracting each other's customers. The port with the least impact was Le Havre, which mainly supplied Paris. However, it also had some influence in Northern France. From 1964, combined transport flows, so-called *Kangaroo* transport, were going to France. In this case, however, unlike that of Italy, these flows did not reveal any growth. Indeed, France was not an important hinterland area of the Port of Rotterdam at any time. The transport of maritime containers to France by rail, after shuttles to Metz were enthusiastically set up, did not meet expectations; there was no substantial growth despite the fact that the liberalization of the European transport market made transport between France and the Netherlands less complicated. From 1989, the tour de role system for irregular transport was abolished, freeing barge transport on the Scheldt from the *Schippersbeurs* (Skippers Exchange), while from 1993 onwards, cross-border licenses for transport to France were also no longer required.

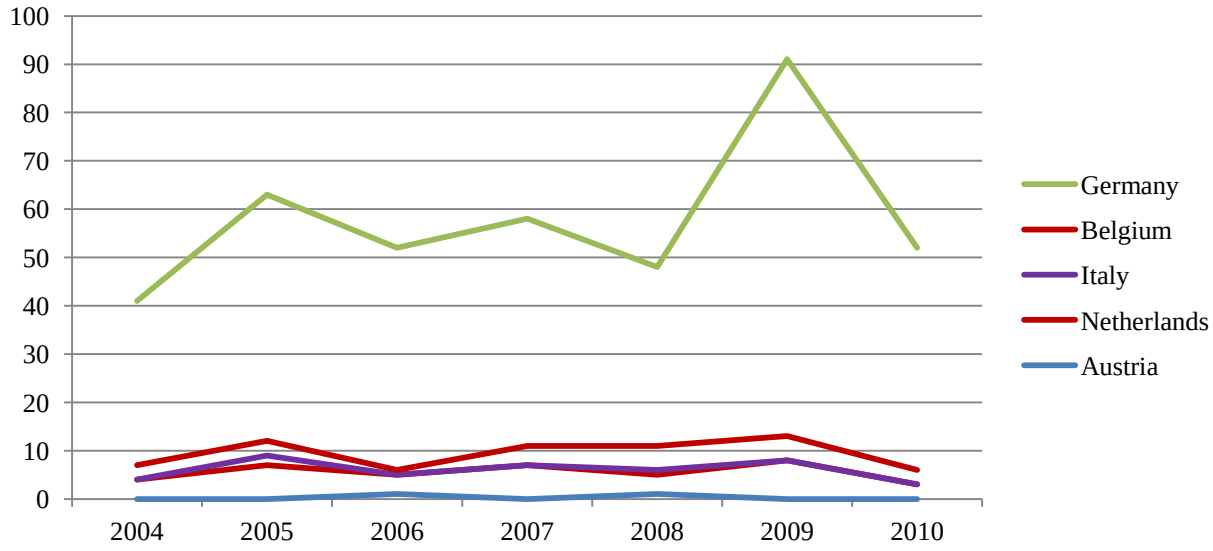
Nevertheless, minor container flows did go from Rotterdam to Valenciennes, Lille, Boulogne-sur-Mer and Paris. This transport was mainly carried out by trucks, and later also by multimodal transport, including barge and trucks. There were two ways to transport maritime containers by barge to France on the Rhine, for example to the terminals of Strasbourg and Ottmarsheim on the French part of the Upper Rhine, or on the Scheldt to the north of France. With respect to the latter route, the opportunities for barge transport were limited by the bridge over the Scheldt in Avelgem, which could only be passed by barges carrying no more than two layers of containers. Contargo did transport numerous containers to the Valenciennes area, but most of these had Antwerp as their origin or destination.

This minor container flow can be seen as port competition with Le Havre, as these destinations logically belonged to its hinterland. Due to the modal split at Le Havre, where road haulage had a dominant role, the port had a limited geographic reach. Indeed, barge and rail transport, which have a wider range, played a minor role. As a result, it is unlikely that the relatively small Le Havre would become a serious competitor to the Port of Rotterdam. Nevertheless, the fact that Rotterdam did not manage to achieve any growth with respect to the transport of maritime containers

to France means that either there was very little demand for them in the north of France, or that Le Havre was able to maintain its position. There must have been more volumes going to France from the Netherlands, but these were transshipped in Belgium. In this context, it is significant that most rail container terminals in Belgium were situated close to the French border.

From the distribution of container transport by road between France and its major hinterland countries (Figure 0.1), it is clear that the largest volumes were conveyed between France and Germany.[1] These volumes probably did not come from Le Havre, but from either Antwerp or Rotterdam before being transshipped at a French barge terminal along the Rhine. Interestingly enough, the volumes between France and the Netherlands were slightly higher than those between France and Belgium, even though Belgium is closer to France.

Figure 0.1 *Container transport flows by road haulage between France, European ports and the major hinterland areas per 1000 TEU between 2004 and 2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

The Rotterdam transport flows to this minor French hinterland were mainly due to logistics, namely the redistribution of containers that would normally arrive at Le Havre but, because of the main port effect, ended up in Rotterdam. These volumes could easily migrate to Le Havre in the case of the growth and development of that port. The maritime flows were not connected to production and consumption, as products of French and Dutch industry were generally palletized and transported in continental loading units rather than maritime containers. Continental volumes probably consisted mostly of food stuff.

[1] The statistics for barge and rail transport are unfortunately unavailable.

The Dutch domestic hinterland: back to the backyard

Directly after World War II, goods transported from Rotterdam had a domestic destination. In the 1950s, cross-border truck transport started cautiously, as roads had been damaged by the war. Until the 1980s, domestic container transport was mainly performed by road haulage, as the first domestic rail terminals outside Rotterdam, Heerlen, Leeuwarden, Almelo and Veendam were only built in 1982, and the first domestic barge terminal in Nijmegen in 1987. Most of these initial terminals were situated close to the German border, which meant that they were strategically positioned for transport to Germany, which was the most important export country for the Netherlands. As the importance of domestic container transport grew, terminals spread throughout the country. This was enhanced by the fact that Dutch municipalities were eager to open their own container terminals to create employment and attract industry, even if there were already many other terminals in the area. While in 1987 there were only four inland rail terminals and one barge terminal in the Netherlands, by 2006 these numbers had increased to 10 and 50, respectively. The road haulage modality did not have its own terminals, and performed the last mile of transport from the rail and barge terminals. Transport also became increasingly intermodal. At the same time, after transport liberalization, maritime and continental containers were handled together. This improved the efficiency of container transport.

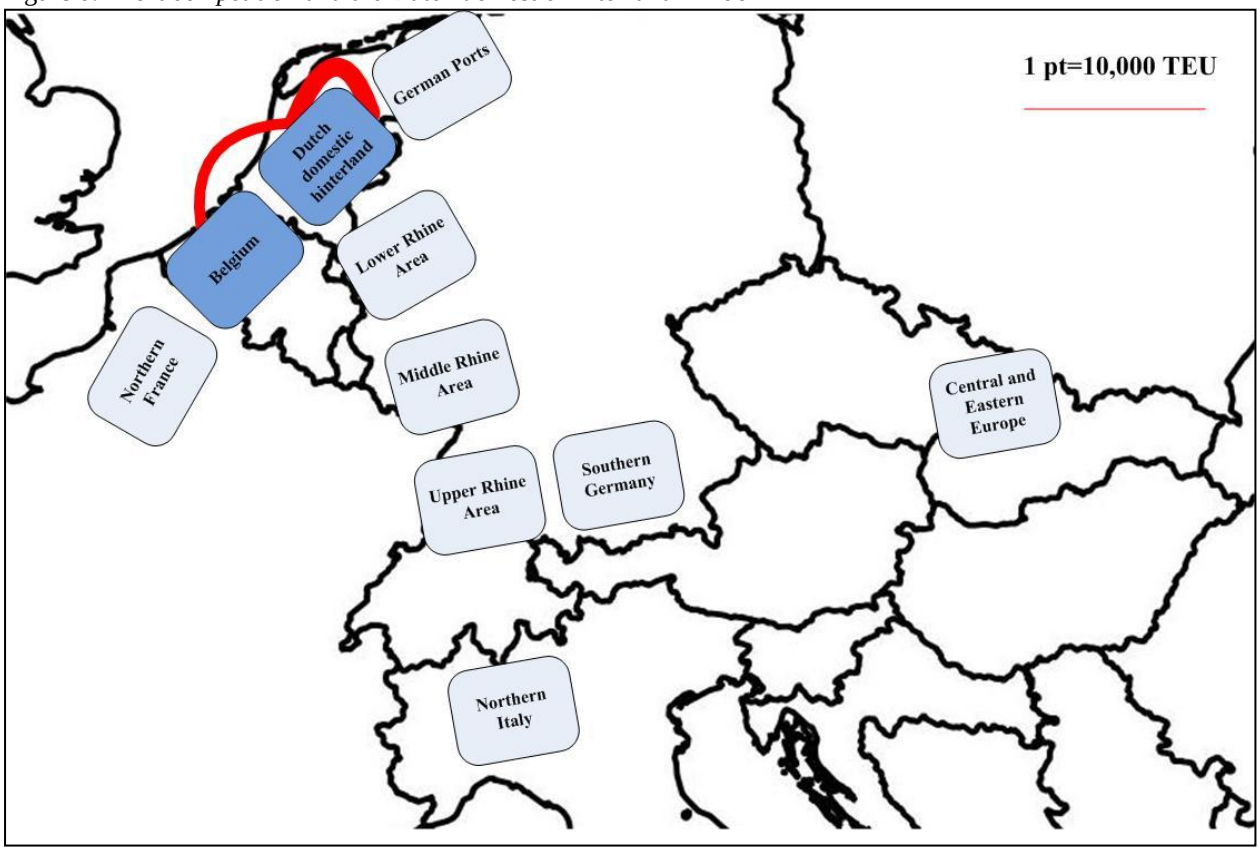
Liberalization, which typically concerned cross-border transport, did not have a direct effect on the domestic flow of maritime containers, but certainly had an indirect influence. As a result of liberalization, the intermodal competition in cross-border transport to destinations increased, while the geographic reach of the hinterland transport of maritime containers decreased. This, in combination with the discovery of the opportunities offered by container transport over relatively shorter distances, increased the importance of the domestic market. Growth was most spectacular in domestic barge transport, which rose from 21 percent in 1994 to 44 percent in 2010. In the first few years after the arrival of maritime containers in Rotterdam, cross-border destinations were relatively important for truck container transport as most of the goods transported by Sea-Land and United State Lines had their destinations in Germany in the Middle Rhine area. Nevertheless, according to the source used herein, the share of domestic destinations in 1985 was as high as 72 percent. This figure is probably too high. Indeed, according to the CBS data, the share of the domestic transport of maritime containers by road haulage between 1997 and 2010 fluctuated around 50 percent, but this number is probably too low. According to the interviews, the share of the domestic market was higher, and grew after liberalization, especially in the first few decades of the 20th century. Yet human memory is a disputable source, especially for statistical information. A limited number of interviews, and the huge number of companies, especially in this sector, mean that this data is of limited value in any event. The share of rail transport in the domestic market, which has competitive advantages for destinations above 300km, did not grow spectacularly. Indeed, in the period between 1994 and 2010, it fluctuated around 25 percent of the total maritime containers transported to and from Rotterdam. Overall,

especially as a result of the growth of the volumes transported by barge, the importance of the domestic market grew during the research period.

The Dutch domestic hinterland belonged to the captive hinterland of the Port of Rotterdam, and was primarily served by it. Notwithstanding this, Rotterdam had to face increasing competition due to the growth in intramodal transport. In the case of the domestic market, with the exception of minor maritime container flows taken by road haulage between Rotterdam and Hamburg, the biggest competitor was Antwerp. According to the director of Europe Container Terminals, R.P.A. Hoorweg (1983-1995), the competition with the Flemish port started in 1982 when Antwerp opened the Delwaide terminal and started to offer services that were comparable with those of Rotterdam for a lower price. This was possible as the Belgian government invested more in port infrastructure than its Dutch counterpart. In addition, Hessenatie, a stevedore in Antwerp, acquired a major customer (the Mediterranean Shipping Company) from Seaport/Katoen Natie in the early 1990s. As a result, a tariff war broke out in the Flemish port, which forced prices down and put the sea shipping companies in a very powerful position during the negotiations with Europe Container Terminals, enabling them to threaten to switch to Antwerp.[2] Figure 0.2 portrays the container flows within the Netherlands and between the Netherlands and Belgium in 2004 with a red line, with one point of the line thickness representing 10,000 TEU of transported containers. The domestic volumes were almost twice as important as those between the two countries. Nevertheless, there were major maritime container flows moving between Belgium and Rotterdam, with the majority going to or coming from Antwerp. These flows by all of the three container transport modalities were primarily the result of the main port effect and the complementarity of the two ports. Many of these containers were redistributed because they had the other port as their destination. Moreover, the majority of these containers were empty.

[2] R. Mackor, 'ECT's 'verkoopdier' neemt afscheid Hoorweg: Twaalf jaar knokken tegen de Belgen', *Nieuwsblad Transport*, (9 maart 2005).
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/29769/ArticleName/ECTsverkoopdierneemtafscheidHoorwegTwaalfjaarknokkentegendeBelgen/Default.aspx, seen on 28-11-2013.

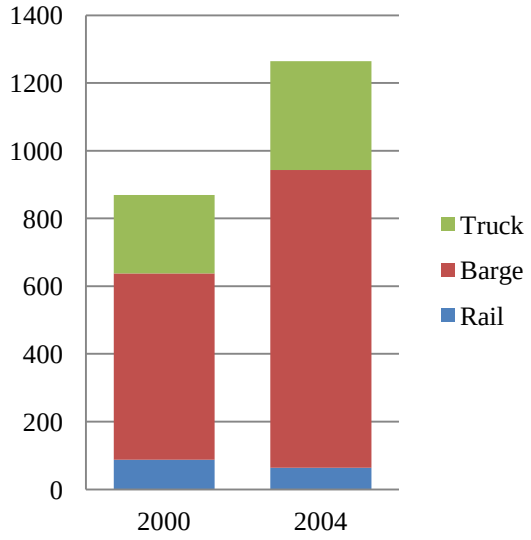
Figure 0.2 *Port competition and the Dutch domestic hinterland in 2004*



The red lines represent the transport flows. The one point size represents 10,000 TEU.
Source: Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011), Railion, *Intermodal Shuttles* (Utrecht 2000).

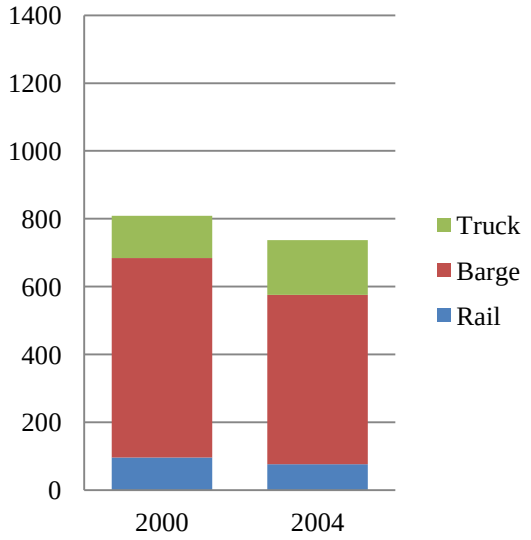
The domestic transport of maritime containers showed spectacular growth in the period between 2004 and 2010. This was, however, also the case during most of the research period, both in the absolute as well as the relative sense (Figure 0.3). The volumes conveyed between the Netherlands and Belgium fell slightly, but this was only a temporary effect (Figure 0.4). The Dutch domestic market was connected to logistics as well as production and consumption-based activities. The former spread from the port to the inland terminals, which grew like mushrooms in the country. This was partly because the port of Rotterdam tried to move as many of its activities as possible further inland to economize on space and reduce congestion. Multimodal transport thus generated logistics activities in different parts of the country. Maritime container transport was based on production in so far as it was used for the overseas export of products from Dutch industry. Furthermore, Dutch industry needed supplies, which could also arrive in maritime containers. The Port of Rotterdam supplied goods for local consumption if the distribution centre of the companies was situated within the country, which belonged to the captive hinterland of Rotterdam. This was in contrast with the relationship with Belgium, which was just a byproduct of logistic processes.

Figure 0.3 *Domestic transport of maritime containers within the Netherlands per 1000 TEU in 2000 and 2004.*



Source: Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Figure 0.4 *Transport of maritime containers between the Netherlands and Belgium per 1000 TEU in 2000 and 2004.*



Source: Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

The same was true for volumes going from Rotterdam to the German ports, in particular Hamburg. There was actually a short sea feeder service between Rotterdam and the German ports, but this transport flow is excluded here as the research concentrates on the hinterland and not outport transport. There was no direct rail connection between Rotterdam and the German ports, but containers could be indirectly exchanged between them through Duisburg, which emerged as a transport hub in the 2000s. The redistribution mainly happened by truck, which shows that it did not take place on a large scale. This was, just like the flow between Rotterdam and Antwerp, also a byproduct of logistics. Over this relatively long distance of approximately 500km, trucks were only used when there was a requirement for speed, for example because a container had missed the boat in Rotterdam. Another reason could be making use of the time that passed between a ship's arrival in Rotterdam and the German ports. Goods transshipped in Rotterdam were transported to their destination, and the containers were stripped and brought to the ship which sailed to Hamburg in the meantime. In the case of the transport of frozen fish, this involved the shipping line Samband for New Zealand again. This connection was purely logistical, as it had nothing to do with production or consumption-based relationships.

Lower, Middle, Upper Rhine and Italy

The second axis discussed here stretches from the United Kingdom through the Netherlands and the Lower, Middle and Upper Rhine area to the north of Italy. This axis is strongly determined by the Rhine, which has given a 120-year geographical advantage to those offering cheap barge transport to

Rotterdam.[3] Indeed, these areas formed the most important hinterland for container transport from and to Rotterdam.

The relatively short distance between Rotterdam and the Lower Rhine region meant that this area was not particularly interesting to those involved with rail transport in the early years of containerization, which had a competitive advantage with respect to distances above 300km. Indeed, the majority of the cargo transported by the first container ships to Rotterdam had the Middle Rhine region as their final destination. The barge transport of maritime containers also started higher up on the Rhine, meaning that those with a destination in the Lower Rhine region travelled by truck in the early period of containerization. Truck transport was complicated by the compulsory cross-border licenses it required to travel between Germany and the Netherlands until the liberalization of the road haulage sector in 1993.

The gravity point of the barge transport of containers moved slowly down the Rhine in the period 1990-2010, as it also did for rail transport. As liberalization allowed new entrants to join the rail market, ERS Railways took advantage of this opportunity in the early period of containerization to break the rail shuttle market open and establish cheap shuttles to relatively close-by areas. This meant that the Lower Rhine region came within reach of all three modalities after liberalization, leading to strong competition.

Before discussing the effects of port competition on the importance of the Lower Rhine region as a hinterland area, an important factor in the development of this region that has received very little attention needs to be examined: the development of Duisburg into a major transport hub. Duisburg is situated approximately 200km from Rotterdam and 300km from the German ports, mirroring Dortmund, which is 250km from Rotterdam and 300km from the German ports. Just like Dortmund, Duisburg could be reached by both barge from Rotterdam and rail from the German ports, and the transport costs from both ports were approximately the same.[4] When the barge shuttle connection to Duisburg stopped running, Dortmund became increasingly oriented towards the German ports. However, Duisburg was still easily accessible by barge from Rotterdam, was well connected by rail to the German ports, and also had short sea connections to the United Kingdom. Due to its position along the Rhine, Duisburg was more oriented towards the North Sea ports than the German ports. Indeed, although the North Sea could be reached from Hamburg and Bremen by rail, this connection was relatively expensive, and so Duisburg exploited its position as the third point of the triangle formed by the North Sea and the German ports. Duisburg also tried to solve the problems of deindustrialization and the consequential loss of employment caused by the gradual disappearance of heavy industry from the Ruhr area by shifting its focus from production to logistics.

[3] H.A.M. Klemann and J. Schenk, 'Competition in the Rhine delta: waterways, railways and ports, 1870-1913', *The Economic History Review*, 66, 3 (2013) 826-827.
[4] Interview with Heinrich Kerstgens, director *Contargo*, 04-10-2011.

The Port of Duisburg, which was located in the Ruhrort district, was established in 1926 as a joint venture between the municipality of Duisburg and the state of Prussia for the transshipment of supplies for local heavy industry. In 1950, however, the port had to adjust to the changes brought about by the energy transition from coal to oil.[5] Oil handling and storage facilities were therefore built and connected to the refineries in the Ruhr area with pipelines.[6] As a result of this change in the energy base of the Ruhr area, government subsidies for expensive import coal were abolished in the 1980s.[7] Nevertheless, coal transshipments did not end immediately, and in the mid-1980s their number was in fact still growing.[8] Indeed, almost 25 million tons of coal per annum were transshipped in Duisburg in that decade. In the 1990s, however, there was a rapid reduction in the volumes of coal that were transshipped , with only 3.5 million tons being handled in Ruhrort in 1991.[9]

These reduced bulk volumes were replaced by general cargo, maritime containers and short sea transport. Containers made their entrance at the Port of Duisburg in 1984, when the first container terminal was built by the Duisburger Container Gesellschaft (DeCeTe) along with a ro-ro facility for short sea transport.[10] In 1988, the federal government decided that Duisburg was to be transformed into a European logistics hub, for which a 150 million DM government subsidy was reserved. Duisburg also received the status of a free port, where transit goods could be stored, processed and forwarded without the need to pay duties.[11] Only the ports of Hamburg and Bremen had had this status before.[12] Given German transport policy's obsession with multimodal transport, the project started with the building of a 90,000m^2 multimodal terminal in 1991 with an investment of 29 million DM.[13] Duisburg also managed to acquire further subsidies by applying for the construction of a *Guterverkehrszentrum* (GVZ; Cargo Transportation Centre), 41 of which were planned for the entirety of Germany. This took a total investment of almost one billion DM.[14] As a result of these

[5] M. Boon, 'Energy Transition and Port-Hinterland relations. The Rotterdam oil port and its transport relations to the West German hinterland, 1950–1975', *Jahrbuch für Wirtschaftsgeschichte / Economic History Yearbook,* 52, 2 (2012) 215.
[6] www.duisport.de, seen on 11-06-2013.
[7] Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport,* (6 juni 1992) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx, seen on 28-11-2013.
[8] www.duisport.de, seen on 11-06-2013.
[9] Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport,* (6 juni 1992) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx, 28-11-2013.
[10] www.duisport.de, seen on 11-06-2013.
[11] The Rhine-Ruhr Port of Duisburg', *Logistic Management and Distribution Report,* 36, 7 (1999) 11.
[12] Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport,* (6 juni 1992) . http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx, seen on 28-11-2013.
[13] Duisburg wil samenwerking met Rotterdam uitbouwen', *Nieuwsblad Transport,* (3 januari 1995). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/7469/ArticleName/DuisburgslaatfractiemeergoederenoverDefault.aspx, seen on 28-11-2013.
[14] Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport,* (6 juni 1992). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx, seen on 28-11-2013.

investments in the early 1990s, the Port of Duisburg's total number of transshipments (in tons) continued to grow, despite the reduction in coal transshipment.[15]

The next step was to integrate the growing port into Europe's transport networks and enter into an agreement with the Western European ports. In 1991, when Kühne & Nagel's EuroLogistik-Terminal was opened, Duisburg was included in the network of this major German forwarder, which had five distribution centers in Europe. The port also constructed its own rail connection for the terminal from where it transported expensive consumption goods, including televisions and radios.[16] In the early 1990s, the port at Duisburg increasingly depended on the Port of Rotterdam and increased its cooperation with this competitor. Indeed, the saying went: "If Rotterdam coughs, Duisburg contracts pneumonia."[17]

In the mid-1990s, the cooperation focused on multimodal transport. Duisburg had a goal to collect the containers coming from Rotterdam and then forward them by train to their final destination.[18] Indeed, the director of the port in the 1990s, K. van Lith, expected the Port of Rotterdam to become overcrowded and its infrastructure jammed, with Duisburg offering an escape. Lith argued that it was easier to load shuttles in Duisburg, where volumes were concentrated. Multimodal transport there was executed by *Planungsgesellschaft Kombinierte Verkehr* (PKV; company for planning multimodal transport), which was a cooperation between Transfracht, a subsidiary of Deutsche Bahn that was responsible for container transport, and Kombiverkehr, which was a German company involved in multimodal transport. This organization bundled expertise in the field of intermodal transport,[19] which was a possible solution to the old problem of not now having a connection to the German rail system, which had closed in 1984. A good rail connection from Duisburg to the German ports was also seen as an absolute necessity, and a new yard was built and the number of tracks increased.

Yet Duisburg not only cooperated with the Port of Rotterdam, but also with the Port of Amsterdam. In 1996, an area of 210,000m^2 that had belonged to a copper mill was made ready for the

[15] 'Duisburg wil samenwerking met Rotterdam uitbouwen', *Nieuwsblad Transport*, (3 januari 1995). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/7469/ArticleName/DuisburgslaatfractiemeergoederenoverDefault.aspx, seen on 28-11-2013.

[16] Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport*, (6 juni 1992). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx, seen on 28-11-2013

[17] Own translation: Als Rotterdam hoest, krijgt Duisburg longontsteking. Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport*, (6 juni 1992). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx, seen on 20-11-2013.

[18] M. Gonlag, 'Shuttle Rotterdam-Duisburg moet (beter) aansluiten op Duits spoor Havens willen samenwerking tussen spoor en binnenvaart', *Nieuwsblad Transport*, (16 September 1995). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/33314/ArticleName/SHUTTLEROTTERDAMDUISBURGMOETBETERAANSLUITENOPDUITSSPOORHavenswillensamenwerkingtussenspoorenbinnenvaart/Default.aspx, seen on 28-11-2013.

[19] 'Duisburg wil samenwerking met Rotterdam uitbouwen', *Nieuwsblad Transport*, (3 januari 1995). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/28674/ArticleName/DuisburgwilsamenwerkingmetRotterdamuitbouwen/Default.aspx, seen on 28-11-2013.

transshipment of coal for Amsterdam. It was not, however, only Duisburg that reached out to Rotterdam; the latter port was also willing to cooperate. In 1999, European Container Terminals, the largest stevedore in Rotterdam, established a container terminal in Duisburg on the basis that it would enable it to take advantage of a good connection to the German rail system. ECT did not, however, make use of this opportunity until 2000 when it merged with Duisburger Container Gesellschaft, which was the first container terminal in Duisburg.[20] A cooperation agreement with the Port of Antwerp was also put in place, with Duisburg opening its own terminal in 2005 (the Antwerp Gateway terminal) for the transshipment of volumes with Duisburg as their destination.[21]

From the 1990s onwards, the port grew quickly, managing 19 harbor basins with a surface area of 7,400,000m^2 in the early part of the decade. Companies increasingly demanded space, preferring it to berth. Yet, as a result of the growing speed of the transshipment process, barges spent less time in the port, and so needed less space; there was more of a need for warehouses in which to perform value added operations. The port expanded by filling up the harbour basins.[22] For example, part of Kaisershafen, which was where bulk used to be transshipped, was dredged to create space for transshipment for multimodal transport purposes. Indeed, fast transshipment installations were built in this new location with a surface area of 150,000m^2. In 1998, the port added an extension called Logport I in a new area on the former site of a Krupp steel mill in Rheinhausen. This was followed in 2006 by the construction of Logport II in the former area of Sudamin MHD.[23]

In 2000, the port was given the name Duisport , and its growth accelerated in the same year.[24] Its turnover also grew, rising from 34 million euros in 2000 to 58 million in 2005, which is annual growth of approximately 12 percent. Moreover, 36.4 million tons were transshipped in 2001, but this grew annually by an average of five percent, reaching 45 million tons in 2005. The transshipment of containers, meanwhile, almost doubled between 2002 and 2004 from 38,000 to 61,000 TEU, and in 2005 more tons of containers than bulk were transshipped for the first time. In 2008, the transshipment of containers reached 1 million TEU.[25] Duisburg's target to create employment was

[20] 'Fusie ECT en DeCeTe Duisburg mag', *Nieuwsblad Transport*, (15 februari 2002). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/74658/ArticleName/FusieECTenDeCeTeDuisburgmag/Default.aspx, seen on 21-11-2013.

[21] [21] www.duisport.de, seen on 11-06-2013.

[22] Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport*, (6 juni 1992) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx, seen on 11-11-2013.

[23] A metal mill and originally also a plant for the production of sulfuric acid founded in 1905, *Von der Metalhütte zum Angerpark Ein Dokumentation*, (Duisburg 2005). http://www.duisburg.de/news/medien-12/Doku_Logport_II_f__r_Download.pdf, seen on 20-11-2013. 'Duisburg is bulkhaven af', *Nieuwsblad Transport*, (12 April 2006). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/98641/ArticleName/Duisburgisbulkhavenaf/Default.aspx, seen on 20-12-2013.

[24] 'Havenbedrijf Duisburg tevreden over jaarcijfers', *Nieuwsblad Transport*, (15 April 2003). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/82704/ArticleName/HavenbedrijfDuisburgtevredenoverjaarcijfers/Default.aspx, seen on 19-11-2013.

[25] 'Opnieuw sterk toeneming containeroverslag Duisburg', *Nieuwsblad Transport*, (23 maart 2005). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/94645/ArticleName/Opnieuwst

also quite successful; in 2006, the port provided direct and indirect employment for 17,000 people in Duisburg itself and 36,000 in the region.[26] The port's growth did not, however, happen spontaneously, instead requiring major investment. Indeed, in the period between 2001 and 2004, 54 million euros were invested in the port by the federal government, while 70 million was spent on preparing the former Sudamin MHD area for the construction of Logport II in 2006. Furthermore, 155 million was spent on the expansion of the rail infrastructure and the container transshipment capacity between 2006 and 2008.[27]

Between the mid-1980s and 2010, the Port of Duisburg became a terminal cluster, with eight terminals built in that period.[28] At the same time, a company cluster also emerged (Table 0.1). The port area of Logport I, for example, was a magnet for logistics companies, while 50 firms settled at Duisburger Hafen between 1996 and 2006.[29] This was a classic clustering effect; companies with similar activities tend to settle close together to enable them to profit from the positive externalities of their neighbours.[30] By 2010, Duisburg, which had tried to become the most important inland barge terminal in Germany, proved to be a pivotal port, developing an elaborate barge network that was connected to 160 trimodal terminals. Indeed, with its terminal and company cluster in the late 2000s, it was the only port area to have shown spectacular growth despite the fact that the transport of containers stagnated in the rest of Germany.[31]

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erketoenemingcontaineroverslagDuisburg/Default.aspx, seen on 19-10-2013. 'Nieuwe en andere klanten voor Duisburg', *Nieuwsblad Transport*, (9 maart 2005). http://www.nieuwsbladtransport.nl/Edition/tabid/321/ArticleID/10051/PageID/3909/PageTitle/12/EditionID/197/Default.aspx?ArticleTitle=Nieuwe+en+andere+klanten+voor+Duisburg&EditionTitle=Edition+9-3-2005, seen on 20-11-2013. 'Duisburg is bulkhaven af', *Nieuwsblad Transport*, (12 April 2006). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/98641/ArticleName/Duisburgisbulkhavenaf/Default.aspx

[26] www.duisport.de, seen on 11-06-2013.

[27] 'Opnieuw sterk toeneming containeroverslag Duisburg', *Nieuwsblad Transport*, (23 maart 2005). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/94645/ArticleName/OpnieuwsterketoenemingcontaineroverslagDuisburg/Default.aspx, seen on 19-10-2013. 'Nieuwe en andere klanten voor Duisburg', *Nieuwsblad Transport*, (9 maart 2005). http://www.nieuwsbladtransport.nl/Edition/tabid/321/ArticleID/10051/PageID/3909/PageTitle/12/EditionID/197/Default.aspx?ArticleTitle=Nieuwe+en+andere+klanten+voor+Duisburg&EditionTitle=Edition+9-3-2005, seen on 20-11-2013. 'Duisburg is bulkhaven af', *Nieuwsblad Transport*, (12 April 2006).

[28] www.duisport.de, seen on 11-06-2013.

[29] 'Havenbedrijf Duisburg tevreden over jaarcijfers', *Nieuwsblad Transport*, (15 April 2003). http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/82704/ArticleName/HavenbedrijfDuisburgtevredenoverjaarcijfers/Default.aspx, seen on 19-11-2013.

[30] M.E. Porter, 'The Economic Performance of Regions', *Regional Studies*, 37 (2003) 562.

[31] Buck Consultants International, *Notitie groei containerbinnenvaart en kansen nieuwe initiatieven (concept)* (Den Haag 2012) 11.

