Anglo-German Rivalry in Coal Markets in France, the Netherlands and Germany 1850-1913

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1. Introduction

The rivalry between Britain and Germany as economic superpowers of that time had gained a lot of attention around 1900. Rivalry bears the connotation of being antagonistic and putting it in the words of a zero sum game it reads: What the protagonist gains the antagonist will lose. On the level of competing enterprises this equation may be correct but the customer of products in a competitive market is in most cases better off than in a monopolised or cartelised market. The case discussed here is not so much concerned with rivalry between nations but rather with the competition among coal-producing regions in third markets.

The trend from natural sources of power (water and wind) and vegetable fuels (chiefly wood) towards mineral resources (chiefly hard coal) constituted a central element of early industrialisation. Britain's leading role in industrialising her economy largely depended on the early use of hard coal as primary energy in various production processes. Several regions in Continental Europe, which industrialised later, also based their development on locally available coal resources, e.g. Wallonia and the Ruhr. But the success of industrialisation during the XIXth century was not necessarily dependent on the exploitation of local mineral fuel. On the one hand traditional energy sources like water-power proved sufficient for early industrialisation (as in Switzerland), and on the other hand hard coal could be transported and stored. Thus, in regions of northern Germany, the Netherlands, or large parts of

France[1] a local lack of mineral fuel deposits could be compensated for. Within the coal-mining districts entrepreneurs got more and more interested in selling their product outside of the area. With regard to the growing local demand, coal-mining tended to increase its capacity more than proportionally. Due to the long gestation period it often grew in unevenly.[2] In the Ruhr area cartelisation helped to maintain sufficient profits, but the widely-spread strategy was to find new sales areas outside the mining districts.

After all there existed a potentially high and growing demand for mineral fuel in regions far from the coalfields, but the major obstacle to meeting this demand was high transportation costs. Coal is a bulky commodity with a low value in relation to its weight. Therefore underdeveloped transportation systems greatly limited the market areas for coal.[3] After ocean freight rates had declined dramatically in the second half of the XIXth century coal was sold world-wide on a massive scale. This situation continued for a long time so that shortly before World War I coal had become one of the most important commodities in international trade surpassed only by raw cotton and grain.[4]

During the second half of the XIXth century freight rates for coal on canals, rivers and especially on railways likewise declined drastically thereby making the natural distance to the regions far away from the coalfields economically less significant.[5] Thus coal producers were capable of widening their markets. With a very high price elasticity of demand sales increased enormously in distant markets, which had already been breached. The spatial expansion led to overlapping markets for different coalfields and hence

[1] On the significance of coal and water-power for European industrialisation see Cameron 1985. He stresses (*bid*, p. 5 *et seq.*) that water-power was of major importance even in the mother country of industrialisation, Great Britain, until far into the second half of the XIXth century. On this see especially von Tunzelmann 1978. For a preliminary and abridged version of this article see Fremdling 1989.

[2] Holtfrerich 1973, pp. 116 *et seq.*

[3] Customs duties and similar taxes lost their significance in the second half of the 19th century. Therefore I deal with them only occasionally.

[4] Lamartine Yates 1959, p. 150.

[5] For an overview concerning transportation in Europe see Ville 1994.

competition and rivalry arose among mining areas, which in former times had been pretty isolated. This competition became highly intensive in France, the Netherlands and northern parts of Germany. Although before World War I Germany had emerged as the second largest exporter of coal after Britain, she was at the same time one of the foremost importers of coal as well.[6] In northern Germany not only domestic coal-producing regions competed against each other but also foreign suppliers, namely British.

Before analysing the competition in specific market areas for coal, I will sketch the importance and direction of British coal exports in general.

2. British Coal Exports

During the XIXth century Britain's coal exports[7] grew at a faster rate then her coal output. According to the recent estimate by Church British output increased from 63.5 million tons[8] of coal in 1850 to 292.1 million tons in 1913.[9] During the same years exports first comprised little more than 4 million tons and finally nearly 100 million tons.[10] Whereas in 1855 exports (7.5%) had clearly stayed below the two most important indigenous consumers of coal, namely the iron and steel industry (24.9%) and domestic fuel (20.9%), in 1913 exports outstripped both of them, taking 34.1% as against 11.6% and 12.2% respectively.[11] Coal exports also contributed more than proportionally to the growth of the entire British foreign trade. Coal had comprised only 1.8% of total

[6] Lamartine Yates (1959, pp. 150 *et seq.*) gives figures for 1913. The United Kingdom held a share of 48.6% in world exports, Germany of 22.5%. Germany absorbed 7.5% of the worldwide import volume.

[7] As far as I know there is no monograph on this subject. Besides small chapters within books on British coal mining in general see the articles by Palmer 1970; Harley 1989, and the older studies by Thomas 1903; Jevons 1909 and Zimmermann 1911.

[8] If not mentioned otherwise I use metric measures.

[9] These and the following figures are taken from Church 1986 pp. 19, 32, 86.

[10] Coke and patent fuel are converted into coal equivalents and are included here. Bunkering coal for foreign vessels in Britain and bunker coal for British vessels at foreign bunkering stations are also counted as exports.

[11] Slightly different figures but with the same tendency as given by Church are to be found in Mitchell 1984 p. 12.

domestic parts in 1850, but increased to 10.2% in 1913.[12] A major cause of the enormous growth of British coal exports lay in decreasing ocean freight rates. Many British coal districts were located along the coast or were at least connected with ports through short-distance railways.[13]

Harley systematically compiled freight rates of coal shipments covering a longer period. Some of his data are shown in Table 1. In addition I computed freight rates from figures collected by Thomas and Jevons (Table A1). Starting before the far reaching technical changes in ocean shipping gained momentum, Harley's data thus include the decisive transition from the wooden sailing vessel to the iron steamship. Harley registers no falling trend in the overall level of freight rates before the 1860s. Thereafter the rates declined dramatically until the early 1890s; in subsequent years they fell rather moderately and shortly before World War I they increased again.[14] In Table A1 the freight rates are listed only during their downward trend and since then they support Harley's findings.[15] The development of coal freight rates during the XIXth century differs from North's statement that general ocean freight rates already showed a downward trend in the first half of the XIXth century.[16]

The steep fall in freight rates from the 1860s was due to innovations which improved the economic performance of steamships.[17] Modern iron steamships had been in use for decades, but were less economical than sailing vessels. Steamers lagged behind because for a long time they had to rely on steam engines

[12] Based on the figures in Mitchell/Deane 1962, pp. 283f., 303, 305. Bunker coal for foreign vessels in British ports is not included. In 1913 this comprised 25% of the remaining exports of coal.

[13] See the map in Church 1986, pp. XXI.

[14] Harley 1989, pp. 315 *et. seq.*

[15] See also Jevons (1915, pp. 692 *et. seq.*), who compiled data for eight ports from 1863/65 up to 1913 (yearly data without gaps from 1886 onwards). They also reveal the described trend.

[16] See also Harley 1988 and North 1971, pp. 163-174.

