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Trading Places. How merchants shaped the Rotterdam-Ruhr axis in the  
first global economy, 1870-1914.

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## Introduction

The first global economy had numerous causes but one of the important drivers was the declining cost of transport set in motion by the emergence of steam powered ships and railways.<sup>1</sup> Ports in northwestern Europe that had access to the burgeoning railway network on the continent profited strongly from the continuously growing global trade in the second half of the nineteenth century. Although the Rotterdam port was connected to the railways, its principal hinterland connection had always been the Rhine. Around the 1870s, Rhine traffic was dwarfed by rail traffic and the Rotterdam port lost ground to its main rivals in the Antwerp-Hamburg range. However, as Hein Klemann and Joep Schenk have shown in a forthcoming article institutional, technological and organisational changes caused freight rates on the Rhine to decline, making Rotterdam Europe's leading bulk port by the end of the nineteenth century.<sup>2</sup>

In their article, Klemann and Schenk focused on institutional and technological factors as the driving forces for declining Rhine freights. Although they mentioned that organisational improvements complemented the institutional and technological ones, they did not elaborate how and why organisational improvements came to bear. However, the organisational level, i.e. the level of firms and industries, is an important factor in this story for at least three reasons. Firstly, the changing competitive relations between rail and inland navigation had a considerable impact on port competition in the Antwerp-Hamburg range. As imports and exports of bulk goods were increasingly directed through the port of Rotterdam, merchants, shippers and expeditors in Rotterdam profited considerably, to the detriment of their counterparts in other ports. Secondly, changes to the business environment lead to adaptation and selection processes in the composition of a sector in terms of numbers and organisational forms of companies.<sup>3</sup> And thirdly, entrepreneurs not only adapt to changes to the business environment, they are often actively involved in the process of change. Klemann and Schenk alluded to that process shortly when they referred to the cartelisation of the Ruhr coal trade in the 1890s in relation to the rise of the Rhine coal trade, but they did not develop that point further.

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<sup>1</sup> G. Jones, *Multinational and Global Capitalism: From the Nineteenth to the Twenty-first Century* (Oxford 2005) 18.

<sup>2</sup> Hein A.M. Klemann and Joep Schenk, 'Competition in the Rhine delta. Waterways, railways and ports, 1870-1913', *Economic History Review*, (forthcoming), passim.

<sup>3</sup> For instance, M.T. Hannan and J. Freeman, 'Population Ecology of Organisations', *American Journal of Sociology* 82 (1977), passim.

Therefore, several questions have remained unanswered. To what extent did competition emerging between ports cause increasing competition between companies active in those ports? Did these companies attempt to bolster their relative position by investing in transport technology? To what extent did the increasing capital requirements for investing in transport technology lead to increased concentration of port industries? And, finally, could increased competition and concentration have caused a process of vertical integration as traders became active in transportation or even production, and producers sought to gain more control over their sales?

Such questions have been omitted in the Klemann and Schenk article and we aim to address them by taking a closer look at the organisation of trade in two important commodities for the Rotterdam port in the late nineteenth century: petroleum (for illumination) and coal. We raise three questions: Firstly, how and why was the organisation of trade in petroleum and coal in Rotterdam affected by the resurgence of Rhine shipping in the 1880s and 1890s? Secondly, what role did the companies involved in these trades play in the technological change observed by Klemann and Schenk? And, thirdly, to what extent did technological change lead to processes of concentration and vertical integration in the organisation of the petroleum and coal trades?

### **Rotterdam as a coal port?**

'Antwerp as a port for coal exports', headlined the Dutch scientific magazine *De Economist* in 1876, almost menacingly.<sup>4</sup> Thanks to agreements between the Westphalian mines, Antwerp trading houses, railway companies and Belgian governments it was possible to offer Westphalian coal at competitive prices in the seaport. Should Antwerp succeed in turning into a coal port, the article said, it would gain an important competitive advantage over the Dutch ports. The importance of coal supply in ports lies not only in the fact that it attracts steam liners, but also that it provides suitable outward freight for incoming cargo ships making the freight rates fall. As a consequence, it was expected that Antwerp would withdraw a substantial flow of goods from the Dutch ports. In order to lead back the coal transports over Amsterdam and other Dutch ports, collaboration between the State, municipality,

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<sup>4</sup> G.J. Rive, 'Antwerpen, als uitvoerhaven voor steenkolen', *De Economist* 1876/2, 670-672.

commerce and railway companies was necessary in the Netherlands as well, according to the article.<sup>5</sup>

The trial with the Westphalian coal export via Antwerp was not an isolated event. Since the fifties, coal production had increased dramatically in the Ruhr area. With the world crisis of 1857 this increase resulted in massive overproduction. Consequently, mine owners looked for new markets for their products. In 1858 one of the main reasons for the foundation of the interest group, *Verein für die bergbaulichen Interessen im Oberbergamtsbezirk Dortmund* (Association for the mining interests in the Dortmund District), was the desire to increase the distribution area for Westphalian coal.<sup>6</sup> Railways were an important new mode of transport to make distant markets accessible. However, the high freight rates made it impossible to compete with British coal or local fuels such as wood and peat. By negotiating special rates with the railway companies, the *Bergbau-Verein* tried to make its coal competitive in these distant markets nonetheless.<sup>7</sup>

In 1875 several mining entrepreneurs joined a consortium that took up the sales of Ruhr coal on a larger scale and tried to organize the distribution of coal in the North German market more regularly. By acting as a consortium, they could insure a sizeable and steady flow of coal, which allowed the railroad company to use lower rates. For the first time, sales of Ruhr coal in Hamburg, the port, which until then was lost to British coal, increased.

The decline in freight rates to the German North Sea port elicited a broader discussion among mining companies about the possibility of overseas exports. In 1876 therefore, the *Bergbau-Verein* founded a committee dealing exclusively with this issue. It was this committee that successfully strengthened the bonds with Antwerp as the Dutch magazine *De Economist* reported the same year. One year later, the chairman of the committee, W.T. Mulvany, and 23 mining companies established a trading company that was independent from the *Bergbau-Verein* and had more executive strength than the committee. The core of this *Westfälische Kohlen-*

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<sup>5</sup> Rive, 'Antwerpen, als uitvoerhaven', 670-672.

<sup>6</sup> Olaf Schmidt-Rutsch, *William Thomas Mulvany. Ein irischer Pragmatiker und Visionär im Ruhrgebiet 1806-1885* (Cologne 2003) 197. Stefan Przigoda, *Unternehmensverbaende im Ruhrbergbau. Zur geschichte von Berbau-Verein und Zechenverband 1858-1933* (Bochum 2002) 25-40. W.O. Henderson, *William Thomas Mulvany. Ein irischer Unternehmer im Ruhrgebiet 1806-1885* (Cologne 1970) 12-19.

<sup>7</sup> Rainer Fremdling, *Anglo-German rivalry on coal markets in France, the Netherlands and Germany, 1850-1913* (Groningen 1995) 14-15.

*Ausfuhr-Verein* (Westphalian Coal Export Association) was to stimulate the coal exports through the German, Belgian and Dutch seaports.

To realize their aims, the *Ausfuhr-Verein* pursued three strategies. Firstly, railway freight rates had to decrease further. Secondly, transit in the ports needed to be mechanized. And thirdly, it was of the utmost importance to provide prospective markets with scientific proof of the high quality of the Westphalian coal. The three questions were closely linked. Although it was soon proven that the chemical quality of Ruhr coal was similar to British coal, the rough way of transshipment in the ports caused the soft Westphalian coal to break, thereby losing its value after all. The quality loss in the ports made Ruhr coal undesired and delayed investments in improvements of the mechanical handling of coal. However, mechanization of transshipment in the port allowed a more efficient use of rail equipment, which in turn allowed a further decrease of railway freight rates.<sup>8</sup>

The discussion about the Westphalian coal exports through the ports was completely dominated by the question of railways.<sup>9</sup> This is not only explained by the attraction the iron road had as the futuristic mode of transport, the railways also had a number of competitive advantages over water transport, which outweighed the higher transport costs per ton / kilometer. Flexibility, speed and regularity were the main advantages of rail transport. Demand and supply were simply matched by attaching or disconnecting standard-sized cars. Due to the ever-expanding railway network an increasing amount of destinations could be reached, while the new coalmines, located north of the Rhine and far from the river, were without exception connected to the track. Thanks to the regular supply, which was not impeded by weather or water conditions, storage became redundant and consumers saw their expenses decline.<sup>10</sup>

In January 1878 the *Ausfuhr-Verein* sent a circular to all northwest European ports, in which it called for the improvement of their transshipment facilities. More specifically, the circular suggested the purchase of a coal tip.<sup>11</sup> One month later the

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<sup>8</sup> Schmidt-Rutsch, *Mulvany*, 200-202 and 206-211. Henderson, *Mulvany*, 12-13.