Table 0.1 *Establishment of major companies in the Port of Duisburg (1995-2010)*

Year	Company	Origin	Activity	Specific	Location
1995	Textilfinishing- und	German	Logistics	Textile	Port
1995	Schenker	Austrian	Logistics	General	Port
1995	Duisburger Freihafen	German	Logistics	General	Port
1997	PCD Packing Centre	German	Logistics	Stuffing stripping	Port
1999	NYK Logistics	Japanese	Logistics	General	Logport I
1999	CM Eurologistik	German	Logistics	General	Logport I
2001	Rhenus IHG	German	Logistics	General	Logport I
2003	Kuhne & Nagel	German	Logistics	General	Logport I
2004	Colbelfret	Belgian	Logistics	Automobiles	Logport I
2004	UnionStahl	Belgian	Logistics	Automobiles	Logport I
2004	Seacon Logistics	Dutch	Logistics	General	
2005	Mates Spedition	German	Logistics	General	Logport I
2005	Buhlmann Tube	German	Distribution	Pipes petrochemical	Logport I
2005	E.H. Harms	Dutch	Logistics	Automobiles	Logport I
2005	Siemens Healthcare	German	Distribution	Medical devices	Logport I
2005	Greiwig Logistics For	German	Logistics	General	Logport I
2006	Industriereifenkontor	German	Distribution	Industrial tires	Logport I
2006	DHL Supply Chain	Multinational	Logistics	Postal services	Logport I
2007	Gökbora	Turkish	Logistics	General	Logport I
2007	Verbatim	Multinational	Distribution	Electronics	Logport I
2007	Simon Hegele	German	Logistics	Medical technology	Logport I
2008	Danone	Multinational	Distribution	Spa water	Logport I

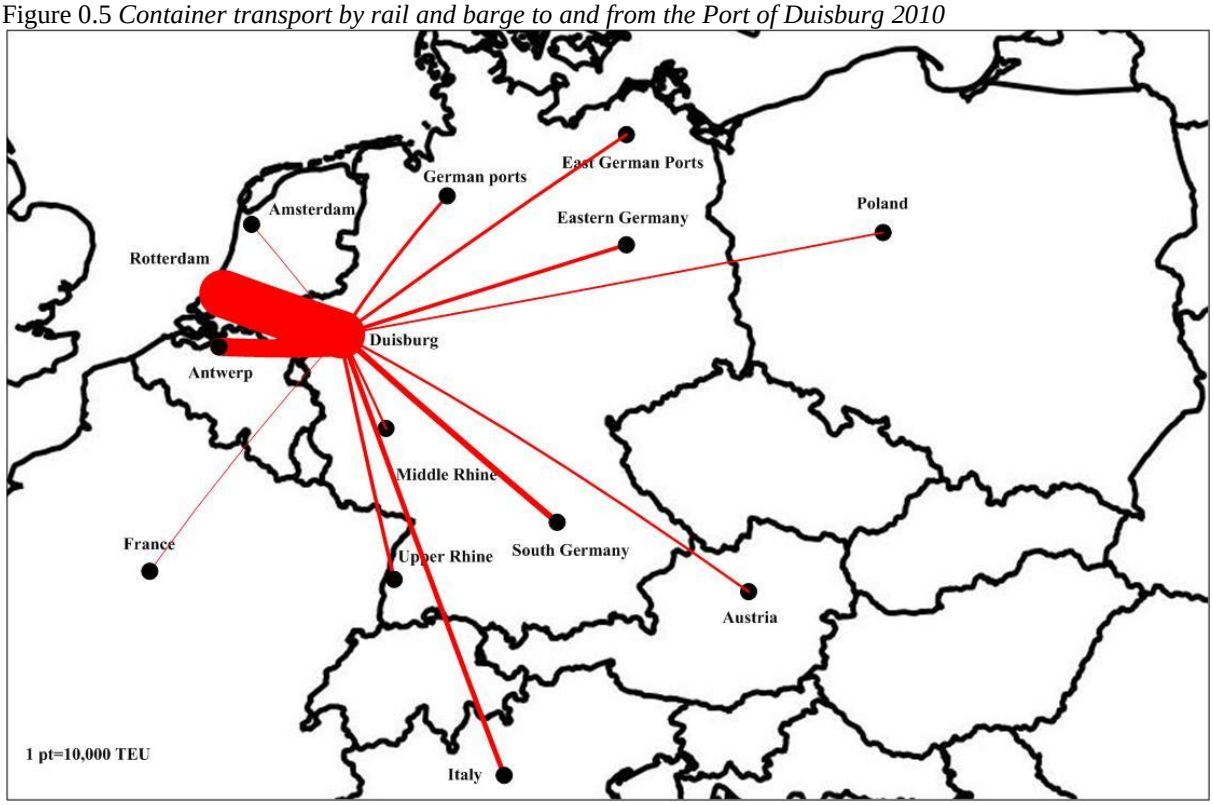
Source: www.duisport.de, seen on 11-06-2013, Nieuwsblad Transport.

Figure 0.5 shows the container transport flows by rail and barge to and from the Port of Duisburg. It is clear that the most intensive connections were with Rotterdam and Antwerp, which could be reached from Duisburg by barge. The connection to the German ports was less important. Looking at the figure, it is notable that the transport flows from Duisburg targeted the hinterland areas of the North Sea ports, destinations within the Rhine region, and the German ports in the south and east of the country. Looking at the development of the share of the different areas in terms of total transport (Figure 0.6), Rotterdam had the most concentrated flows to Duisburg, and these were growing, with only a minor dip during the economic crisis in 2008. Flows of volumes between Antwerp and Duisburg were also rising, although they started at a lower level and grew more slowly than those of Rotterdam.

The remaining areas, including the German ports, mainly stayed under 50,000 TEU, and none of them demonstrated spectacular growth between 2004 and 2010. A comparison of the container transport flows by barge and rail of Duisburg and the entire Lower Rhine region (Figure 0.7) highlights that the former was more oriented towards Rotterdam than to the rest of the latter. The Lower Rhine region had approximately equal transport flows with Rotterdam and Hamburg, and a

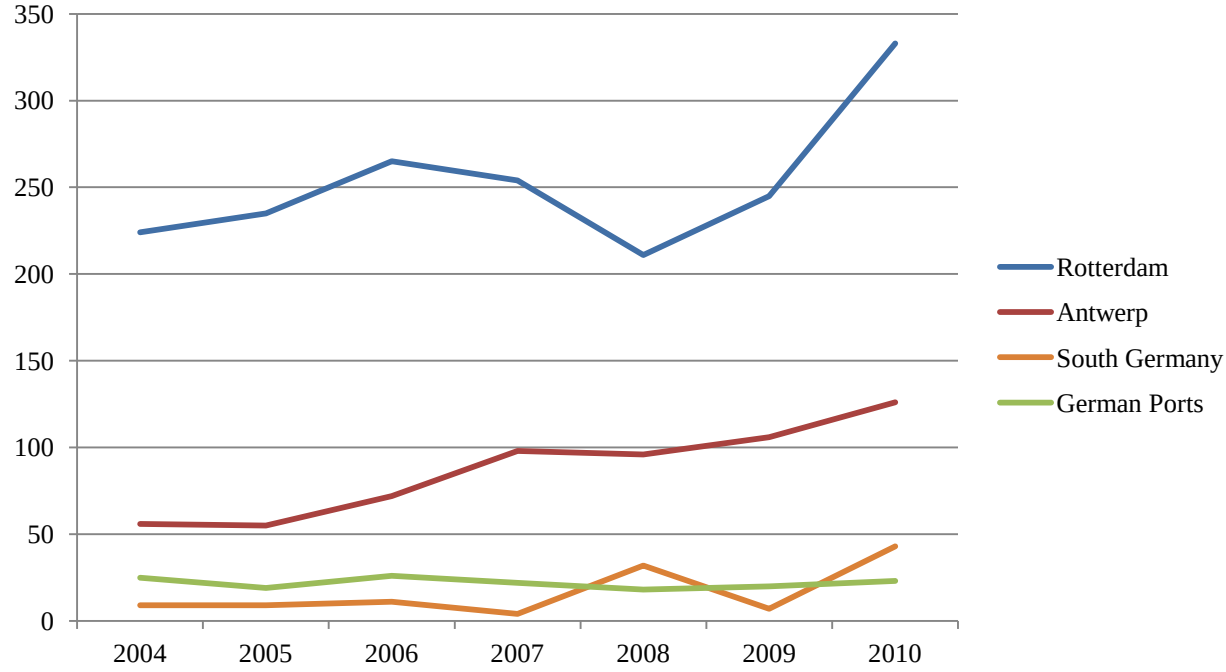
much less intensive flow going to Antwerp. The distribution flows followed the Rhine region, with an important stream going to Italy and a rail connection to Southern Germany. The development of container transport in the Lower Rhine region (Figure 0.8) from 2004-2010 by rail and barge reveals that the role of the most significant flows to Rotterdam and the German ports increased in importance during the period, with the exception of a minor dip by Rotterdam in 2008. Italy and Antwerp lagged behind in this respect and declined from 2007 onwards. Southern Germany and the Upper Rhine, meanwhile, never reached the 100,000 TEU level.

Figure 0.5 *Container transport by rail and barge to and from the Port of Duisburg 2010*



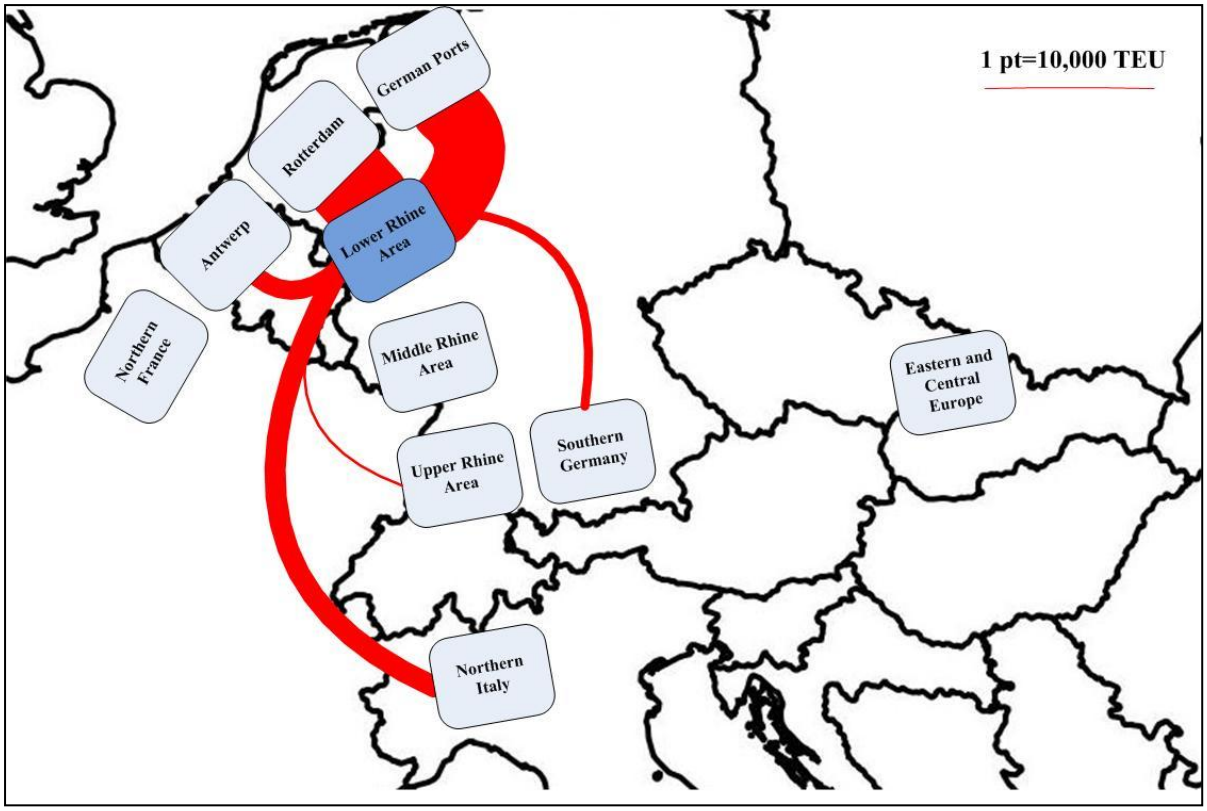
Source Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Figure 0.6 *Development of the transport flows from and to Duisburg per hinterland area in 1000 TEU (2004-2010).*



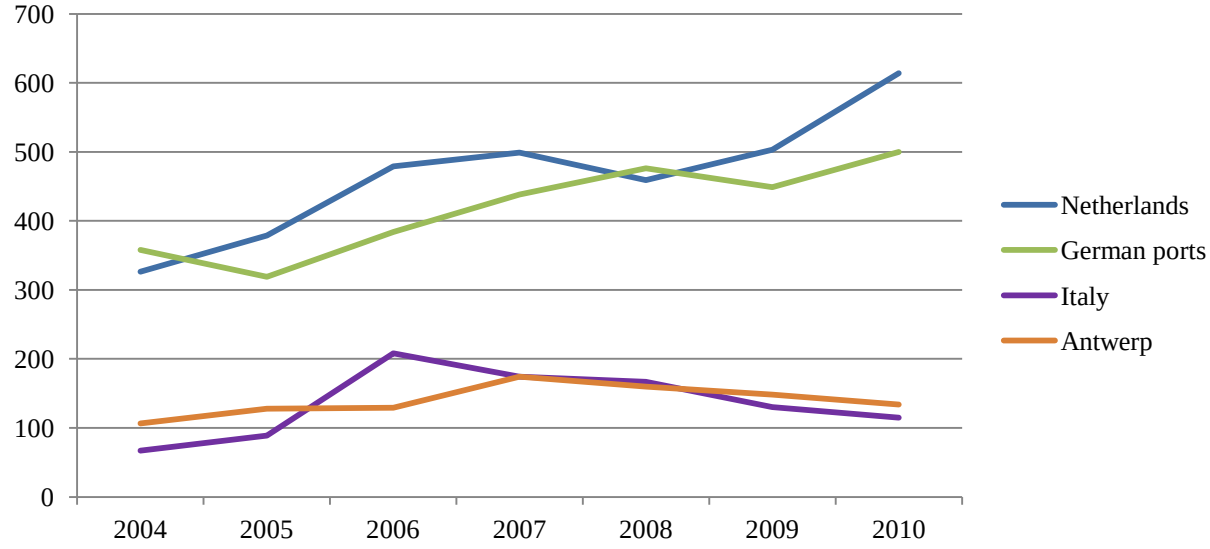
Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Figure 0.7 *Container transport flows between the Lower Rhine region, West European ports and the hinterland areas in 2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011)

Figure 0.8 *Number of containers transported between the Lower Rhine region and the different hinterland areas per 1000 TEU in the period 2004-2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

The Lower Rhine region increasingly belonged to the contested hinterland of Rotterdam, and was targeted by both Antwerp and the German ports. Antwerp's weapons were its cooperation with Duisburg in the form of German investments in the Belgian port and the Belgian logistics companies that established themselves in the German city. Rotterdam fought back with its cheap barge connection on the Rhine, the German ports with good rail connections and Deutsche Bahn. Unfortunately, Deutsches Statistisches Bundesamt's statistics are only available for the last seven years of the research period. Nevertheless, these show that in this period Antwerp was losing its position and the competition between the German ports and Rotterdam was more or less equal.

Companies that had distribution centers in the Lower Rhine region benefitted from this competition, and had a choice of four ports for their transshipment needs, with a logistics cluster providing all possible high quality logistics services in Duisburg. Prior to the liberalization of the European transport sector, when cross-border transport was subjected to a number of restrictions, companies could best organize the distribution of their products per country. After liberalization, however, the majority of the problems of crossing national borders were resolved, resulting in increasing intermodal competition and lower transport costs. Furthermore, liberalization meant that the distribution of products of multinationals no longer needed to take place per country, but could be arranged from one central warehouse. As a consequence, warehouses and the European distribution centers of these firms settled in the Lower Rhine region.[32] For example, those of IKEA, Hewlett

[32] Theo Notteboom, *The relationship between seaports and their intermodal hinterland in light of global supply chains* (2008) 9-10.

Packard, Konica-Minolta, Metro (Makro) and the largest distribution centre of the toy manufacturer Hasbro were situated there.[33] As a result, transport between Rotterdam and the Lower Rhine region increasingly depended on the logistics activities of these companies. At the same time, production activities were gradually leaving the Lower Rhine region, because the traditional Ruhr industry disappeared. Accordingly, municipalities tried to create employment in logistics. As a consequence, and in combination with the growth in production in Southern Germany, the industrial gravity point of the country was moving to the south, away from the Lower Rhine Region, although some production did remain there, for example, a plant of the chemical giant Bayer stayed in Leverkusen, close to Cologne.

Meanwhile, in the macroeconomic hinterland of Rotterdam, the share of logistics activities was growing fast, in contrast to production. As container transport is footloose and can take alternative routes without major tariff differences, an economic shift in Europe could therefore mean a loss of container volumes for the Port of Rotterdam.[34] Indeed, the fact that its major hinterland was no longer Europe's main industrial centre, but primarily a centre of logistics, made its position vulnerable. In fact, in spite of the success story of Duisport, the Lower Rhine region gradually became a problematic area. An example is North Rhine Westphalia, which developed more slowly than the rest of the German federal state from 1773 onwards. In Southern Germany, the opposite was the case, and this phenomenon became known as the *Süd-Nord Gefälle* (South-North gradient).[35] Between 1975 and 1987, unemployment in North Rhine Westphalia compared to the average in Germany grew from 102.1 to 123.6, whereas German unemployment overall was 100, and its share of the country's GDP also fell. One of the causes of unemployment was that process innovation almost automatically caused layoffs in the large companies that dominated the Ruhr area.[36] In the following two decades, these developments continued, the economy no longer grew, the population fell and unemployment rose.[37]

Ever since the admission of a number of Central and Eastern European countries to the European Union, the economic gravity point of the continent has been shifting towards the east. Indeed, even limited growth in the prosperity of that area could generate major container flows. If the new entrants to the European Union wish to copy the consumption patterns of Western European

[33] Interview with Michael Mies, managing director, Contargo, Rhein Waal Terminal Emmerich and Heiko Vollmer, sales manager, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012, David Taylor, interview with Kees Kleijn, director Kleijn Transport, 03-07-2013, 'Case 4 Hasbro Europe'. In *Global cases in logistics and supply chain management* (Tunbridge Wells 1997) 48-60.

[34] Theo Notteboom, *The relationship between seaports and their intermodal hinterland in light of global supply chains* (Antwerp 2008) 20, 29.

[35] Onno Möller, *Nederlands-Duitse handel op de helling? De verschuiving van het economisch zwaartepunt in de Bondsrepubliek en de ontwikkelingen in de goederenstroom tussen Nederland en de Bondsrepubliek* (Utrecht 1991) 15-16.

[36] Ibidem, 22.

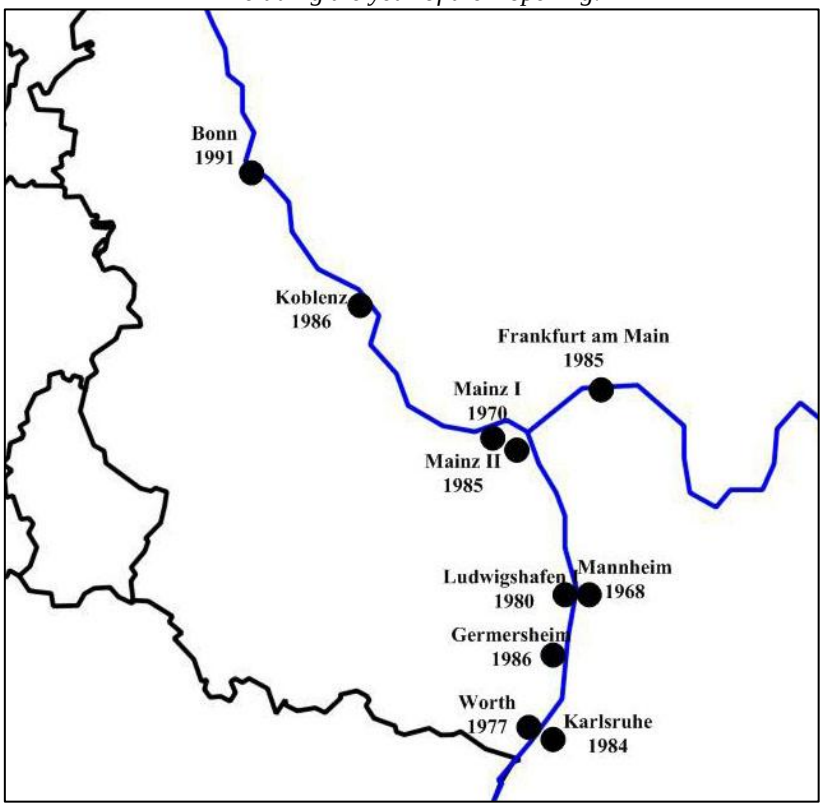
[37] H.A.M. Klemann and Dirk Koppenol, 'Port competition. Rotterdam within the Le Havre-Hamburg range (1850-2013)', in Bart Kuipers and Rob Zuidwijk (eds.), *Smart Port Perspectives Essays in Honour of Hans Smits* (Rotterdam 2013) 74, M. Greive, C. C. Malzahn, L. Rethy, D. Siems, D. F. Sturm and T. Vitzhum, 'Gespaltenes Land Die unheimliche Kraft des Südens', *Die Welt*, 26-jan-2014, 1-5.

countries, this would create a growth in demand. This could lead to multinationals moving their distribution centers closer to these emerging markets. The fact that this is not unlikely is highlighted by the move of Lego's European distribution centre from Germany to the Czech Republic in the late 2000s. Within the research period, the service levels and quality of the infrastructure of Western European countries were superior. However, at the end of the 2000s, this was changing, with new infrastructure being built in Central and Eastern European nations and upgrades being made to their service levels. At the same, time these countries still had lower labour costs. Any shift of logistics towards the east would drive companies into the arms of the German ports, whose hinterland traditionally includes Central and Eastern European ports.

The Middle Rhine

The Middle Rhine is 300km long, but herein the most important part is the last 140km between Mainz and Worth, as demonstrated by the positions of the Rhine barge terminals (Figure 0.9). There were two barge terminals at Bonn and Koblenz on the lower part of the Middle Rhine, between Cologne and Koblenz, while on the highest part there were eight such terminals in 2010. This is because there was less demand for transport on the lower part of the Middle Rhine area as the Rhine valley is too narrow for industrial activities along the approximately 100km of the Rhine between Koblenz and Mainz. Meanwhile, there is a large transport demand generated by the American army depots and the local machine, automobile, and chemical industries on the part of the Rhine between Mainz and Worth.

Figure 0.9 *Position in 2010 of barge terminals on the Middle Rhine, including the year of their opening.*



The fact that since 1956 the majority of military cargo for the US army in Germany was transshipped in Rotterdam instead of Bremen was essential for the choice of location of the first container port in Europe. If the flow of military cargo had not been redirected from the German port to Rotterdam, Bremen could have become the pioneering container port on the continent. Military cargo supplied basic volumes to create economies of scales, which is key to profitable container transport. After World War II, military supplies were initially transshipped in Bremen. Later, this gradually shifted to Rotterdam. After the war, Germany was divided into different occupation zones. In the American zone, there were numerous military bases along the Rhine, because the river used to form a major demarcation point. The largest army depots were situated in the neighborhood of Mannheim,[38] which could be served either from Rotterdam by barge or from the German ports by rail. In 1945, the goods destined for the American zone were transshipped in Bremen. As the transshipment and transport costs of these supplies were paid from German war reparations, transport costs via Rotterdam were substantially lower, although they had to be paid in a foreign currency, which tended to be scarce at that time. In Rotterdam, the choice of Bremen was seen as discrimination against the Dutch port,[39] leading to the Dutch transport attaché in Bonn, C.A.F. Kalhorn, getting involved in 1954. However,

[38] Interview with Konrad Fischer, Contargo, managing director Terminal Ludwigshafen, 06-06-2012.
[39] Martijn Lak, *Because we need them... German-Dutch relations after the occupation: economic inevitability and political acceptance, 1945-1957* (Rotterdam 2011) 165.

only two years later, when the Americans had to pay all of their transport costs from their own resources, they soon became interested in Kalhorn's offer of cheaper transport through Rotterdam. In 1956, the transport of military goods on the Rhine thus began, and 20,000 tons of supplies were soon going up the river and 30,000 tons of military goods were travelling downstream.[40] Indeed, in 1956, a third of the military cargo for American troops was transshipped in Rotterdam. Nevertheless, refrigerated cargo, cars and passengers still came through Bremen because of the investments made there for these purposes.[41]

By the time maritime containers made their entrance in Europe, Rotterdam had become a major port for the transshipment of American military goods. The first such container arrived at the port in 1966, at the same time as McLean was engaged in setting up container services between the United States and Vietnam. These first maritime containers were filled with jeans, tires, cotton and electric appliances, and there were more to follow.[42] The American army had learned a lesson in Vietnam about logistics, and by 1970, half of the military cargo going to Europe was containerized, with this share growing even more in the years that followed.[43] Another factor that caused the shift of military cargo from Bremen to Rotterdam was the transfer from the former to the latter of the activities of a German road hauler, Erich Kieserling, in 1974. In that year, Kieserling started barge transport on the Rhine, including handling containers for Hapag Lloyd, which had already been a customer in Bremen. At the same time, Kieserling started to transport military goods for Sea-Land, which gradually relocated its services from the German ports to Rotterdam. Kieserling played an important role in this process, as he attracted his former customers from Bremen to the Dutch port.

During the Cold War, more than 200,000 American soldiers were stationed in Germany, but after the end of Soviet dominance in Central and Eastern European countries their number was reduced. The presence of the American troops was essential for the Rhine barge container flows between Rotterdam and the Middle Rhine. In 2010, there were still more than 50,000 American military personnel in Germany who, because of the US army's tendering system, received almost all of their supplies from their homeland. Supplies in this sense did not mean strictly military goods. Indeed, as Jasmin Daum, the manager of Contargo's Germersheim barge container terminal, put it: "American soldiers eat American brownies and use American toilet paper."[44]

In addition to military volumes, the products of major chemical companies like BASF, Bayer and Hoechst were also important in the Middle Rhine area. Transporting the exports and supplies of

[40] Nationaal Archief 2.05.118 BuZa Code Archief, inventarisnr. 8617 Vervoer van goederen, bestemd voor Amerikaanse troepen, via Rotterdam naar Duitse Rijnhavens, 1955-1960, from C.A.F. Kalhorn to MVW DGV 1-7.
[41] Nationaal Archief 2.05.118 BuZa Code Archief, inventarisnr. 8617 Vervoer van goederen, bestemd voor Amerikaanse troepen, via Rotterdam naar Duitse Rijnhavens, 1955-1960, from J.A.M.H. Luns to Washington, 4 December 1956.
[42] M. van Baal, 'Containerrevolutie Hagiografie van een grote doos', *Maritieme historie*, (2007).
[43] Marc Levinson, *The Box: How the shipping container made the world smaller and the world economy bigger* (Princeton 2006) 183.
[44] Interview with Jasmin Daum, manager Contargo Terminal Germersheim, 07-06-2012.

these firms, which were increasingly conveyed in tank containers, namely capsule-formed tanks in a frame with standardized measurements, contributed to local transport demand. The same was true for the automobile and machine industries. In Koblenz, the transport demand consisted of products of and supplies for light industry and agriculture, but the machine industry, such as the rolling machine plants of Bomag and Aleris Aluminium Koblenz Gmbh, was also present in the neighbourhood.[45] Daimler Benz had a car factory in Germersheim and a truck plant in Worth; Mercedes, Daimler, Roche and Boring had plants in Ludwigshafen, while in Mannheim, the producer of agricultural machines, John Deere, was a presence.[46] Finally, the tire company Goodyear also had a warehouse in the neighbourhood.[47]

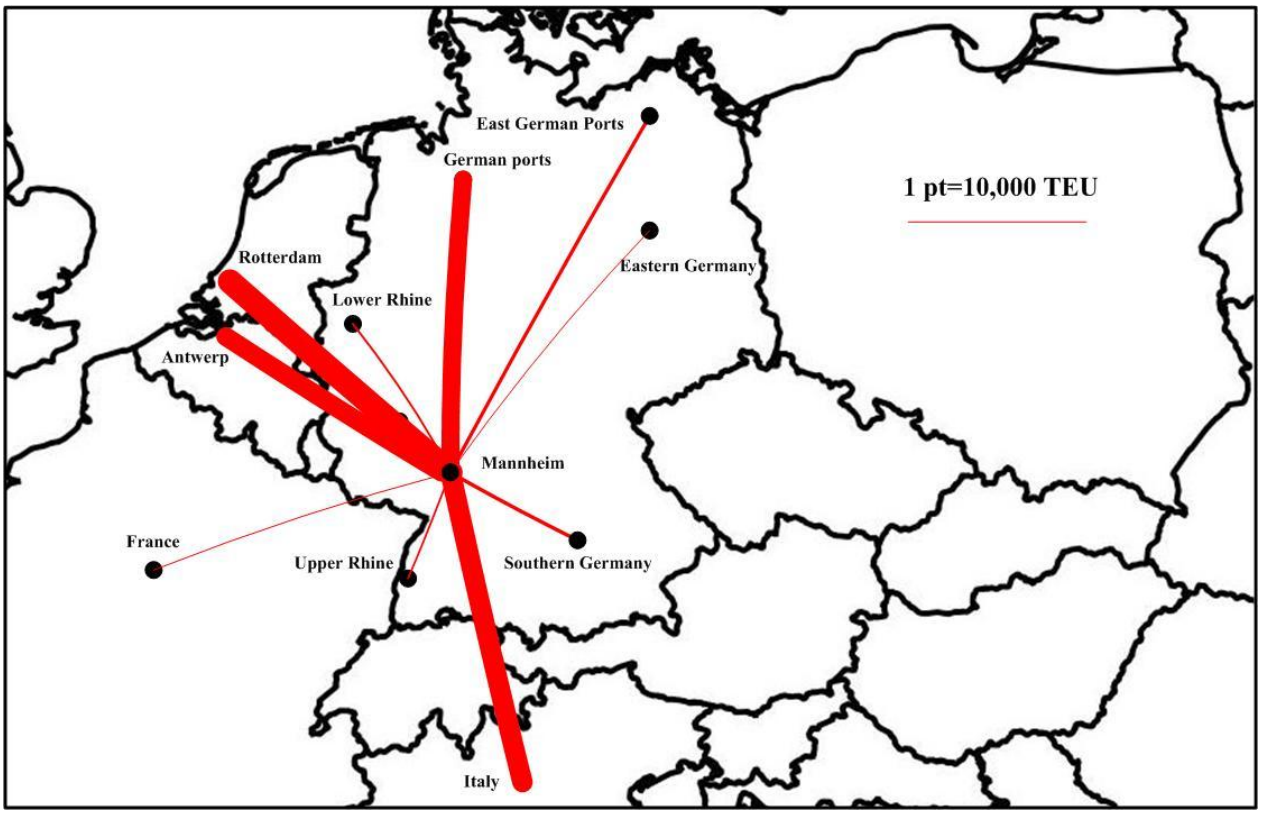
The Middle Rhine area, especially the surroundings of Mannheim, was of great importance for maritime container transport from and to Rotterdam. Indeed, the first barge terminal was built in Mannheim in 1968, and the ones that followed were mainly also constructed along the Middle and Upper Rhine, as barge transport was initially thought to only be cost-effective over longer distances. This view later changed, but the Middle Rhine area remained a major centre for container transport. In the 1980s, *One Way Trucking* set up its warehouse for securing return cargo to Rotterdam because of the major volumes available in this area. However, after a short stay, the company abandoned its activities there because of the growth in competition due to all of the modalities being attracted by the region's opportunities. In 1991, the Delta Bayern Express transported containers to Mannheim on its way to Southern Germany. By that time, all eight container terminals between Mainz and Worth were in operation. Liberalization made it easier to transport goods between the Middle Rhine area and Rotterdam, as well as between this region and other ports. In the long run, this led to more competition between the modalities and between the ports. As a consequence, the amount of rail and truck transport between Rotterdam and this region has fallen. Barge transport, meanwhile, was growing, but Antwerp's share was rising more than that of Rotterdam. Indeed, Antwerp was taking over the Middle Rhine region.

Due to the importance of Mannheim and its neighborhood, its transport connections are analyzed here. Figure 0.10 shows the transport volumes from and to Mannheim/Ludwigshafen in 2010. The largest flow is between Mannheim and Rotterdam, followed by Italy, the German ports and, finally, Antwerp. The Mannheim area is clearly a contested hinterland between Antwerp, Rotterdam and the German ports. There is even a minor transport flow to be seen between Mannheim/Ludwigshafen and the East German ports. The rest of the transport flows are much less important, and never exceeded 40,000 TEU, while the lowest of the major flows was just below 60,000 TEU. Furthermore, according to Figure 7.10, Mannheim/Ludwigshafen had a similarly pivotal

[45] Interview with Arndt Puderbach, terminal manager Contargo Rhein-Main Terminal Koblenz, former terminal manager Contargo Terminal Aschaffenburg, 05-06-2012.
[46] Interview with Jasmin Daum, manager Contargo Terminal Germersheim, 07-06-2012.
[47] Interview with Konrad Fischer, Contargo, managing director Terminal Ludwigshafen, 06-06-2012.

position between the Northern European ports and hinterland destinations like Duisburg. The majority of the container flows followed the Rhine region, but Mannheim/Ludwigshafen also had connections with the traditional hinterland areas of the German ports, such as those in Eastern and Southern Germany.