[17] Only a few aspects of technological improvements are sketched here. For more information see Dyos/Aldcroft 1969, pp. 254 *et seq.*; Harley 1971, pp. 216 *et. seq.*; Ville 1990, pp. 49 *et. seq.*

Table A1. Freight Rates for Coal Shipments from Cardiff to Various Ports, 1872-1909/11, in shillings per ton and per 100 kilometres

Ports of Destination	1872	1873	1875	1888	1890	1892	1893	1898	1900	1901	1902	1905/07	1909/11
Group 1: Mediterranean and European Atlantic	0.58	0.67	0.55	0.39	0.36	0.33	0.28	0.36	0.40	0.28	0.25	0.24	0.26
Group 2: Baltic and North Sea	0.57	0.69	0.62	0.42	0.43	0.27	0.23	0.39	0.40	0.28	0.26	0.25	0.22
Group 3: East African	0.33	0.38	0.30	0.26	0.19	0.13	0.12	0.15	0.23	0.15	0.12	0.11	0.10
Group 4: West African	0.36	0.44	0.37	0.25	0.17	0.25	0.33	0.36	0.16				
Group 5: South African	0.19	0.27	0.21	0.31	0.12	0.20	0.25	0.18	0.14	0.11			
Group 6: Continental Indian	0.23	0.27	0.19	0.19	0.13	0.09	0.08	0.12	0.18	0.11	0.09	0.09	0.08
Group 7: Asian Far Eastern	0.20	0.21	0.17	0.16	0.13	0.09	0.08	0.13	0.16	0.11	0.08	0.08	0.06
Group 8: South American Atlantic	0.27	0.35	0.23	0.32	0.26	0.13	0.10	0.15	0.16	0.12	0.10	0.12	0.13
Group 9: West Indian	0.25	0.26	0.17	0.20	0.14	0.10	0.10	0.13	0.19	0.11	0.11	0.12	0.11
Group 10: American Pacific	0.18	0.19	0.12						0.08	0.08	0.06	0.11	0.09
Total Average	0.53	0.62	0.53	0.38	0.34	0.27	0.23	0.34	0.37	0.26	0.23	0.22	0.22

Sources and notes on Table A1: 1872-1902, Thomas 1903: 505 ff.; 1905/07, Jevons 1909: 13; 1909/11, Jevons 1915: 685 f.

The freight rates are standardized per 100 kilometre. For each group there are unweighted averages given, and the total average is weighted by the shipped quantities in 1902. For the quantities see Thomas, Growth, p. 510.

Name of the ports (Distance from Cardiff in nautical miles):

Group 1: Alexandria (2,943), Barcelona (1,664), Bilbao (560), Bordeaux (542), Cape de Verdes (2,408), Dieppe (417), Genoa (2,020), Gibraltar (1,156), Havre (382), Lisbon (882), Malta (2,133), Marseilles (1,844), Odessa (3,272), Piraeus (2,616), Port Said (3,072), Rouen (420), Trieste (2,806), Venice (2,800).

Group 2: Antwerp (558), Cronstadt (1,776), Hamburg (821), Stockholm (1,498).

Group 3: Aden (4,489).

Group 4: Sierra Leone (2,885).

Group 5: Cape Town (5,998).

Group 6: Bombay (6,154).

Group 7: Colombo (6,606), Hong Kong (9,716), Shanghai (10,466), Singapore (8,186), Yokohama (11,094).

Group 8: Buenos Ayres (6,249), Monte Video (6,139), Rio Janeiro (5,027).

Group 9: Havanna (4,025), Jamaica (4,034), St. Thomas (3,525).

Group 10: Iquique - via Cape Horn (9,623), Iquique - via Isthmus (6,830), San Francisco - via Cape Horn (13,606), San Francisco - via Isthmus (8,175), Valparaiso - via Cape Horn (8,869), Valparaiso - via Isthmus (7,588).

TABLE 1. Freight Rates for Coal Shipments from Britain, 1850-1913, in shillings per ton

Year	to Hamburg/Le Havre	to Danzig	to Bordeaux	to Genoa	to South-America
1850/54	9.7	10.3	11.8	19.4	-
1855/59	10.0	11.7	14.7	26.6	52.0
1860/64	9.2	10.3	14.0	23.6	36.8
1865/69	8.3	9.3	12.6	19.5	32.6
1870/74	8.7	9.2	10.5	17.2	30.0
1875/79	7.3	9.1	9.3	13.9	23.4
1880/84	6.3	8.3	7.8	12.8	23.3
1885/89	4.8	5.9	6.4	10.3	22.4
1890/94	4.7	4.8	4.8	7.5	16.8
1895/99	4.4	4.4	4.6	8.0	13.8
1900/04	4.3	4.8	4.3	7.0	11.8
1905/09	3.8	4.4	4.1	6.5	11.2
1910/13	4.3	5.4	5.3	8.8	17.1

Source: Calculated from Harley 1989, pp. 334-336.
1 Various ports.

which consumed a considerable amount of coal. This had two disadvantages: first, the running costs were high and second, the coal bunkered aboard greatly limited the carrying capacity. Not before the 1860s did the compound engine (later the triple-expansion engine and further improvements) become standard equipment in steamships. These fuel-saving devices reduced the consumption of coal considerably. Harley shows that in 1855 five pounds of coal were necessary to generate one horsepower for one hour and in 1890 less than two pounds sufficed to generate the same power.[18] This fuel-saving effect directly lowered the running costs and indirectly increased the freight-earning capacity, which was further enlarged through the smaller dimensions of the improved steam engines.

The steamship itself was decisive in increasing British coal exports. Through forward linkage effects, i.e. decreasing freight rates (caused by steam technology), the sale of British coal was

[18] Harley 1971, p. 220.

promoted on foreign markets. To reach these markets powerful backward linkage effects were induced, because this means of transportation itself consumed coal. In 1905 about 17 million tons of coal were bunkered in British ports and a contemporary maintained before the Coal Supply Commission that, in the same year at least 5 million tons of coal were shipped to foreign bunkering stations.[19] This means that nearly one third of the coal leaving Great Britain by sea was used for Marine transport.[20] From this demand Welsh steamcoal profited extraordinarily. Besides other qualities it had the advantage of a higher density and thus required less storage capacity.[21] In 1850 the coal leaving the Bristol channel had made up just 12.5% of all exported coal, but in 1913 its share comprised 41.8%.[22]It is often argued that coal freight rates could only be so low because they were based on a particular calculation. And the low rates alone should have guaranteed Britain's merchant fleet the profitable use of its otherwise excessive capacity for return freights. Precisely this argument is examined by Harley with the following conclusion:[23] The great success of the British merchant fleet in non-European trade was not even partly due to coal transportation. The shipment of coal into non-European regions was comparatively very small.[24] Table 2 confirms that this trade was concentrated on Europe.

According to Harley the traffic with foreign North Sea and Channel ports was carried out with special ships, which had to earn their returns from coal transportation alone. Shipments to Scandinavia and the Baltic, however, were another matter; as transportation of timber formed the major source of income, the

[19] Church 1986: 34.

[20] In 1905 hard coal exports (without coke, patent fuel, bunkers) were about 48 million tons. Source: see Table 2. Thomas even estimated that this share was more than 50%. Thomas 1903: 469; See also Palmer 1970, p. 337 *et seq.*

[21] Church 1986, p. 33; Palmer 1970, p. 336, 340.

[22] Church 1986, p. 35.

[23] Harley 1989, passim. This argument is set forward e.g. by Crouzet, who points out that 80% of the weight of British exports consisted of coal. Crouzet 1978, p. 236; see also Zimmermann 1911, pp. 1225, 1261 *et seq.*

[24] South-America alone played a significant role.

TABLE 2. British Exports of Hard Coal, 1853-1913, five-year averages in per cent.