<sup>9</sup> H.P.H. Nusteling, *De Rijnvaart in het tijdperk van stoom en steenkool, 1831-1914* (Amsterdam 1974) 285-286.

<sup>10</sup> Zeger W. Sneller, *Geschiedenis van den steenkolenhandel van Rotterdam* (Groningen and Batavia – current Jakarta – 1946) passim. 'Kolenbelasting', *De Economist* 1863, 235.

<sup>11</sup> Hugo van Driel and Ferry de Goey, *Rotterdam Cargo Handling Technology 1870-2000* (Zutphen 2000). Technical University Eindhoven, 'De overslag van kolen en erts', *Techniek in Nederland in de Twintigste eeuw*:

[http://www.techniekinnederland.nl/nl/index.php?title=De\\_overslag\\_van\\_kolen\\_en\\_erts](http://www.techniekinnederland.nl/nl/index.php?title=De_overslag_van_kolen_en_erts) (visited 12 August 2012).

*Ausfuhr-Verein*, which had at that time annually over 5 million tons of export coal at its disposal, organized a special conference in the port of Hamburg. The main issue of the conference was coal exports via German, Dutch and Belgian ports.<sup>12</sup> During this conference, transshipment devices in the Hamburg port were studied and the newest, often English, techniques for the loading and unloading of coal by rail were broadly discussed. In addition to coal merchants, a large part of the attendees consisted of railway engineers and representatives of ports. Among the 87 guests were also several representatives from the Netherlands and Belgium.<sup>13</sup> Illustrative for the 'rail fixation' in this meeting was not only that no less than five engineers from the three major Dutch railway companies were present, but also that of the four port delegates none came from Rotterdam. Flushing, Amsterdam and Harlingen, ports that had sent a representative, saw themselves at that time apparently as more appropriate a rail port than Rotterdam.

Until the 1880s, the position of Rotterdam as a coal port was very modest.<sup>14</sup> Of all seaports Amsterdam simply had the better position, being only 200 km away by rail from the center of the Ruhr area.<sup>15</sup> In this context *De Economist* called in 1876, "especially Amsterdam (...) the designated place for the export of German coal."<sup>16</sup> Between 1869 and 1874 the city of Amsterdam had constructed, at its own expense and risk, a railroad port basin that was mainly intended for the handling of coal and ore.<sup>17</sup> Possibly, the journalist of *De Economist* also had in mind the completion of the North Sea Channel in the same year, which improved Amsterdam's accessibility from the sea.

Rotterdam showed no interest at this point in the mechanization of coal handling. However, in the mid-1880s this would change. In 1882 the Rotterdam

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<sup>12</sup> 'De tegenwoordige steenkool-handel, *De Economist*, 1878, 587.

<sup>13</sup> Protokoll über ein Konferenz vom Westfälischen Kohlen-Ausfuhrverein, 09-02-1878. Bergbau Archiv, Bochum, 32/751: Stellungnahmen Mulvanys zu Export- u. Verkehrsfragen (1864 – 1885). Rutsch-Schmidt, *Mulvany*, 210.

<sup>14</sup> Paul van de Laar, 'Port Traffic in Rotterdam: the competitive edge of a Rhine-port (1880-1914)', in E. Buyst and R. Loyen (Eds.), *Struggling for leadership: Antwerp-Rotterdam. Port competition between 1870-2000* (New York 2002) 63-86, there: 78. Also idem, *Stad van formaat. Geschiedenis van Rotterdam in de negentiende en twintigste eeuw* (2000 Zwolle).

<sup>15</sup> The other Dutch or Belgian ports were further removed from the Ruhr area: Antwerp 220, Rotterdam 225 and Flushing 288 kilometers. W.T. Mulvany, *Denkschrift über Reform der Eisenbahn-Gütertarife und der Verhältnisse zwischen Frachtgeber und Frachtnnehmer zum Vortheile beider und des nationalen Wohlstandes Deutschlands* (Pempelfort-Düsseldorf juli 1879), attachment B 'Eisenbahn-, Seehäfen- und Export-Tarif'.

<sup>16</sup> Dutch original: "vooral Amsterdam (...) de aangewezen plaats om voor den uitvoer van Duitsehe kolen in aanmerking te komen." 'Antwerpen als kolenuitvoerhaven', *De Economist* 1876, 671.

<sup>17</sup> Roeland Gilijamse etc., *De haven van Amsterdam. Zeven eeuwen ontwikkeling* (Bussum 2009) 94.

Chamber of Commerce wrote in its annual report that it would be wise to increase the Westphalian coal exports over Rotterdam. Especially Dutch shipping lines to the colonies in Asia would benefit from a secure supply of Westphalian coal, because it saved them a trip to the British coal ports. In addition, the supply of Westphalian coal was also of great importance for the port as a whole, the report argued. A continuous supply of outward freight would decrease freight rates to Rotterdam, and improved as a consequence the competitiveness of the port towards Antwerp or the North German ports.<sup>18</sup>

The Chamber reiterated its plea until the development of the port of Rotterdam accelerated in 1884. Firstly, the problems with the passage in the new channel to the sea (The New Waterway) were resolved around this time.<sup>19</sup> And secondly, the modernization of transshipment in the port of Rotterdam suddenly seemed near. One of the directors of the Rotterdam port authorities wrote a report in which the words of the *Ausfuhr-Verein* seemed to echo: "The three essential conditions in the transshipment of coal are speed and very low cost, coupled with a good treatment of the coal." The existing steam driven grab cranes met, according to the Director, none of these requirements and he advised the municipality to purchase a coal tip. The municipality accepted the advice and the first municipal coal tip was in use by 1885.<sup>20</sup>

Following the urging of interested railway companies and the Westphalian mining industry, the municipality decided to purchase another two tips in the 1890s. And in 1898 the Chamber of Commerce wrote in its annual report: "The coal tips are used here only to transship German coal and coke and to a large extent it is certainly due to the presence of these tips, that the export of coal from Germany through our port has assumed such large proportions." For the first time Rotterdam was called a 'coal port'.<sup>21</sup> The opening of the Dortmund-Ems canal the same year constituted

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<sup>18</sup> *Jaarverslagen van de kamer van koophandel en fabrieken Rotterdam*, 1882, 10. Also cited in Sneller, *Geschiedenis*, 184-185, 223.

<sup>19</sup> Technical University Eindhoven, 'De overslag van kolen en erts', *Techniek in Nederland in de Twintigste eeuw*: [http://www.techniekinnederland.nl/nl/index.php?title=De\\_aanleg\\_van\\_nieuwe\\_havencomplexen](http://www.techniekinnederland.nl/nl/index.php?title=De_aanleg_van_nieuwe_havencomplexen), visited 12 August 2012.

<sup>20</sup> Dutch original: "De drie onmisbare voorwaarden bij de verscheping van steenkolen zijn snelheid en hoogst geringe kosten, gepaard aan een goede behandeling der kolen." As cited by Sneller, *Geschiedenis*, 184-185, 223-225.