Figure 0.10 *Container transport by rail and barge to and from the Mannheim and Ludwigshafen terminals in 2010.*

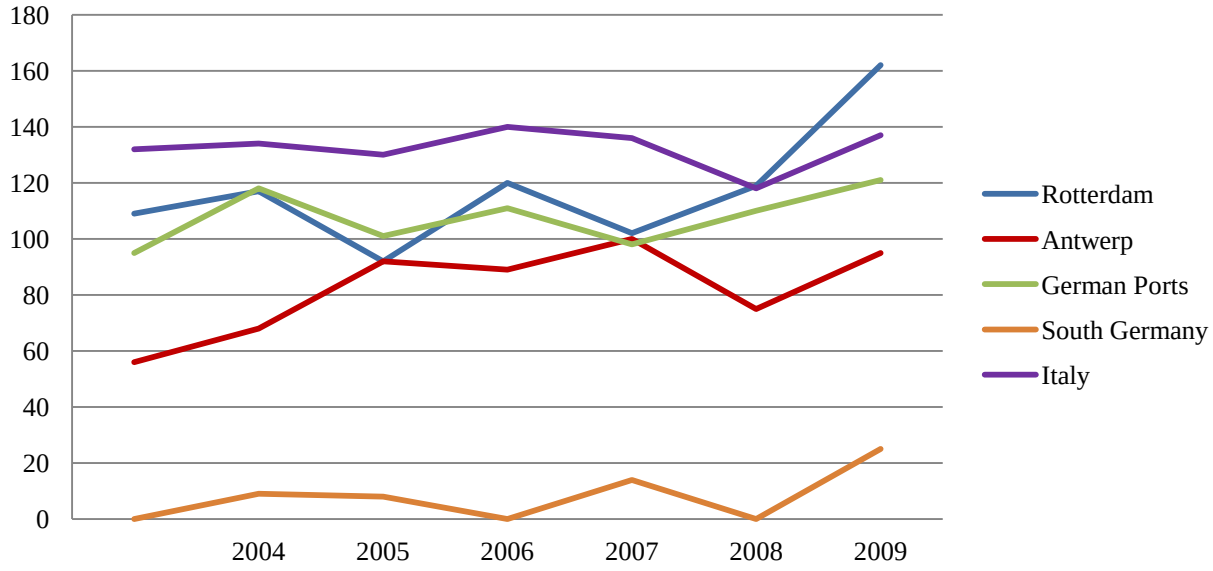


Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr,* Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

The development of the flows between 2004 and 2010 (Figure 0.11) shows that in 2004 the most important flows went to Italy, followed by the German ports and Antwerp. In 2010, the tables turned, and Rotterdam was in the lead, with Italy, the German ports and Antwerp as other major flows. These destinations were well ahead of the rest of the hinterland areas. The fact that at the end of the period Rotterdam was leading and Antwerp had the smallest of the major flows seems to be inconsistent with the results of Chapter 5, namely that Antwerp had surpassed Rotterdam in the Middle Rhine area. There are two reasons for this. The numbers represented in Figure 0.11 include data on rail transport, which correct the picture. Furthermore, this figure only concerns the Mannheim area, which has rather varied transport volumes: chemical goods, army supplies and consumption items from Asia, in which

Rotterdam was strong. There is less of a presence of the machine and automobile industries in this part of the Middle Rhine region, in which Antwerp had an advantage. The varied volumes were possibly also responsible for the fact that transport flows between 2004 and 2010, despite the 2008 crisis, developed quite gradually, in contrast to the development of the volumes of the entire Middle Rhine area (Figure 0.12).

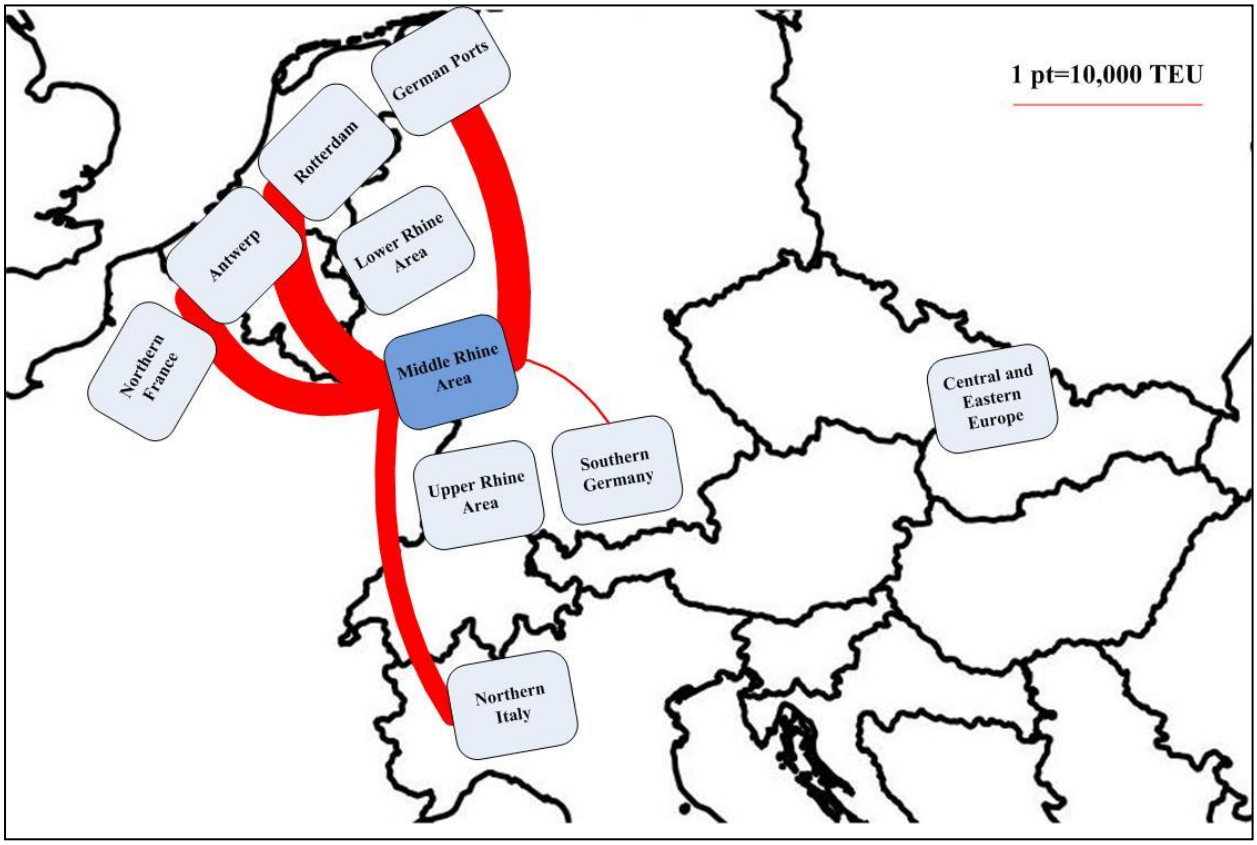
Figure 0.11 *Transported containers between Mannheim/ Ludwigshafen and the different hinterland areas per 1000 TEU, 2004-2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

This figure on the entire Middle Rhine region is very similar to that of the Mannheim/Ludwigshafen region, with the difference being that in these statistics hinterland areas with minor container flows, with the exception of Southern Germany, are not included. Nevertheless, the development of the flows in the entire Middle Rhine area (as shown in Figure 0.13) is quite different from Mannheim's flows.

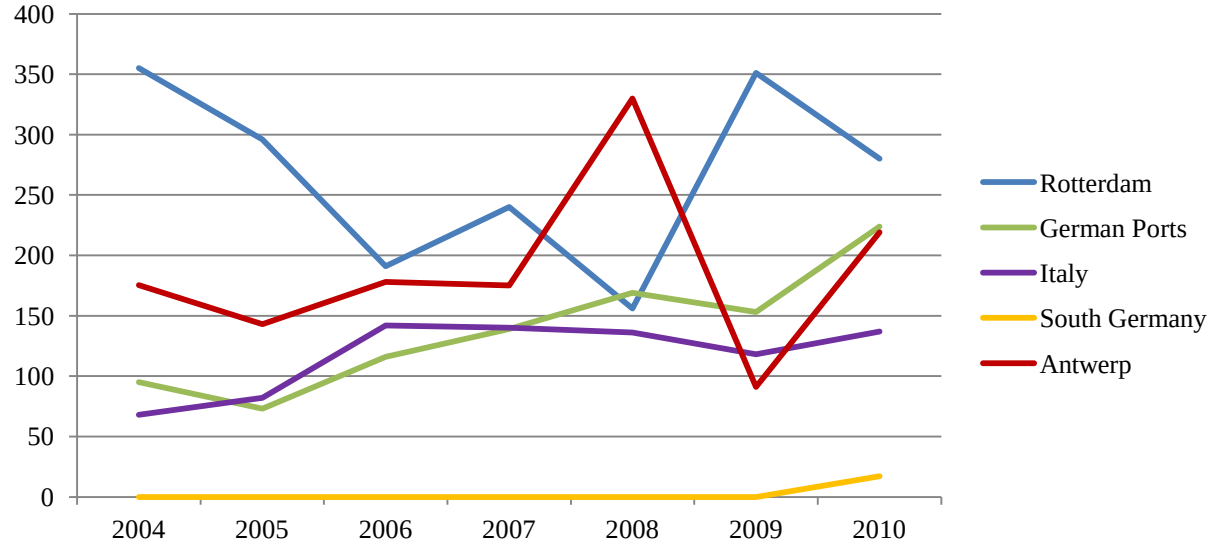
Figure 0.12 *Container transport flows between the Middle Rhine area, Western European ports and the hinterland areas in 2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Figure 0.13 depicts a rather volatile development. In 2004, Rotterdam had the highest share, followed by Antwerp and the German ports. Then, up to 2006, the volumes between Rotterdam and the Middle Rhine area fell to a point where the shares of Rotterdam, the German ports and Italy were similar to each other. Thereafter, Rotterdam's share grew cautiously, only to fall again below the German ports in the 2008 crisis. Meanwhile, by 2009, it had almost regained its 2004 level, before losing volumes once more in 2010. Antwerp's volumes reached a peak in 2008, simultaneously with the fall of Rotterdam, and also fell at the same time as Rotterdam's 2010 peak. This seems to contradict the results with respect to Mannheim/Ludwigshafen. Nevertheless, the fall in Antwerp's volumes in 2009 can be explained by the fact that the automobile industry, which generated much of the Belgian port's container transport, was hit relatively hard during the 2008 crisis, and it might have taken a year for this to show in the numbers as vehicles are often ordered in advance. Italy demonstrated initial growth, but none after 2006. The fact that between 2009 and 2010 the share of all of the mentioned ports was growing, while that of Rotterdam was falling, shows that the latter might have been losing ground in this very competitive hinterland area. Indeed, since 2008, Rotterdam had certainly lost its dominance in this area.

Figure 0.13 *Number of containers transported between the Middle Rhine area and the different hinterland areas per 1000 TEU in the period 2004-2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011)

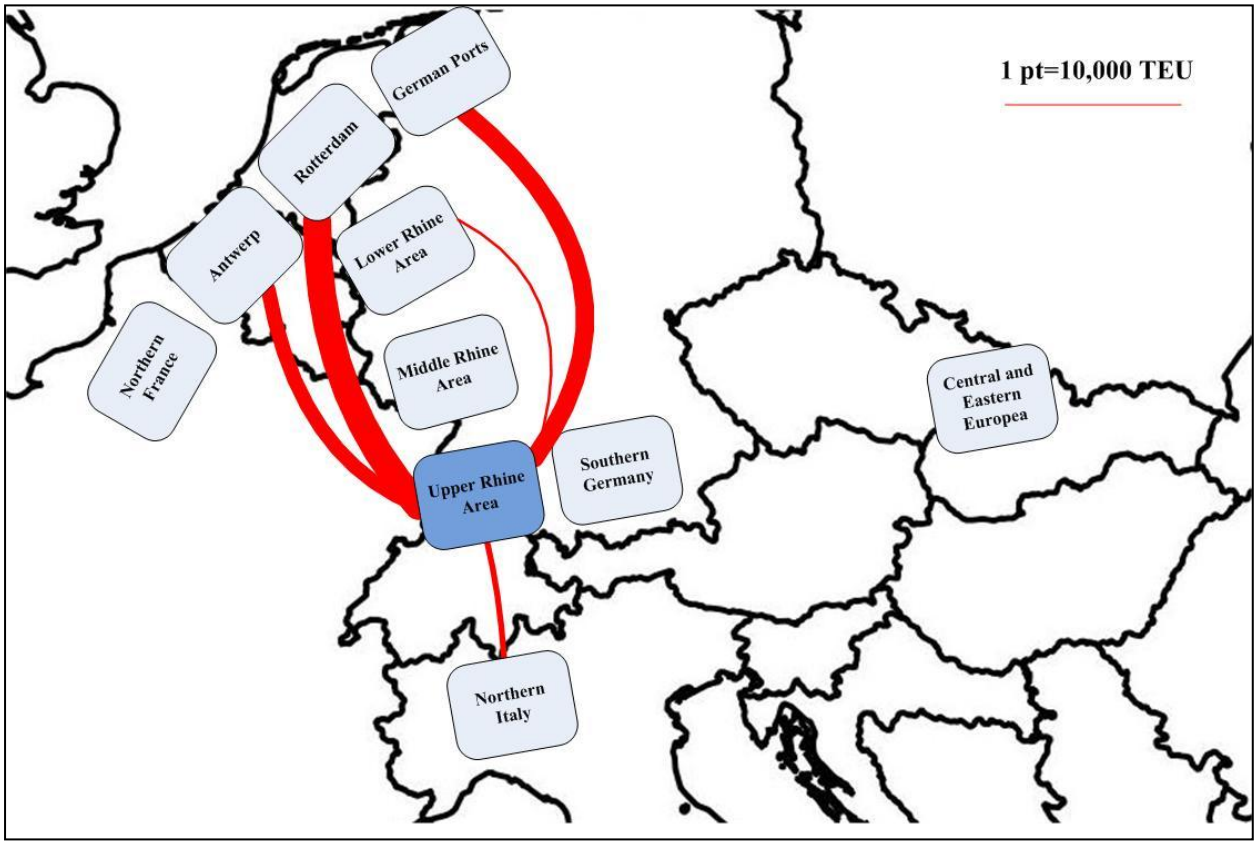
The Upper Rhine area

Switzerland, as part of the Rhine region, was already a hinterland area before the introduction of maritime containers to Rotterdam. In 1965, NS established a rail connection to both Basel and Chiasso. Switzerland also played an important role in barge transport in the early years of containerization, when this was thought to only be profitable over longer distances. Consequently, after the construction of the first container terminal in Mannheim in 1968, the second one was built in 1969 in Basel at the same time as the barge terminal in Strasburg. In 1973, a new Huckepack connection to Germany offered transfer options to both Austria and Switzerland. This indicates that the majority of the volumes between Switzerland and Rotterdam consisted of continental cargo. The share of rail shuttles between Rotterdam and this region varied between seven and four percent, which means that Switzerland was not a major hinterland area. Barge transport likewise did not confirm Switzerland to be a major hinterland, as only a fraction of the maritime containers from Rotterdam was conveyed there. Moreover, Rotterdam lost its market share in this region to Antwerp. The same was true for truckers; for most of them, Switzerland was not an important destination. Indeed, the liberalization of the European road haulage sector did not make much difference to the accessibility of this hinterland area because, at the same time, Switzerland imposed heavy restrictions on truck transport within the country. For Rotra Transport, the road hauler from Doesburg with a focus on continental volumes, Switzerland was an important target area. This also shows the impact of continental volumes in the transport flows to and from Switzerland.

Looking at the container transport flows between the Western European ports and the Upper Rhine area (Figure 0.14), it is clear that the Upper Rhine was contested between Antwerp, Rotterdam

and the German ports. According to the figure, Rotterdam had the largest flow, followed by the German ports and Belgium. This seems to contradict Rotterdam's loss of share mentioned above. This is because, although Rotterdam lost its share of barge transport, Figure 7.14 includes rail transport, which corrects the picture. The Deutsches Historisches Bundesamt's statistics include continental flows. As these flows were important to Switzerland before the arrival of maritime containers, this explains why Rotterdam is shown as a market leader in the figure.

Figure 0.14 *Container transport flows between the Upper Rhine area, Western European ports and the hinterland areas in 2010.*

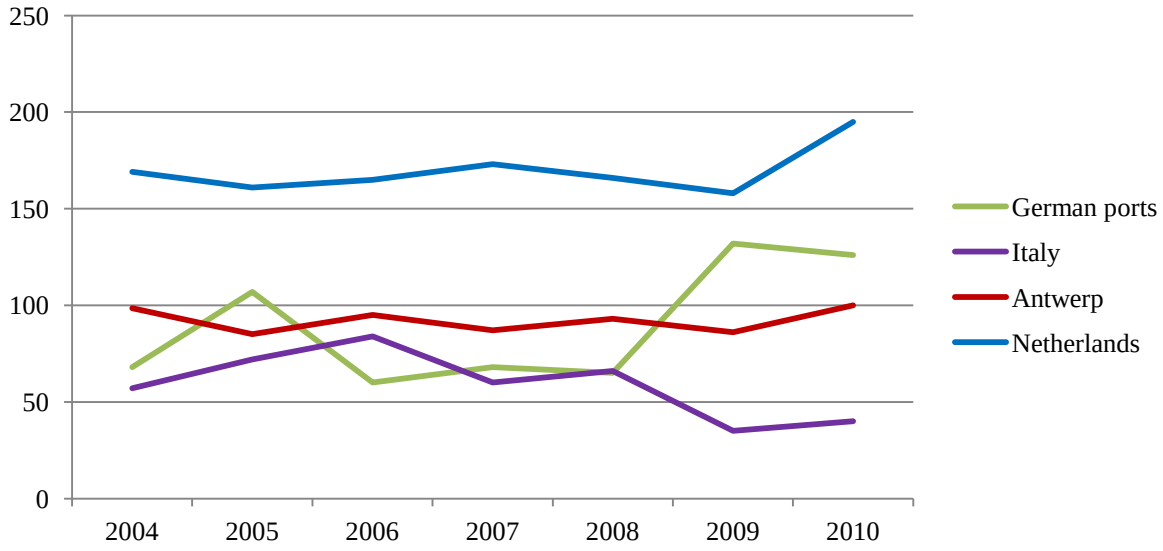


Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr,* Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

The development of multimodal transport flows shows a similar pattern (Figure 0.15): Rotterdam is at the top and develops in parallel with Antwerp between 2004 and 2010. There is then a slight dip caused by the crisis and modest growth thereafter, but the most important development is the Dutch port clearly losing its lead. To understand the reason for this, it is necessary to analyze the share of maritime and continental flows. Unfortunately, data was not available for that level of analysis. It is

feasible to believe that the growth of the transported container volumes between Switzerland and Rotterdam was caused by continental volumes. This assumption is supported by the fact that between 2008 and 2010 Italy's role was taken over by the German ports. The flows to the German ports almost certainly consisted of maritime cargo, which could mean that the maritime volumes with a destination of Switzerland were taken over from Italy by the German ports. Due to the importance of rail transport in Switzerland and Hamburg and Bremen, this is feasible. Furthermore, Italy's share diminished at the time when the new Mediterranean ports, Gioia Tauro and Algeciras, took over the distribution of maritime containers from Rotterdam. Consequently, if the flows between Italy and Switzerland were maritime in origin, they would not have declined. In fact, they must have been continental volumes containing the products of Italian industry. Due to the shock that the Italian economy suffered as a result of the 2008 economic crisis, these volumes could have been replaced by either continental volumes from Scandinavia, which would have arrived through the German ports, or those from the Netherlands. The latter is more likely, as both the Netherlands and Switzerland are situated on a transport axis that has a long tradition of transporting continental volumes, even before maritime containers. The growth of the share of continental volumes means that Rotterdam probably lost more of its lead in the transport of maritime containers than is depicted in Figure 0.15.

Figure 0.15 *Number of containers transported between the Upper Rhine area and the different hinterland areas per 1000 TEU in the period 2004-2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Continental volumes played an important role in the transport of goods between Switzerland and Rotterdam, as an important industry cluster was situated in the neighborhood of Basel, for example, the pharmaceutical company Sandoz and the multinational food concern Nestle. These shippers had

an interest in cheap transport with respect to both their exports and supplies, and a cluster of terminals was formed around Basel. The shippers imported raw materials, such as cacao and chemicals, and then exported finished products, with both flows travelling along the Rhine.[48] Consequently, Switzerland was important to Rotterdam in terms of the export of the products of Swiss industry, the importation of raw materials, and the transport of continental units to and from the United Kingdom or overseas, as these were transshipped in the port. When it comes to the continental container flows between Switzerland and the Netherlands, these were more important for the Dutch economy in general than for the Port of Rotterdam. The research findings suggest that continental flows dominated container transport between the two countries. The flexible maritime flows could either go through Italy, Antwerp or the German ports. The flow between the German ports and Rotterdam in particular showed remarkable growth between 2008 and 2009. Accordingly, Switzerland turned out to be a minor hinterland of Rotterdam, especially in comparison with Italy, which is situated even further away.

Northern Italy: Rotterdam versus the Mediterranean

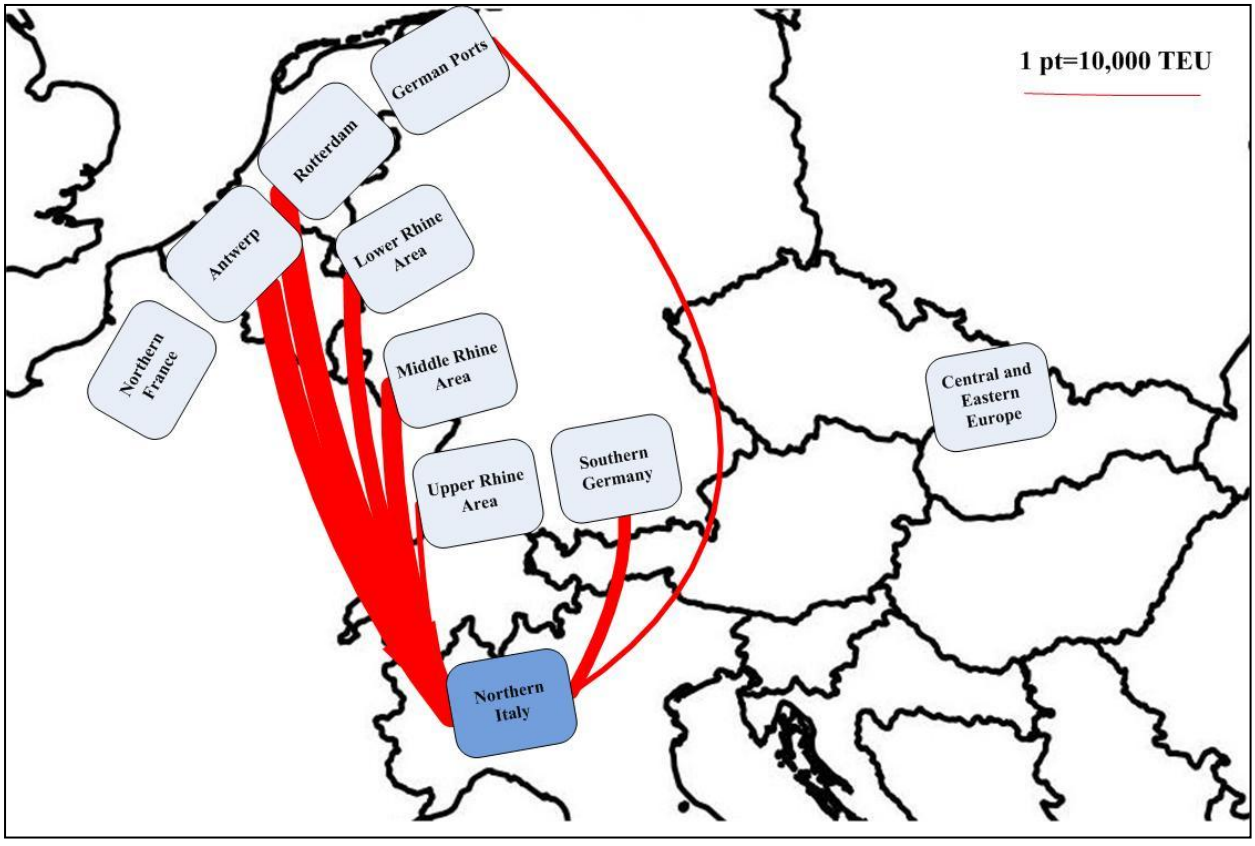
Italy, or to be more precise, the north of Italy belonged to the contested hinterland of the Port of Rotterdam. Volumes had already been transported between the United Kingdom and Italy, through Rotterdam, before the introduction of the maritime container to the port in 1966. Many maritime containers followed the same trajectory. The majority of transport was performed by rail, as this modality had a competitive advantage at distances above 300km. In the 1980s, there had been spectacular growth in the connections between Rotterdam and Italy. In the period 1994-2010, the share of rail shuttles going to or coming from Italy was around 20-30 percent of the total number of shuttles, forming the third most important cross-border destination for containers from Rotterdam. At the end of the period, volumes were growing, but the share of maritime containers fell; it was continental containers that increased the volumes. Italy could not be reached by barge from Rotterdam, but much of the volumes that were transported by rail probably sailed the first part of the journey on the Rhine. Incidentally, trucks went to Italy carrying maritime containers before liberalization in spite of the long distance and the obstacles formed by the Alps. After liberalization, when many of the obstacles to cross-border transport were lifted, the number of trucks going to Italy grew. However, as a result of increasing port competition, their number fell again in the 2000s. At the same time, as the example of Rotra Transport, which mostly transported continental loading units, shows, the continental flow travelling between the Netherlands and North Italy grew;[49] this was because the transport of continental transport units was less influenced by port competition.

In the 1980s, many of the volumes with a destination of North Italy arrived at the Port of Rotterdam, but after liberalization the competition between Antwerp, Rotterdam, Hamburg and Genoa

[48] Interview with Leo Roelofs, sales and intermodal products, Contargo, DIT Duisburg Intermodal Terminal GmbH, 13-04-2012, 26-06-2012.
[49] Interview with Gerard J. B. Roelofsen and Harm Roelofsen, directors of Rotra Transport, 17-01-2013.

increased. The breakthrough was forced by Maersk, which started to use Gioia Tauro in the south of Italy in the 2000s for the transshipment of containers with an Asiatic origin, and Algeciras, close to Gibraltar, for Atlantic transport. This counteracted the main port effect, as it attracted maritime containers to these Mediterranean ports for distribution. Figure 0.16 shows the rail container transport flows between Italy, European ports and the major hinterland areas in 2010. Then, there were major container flows between Antwerp, Rotterdam and Italy. In spite of the claim of Deutsches Statistisches Bundesamt, these statistics probably include continental containers, although, in 2010, hardly any maritime containers were transported between Rotterdam and Italy. The thick flows can, therefore only be explained by intensive continental flows that were transported along the Rhine region. According to the figure, Northern Italy was a hinterland area contested between the ports of Antwerp, Rotterdam and Germany. Of these ports, Hamburg and Bremen had the smallest share. This is understandable, as North Italy belonged to the Rhine area, which had been the stronghold of Rotterdam since the early 1960s, although some of the containers from Rhine terminals with good rail connections could have arrived from German ports. The same is true for the volumes arriving from the south of Germany, but it is probable that the majority of this flow consisted of products of Southern German industry stuffed in continental pallet wide containers.

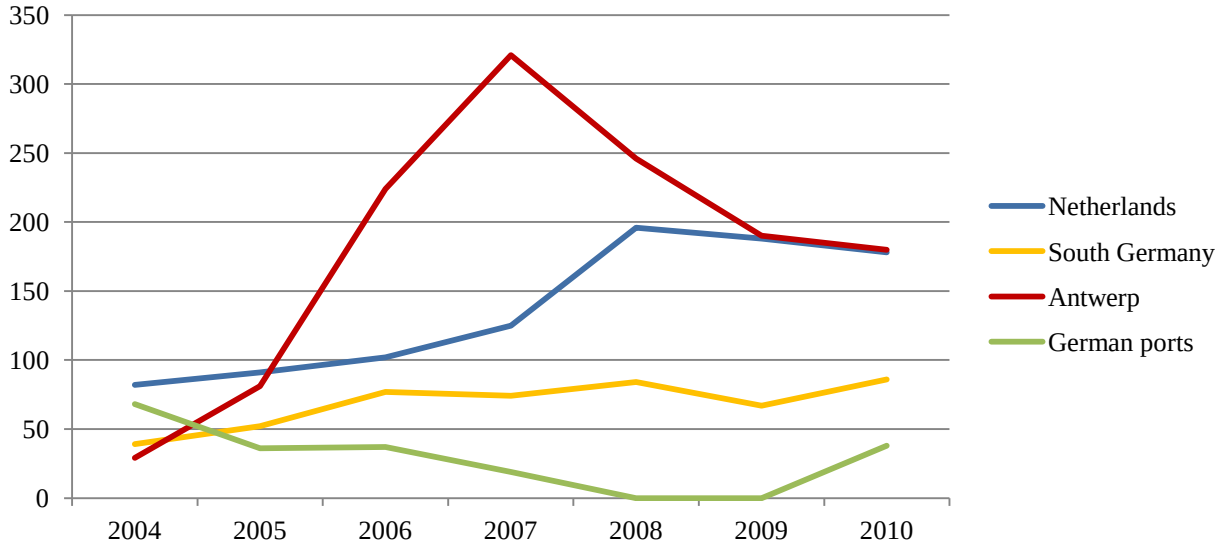
Figure 0.16 *Rail container transport flows between Italy, European ports and the major hinterland areas in 2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Looking at the development of rail container transport flows between Italy and the major hinterland areas between 2004 and 2010 (Figure 0.17), it seems that the role of almost all of the countries increased at the start of the period. In particular, the growth of the volumes from Antwerp and the Lower Rhine region were spectacular. In the case of the latter, part of the containers could have arrived from the German ports through Duisburg, which emerged as a logistics hub in that period. After the economic crisis of 2008, the transport shares between Italy and the other countries fell, while those of Antwerp and Rotterdam remained dominant. The German ports played a particularly minor role in the movement of goods to and from Italy. This is certainly not due to the distance, which is only 50km, but because the north of Italy is at the end of the Rhine region and is, as a result, linked more strongly to Rotterdam and Antwerp than to the German ports.

Figure 0.17 *Rail container transport flows between Italy, European ports and the major hinterland areas per 1000 TEU between 2004 and 2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011)

Logistics played the most important role in the transport of maritime containers to the north of Italy. The containers went through Rotterdam, despite the unfavorable geographic circumstances on the transport route to Italy, because of the main port effect and the good service available there. As a consequence of the development of competing ports and the fact that the main port effect was counteracted by the establishment of the two Mediterranean ports, maritime containers gradually changed their route. This demonstrates that deep sea maritime containers were footloose. On the other hand, the transportation of continental containers to Italy kept on growing, because it was much less

influenced by port competition. Intensive transport flows along the Rhine area continued, as they were based on stronger relationships, production and consumption.

Central and Eastern European countries

The third and final category of hinterland areas discussed here consists of destinations that are relatively far away from Rotterdam and do not belong to the Rhine region, namely the Central and Eastern European nations and Southern Germany. The Central and Eastern European countries of the former GDR, Poland, the Czech Republic, part of Russia, and Hungary traditionally belonged to the hinterland of the German ports. This is unsurprising as Prague, which is the most important central contested hinterland destination, is situated closer to them at a distance of approximately 600km from the German ports and 900km from Rotterdam. Nevertheless, when transport started-up on the damaged roads after World War II, Czechoslovakia was the first important cross-border destination and, between 1955 and 1960, was the only Eastern European destination to which NS transported goods. In this period, an average of 140,000 tons of goods was transported annually between the two countries. This amounted to 1.6 percent of the total Dutch cross-border rail transport. This was because industry in the occupied Czech territories was spared and stimulated by the Germans in World War II, as the Nazi regime had depended on industrial production there. As a result, it was relatively easy to restart industrial production in Czechoslovakia after the war, for example in Sudetenland, where heavy industry was located.[50] Due to the lack of data, it is impossible to identify how many containers travelled to Central and Eastern European countries between 1966 and 1997. It is therefore difficult to determine how liberalization actually affected transport to Central and Eastern European destinations. However, as the effects of liberalization were combined with the results of a complex political and economic transformation in these countries, it would be hard to reach a conclusion in any event.

In 1992, the Rhine-Main-Danube Canal opened as a new trajectory to Czechoslovakia, Hungary, Romania and Bulgaria. However, because of nautical restrictions and the low speed of transport on the canal, it continued to be a route of minor importance. It is likely that the abolition of numerous restrictions on road haulage caused the growth in the volumes going to destinations in these countries, although the economic transformation also made these nations partners again. Furthermore, the activities of ERS in the late 1990s saved some shuttle services going to Poland and Czechoslovakia.

After the implosion of the Soviet system, the Port of Rotterdam and Dutch transport companies increasingly became interested in this emerging market in Central and Eastern Europe. Rotterdam had a trump card to play as, despite the fact that the German ports were situated closer to the Central and Eastern European countries, it was the first port of call on the Western European

[50] H.A.M. Klemann and Sergei Kudryashov, *Occupied economies An economic history of Nazi-occupied Europe* (London 2012) 47, 173, 234, 435.

coastline on both the Asiatic and Atlantic routes. This meant that goods arrived one or two days earlier in Rotterdam than in the German ports. Indeed, with a good rail connection, a time advantage of 24 hours could be achieved, which eliminated the effect of the vicinity of the German ports to this hinterland area.

Nevertheless, it was not easy to start a transport connection to Central and Eastern Europe, as there was a limited amount of cargo for the area. Moreover, as it needed to be shared with other modalities, and because there was hardly any return cargo, starting a rail shuttle was a precarious business. The lack of return cargo was due to the fact that while Western Europe was keen on using Central and Eastern Europe as an outlet for its own products, it had less need for the industrial goods produced there. As a consequence, the return cargo mostly consisted of canned fruit, vegetables and other agricultural products.

From the time of the introduction of maritime containers, NS had been busy setting up a wide container shuttle transport network. It also tried to gain ground in Central and Eastern Europe, and started a shuttle connection with Prague in 1994. This was one of numerous efforts made to establish a connection to these countries, which were followed by an attempt to establish a shuttle to Poznan. Prague and Poznan were not always the final destinations of goods coming from Rotterdam; from Poznan they were often transshipped to Malaszevicze on the Russian border, and from Prague to Bratislava in Slovakia, and Sopron and Budapest in Hungary.[51] In the late 1990s, ERS Railways saved these connections, which were on the verge of bankruptcy, and made them feasible by adding volumes supplied by Maersk and combining these with continental containers. Maersk took over the majority of ERS Railways' shares, with the latter promoting the Rotterdam rail connection to the Central and Eastern European hinterland in Maersk's head office in Copenhagen. Maersk was initially interested, but it became more and more difficult to explain why it should choose Rotterdam over the German ports, whose rail connections continued to improve. Maersk was not a stakeholder in Rotterdam; it just wanted to transport its containers as cheaply and efficiently as possible to their destinations. When the majority of the containers with destinations in Central and Eastern Europe went to German ports, why would Maersk send a fraction through Rotterdam? Nonetheless, in the second half of the 1990s, ERS managed to increase the number of departures from three to four times a week to seven to eight times a week, and the connection was exploited with some degree of success. In 2004, departures were taking place six times a week while, at the same time, there was a connection between Prague and the German ports seven times a week.[52]

Figure 0.18 shows the port competition with respect to the Central and Eastern European countries between Rotterdam and the German ports. This figure clearly demonstrates that this area was more the hinterland of the German ports than of Rotterdam. Indeed, in spite of Rotterdam's attempts to hold ground in this increasingly important hinterland area, it failed to do so.