Country/Region	1853-57	1858-62	1863-67	1868-72	1873-77	1878-82	1883-87	1888-92	1893-97	1898-02	1903-07	1908-12/13
Russia	3.1	5.0	5.6	6.5	6.3	7.5	6.1	5.3	5.5	6.4	5.2	6.0
Sweden/Norway	4.2	4.4	4.5	5.2	7.1	7.0	7.4	8.0	9.1	10.0	9.4	9.5
Denmark	7.9	6.5	5.8	5.6	5.0	4.9	5.0	4.8	5.0	5.0	4.8	4.5
Germany	15.5	15.7	14.5	15.2	14.3	12.0	11.6	12.5	13.2	13.3	14.7	14.0
Netherlands	3.9	3.9	2.6	3.3	3.2	2.5	1.5	1.7	1.8	2.8	3.8	3.3
Belgium	0.4	0.7	0.7	1.0	2.0	1.4	1.3	1.5	1.0	1.7	1.9	2.6
France	19.7	19.3	18.3	17.8	19.1	19.6	18.5	16.5	15.8	17.3	15.7	16.3
Portugal/Azores/Madeira	1.8	1.5	1.7	1.6	1.8	1.8	1.8	2.0	1.9	1.9	1.9	1.8
Spain/Canary Islands	3.6	5.2	4.9	4.0	4.0	4.3	4.8	5.6	5.8	5.2	4.8	4.6
Italy	2.4	4.2	5.8	6.0	6.9	8.2	11.1	12.2	13.0	12.7	13.6	14.0
Austria	1.4	1.3	0.7	0.3	0.5	0.3	0.3	0.3	0.6	0.5	1.2	1.5
Rest of Europe	6.3	4.6	4.3	3.3	4.0	5.6	5.9	5.2	4.3	3.5	3.0	3.0
Europe	70.2	72.5	69.6	69.7	74.3	75.0	75.3	75.8	76.9	80.4	80.0	81.0
Egypt	1.2	1.4	3.4	3.6	3.9	3.8	4.9	5.4	5.1	4.8	4.7	4.3
Rest of Africa	1.1	0.8	1.5	0.1	0.6	2.1	2.1	2.7	3.2	3.7	3.1	2.7
Turkey	5.1	2.6	2.1	2.3	1.8	1.6	1.5	1.5	1.5	1.0	0.9	0.7
India	3.2	3.0	4.5	3.9	4.8	5.1	5.4	4.3	3.2	1.5	1.1	0.8
Rest of Asia	1.7	2.1	2.6	1.1	1.7	1.7	1.4	1.2	1.1	1.0	1.1	0.5
USA	3.8	4.2	2.1	1.0	0.9	1.2	1.0	0.6	0.5	0.6	0.6	.0
Canada	1.9	2.0	2.0	1.8	1.2	0.9	0.5	0.3	0.3	0.2	0.2	0.1
Central America	4.4	4.2	5.1	3.6	3.1	2.8	1.9	1.2	1.0	0.4	0.5	0.2
Chili	1.0	0.8	1.1	1.0	1.3	1.0	0.6	0.8	0.9	0.7	0.9	1.0
Brasil	1.8	2.0	2.2	2.5	2.5	2.0	2.0	2.4	2.6	2.1	2.1	2.4
La Plata-Region	0.0	0.6	1.2	1.8	1.2	1.3	2.3	3.0	3.4	3.3	4.6	6.0
Rest of South America		0.3	0.2	0.6	0.8	0.8	0.8	0.5	0.3	0.2	0.1	0.10
America	13.2	14.1	14.3	12.5	11.1	10.0	8.9	8.7	8.9	7.4	8.9	9.8
Australia,New Zealand, Pacific Islands	0.9	0.5	0.3	0.0	0.0	0.0	0.0	.0	.0	.0	.0	.0
Other Countries	3.5	3.0	1.8	6.8	1.7	0.7	0.6	0.4	0.1	.0	0.2	0.2
Total (metric tons)	5032045	7261365	9177838	11553735	14226455	17818577	22780126	28534745	32428068	41731913	52404256	66258503

Source: Computed from yearly data in the British foreign trade statistics, see *Parliamentary Papers* 1854/55 *et seq.*

return freight for coal merely had to defray marginal costs. In the Mediterranean area coal freights covered the bulk of the receipts, with grain transported as return cargo not having to bear the entire costs of the double journey. In any case it should be stressed that the tendency for falling and finally low freight rates made British coal more and more competitive on foreign markets, in particular because (disregarding cyclical fluctuations) British coal prices at the pit-head stagnated from the 1850s to the 1880s and even increased[25] thereafter.

How were British coal exports distributed among the receiving countries or regions? To my knowledge the secondary literature deals with this subject in a rather crude manner.[26] Therefore basic data had to be compiled making fundamental use of British foreign trade statistics. I assembled yearly data on British coal and coke exports to each destination, disregarding both the figures on patent fuel and on bunkers for foreign vessels in Britain. The regional distribution of exports is determined by the receiving port. Table 2 shows the already mentioned dominance of European customers. Between 1853 and 1913 this preponderance increased: initially the European share made up about 70%. During the 1870s and around 1900 it took two further upward steps of 5% percentage points. Finally Europe received about 80% of all British coal exports. Outside of Europe large amounts were sent to Egypt, which was due to the opening of the Suez Canal in 1869. This canal helped to diffuse the innovation of steamships to the Far East.[27] It seems likely that coal exports to the rest of Africa mainly served to supply bunkering stations. Initially, i.e. in 1853/57, Turkey was an important customer, but declined thereafter, suggesting export shares economic stagnation in this area. India took a high level of coal shipments

[25] See the graph in Church 1986, p. 53. A similar tendency occurred in Ruhr coal mining, see Holtfrerich 1973, p. 20.

[26] See, however, Harley 1989. He compiled yearly data between 1850 and 1913, broken down to only seven destinations, i.e. the major shipping routes.

[27] See Farnie 1969, passim.; Harley 1971, pp. 223 *et. seq.*

until the 1880s but, as with of Africa, it received rather modest shares in the following decades. Local demand was increasingly met by supplies of newly explored coal mines in the regions themselves. The same applies to South Africa and Australia.[28] Until the 1860s the shares of North America were surprisingly high, but through improved transportation systems there plentiful indigenous coal resources could soon be distributed more effectively to other North American regions. As in Latin America, rich coal basins had not been explored or exploited before World War I and British coal could therefore gain important sales in spite of high transportation costs.[29]

The market significance of single countries in Europe and the shifting export ratios over time actually require a differentiated analysis. One might expect countries poorly endowed with coal resources but blessed with a long coast line to have offered an ideal sales market for British coal. Denmark, with her constantly high imports, lends strong support to this. But the shares of Sweden/Norway and above all Italy become too large to be fully explained by this hypothesis. The demand for coal depended on the stage of development, i.e. the timing of entering into industrialisation, which was mainly characterised by extending coal using techniques. Hence the shares of British coal exports to the various European countries shifted considerably.[30] France and the Netherlands, serving as contrasting examples of coal imports from Britain, are dealt with separately. The high Russian and the huge German shares point to a further factor of influence. Both Russia and Germany possessed enormous indigenous coal resources. But for a long time it was cheaper for locations near the coast to import British coal than to rely on domestic supplies. So these British exports were protected against domestic competition by the high

[28] See Jevons 1915, pp. 783 *et. seq.*; Hassel 1905, pp. 175 *et. seq.*; Zimmermann 1911, p. 1150; Palmer 1970, p. 339.

[29] Jevons 1915, pp. 782 *et. seq.*; Hassel 1905, pp. 36 *et. seq.*

[30] Alternative domestic sources of energy should also be considered, e.g. the wealth of timber in the case of Sweden. See Hassel 1905, pp. 122 *et. seq.*

costs of overland transportation. Up to World War I British coal remained competitive in coastal markets in spite of decreasing railway freight rates.