<sup>21</sup> Dutch original: "De kolentippen worden hier uitsluitend gebruikt om Duitse kolen en cokes over te laden en voor een groot deel is het zeker aan het feit, dat hier kolentippen waren, te danken, dat de uitvoer van kolen uit Duitsland over onze haven een zo grote vlucht heeft genomen." 'Jaarverslagen van de kamer van koophandel en fabrieken Rotterdam', 1893, 1896 en 1898. As cited by Sneller, *Geschiedenis*, 226-227.



according to the director no threat, since "the transport of export coal, preferably takes place by railway." The Director expected Rotterdam's position as a coal port could be maintained in the future.<sup>22</sup>

### *The emergence of 'Rhine Coal'*

It follows that far into the 1890s seaports could distinguish themselves as a coal port by improving rail access to port basins and by the acquisition of modern rail-based handling equipment. The *Ausfuhr-Verein* never denied the importance of waterways for the export of coal, but clearly subordinated it to railways. In the eyes of the *Verein*, the lower Rhine rates did not outweigh the benefits of rail transport as listed before. Nevertheless, it was important to decrease water freights by the introduction of modern handling equipment and steam driven Rhine ships: "For the German coal en coke trade, as for the industry in general, competition between Rhine shipping and the Dutch and German railways can only be advantageous," the future President of the *Ausfuhr-Verein*, Mulvany, said already in 1869.<sup>23</sup> From this perspective reduced Rhine freight rates were especially instrumental in the reduction of rail freight rates to the Dutch seaports.

Around 1880, however, this idea changed. Although Karl Breuer, chief representative of the *Ausfuhr-Verein*, confirmed that "with regard to our overseas export through Antwerp and Rotterdam, we prefer using rail transportation and make use of inland waterway shipping only in the rarest of cases,"<sup>24</sup> he understood the significance of improved Rhine transportation. In a letter to the mines involved in the *Verein* he wrote that with regard to waterway investments in Germany one should put "the focus on the most thorough correction of its existing natural waterways, the Rhine, (...) and do everything possible to achieve the same [in the Netherlands – JS]

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<sup>22</sup> 'Jaarverslagen van de kamer van koophandel en fabrieken Rotterdam', 1898.

<sup>23</sup> German original: "Für den Deutschen Kohlen-und Coke Handel, wie für die Industrie im Allgemeinen, kann jene Konkurrenz der Rheinschiffahrt mit den verschiedenen Netzen der Deutschen und Niederländischen Eisenbahnen nur von Vortheil sein," Wm. T. Mulvany, *Deutschlands Kohlen-und Cokes-Export. Abteilung I. Holland. Denkschrift und Correspondenz mit Eisenbahn-Directionen* (Düsseldorf 1869) 4-6.

<sup>24</sup> German original: "Thatsache ist es, dass wir uns bei unseren Aussendungen über See via Antwerpen und Rotterdam nur in den seltensten Fällen des Flussschiffes bedienen den Bahntransport vorziehen." Bochum, december 1880 Westfälischer Kohlen-Ausfuhr-Verein (Carl Breuer) aan de Verein-mijnen, in: [55/2230] Westfälischer Kohlen-Ausfuhr-Verein, Bochum, anfangs Westfälisches Kohlenausfuhr-Comitee des Vereins für die bergbaulichen Interessen im OBA-Bezirk (1879 – 1894).

by communicating energetically with the Royal Dutch government.”<sup>25</sup> From the 1880s, Mulvany even saw the improvement of existing waterways as essential for Germany’s competitiveness. He was convinced, “that without a direct connection between German production areas and overseas markets, it would be futile to compete with nations that possess industrial areas at the sea, or have been smart and careful enough to construct canals and other navigable routes in order to allow sea vessels to enter the heart of the country.”<sup>26</sup> Mulvany's ideal of a Rhine-sea ship had, because of its enormous capacity and use of the waterways, not only very low freight rates, it also needed, due to the direct connection between the Ruhr ports and overseas markets, only one transshipment, keeping the quality of the coal intact. Therefore an improvement of the Rhine was necessary and Mulvany did lose no opportunity to pass this message to the International Rhine Commission<sup>27</sup> and the relevant Prussian authorities. The Prussian Minister of Commerce Albert von Maybach supported his plans. In 1885 the first Rhine-ship, a 500-ton screw ship called 'Industry', made its first trip between Cologne and London.<sup>28</sup>

Rhine-Sea shipping never experienced a real take off. However, the somewhat utopian plan of Mulvany can be placed in an increasingly broad-based demand from the Westphalian industry to further decrease the transport costs of their exports. The ever-increasing coal production made it compulsory to strongly expand the sales distribution, entering the competition with English coal. The industry saw opportunities in water transport and therefore pleaded for the improvement of the waterways. Particularly the Rhine could be suitable for the export of coal. Exports to the Netherlands took place mainly by the widely branched railroad, in order to offer tailor-made services to almost all Dutch cities and villages. However, for bulk transport of export coal destined for overseas markets the Rhine offered the lowest

<sup>25</sup> German original: “den Schwerpunkt auf die gründlichste Correction der vorhandenen natürlichen Wasserstrasse, den Rhein, zu legen und alles nur irgend Denkbare anzubieten, dieselbe zu erzielen und sich zu diesem Zwecke energisch mit der Königlichen Niederländischen Regierung in Verbindung zu setzen.“ Bochum, december 1880 Westfälischer Kohlen-Ausfuhr-Verein (Carl Breuer) aan de Vereenmijnen, in: [55/2230] Westfälischer Kohlen-Ausfuhr-Verein, Bochum, anfangs Westfälisches Kohlenausfuhr-Comitee des Vereins für die bergbaulichen Interessen im OBA-Bezirk (1879 – 1894).

<sup>26</sup> German original: "dass ohne directe Verbindung zwischen den deutschen Productionsbezirken und den überseeischen Märkten es für Deutschland nahezu hoffnungslos ist, mit Nationen zu concurriren deren Industriebezirke an der Seeküste liegen, oder welche schon lange so klug und vorsichtig waren, Kanäle und andere schiffbare Wege für Seeschiffe bis in das Herz über Länder hinein anzulegen." As cited by Schmidt-Ratsch, 334.

<sup>27</sup> The Central Commission for the Navigation of the Rhine is the oldest supranational organization in the world and has its seat in Strassbourg. The Commission was established in 1815 and guarantees free shipping on the Rhine as stated in the Act of Mannheim (1868).

<sup>28</sup> Schmidt-Ratsch, *Mulvany*, 331-338.

freight rates and the most direct route from the German Rhine ports to the Rotterdam seaport. Around 1890 the Rhine was at the center of attention of coal exporters. However, Rotterdam's role as coal port would only reach maturity after the turn of the century. Massive coal exports via the Rhine, and thus via Rotterdam, was only possible after a major reorganization of the coal trade.

The organization of the coal exports that was jointly controlled by the major Westphalian industrialists since the 1850s was built on a blueprint of the railways. By 1884 more coal was shipped to the Netherlands by rail than by waterway. This was not the case with coal sales in southern Germany however. Here the shipments were in the hands of large and wealthy companies such as Stinnes or Haniel. They were able to set up transshipment stations along the Rhine, where broken coal and grit were processed into briquettes. This way the problem of soft coal and water handling were resolved and Ruhr coal entered competition with Saarland coal in the South. While the improvement of the Dutch part of the Rhine was completed by the early 1890s, Rhine shipping of coal was limited to retail, carried by small private carriers. These shipmasters were, in contrast to the Haniels and Stinneses in Germany, in no way capable of financing handling or transshipment devices along the lower parts of the Rhine. In addition, the Dutch ports were not equipped for handling bulk transport of Rhine coal. It is conceivable that the recently installed rail transshipment facilities, discouraged investments in modern water transshipment facilities. Certainly the coal cartel clubs, that arose in the years after the *Grunderkrise* in 1874, but also the *Rheinisch-Westfälisches Kohlen-Syndicat* (RWKS / 1893), have initially, concerning their exports, only shown interest in railways.<sup>29</sup>

The RWKS, that also absorbed the tasks of the *Ausfuhr Verein*<sup>30</sup>, is known as the most powerful and most enduring cartel in German history. Penetration into new markets, one of the main goals of the cartel, required a powerful organization. Sales to the Netherlands were controlled at an early stage by the creation of a so-called Syndicate's Trade Association, the *Steenkolen-Handelsvereniging*, or: Coal-Trade Association (SHV / 1896). Such a company acquired the exclusive sales rights of Syndicate coal for a given area and for a certain term. Moreover, it could no longer

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<sup>29</sup> Nusteling, *De Rijnvaart*, 274-283. Kurt Wiedenfeld, *Das Rheinisch-Westfälische Kohlen-Syndikat* (Bonn 1912) passim.