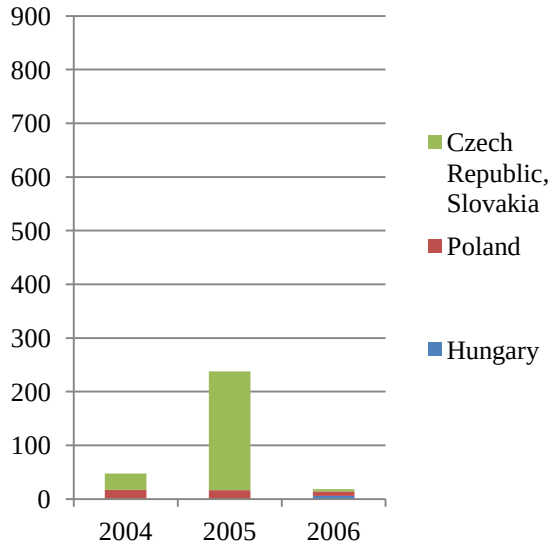
[51] Altena, Cees van, interim manager Rail Cargo Information, former manager ERS, Maersk 23-04-2013.
[52] Ibidem.

Figure 0.18 *Rail container transport flows between the Netherlands, the German ports and Central and Eastern European countries in 2006.*

Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

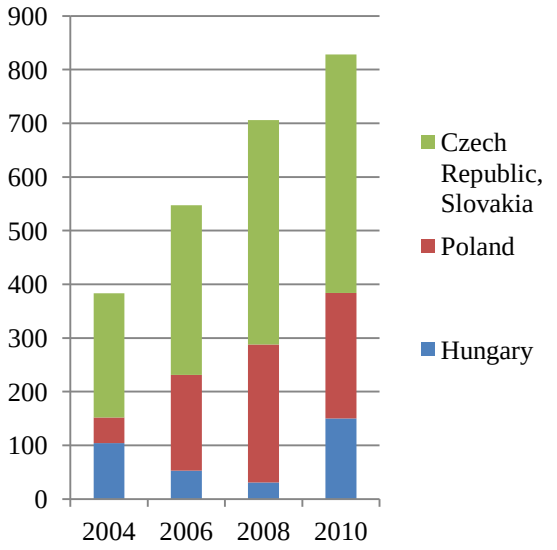
The following figures (Figure 0.19 and Figure 0.20) show how rail container transport to these countries developed in the period between 2004 and 2010. For the German ports, this market in 2004 was more important than for Rotterdam and the transported volumes followed a crescent line. The conveyance of goods to these countries from Rotterdam never reached a total volume of 300,000 TEU and, after a short period of growth in 2006, fell back to 18,000 TEU. Unfortunately, there is no data available for 2009. However, as the number of shuttles decreased, there is no reason to assume that the volumes would have grown in this period.

Figure 0.19 *Number of containers transported between Rotterdam and the Central and Eastern European countries per 1000 TEU in 2004, 2005 and 2006.*



Source: Centraal Bureau voor de Statistiek, Containerstatistiek (Heerlen 2011)

Figure 0.20 *Number of containers transported between Hamburg and Bremen and the Central and Eastern European countries per 1000 TEU in 2004, 2006, 2008 and 2010.*



Source: Deutsches Statistisches Bundesamt, Kombinierter Verkehr, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011)

From the 1990s, the hinterland area formed by the Central and Eastern European countries had more and more to offer, and made the transition from a supply-based to a demand-based coordinated market economy. This initially caused a crisis, but was followed by a boost at the end of the 1990s and steady economic growth in the first decade of the new century.[53] As a consequence of the reunification of Germany and the admission of Slovakia, Poland and Hungary to the European Union, the geographical gravity point moved from the Netherlands and Belgium to the east towards Germany.[54] In 2008, it was expected that the annual 5-7 percent GDP growth of the Central and Eastern European countries would continue in the years that followed.[55] The 2008 crisis, however, also hit these nations hard.[56] Indeed, in 2009, the growth in GDP of the Central and Eastern European countries was closer to that of Germany and the Netherlands. After a short recovery between 2010 and 2011, the GDP of the Central and Eastern European countries and their two Western competitors fell again. However, the Organisation for Economic Cooperation and Development (OECD) expected the former to recover faster than the latter (Figure 0.21). This suggests that the geographical gravity point would

[53] H.W. Hoen, 'Crisis in Eastern Europe: The Downside of a Market Economy', *European Review*, 19, 1 (2011) 32, 35-36.
[54] Theo Notteboom, *The relationship between seaports and their intermodal hinterland in light of global supply chains*, (Antwerp 2008) 10.
[55] Ibidem, 8.
[56] H.W. Hoen, 'Crisis in Eastern Europe: The Downside of a Market Economy', *European Review*, 19, 1 (2011) 32.

move further eastwards. There is evidence that this shift would not only involve the geographic, but also the economic, gravity point of Europe. The Central and Eastern European countries profit more from the integration between Eastern and Western Europe than the old EU nations. Furthermore, their lower taxes and cheap labor attract foreign investments. Moreover, because of their cheap currency between 2008 and 2009, exports from Poland and Slovakia grew, while those from France and the Netherlands fell.[57] Indeed, the development of average income indicates that the gap in this measure between the Western and the Central and Eastern European countries, especially Poland, Slovakia and the Czech Republic, slowly closed.[58]

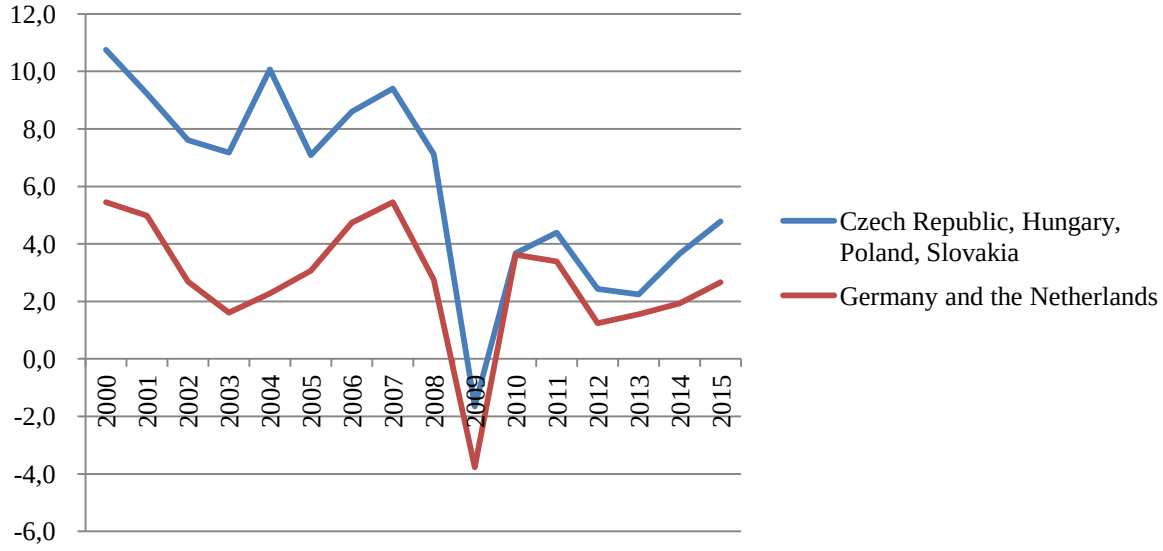
Of course, the Central and Eastern European countries mentioned have different economic circumstances. For example, Slovakia is a major car manufacturer and, in 2008, 100 cars per 1000 inhabitants rolled off the assembly line there, 90 percent of which were destined for export. As a result of the economic crisis, the demand for automobiles fell, which caused problems for Slovakia. This was exacerbated by the fact that the euro was introduced to the country in 2009 and its strength makes its exports expensive. Nevertheless, Slovakia, together with Poland, which kept its cheap currency, had the highest GDP growth. Meanwhile, the Czech Republic was in an intermediate position, while Hungary had the worst performance of the Central and Eastern European countries mentioned because of its inefficient economic policy.[59]

[57] Andrei A. Levchenko and Jing Zhang, *Comparative advantage and the welfare impact of European integration* (Cambridge MA 2012) 32; Matthew M. C. Allen and Maria L. Aldrecht, 'The Impact of institutions on economic growth in Central and Eastern Europe', in Gary Cook and Jennifer Johns (eds.), *The changing geography of international business* (London 2013) 42; Witold Wilinski, 'Internationalization of Central and Eastern European countries and their firms in the Global crisis', in Marin A. Marinov and Svetlana A. Marinova (eds.), *Emerging economies and fims in the global crisis* (London 2013) 92, 98.

[58] Jesus C. Cuaresma, Harald Oberhofer, Karlis Smits and Gallina A. Vincelette, *Drivers of convergence in eleven Eastern European countries*, The world bank Europe and Central Asia region, poverty reduction and economic management, department of policy research working paper (2012) 5.

[59] Matthew M. C. Allen and Maria L. Aldrecht, 'The impact of institutions on economic growth in Central and Eastern Europe', in Gary Cook and Jennifer Johns (eds.), *The changing geography of international business* (London 2013) 37-38.

Figure 0.21 *Average GDP development of the Czech Republic, Hungary, Poland, Slovakia, Germany and the Netherlands in percentage terms 2000-2015.*



The data from 2014 is a forecast.
Source: OECD Nominal GDP growth forecast.
http://stats.oecd.org/Index.aspx?QueryId=51654, seen on 01-02-2014.

As result of the rising standard of living, it was expected that the demand for diverse transatlantic and Asiatic goods would grow. Furthermore, as a result of new plants being built by multinational companies in Central and Eastern Europe, it was anticipated that acquiring return cargo would become easier. Due to the construction of new infrastructure in these new markets, it became increasingly possible for the European distribution centers of other multinationals to follow the example of Lego and move east to get closer to new consumers. The key for this market lay in good rail connections. This was traditionally the strong point of the German ports, where almost all hinterland transport was performed by rail. Rotterdam, which had more of an advantage in barging, depended on the Betuwe Route which, in 2010, was still debouched into a jammed German connection at Emmerich. The construction of a third rail that would have resolved the problem was postponed again and again. Indeed, according to predictions in 2010, construction could only start in 2015. However, by that time, the German ports would probably have already settled in the new market in the Central and Eastern European countries.

The relationship between Rotterdam and Central and Eastern Europe was mostly based on logistics. Maritime containers could arrive at their destination more cheaply through the German ports, but with a good rail connection could arrive faster through Rotterdam. ERS combined the maritime and continental flows to make rail shuttles profitable. The continental flows indicate a production and consumption based relationship. While footloose maritime containers have alternative routes, the fact that a maritime container flow made the transport of continental volumes cheaper

meant that this new market was not only interesting for Rotterdam, but also for the entire Dutch economy.

Southern Germany: the backyard of the German ports

The German ports of Bremen and Hamburg performed their hinterland transport almost entirely by rail. This formed an important part of German transport policy during the entire research period. Southern Germany was already connected to the German ports in the 1850s, and when maritime containers arrived in Bremen in 1966, most of them had this area as their final destination. After the liberalization of the rail sector, ERS Railways founded a subsidiary, BoxXpress, which runs shuttles between the German ports and Southern Germany. This was successful, because it was already transporting 900 TEU per day by 2004, which made it the largest container transporter in the country.

It is also easy to serve Southern Germany by rail from Rotterdam. For truck transport, however, which only exceptionally journeys further than 300km, Southern Germany, being 600-800km away, was too far. Meanwhile, by barge, it only became possible to reach Southern Germany directly when the Rhine Main Danube Canal was opened in 1994, although there were still no major volumes sailing on the canal in 2010 because of its nautical restrictions. Accordingly, rail transport remained the only feasible alternative. In 1991, NS tried to conquer this area with the Delta Bayern Express, which connected the Dutch port with, among other places, Nurnberg, Augsburg and Munich, and from there to 50 other destinations in Southern Germany. Nevertheless, the transport of containers between Rotterdam and Southern Germany was not a major success. Indeed, although the share of container shuttles going between Rotterdam and Germany increased between 1994 and 2010, especially after ERS broke the market open, the share of shuttles to Southern Germany fell dramatically. This fits into the picture of a retreating hinterland, which was caused by port competition between Northern European ports.

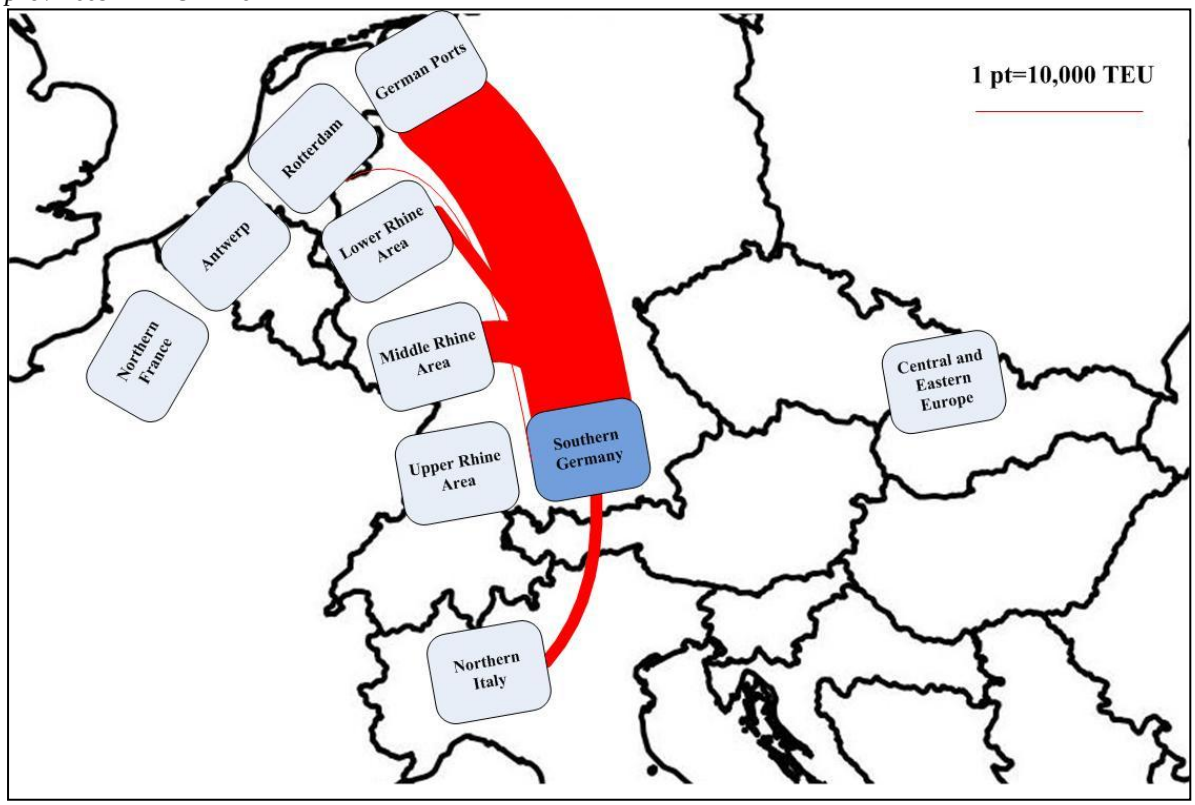
The loss of Southern Germany as a hinterland area seemed to be a missed opportunity for Rotterdam, as the south of the country, especially Bayern, became an increasingly interesting hinterland area. Until the 1950s, Southern Germany was an industrially underdeveloped area as a result of its lack of raw materials. In Bavaria, the major economic activity was agriculture and, as it offered enough revenues, there was no need for industrialization, while Baden Wurttemberg was one of the poorest areas of Europe. In 1900, Baden Wurttemberg had started the process of industrialization, with Stuttgart as a centre, and cheap labor attracted Daimler and Bosch to this area. Bavaria started to industrialize in 1950, when numerous companies like Siemens fled to Southern Germany, which was occupied by US troops, from the zones occupied by the Soviet Union, Eastern Germany and Sudetenland.[60] In the 1950s, transport to this peripheral area of Germany became easier as a result of the growth in road haulage transport. Indeed, in that decade, the companies Siemens, BMW and MBB, an airplane and space shuttle factory, grew quickly and an industrial cluster formed

[60] Ibidem 23.

around them. Large companies also attracted their smaller suppliers, and the conglomeration of these firms formed an information network that encouraged innovation and created new jobs. The companies were export-oriented and Southern Germany excelled in attracting direct foreign investment.[61] From 1973, the industrial growth of Southern Germany surpassed the average of German industry overall. As the opposite occurred in North Rhine Westphalia in this period, this development was given the name the South-North divide. In the period 1975-1987 in Southern Germany, unemployment fell substantially and the area's share of German GDP grew.[62] In the following two decades, the self-reinforcing clustering effects persisted and the gravity point of German industry moved further southwards. In the 1990s and the first decade of the new century, the unemployment rates in Southern Germany remained well below the country's average. Furthermore, Bayern and Baden-Wurttemberg paid increasing amounts to the German federal government, much of which was reinvested in the poorer north, especially North Rhine Westphalia. Moreover, it was in Southern Germany that the largest investments were made in the field of research and development.[63] German industry played a major role in generating flows of containerized goods, and its role became even more apparent in the economic crisis of 2008 when it was hit less hard than the industries of other countries. As a result of a combination of deindustrialization in the Lower Rhine region and industrialization in Southern Germany, Bayern and the Baden-Wurttemberg area became the industrial centers of the federal republic. In Southern Germany, there was electrical engineering, and the automobile and machine industries. Companies such as Nixdorf Computer AG, BMW, which had its headquarters in Munich, Audi, which was based in Ingolstadt and Heilbronn, and Siemens which was in Stuttgart, all had their plants in Southern Germany.[64] Furthermore, the Trieste pipeline ended in Ingolstadt, while oil refineries and the chemical industry were also situated in the area. Moreover, Southern Germany had a food industry and Ober Bayern a fast growing high tech sector. The entire area was strongly export oriented, and much of the transport was executed through the German sea ports. As a consequence, the region could be seen as a gold mine for container transport, and the German ports could not have agreed more. When comparing the number of transported containers between the two most important German ports and Southern Germany between 2004 and 2010 (Figure 0.22), it is clear that the latter belonged to the captive hinterland of the German ports. There was only a minor flow from and to Rotterdam, although part of the flows from the Lower and Middle Rhine area probably also originated from Rotterdam or Antwerp.

[61] Ibidem, 22.
[62] Ibidem, 17, 19.
[63] M. Greive, C. C. Malzahn, L. Rethy, D. Siems, D. F. Sturm and T. Vitzhum, 'Gespaltenes Land Die unheimliche Kraft des Südens', *Die Welt*, 26-jan-2014, 1-5.
[64] Ibidem.

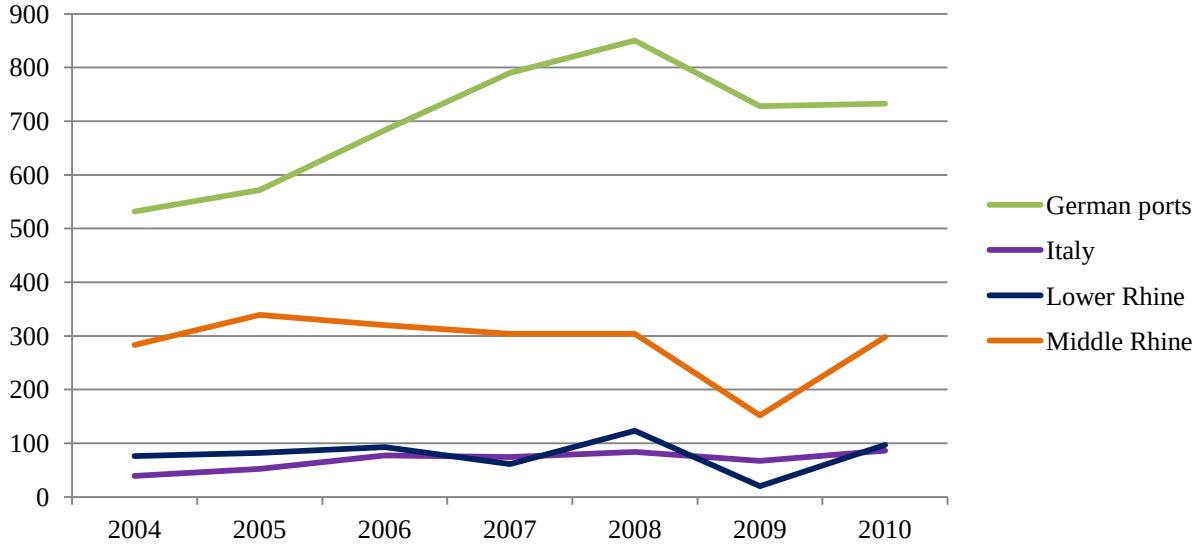
Figure 0.22 *Rail container transport between Antwerp, Rotterdam, Bremen, Hamburg en and the German provinces in TEU in 2012*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011). The volumes from Rotterdam are estimated based on the shuttle timetable of Rail Cargo Information. http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

Looking at the dynamics of container transport between Southern Germany and the seaports (Figure 0.22), it is clear that the German ports were almost exclusively performing this transport. The share of the German ports grew steadily between 2004 and 2008, before falling back in 2009 to less than the volumes of the Lower and Middle Rhine. Due to its vested interest and the fierce port competition, it was unlikely that the interests of the German ports in Southern Germany would be contested. Rotterdam could be serious competition if it had good rail connections, but while the Betuwe Route debouched into a jammed German rail connection in Emmerich, the rail companies made an effort to improve the rail connections to the German ports. In 1992, a new rail terminal was built in Munich-Riem with a capacity of 250,000 TEU and good shuttle connections to both of the major German ports. This terminal was developed further at a later date.

Figure 0.23 *Rail container transport flows between Southern Germany, European ports and the major hinterland areas per 1000 TEU between 2004 and 2010.*



Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011)

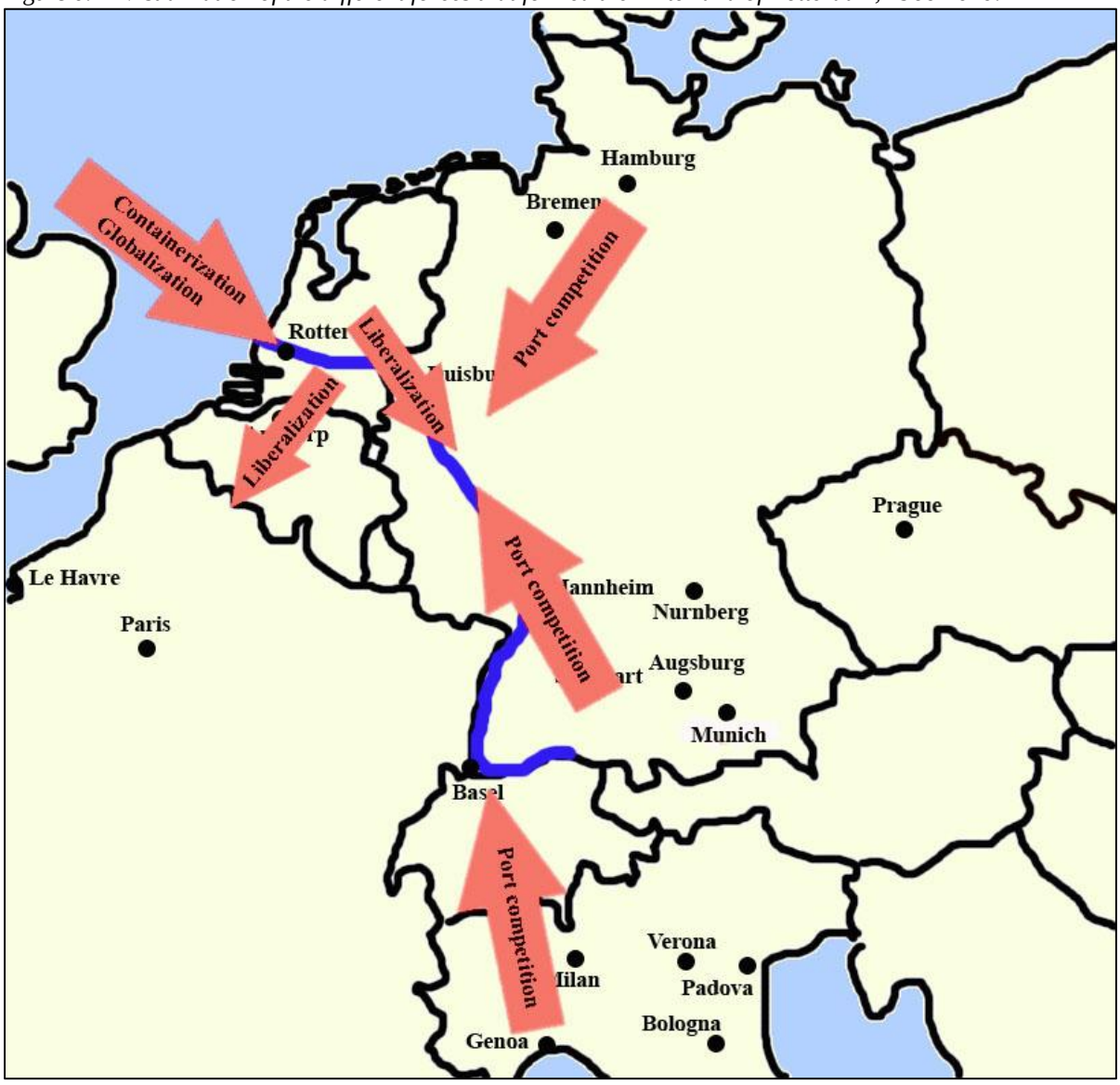
Macroeconomic hinterland

This chapter has revealed that the hinterland of container transport at the Port of Rotterdam decreased in size in the first decade of the new century. This contraction of the hinterland was the result of the interaction of containerization, globalization, liberalization and port competition. The arrival of maritime containers in Rotterdam in 1966 meant the introduction of a cheap and flexible transport system that the port was unused to. Indeed, the entire European transport sector was forced to adjust to the new flows and started to forward transshipped boxes to the hinterland. This was a major push factor, which stimulated the extension of the transport network of the Port of Rotterdam, as well as those of the other ports in Northern Europe (Figure 0.24). Containerization, together with developments in the information and communication technology sectors, encouraged globalization, the extension of networks, and the intensification of transport flows within these networks on a global scale. With the introduction of maritime containers to Rotterdam, the port was included in a newly-emerging transatlantic network. This encouraged firms within the port to extend their networks within Europe.

Prior to liberalization, the extension of such networks was hindered by restrictive post-war transport policies, especially in Germany, which put obstacles in the way of cross-border transport. This created transport patterns based on political, not economic, principles. Liberalization gradually removed most of these obstacles. This initially led to the further extension of hinterland transport and ownership networks, but, in the long-run, liberalization caused the intensification of intramodal and intermodal rivalry, leading to growing port competition. In the case of footloose containers in particular, the competition increasingly became a rivalry between alternative transport routes that

could bring containers to the hinterland without much difference in price. This port competition was a major factor in forming the hinterland. Port competition was strongly influenced by major sea shipping companies, especially Maersk, which orchestrated hinterland transport from the outport. Maersk was the reason why the new entrant, ERS Railways, was able to create profitable rail connections to relatively close by areas. Competition had the effect of shrinking the captive hinterland and growing the contested hinterland of ports. Indeed, it was not only Rotterdam, but all ports in Northern Europe that started to expand their hinterland container transport networks. These networks met in Middle Europe, where a struggle commenced. As a result, most areas became contested and fewer and fewer regions were served by a single port, with ports retreating to their backyards. The contraction of Rotterdam's captive hinterland accelerated in the first decade of the new century. This meant that the port's transport flows were growing relatively more within the Lower Rhine economy because of the shifting down the Rhine of the hinterland's gravity point, which consisted of Rotterdam and the Lower Rhine region. Additionally, a logistics triangle emerged between Rotterdam, Antwerp and the Lower Rhine region, because of the growing network connections with Antwerp in the first decade of the new century. With a tradition of being an industrial port, Antwerp sustained and developed its volumes based on production, serving as an export port for German industry. Rotterdam, meanwhile, which was strong in terms of the Asiatic route and imports, increasingly specialized in logistics flows connected to European distribution centers in 2000-2010.

Figure 0.24 *Visualization of the different forces that formed the hinterland of Rotterdam, 1966-2010.*



When considering the macroeconomic importance of the different hinterland areas, it is clear that the connection to Antwerp was a byproduct of logistics. Indeed, it was barely related to production or consumption, but to the distribution of – often empty - containers. This mirrored the transport flows to the Lower Rhine region, which themselves used to be connected to production and consumption, before the place of industry was increasingly taken over by logistics as the area was deindustrialized. From the 1990s, Duisburg turned into a logistics hub and the surrounding area attracted the warehouses and European distribution centers of major multinational companies. Liberalization played an important role in this; prior to liberalization, it was easier for multinational companies to distribute their products within a country, as there were obstacles to be faced in cross-border transport. After liberalization, however, it became possible to distribute products, raw materials and semi-finished goods from one single point to a large area, covering more countries or even the entire

continent. As a result, transport flows became ever more dependent on logistics and could take multiple routes through the Dutch ports, as well as Antwerp or the German ports.

There were two hinterland areas where the transport flows were strongly connected to production, the highly industrialized Middle Rhine region and Southern Germany. As a result of port competition, after liberalization, and especially in the first decade of the new century, both areas became less important to Rotterdam. Meanwhile, the flow to Italy for maritime containers was created by logistics processes, as the containers arrived there through the Port of Rotterdam as a consequence of the main port effect. Over the years, as the flows increasingly became continental, they also became more connected to production and consumption. Many of the transported goods had an origin or destination in the United Kingdom and were transshipped in the port. When items were produced or consumed in the Netherlands or Italy, they were important to the economy of both countries, but not directly to Rotterdam. Accordingly, it can be concluded that after the expansion of the hinterland as a result of both the introduction of the maritime container to Rotterdam and liberalization, the hinterland contracted due to port competition. Distant areas became less important and those that were closer, such as the Lower Rhine and Antwerp, became more significant. Moreover, the basis for container transport became increasingly logistical, with this factor becoming even more crucial due to the loss of share of both the Middle Rhine area and Southern Germany.

This one-sided dependence on logistics instead of production made the Port of Rotterdam vulnerable. Indeed, although it had the advantage of having a wealthy and productive hinterland, especially in the Middle Rhine region, this contracted as a result of port competition (Figure 0.25). Due to deindustrialization in the Lower Rhine region and the growth of industry in Southern Germany, the industrial gravity point of the country moved to the south, which is a factor known as the South-North gradient.[65] For Rotterdam, this meant that fewer volumes were generated by industry, which was geographically more stable than footloose logistics activities. In parallel with these developments, the economic gravity point of Europe moved to the east, because of the rising standard of living in Central and Eastern Europe.[66] This means that more European distribution centers may

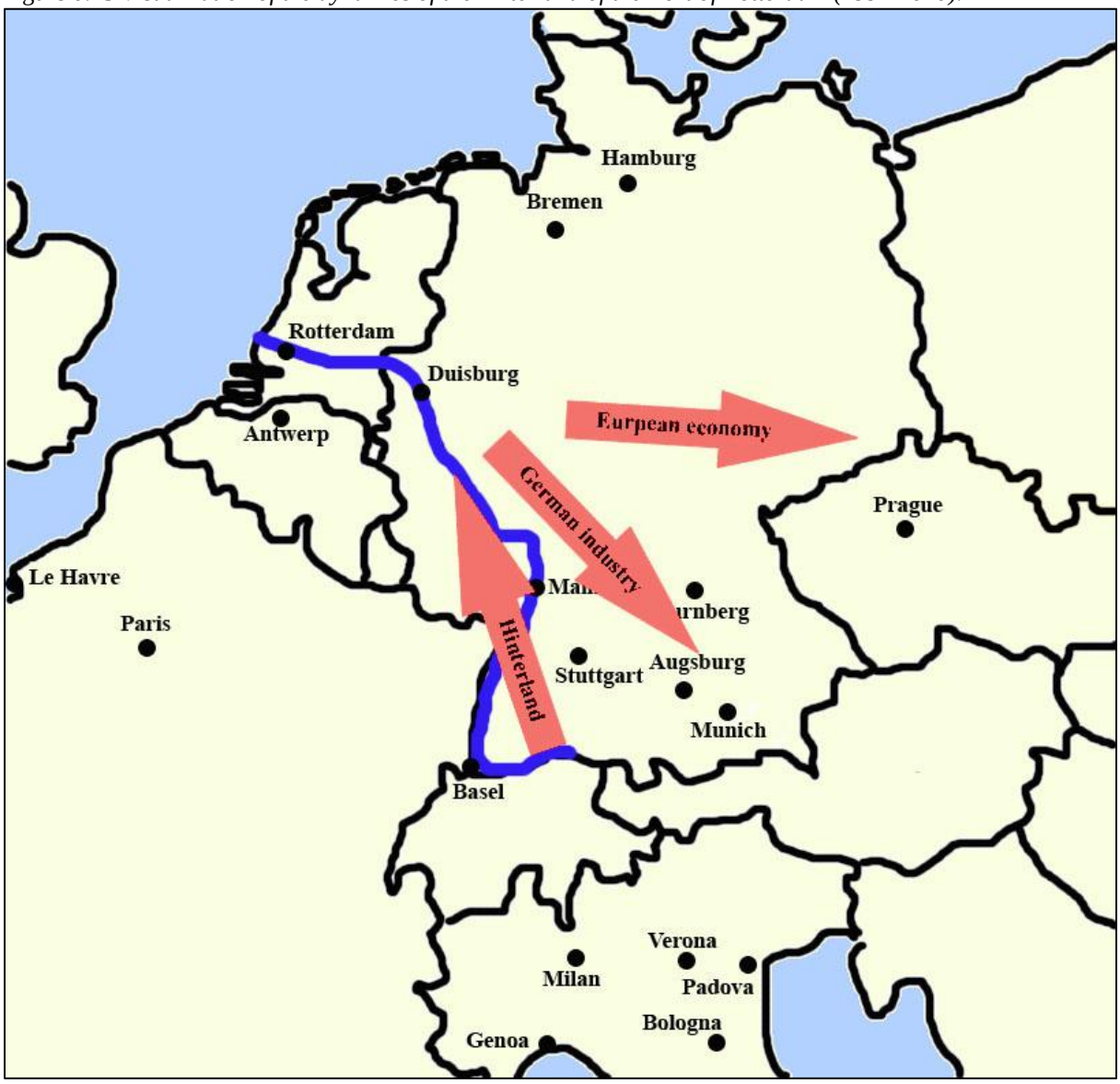
[65] Onno Möller, *Nederlands-Duitse handel op de helling? De verschuiving van het economisch zwaartepunt in de Bondsrepubliek en de ontwikkelingen in de goederenstroom tussen Nederland en de Bondsrepubliek* (Utrecht 1991)15.