Finally a remark on quality differences concerning coal is in order. Quality had a great influence on the market opportunities of this commodity. Coal is not at all a homogeneous product, but rather a generic term. The comparison of Jevons is striking: "'Coal' to the uninitiated means something pretty definite, but to the dealer in coal it is only the name of a whole class of substances, and, without further qualifications, means about as much as the words 'cloth' or 'paper'". Different coal qualities influenced considerably the spatial dimension of sales markets within certain price limits independent of other causes.

The British perspective alone is not sufficient to explain the direction and significance of British coal exports. Characteristics of the importing markets have to be considered as well, which is attempted for France, the Netherlands and northern Germany.

TABLE 3. French Imports of British Coal, 1841-1913, in five-year averages

Years	1000 metric tons	as % share of total imports	as % share of total consumption
1841/45	476	24	9
1846/50	576	24	8
1851/55	702	19	7
1856/60	1.236	22	9
1861/65	1.392	21	8
1866/70	1.854	24	9
1871/75	2.240	30	10
1876/80	3.012	35	12
1881/85	4.032	37	14
1886/90	4.156	40	13
1891/95	4.805	42	13
1896/00	6.232	48	16
1901/05	7.181	49	15
1906/10	10.235	53	19
1911/13	11.107	49	18

Source: Crouzet 1966, p. 178.

3. France

Table 2 proves France to have been the major customer of British hard-coal exports from the middle of the XIXth century until 1913. In the west and southwest of France it was much cheaper to import coal from Britain than to buy it from indigenous coalfields.[31] Although France had drawn on British coal resources since the XVIth century, a major set-back occurred during the Napoleonic Wars and the subsequent period of the Restoration: war-time prohibition and later high differential tariffs discriminating against Britain withheld British coal from the French market. This changed between 1834 and 1837 when import duties on British coal were lowered considerably. The abolition of the British export duty followed in steps until 1850, and France for her part lowered import duties further in 1853, 1860, and 1863. This clearing away of customs barriers stimulated the importation of British coal into France.[32]

In the long run, British coal exports to France gained higher market shares than those of Belgium and Germany, rising from 20 to 25 percent in the middle of the XIXth century to half of all French coal imports in 1913. Whereas British coal had initially made up roughly ten percent of domestic consumption it comprised nearly 20 percent shortly before World War I (see Table 3). Crouzet distinguishes two different stages in the position of British coal on the French market. After rapid gains in the 1830s its market share remained stable until 1865 (first stage) followed by large increases (second stage). There are several reasons for the changes during the second stage: since the 1870s British coal prices declined as well as freight rates across the Channel and within France.[33] Ceding Alsace-Lorraine to Germany, France underwent drastic changes in her foreign trade balance in coal.

[31] For the following remarks I draw exclusively on Crouzet 1978. Other references are indicated by a special footnote.

[32] The duty finally made up only 10 per cent of the import value.

[33] For coal prices see Mitchell 1984, pp. 273 *et. seq.* From the 1890s, however, the trend was reversed, i.e. the prices increased. For freight rates see Tables 1, A1 and Merger 1995.

Belgian coal exports to France stagnated relatively from 1866 onwards and declined after 1883. Coal from Belgium made up the following percentages of total French coal imports: 1834 83, 1866 60, 1889 50, 1901 36, 1913 20. Belgian coal could not fully compete with coal from the new French mines in the Départements Nord and Pas-de-Calais. This indigenous coal penetrated mainly into the traditional Belgian market in France leaving the British unmolested. Since the July Monarchy Britain had gained more and more sales areas from Belgium. Initially she supplied the French Atlantic ports, and under the Second Empire Basse-Seine, Calais and Boulogne followed.

During the last third of the XIXth century British and Belgian sales areas scarcely overlapped, with the important exception of the Paris region. But it was not before 1894 that British coal finally overtook Belgian coal on the French market. Another reason for the partial retreat of Belgian coal from the French market was probably the rapid industrial development of Belgium itself. It even forced Belgium to import German and some British coal via the Netherlands (see Table 5). After 1901 the British market share in France diminished because of the increase of German exports. The German market share in France increased from 12 percent in 1900 to 27 percent in 1913. Most of the German coal destined for the metal industry in Lorraine did not compete with British coal in its sales areas directly, but the dynamic price and marketing policy of the *Rheinisch-Westfälische Kohlensyndikat* produced a successful coal export trade via the Rhine and Rotterdam. In the end German coal even arrived at French ports such as Boulogne, Rouen, Saint-Nazaire, la Rochelle and Bayonne. Coal from Germany sometimes held a considerable share of the market in certain coastal *départements*,[34] but, by and large, Crouzet concludes that the British market position was never seriously undermined by German coal exports to France.

[34] In 1911 seven of these *départements* imported 2,641,000 tons of British and 580,000 tons of German coal.

TABLE 4. Regional Distribution of the Consumption of British Coal in France, 1838-1911, as per cent of total consumption

Regions	1838	1867	1879	1892	1900	1911
Maritime Normandy	62	80	87	78	81	66
Brittany	66	80	90	92	96	84
Maritime South-West	95	77	88	82	91	84
Pas-de-Calais	9	10	14	7	12	8
Mediterranean Coast	-	-	5	21	16	25
Paris Region	9	12	12	11	11	24
Interior West	8	37	64	74	77	75
Middle Loire Region	10	20	41	28	26	33
Central West	69	60	58	54	53	59
Interior Aquitaine	-	-	21	18	26	34

Sources and notes: Crouzet 1966, p.192.

Maritime Normandy: Seine-Inférieure, Eure, Calvados, Manche.
Brittany: Ille-et-Vilaine, Côtes-du-Nord, Finestère, Morbihan,Loire-Inférieure.
Maritime South-West: Vendée, Charente-Inférieure, Gironde, Landes, Basses-Pyrénées.
Mediterranean Coast: Alpes-Maritimes, Var, Bouches-du-Rhône,Gard, Aude, Pyrénées-Orientales, Corse.
Interior West: Orne, Sarthe, Mayenne, Maine-et-Loire.
Paris Region: Seine, Seine-et-Oise.
Middle Loire Region: Indre-et-Loire, Loir-et-Cher, Loiret, Eure-et-Loir.
Central West: Vienne, Deux-Sèvres, Charente, Haute-Vienne.
Interior Aquitaine: Dordogne, Lot-et-Garonne, Gers, Haute-Garonne, Hautes-Pyrénées.

Only those *départements* are listed here where British coal was sold regularly and in quantities.

If the total imports of British coal are broken down in different regions of consumption over time a differentiated picture appears (see Table 4). In the coastal regions between the Somme and the Bidassoa British coal held its strongest market position in the long run. In 1838 the 14 *départements* of Maritime Normandy, Brittany, and Maritime South-West received 66 percent of their supplies from Britain. Small local coalfields covered the rest of consumption. But local supply could not satisfy the increasing demand, thus the British share increased considerably during the second half of XIXth century: 1867 80%, 1883 88%, 1892 82%, and 1900 88%. Thereafter British coal lost a little to German, Belgian and French exports, so that in 1911 its share had dropped to 75 percent.

But in two coastal regions British supplies never dominated the

market. The first was Pas-de-Calais north of the Somme, where local and Belgian supplies met most of the demand. The second was Bouches-du-Rhône, including Marseille. During the July Monarchy and at the beginning of the Second Empire only modest quantities of British coal were used here; in 1847 they made up 15% of the coal consumed in this region. After 1858 British coal had to face fierce competition from coal from the mines in Gard and Hérault. During the 1860s cheap railway transportation allowed French coal to almost esclude British coal from this Market. Thereafter declining ocean freight rates led to a recovery and finally to gaining an even stronger position in this market.