<sup>30</sup> The *Ausfuhr-Verein* was cancelled in 1894, one year after the establishment of the RWKS.

trade in other coal. The Syndicate determined coal prices and quota, while the company was assured of a monopoly position and profitable income.

The SHV was not created out of nothing. It consisted of eight Dutch established wholesalers that each imported at least one train of German coal per day. Because of this massive supply each of them had negotiated special freight rates with the Dutch railways. Some of these traders were even officials of the railway companies and traded as commissionaires in Ruhr coal on Dutch stations. Others were wholesalers who had acquired the exclusive marketing rights of certain mines and traded on their own account and risk.<sup>31</sup> Before unification, these coal traders acted, also concerning Ruhr coal, in a competitive market. "The Coal Syndicate in Germany has forced the 8 gentlemen to unification (Limited Company), as otherwise it would have established an office of its own in Holland," the son of one of the Dutch traders wrote in his diary.<sup>32</sup>

It is likely that the RWKS never planned to establish an agency of its own, since it had an interest in incorporating the knowledge about the Dutch market and the existing transportation contracts of the incumbent operators in a Syndicate's Trade Association for the Netherlands. All the same, the power rhetoric was successful and led to the cooperation of the Dutch traders. The SHV became the sales agent of the RWKS, it received the monopoly on Ruhr coal imported by rail into the Netherlands, and made competition between rail coal in the Netherlands disappear. The import via the Rhine, as the exports through the Dutch seaports, remained to members of the Syndicate and the smaller private shippers.

Little after 1900 the RWKS requested the SHV to increase competition with English coal in Rotterdam. The SHV urged the various retailers to increase their sales. The result however, was unimpressive and it soon became clear that the presence of the SHV in Rotterdam was required. Therefore, in October 1901 in a meeting of the Board of Directors it was decided the SHV would open a branch in the port.<sup>33</sup> The branch opened on April 1, 1902. In order to gain a foothold in Rotterdam it instantly took over an existing coal merchant. In subsequent years it continued a rapid

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<sup>31</sup> Sneller, *Geschiedenis*, 203-206.

<sup>32</sup> Diary Willem van Beuningen, 8. Family archive Van Beuningen, in Utrechts archief.

<sup>33</sup> Sneller, *Geschiedenis*, 196-215. Board minutes, 4 October 1901, Company archive SHV. It is noteworthy that the board minutes reflect disagreement among the board members about the establishment of this decision. While some member say it was an initiative of the SHV, while another says it was decided by the RWKS. Eventually one writes that 'the SHV decided with the knowledge of the RWKS.' Dutch original: 'met medeweten van het Syndicaat de SHV heeft besloten'.

concentration in the coal trade in Rotterdam. The concentration not only concerned the limitation of competition between Ruhr-coal and thereby constituting a strong block against the English coal, it was also intended to get a grip on coal transshipment in the port of Rotterdam. In addition, a modest Rhine fleet came under the supervision of the SHV that, with the acquisition of the Rotterdam coal trader Van Nievelt and Co. was significantly expanded. In 1905 the SHV made a huge leap forward when it incorporated the firm P.W. Louwman. Since 1892, the company Louwman was responsible for the expedition for the Coke Syndicate in Rotterdam. Probably as a result of this exclusive contract, the company was able to invest in the mechanization of water transshipment.<sup>34</sup> The concentration process resulted in the complete control of the Rotterdam SHV branch over the Westphalian coal supply in the port, the bunker coal business and the expedition of export coal. Investments in mechanization had not yet occurred. For this the SHV firstly needed to gain the control over the Rhine coal.

As mentioned earlier, the SHV had obtained the sole selling right of Ruhr coal imported in the Netherlands by rail in 1896. As long as there was no certainty about the continuous supply of Rhine-coal to its branch in Rotterdam, it was unlikely that the SHV would invest in water handling equipment. However, it is likely that the RWKS perceived the SHV as its ideal partner in relation to the sale of bunker coal and the expedition of export coal in the port of Rotterdam already by 1901. The fact that the syndicate insisted on the foundation of a SHV branch in Rotterdam confirms this suspicion. Nevertheless, at that time the Syndicate did not yet control the sale of Ruhr coal sent via the Rhine. It only gained this control by 1903, when the Rhenish Coal Trade and Shipping Company (*Rheinische Kohlenhandel & Rhederei Gesellschaft*) was established in Mülheim. This so-called '*Kohlen-Kontor*' was in fact a new Syndicate's Trade Association that received the sole selling right for Rhine coal in Southern Germany, Switzerland, Vorarlberg, Tyrol, Salzkammergut, the French departments of Doubs, Haute-Saone and Territoire de Belfort and the Netherlands (as far as it was located at the Rhine). The *Kontor* encompassed all the companies that turned over more than 50,000 tons of Ruhr coal annually. All fleets, handling

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<sup>34</sup> Zeger W. Sneller, *De geschiedenis van de Steenkolen-Handelsvereniging*, unpublished manuscript (np. Nd. Presumably 1947-1953) 102-104. Hugo Van Driel, 'Innovation and integration in mineral bulk handling in the port of Rotterdam, 1886-1923, *Business history* 44, (2002 nr.3) 63-90, there 74. In 1898 Louwman purchased its first 'floating bucket elevator'.

equipment, warehouses and briquette factories owned by the *Kontor* members were at the disposal of all fellow members in the association.

While the amalgamation of the Rhine coal traders led to a concentration of the coal market and the elimination of competition in Germany, the establishment of the *Kohlen-Kontor* was perceived by the SHV as a new powerful competitor. "As soon as the matter became a *fait accompli*, we understood that the competition of Rhine coal to our company would be experienced even more than today, because certainly the waterway would only come to its full advantage when united in one hand, and it would be this cheap and easy way that will be used in most cases, something that we were only able to prevent to this day because of our great power on the railways."

Since the RWKS was receptive to the argument that the existence of rival trading companies in the Netherlands caused harm to the market position of Ruhr coal, the SHV managed to obtain the sole selling rights of Rhine coal as well. The *Kontor* transferred its privilege of exclusive marketing to the SHV and by April 1904 the SHV owned both the sole selling rights for coal imported by rail, as for Rhine coal. In return, the Syndicate and the *Kontor* received a 40 percent participation in the company, and were assigned positions in the administration of the company.<sup>35</sup>

The negotiations with the RWKS were accompanied by a new orientation on the mechanization of coal handling in the Rotterdam port. Already in December 1903 the director of the Rotterdam branch, D.G. van Beuningen, and one of the directors of the headquarters, left for a month to America to study the latest handling techniques in the coal sector. In March 1904 the Board agreed to purchase a floating coal transporter. The acquisition of Louwman in 1905, assured the SHV of the expedition of Ruhr coal overseas, which stimulated further mechanization in water transshipment. That same year a coal conveyor and two floating cranes were purchased. The conveyor allowed the transshipment of bunker coal on the water, while the cranes were primarily intended for transshipment of export coal 'on stream', without damaging the soft Ruhr coal. In 1906, a second conveyor followed, and in 1907 the first elevator conveyor was put into use and a start was made with the purchase of a Rhine fleet. The modern transshipment facilities of the SHV were so

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<sup>35</sup> Dutch original: 'Zoodra de zaak een *fait accompli* geworden was, begrepen wij, dat de concurrentie der scheepskolen zich voor onze Vereeniging nog meer zou doen gevoelen dan tegenwoordig, omdat zeer zeker de waterweg in eene zeer krachtige hand meer tot zijn recht zou komen, en deze goedkope, gemakkelijke weg in vele gevallen zou benut worden, waar dit tot heden door onze groote macht per spoor nog steeds kon worden verhinderd.' As cited by Sneller, Manuscript, 79-81. Idem, *Geschiedenis*, 212.