[66] H.W. Hoen, 'Crisis in Eastern Europe: The Downside of a Market Economy', *European Review*, 19, 1 (2011) 32; Matthew M. C. Allen and Maria L. Aldrecht, 'The Impact of institutions on economic growth in Central and Eastern Europe', in Gary Cook and Jennifer Johns (eds.), *The changing geography of international business* (London 2013) 37-38; Andrei A. Levchenko and Jing Zhang, *Comparative advantage and the welfare impact of European integration* (Cambridge MA 2012) 32; Matthew M. C. Allen and Maria L. Aldrecht, 'The Impact of institutions on economic growth in Central and Eastern Europe', in Gary Cook and Jennifer Johns (eds.), *The changing geography of international business* (London 2013) 42; Witold Wilinski, 'Internationalization of Central and Eastern European countries and their firms in the Global crisis', in Marin A. Marinov and Svetlana A. Marinova (eds.), *Emerging economies and firms in the global crisis* (London 2013) 92, 98.

move eastwards to be closer to the emerging market. This would favour the German ports, as those countries belong to their captive hinterland. For Rotterdam, because of the distance of more than 300km, the only way to compete with the German ports in Central and Eastern Europe and Southern Germany is to use rail shuttles. However, to do this, a good connection to the German rail system is a necessity, which had not yet been realized in 2010. Without a good rail connection, Rotterdam's geographical advantage, namely being situated on the estuary of the Rhine, would become a disadvantage; the Rhine cannot be moved. The inflexibility of waterways was demonstrated by the history of container transport on the Rhine-Main-Danube Canal, as its nautical restrictions meant that it was only navigable by barges equipped to carry no more than 100 TEU. However, when the canal was opened in 1994, numerous Rhine barges were able to transport three times as many containers as previously, while increasing numbers of fast rail shuttles crossed Europe. Slow barge transport can only attract major container volumes due to its large scale, which keeps costs low.

As a result of the failure of the Betuwe Route in Emmerich, the hinterland seemed to move away from Rotterdam and leave the geographically fixed Rhine behind. That this connection was never realized was an enormous advantage for Germany and the German ports and railways. As the railway infrastructure is only partially separate from railway exploitation, it is clear that Dutch interests are dependent on the cooperation of competitors. Indeed, it is only when Germany and Deutsche Bahn build a railway track from Emmerich to the main German rail network that the Dutch port will be able to compete with its German counterparts and the German railways. It is clear that German interests have been opposed to any strengthening of Rotterdam and their cooperation could, indeed, hardly be expected. European liberalization thus proved to be a limited shield against the national interests of the most powerful state in Europe.

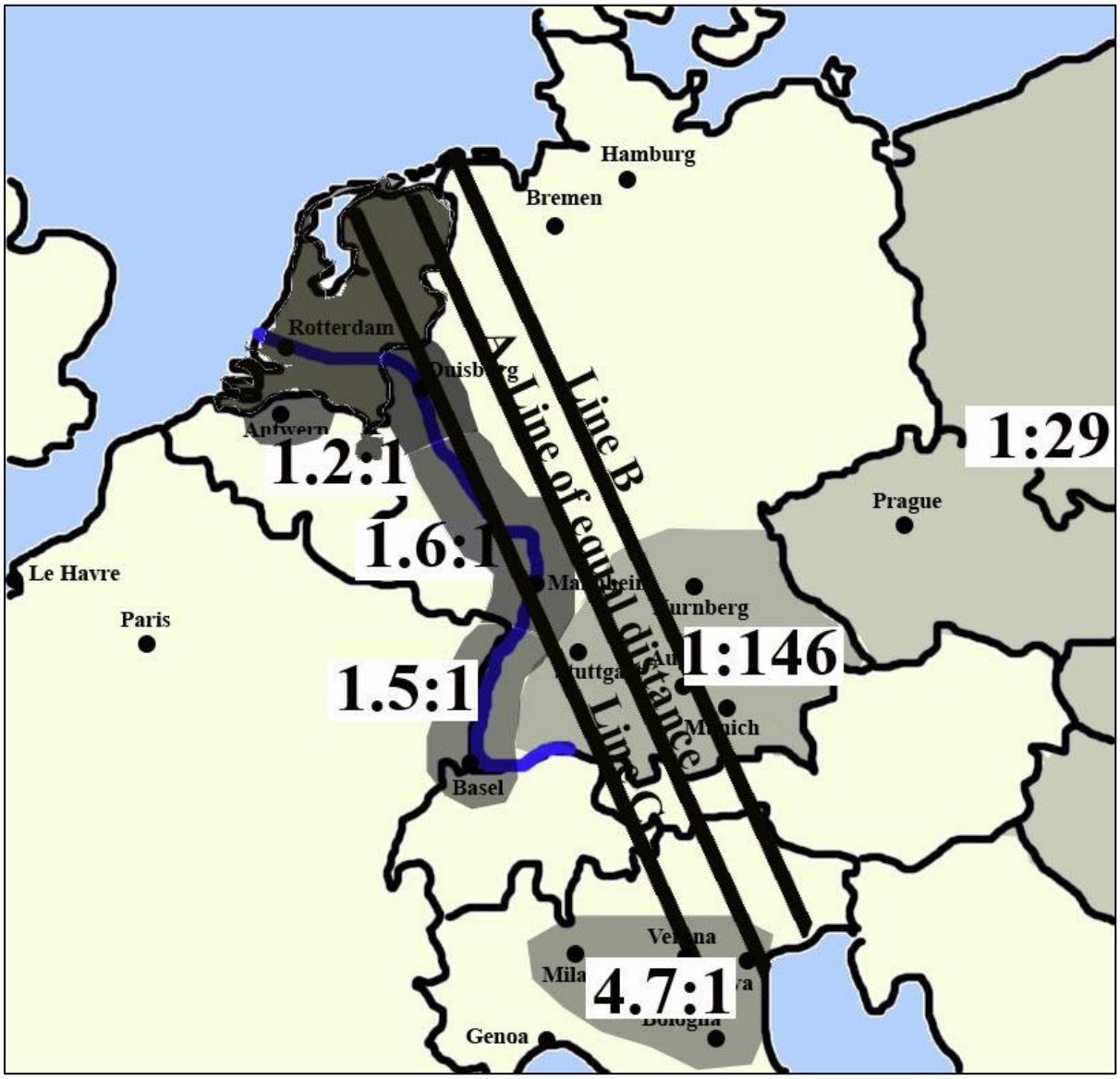
Figure 0.25 *Visualization of the dynamics of the hinterland of the Port of Rotterdam (1994-2010).*



The competitive situation of the Port of Rotterdam versus the German ports can be explained by German rail policy. The effect of this policy can be demonstrated by a thinking experiment on the map of Western Europe (Figure 0.26). A line is drawn on the map that visualizes the points that are an equal distance from the Dutch and the German ports. Transport costs on this line from all three ports would be the same when excluding the effect of geography, the differences between the transport costs of the different modalities and transport policy (Line A). If the transport costs of the two countries' ports on this line were the same, the majority of transport from the Dutch port would have its origins and destinations on the western side of the line, while those of the German ports would be on the eastern side. Transport costs were not, however, equal. As Rotterdam provided hinterland

transport by barge, this was cheaper than what the German ports had to offer, as they performed their hinterland transport over longer distances almost exclusively by rail. This means that the line of equal transport costs would have to be situated more to the east, considering the average geographical reach of the Rhine terminals, which was 50-60km (Line B). Prior to liberalization, the *Seehafenausnahmetarife* and the restrictions on cross-border transport neutralized the price differences, which would move the line of equal transport costs to the west, for instance to the Rhine (Line C). After liberalization, when all conditions obstructing free intra and intermodal competition disappeared, the line of equal transport costs would have moved to the eastern side of the line of equal distances. This did not, however, happen according to the calculations in this chapter based on German container transport data. The ratios of the German and Dutch ports on the two sides of the line indicate that the line of equal transport costs was situated on the western side of the equal distance line, notwithstanding the fact that Rotterdam had in the Rhine a very cheap hinterland connection.

Figure 0.26 *Map of Western Europe with the line of equal distance and equal transport costs before liberalization, and the ratio of transported containers per hinterland area between Rotterdam and the German ports in 2010.*



The ratio: the share of the Port of Rotterdam versus the share of the German ports. For example, in the north of Italy, the Port of Rotterdam had 4.7 times the share of the transported containers in TEU than the German ports. In Southern Germany, the share of the German ports was 146 times more in terms of the transported containers in TEU.
The figure is visualization, as the data is not precise enough to determine the exact line; the actual line would be curved.
Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr,* Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011), Rail Cargo Information Shuttle Timetable
http://www.railcargo.nl/uploads/tekstblok/timetable_september_2010.pdf, seen on 07/12/2011.

When considering the calculations of the shares of the individual hinterland areas, the Lower Rhine region, being situated less than 300km from both Rotterdam and the German ports, is inefficient with respect to rail transport. Nevertheless, there has been rail transport from the German ports to this area. Before liberalization, this can be explained by the preferential German rail tariffs, which were not

related to transport costs, but to the importance of areas to the German ports. After liberalization, there were still major container flows between the Lower Rhine region and the German ports. This was related to the pivotal position of the logistics hub in Duisburg, although the Lower Rhine region was situated closer to Rotterdam than the German ports and could be reached from there by cheap barge journeys, attracting a lot of business from the German ports. Before liberalization, the transport market was hindered by restrictive transport regulations, but the German ports could easily cross this line. After liberalization, the hinterland areas of Rotterdam were situated on the western side of line A and those of the German ports on the eastern side. There was one exception to this: the Lower Rhine region, where Rotterdam and the German ports had an almost equal share. The Dutch hinterland was barely contested by the German ports, and the Middle and Upper Rhine regions belonged more to Rotterdam than to their hinterland. The German ports also only had a minor interest in Northern Italy. On the other side of the line, the Central and Eastern European countries belonged more to the hinterland of the German ports than to those of Rotterdam, while Southern Germany was almost exclusively served by the German ports. It is noticeable that while the ratio of the share of the Dutch and German ports in the case of their Central and Eastern European counterparts in 2010 was 1:29, it was 1:146 in Southern Germany. This means that Rotterdam had less success in contesting the areas belonging to the German ports than vice versa and it was actually unimportant in those regions. The ratio between the position of Rotterdam and the German ports in the Lower Rhine region was 1.2:1; this was 1:6:1 in the Middle Rhine and 1:5:1 in the Upper Rhine. It was only in Northern Italy that this ratio was higher at 4.7:1.

This means that Rotterdam was less successful in contesting the German ports' hinterland than vice versa. The major difference in the ratios on the two sides of the line suggests that the German ports could still use rail transport efficiently, despite the fact that Rotterdam was blessed with the option to use cheap barge transport. This implies that liberalization did not lead to equal competition. Indeed, Dutch rail transport was disabled due to the lack of a good rail connection to the German rail network, which would have made it possible to exploit Rotterdam's position as the first port of call. This means that in 2010 there must have been a force that counteracted equal competition between the ports in the hinterland. This force is probably the pressure the German ports put on the German government, thereby hindering the construction of the third track in Emmerich. This connection would give the Port of Rotterdam a chance at distances above 300km, and would bring Southern Germany and Central and Eastern Europe within the range of efficient container transport from and to the Port of Rotterdam.

Conclusion

This chapter analyzed the container transport flows from a hinterland perspective, which made it possible to examine port competition in the Le Havre-Hamburg range, with a focus on the period 2004-2010. Due to the lack of available statistics, it is difficult to assess the container flows for the

previous period. Between 1966 and the late 1990s, it is likely that the hinterland of the Port of Rotterdam expanded as a result of cheap intermodal container transport and the liberalization of the European transport market. In the first decade of the new century, Rotterdam's hinterland with respect to container transport was shrinking

This chapter has shown that the transport of containers from and to Rotterdam mainly occurred along two axes. One axis, which was parallel with the coastline reaching from Le Havre to Hamburg, was formed to redistribute containers because of the main port effect. Deep sea ships of increasing sizes did not stop at all ports in an attempt to economize, while containers that arrived at the wrong port were redistributed by another transport modality. Within these flows, only the domestic market and Antwerp were the major hinterland areas of the Port of Rotterdam. The volumes between Antwerp and Rotterdam, which were mostly maritime containers, grew during the research period. As a result of these volumes, Antwerp was an important hinterland area that was contested by Le Havre to a relatively limited extent. Despite the redistribution flows between Antwerp and Rotterdam, the Dutch domestic market can be seen as the captive hinterland of the latter port. From the second axis, which runs along the Rhine, the Lower Rhine region became the most important hinterland area in the last decennium of the new century. It was contested by Antwerp and the German ports, but the former's share in that area fell during the research period, as port competition increased the size of the contested hinterland and the captive hinterland shrank. Due to the falling geographical range of the Port of Rotterdam, the Lower Rhine region became increasingly important. The Middle Rhine region, meanwhile, started to become an important hinterland area due to the arrival of maritime containers, although it later became less significant. Italy, especially for rail transport, is an important hinterland area and what Theo Notteboom calls a distinct hinterland. The transport flows to the north of Italy were already important before the arrival of maritime containers in Rotterdam. In the 2000s, the share of maritime containers in this flow fell, because the ports of Genoa, Gioa Tauro and Algeciras took over the distribution of these containers in the Mediterranean area. The containers were replaced by continental volumes in this flow. Until the 1990s, Rotterdam's hinterland of container transport used to include the north of Italy and the Middle Rhine area, but in the 2000s it shrunk to the triangle consisting of Antwerp, the Netherlands and the Lower Rhine region. This was because different forces were at work. The introduction of cheap intermodal transport in 1966, together with the liberalization of the European transport market in the 1990s, stimulated the growth of the hinterland of the Port of Rotterdam. Liberalization, however, in the long-run increased port competition, which resulted in a contraction of this hinterland.

This development had two consequences for the Port of Rotterdam; while the gravity point of its container transport moved to the north, the industrial gravity point of Germany moved in the opposite direction as a result South-North divide. This meant that Rotterdam increasingly lost its cargo, which was generated by industrial production, and gained container flows, which were mostly the result of logistics activities. These activities may move away from Rotterdam, because, as a result

of growing prosperity in Central and Eastern European countries, the economic gravity point of Europe has moved towards the east and the European distribution centers of multinationals in the Lower Rhine region may well follow suit. This movement would displace major container flows from Rotterdam to the German ports.

The German ports already had a major advantage over the Port of Rotterdam. In 2010, the latter had a significantly smaller share of the former's hinterland areas than the ports in Germany had of the Rotterdam port's hinterland areas. This was due to German rail policy, which was backed by the German ports. Hamburg and Bremen had a strong position in hinterland areas that are relatively far from Rotterdam, and, in these areas the Dutch port could only increase its share and benefit from its position as a first port of call for rail connections. The dedicated freight line connection, the Betuwe Route has not yet provided a good link to the German railway network. As a consequence, the destiny of the Port of Rotterdam is still determined by the geographically fixed Rhine and cannot adjust to the economic shifts within Europe. What remains is a fight between the Rhine and Deutsche Bahn.

Chapter 8
Conclusion

This thesis has examined the history of container transport between the Port of Rotterdam and its hinterland from 1966 to 2010. The work is based on a combination of numerical analyses and case studies focusing on economic integration within the Lower Rhine economy and the role of liberalization in the 1990s. The Lower Rhine economy was created by transport connections provided by the River Rhine at the end of the 19th century. The main transported products were imported bulk cargo, such as coal, iron ore, foodstuffs and mine wood for Ruhr industry. Right from the start, there was competition between the northern European ports of Le Havre in France, Antwerp in Belgium, Dordrecht and later Rotterdam in the Netherlands, and the two major German ports of Hamburg and Bremen. This competition was also a rivalry between modalities. Antwerp had a good rail connection, the Iron Rhine, while in Rotterdam from 1840 onwards rail was the dominant hinterland transport modality. Cheap Rotterdam barge transport also competed with rail transport from the German ports. The German rail sector did not have a serious domestic competitor. This was partly the result of German geography, as the rivers in the country, in particular the Weser and the Elbe, were shorter than the Rhine, did not provide access to the major German industrial centers, and were less navigable.

In order to restrict competition, the emerging competitor to the railways, road haulage, had to face a restrictive transport policy and truck tariffs in the 1960s, just as barge tariffs became dependent on rail tariffs. Rotterdam was well equipped to cheaply provide for the needs of Ruhr industry located on the Rhine, but was thwarted by German policy backed by the German ports, which had preferred Germany to be supplied from its own ports from the 19th century onwards. Indeed, Germany did not tolerate competition, whether within the country or with a neighbor. It achieved this with preferential tariffs, which discriminated against Rotterdam. Due to its concentration on barge transport, Rotterdam was strong in terms of bulk, while break bulk and general cargo were less important. Antwerp, on the other hand, was strong in general cargo because of its dominant rail transport. This meant that the Flemish port was ideal for exporting the products of German industry, which were conveyed in the form of general cargo. As a result, as well as competition, complementarity emerged between Antwerp and Rotterdam. From the 1950s, as a result of the energy transition from coal to oil, Rotterdam occupied an important position as an oil transit port. This was consistent with its strong position in barge transport. Nowadays, most petrochemical products are moved by pipelines, but the transport of chemical items via a tanker on the Rhine still takes place.

The arrival of maritime containers in 1966 caused a rupture in the port. Containers were the heir of general cargo, with which the Port of Rotterdam had less experience than with bulk. In the Netherlands, there had been a tradition of the intermodal transport of standardized containers. However, this was not performed by ships, but by rail and truck. Rail transport played a minor role at

Rotterdam's port, while barge transport was, at that time, seen as less suitable for the conveyance of standardized units because of the irregular shape of barges' interiors. Antwerp, with its experience with general cargo, would have been a more likely port to pioneer the introduction of maritime containers. Rotterdam, however, had an advantage, namely the transshipment of military cargo in the port, which gradually moved from Bremen to Rotterdam in the late 1950s. The history of the maritime container is closely connected to the military in the United States. McLean, the innovator of the American maritime container, managed to supply the US army in the Vietnam War (1965-75). The American military learned from this and increasingly containerized its goods. The major military volumes that arrived at the Port of Rotterdam in the 1960s formed the critical mass for container transport that was needed for profitable intermodal transport. As a consequence, the port was able to accelerate the transshipment of maritime containers and take the lead over its competitors.

Another effect of military cargo was the expansion of the hinterland of barge transport in the late 1960s. Prior to the breakthrough of container transport, the majority of barge volumes, particularly bulk, had a destination in the Ruhr area. Barge container transport started on the Middle and Upper Rhine, but the availability of military cargo with a destination of Mannheim was relatively too far away for the Dutch barge sector. Later, when there was a shift in deep sea container transport routes from transatlantic to Asiatic destinations in the 1990s, and in the first decade of the new century, growing volumes of mass produced Asiatic products flooded Europe and Rotterdam lost its advantage. Military goods, however, had a link to the Port of Rotterdam, as the US army had its warehouses around Mannheim along the Middle Rhine and transport from Rotterdam was the cheapest available. Rhine barge transport certainly benefitted from the transport of military goods, as both the Gulf War (1990-1991) and the Iraq War (2003-2011) relied on supplies from the US army depots around Mannheim which were moved by barge through Rotterdam. Asiatic goods, however, did not have a fixed destination in Europe; they were flexible and able to take advantage of multiple routes. This gave the other ports the chance to catch up.

The introduction of maritime containers required a major adjustment to the transport infrastructure of Western Europe. Container transport needed costly transshipment equipment and expensive berths that could support major weights. The deep sea transport of containers between 1966 and 2010 became cheaper as a result of the growth in scale, and put pressure on relatively expensive land transport. The hinterland transport of containers in the late 1960s was mainly performed by road, as American shipping companies were used to dealing with truckers and trucks, which were flexible and cheap. However, as a driver could only transport a maximum of two TEU, labour productivity could only be improved by increasing work hours, which was subject to regulation. Rail, because of its larger scale, was more suitable for container transport. Indeed, the Dutch railways reacted quickly to the opening up of the new market, and in the second half of the 1960s made investments in Dutch ports and container transport companies, for example Intercontainer in 1966 and Holland Rail Container in 1982. Dutch rail transport was not, however, well suited to container transport. Indeed,

the distribution of coal, its stronghold that gradually disappeared after the 1950s, had different requirements. Coal needed a dense network that could supply every coal merchant at every small station, while containers could be only transported efficiently by frequently operating bundled trains – shuttles – between a limited number of points. Furthermore, in order to transport goods to German destinations, the Dutch railways needed the cooperation of Deutsche Bahn. Indeed, the most important issue was getting a good connection to the German network, but this was problematic following several fiascos when attempting to get this off the ground. Barge transport entered the container market later and only gained in importance as a result of the energy crises in the 1970s, just in time deliveries, and its success in establishing liner services.

Cheap container transport opened up new possibilities for both the Port of Rotterdam and transport companies, and the Dutch railways in particular started to build wide transport networks for container transport in the 1960s. Road haulage also tried to reach destinations that were further away, and attempted to profit from its speed and flexibility, which made consignors turn to this modality despite its high costs over longer distances. Road transport, however, was hindered by German regulations on the need for licenses for cross-border road haulage, although these were gradually abolished in the 1990s. Liberalization made it easier to cross national borders and Dutch transporters were able to profit from the fall of the German system of fixed tariffs. At the same time, liberalization led to increasing inter and intramodal competition. Other ports also strived to extend their transport networks, and those of the competing ports of Antwerp, Rotterdam, Hamburg and Bremen met in the middle of Europe. This increased port competition, leading to an expanding contested hinterland and a shrinking captive one. For Rotterdam, this meant that in the late 1990s and the first decade of the new century, its geographical reach shrank and the gravity point of its container transport moved to the north, towards the port. The effect on the hinterlands of Antwerp and the German ports was different; the hinterland of Antwerp even expanded, as it took over Rotterdam's leading position in barge container transport in the Middle Rhine region from 2005 onwards. This was due to the new opportunities provided by barge after the opening of the Rhine-Scheldt Canal in 1986, which made use of Antwerp's stronghold as an exporter of general cargo and an industrial port. Antwerp increasingly exported the products of German industry situated along the Middle Rhine, and its role grew with the establishment in Duisburg of Belgian dealers in car parts in the 2000s.

The hinterland of the German ports probably lost some ground to Rotterdam after the liberalization of the European transport sector in the 1990s. Liberalization, which brought an end to artificially low tariffs in the German road haulage and barge sectors, made it easier for Dutch companies to enter the German market. However, the German ports, which were backed by German government policy, defended their hinterland well despite liberalization. Indeed, Rotterdam had virtually no share of the market in the German captive hinterland, Southern Germany and the Central and Eastern European countries. Yet, at the same time, the German ports had a substantial share of the marketplace of the Dutch hinterland areas on the Lower and Middle Rhine. This was only possible

due to protective measures that replaced the restrictive German transport policy in existence before liberalization. The Dutch long distance transport of containers was mainly performed by barge from the 1980s. However, this modality was confined to the Rhine, the transport condition of which had been regulated by the Act of Mannheim. Truck transport, meanwhile, was expensive over destinations above 250km. This meant that the only way for Rotterdam to extend its hinterland towards Southern Germany and Central and Eastern Europe was by rail. Yet rail container transport depended on German cooperation and good connections to the German network, and forces obstructed the construction of the third track that would achieve this link and enable Rotterdam to distribute its containers to destinations that are further away via frequent and cheap shuttles. These shuttles would also allow Rotterdam to combine maritime with continental volumes, and thereby convey the products of Dutch industry to these areas and profit from the cheap transport of products on the journey back. This was not yet possible at the end of 2010.

Accordingly, the hinterland of Rotterdam in terms of maritime container transport contracted in the second half of the 1990s and the first decade of the new century. It lost Italy to the Mediterranean ports of Gioia Tauro and Algeciras, while the Upper Rhine, which had never been important, became even less so. On the Middle Rhine, it had to compete with Antwerp and the German ports, providing support for the observation of Hercules Haralambides that the captive hinterland of ports decreases and their contested hinterland grows due to port competition. Containerization, enhanced by the liberalization of the European transport market in the 1990s, resulted in growing port competition, which caused the hinterland of the Port of Rotterdam to shrink. What remained in the first decade of the new century was a triangle formed by Rotterdam, Antwerp and Duisburg. The growing container flows between Rotterdam and Antwerp were mostly the result of the main port effect, and mainly consisted of the redistribution of generally empty containers. The flows between Rotterdam and the Lower Rhine region were also usually the products of logistics. Indeed, employment in industrial production was gradually replaced by logistics activities in the 1990s in the region, which played host to a growing number of major European distribution centers from the start of the 2000s.

These shifts in the macroeconomic hinterland were disadvantageous for the Port of Rotterdam for several reasons. Parallel with the movement of the gravity point of container transport to the north, the industrial gravity point of Germany moved in the opposite direction, from the north to the south. This was due to a combination of deindustrialization in the Lower Rhine region and the settlement of new industry in Southern Germany, which is an example of the emergence and lock-in of industrial clusters, as highlighted by Paul Krugman. In this way, container transport at the Port of Rotterdam increasingly lost touch with German industry, which survived the 2008 economic crisis better than other countries and generated major containerized volumes. At the same time, the economic gravity point of Europe moved towards the east, due to the growth in prosperity in Central and Eastern Europe. Rotterdam could not profit from these emerging markets, as it needed fast rail connections to

benefit from its position as the first port of call. This was not possible because of the lack of a good connection to the German rail network due to the fiasco of the Betuwe Route; at the end of 2010, this dedicated rail freight connection still debouched into a German railway track congested with passenger trains. Likewise, Rotterdam could only acquire a greater share of the Southern Germany market, with its major industrial products, by offering frequent shuttle connections. Accordingly, despite liberalization, Germany was still able to protect its hinterland from Dutch competition. Moreover, because of the contraction of its container transport hinterland, Rotterdam became increasingly dependent on both Antwerp, with its good logistics flows generated by the main port effect, and the Lower Rhine region in Germany, with its major economic problems. The flows of goods to these areas were also generated by logistics processes, with Rotterdam mainly transshipping supplies for the major European distribution centers to this area. These warehouses were attracted to this region by its strategic position between the North Sea ports and the German ports, the good infrastructure, and the level of service on offer. However, with changes to the macroeconomic hinterland, these companies were able to follow the economic gravity point of Europe towards the east to be closer to new markets, as Lego did when it moved to Prague. In these circumstances, the flows are more likely to go via the German ports. Rotterdam's only chance is rail transport, as the new markets are too far away for efficient truck transport and Rotterdam's stronghold, the Rhine, is geographically fixed. This gives Deutsche Bahn an advantage.

The answer to the research question posed is that containerization in the period from 1966 to the1990s loosened the economic bonds within the Lower Rhine economy. Container transport, which is the heir to break bulk cargo, was not oriented towards the Ruhr area and North Rhine Westphalia, as the transport of bulk had been before. This was because the majority of transported goods in the late 1960s were military supplies, which had a destination higher up on the Rhine. From the 1990s onwards, the contents of the containers transshipped in Rotterdam were increasingly the products of Asian industry. These did not have a fixed destination, but had to be distributed in Europe. In the first decade of the new century, however, and as a result of increasing port competition, the hinterland of the Port of Rotterdam retreated to the triangle formed by Rotterdam, Antwerp and Duisburg. This intensified the transport links within the Lower Rhine economy.

Containerization, which is closely connected to globalization, led to regionalization in the Lower Rhine economy. The role of liberalization was twofold. First, it was one of the forces that helped to extend the hinterland of the Port of Rotterdam in terms of container transport, but it later led to growing port competition, which resulted in a shrinking hinterland. There is continuity in the history of Rotterdam's transport relationships since the 19th century in that they have largely been dependent on the Rhine. Indeed, most of the rail and truck transport from Rotterdam towards its hinterland followed the Rhine basin, as many rail tracks and motorways were built in this region. The same is true for the transport relationships of the German ports, which show great continuity regarding their dependence on the railway connections to their hinterlands. Consequently, competition

between Rotterdam and the German ports is a fight between the Rhine, the stronghold of Rotterdam, and rail transport by Deutsche Bahn.

Appendix A The Choice of Benchmark Years

The light grey columns mark the chosen benchmark years. The medium grey fields mean that there is sufficient data available, while the dark grey fields indicate that there is not enough data to conduct the analysis.

		1966-1983	**1984-1987**	**1988-1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Rail	Country	no data	no data	no data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data
	Region	no data	no data	no data	Data	Data	Data	Data	Data	no data	Data	no data	no data	no data	Data	no data	no data	Data	no data	Data	Data
Barge	Country	no data	1987	no data	no data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data
	Region	no data	1984	no data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data
Road	Country	no data	1985	no data	no data	no data	no data	Data	no data	no data	Data	no data	no data	no data	Data	no data	no data	Data	no data	no data	Data
	Region	no data	1985	no data	no data	no data	no data	Data	no data	no data	Data	no data	no data	no data	Data	no data	no data	Data	no data	no data	Data
			Benchmark		**Benchmark**			**Benchmark**			**Benchmark**				**Benchmark**			**Benchmark**			**Benchmark**

Appendix B The Data Used

Data for Chapter 2

Data for Figure 2.2

Number of transshipped containers in the Port of Rotterdam per millions of containers (1968-2010)

Year	Millions of containers	Year	Millions of containers	Year	Millions of containers	Year	Millions of containers
1968	0.1	1979	1.2	1990	2.5	2001	3.8
1969	0.2	1980	1.3	1991	2.5	2002	4.1
1970	0.2	1981	1.4	1992	2.7	2003	4.4
1971	0.3	1982	1.5	1993	2.8	2004	5.1
1972	0.4	1983	1.6	1994	3.0	2005	5.6
1973	0.7	1984	1.8	1995	3.1	2006	5.8
1974	0.8	1985	1.9	1996	3.2	2007	6.5
1975	0.7	1986	2.0	1997	3.5	2008	6.5
1976	0.8	1987	2.0	1998	3.8	2009	5.9
1977	0.9	1988	2.3	1999	4.0	2010	6.7
1978	1.1	1989	2.5	2000	3.9		

In the early years of containerization, containers were counted per piece. TEU data has only been available since 1989.

Source: Port of Rotterdam

http://www.portofrotterdam.com/nl/Over-de-haven/havenstatistieken/Documents/Containers%20en%20TEU%27s%20tijdreeks.pdf, seen on 17-06-2013.

Data for Figure 2.3 *Total transshipments of the Port of Rotterdam specified per millions of tons (1975-2010*)

	1975	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**
Bulk	243	252	242	230	260	240	241	209	193	205
Container	10	12	13	17	18	19	21	22	24	27
Break bulk	17	19	17	19	17	17	16	16	17	17
	1985	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**
Bulk	206	211	208	220	233	230	232	230	219	224
Container	28	30	31	35	40	39	40	44	46	50
Break bulk	16	16	17	19	19	19	19	19	18	19
	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Bulk	222	220	232	233	219	238	235	239	239	250
Container	52	53	59	61	66	65	62	66	71	83
Break bulk	19	19	20	20	18	19	17	17	19	20
	2005	**2006**	**2007**	**2008**	**2009**	**2010**				
Bulk	261	264	277	289	265	294				
Container	91	95	105	107	100	112				
Break bulk	18	22	27	25	22	24				

Source: Port of Rotterdam, http://www.portofrotterdam.com/nl/Over-de-haven/havenstatistieken/Documents/Totale%20goederenoverslag%20tijdreeks.pdf, seen on 17-06-2013.

Data for Chapter 3

Data for Figure 3.1 *Average external costs of transport in the 17 EU countries in euros per 1000 tons/km in millions of euros per year excluding congestion costs in 2000.*

	Road	**Rail**	**Barge**
Accident	35	0	0
Noise	32.4	3.2	0
Air pollution	89.9	8.3	14.4
Climate change (low)	8.2	0.5	0.6
Urban effects	5.2	0.5	0

Source: INFRAS&IWW. External costs of transport (Zurich, Karlsruhe 2004).

Data for Chapter 4

Data for Figure 4.1 *Cross-border transport by Nederlandse Spoorwegen per 1000 tons (1955-1960)*

	1955	**1956**	**1959**	**1960**
Germany	4669	4631	4701	5158
Belgium and Luxemburg	1990	2193	1770	1820
France	1065	1146	1287	1670
Austria	332	298	233	271
Switzerland	206	294	222	218
Italy	190	193	216	279
Czechoslovakia	152	142	138	148
Total	8604	8897	8567	9564

Source: NV Nederlandse Spoorwegen, *Jaarverslag 1955* (Utrecht 1956); NV Nederlandse Spoorwegen, *Jaarverslag 1956* (Utrecht 1957); NV Nederlandse Spoorwegen, *Jaarverslag 1957* (Utrecht 1958); NV Nederlandse Spoorwegen, *Jaarverslag 1958* (Utrecht 1959); NV Nederlandse Spoorwegen, *Jaarverslag 1959* (Utrecht 1960); and NV Nederlandse Spoorwegen, *Jaarverslag 1960* (Utrecht 1961).