Except for markets accessible via navigable rivers British coal had hardly penetrated into interior French regions. This changed during the Second Empire when railway construction boomed. Lower overland transportation costs helped both British and French coal to widen their markets. In general British coal increased its market shares put not before the last third of the XIXth century. Still higher shares were achieved at the beginning of the XXth century. In some upcountry regions British coal held a strong position, for example in the interior and Central West, which both had good connections to ports, but were accessible to French coal only on secondary railway lines. Moreover these were built rather belatedly. The Paris region, being the most important inland place of consumption, had always been an important sales area for Britain.[35] In 1911 it absorbed 20% of the British coal consumed in France. In the remaining French regions, including those not mentioned in Table 4, British coal appeared rather sporadically, if at all. The vicinity to French or even Belgian and German mining areas kept British coal out of the centre, the east, the greatest part of the south-east and the north, with the exception of Pas-de-Calais.

On the one hand, Crouzet concludes that British coal supported industrial development in, for instance, Basse-Seine and Basse-Loire because it was cheaper there than French coal. On the other

[35] Merger 1995: 205 ff.

hand, transportation costs made imported British coal significantly dearer than on the other side of the Channel and than French coal in the mining districts themselves. This may partly explain why vast regions succeeded less well in industrialising in spite of importing British coal.

4. The Netherlands

Until recently the timing and nature of Dutch economic development during the XIXth century has remained rather obscure. Its periodisation depends on statistical information about basic economic data, which have been collected within the framework of national accounts only during the last decade. The project on "Reconstruction of National Accounts for the Netherlands in the XIXth Century" is supervised jointly by van Zanden and myself. It is organised around a number of Ph-D theses.[36] The quantitative framework, which is now coming to light, will surely clarify the discussion concerning the Dutch path into the XXth century. As yet the discussion had been confused by the use of different concepts of periodisation: Brugmans placed the "Industriële Revolutie" between 1850 and 1870; de Jonge identified the Dutch "take-off" from 1890 or 1895 to 1910, and van Zanden placed the beginning of the process of "moderne economische groei" in the years between 1850 and 1880. In a broader study Maddison included the Netherlands in the group of countries which were involved in a process of "substantial and sustained growth" (measured in gross domestic product per capita) from 1820.[37]

Although the evidence is now becoming more conclusive, most scholars might still agree on labelling the Netherlands as a late-comer concerning an important aspect of economic development, namely industrialisation. Such retarded industrialisation has often

[36] Already published are the following: Knibbe 1993; van der Voort 1994; Groote 1995; Horlings 1995 and Smits 1995 (forthcoming).

[37] See Brugmans 1983, pp. 201 *et. seq.*; de Jonge 1976, pp. 236, 343 *et. seq.*; van Zanden 1987, pp. 64 *et. seq.*; Maddison 1982, pp. 43 *et. seq.*, 166; van Zanden 1989, p. 17 *et. seq.*; van Zanden 1995.

been explained by the lack of domestic sources of raw materials such as hard coal.[38] It is true that the exploitation of domestic coalfields in Limburg did not take off earlier than the turn of the XXth century. Before World War I the rapidly expanding domestic supply of hard coal hardly covered one fifth of domestic consumption.[39]

The high consumption of imported coal, however, severely weakens the argument that Dutch industrialisation was necessarily hindered by lack of domestic raw material supplies. Even before the railway age the Netherlands had a highly developed system of inland water transportation (rivers and canals) and could thus draw on coal supplies from neighbouring countries[40]. With regard to the transportation costs for coal, the major Dutch cities were in a better location than, for example, Berlin, which industrialised early and very rapidly during the XIXth century.[41] Thus, an explanation for the retarded

[38] Bos (1987, p. 111) quotes van Dillen and Brugmans as advocates of this view. He also mentions Wieringa who gives only secondary importance on the lack of domestic raw materials. See Brugmans 1983, p. 213. Furthermore see Griffiths 1979, pp. 75 *et. seq.*; Kreeft 1988, pp. 219, 225 *et. seq.*; Van Zanden 1995, p. 61.

[39] Bos 1978, p. 111.

[40] For a review of the literature on this subject see de Jong 1992. Although he labels the quality of the waterway network as "poor", he nevertheless concludes: "The limitations of this system did not hamper or frustrate the process of industrialisation in the country" (de Jong 1992: 19). Recent studies of the Dutch transportation system, however, clearly reveal that the major improvements in transport infrastructure were made in the third quarter of the XIXth century. See Clement 1994, Groote 1995 and Niemeijer 1995.

[41] In fact some regions, e.g. Twente, had to wait for railway connections in order to get better access to foreign coal supplies. A national railway network emerged rather late in the Netherlands. But from an international perspective, de Jonge and Bos are wrong when they see the Netherlands as badly suited for internal communication before the 1880s. See Bos 1978, pp. 112 *et. seq.* On the development of the Dutch transportation system see Brugmans 1983, pp. 226 *et. seq.*; Clement 1994; Groote 1995. The careful assessment of the Dutch transportation problem in the first half of the XIXth century by Griffiths (1979, PP. 66 *et. seq.*) can be seen as inconsistent with his conclusion. Thus this assessment and similarly the one by Kreeft (1988, PP. 226 *et. seq.*) rather support my argument. It depends on the yardstick for comparison: as compared to Britain or Belgium the Dutch transportation system and hence fuel costs were at a clear disadvantage, but not at all when compared to regions in the south, the middle and the north of Germany. And, after all, those "handicapped" regions were successfully industrialising.

industrialisation in the Netherlands should not take the lack of domestically available coal resources into account. Rather, the argument should be reversed to ask why the Netherlands did not make more use of foreign coal supplies than they actually did in order to adopt coal-consuming technologies.[42] However, as speculation on this clearly relevant question extends beyond the scope of this article, I will restrict myself to the facts about coal supplies to the Netherlands.

As shown by the figures in Table 2 the Netherlands were a rather moderate importer of *British* coal, though not insignificant for British exporters. They could not dominate this nearby market because the Belgian coal mines lay in the vicinity and above all because Ruhr coal had such an easy access to the Dutch market. Since the middle of the XIXth century German suppliers of coal were freed from artificial trade barriers, such as the different import duties, navigation laws, and river tolls.[43] Drawing on figures calculated by Nusteling the Netherlands imported hard coal from the following countries:[44]

Year	from Germany %	from Great Britain %	from Belgium %
1850	29	33	38
1855	46	32	22
1860	51	31	18
1865	66	16	18
1870	65	22	13

Up to the decade around 1890 the British share declined to under 10 per cent. In the following years the share at first increased, but shortly before World War I it again dropped below the 10 per cent level. The overwhelming gainer was the mining industry in the Ruhr (see Table 5).45

[42] To some extent this is discussed by van Zanden 1995, pp. 58 *et. seq.*

[43] Nusteling 1974, pp. 174 *et. seq.*

[44] Nusteling 1974, p. 174.

[45] On average about 10% of Ruhr coal output was sent to the Netherlands, Nusteling 1974, p. 173.