efficient that they soon became the dominant technology in the Rotterdam port. The innovations also resulted in an absolute dominance of the SHV in bunkering. The security of a steady flow of Ruhr coal, which the SHV had acquired as a result of the quasi-integration with the RWKS, reduced the financial risk of scale increase of the Rotterdam branch and allowed extensive investments in modern transshipment equipment.<sup>36</sup>

Cooperation between state, municipality, commerce and railways, as the article advocated in *De Economist* of 1876, in order to attract coal to the Dutch ports was only partly important in the rise of Rotterdam as a coal port. As long as the export of coal took place by rail, the flow could also be easily diverted to other ports such as Antwerp, and Rotterdam's position was all but unassailable. Only a good connection with a navigable Rhine, mechanized coal transshipment and a transnationally organized coal trade, could leave Rotterdam's largest competitor, Antwerp, behind.<sup>37</sup>

### **The petroleum trade in the Antwerp-Hamburg range**

Klemann and Schenk conclude that the policies of the Prussian government and the Act of Mannheim (1868) led to structural improvements of the navigability of the Rhine. Bigger barges, made from steel and powered by steam led to transport economies that gradually, over the course of the 1880s and 1890s lowered the freight rates for inland navigation, giving Rhine shipping an advantage over railways in the transportation of bulk goods.<sup>38</sup> In the case of petroleum (illuminating oil), the declining freights for inland navigation changed the relative position of ports in the Antwerp-Hamburg range. Antwerp and Bremen were dependent on rail connections to their hinterland, Rotterdam and Hamburg commanded natural hinterland connections through the Rhine and Elbe respectively. With water freights falling over the course of the 1880s, the ports of Hamburg and Rotterdam gained importance in the petroleum trade, to the detriment of Bremen and Antwerp (see graph 1).

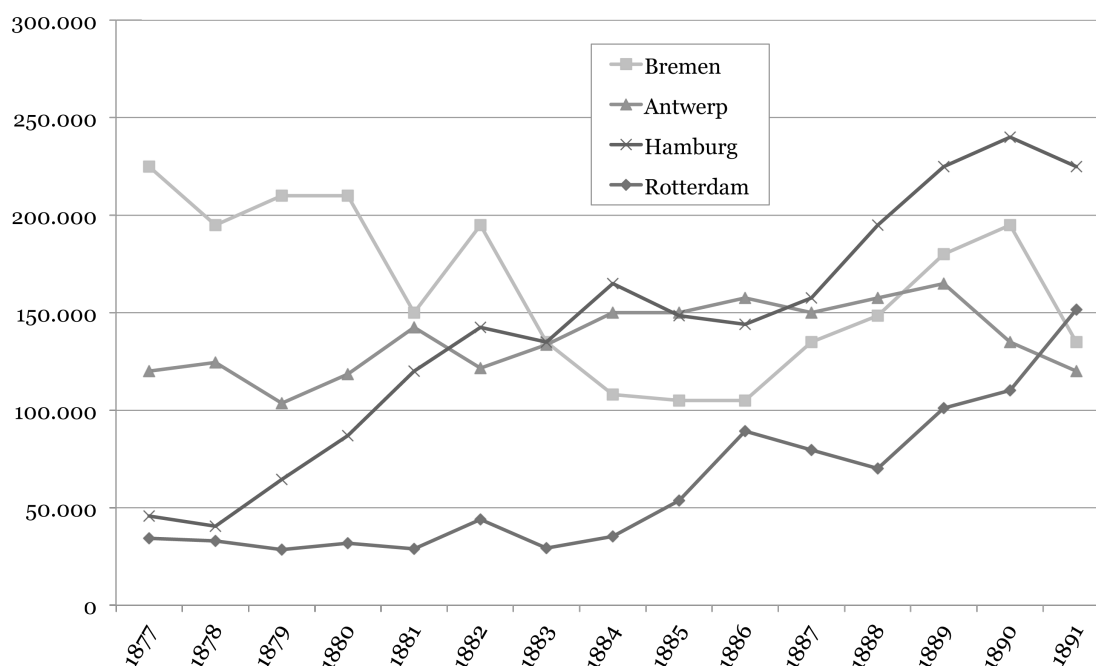
### **Graph 1. Petroleum imports in Antwerp-Hamburg range, 1877-1891 (in tons)**

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<sup>36</sup> Van Driel, 'Innovation', 77-80.

<sup>37</sup> Sneller, *Geschiedenis*, 233.

<sup>38</sup> Klemann and Schenk, 'Competition in the Rhine delta'. passim.



Source: Nusteling, *De Rijnvaart*, 325; A. Koelmans, *Van pomp tot put in honderd jaar* (Wormerveer, 1970), 15.

This shift from rail to water was a technological shift in the transportation of petroleum: from barrels to bulk. Although the shift materialised in just ten years, it had a profound impact on the organisational level of the trade and shipping business in the ports of the Antwerp-Hamburg range. When transportation was done in barrels, railways were the dominant mode of transportation. Barrelled petroleum stored inefficiently and was prone to leakage, so customers wanted to keep stocks low. This required restocking to be fast and reliable. Trains were better at this than barges. Moreover, because petroleum demand peaked in the winter, inland navigation had the extra disadvantage of freezing rivers. The introduction of bulk transportation of petroleum would eradicate the advantage of rail transportation by utilising the full potential of cheap bulk transportation over inland waterways, and led to Rotterdam overtaking Antwerp and Bremen as Germany's second most important petroleum port. The question of how and why this bulk revolution came about, is an excellent case study for the research questions we raise in this paper.

### *Port competition and technological change*



In the 1870s, Bremen and Antwerp were the most important petroleum ports in Northwestern Europe. In Bremen's peak year, 1877, it imported 52 percent of all petroleum imported by ports in the Antwerp-Hamburg range, with Antwerp importing an additional 28 percent (graph 1).<sup>39</sup> Franz Schütte was the most prominent petroleum importer in Bremen and worked closely with shipper and expeditor W.A. Riedemann of Geestemünde. Schütte's trading house imported the majority of Germany's petroleum, all of which came from America.<sup>40</sup>

When water freights started to decline from the late 1870s on, Bremen gradually lost its position, first to Hamburg and Antwerp, later to Rotterdam. At first, Bremen lost its trade on southeastern Germany and Austria to Hamburg.<sup>41</sup> Because the Weser lacked the economically attractive hinterlands of the Rhine and Elbe, Bremen's traders were left to compete for the petroleum trade on the Rhine provinces, Baden, Württemberg and Bavaria. In the 1880s, Antwerp was Bremen's main competitor for these markets. This incited the German railways to introduce special rail freight rates for petroleum transportation between German North Sea ports and southern Germany in 1882.<sup>42</sup> These special freights (*Sonderausnahmetarife*) stimulated Bremen's petroleum trade somewhat but in 1884, Schütte and Riedemann saw their petroleum trade decreasing again (from 195,000 tons in 1882 to 108,000 tons in 1884, see graph 1).<sup>43</sup>

The competitive pressure of declining water freights, among others, stimulated Schütte and Riedemann to look for other ways to remain competitive. They developed three strategies. Firstly, Riedemann and Schütte contemplated to transfer their business to the Rhine in 1886.<sup>44</sup> This could be interpreted as an indication of the petroleum trade shifting from rail to water.<sup>45</sup> However, it could also have been a means to achieve the second strategy that Riedemann and Schütte deployed, i.e. to

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<sup>39</sup> Nusteling, *De Rijnvaart*, 325, own calculations.

<sup>40</sup> R. Schneider, 'Der Petroleumhandel', *Zeitschrift für die gesamte Staatswissenschaft* 3 (1902), 61-72, here: 61; W. Weber, *Erdölhandel und Erdölverarbeitung an der Unterweser 1860-1895* (Bremen, 1968), 159.

<sup>41</sup> Schneider, 'Der Petroleumhandel', 63-64.