Data for figures 4.4 and 4.6. *The volume of container transport compared to the total transport volumes of Nederlandse Spoorwegen per million tons (1969-1977)*

		1967	**1968**	**1969**	**1970**	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**
Maritime containers	Number of containers	600	2000	6600	88139	96170	10714	15000	15000	11700	14500	14545	16000	18880	21360	20972
Continental containers	Number of containers	1800	1640	1200	12000	12000	12000	12000	12000		12000	12000	12000	10200	10700	9013
Total container transport	Number of containers	2400	1920	7800	10013	10817	11914	16200	16200		15700	15745	17200	19900	22430	21873
Total weight of containers	x 1000 ton	2.4	1.92	7.8	1	1.08	1.19	1.6	1.62		1.57	1.57	1.72	1.99	2.24	2.18
Total weight of NS freight	x 1000 ton	26	26	26	27	23	22	24	23	18	18	18	18	22	22	21
Degree of containerization	Percentage	0.1	0.7	3.0	3.7	4.7	5.5	6.8	7.2		8.9	8.9	9.4	9.1	10.1	10.4

Source: N.V. Nederlandse Spoorwegen, *Jaarverslagen (1969-1997)*. Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Data for Figure 4.5 *The volume of container transport compared to the total transport volumes of Nederlandse Spoorwegen per million tons (1969-1977)*

1982	**1983**	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
19520	19142	231000	236520	219000	216000	228000	260000	270400	259849	254000	254000				445450	490000
10635	11479		12000	14590	15020	16300	23500	28670	26000	1200					1200	1200
20583	20289	231000	248520	233590	231020	244300	283500	299070	285849	255200					446650	491200
2.05	2,02			2.33			2.835		2.85	2.55					44.66	4.91
18	14	20	20	19	19	20	19	18	18	17	17	18	21	21	23	25
11.3	14.6			12.2			14.7		16	15					20	20

The degree of containerization: the number of containers is multiplied by the average container weight, which is 10 tons. This is the total weight of the transported containers. The percentage of the total transported tonnage is then calculated.
Source: N.V. Nederlandse Spoorwegen, *Jaarverslagen (1969-1997)* (Utrecht).

Rail container transport to and from the Netherlands in TEU (1998-2006).

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
A	22866	18526	16362	9843	8691	578	207	7115	14952
B	103239	112836	95905	77326	69547	78295	76566	43669	25488
G	93477	118422	91530	70469	85204	53346	51850	35876	37716
DK	1340	1367	1347	1036	977	407	409	268	149
SP	2060	5	0	1	4	0	0	0	0
F	21226	21262	8551	53	72	81	67	319	961
I	45109	48955	50570	52438	82612	90316	47486	43776	50537
Lux	14631	13123	10341	7355	5543	3155	0	0	0
S	116	142	77	27	2	0	0	0	0
CZ	9557	14334	17667	17785	20272	21502	30462	19022	102
H	1	58	5	2	2	0	26	0	5416
PL	8689	15016	16638	14767	16091	16131	17082	16560	8688
Slo	170	3	0	0	0	0	0	2170	4173
Slov	18	25	5	1	0	0	0	1	0
Oth	16693	15566	27620	31877	33796	35848	40034	47419	46761

Sum of: empty; full; and to and from. Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011)

Data for Chapter 5

Data for Figure 5.1. *Number of containers transported on the Rhine per 1000 (1975-2010).*

Year	Number of containers	Year	Number of containers	Year	Number of containers	Year	Number of containers
1975	10	1984	180	1993		2002	657,4365
1976	20	1985	210	1994	403,3633	2003	698,2731
1977	43	1986	230	1995	476,2674	2004	810,4237
1978	60	1987	225	1996	504,0684	2005	905,0664
1979	73	1988		1997	606,6654	2006	904,1067
1980	80	1989		1998	678,39	2007	997,9614
1981	86	1990	430	1999	706,25	2008	993,3891
1982	118	1991		2000	670,6605	2009	1020,676
1983	140	1992		2001	586,0242	2010	1135,848

The Port of Rotterdam started to count containers in TEU in 1989. As there is no reliable way to convert the number of containers into TEU, the time series that start before 1989 are presented per numbers of containers.

Source: Hugo van Driel, *Kooperation im Rhein-Containerverkehr: Eine historische analyse* (Rotterdam 1993) rough estimations, Rotterdam Port Authority, own calculations combining time series and modal split.

http://www.portofrotterdam.com/en/Port/port-statistics/Pages/containers.aspx.

Data for Figure 5.2. *Share of different hinterland countries involved in container barge transport in percentage terms for the years 1997, 2000 and 2004.*

	1984	**1997**	**2000**	**2004**	**2007**	**2010**
Domestic	1	25	29	48	35	32
Belgium	21	34	31	27	35	25
Germany	74	37	36	23	26	40
France	3	1	1	1	1	1
Austria	0	0	0	0		
Czech Republic	0	0	0	0		
Hungary	0	0	0	0		
Poland	0	0	0	0		
Slovakia	0	0	0	0		
Other	0	3	3	2	3	3

Source: Containervervoer in de grensoverschrijdende binnenvaart, CBS *Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken, 59-71, Centraal Bureau voor de Statistiek, *Binnenvaart; goederenvervoer binnenlandse en internationale binnenvaart* (Heerlen 2013).

Data for Figure 5.3. *Number of containers transported from Rotterdam to and from the major hinterland countries by barge per million TEU (1987-2010).*

	1987	**1997**	**2000**	**2004**	**2007**	**2010**
Domestic	3000	319600	550798	880000	881000	823228,2
Belgium	44900	430127	587799	499035	882000	639620,2
Germany	158460	473564	680437	418187	645000	1026179
France	7300	6811	14352	9648	19000	17243
Austria		629	4156	683		
Czech Republic		0	253	0		
Hungary		0	68	94		
Poland		0	118	0		
Slovakia		30	0	0		
Other		41582	65598	38387		

Source: Containervervoer in de grensoverscheidende binnenvaart, in *CBS Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011) Joost Kolkman, *Binnenvaart en containerlogistiek Leerervaringen uit het buitenland en van andere modaliteiten voor afhandelingsproblematiek in de zeehaven* (Den Haag 2009), Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2010 (Wiesbaden)

Data for Figure5.4. *Relative importance of the Lower, Middle and Upper Rhine in percentage terms (1987-2010).*

	1987	**1994**	**1997**	**2000**	**2004**	**2007**	**2010**
Lower Rhine	21	29	28	32	42	56	64
Middle Rhine	36	56	56	50	46	31	21
Upper Rhine	43	15	16	18	12	14	15

Containervervoer in de grensoverschrijdende binnenvaart, in *CBS Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken, Centrale Commissie voor de Rijnvaart, *Economische ontwikkeling van de Rijnvaart Statistieken* 1994, 1997, 2000 (Straatsburg), Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2004, 2007 2010 (Wiesbaden).

Data for Figure 5.5 and Figure 11. *Share of container transport between Rotterdam and Antwerp, the Lower Rhine, the Middle Rhine and the Upper Rhine in percentage terms in the years 1987, 2004 and 2010.*

	Rotterdam				Antwerp		
	1987	2004	2010		1987	2004	2010
Lower	21	46	64	Lower	64	23	29
Middle	3	42	21	Middle	52	55	50
Upper	43	12	15	Upper	18	22	21

Containervervoer in de grensoverschrijdende binnenvaart, in CBS *Maandstatistiek voor verkeer en vervoer* 1989 speciaal nummer: 50 jaar verkeers- en vervoerstatistieken, 59-71, Deutsches Statistisches Bundesamt, *Kombinierter Verkehr,* Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Barge container transport to and from the Netherlands in TEU (1997-2006)

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
A	629	1664	6321	4156	5821	6199	517	683	609	0
B	430127	466017	479691	587799	632192	604480	508345	499035	516792	505889
D	473564	505492	672069	680437	558077	499133	363718	418187	439817	431832
F	6811	6432	15956	14352	12635	12926	9239	9648	9344	13584
Lux	0	0	414	0	0	0	0	0	192	0
Gr	0	0	0	0	0	0	23			
Nl	0	0	0	0	0	0	0	11	0	17
Cz	0	96	101	253	2	196	0	0	0	0
H	0	0	336	68	301	247	116	94	0	0
PL	0	0	20	118	154	187	21	0	7	0
Slo	30	0	126	0	0	0	0	0	0	0
Oth.	41582	40286	57320	65598	60761	50561	36797	38387	42744	39401

Sum of empty, full, and to and from; Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Data for Chapter 6

Data for Figure 6.7, Figure 6.11 and Figure 6.12. *The transported container volumes by road haulage between the Netherlands and the most important hinterland countries per TEU and percentage terms (1985, 1997, 2000, 2004, 2007, 2009)*

TEU	**1985**	**1997**	**2000**	**2004**	**2007**	**2009**
Domestic	1162	601703	612578	724239	901156	701435
Belgium	158	302249	340249	375673	470258	364796
Germany	257	299454	272329	348566	430898	336639
Other	29	58855	51066	72944	64183	53913
Total	1606	1262261	1276222	1521422	1866495	1456783
Percentage						
Domestic	72	48	48	48	48	48
Belgium	10	24	27	25	25	25
Germany	16	24	21	23	23	23
Other	2	5	4	5	3	4

Vuren, T. van and G. R. M. van Jansen, *De verkeersafwikkeling van het container-wegvervoer van en naar de Rotterdamse haven* (Delft 1986), Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Container transport by road haulage to and from the Netherlands 1997-2009 in TEU

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
A	1446	1480	1454	1342	873	816	707	955	814	594	758	829	1243
B	231066	219232	212775	231694	247362	208839	248119	321009	279327	228283	231048	217512	235516
D	264376	263024	269091	274891	289466	252378	234006	293014	269076	239102	264323	255250	219794
DK	229	246	294	349	511	428	550	900	751	428	372	387	2099
SP	391	381	686	696	556	560	554	889	998	686	692	557	540
Fin	0	0	0	0	0	0	0	0	0	14	14	0	0
F	42848	44017	49172	46626	40698	33044	32676	41428	35360	29639	28938	24810	34080
GR	56	56	28	28	14	14	40	81	54	13	0	0	0
Ier	27	41	28	14	0	0	13	13	96	96	67	67	97
I	541	585	657	680	764	643	610	835	960	813	1219	1100	450
Lux	4738	4618	3635	4322	5949	6076	5988	7833	10121	7895	4347	3291	2105
P	13	27	28	28	27	13	28	55	41	56	139	111	56
S	191	163	168	168	56	56	122	150	261	246	163	178	70
UK	892	924	545	489	384	398	978	1255	845	552	543	503	370
BG	4	4	4	4	11	11	0	1	2	1	6	6	2
Cz	693	649	478	520	857	814	862	1033	954	786	794	791	373
H	53	53	93	96	28	25	20	34	60	47	106	109	68
Lit	2	2	0	0	0	0	0	0	0	0	1	1	0
PL	453	462	422	453	367	321	378	465	470	384	285	306	219
R	18	18	11	11	0	0	1	1	3	3	10	10	4
Slo	24	24	12	12	21	21	97	115	122	104	52	52	33
Slov	4	4	10	10	2	2	3	18	33	18	44	47	26
NL	110547	105135	116922	125143	133636	111193	136386	161413	143558	136504	133905	153879	153246
Oth.	1946	2098	1814	1851	1288	1017	1506	1773	1012	730	649	702	1479

Sum of empty, full, and to and from.

Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Data for Chapter 7

Data for Figure 7.1. *Container transport flows by road haulage between France, European ports and the major hinterland areas per 1000 TEU between 2004 and 2010.*

		2004	2005	2006	2007	2008	2009	2010
France	Austria	0	0	1	0	1	0	0
France	Netherlands	4	7	4	7	4	8	3
France	Italy	0	2	0	0	1	0	0
France	Belgium	3	3	1	4	5	5	3
France	Germany	34	51	46	47	37	78	46

Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr*, Fachserie 8 Reihe 1.3. (Wiesbaden 2004-2011).

Data for Figure 7.2. *Container transport between Belgium and the Netherlands, and the Dutch domestic transport of containers per TEU in 2000 and 2004*

		2000	2004
Belgium	Rail	95905	76566
	Barge	587799	499035
	Truck	125143	161413
Domestic	Rail	87271	63539
	Barge	550798	880000
	Truck	231694	321009

Source: Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011)

Data for Figure 7.6. *Number of containers transported between the Lower Rhine region and the different hinterland areas per 1000 TEU in the period 2004-2010.*

	From	To	2004	2005	2006	2007	2008	2009	2010
Rail	Lower Rhine	Netherlands	0	0	41	62	22	87	85
	Lower Rhine	East Germany	0	0	0	0	0	0	13
	Lower Rhine	Southern Germany	0	0	0	0	62	0	63
	Lower Rhine	Upper Rhine	51	48	47	41	0	37	19
	Lower Rhine	Spain	18	38	43	48	41	0	12
	Lower Rhine	Middle Germany	0	0	0	0	0	0	12
	Lower Rhine	Austria	29	32	0	104	46	0	38
	Lower Rhine	German Ports	41	47	56	86	124	74	110
	Lower Rhine	Italy	67	89	208	174	167	130	115
Road haulage	North Rhine Westphalia	Bremen	138	112	117	129	129	125	120
	North Rhine Westphalia	Hamburg	179	160	211	223	223	250	270
	North Rhine Westphalia	German ports	317	272	328	352	352	375	390
Barge	Lower Rhine	Antwerp	106	128	129	174	160	148	134
	Lower Rhine	Rotterdam	327	379	438	437	437	416	529
Total	Lower Rhine	Netherlands	327	379	479	499	459	503	614
	Lower Rhine	German ports	358	319	384	438	476	449	500
	Lower Rhine	Southern Germany	0	0	0	0	62	0	63
	Lower Rhine	Upper Rhine	51	48	47	41	0	37	19
	Lower Rhine	Italy	67	89	208	174	167	130	115
	Lower Rhine	Antwerp	106	128	129	174	160	148	134

The following units are considered to be situated in the Lower Rhine region: Dortmund, Duisburg, Dusseldorf, Cologne, Krefeld, Wesel, and North Rhine Westphalia. The total numbers were calculated from the aggregated transport volumes from and to the different geographic units by all three modalities.
Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2004-2010 (Wiesbaden)

Data for Figure 7.7. *Number of containers transported between the Middle Rhine area and the different hinterland areas per 1000 TEU in the period 2004-2010.*

			2004	2005	2006	2007	2008	2009	2010
Rail	German ports	Middle Rhine	36	23	72	87	117	115	174
	Italy	Middle Rhine	68	82	142	140	136	118	137
	Middle Rhine	Netherlands	0	0	0	0	0	64	68
	Middle Rhine	Spain	13	0	0	0	0	0	21
	Middle Rhine	Southern Germany	0	0	0	0	0	0	17
Road Haulage	Baden Wurtemberg	Bremen	13	11	8	16	16	7	10
	Baden Wurtemberg	Hamburg	46	39	36	36	36	31	40
	Baden Wurtemberg	German Ports	59	50	44	52	52	38	50
Barge	Antwerp	Middle Rhine	175	143	178	175	330	91	219
	Rotterdam	Middle Rhine	355	296	191	240	156	287	212
Total	Middle Rhine	Rotterdam	355	296	191	240	156	351	280
	Middle Rhine	German Ports	95	73	116	139	169	153	224
	Middle Rhine	Italy	68	82	142	140	136	118	137
	Middle Rhine	Southern Germany	0	0	0	0	0	0	17
	Middle Rhine	Antwerp	175	143	178	175	330	91	219

The following units are considered to be situated in the Middle Rhine area: Mannheim, Ludwigshafen Kaiserslautern, Worth, Germersheim, Karlsruhe and Baden Wurtemberg. The total numbers were calculated from the aggregated transport volumes from and to the different geographic units by all three modalities. The decision to add the road haulage volumes to the Middle Rhine area and not to Southern Germany was made for two reasons: Mannheim was one of the most important barge terminals on the Rhine. Because of the German obsession with multimodal transport and the major supply and demand for containerized cargo there, it is more likely that the majority of the container transport happened between Mannheim and the German ports. Because of the good rail connection between the German ports and Southern Germany, containers were most likely to arrive in South Germany by rail than by road haulage.

Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2004-2010 (Wiesbaden)

Data for Figure 7.8. *Number of containers transported between the Upper Rhine area and the different hinterland areas per 1000 TEU in the period 2004-2010.*

			2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Rail	Upper Rhine	German ports	68	107	60	68	65	132	126
	Upper Rhine	Italy	57	72	84	60	66	35	40
	Upper Rhine	Lower Rhine	51	48	47	41	0	37	19
	Upper Rhine	Netherlands	80	69	68	66	65	61	70
Road haulage	Upper Rhine	Antwerp	99	85	95	87	93	86	100
	Upper Rhine	Rotterdam	89	92	97	107	101	97	125
Barge	Upper Rhine	Netherlands	169	161	165	173	166	158	195
Total	Upper Rhine	German ports	68	107	60	68	65	132	126
	Upper Rhine	Italy	57	72	84	60	66	35	40
	Upper Rhine	Lower Rhine	51	48	47	41	0	37	19
	Upper Rhine	Antwerp	99	85	95	87	93	86	100
	Upper Rhine	Netherlands	169	161	165	173	166	158	195

The following units are considered to be situated in the Upper Rhine area: Basel, Switzerland. The total numbers were calculated from the aggregated transport volumes from and to the different geographic units by all three modalities.
Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2004-2010 (Wiesbaden)

Data for Figure 7.9. *Rail container transport flows between Italy, European ports and the major hinterland areas per 1000 TEU between 2004 and 2010.*

			2004	2005	2006	2007	2008	2009	2010
Rail	Italy	Netherlands	82	91	102	125	196	188	178
	Italy	Southern Germany	39	52	77	74	84	67	86
	Italy	Middle Rhine	68	82	142	140	136	118	137
	Italy	Upper Rhine	57	72	84	60	66	35	40
	Italy	Lower Rhine	67	89	208	174	167	130	115
	Italy	Belgium	29	81	224	321	246	190	180
	Italy	Scandinavia	32	37	48	51	58	20	41
	Italy	German ports	68	36	37	19	0	0	38

Italy cannot be reached by barge from the Western European ports, and information about the transported volumes by road haulage was not available.
Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2004-2010 (Wiesbaden)

Data for Figure7.10. *Rail container transport flows between Southern Germany, European ports and the major hinterland areas per 1000 TEU between 2004 and 2010.*

			2004	2005	2006	2007	2008	2009	2010
Rail	German ports	Southern Germany	434	472	600	688	748	647	634
	Italy	Southern Germany	39	52	77	74	84	67	86
	Lower Rhine	Southern Germany	0	0	0	0	62	0	63
	Middle Rhine	Southern Germany	0	0	0	0	0	0	17
Road haulage	Bayern	Bremen	23	27	20	21	21	14	14
	Bayern	Hamburg	75	73	63	81	81	67	85
	Bayern	German ports	98	100	83	102	102	81	99
	Bayern	Middle Rhine	283	339	320	304	304	152	298
	Bayern	Lower Rhine	76	82	93	61	61	20	34
Total	Southern Germany	German ports	532	572	683	790	850	728	733
	Southern Germany	Italy	39	52	77	74	84	67	86
	Southern Germany	Lower Rhine	76	82	93	61	123	20	97
	Southern Germany	Middle Rhine	283	339	320	304	304	152	298

Barge transport is not included here as, according to the definition of geographic areas in this work, the area within a radius of 50-60 kilometers from the Rhine belongs to the Middle Rhine region, which means that part of Baden Wurtemberg cannot be reached directly from the Rhine. For road haulage transport, Baden Wurtemberg is added to the Middle Rhine area. The following units are considered to be situated in Southern Germany: Munchen, Lanschut, Bayreuth, Danube Illier, Rosenheim, Stuttgart, Augsburg, Nurnberg, Memmingen, Passau, Konstanz, Lorrach and Bayern. The total numbers were calculated from the aggregated transport volumes from and to the different geographic units by rail and road haulage.
Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2004-2010 (Wiesbaden)

Data for Figure7.11 and Figure7.12. *Rail transport of containers between the German ports, Rotterdam, and CEE countries per TEU (2004, 2006, 2008, 2010).*

From	**To**	**2004**	**2006**	**2008**	**2010**
German ports	Hungary	104000	53000	31000	150000
German ports	Poland	48000	178000	257000	234000
German ports	Czech Republic, Slovakia	231000	316000	418000	444000
		383000	547000	706000	828000
Rotterdam	Hungary	26	0	5416	
Rotterdam	Poland	17082	16560	8688	
Rotterdam	Czech Republic, Slovakia	30462	221192	4275	

Source: Source: Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* 2004-2010 (Wiesbaden), Centraal Bureau voor de Statistiek, *Containerstatistiek* (Heerlen 2011).

Figure7.13. *Average GDP development of the Czech Republic, Hungary, Poland, Slovakia, Germany and the Netherlands in percentage terms 2000-1015.*

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Czech Republic	5.6	7.9	4.9	4.7	9.0	6.4	7.6	9.2	5.1	-2.3	0.8	0.9	0.6	0.0	2.2	3.9
Germany	2.6	2.8	1.5	0.7	1.8	1.5	4.2	5.1	1.6	-4.0	4.9	4.7	2.4	2.7	3.0	3.6
Hungary	14.4	15.4	13.3	9.5	10.3	6.5	7.5	5.6	6.2	-3.5	3.5	4.2	1.5	4.6	4.5	4.9
Netherlands	8.3	7.2	3.9	2.5	2.8	4.7	5.3	5.8	3.9	-3.6	2.3	2.1	0.1	0.4	0.9	1.7
Poland	12.1	4.9	3.6	4.2	9.8	6.2	7.7	11.1	8.4	5.2	5.5	7.8	4.6	2.2	4.2	5.5
Slovak Republic	10.9	8.7	8.6	10.3	11.2	9.2	11.5	11.7	8.8	-6.1	4.9	4.7	3.1	2.2	3.8	4.9

The data from 2014 is a forecast.
Source: OECD Nominal GDP growth forecast.
http://stats.oecd.org/Index.aspx?QueryId=51654, seen on 01-02-2014.

Interviews

Altena, Cees van, interim manager Rail Cargo Information, former manager ERS, Maersk 23-04-2013.

Boom, Frans van den, sales manager, Groenenboom Containertransferium Ridderkerk, 03-09-2013.

Classen de Cunto, Andrea, head of maritime accounts West DB Schenker Rail Nederland N.V., 18-05-2011.

Cok, Vincke, managing director Contargo Zwijndrecht, 8-10-2012.

Daum, Jasmin, manager Contargo Terminal Germersheim, 07-06-2012.

Denis, Jos, director Combined Container Service 1991-2000, 06-09-2012.

Fischer, Konrad, Contargo, managing director Terminal Ludwigshafen, 06-06-2012.

Heuvel, Wout van de, policy advisor at Transport and Logistiek Nederland 2008; diverse positions related to intermodal container transport at Maersk, 08-12-2013.

Hoenders, Cor, director Rail Service Centre Rotterdam, 02-11-2011, 07-02-2012.

Ielen, Henk van, director Kieserling 1990-1994, manager container transport at Kleijn Transport 1994-2010, 18-07-2013.

Kerstgens, Heinrich, managing director Contargo, 04-10-2011, 26-06-2012.

Kleijn, Kees, director Kleijn Transport, 03-07-2013.

Kool, Frans, Bibliotheek Maritiem Museum, former employee in the general cargo sector, 02-11-11.

Koolwijk, Arie, director Koolwijk Transport, 23-07-2013.

Mager, Andreas, terminal manager Contargo Terminal Frankfurt am Main, 05-06-2012.

Mensink, Gert, coordinating policy advisor, Ministerie van infrastructuur en milieu, 17-05-2013.

Mies, Michael, managing director, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012.

Minnaard, J., former director Vereeniging van Zeecontainer Vervoerders, former director Spronssen Transport, 23-07-2013.

Niehof, Jan, account manager CARU Containers, former managing director Schouten Containers, Schouten Transport, 10-06-2013.

Overbeek, Kees jr., director/owner, Intern. Transportbedrijf Overbeek bv 24-09-2013.

Poorten, Johann ter, KNV Spoorgoederenvervoer, former manager external relations at DB Schenker, 1-03-2012.

Puderbach, Arndt, terminal manager Contargo Rhein-Main Terminal Koblenz, former terminal manager Contargo Terminal Aschaffenburg, 05-06-2012.

Riegel, Christian, Contargo, company management Container Terminal Dortmund, 11-04-2012.

Roeleveld, Pieter-Dirk, Communicatie medewerker, Rail Cargo Information Netherlands, 01-02-2012.

Roelofs, Leo, sales and intermodal products, Contargo, DIT Duisburg Intermodal Terminal GmbH, 13-04-2012, 26-06-2012.

Roelofsen, Harm, operational director Rotra Forwarding BV, 17-01-2013.

Roelofsen, Gerard J.B., general director Rotra Forwarding BV, 17-01-2013.

Schlegel, Wolfgang, manager Contargo Terminal Wörth, 08-06-2012.

Stuij, Tom, owner/director Stuij en de Man 1973-1999, 15-10-2013.

Swier, Jan, manager, Prorail, 27-06-2011.

Visser, Ruud, manager OPDR Netherlands Agencies, 06-09-2010.

Vollmer, Heiko, sales manager, Contargo, Rhein Waal Terminal Emmerich, 02-05-2012.

Welters, Harry, former sales director of NS Cargo, former director SVZ, 14-12-2011.

Willeumier, Arnaud, Port Authority Rotterdam, 29-01-2012.

Winter, Ingrid de, planner, Intern. Transportbedrijf Overbeek bv, 24-09-2013.

Winterswijk, Gijs, commercial director/owner Winterswijk BV 1975-1999, 29-10-2013.

Archival Sources

Nationaal Archief Den Haag

Nationaal Archief, 2.03.01, Ministeries voor Algemene Oorlogvoering van het Koninkrijk en van Algemene Zaken, Kabinet van de Minister-President, Onderhandelingen met Duitsland 3125, Vereniging van kamers van Koophandel en Fabrieken in Nederland to minister president 12/09/1968.

Nationaal Archief, 2.05.118 BuZa Code Archief, 8617 Vervoer van goederen, bestemd voor Amerikaanse troepen, via Rotterdam naar Duitse Rijnhavens, 1955-1960, from C.A.F. Kalhorn to Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer 1-7.

Nationaal Archief, 2.05.118 BuZa Code Archief, 8617 Vervoer van goederen, bestemd voor Amerikaanse troepen, via Rotterdam naar Duitse Rijnhavens, 1955-1960, from J.A.M.H. Luns to Washington, 4 December 1956.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, 167. Ontwikkeling van een gemeenschappelijke vervoerspolitiek vanuit de EEG Vervoerspolitiek II. 1976-1977, Memorandum William Rogers 24/06/1977.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat-Generaal van het Verkeer, 585 Verslagen van overleg met de Vaste Kamercommissie voor Verkeer en Waterstaat inzake de algemene ontwikkeling van het internationale verkeer- en vervoerbeleid1981-1984, from Nelie Smit-Kroes to de voorzitter van de Vaste Commissie voor verkeer en Waterstaat DGV/IG-3/V 20374, 17 January 1984.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, 593, Steunmaatregelen op het gebied van het vervoer in de landen van de Europese Economische Gemeenschap (EEG) 1980-1985, Verslag van de vergadering van de Financieel steun 592, 5/1/1977.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, Codebericht 11655, 14/06/1981.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Verkeer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, from Commissie Overleg voor het Goederenvervoer to Van Agt, 30/06/1982.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Vervoer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, from Algemene Verladers Eigen Vervoer to Van Agt, 1/06/1982.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Vervoer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, Codebericht 7447, 27/03/1984, 4.

Nationaal Archief, 2.16.108, Ministerie van Verkeer en Waterstaat, Directoraat Generaal van het Vervoer, Onderhandelingen met andere landen inzake vervoersaangelegenheden.1980-1985, 598 Duitsland 1981-1985, Commissie Overleg voor het Goederenvervoer to Dollinger 3/12/1984.

Nationaal Archief 2.19.054.01 Nederlandse Redersvereniging 279, International Chamber of shipping user-carrier consultation Palletisation Vergadering van 16/01/1958 in Parijs, International Chamber of Commerce meeting over palletisation 19/09/1957, Verslag van C. Storm, Chef Etablissementen der HAL.

Nationaal Archief, 2.21.245 Collectie 463 PH Bosboom 19, Commissie goederenvervoer vergadering 8/4/1968.

Nationaal Archief, 2.21.245 Collectie 463 PH Bosboom 19, NS Dienst van exploitatie over containervervoer 4 April 1968.

Utrechts Archief

Utrechts Archief, Nederlandse Spoorwegen, 937 Rapporten, 127 Gecombineerd Weg/ Rail Vervoer, from Groep Toekomstontwikkeling to Leden Concernleiding 10 June 1974.

Utrechts Archief, Nederlandse Spoorwegen, 937 Rapporten, 75 Beleidsnota Internationale zaken EP Januari 1977 1-63.

Utrechts Archief, Nederlandse Spoorwegen, 937 Rapporten, 68 NS-DGV werkgroep goederenvervoer per spoor 1 September 1976, 19.

Electronic sources

'Albers koopt Winterswijk', *Nieuwsblad Transport* (10 July 1997)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/48464/ArticleName/AlberskooptWinterswijk/Default.aspx

'Bolk begint binnenvaartdienst tussen Almelo en Rotterdam', *Nieuwsblad Transport* (17 May 1996)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/38113/ArticleName/BolkbegintbinnenvaartdiensttussenAlmeloenRotterdam/Default.aspx

'Brochure KNV moet vragen over tolvignet beantwoorden', *Nieuwsblad Transport* (20 December 1994)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/27694/ArticleName/BrochureKNVmoetvragenovertolvignetbeantwoorden/Default.aspx

'Burger en CCS samen in netwerk binnenvaart', *Nieuwsblad Transport* (1 July 1999)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/100977/ArticleName/BurgerenCCSsameninnetwerkbinnenvaart/Default.aspx

'CCS biedt dienst naar Aschaffenburg', *Nieuwsblad Transport* (18 November 1999)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/104220/ArticleName/CCSbiedtdienstnaarAschaffenburg/Default.aspx

'Congestion in the seaports of Antwerp and Rotterdam':
http://www.contargo.net/index.php?option=com_content&task=view&id=123&Itemid=296 .

'Containerterminals van Nijmegen en Emmerich willen samenwerken', *Nieuwsblad Transport* (17 oktober 1991)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/4769/ArticleName/ContainerterminalsvanNijmegenenEmmerichwillensamenwerken/Default.aspx

'Contargo adopts longer schedule rhythm for Antwerp service':
http://www.contargo.net/index.php?option=com_content&task=view&id=117&Itemid=296 .

'Contargo bereitet Zugverbindung zwischen Hamburg und Ludwigshafen vor':
http://www.contargo.net/index.php?option=com_content&task=view&id=115&Itemid=296

'Contargo breidt bovenrijn vaarplan uit':
http://www.contargo.net/index.php?option=com_content&task=view&id=480&Itemid=292

'Contargo stärkt seinen Einfluss in Nordwest-Frankreich':
http://www.contargo.net/index.php?option=com_content&task=view&id=280&Itemid=294 .

'Contargo succeeds in keeping its handling volume stable':
http://www.contargo.net/index.php?option=com_content&task=view&id=380&Itemid=301 .