TABLE 5. Imports and Exports of Hard Coal in the Netherlands, 1870-1914, five-year averages

Years	Import total 1000 metric tons	Import from Great Britain %	Import from Belgium %	Import from Germany %	Export total 1000 metric tons	Export to Great Britian %	Export to Belgium %	Export to Germany %	Net Import 1000 metric tons
1870/74	2,091	21.7	18.5	59.7	272	0.1	70.7	22.4	1,819
1875/79	2,943	15.2	10.5	74.2	618	0.1	90.0	7.8	2,325
1880/84	4,346	10.7	6.7	82.5	1,287	0.0	94.6	4.4	3,060
1885/89	4,945	7.1	8.0	84.9	1,309	0.0	89.8	7.1	3,636
1890/94	5,803	9.2	8.2	82.4	1,792	0.2	87.0	6.5	4,011
1895/99	7,277	12.4	9.7	77.9	2,822	0.2	82.7	8.4	4,455
1900/04	10,141	11.1	7.3	81.0	5,164	0.2	78.6	9.4	4,978
1905/09	14,825	17.3	6.1	76.4	8,851	0.3	71.8	15.2	5,974
1910/14	22,278	9.3	3.0	86.7	15,179	0.5	72.0	8.2	7,100

Source: Computed from Bos 1978, pp. 362 *et. seq.*
Note: Transit trade is included.

It is much more difficult to explain the long-term trends of the Dutch coal market which have been described. Production prices at the pit-head abroad only influenced short-term fluctuations in the different market shares.[46] The crucial points were transportation and related costs. Although one might suppose water transport to be cheaper than railway transport, there were considerable advantages for the railways. From Duisburg or Ruhrort to Rotterdam shipping was always cheaper, but this was not the case with haulage to Amsterdam. Here the costs were forced up by the overland transportation from the coal mine to the Rhine. As the River Ruhr was hardly navigable for large coalships, railways had to transport the coal from the mines to the Rhine ports. Furthermore, with differential tariffs set very high for short haulage distances, the railway favoured direct transportation to the Netherlands by rail.[47] Loss of quality through trans-shipment and inadequate facilities for shipment on waterways helped railways maintain an advantage over waterway transportation from the Ruhr to the Netherlands. But this changed after the turn of the century: freight rates on railways did not decline although those on waterways did. Trans-shipment facilities in Rotterdam were much improved and larger vessels also lowered transportation costs. As a consequence much more coal was brought to the Netherlands by waterway.[48] Shortly before World War I an increasing quantity of Ruhr coal reaching Rotterdam was even bound for overseas markets.[49]

To sum up, Belgium played a minor role in the Dutch coal market. Since production there could not even meet internal demand, Belgium herself had to import large quantities.[50] It is true that the Rheinisch-Westfälische Kohlensyndikat occasionally

[46] Bos 1978, p. 123.

[47] The breakthrough for coal transportation to the Netherlands on railways occurred between 1867 and 1875. See Nusteling 1974, p. 176.

[48] Nusteling 1974, p. 288.

[49] Nusteling 1974, p. 289; Bos 1978, pp. 138 *et. seq.*

[50] See Table 5. A large part of alleged Dutch imports from Belgium consisted of mere trans-shipments from Belgian coalfields to other parts of Belgium. Bos 1978, p. 119.

dumped large quantities of coal on the Dutch market whenever exposed to unfavourable conditions in Germany. But on the other hand the same cartel even imported British coal via the Rhine whenever domestic coal did not suffice to fulfil long-term contracts in boom periods.[51] The dominance of Ruhr coal on the Dutch market was mainly due to lower transportation costs (and related costs) as compared with those of coal from British mines. After losing its initially strong position British coal by and large served as nothing more than a stop-gap for the Dutch market.[52]

5. Northern Germany

5.1 Regional Development of Coal Output and Foreign Trade

In 1850 the Prussian mining districts alone produced more than 82 percent of Germany's[53] hard coal output. And to the total German production of more than 5 million tons Silesia contributed 28.5 percent, Westphalia 32.9 percent, and the Rhineland 20.1 percent. Apart from Prussia only the Kingdom of Saxony achieved a remarkable output reaching 12.6 percent. Small shares came from Bavaria (2.5 percent) Electorate of Hesse (2.6 percent) and Hanover (0.9 percent). The remaining mining districts were negligible.[54] Table 6 shows the enormous increase in total production with the shares of different coalfields until World War I. The Lower Rheinish-Westphalian district, i.e. the Ruhr, became predominant. Upper Silesia also gained a little, whereas all other districts declined relatively.[55]

[51] Nusteling 1974, p. 287; Bos 1978, p. 135.

[52] See also Bos (1978, pp. 116 *et. seq.*). Going into more details than Nusteling, Bos discusses the position of British coal on the Dutch market. The stopgap function of British coal becomes very clear after the 1880s (see *ibid*, pp. 125 *et. seq.*). But according to Bos (*ibid*, pp. 132 *et. seq.*) Britain had even lost this rôle by 1909.

[53] That is the area which later formed the German Empire without Alsace-Lorraine.

[54] Viebahn 1862, pp. 362 *et. seq.*

[55] Viebahn 1862, pp. 367 *et. seq.*; *Vierteljahrshefte* 1901, II, 9.f. *et. seq.*; *Statistisches Jahrbuch* 1912, p. 92.

TABLE 6. Output of Hard Coal in German Mining Districts, 1860-1912, in per cent

Districts	1860	1872	1881	1890	1900	1912
Lower Rhenish-Westphalian	34.8	43.2	48.8	50.6	55.0	58.8
Aachen	5.0	3.1	2.5	2.1	1.6	1.8
Saar (including Bavarian Rhenish Palatinate, Lorraine[1] and Baden)	17.3	14.1	12.2	10.6	10.2	9.3
Saxon	12.8	8.8	7.0	5.5	4.4	2.9
Lower Silesian	6.2	6.4	5.6	4.6	4.4	3.2
Upper Silesian	19.8	21.8	21.4	24.0	22.7	23.5
Other	4.1	2.6	2.9	2.6	1.7	0.5
Total (in 1,000 metric tons)	12,533.7	33,306.4	48,688.2	70,237.8	109,225.0	174,875.3

1) 1860 without Lorraine, which Schulz includes.
Sources: Schulz 1911: Table I. and III.; Flegel/Tornow 1915, pp. 122-129.

The output of brown coal (lignite) was less important than hard coal. The brown coal mining fields were favourably scattered over Germany, whereas hard coal was concentrated in border regions. Rich brown coal resources were exploited in the middle of Germany. The output of brown coal also grew remarkably during the second half of the XIXth century developing from 2.4 million tons (1853) to 40 millions (1900) and 67 millions (1910). Germany both exported and imported coal, with the export of hard coal considerably outstripping imports most of the time. By using two ratios the significance of foreign trade may be demonstrated. Hard coal export (X) is expressed as per cent of production (P) and imports (M) are expressed as per cent of consumption (C).[56]

[56] The calculations are based on the following sources: On production see Table 6, for 1850 see Fischer *et al.* 1982, p. 63. On foreign trade see *Statistisches Handbuch* 1907, pp. 471, 393 *et. seq.*; *Statistisches Jahrbuch* 1915, p. 202. Foreign trade of coke and patent fuel is excluded.

Year	X / P	M / C
1850	9.9	8.3
1860	14.4	6.6
1872	17.4	7.6
1881	15.3	4.5
1890	13.0	6.4
1900	14.0	7.3
1912	17.8	6.7

German exports were concentrated in neighbouring countries. Shortly before World War I Austria-Hungary was the most important customer, followed by the Netherlands, Belgium, France, Russia, Switzerland and Italy. The major exporter of hard coal to Germany remained Great Britain. Exports of brown coal played a minor role. Imports, however, which came almost exclusively from Bohemia, constituted for some time a major part of German consumption, rising from 5 percent (1866), to 24.9 percent (1891), 16.5 percent (1900) and 7.4 percent (1913).[57] After 1890 the import quotas dropped because brown coal resources in central Germany and in the Rhineland were then being exploited heavily.[58]

In order to explain regional variations in the development of output and the changing position of foreign coal in Germany a number of influences have to be taken into account. Besides supply-side factors, which determined the cost and price levels within the mining districts, there were demand-side factors. In the mining regions output was increasing to meet the growing demand of coal-consuming industries, of which the iron and steel industry was by far the most important.[59] The close connection between local coal-consuming industries only partly explains the demand-induced growth of output and the changing importance of particular mining

[57] Calculations are based on Fischer *et al.* 1982, p. 65; *Statistisches Handbuch* 1907, p. 459; *Vierteljahrshefte* 1901, II, p. 10 *et. seq.*; *Statistisches Jahrbuch* 1915, p. 202; *ibid* 1929, p. 298. Foreign trade of patent fuel is excluded. See also Randhahn 1908, p. 89. According to his yearly figures Bohemian coal reached its highest share of 25.5% in 1890.