<sup>42</sup> F. Schulte, W. Nasse and W. Wirminghaus, *Die Schifffahrt der Deutsche Ströme* (Leipzig, 1905), 490.

<sup>43</sup> Nusteling, *De Rijnvaart*, 325; Schneider, 'Der Petroleumhandel', 65; Weber, *Erdölhandel*, 159.

<sup>44</sup> J.G. Loohuis, *Rotterdam als petroleumhaven in de negentiende eeuw* (Rotterdam, 1952), 75.

<sup>45</sup> *Ibid.*, 124.

achieve further reductions in the railway freights for petroleum, which were granted in 1886.<sup>46</sup>

However, Riedeman and Schütte's third strategy was the boldest and consisted of the introduction of bulk transportation and storage in the transatlantic and European petroleum trade. Riedemann and Schütte invested in the construction of ocean going tankers, bulk storage at the port in Bremen and 150 rail tank cars to distribute their petroleum in bulk to markets in southern Germany. The cost advantages of handling their petroleum in bulk, gave Bremen a renewed competitive advantage over other ports and Bremen's petroleum imports increased again between 1886 and 1890 (from around 100.000 tons to 181.000 tons).<sup>47</sup> Tank storage and rail tank cars were not new as they were already extensively used in the US. Transatlantic tankers, on the other hand, were a novelty and truly revolutionised the petroleum trade.

Introduced by Ludwig Nobel in the late 1870s,<sup>48</sup> tankers represented a saving of 63 percent in the total transport costs of petroleum, while tank steamers were also faster, completing up to seven round trips annually as against three with sailing ships.<sup>49</sup> However, most European and American shippers and traders were weary of Ludwig Nobel's invention. Many thought that tank steamers would be unfit to travel the fickle Atlantic Ocean.<sup>50</sup> Moreover, crews were fearful of serving on a tanker, stevedores protested against the automated loading and unloading and insurers refused to fully insure such a ship and its cargo.<sup>51</sup> Notwithstanding these constraints, Riedemann and Schütte invested in tankers in 1885.<sup>52</sup> After the successful maiden voyage of Riedemann's first tanker, *Glückauf*, in 1886, the introduction of tankers in the petroleum trade accelerated and by 1895 over 80 tank steamers were active on the Atlantic route.<sup>53</sup>

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<sup>46</sup> Weber, *Erdölhandel*, 159.

<sup>47</sup> Schneider, 'Der Petroleumhandel', 65.

<sup>48</sup> R.W. Tolf, *The Russian Rockefellers: the saga of the Nobel family and the Russian oil industry* (Stanford, 1976), 55-57.

<sup>49</sup> O. von Brackel and J. Leis, *Der dreissigjährige Petroleumkrieg: eine handelswissenschaftliche Studie* (Berlin, 1905), 350; H.F. Williamson and A. Daum, *American petroleum industry: the age of illumination 1859-1899* (Westport, 1981), 642-643.

<sup>50</sup> C.T. Marvin, *The region of eternal fire: an account of a journey to the petroleum region of the Caspian in 1883* (London, 1891), 341.

<sup>51</sup> Schneider, 'Der Petroleumhandel', 64-65.

<sup>52</sup> Tolf, *The Russian Rockefellers*, 58-59.

<sup>53</sup> *Ibid.*

The competitive advantages gained by lower freights and bulk shipping were especially detrimental to Mannheim's petroleum trade. Mannheim was the main German inland port as it connected the Rhine with the railways of southern Germany.<sup>54</sup> The *Sonderausnahmetarife* of 1882 and 1886 had provoked sharp protest in Mannheim.<sup>55</sup> However, the initial advantages that Riedemann and Schütte enjoyed from lower rail freights and handling petroleum in bulk from 1886 onwards, were short lived. In Rotterdam, improvements to the channel that connected the port with the sea had improved the competitive position of petroleum traders and brokers in Rotterdam.<sup>56</sup> But the most fervent reaction came from Mannheim. One of Mannheim's most prominent petroleum traders, the "vigorous marketer" Philipp Poth<sup>57</sup>, decided to copy the bulk handling system that Riedemann and Schütte had so successfully introduced to counter the increased competition from Bremen. Poth invested in a fleet of rail tank cars (70 by 1891) and erected tank storage facilities in Flushing, Mühlheim am Rhein, Mannheim, Strassbourg and Basel.<sup>58</sup> He also introduced the first tank barge on Europe's waterways.

Poth presumably reasoned that the only way to profit optimally from the cheaper freights on waterways with respect to railways was to introduce tank barges. To realise this step Poth found a partner in Joseph Conrad Fendel, a fairly small-time barge shipper from Mannheim. Fendel agreed in 1887 to ship 50,000 barrels in bulk annually from storage facilities in Vlissingen and Rotterdam to Mannheim. For this purpose he fitted one his four barges – *Carolina* - with tanks holding approximately 720 tons and commenced his contract in 1888.<sup>59</sup> Poth's marketing was so successful that Fendel ordered four new tank barges between 1890 and 1891.<sup>60</sup>

Poth was part of an emerging transatlantic bulk handling chain. In the 1880s, Poth procured his petroleum through prominent merchant houses in Rotterdam and Antwerp, Horstmann & Co and F. Speth & Co respectively. Otto Horstmann was an

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<sup>54</sup> According to Nusteling, about half of all petroleum shipped over the Rhine to Germany was destined for Mannheim throughout the 1870s, 1880s and 1890s (331-332); I. Heidbrink, *Deutsche Binnentankschiffahrt 1887-1994* (Hamburg, 2000), 36.

<sup>55</sup> W. Lotz (ed.), *Eisenbahntarife und Wasserfrachten: Studien zur Frage der Gebührenerhebung auf Binnenwasserstrassen* (Leipzig, 1900), 493-498; Schulte et al, *Der Schifffahrt*, 490-491; Nusteling, *De Rijnvaart*, 345

<sup>56</sup> J.D. Veegens, *Enquête omtrent de exploitatie der Nederlandsche spoorwegen* ('s Gravenhage, 1882), 173.

<sup>57</sup> R.W. Hidy and M.E. Hidy, *History of Standard Oil Company (New Jersey), vol. I. Pioneering in big business, 1882-1911* (New York, 1955), 253.

<sup>58</sup> Schneider, 'Der Petroleumhandel', 66.

<sup>59</sup> I. Heidbrink, *Deutsche Binnentankschiffahrt*, 23-24.

<sup>60</sup> Rheinschiffs-Register-Verbande, *Rheinschiffs-Register*, 1896.

enterprising petroleum trader in Rotterdam who mainly traded petroleum on Germany, which he procured from Hermann Stursberg & Co in New York. Horstmann and Stursberg were working together in implementing a bulk transportation network between the US and Rotterdam, complementing the bulk distribution network developed by Poth. In 1886, Horstmann found space in the Rotterdam port to erect six tanks to receive bulk shipments of petroleum.<sup>61</sup> He also invested in 20 rail tank cars.<sup>62</sup> Hermann Stursberg on his end, invested in four ocean tank steamers, which were constructed between 1888 and 1890 to ship his petroleum in bulk to European ports.<sup>63</sup> Stursberg also took a stake in Horstmann's tank depot and they jointly owned the Tank Rijnschip Reederij (Tank Rhinecraft Company) for the operation of their tank barge *Petrolea I*, which was built in Duisburg in 1890 and delivered its first shipment of petroleum in Mannheim on 14 May 1890.<sup>64</sup>

From New York, where Standard Oil sold its petroleum free on board to Stursberg<sup>65</sup>, via Rotterdam where Horstmann received the petroleum in his tanks in Charlois, to Poth in Mannheim, where tank barges delivered the petroleum in his tank depot, the whole import trade across the Atlantic and along the Rhine into Germany was adapted to bulk handling. Moreover, the Atlantic part of the bulk chain had been integrated to some extent by the joint venture between Horstmann and Stursberg.<sup>66</sup>

### *Concentration and integration*

Although the Stursberg-Horstmann-Poth connection marketed Standard Oil petroleum successfully, Standard Oil was concerned over its European export business. Up to the late 1880s, Standard had very little to do with organising export marketing.<sup>67</sup> However, in the late 1880s, increasing competition on the major European petroleum markets provoked a reaction from Standard Oil. Ludwig Nobel's inventions had not only given Riedemann and Schütte a competitive advantage in transportation and handling, but also paved the road for Russian petroleum in Europe. The Russians

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<sup>61</sup> Loohuis, *Rotterdam als petroleumhaven*, 81.