Contargo, 'History'
http://www.contargo.net/index.php?option=com_content&task=view&id=149&Itemid=228

'CSX vaart rechtstreeks naar Germersheim', *Nieuwsblad Transport* (9 March 2005)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/94480/ArticleName/CSXWTvaartrechtstreeksnaarGermersheim/Default.aspx

Dekker, Martin, 'Wegvervoerder Groenenboom gaat intermodaal: List leidt naar het water', *Nieuwsblad Transport*, (30 August 1997)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/48753/ArticleName/WEGVERVOERDERGROENENBOOMGAATINTERMODAALListleidtnaarhetwater/Default.aspx

'Drie nieuwe partners voor Rotra op Italie', *Nieuwsblad Transport* (14 May 1994)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/23638/ArticleName/DrienieuwepartnersvoorRotraopItalie/Default.aspx

'Duisburg is bulkhaven af', *Nieuwsblad Transport* (12 April 2006)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/98641/ArticleName/Duisburgisbulkhavenaf/Default.aspx

'Duisburg wil centrale rol in Europees transport spelen', *Nieuwsblad Transport* (6 June 1992)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10029/ArticleName/DuisburgwilcentralerolinEuropeestransportspelen/Default.aspx

'Duisburg wil samenwerking met Rotterdam uitbouwen', *Nieuwsblad Transport* (3 January 1995) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/7469/ArticleName/Duisburgslaatfractiemeergoederenover/Default.aspx

'Duitse verladers zijn niet bang van acties', *Nieuwsblad Transport* (25 November 1993) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/19880/ArticleName/Duitseverladerszijnnietbangvooracties/Default.aspx

ECT, 'Europe Container Terminals': http://www.ect.nl

'ERS doet het zelf', *Nieuwsblad Transport* (31 August 2005) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/96445/ArticleName/ERSdoethetzelf/Default.aspx

'ERS maakt het traditionele spoorwegen moeilijk', *Nieuwsblad Transport* (16 March 2004) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/88846/ArticleName/ERSmaakthettraditionelespoorwegenmoeilijk/Default.aspx

'Fusie ECT en DeCeTe Duisburg mag', *Nieuwsblad Transport* (15 February 2002) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/74658/ArticleName/FusieECTenDeCeTeDuisburgmag/Default.aspx

'Gevolgen opheffing van cabotageverbod zouden meevallen', *Nieuwsblad Transport* (15 December 1994) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/27793/ArticleName/Gevolgenopheffingvancabotageverbodzoudenmeevallen/Default.aspx

Gilbert Bredel has been in charge at Contargo Container Escaut Ser-vice, CCES, in Valenciennes for three years http://www.contargo.net/index.php/en/press-archives/press-2011/455-the-captain

Gonlag, Michel, 'Shuttle Rotterdam-Duisburg moet (beter) aansluiten op Duits spoor Havens willen samenwerking tussen spoor en binnenvaart', *Nieuwsblad Transport* (16 September 1995) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/33314/ArticleName/SHUTTLEROTTERDAMDUISBURGMOETBETERAANSLUITENOPDUITSSPOORHavenswillensamenwerkingtussenspoorenbinnenvaart/Default.aspx

'Groupage en luchtvracht', *Nieuwsblad Transport* (8 April 1995)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/30398/ArticleName/Groupageenluchtvracht/Default.aspx

'Havenbedrijf Duisburg tevreden over jaarcijfers', *Nieuwsblad Transport* (15 April 2003)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/82704/ArticleName/HavenbedrijfDuisburgtevredenoverjaarcijfers/Default.aspx

http://www.apmterminals.com/

http://www.ctt-twente.nl/gecombineerd-vervoer/?PHPSESSID=92f633743293a4d47c792d6bfb635373

http://www.dbschenker.com/site/logistics/dbschenker/com

http://www.deutschebahn.com/en/group/history/chronology/1835_1994.html

http://www.ekb-kieserling.de/herkunft-und-philosophie.php

http://www.eshcc.eur.nl/english/rhineeconomy/subprojects/transnational/

http://www.europark-terminal.de/leistungen/bahn/

http://www.groningen-railport.com/containershuttle.php

http://www.logistiek.nl/dossierartikelen/did976-Container_Terminal_Stein_groeit_hard.html

http://www.railcargo.nl/actueel/nieuws/nieuws_item/t/rail_terminal_tilburg

http://www.railgoed.nl/welter.html

http://www.vanrooijen.nl/rail-terminal-nl

http://www.zschimmer-schwarz.com/1-71.History.html

'Invoering vrije cabotage binnen EG nog ver weg', *Nieuwsblad Transport* (23 July 1992) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/10363/ArticleName/InvoeringvrijecabotagebinnenEGnogverweg/Default.aspx

Konings, Ted, "'One way truckers' niet onverdeeld optimistisch' *Nieuwsblad Transport* (4 July 1995) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/32281/ArticleName/Onewaytruckersnietonverdeeldoptimistisch/Default.aspx

Konings, Ted, 'Terminals over de grens in tel bij Nederlandse spoorexpediteurs', *Nieuwsblad Transport* (19 July 1997) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/48270/ArticleName/TerminalsoverdegrensintelbijNederlandsespoorexpediteurs/Default.aspx

'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf

'Koninklijke Rotra Kroonjuweel van Doesburg en omstreken': http://www.rotra.nl/assets/Uploads/Geschiedenis-Rotra.pdf

'Locale expediteurs vinden Betuwelijn vooral dom', *Nieuwsblad Transport* (4 September 2009) http://www.nieuwsbladtransport.nl/?TabId=101&ArticleID=519&ArticleName=LokaleexpediteursvindenBetuwelijnvooraldom

Mackor, Rob, 'ECT's 'verkoopdier' neemt afscheid Hoorweg: Twaalf jaar knokken tegen de Belgen', *Nieuwsblad Transport* (9 March 2005) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/29769/ArticleName/ECTsverkoopdierneemtafscheidHoorwegTwaalfjaarknokkentegendeBelgen/Default.aspx,

'Meeste cabotage in Duitsland gebruikt', *Nieuwsblad Transport* (23 August 1991) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/786/ArticleName/MeestecabotageinDuitslandgebruikt/Default.aspx

'Nautische beperkingen te groot Einde voor shuttle op Almelo', *Nieuwsblad Transport* (7 June 1997) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/47811/ArticleName/NautischebeperkingentegrootEindevoorshuttleopAlmelo/Default.aspx

NEA Transportonderzoek en –opleiding, *Kaarten achterland Scheldebekken*, (2006) 1-45 http://www.nea.nl/

NEA Transportonderzoek en –opleiding, *Analyse goederenstromen op de corridor Rotterdam-Antwerp* (Rijswijk 1993) 1-57. http://www.nea.nl/

'New names for the container terminals in Aschaffenburg and Koblenz': http://www.contargo.net/index.php?option=com_content&task=view&id=137&Itemid=296

'New rail connection from DIT in Duisburg to Rotterdam': http://www.contargo.net/index.php?option=com_content&task=view&id=412&Itemid=301 .

'New release of the IMTIS tariff information system is here!' http://www.contargo.net/index.php?option=com_content&task=view&id=116&Itemid=296 .

'New! Container Barge Service Amsterdam - Basel': http://www.contargo.net/index.php?option=com_content&task=view&id=236&Itemid=294 .

'Nieuwe dienst op de Danube', *Nieuwsblad Transport* (24 March 1994) http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/22206/ArticleName/NieuwedienstopdeDanube/Default.aspx

'Nieuwe en andere klanten voor Duisburg', *Nieuwsblad Transport* (9 March 2005) http://www.nieuwsbladtransport.nl/Edition/tabid/321/ArticleID/10051/PageID/3909/PageTitle/12/EditionID/197/Default.aspx?ArticleTitle=Nieuwe+en+andere+klanten+voor+Duisburg&EditionTitle=Edition+9-3-2005

'Nieuwe Marco Polo-projecten geselecteerd', *Nieuwsblad Transport* (07 April 2011) http://www.nieuwsbladtransport.nl/Modaliteiten/Spoorvervoer/ArticleSpoorvervoer/tabid/145/ArticleID/16153/ArticleName/NieuweMarcoPoloprojectengeselecteerd/Default.aspx

OECD Nominal GDP growth forecast
http://stats.oecd.org/Index.aspx?QueryId=51654

'Opnieuw sterk toeneming containeroverslag Duisburg', *Nieuwsblad Transport* (23 March 2005)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/94645/ArticleName/OpnieuwsterketoenemingcontaineroverslagDuisburg/Default.aspx

'Rotra neemt belang in H.T. Airfreight', *Nieuwsblad Transport*, (16 May 1998)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/55299/ArticleName/RotraneemtbelanginHTAirfreight/Default.aspx

'Samskip wil oogsten na schaalvergroting', *Nieuwsblad Transport* (13 October 2000)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/65801/ArticleName/Samskipwiloogstennaschaalvergroting/Default.aspx

'Spooralternatief voor 't Main-Danube-kanaal', *Nieuwsblad Transport* (7 December 1996)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/43360/ArticleName/SpooralternatiefvoortMainDanubekanaal/Default.aspx

'Succesvolle start voor de 'natte' shuttle op Almelo', *Nieuwsblad Transport* (4 June 1996)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/39096/ArticleName/SuccesvollestartvoordenatteshuttleopAlmelo/Default.aspx

'SVZ wil opheldering', *Nieuwsblad Transport* (31 August 1996)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/39811/ArticleName/SVZwilopheldering/Default.aspx

'Tarieven in Duitsland dramatisch onderuit', *Nieuwsblad Transport* (13 January 1994)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/21343/ArticleName/TarieveninDuitslanddramatischonderuit/Default.aspx

'TriPort Ludwigshafen opens Branch Office in Germersheim':
http://www.contargo.net/index.php?option=com_content&task=view&id=78&Itemid=296 .

Von der Metalhütte zum Angerpark Ein Dokumentation, (Duisburg 2005)
http://www.duisburg.de/news/medien-12/Doku_Logport_II_f__r_Download.pdf

'Wegvervoerder ziet grote toekomst voor combivervoer', *Nieuwsblad Transport* (23-01-1993)
http://www.nieuwsbladtransport.nl/Archive/Article/tabid/409/ArchiveArticleID/14079/ArticleName/Wegvervoerderzietgrotetoekomstincombivervoer/Default.aspx

'Wim Bosman werkt samen met Fornesa', *Nieuwsblad Transport* (30 May 1992)
http://www.nieuwsbladtransport.nl/gsearchresults.aspx?cx=011312353602961451014%3Ach35zk3qbju&cof=FORID%3A10%3BNB%3A1&ie=UTF-8&q=Wim+Bosman+werkt+samen+met+Fornesa&sa=Search

www.duisport.de

Bibliography

Allen, Matthew M. C. and Maria L. Aldrecht, 'The Impact of institutions on economic growth in Central and Eastern Europe'. In Gary Cook and Jennifer Johns (eds.), *The changing geography of international business* (London 2013) 25-54.

A&S management DLD and Stichting Projecten Binnenvaart, *Basisdocument Containervaart*, (Rotterdam 2003).

Baal, Mark van, 'Containerrevolutie Hagiografie van een grote doos', *Maritieme Historie* 1 februari 2007.

Beek, Daniel J. van, *Barging on the Rhine and the challenge for the port of Rotterdam*, (Rotterdam 2009).

Beraadsgroep Delta 2000-8, *Een nieuwe zeeslag*, (Rotterdam 1992).

Berend, Ivan T., *An Economic History of Twentieth-Century Europe* (Cambridge 2006).

Blackbourn, David, *The Conquest of Nature Water, Landscape and the Making of Modern Germany* (London 2006).

Bläsing, J.F.E., *Das goldene Delta und sein eisernes Hinterland 1815-1851 Von Niederländisch-preußischen zu deutsch-niederländischen Wirtschaftsbeziehungen* (Leiden 1973).

Blonk, W.A.G., 'Enige aspecten en problemen van het goederenvervoer tussen de lid-staten van de Europese economische gemeenschap met name ten aanzien van de kwantitatieve beperkingen en kwalitatieve belemmeringen', (1968) 1-419.

Blumenhagen, Dietmar, 'Containerization and hinterland traffic', *Maritime Policy & Management* 8 (1981)

Boon, M., 'Energy transition and port-hinterland relations. The Rotterdam oil port and its transport relations to the West German hinterland, 1950–1975', *Jahrbuch für Wirtschaftsgeschichte/Economic History Yearbook*, 52, 2 (2012) 215-235.

Boterman, Frits, *Moderne Geschiedenis van Duitsland 1800-1990* (Amsterdam 1996).

Brabers, Jan, 'Bonn, Den Haag und das Scheitern der europäischen Verkehrspolitik 1950-1962', in Jac Bosmans (ed.), *Europagedanke, Europabewegung und Europapolitik in den Niederlanden und Deutschland seit dem Ersten Weltkrieg* (Münster 1996) 189-212.

Brugh, Marcel van de and Piet Depuydt, 'Overal in De Rotterdamse haven duiken Chinezen op', *NRC Handelsblad,* 31 December 2010, 18.

Buck Consultants International, *Notitie groei containerbinnenvaart en kansen nieuwe initiatieven (concept)* (Den Haag 2012).

Buck Consultants International, *Seaports and their hinterland* (Nijmegen 1996).

Burridge, Elaine, 'Commission goes Dutch', *European Chemical News* 82 (2005) 14.

Carlebur, A.F.C., 'Normalisatie containers en wissellaadbakken', *Schip En Werf De Zee* 20-24-January 2001.

Cazzaniga Francesetti, Dionisia and Alga D. Foschi, *Mediterranean versus Northern Range Ports. Why do Italian Containers Still Prefer Routing via the Northern Range Ports? Advice for a New Policy,* (Panama City 2002).

CBS, 'Containervervoer in de grensoverschrijdende binnenvaart', *CBS Maandstatistiek Voor Verkeer En Vervoer* Speciaal nummer: 50 jaar verkeers- en vervoerstatistieken (1989) 59-71.

Centraal Bureau voor de Statistiek, *Nederland en het wegvervoer* (Heerlen 1997).

Claringbould, M.H., Spoorweg aanpassingsvermogen (Purmerend 1929).

Clavin, Patricia, 'Defining Transnationalism', *Contemporary European History* 14 (2005) 421-439.

Commission of the European Communities, *Fair payment for infrastructure use: A phased approach to a common transport infrastructure charging framework in the EU* (Brussels 1998).

'Container vervoer - verachtert', *KNVTO Nederlands Transport,* 17 september 1982, 506-509.

'Containers op de Rijn: de 100.000 nu voorbij?', *Rotterdam Europoort Delta* (1980) 34.

'Containerticker', *Schiffahrt Haven Bahn Und Technik* 2 (2012) 75-77.

'Containervervoer op de Rijn gebeurt op allerlei manieren', *Rotterdam Europoort Delta* (1980) 16-20.

Cudahy, B.J., *Box boats: How container ships changed the world* (New York 2006).

Dam, T. van, *De Rotterdamse haven 650 jaar* (Amsterdam 1990).

Dankers, Joost and Jaap Verheul, *Twee eeuwen op weg Van Gend & Loos 1796-1996* (Den Haag 1996).

Deutsches Statistisches Bundesamt, *Kombinierter Verkehr* (Wiesbaden 2006).

'Die partner müssen einander zuhören', *Deutsche Verkehrs-Zeitung, Niederlande eine sonderbeilage,* Dienstag 10 November 1992.

Dommann, Monika, '"Be Wise - Pallatize" Die Transformationen eines Transportbretts zwischen den USA und Europa im Zeitalter der Logistik', *Traverse* (2009) 21-35.

Donnovan, A. J. Bonney, *The box that changed the world: Fifty years of container shipping* (Chicago 2006)

Driel, Hugo van (ed.), *Ontwikkeling van bedrijfskundig denken en doen: een Rotterdams perspectief* (Rotterdam 1993).

Driel, Hugo van, 'Co-operation in the Dutch container transport Industry', *The Service Industries Journal* 12 (1992) 512-532.

Driel, Hugo van, *Kooperation im Rhein-Containerverkehr : Eine historische Analyse* (Rotterdam 1993).

Driel, Hugo van, *Samenwerking in haven en vervoer in het containertijdperk* (Rotterdam 1990).

'Duisburg makes plans for first district park', *Fast Forward* (1998) 6.

'Duitse klacht over steun voor Nederlandse shuttle', *Rail Cargo Magazine,* 12-13.

'Duitse minister bleef hameren op nationale vervoersproblemen Leber Zwicht niet', *Algemeen Dagblad,* 1 december 1967.

Dutch Inland Shipping Information Agency, *Intermodal transport from a Dutch perspective* (Rotterdam 2008).

'Dutch, Belgians agree on canals joint project to link Rhine and Antwerp is among major waterway plans', *New York Times,* May 14, 1954, 8.

Economisch Bureau van de Amro Bank, *Op weg naar 1992 Binnenvaart, de gevolgen van de Europese integratie* (Amsterdam 1988).

Economisch instituut voor het midden- en kleinbedrijf, *Gevolgen opening nieuwe Schelde-Rijnverbinding voor het midden- en kleinbedrijf te Hansweert en Wemeldinge* ('s Gravenhage 1973).

Eggink, Ellen, 'Gecombineerd vervoer: Shuttle trein verbindt Rotterdam met Italië', *Rail Cargo Magazine*, feb/mar, 1.1, 3-4.

Egyedi, Tineke, 'The Standardized Container: Gateway Technologies in Cargo Transportation', *Stockholm Papers in the History and Philosophy of Technology* TRITA-HOT 96/2029 (1996) 1-29.

Eijk, Dick van and Gretha Pama, 'Te groot voor beleid; De beperkte houdbaarheid van een Haags concept', *NRC Handelsblad*, 14 juni 2003, 23.

Eisenkopf, Alexander et al., 'The Liberalisation of Rail Transport in the EU', *Intereconomics* 41 (2006) 292-313.

European Commission, *Keep Europe moving: Sustainable mobility for our continent* (Brussels 2006).

European Commission, *White paper European transport policy for 2010 time to decide* (Brussels 2001).

European Conference of Ministers of Transport, *Railway reform and charges for the use of infrastructure,* (Paris 2005).

'Festtariefe', *Inland Shipping*. 1 februari 1993, 11-14.

Formula Container Precision, coordination, speed – the Rhein-Waal-terminal is a class of its own (Emmerich 2012).

'Forse opleving in Rotterdamse haven', *NRC Handelsblad*, 30 december 2010, 17.

Fremdling, Rainer, *Eisenbahnen und deutsches Wirtschaftswachstum 1840-1879* (Dortmund 1985) 59.

Gaarlandt, H., 'De akte van Mannheim', *Internationale Spectator* 9 (1955) 435-450.

Gatz, Werner, *Container facilities and traffic in 89 ports of the world* (Bremen 1974).

Geerlings, Harry, Horst, Martijn van der, Kort, Michiel and Bart Kuipers, *Beschrijving huidige binnenvaart en eerste probleemanalyse Eindrapportage* (Rotterdam, Zoutermeer 2012).

Gelder, Ed van, *Wegvervoer becijferd en beschouwd* (Heerlen 1996).

Goey, Ferry d. and Hugo van Driel, 'Rotterdam und das Hinterland (1920-1995)', in H.A.M. Klemann and Friso Wielenga (eds.), *Deutschland und die Niederlande Wirtschaftsbeziehungen im 19. und 20. Jahrhundert* (Münster New York Munich Berlin 2009) 127-151.

Graaf, G. W. d. (ed.), *Sporen van verandering* (Alkmaar 2006).

Greive, M., C. C. Malzahn, L. Rethy, D. Siems, D. F. Sturm and T. Vitzhum, 'Gespaltenes Land Die unheimliche Kraft des Südens', *Die Welt,* 26-jan-2014.

Greup, E. K. and A. Ketting, *De handelsbetrekkingen tussen Nederland en de Bondsrepubliek, een onderzoek op basis van goederenexportprestaties,* ('s-Gravenhage 1982).

Groeneboom-Droge, Marijke, *De aanhouder wint!* (Rotterdam 2011).

Groenewegen, J.P.M., *Institutionele economie, Van zwart schaap tot witte ridder* (Rotterdam 2000).

Ham, Hans van and Cathy Macharis, *Intermodaal vervoerbeleid in Nederland en Belgie,* (Rotterdam 2005).

'Hamburg op goede spoor naar volgende eeuw', *Rail Cargo Magazine,* 3, 5, 5.

Haralambides, H.E., 'Competition, access capacity and the pricing of port infrastructure', *International Journal of Maritime Economics* 4 (2002) 323-347.

Havenbedrijf der Gemeente Rotterdam, *Rotterdam en de bevordering van het gecombineerd vervoer van containers van en naar het achterland: Covernota en een Plan van Aanpak* (Rotterdam 1986).

Hayuth, Yehuda, 'Intermodal transportation and the hinterland concept', *Tijdschrift Voor Economische En Sociale Geografie* 73 (1982) 13-21.

Heerschop, Tessa, 'Geen geld voor aansluiting op Betuwelijn', *Schuttevaer* (19 november 2010) .

Held, David et al., *Global transformations* (Oxford 2001).

Hoen, H.W., 'Crisis in Eastern Europe: The Downside of a Market Economy', *European Review,* 19, 1 (2011) 31-41.

Hoeven, Henk van de, *De Rijnvaartakten en de cabotage* (Rotterdam 1956).

Hoffman, Alice, 'Reliability and validity in oral history', in David K. Dunaway and Willa K. Baum (eds.), *Oral history: an interdisciplinary anthology* (Walnut Creek 1996).

Horst, Martijn van de and Larissa van de Lugt, *Coordination in railway hinterland chains: an institutional analysis,* 2009, Copenhagen).

IG&H management consultants, *Platform Modal Split: een praktische impuls aan intermodaal vervoer vanuit de regio Rijnmond* (Utrecht 1997).

INFRAS and IWW, *External costs of transport* (Zurich, Karlsruhe 2004).

Jahrbuch des Eisenbahnwesens (Darmstadt 1954-1994).

Janssen van Raay, H., *Container-verkeer voor Nederland* (Amsterdam 1934).

Jongma, Johan W. D., *Geschiedenis van het Nederlandse wegvervoer* (Drachten 1992).

Jonker, J. P. D., "Koopman op een dwaalspoor. De Seehafenausnahmetarife in de betrekkingen tussen Nederland en Duitsland aan het begin van de jaren twintig.", *Jaarboek Buitenlandse Zaken 1988-1989* (1989) 181-201.

Kammerer, Klaus, 'The integration of systems and non-systems - EC-92 and the West German transportation carriers', in Michael S. Steinberg (ed.), *The Technical Challenges and Opportunities of a United Europe* (London 1990) .

Karlsch, Rainer and Raymond Stokes, *The Chemistry Must Be Right: The privatization of Buna Sow Leuna Olefinverbund GmbH* (Leipzig 2001).

Klemann, H.A.M. and Friso Wielenga, 'Die Niederlande und Deutschland, oder verschwindet die nationale Ökonomie? Eine Einleitung', in A. M. Klemannand Friso Wielenga (eds.), *Deutschland und die Niederlande Wirtschaftsbeziehungen im 19. und 20. Jahrhundert* (Münster New York Munich Berlin 2009) 7-17.

Klemann, H.A.M. and J. Schenk, 'Competition in the Rhine Delta. Waterways and ports, 1870-1913', *Economic History Review* (2012).

Klemann, H.A.M., 'Europe without economy', *Bijdragen En Mededelingen Betreffende De Geschiedenis Der Nederlanden* 125 (2010) 71-78.

Klemann H.A.M. and Sergei Kudryashov, *Occupied economies: An economic history of Nazi-occupied Europe* (London 2012).

Klemann, H.A.M., and Dirk Koppenol, 'Port competition. Rotterdam within the Le Havre-Hamburg range (1850-2013)'. In Bart Kuipers and Rob Zuidwijk (eds.), *Smart Port Perspectives Essays in Honour of Hans Smits* (Rotterdam 2013).

Klemann, H.A.M., *Tussen reich en empire de economische betrekkingen van Nederland met zijn belangrijkste handelspartners: Duitsland, Groot Brittannië en België en de Nederlandse handelspolitiek, 1929-1936* (Amsterdam 1990).

Klemann, H.A.M., *Waarom bestaat Nederland eigenlijk nog? Nederland-Duitsland: Economische integratie en politieke consequenties 1860-2000* Erasmus Universiteit Rotterdam, 2006).

Klimbie, Bas and Dirk van d. Meulen, *Jaarboek binnenvaart* (Alkmaar 1998).

Klink, H.A. van and G.C. van d. Berg, 'Gateways and intermodalism', *Journal of Transport Geography* 6, 1 (1998).

Klink, H.A. van, *Towards the borderless mainport Rotterdam - an analysis of functional, spatial and administrative dynamics in port systems* (Amsterdam 1995).

Kolb, Eberhard van, 'Die Reichsbahn vom Dawes-Plan bis zum Ende der Weimarer Republik', in Lothar Galland Manfred Pohl (eds.), *Die Eisenbahn in Deutschland Von den Anfängen bis zur Gegenwart* (München 1999) .

Kolkman, Joost, *Binnenvaart en containerlogistiek Leerervaringen uit het buitenland en van andere modaliteiten voor afhandelingsproblematiek in de zeehaven* (Den Haag 2009).

Koning, M. et al., *Concurrentiestudie Duitsland, Onderzoek naar de concurrentiekracht van de havens van Rotterdam, Antwerp, Hamburg en Bremen op de Duitse markt.* (Den Haag 1999).

Kosmeijer, Karin, 'CTN meer shuttles naar Oost Europa', *Rail Cargo Magazine,* 2.2 (1995) 18-21.

Koster, Dennis and Emiel de Block, 'Stand van zaken augustus 2010 Goederenvervoer in Nederland', *Op De Rails* Oktober (2010) 486-490.

Krugman, Paul R., *Growth on the periphery: Second winds for industrial regions?* (Strathclyde 2003).

Krugman, Paul R., 'What's new about the new economic geography?', *Oxford Review of Economic Policy* 14 (1998) 7-17.

Kuipers, B. and W. Manshanden, *Van mainport naar wereldstadhaven Belang en betekenis van mainports in 2040 voor de Nederlandse economie* (Rotterdam 2010).

Kunzler, Leo S., Christoph, *Container Verkehr in der Binnenschiffart,* (Frankfurt am Main 1981).

Lak, Martijn, *Because we need them... German-Dutch relations after the occupation: economic inevitability and political acceptance, 1945-1957* (Rotterdam 2011).

Langen, P.W. de and M.H. Nijdam, *Port Economics, policy and management* (Rotterdam 2008).

Langen, Peter d. and Ariane Chouly, '
Hinterland Access Regimes in Seaports', *European Journal of Transport and Infrastructure Research* 4 (2004) 361-380.

Laspeyres, Renate, *Rotterdam und das Ruhrgebiet* (Marburg 1969).

Lehmkuhl, Dirk, 'From regulation to stimulation: Dutch transport policy in Europe', in Adrienne Heritier, Dieter Kerwer, Christoph Knill, Dirk Lehmkuhl, Michael Teutsch and Anne-Cecile Douillet (eds.), *Differential Europe: The European impact on national policy making* (New York 2001) 217-255.

Levchenko, Andrei A. and Jing Zhang, *Comparative advantage and the welfare impact of European integration* (Cambridge 2012) 1-48.

Levinson, Marc, *The Box: How the shipping container made the world smaller and the world economy bigger* (Princeton 2006).

Liefveld, W. M. and R. Postma, *Two Rivers: Rhine and Meuse,* (Nieuwegein 2007).

Lutteroth, Johanna, 'Container-revolution Weltervolg mit der Wunderkiste', *Spiegel Online*, 18 July 2011, 1-4.

Mantel, J. and J. de Weerdt, 'Vervoertechnische veranderingen in de laatste dertig jaar', in *Vracht op de rails* (Schoonhoven 1992) 83-99.

Meersman, Hilde et al., 'Havenconcurrentie en Hinterlandverbindingen in relatie tot de Ijzeren Rijn en de betuwenroute', *Tijdschrift Vervoerwetenschap* 43 (2007) 35-43.

Mellor, Roy E. H., *German Railways: A Study in the Historical Geography of Transport* (Aberdeen 1979).

Mester, Bernt, *Marktchancen der Binnenschiffahrt im Container-Hinterlandverkehr der Häfen der Hamburg-Antwerp-Range* (Düsseldorf 1986).

Ministerie van Verkeer en Waterstaat Directoraat-Generaal Rijkswaterstaat Adviesdienst Verkeer en Vervoer, *Nederland en de scheepvaart op de binnenwateren*(Rijswijk 2000).

Ministerie van Verkeer en Waterstaat rijkswaterstaat - directoraat generaal van het verkeer, *Onderzoek naar het containervervoer per binnenschip,* (Rijswijk 1987).

Ministerie van Verkeer en Waterstaat, *Binnenvaart en containerlogistiek* (Den Haag 2009).

Ministerium für Verkehr Energie und Landesplannung des Landes Nordrhein Westfalen, *Wasserstrassenverkehrs- und Hafenconzept Nordrhein-Westfalen,* (Essen 2004).

Moerman, P.A., B. van Dorp and P.M. Schoonen, *INCOMAAS Binnenvaart Studie Markt en Organisatie Tussenrapportage,* (Rotterdam 1995).

Möller, Onno, *Nederlands-Duitse handel op de helling? De verschuiving van het economisch zwaartepunt in de Bondsrepubliek en de ontwikkelingen in de goederenstroom tussen Nederland en de Bondsrepubliek* (Utrecht 1991).

Morgan, W., 'Observations on the study of hinterlands in Europe', *Tijdschrift Sociale En Economische Geografie* 42 (1951) 366-371.

Müller, Peter, *Die Finanzlage der Schweizerischen Bundesbahn (SBB) in Vergleich mit der Deutschen Bundesbahn (DB) der Französischen Staatsbahn (SNCF) und der Niederlandischen Staatsbahn (NS) zwischen 1955 und 1975* (Bern 1981).

NEA Nieuws 15 December 2011 4.

NEA Transportonderzoek en –opleiding, *Analyse goederenstromen op de corridor Rotterdam-Antwerp* (Rijswijk 1993).

NEA Transportonderzoek en –opleiding, *Analyse maritieme goederenstromen in de Hamburg - Le Havre range,* (Rijswijk 2004).

NEA Transportonderzoek en –opleiding, *Freight flows in an enlarging Europe: From facts to visuals* (Rijswijk 2010).

NEA Transportonderzoek en –opleiding, *Freight flows in an enlarging Europe*, (Rijswijk 2006).

NEA Transportonderzoek en –opleiding, *Haalbaarheid Initiatieven in het gecombineerd Weg-Watervervoer* (Rijswijk 1991).

NEA Transportonderzoek en –opleiding, *Kaarten achterland Scheldebekken*, (Rijswijk 2006).

NEA Transportonderzoek en –opleiding, *The Balance of Container Traffic amongst European Ports* (Zoetermeer 2011).

NEA Transportonderzoek en –opleiding, *Vaart in containers Positieschets van de containerbinnenvaart als volwaardig intermodaal alternatief* (Rijswijk 1995).

Nederlands centrum voor onderzoek, advisering en onderwijs op het gebied van verkeer en vervoer, *Het Nederlandse internationale beroepsgoederenvervoer over de weg en de Europese markt na 1992 deel 1* (Rijswijk 1990).

Nederlands centrum voor onderzoek, advisering en onderwijs op het gebied van verkeer en vervoer, *Het Nederlandse internationale beroepsgoederenvervoer over de weg en de Europese markt na 1992 Deel II* (Rijswijk 1990).

Nederlandse Spoorwegen, *150 jaar spoorwegen 1839-1989* (Utrecht 1989).

Nederlandse Spoorwegen, *Spoor naar '75*, (Utrecht 1969).

Nederlandse Spoorwegen, *Spoor verder Plannen voor de jaren tachtig*, (Utrecht 1982).

Ng, Adolf, *Port Competition: The Case of North Europe* (Saarbrücken 2009).

Nieuwenhuis, Gerrit, *De Betuweroute goederen sporen van zee naar Zevenaar* (Alkmaar 2012).

Nieuwenhuis, Gerrit, *Moderne Spoorwegen* (Alkmaar 1981).

Nieuwenhuis, Gerrit, *Nieuw spoor De ontwikkelingen van de spoorwegen in Nederland na 1970* (Alkmaar 2005).

NOB Wegtransport, *Ruime baan voor wegtransport* (Rijswijk 1988).

Notteboom, Theo and Jean-Paul Rodrigue, 'Re-Assessing Port-Hinterland Relationships in the Context of Global Commodity Chains', in James Wang, Daniel Olivier, Theo Notteboom and Brian Slack (eds.), *Inserting Port-Cities in Global Supply Chains* (London 2007) 1-18.

Notteboom, Theo and Rob Konings, 'Network dynamics in container transport by barge', *Belgeo* (2004) 461-477.

Notteboom, Theo, Cosar Ducruet and Peter d. Langen (eds.), *Ports in Proximity* 2009).

Notteboom, Theo, 'Current Issues in Port Logistics & Intermodality', (2002) .

Notteboom, Theo, 'Inland waterway transport of containerised cargo: From infancy to a fully-fledged transport mode', *Journal of Maritime Research* IV (2007) 63-80.

Notteboom, Theo, 'Port regionalization: towards a new phase in port development', *Maritime Policy & Management* 32, 3 (2007) 297-313.

Notteboom, Theo, *The relationship between seaports and their intermodal hinterland in light of global supply chains,* (Paris 2008).

Notteboom, Theo, 'Thirty-five years of containerization in Antwerp and Rotterdam: structural changes in the container handling market', in Reginald Loyen, Erik Buyst and Greta Devos (eds.), *Struggling for Leadership: Antwerp-Rotterdam Port Competition between 1870-2000* (Antwerp 2000) 117-142.

'NS Cargo zoekt operator voor shuttle op Prague', *Rail Cargo Magazine*, 5.

NS Cargo, *Intermodal rail shuttles into Europe* (Utrecht 1995).

Offizieller jubiläumsband der Deutschen Bundesbahn, 150 Jahre Deutsche Eisenbahn 1935-1985 (Munich 1985).

Oldendal, F., 'VGL kisten', *Rail Cargo Magazine*, 1 aug/ sep (1994) 23.

One Way Trucking: The right way to save container trucking costs (Rotterdam 1986).

'Ontwikkelingen in gecombineerd vervoer gaan door, maar container is nog steeds het populairst', *Rail Cargo Magazine*, 6-10.

Paridon, Kees van, *De handelsrelatie van Nederland met de Bondsrepubliek: Belangrijk maar niet uitzonderlijk,* ('s Gravenhage 1982).

Paridon, Kees van, 'Geht es noch enger? Die Wirtschaftsbeziehungen zwissen Deutschland und de Niederlanden nach 1945', in H. A. M. Klemannand Friso Wielenga (eds.), *Deutschland und die Niederlande Wirtschaftsbeziehungen im 19. und 20. Jahrhundert* (Münster New York Munich Berlin 2009) 87-126.

Pestman, Paul, *In het spoor van de Betuweroute* (Amsterdam 2001).

Pearson, R. *Container ships and shipping* (London 1988).

Platz, Tilman E., *The efficient integration of inland shipping into continental intermodal transport chains* (Delft 2009).

'Plek van overslag van de baan', *NRC Handelsblad,* November 19, 2002, 1.

Port of Rotterdam, *Container Yearbook 1996* (Rotterdam 1996).

Porter, Michael E., 'The Economic Performance of Regions', *Regional Studies* 37 (2003) 549-578.

Preuß, O., *Eine Kiste erobert die Welt* (Hamburg 2010).

Puffert, Douglas J., 'Path dependence in spatial networks: The standardization of the railway track gauge', *Explorations in Economic History* 39 (2002) 282-314.

Rede van de staatssecretaris M.J. Keyzer gehouden voor de jaarvergadering van de stichting N.I.W.O. te Arnhem op 10 september 1969.