[58] Calwer 1914, pp. 98, 102 *et. seq.*; see also Zickert 1907.

[59] See figures in Holtfrerich 1973, pp. 139 *et. seq.*; Krengel 1983, pp. 131 *et. seq.*; for a general assessment of Germany's inland navigation, see now Kunz 1995.

districts over time. In addition, sales opportunities outside these areas should be analysed and these changed fundamentally in the late 1850s when drastically cheapened overland transportation allowed massive coal sales to regions far away from mining areas.

5.2 Transportation Costs within Germany

Freight rates on rivers and canals declined from the middle of the XIXth century up to World War I because of pressure from competing railways and improvements in shipbuilding and the infrastructure in general. This tendency was enhanced by the abolition of river tolls in the 1860s. Until about 1880 railways had lowered their freight rates probably faster than inland waterways, but the position then changed so that by the beginning of the XXth century the freight rates for bulky commodities on water were about half those of the railways.[60] On the freight rates for coal transportation on inland waterways I have not yet gathered much information. Large cargoes of coal shipped on the Rhine from Ruhrort to Mannheim had to bear costs about 6 marks per ton in 1854 and 2.70 marks around 1900.[61] More important for the regions treated here were changes in freight rates on rivers and canals in northern parts of Germany. On the Weser between Bremen and Minden the rates declined from 17.40 marks in 1853 to about 7 marks per ton in 1900.[62] Shipments on the Elbe were liable to high river tolls until 1866, which could double the freight rates from Hamburg to Magdeburg. As shipments on the Oder were free from any river tolls certain commodities were cheaper to transport to Magdeburg (Elbe) via Stettin (Oder, canals, minor rivers) than via Hamburg (Elbe).[63] But in the long run freight rates on the Elbe declined.[64]

[60] Huber 1978, pp. 161 *et. seq.*

[61] Entwickelung 1904, pp. 112 *et. seq.* The figure for 1854 is not well documented, and for 1900 the rate varied between 1.70 and 6.10 marks per ton. On 28 May, 1910, the rate amounted to 1.25 marks per ton, Sonndorfer/Ottel 1912, appendix 3.

[62] Rauers 1913 pp. 85, 97.

[63] Fischer 1907 pp. 16, 62, 73 *et. seq.*

[64] Fischer 1907, pp. 94 *et seq.* 184 *et seq.* Unfortunately he gives no figures on coal transportation.

Table 7 shows a downward trend for coal freight rates from Hamburg to Berlin between 1898 and 1909. In real terms the abatement was even more pronounced since the general price level rose at that time.

TABLE 7. Freight Rates for Coal Transportation on Waterways to Berlin, 1898-1909, in marks per metric ton

Year	from Hamburg	from Stettin	from Breslau	from Kosel(Oder)
1898	4.95		4.00	6.15
1899	2.95		3.65	5.90
1900	4.15		4.05	5.95
1901	4.25		4.15	6.75
1902	3.75		3.45	5.50
1903	3.95		3.20	5.65
1904	4.50		4.20	6.00
1905	3.30	2.85	3.30	5.80
1906	2.85		3.15	5.50
1907	3.15		3.15	5.40
1908	2.70	2.75	3.10	5.30
1909	3.20	2.75	3.35	5.65

Source and notes: Zentgraf 1913, pp. 494 *et. seq.*
Costs of transfer and insurance are included.
These average rates are only a rough guide; even in a normal year they could vary between 1.80 and 5 marks.

The freight rates on the rivers Elbe and Havel were decisive for the competitive position of British coal in Berlin.[65] This coal, however, could also reach Berlin via Stettin (Oder, Finowcanal, upper Havel). Being rather narrow, the Finow canal proved to be a severe bottleneck, which is why Hamburg enhanced its transhipment function for British coal destined for Berlin.[66] To compensate Stettin for the disadvantage a new connecting canal to Berlin was built, which, however, was not opened before 1914.[67]

At first sight one might expect Silesian coal to have profited

[65] This held true for Bohemian coal as well.
[66] Zentgraf 1913, pp. 458 *et. seq.*
[67] Mewes 1937, pp. 59 *et. seq.*

from the Oder for long-distance haulage, the more so as a XVIIth century canal, together with the Spree, gave access to Berlin.[68] But extremely irregular waterlevels often made the Oder unnavigable. Heavy investment for regulating and canalising the river in the 1870s only partly solved this basic problem. Furthermore the Oder does not lead to the coalfields in Silesia directly and the connecting Klodnitzcanal, built at the end of the XVIIth century, was far too narrow and thus only of minor importance. If coal was shipped on the Oder at all it reached that river in general by rail.

In the middle of the XIXth century the freight rates for Upper Silesian coal shipped to Berlin by waterway came to 27 - 29 marks per ton. This was ten times as high as the rates from Breslau-Pöpelwitz (upper Oder) in 1895.[69] The rates from Breslau to Berlin compiled by Zentgraf (Table 7) indicate a decline since 1892. But Kosel, as the main place for transhipment, shows no downward trend. Under normal conditions the waterway was clearly the best means of shipping Silesian coal. But unfortunately the basic shortcomings of the Oder did not allow a regular and thus an organised traffic.

For the sale of Westphalian coal in northern Germany inland water navigation was not very significant. The Dortmund-Ems canal (fully opened in 1899) was mainly built to improve the sales of Ruhr coal in northern Germany and to drive British coal away from German ports.[70] In fact hard coal did become the bulk of the cargo in the northern direction.[71] But for the entire north-western part of Germany the canal was of rather limited importance, as Ruhr coal entrepreneurs preferred to send their coal to Hamburg by train.

The development of overland freight rates was decisive in gaining new distant markets in northern Germany because the only means of transport there was the railway.[72] Such a railway

[68] On the following points, see Zentgraf 1913, pp. 456 *et. seq.*

[69] Berlin 1896, p. 356.

[70] von Nördling 1885, p. 155; Meitzen 1884, pp. 25 *et. seq.*

[71] Entwickelung 1904, p. 85 *et. seq.*; Verkehr 1912, p. 135.