<sup>62</sup> 'Publicatie Staatscourant no. 91, Oprichting American Petroleum Company' (official publication incorporation of American Petroleum Company), *Nieuwe Rotterdamsche Courant*, 19 April 1891. See also: Hidy and Hidy, *Pioneering*, 150.

<sup>63</sup> Clydebuilt database, <http://www.clydesite.co.uk/clydebuilt/search.asp>, accessed on 1 August 2012.

<sup>64</sup> 'Petrolea I', *Algemeen Handelsblad*, 15 May 1890, 2; 'Oprichting American Petroleum Company', *Nieuwe Rotterdamsche Courant*, 19 April 1891. See also: Hidy and Hidy, *Pioneering*, 150.

<sup>65</sup> Hidy and Hidy, *Pioneering*, 42.

<sup>66</sup> Weber, *Erdölhandel*, 173.

<sup>67</sup> Hidy and Hidy, *Pioneering*, 42.

(mainly the Nobel’s) were actively seeking footholds in the European market and constructed tank depots in the ports of Bremen, Rotterdam, Antwerp, Marseille, Genoa, Fiume and Trieste between 1885 and 1890.<sup>68</sup> Although the actual amounts of Russian petroleum arriving in Germany were minimal (only 2-3 percent of the volume of American imports in 1889 and 1890)<sup>69</sup>, the presence of Russian affiliates, agents and brokers in the major European sea ports raised among Standard executives the question whether Standard shouldn’t gain more control over its export marketing in Europe.<sup>70</sup> Because the established merchants possessed local market knowledge, understood the local legislation, had acquired the necessary permits and licenses to do business, and, most importantly, had already invested considerably in bulk transportation and storage facilities, Standard opted to integrate their businesses into the Trust and retaining the merchants as directors.<sup>71</sup>

Firstly, Standard forced Riedemann and Schütte to merge their business into a new Standard affiliate, the Deutsch-Amerikanische Petroleum Gesellschaft (DAPG), which was incorporated on 25 February 1890.<sup>72</sup> Standard then proceeded to incorporate a second affiliate, the American Petroleum Company NV (APC) in Rotterdam, on 10 March 1891, which comprised of the businesses of Stursberg, Horstmann and Speth (in Antwerp).<sup>73</sup> Through these affiliates, Standard divided the German market. APC served the left bank of the Rhine up to Mainz, including all the principal cities along the Rhine between Mainz and the Dutch-German border. DAPG took care of the rest of Germany, although it remained present in Rotterdam with a tank depot and a fleet of nine tank barges.<sup>74</sup>

However, Standard’s grip on the German petroleum market was not yet complete. When Standard integrated the ventures of Stursberg, Horstmann and Speth, the “vigorous marketer” Poth in Mannheim refused to join the APC. However, since his former suppliers were now part of the Trust, Poth turned to a group of American producers that operated independently of the Standard Oil Trust, the so-called

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<sup>68</sup> Loohuis, *Rotterdam als petroleumhaven*, 80-84; Marvin, *The Region of Eternal Fire*, 340-341.

<sup>69</sup> G. Zoepfl, *Der Wettbewerb des russischen und amerikanischen Petroleums : eine weltwirtschaftliche Studie* (Berlin, 1899), 64.

<sup>70</sup> *Ibid.*, 144.

<sup>71</sup> Hidy and Hidy, *Pioneering*, 148.

<sup>72</sup> Williamson and Daum, *American petroleum industry*, 649; Weber, *Erdölhandel*, 160-162.

<sup>73</sup> Publicatie Staatscourant no. 91, Oprichting American Petroleum Company, *Nieuw Rotterdamsche Courant*, 19 April 1891. See also: Hidy and Hidy, *Pioneering*, 150; Zoepfl, *Der Wettbewerb*, 119.

<sup>74</sup> W. Mancke, *Ein Weltmonopol in Petroleum* (Berlin, 1895), 100; Schneider, ‘Der Petroleumhandel’, 69; Rheinschiffs-Register, 1896.

outsiders. By 1892, the outsiders, led by Lewis Emery, were looking for an opportunity to export part of their production. Because Germany was the largest European market that was not yet entirely controlled by Standard Oil, the outsiders turned to Poth. Emery sold his complete export production to Poth, through a broker in New York, Goepel and Trube.<sup>75</sup>

In response, Standard Oil unleashed a price war to force Poth to withdraw from the market.<sup>76</sup> Poth, nonetheless, managed to increase his market share from 7 percent of total German petroleum imports in 1891 to 10 percent in 1894, mainly because of his investments in bulk distribution.<sup>77</sup> However, by 1894, Poth’s financial resources had run out and he was unable to find private financiers. He petitioned the government for a guarantee on a 10 million Mark loan but the effort came to nothing.<sup>78</sup> In order to gain more competitive strength, the outsiders set out to merge the various outsider companies in the US with Poth’s marketing venture in Germany, creating an integrated business similar to the one Standard was building. When Emery attempted to integrate Poth’s business into the new company in 1895, Standard successfully intervened by taking over the export merchants Goepel and Trube, thwarting the attempts of Emery and forcing Poth to sell his business in 1896.<sup>79</sup>

The effect of the introduction of Rhine tank shipping and Standard’s integration of the European export trade on Rotterdam’s share in German imports was considerable (table 2).

**Table 2. Dutch share in German petroleum imports, 1892, 1899**

	<b>1889</b>	<b>1899</b>
<b>Dutch imports (in tons)*</b>	138,594	404,750
<i>Domestic consumption (in tons)*</i>	98,850	157,895
<i>Transshipped to Germany (in tons)</i>	39,744	246,855
<b>German imports (in tons)**</b>	543,900	896,100
<i>Dutch share in German imports (in pct)</i>	7	28

Source: \* Koelmans, *Van put tot pomp*, 15, 23, 29, 49 & 53; \*\* Schneider, ‘Der Petroleumhandel’, 60.

<sup>75</sup> Testimony of Lewis Emery, in: *USA (petitioner) v. Standard Oil of New Jersey et al (defendants)*, Volume 6 (Washington, 1908), 2794; Williamson and Daum, *The American Petroleum Industry*, 573; Zoepfl, *Der Wettbewerb*, 69.

<sup>76</sup> Schneider, ‘Der Petroleumhandel’, 69.

<sup>77</sup> Mancke, *Ein Weltmonopol*, 103.

<sup>78</sup> Mancke, *Ein Weltmonopol*, 196-197; Weber, *Erdölhandel*, 178-180.

<sup>79</sup> Pure Oil Trust vs Standard Oil Company, being the Report of an Investigation by the US Industrial Commission, 1899-1900, 133-134.

Between 1889 and 1899, the Dutch share in German petroleum imports quadrupled from 7 percent in 1889 to 28 percent in 1899. As 75 percent of the Dutch imports came through Rotterdam, the increasing Dutch share in German imports suggests that the Rotterdam petroleum port did profit considerably from the introduction of Rhine tank shipping as well as from Standard's successful integration of the German trade. The Rhine ship register of 1896, mentioned a total of 17 Rhine tank ships. These included the five Fendel ships of approximately 5,120 tons total capacity. To face Philipp Poth's efficient Rhine transportation system, Standard's affiliate DAPG ordered 9 tank barges between 1891 and 1892 with a total tonnage of 10,200 tons, thus tripling the total capacity of the Rhine tank fleet in just two years.<sup>80</sup> The combined total capacity of these two fleets (15,320 tons) was fully operational in 1893. Presuming that each ship could make 11-12 round trips a year, which is what Fendel managed with his first tank barge *Carolina*<sup>81</sup>, the Fendel and DAPG fleets would have been capable of transporting between 170,000 and 185,000 tons of petroleum between Rotterdam and Mannheim in 1893. The total amount of petroleum shipped over the Rhine to Germany in 1893 was 200,000 tons<sup>82</sup>, which implies that already in 1893 at least 85-90 percent of all petroleum shipped to Germany over the Rhine could have been shipped in bulk. The introduction of bulk shipping on the Rhine had decisively shifted the balance of power from Bremen to Rotterdam and the capital provided by Standard accelerated that process considerably.