Rijkswaterstaat Dienst Verkeer en Scheepvaart, *Containervervoer per binnenschip beschrijving van een transportrevolutie te water* (Rijswijk 2001).

Rijkswaterstraat, *Scheepvaartinformatie hoofdvaarwegen* (Den Haag 2008).

Rodrigue, Jean-Paul, 'The geography of containerization: half a century of revolution, adaptation and diffusion', *Geojournal* 74 (2009) 1-4.

Romijnsen, Ivo, *De invloed van economische ontwikkeling in het relevante achterland op containeroverslag in de Hamburg-Antwerp range* (Rotterdam 2010).

Ross, John F.L., *Linking Europe Transport Policies and Politics in the European Union* (London 1998).

Rothengatter, Werner, 'Transport subsidies', in Kenneth Button J. and David Henser A. (eds.), *Handbook of transport systems and traffic control* (Amsterdam 2001).

Samuel, Simone, *Handboek railgoederenvervoer* (Utrecht 2011).

Sargent, A. J., *Seaports and hinterlands* (London 1938).

Schade, Albert, 'Züge für den Containerverkehr ', in Horst Weigeltand Ulrich Langner (eds.), *40 Jahre Deutsche Bundesbahn 1949-1989* (Darmstadt 1989) 330-331.

Scheerer, Manfred and Helmut Bauer, 'Huckepackverkehr, Containerverkehr und kombinierter Ladungsverkehr', in Horst Weigeltand Ulrich Langner (eds.), *40 Jahre Deutsche Bundesbahn 1949-1989* (Darmstadt 1989) 487-489.

Schmidt-Sommerfeld, Georg-Wilhelm, 'Großbehaltälter bleiben aktuell', in Anonymous *Verkehrsmärkte der Bahn Probleme und Prognosen Ein Kompendium des Güterverkehrs* (Darmstadt 1972) 74-86.

Schmutzler, A., 'The New Economic Geography', *Journal of Economic Surveys*, 13, 4 (1999) 355-379.

Schook, Wim, *Vracht aan verleden lading voor de toekomst EVO 66 jaar* (Zoetermeer 2007).

Seidelmann, Christoph, *40 years of Road-Rail Combined Transport in Europe* (Frankfurt am Main am Main am Main 2010).

Simons, J. G. W., *Een achterlandverkenning: enkele beschouwingen over het begrip "achterland" aan de hand van literatuur, een factorenoverzicht, Rotterdamse promotiereizen en statistische gegevens met betrekking tot Rotterdam* (Rotterdam 1984).

Slack, Brian and Visser, Ruud 'Challenges confronting new traction providers of rail freight in Germany', *Transport Policy* 14 (2007) 399-409.

Sluyterman, Keetie and Ben Wubs (eds.), *Over grenzen multinationals en de Nederlandse markteconomie* (Amsterdam 2009).

'Staatssecretaris N. Smit-Kroes: “Problemen zijn er onmiskenbaar, maar ze kunnen worden opgelost”', *Rotterdam Europoort Delta* (1980)

Stake, Robert E., *Multiple case study analysis* (London 2006)

'Superhub Duisburg: The fast growth of DeCeTe', *Fast Forward* 24 (2002) 17.

Swanborn, Peter G., *Case studies: wat, wanneer en hoe?* (Den Haag 2013) 1-271

Taylor, David, 'Case 4 Hasbro Europe', in Anonymous *Global cases in logistics and supply chain management* (Tunbridge Wells 1997) 48-60.

Terlouw, Kees, 'Transnational regional development in the Netherlands and Northwest Germany, 1500-2000', *Journal of Historical Geography* 2009 (2009) 26.

Teutsch, Michael, 'Regulatory reforms in the German transport sector: How to overcome multiple veto points', in Adrienne Heritier, Dieter Kerwer, Christoph Knill, Dirk Lehmkuhl, Michael Teutsch and Anne-Cecile Douillet (eds.), *Differential Europe: The European impact on national policy making* (New York 2001) 133-172.

'Tien jaar reguliere lijndiensten voor containers tussen Rotterdam en Antwerp', *Havennnieuws* 5 (1993) 19-21.

'The Rhine-Ruhr Port of Duisburg', *Logistic Management and Distribution Report,* 36, 7 (1999) 11.

Tilière, Guillaume de, 'European railway harmonization: How technology induces organizational and institutional mutations', *Network Industries Quarterly* 13 (2011) 18-21.

'Transfracht begint eigen spoorshuttles vanaf Rotterdam', *Rail Cargo Magazine,* 5.

Trappen, Eric, 'Intermodaal vervoer alleen nog maar met shuttle treinen', *Rail Cargo Magazine,* 1 jun/ jul (1994) 6-10.

Trappen, Eric, 'Weekendservice nieuwe ERS shuttle', *Rail Cargo Magazine,* dec 1994/ jan 1995, 3.

'Tweede- en derdelijsterminals in het achterland versterken Mainport', *Havennieuws* 7 (1993) 17-21.

Tweede Kamer der Staten-Generaal, *Onderzoek naar infrastructuurprojecten,* ('s-Gravenhage 2004).

Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met J.D. Blaauw,* 2004).

Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met J.H.R. Maij Weggen,* (Den Haag 2004).

Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met Neelie Smit-Kroes,* 2004).

Tweede Kamer der Staten-Generaal, *Stenografisch verslag van een gesprek in het kader van de Tijdelijke commissie Infrastructuurprojecten op 1 september 2004 in de Enquêtezaal van het Logement te Den Haag, gesprek met P.J.L. Verbugt*, (Den Haag 2004).

Vahrenkamp, Richard, *The logistic revolution: The rise of logistics in the mass consumption society* (Cologne 2012).

Vanfraechem, Stephan, 'Why they are tall and we are small! Competition between Antwerp and Rotterdam in the twentieth century', in Gelina Harlaftis, Stig Tenold and Jesus M. Valdaliso (eds.), *The world's key industry: History and economics of international shipping* (London 2012) 1-308.

'Vechten voor vervoer', *Uit Europoortkringen*, 24-25.

Veenendaal, Guus, *Spoorwegen in Nederland: van 1834 tot nu toe* (Amsterdam 2008).

Veenendaal, Guus, *Spoorwegen in Nederland: van 1834 tot nu toe* (Amsterdam 2004).

Verkeers- & vervoesmiddelen BV, *Grensoverschrijdend vervoer* (Rijswijk 2001).

Verstegen, S.W. and Y. Alkema, *Containerisatie in het Nederlandse transport* (Den Haag 1991).

Vos, Andre de, 'Commerciële organisaties denken niet nationalistisch', *Rail Cargo Magazine*, feb/mar (1994) 16-18.

Vos, Andre de, 'Interferry profiteert van groei gecombineerd vervoer', *Rail Cargo Magazine*, 2.3 (1995) 24-25.

Vuren, T. van and G.R.M. van Jansen, *De verkeersafwikkeling van het container-wegvervoer van en naar de Rotterdamse haven* (Delft 1986).

Wachter, B., *De beurtvaart* (Zwolle 1959).

Wagner, Torben, Erasmus Universiteit. Faculteit der Economische Wetenschappen Faculteit der Economische Wetenschappen and MSc in Maritime Economics and Logistics, *Private capital in container terminals* (Rotterdam 2007).

Wang, James et al. (eds.), *Ports, Cities, and Global Supply Chains* (Burlington 2007).

Weigelt, Horst and Ulrich Langner (eds.), *40 Jahre Deutsche Bundesbahn 1949-1989* (Darmstadt 1989).

Welters, H.W.H., *Kleine gedachten over een grote haven* (Rotterdam 1991).

Wenger, Hans, *Geschichte der UIRR und des Kombinierten Güterverkehrs Schiene-Strasse in Europa 1970-2000* (Brussels 2000).

Werkgroep hogesnelheidsspoorlijn Randstad Holland, *Rapport over de noodzaak een urgentie van een hogesnelheidsspoorlijn van de Randstad Holland - Rijn/Ruhr in het kader van de Rijnas,* (Amsterdam 1988).

Werkman, Paul E., *Uitgesproken geschiedenis Oral history in geschiedenis en journalistiek* (Zwolle 2001).

Wetenschappelijk Raad voor het Regeringsbeleid, *Infrastructures Time to invest,* (Den Haag 2007).

Wetenschappelijk Raad voor het Regeringsbeleid, *Onder invloed van Duitsland: een onderzoek naar de gevoeligheid en kwetsbaarheid in de betrekkingen tussen Nederland en de Bundesrepubliek,* ('s Gravenhage 1982).

Wilinski, Witold, 'Internationalization of Central and Eastern European countries and their firms in the global crisis'. In Marin A. Marinov and Svetlana A. Marinova (eds.), *Emerging economies and firms in the global crisis* (London 2013) 83-102.

Wissman, Matthias, 'German Transport Policy after Reunification', *Transportation Research* 28A (1994) 453-458.

Witthöft, H.J., *Container: Transportrevolution unseres Jahrhundreds* (Hertford 1977).

Young, O. R., *Power and Interdependence* (Boston 1977).

Zobel, Adolf, *Der Werkfernverkehr auf der Strasse im Binnengüterverkehr der Bundesrepublik Deutschland : zur Problematik staatl. Regulierung im Verkehrsbereich* (Berlin 1988).

Zukunft der Logistik in Dortmund Neue KV-Anlage Am Hafenbahnhof (Dortmund 2011).

Summary in Dutch

Dit werk verkent het transport van maritieme containers tussen Rotterdam en zijn achterland in de periode 1966-2010. Het beantwoordt de vraag hoe containerisatie de economische integratie binnen de Lage Rijn-economie heeft beïnvloed en wat voor rol liberalisering daarin heeft gespeeld. De economische integratie in de Lage Rijn regio is begonnen in de negentiende eeuw en is gebaseerd op transportmogelijkheden per binnenvaart op de Rijn en per spoor op de daarmee parallel lopende rails. Op deze route voorzag Rotterdam in de behoefte van de Ruhr-industrie aan voedselproducten, mijnhout, ijzererts en kool. Na de Tweede Wereldoorlog waren olie en chemische producten aan het pakket toegevoegd. Deze goederen werden meestal per boot getransporteerd. Men maakte gebruik van de gunstige ligging van Rotterdam aan de monding van de Rijn. In dit opzicht vormden de maritieme containers een uitzondering, omdat deze tot de tweede helft van de zestiger jaren via weg- en spoorvervoer werden vervoerd. Vanaf de jaren zeventig werden echter steeds meer containers door middel van binnenvaart vervoerd. De verlate reactie van de binnenvaart had als oorzaak, dat tot die tijd binnenvaart werd gezien als een transportmodus voor bulk- en minder geschikt voor stukgoed. Bovendien had de binnenvaart vrijwel geen ervaring met utilisatie van stukgoed. Het probleem met stukgoed was, dat de overslag daarvan heel arbeidsintensief was. Maritieme containers hebben daar een einde aan gemaakt.

De komst van de maritieme containers naar de haven van Rotterdam in 1966 was een grote verandering voor de haven. Niettemin had de Europese transportmarkt al ervaring met containers, sinds het begin van de 19de eeuw was er een sterke traditie in containerisatie in Europa. Echter, dit vervoer werd uitgevoerd door weg- en spoorvervoer. Aan het einde van de negentiende eeuw, werden al gestandaardiseerde laadeenheden vervoerd per multimodaal transport. In de jaren dertig van de twintigste eeuw werden containers van verschillende ontwerpen en afmetingen ontwikkeld in Europese landen, die geschikt waren voor het vervoeren van goederen op grote schaal. Zo werd bijvoorbeeld in de Zwitserse containers chocolade vervoerd en in de Nederlandse containers werden melkproducten getransporteerd. Dit toont het belang van schaalgrootte aan bij utilisatie. De ontwikkeling van containers met verschillende afmetingen en de toename van intra modaal transport maakte standaardisatie noodzakelijk om interoperabiliteit te kunnen garanderen. In de jaren dertig van de twintigste eeuw, tijdens de eerste globaliseringgolf, het *Bureau International des Containers* – Internationaal Container Organisatie - begon men met het standaardiseren van containers. Intermodaal transport van containers in de twintigste eeuw maakte een substantiële daling van de transportkosten mogelijk, in tegenstelling tot wat Marc Levinson schrijft in zijn boek, The Box: *How the shipping container made the world smaller and the world economy bigger.*

De Tweede Wereldoorlog veroorzaakte een breuk in het proces van containerisatie, vanwege de verkruimeling van de Europese markt in nationale eenheden. In de jaren vijftig van de twintigste eeuw, wanneer de Europese transportsector zodanig was gegroeid dat men begon na te denken over de introductie van pallets, McLean implementeerde containers in de Verenigde Staten, hetgeen utilisatie

op een grotere schaal betekende. In de jaren zestig werden in Europa landcontainers ontwikkeld, die tien centimeters breder waren dan de McLeans containers, want ze werden ontworpen om twee rijen Europallets te kunnen vervoeren. De betekenis van McLean voor de ontwikkeling van de maritieme containers was, dat hij intermodaal transport van laadeenheden van trucks introduceerde. Deze containers werden in Amerika vervoerd door de kustvaart, om het traject op de door filevorming verstopte snelwegen te vermijden. Deze transportwijze was niet alleen al enkele tientallen jaren bekend in Europa, maar had ook een lange traditie in Amerika.

In de Vietnam Oorlog (1965-1975) heeft McLean de bevoorrading van het Amerikaanse leger op een doeltreffende manier georganiseerd en daarmee heeft hij de levensvatbaarheid van zijn innovatie bewezen. In 1966 introduceerde hij maritieme containers ook in de Trans-Atlantische transport. Andere bedrijven volgden zijn voorbeeld en ontwikkelden containers met verschillende afmetingen, die voor hun getransporteerde goederen het meest geschikt waren. Om interoperabiliteit te bereiken, werd de standaardisatie van de maritieme container noodzakelijk. Op de bijeenkomsten van de *International Organisation for Standardisation* (ISO) - Internationaal Organisatie voor Standaardisering - werden de standaarden van Amerikaanse oorsprong geaccepteerd, terwijl de Europese containermaat, die was gebaseerd op de afmetingen van pallets, werd getolereerd als tweederangs standaard. De voorkeur van de ISO voor de Amerikaanse standaard werd veroorzaakt door de politieke en economische kracht van Amerika.

De geschiedenis van containerisatie in Europa plaatst Levinsons ophemeling van McLean in historisch perspectief. McLeans succesvolle innovatie was mogelijk gemaakt door de grote hoeveelheid lading die hij te vervoeren had. Dit was mogelijk gemaakt door het feit dat er in Amerika geen oorlogen waren, die de markt zouden hebben versplinterd en de infrastructuur zouden hebben verwoest. De periode van het naoorlogse herstel van de Europese economie gaf McLean een tijdvoordeel.

De twee containerstandaarden die erkend waren door de ISO, waren niet inter-operabel en werden gescheiden vervoerd door verschillende bedrijven. Dit werd in 1985 geformaliseerd door het verdrag van Montbazon (Frankrijk) tussen de twee internationale bedrijven: *Intercontainer*, voor het vervoer van maritieme containers en *Union Internationale des Sociétés de Transport Combiné Rail-Route (UIRR)* – Internationale Unie voor Gecombineerd Weg en Spoortransport - voor het vervoer van de landcontainers. Het verdrag bevatte ook een prijsafspraak, waar de overeenkomst van Brussel tussen Intercontainer en UIRR in 1990 een einde aan maakte. In de praktijk werd het pas in de jaren 1991-1992 mogelijk voor beide bedrijven om beide containertypen te vervoeren.

Voordat de maritieme containers hun intrede deden in de haven van Rotterdam in 1966, waren de belangrijkste achterlanden van de Nederlandse haven: het Verenigd Koninkrijk, Italië, Frankrijk en Duitsland. Vlak na de oorlog in 1945 was Tsjecho-Slowakije het eerste land waar grensoverschrijdende goederenvervoer naar toeging, dat in de jaren zestig van plek wisselde met Duitsland. In de vroege jaren zestig, waren er Kangaroo transporten naar Parijs, waarbij hele trucks

werden vervoerd op een trein en er was een stroom van landcontainers tussen het Verenigd Koninkrijk en Italië op gang gekomen. In deze periode was Duitsland het belangrijkste achterland land voor transport per spoor en binnenvaart. Deze twee modaliteiten vervoerden vooral bulkgoederen. Tussen Nederland en Duitsland waren er ook Huckepack – de Duitse variant van Kangaroo – stromen.

De eerste maritieme containers die in Rotterdam arriveerden, werden vervoerd met vrachtwagens. Wegvervoer had in Nederland zijn oorsprong in de landbouw, die ruim vertegenwoordigd was in de omgeving van Rotterdam. Deze transportbedrijven vormden een grote reservecapaciteit voor containervervoer Nederland. Omdat er voor containervervoer, in tegenstelling tot het traditionele stukgoedvervoer geen bijzondere expertise nodig was, konden onervaren nieuwkomers gemakkelijk toetreden tot de markt. De Nederlandse Spoorwegen maakte ook snel zijn intree tot de containermarkt. In 1966 investeerde het bedrijf in alle drie de Nederlandse havens die begonnen met containervervoer: Rotterdam, Amsterdam en Vlissingen. De Nederlandse Spoorwegen had grote verwachtingen van de nieuwe transportmarkt. Vanaf de jaren vijftig verloor het geleidelijk zijn belangrijkste cargo, steenkool waardoor zijn goederenafdeling in de financiële problemen kwam. Containers leken een goed alternatief. Echter, voor een winstgevend containervervoer, moest Nederlandse Spoorwegen zijn netwerk, dat oorspronkelijk was ontworpen voor de transport van steenkool, grondig wijzigen. Terwijl steenkool distributie vereiste via een fijnmazig spoornetwerk, om alle koopmannen op kleine stations te voorzien, kon het vervoer van containers alleen winstgevend worden door het vervoer van gebundelde volumes over enkele hoofdassen.

Alle drie de modaliteiten werden gehinderd in grensoverschrijdend transport door obstakels die waren opgeworpen door het Duitse transportbeleid. Voor de liberalisering van de Europese transportmarkt in de jaren negentig, was trucktransport tussen Nederland en Duitland gereguleerd door een systeem van transportvergunningen. Den Haag oefende regelmatig druk uit op Bonn om meer vergunningen te kunnen krijgen. Ondanks de EEG resoluties leverden deze inspanningen zelden resultaat op. Transportbedrijven hebben verschillende strategieën ontwikkeld om de regelingen te omzeilen. De Nederlandse Spoorwegen was ook benadeeld door het Duitse transportbeleid. Twee cruciale punten waren de discriminerende Duitse transporttarieven en het gebrek aan medewerking van de van de Deutsche Bahn om de Nederlandse Spoorwegen een goede connectie te verlenen tot het Duitse spoornetwerk. Tussen 1964 en 1993 heeft de Nederlandse Spoorwegen een wijd container transportnetwerk gebouwd dat zich uitstrekte van Zuid Frankrijk tot de Centraal- en Oost Europese landen en Noord Italië. De wegvervoersector concentreerde zich op de Nederlandse markt, Antwerpen en het Beneden Rijn gebied.

Binnenvaart was een laatkomer in containertransport. In de late jaren zestig werden containers alleen incidenteel vervoerd door binnenvaartschepen, vaak te midden van andere cargo. In de jaren zeventig werd binnenvaart door de energiecrisis populairder, want de groeiende brandstofprijzen hebben de energie-efficiënte binnenvaart minder getroffen dan de andere transportmodaliteiten. In de jaren zeventig ontstonden lijndiensten en binnenvaartbedrijven organiseerden het vervoer in

toenemende mate van deur tot deur. Het binnenvaartvervoer van containers had zijn doorbraak in de jaren tachtig. De belangrijkste achterlandlanden voor deze modaliteit waren in de jaren zeventig de Midden- en Boven Rijn. In de jaren tachtig bewoog het zwaartepunt van containervervoer per binnenvaartschepen naar het noorden op de rivier, richting Rotterdam. Binnenvaarttransport tussen Rotterdam en Antwerpen intensiveerde in 1984, toen het Schelde-Rijnkanaal was voltooid. In 1987 werd binnenvaartvervoer van containers ook mogelijk binnen Nederland, omdat de eerste Nederlandse binnenvaartterminal buiten Rotterdam, in Nijmegen, werd geopend in dat jaar.

In de jaren tachtig ontstond in West Europa een consensus over vrijhandel en vrij vervoer tussen de landen van de EEG door het Europeaniseringproces. In 1985 heeft dit de White paper over de voltooiing van de gemeenschappelijke markt opgeleverd. Deze werd gevolgd door andere stappen om het Europese transport sector te liberaliseren: het weghalen van obstakels van grensoverschrijdend vervoer en het toestaan van vrije intermodale competitie tussen landen binnen de EEG. Hierdoor werden de beperkingen op grensoverschrijdend transport tussen Nederland en Duitsland stapsgewijs opgeheven en in Duitsland werden de vaste vervoertarieven afgeschaft. In beide landen werden de monopolistische staatsspoorbedrijven opgesplitst in verschillende eenheden, waardoor goederenvervoer werd verzelfstandigd en de infrastructuur werd gescheiden van exploitatie. Hierdoor kon de Nederlandse Spoorwegen door een aantal stappen worden overgenomen door de Duitse Deutsche Bahn Schenker. Het afscheiden van de infrastructuur maakte de laatste invloedrijke stap mogelijk: het toelaten van nieuwe toetreders naar de spoormarkt in de vroege jaren negentig.

Het bevrijden in de Europese transportmarkt van hindernissen leidde tot de groei van het achterland van Rotterdam, want het maakte gemakkelijker om de grenzen over te steken. Na de liberalisering ging wegvervoer van containers bijvoorbeeld naar zestien verschillende landen in tegenstelling tot de vier in 1985. Tegelijkertijd leidde liberalisering tot de toename van havencompetitie, die het krimpen van het achterland tot gevolg had. Het Franse achterland is nooit echt belangrijk geweest, of omdat er geen vraag was naar gecontaineriseerde goederen of omdat de concurrerende havens, Le Havre en Antwerpen, dit gebied voorzagen van containers. Het belangrijkste achterlandgebied in België was de haven van Antwerpen en zijn aandeel bleef groeien na de liberalisering. Het belang van de Nederlandse thuismarkt bleef ook groeien. De herverdelingsstromen tussen Rotterdam en de Duitse havens waren niet substantieel en ze groeiden niet spectaculair. Misschien waren er toch containerstromen tussen Rotterdam en de Duitse havens, door de draaischijf Duisburg, maar deze stromen kunnen niet worden achterhaald. Het Beneden-Rijn gebied nam in belang toe voor alle drie de containertransportmodaliteiten. In het Midden-Rijn gebied verloor Rotterdam zijn leidende positie aan Antwerpen, hoewel spoorcontainervervoer dit enigszins compenseerde.

Het Midden-Rijn gebied werd minder belangrijk voor Rotterdam dan het Beneden-Rijn gebied. In het Boven-Rijn gebied groeide het aandeel van Antwerpen. Dit gebied had geen groot belang voor Rotterdam en zijn rol verminderde na de liberalisering. Italië vormde een belangrijk

achterlandgebied voor spoorvervoer, maar na de liberalisering verminderde tegelijkertijd met de groei van deze stroom, het aandeel van de maritieme containers en verdween bijna geheel. De rol van Zuid Duitsland verminderde zwaar, omdat in deze markt Rotterdam de competitie met de Duitse havens geen hoofd kon bieden. Zo behoorde Zuid Duitsland in toenemende mate tot het achterland van de Duitse havens. De rol van de Centraal- en Oost Europese landen nam na een groei in de jaren negentig, veroorzaakt door de activiteiten van ERS Railways, langzaam af. Samengevat, het aandeel van de verdergelegen bestemmingen nam af, tegelijkertijd met de groei van dichterbijgelegen bestemmingen. Na liberalisering bleef voor de haven van Rotterdam weinig anders over dan container vervoer naar de Nederlandse thuismarkt, dat behoorde tot het onbetwiste – captive - achterland van Rotterdam, Antwerpen, met zijn herverdelingsstromen en de Beneden-Rijn gebied met zijn Europese distributiecentra. De verschuiving van het zwaartepunt van containertransport tussen Rotterdam en zijn achterland naar het noorden betekende een groeiend containertransport tussen Rotterdam en het Beneden-Rijn gebied. Dit impliceert wijst op een groeiende economische integratie en regionalisering binnen de Beneden-Rijn economie. Dit is een contra-intuïtief gevolg van containerisatie, dat sterk verbonden is met globalisatie.

Het achterland van de haven van Rotterdam op het gebied van containertransport werd gevormd door de interactie van een aantal krachten. De introductie van de maritieme containers in de haven van Rotterdam in 1966 was een belangrijke factor die de uitbreiding van het achterlandtransportnetwerk van de haven van Rotterdam stimuleerde. De goedkope en flexibele intermodale containertransport bood nieuwe mogelijkheden voor de haven. Desalniettemin werd het achterlandvervoer tegengewerkt door de strenge regelingen van het Duitse transportbeleid en het vergunningssysteem voor grensoverschrijdend vervoer. Deze werden geleidelijk opgeheven in de negentiger jaren. Transportbedrijven werden in die tijd steeds groter, in het bijzonder in het eerste decennium van de eenentwintigste eeuw. Dit gebeurde parallel met de groei van de zeerederijen, met wie ze zaken deden. De zeerederij Maersk kreeg bijvoorbeeld zo veel macht dat zijn havenkeuze een belangrijk effect had op de haven van Rotterdam. In de laatste jaren van het eerste decennium van deze eeuw nestelde Maersk zich in Gioia Tauro in Sicilië en in Algeciras in Zuid-Spanje, dat een verschuiving in de Europese containerstromen veroorzaakte. Verder bezigde Maersk zich ook met achterlandtransport door samen met een aantal van zijn concurrent ERS Railways te creëren en zijn eigen spoorvervoer te regelen.

In de tweede helft van de jaren zestig maakten containers ook hun opwachting in andere belangrijke Europese havens en maakten het ook voor deze havens mogelijk om hun netwerk uit te breiden. De verschillende havennetwerken ontmoetten elkaar in het midden van Europa en veroorzaakten de terugtrekking van hun onbetwiste – captive - achterland en de uitbreiding van hun achterland waar ze competitie te duchtten hadden van andere havens – contested - achterland. De Noord Italiaanse haven Genua, en de Mediterrane havens, Gioa Tauro en Algeciras probeerden container stromen naar zich toe te trekken die daarvoor via Rotterdam arriveerden, Antwerpen

probeerde te zegevieren op de binnenvaart markt aan de Midden Rijn. De Duitse havens bevochtten Rotterdam langs de Rijn en probeerden Zuid Duitsland en Centraal en Oost Europese landen voor zichzelf houden als achterland gebied. Dit gevecht duwde het achterland van Rotterdam naar het noorden, Richting Rotterdam. Deze kracht was sterker dan het effect van liberalisering.

Het krimpen van het achterland van Rotterdam betekende dat containertransport steeds minder verbonden was met productie en steeds meer met logistieke activiteiten. Rotterdam verloor zijn aandeel in achterlandgebieden, die verbonden waren met geografisch verankerde productieactiviteiten in het Midden Rijn gebied en in Zuid Duitsland. Rotterdam moest het steeds meer hebben van zijn thuismarkt, Antwerpen en de Beneden Rijngebied, die gedomineerd werden door niet plaatsgebonden logistieke activiteiten. Tegelijkertijd verschoof door een combinatie van de de-industrialisering in het Ruhrgebied en de ontwikkeling van een industrieel cluster in Zuid Duitsland, het industriële zwaartepunt van Duitsland naar het zuiden in de omgekeerde richting dan het achterland van Rotterdam. Verder bewoog door welvaartsgroei in Centraal en Oost-Europa het economische zwaartepunt van Europa naar het Oosten richting Duitse havens. Dus de processen die grote transportstromen genereren verwijderden zich van de haven van Rotterdam en Rotterdam, waarvan het lot voor een groot deel werd bepaald door de Rijn, kon ze niet volgen. De enige manier om dat te doen zou per spoor zijn, maar daarvoor was een goede connectie met het Duitse netwerk onontbeerlijk. Deze connectie was aan het eind van 2010 echter nog niet gerealiseerd.

Een analyse van het verschil tussen het aandeel van Rotterdam en de Duitse havens in het achterland van Rotterdam in 2010 laat zien dat Rotterdam een lager aandeel in Zuid Duitsland en de Centraal en Oost-Europese landen – de achterlandgebieden van de Duitse havens – had, dan de Duitse havens aan alle drie de delen van de Rijn, die meer tot het achterland van Rotterdam behoorden. Alleen in Noord-Italië had Rotterdam een groter aandeel dan de Duitse havens. Dat betekent dat de Duitse havens meer succesvol waren in het bestrijden van de haven van Rotterdam in hun achterlandgebieden, dan Rotterdam was in die van de Duitse Havens. Kennelijk, tien jaar na de liberalisering van de Europese transportmarkt was er nog steeds geen eerlijke competitie. De Duitse havens konden Rotterdam nog steeds uit hun achterlandgebieden weren. Het derde spoor, dat van de Betuwe Route, dat Rotterdam zou voorzien van een goede verbinding met het Duitse spoornetwerk, was in 2010 nog niet gebouwd. Zonder die aansluiting was Rotterdam niet in staat om te concurreren met de Duitse havens over afstanden van meer dan 300 kilometer. Het lot van Rotterdam wordt nog steeds bepaald door de Rijn. Het gevecht gaat door, de Rijn tegen de Duitse Bahn.

Curriculum Vitae

Klara Paardenkooper (maiden name Süli) was born in 1969 in Szeged, Hungary, where she studied English, Russian and Italian at the University of Szeged. She then interrupted her studies and moved to the Netherlands, continuing her education at the Open Universiteit Nederland. There, she received her Bachelor's and Master's degrees in cultural history. The theme of her Bachelor thesis was secularization in the Netherlands in the 1960s and 1970s, while her Master's thesis concerned the black conservative neoliberal economist Thomas Sowell. Between 2009 and 2014, Klara was a PhD student in economic and business history at Erasmus University Rotterdam, where she worked on the NWO project *Outport and the Hinterland. Rotterdam Business and the Ruhr, 1870-2010*, in particular the sub-project *The Box and Rotterdam's New Hinterland; The Rise of Container Transport and Globalisation, 1966-2010*. From 1 March 2014, Klara has been a port docent at the Hoogeschool Rotterdam. She lives in Delft with her husband and three children.

Publications

Book chapters

- Le conteneur maritime, le port de Rotterdam et la mondialization in Ports d'Europe en quête de nouveaux mondes (Dunkerque 2013) 160-164.
- Containerization of Rotterdam's hinterland (1966-2010), a stimulus of European Economic integration in Matthieu Osmont, Émilia Robin-Hivert, Katja Seidel and Mark Sproerer (eds.), Europeanisation in the 20th century: the historical lens/ Pour une lecture historique de l' européanisation au XXe siècle (Brussel 2012) 185-203.

Papers presented at international conferences

- The tale of two standards. The American maritime container versus the European continental container, 17th EBHA conference, Innovation and Growth, 22-24 Aug 2013, Uppsala.
- Containerization, the Rhine and the military (1945-2010); Vietnam, Bremen, Rotterdam and Iraq, 4th Transnational Rhine Conference: Crossing the Rhine. Globalisation and the Impact of War on the Rhine Economy, 21-23 March 2013, Rotterdam.
- Globalization, regionalization and the hinterland of Rotterdam. The case of rail container shuttles (1966-2010), 16th EBHA conference: Business enterprises and the tensions between local and global, 30 Aug-1 Sep 2012, Paris.
- European cooperation in rail freight transport (1835-2010), 3rd Transnational Rhine Conference, 1-3 December 2011, Bochum.
- Liberalization of the German and Dutch railways and the containerization of the hinterland of Rotterdam (1966-2010), 4th Annual Conference of Competition and Regulation in Network Industries, 25 November 2011, Brussels.

- Cherishing the stepchild of container transport (1966-2010). How and why did the German and Dutch governments keep rail container transport in the race against their cheaper competitors? 15th EBHA Conference, 24-26 August 2011, Athens.
- The Containerization of the Hinterland of Rotterdam, 1966-2010, Third ESTER-GLOBALEURONET Conference, 26 November 2009, Vienna.

Other publications

- Oost-Europese achterland - een glimp achter het gevallen gordijn, Box, magazine voor intermodal exchange and development 4-5/ 2014 14-15.
- MEGA HUB Hoe dichter bij Rotterdam, hoe beter, Box, magazine voor intermodal exchange and development 3/2013, 19.
- Beieren - Freistaat Bayern, Box, magazine voor intermodal exchange and development 2/2013, 48-49.
- Rotterdam containerhaven, de dinosaurier van de toekomst? Box, magazine voor intermodal exchange and development, Starteditie 2012, 46-49.
- The Containerization of the Hinterland of Rotterdam. Rise of Container Transport and Regionalization (1966-2010), Methodology: Internal and Measurement Validity Workshop 30 May 2012, Erasmus University Rotterdam.
- The hinterland of the Port of Rotterdam based on rail container transport streams (1966-2010), Posthumus Conference 24-25 May 2012, Amsterdam.
- Rotterdam's New Hinterland. The Rise of Container Transport and Globalization, 1966-2010, 6th EBHA Summer School, San Gemini, Italy, 27-31 August 2011.
- The Box and Rotterdam's New Hinterland. The Rise of Container Transport and Globalisation, 1960-20002, summer school DHIP in collaboration with RICHIE and Paris IV "Transformations in Europe: Convergence and Divergence in 20th Century Europe", 4-10 July 2010 Moulin d'Ande.
- Containerization of the Hinterland of the Port of Rotterdam (1966-2010), The First Erasmus Smart Port Rotterdam/ Port Research Centre Poster Session, Rotterdam, March 6, 2012, (poster).
- Containerization of the Hinterland of the Port of Rotterdam (1966-2010), 5-8. The First Erasmus Smart Port Rotterdam/ Port Research Centre Poster Session, Rotterdam, March 6, 2012, (paper).