## Conclusions

This paper aimed to explore the causes and effects of declining Rhine freight rates in the late 19<sup>th</sup> century on the organisation of the coal and petroleum trades. We raised three questions: Firstly, how and why was the organisation of trade in petroleum and coal in Rotterdam affected by the resurgence of Rhine shipping in the 1880s and 1890s? Secondly, what role did the companies involved in these trades play in the technological change that Klemann and Schenk alluded to? And, thirdly, to what extent did technological change lead to processes of concentration and vertical integration in the organisation of the petroleum and coal trades?

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<sup>80</sup> Rheinschiffs-Register-Verbande, *Rheinschiffs-Register*, 1896.

<sup>81</sup> Heidbrink, *Deutsche Binnentankschiffahrt*, 23.

<sup>82</sup> Nusteling, *De Rijnvaart*, 325.

With regard to the first question, it is clear that the declining Rhine freights from the 1870s onwards became a competitive force against railways. In the 1870s and 1880s, both coal and petroleum were predominantly transported by rail and port facilities for transshipment were tailored to rail transportation. Although the predecessor to the Ruhr coal syndicate applauded and stimulated the declining freights on the Rhine, it did so primarily to achieve further reductions in rail freights. Lower Rhine freights in the coal trade did not in itself result in a stronger position of Rotterdam in the Westphalian coal export up to the turn of the century. A stronger position of the Rotterdam port required extensive investments in transshipment equipment and as long as these were not made, the potential of lower Rhine freights for the position of the Rotterdam port remained unexploited. The petroleum trade showed a similar pattern of competitive potential in the 1880s, which, however, remained unexploited until a bulk handling and transportation system was introduced in the late 1880s. Both cases point out that the geographical advantages of the improved navigability of the Rhine and the associated decline in freight rates were not enough to decisively shift the coal and petroleum trades from railways to waterways, which brings us to the second question.

Companies played an important role in the utilisation of the potential of Rhine shipping in both the coal and petroleum trade. In the 1880s, the *Ausfuhr-Verein* stimulated mechanisation of coal transshipment in seaports to increase its competitive position against English coal, which led to the Rotterdam port investing in coal tips for the transshipment of coal from rail cars to sea going vessels. The focus was firmly fixed on railways. Although many retailers shipped their coal on the Lower Rhine, they lacked the financial power to realise the potential of Rhine shipping for the wholesale, bunker and export coal trade through Rotterdam. However, when investments were made in Rhine barges and transshipment facilities for coal from 1900 onwards, it were private firms that took the lead, in particular the SHV. Even though, the controlling power of the coal syndicate over rail transportation could well have postponed the shift from rail to waterways, which only materialised when RWKS granted SHV with the sole selling rights of 'Rhine coal' in 1904.

In the petroleum trade, private investments in bulk handling and transportation were equally important. However, in contrast to the coal trade the shift from rail to waterways occurred more than a decade earlier and the introduction of new handling technology was less coordinated. The bulk system was not introduced by a single firm



or cartel but was gradually adopted and developed by several independent merchants and shippers, which does not forego the fact that private companies were the driving force behind the shift from railways to waterways in the petroleum trade. However, notwithstanding the importance of investments by independent merchants and shippers, the market coordination and financial power of the Standard Oil Company did considerably increase the scale of petroleum shipping on the Rhine in the early 1890s.

This brings our third question to the fore: To what extent did technological change lead to processes of concentration and vertical integration in the organisation of the petroleum and coal trades? According to Hugo van Driel, investing in the increasing scale of shipping and handling technology requires a secure volume of trade<sup>83</sup>, which is either accomplished by long term supply contracts or the integration of transport and marketing functions. This development is very clear in the case of coal, where concentration of the trade into SHV and the partial integration of SHV into RWKS were a necessary precondition for the mechanisation of Rhine coal handling in the Rotterdam port. Although in the case of petroleum concentration and integration as a necessary condition for investment in new transportation technology is less pronounced, some form of integration occurred before Standard took over the European export trade in 1890. The bulk transportation and handling chain operated by Hermann Stursberg, Otto Horstmann and Philipp Poth, for instance, was partially integrated through the joint venture of Horstmann and Stursberg. Later, when the latter two were taken over by Standard, Poth concluded a long term supply contract with the Outsiders to secure a steady supply for his distribution network along the Middle and Upper Rhine. In a final – futile – effort to keep Standard at bay, Poth and Emery attempted to integrate their business in 1895. When Standard integrated the European export trade from 1890 onwards, the contemporary literature interpreted it as an expression of Standard's evilness. A more logical interpretation however, would be to assume that Standard chose to integrate because it saw the profits from the efficient bulk transportation and handling operations accruing to independent merchants and shippers in Europe. The investments that Standard subsequently undertook to integrate and expand its European export business in turn necessitated a higher degree of market control in order to maximise the margin on its trade.

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<sup>83</sup> Van Driel, 'Innovation', 77-80.

We conclude with a remark on the difference in timing of the rise of Rhine shipping in the petroleum and coal trades. In the case of petroleum as well as in the case of coal, the new transportation and handling technology that facilitated the shift from railways to waterways came from outside Europe. Bulk transportation and storage of petroleum was pioneered in America (rail tank cars, storage tanks, pipelines) and Russia (tank ships). In the coal trade, new handling technology for transshipment from barge to ship came from America (floating coal transporter). However, the timing and scale of the introduction of new technology differed considerably between petroleum and coal. Whereas in the petroleum trade on the Rhine transport economies through tank shipping were utilised by 1890, in the coal trade it took until 1905 before transshipment facilities enabled a shift from railways to the Rhine, even though Rhine freights were already considerably cheaper than rail freights in the 1890s. The delay in the rise of the coal trade on the Rhine in comparison with petroleum is quite remarkable. Although a comprehensive discussion is outside the scope of this paper, we would like to put forward three possible explanations.

Firstly, it could well be that Rhine transportation of coal was not clearly superior to rail transportation in the 1890s, which could have led SHV/RWKS to postpone significant investments in Rhine shipping and handling of coal until it had full control of the Rhine coal trade. In the case of petroleum, the technology transfer from the first Atlantic tank steamer to Rhine tank shipping transpired in three years, possibly because the savings on transportation, storage and distribution were so considerable – in Atlantic tank shipping only savings amounted to around two thirds of the transportation costs.<sup>84</sup>

A second explanation could be sunk costs, which were presumably much higher in the coal trade than in the petroleum trade, of which the latter was also considerably smaller in volume. Although sailing ships used for the transportation of petroleum barrels were rarely used for other cargoes, shippers typically used older ships for the petroleum trade. Prior to the bulk revolution, overland transportation of petroleum barrels required no special transportation material. Merchants seldom owned transportation material, stocks were typically kept at third party storage facilities and transshipment was neither technologically advanced nor capital intensive

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<sup>84</sup> Williamson and Daum, *The American Petroleum Industry*, 642-643.

(typically consisting of horse drawn carriages, hand carts or small lighter boats). In the coal trade on the other hand, transportation and especially handling were much more capital intensive. Moreover, RWKS had concluded freight rate deals with a wide array of railway companies to control its marketing, which was an investment of sorts in itself.

A third explanation refers to the debate on the delaying effect of monopolies on the introduction of new technology or the development of new markets. The argument would then be that SHV postponed investments in transporting and handling coal on the Rhine because it controlled the coal trade on the railways and only moved to invest in Rhine transportation when they felt their position threatened by others.

All of these arguments could be partly valid, but it needs further research to come to a more comprehensive conclusion.

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#### *Archives*

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