[72] Carriage by horse and cart was no alternative. Around 1840 this led to a doubling of the price of coal after a journey of only 13.5 kilometres. Fremdling 1979, p. 216.

connection, however, did not immediately entail cheap coal haulage over long distances. Berlin, for example, was already connected with both the mining districts of the Ruhr and Upper Silesia in 1847, but at that time only British coal reached this market, and this was transported on waterways.[73]

In general high freight rates were responsible for the delayed start of coal transport on the railways. In the 1840s railways charged between 11 and 14 *pfennigs*[74] per ton/kilometre.[75] This meant a doubling of the price of coal after a distance of 38 to 50 kilometres.[76] Such a tariff destroyed any attempt to compete against British coal in large parts of northern Germany. From Britain the coal arrived cheaply over the North Sea and inland waterways.[77] Since, in the long run, German coal prices at the pit-head either stagnated or even increased, the only chance for German coal to enter into competition in northern Germany lay in lower transportation costs by railway.[78] But up to the early 1850s the level of freight rates prevented any significant coal transportation by rail. Only a successful campaign for the introduction of the *Einpfennigtarif*[79] (i.e. a special low rate for coal transportation of 2.2 *pfennigs* per ton/kilometre) helped to surmount this obstacle.[80] The special tariff was originally designed to make Upper Silesian coal competitive in the Berlin market, and the price differential between British coal in Berlin and Upper-Silesian coal at the pit head determined the rate. Special trains had delivered domestic coal to Berlin as early as 1849. Political pressure compelled the Upper Silesian Railway Company to keep those special trains with this special tariff running regularly from 1852 onwards. In effect the

[73] Berlin 1896, p. 149.

[74] These are always "pfennigs" of the "mark"-currency, not of the "taler"-currency.

[75] Ulrich 1891, p. 58; Engel 1879, pp. 141, 146.

[76] This calculation is based on a coal price of 5 marks at the pit-head. Holtfrerich 1973, p. 22.

[77] Holtfrerich 1973, pp. 20 *et. seq.*; Jacobs/Richter 1935, pp. 62 *et. seq.*

[78] There was no debate on introducing special import tariffs.

[79] This was one "pfennig" of the "taler"-currency per *Zentnermeile*, which meant 2.2 pfennigs of the "mark"-currency per ton/kilometre.

[80] See Bloemers 1966; Martini 1890.

Prussian Minister of Trade threatened to run state-owned trains along the company's network - an action allowable under the legislation of 1838, but never actually implemented.[81] The introduction of the special rate for coal transportation, the *Einpfennigtarif*, from Upper Silesia to Berlin served as a model for demands of colliery owners in other mining areas, such as the Ruhr. Although their demand was supported both by public opinion and by state authorities, it was, nevertheless, the increasing profits - due to economies of scale - which really prompted private railway companies to cut their freight rates. The high price elasticity of demand for coal influenced its transportation considerably. Slightly falling prices outside the mining areas in the 1860s were not the only factor behind the expansion of the coal market. Railways also transported coal to places which formerly could not have been supplied - hence they *created* new markets. Between 1860 and 1862 this special tariff was conceded on all important northern German lines, but it was in force only on special trains.[82] The tariff on shorter distances had not been lowered as much. Therefore the actual receipts the railways got from transporting coal were still higher than the *Einpfennigtarif*. Hence on Prussian railways the average freight rate per ton/kilometre amounted to 4.7 *pfennigs* in 1858, 4.1 in 1862, 3.9 in 1863, and 3.2 in 1872.[83] In 1877 the *Einpfennigtarif* became the norm for distances over 100 kilometres. In subsequent years even lower rates were charged on very long distances or to ports.[84] This reduction led to the curious consequence that, around the turn of the century, huge amounts of coal were sent to Hamburg by train to be transfered into ships for Berlin.[85]

Coal shipments thus reacted very sensitively to changes in transport costs. This meant that the opportunities for mining areas in

[81] Concerning the regulation of the Prussian railway see Fremdling/Knieps 1993.
[82] Erläuterungen 1862, pp. 5, 22; Engel 1879, p. 141.
[83] Complete data in Fremdling 1985, p. 69.
[84] Preussische Landeseisenbahnrat 1908, pp. 39 *et. seq.*; Stuber 1968, pp. 50-61 *et. seq.*
[85] Entwickelung 1904, pp. 157 *et. seq.*

distant markets were closely dependent on changes in freight rates so with tariff reductions on the railways German coal was able to seize large market shares in many regions of northern Germany.

5.3 Local Coal Markets in Northern Germany

By way of example, three important markets are chosen to demonstrate the competition among different German and foreign suppliers of coal. These are Hamburg, Magdeburg and Berlin.[86]

5.3.1 Hamburg

Hamburg was by far the most important port of entry for British coal into the German market.[87] This was not only due to local consumption but also to the fact that British coal was transloaded there and shipped to other German destinations on the river Elbe and its tributaries. Between 1858 and 1870 British export statistics show separate figures for Hamburg. Of all British coal exports to German ports Hamburg clearly received more then 40 percent, and in 1869/70 the share even rose above 50 percent.[88] Until the 1870s German coal had hardly any chance of selling on the Hamburg market.[89] At that time British coal came mainly from Newcastle or Cardiff. In the beginning it was transported on sailing vessels, which were rapidly replaced by modern steamships from the 1860s onwards. Already in 1866 more coal reached Hamburg in steamships than in sailing vessels.[90]

Various quantitative data reveal an overwhelming preponderance of British coal in Hamburg and in the years from 1851 to 1865 the proportion of non-British coal was below 1 percent. Even in 1864 (when Denmark for some time blocked German ports and miners in Britain were on strike) the non-British

[86] For a more detailed analysis see Fremdling 1989.
[87] See now Lyth 1995, pp. 16 *et. seq.*
[88] Source: see footnote for Table 2. Only in 1865 did Hamburg's share drop below 40 percent.
[89] Hamburgs Handel 1897, p. 241; Heidmann 1897, p. 5.
[90] Hamburgs Handel 1897, pp. 240 *et. seq.*

share came to only 1.1 percent.[91] The following table is taken from the statistics compiled by the Prussian Minister for Trade:[92]

Year	1860	1862	1865	1871	1881
Imports of British coal (%)	100	98.2	99.8	99.2	67.8
Total imports (1000 tons)	505.5	614.9	603.3	1145.9	1485.9
Share consumed in Hamburg (%)	50.6	66.3	70.8	49.8	74.0

The preponderance of British coal declined in the middle of the 1870s when special tariffs on the railway enabled increasing quantities of Westphalian coal to reach Hamburg:[93] in 1875 60,000 tons, in 1880 340,000 tons, and in 1881 460,000 tons. Hamburg became a competition market for different mining areas and also between different transportion systems. British coal came as usual by ship, Ruhr coal by rail. Other smaller competitors supplied Hamburg. Bohemian brown coal came by ship on the Elbe, indigenous brown coal as well as hard coal arrived from Hanover and Osnabrück by railway.[94] The bulk of the coal coming to Hamburg was consumed there. The shares given above reveal no clear-cut trend. The high share of local consumption in 1881 coinciding with large quantities of Westphalian coal sent to Hamburg probably indicates that British coal had already lost ground in other German markets dependent on Hamburg. Detailed information for the 1860s shows that these dependent markets, which mainly lay in Prussia, took more than 80 percent of British coal transhipped in Hamburg. Small quantities (1-2 percent) of the British coal were even shipped to Saxony and Bohemia, and the remaining part went to Anhalt, Hanover, Mecklenburg, Lauenburg and Lübeck.[95] The

[91] Erläuterungen 1865, p. 71; Entwickelung 1904, p. 185.
[92] Erläuterungen 1860, p. 29; 1862, p. 43; 1865, p. 54; 1871, p. 41; 1881, p. 46. In this source the non-British shares are a little higher.
[93] Heidmann 1897, p. 16.
[94] Erläuterungen 1865, p. 71; Entwickelung 1904, p. 185.
[95] Erläuterungen 1862, p. 43; 1865, p. 54.

bulk of British coal was sent on to Prussia by way of the following rivers: Havel and Spree (1862) 50 percent and (1865) 60 percent; Saale 9 percent and 5 percent respectively; Elbe 41 percent and 36 percent respectively.[96] This identifies the regions of Magdeburg and Berlin as being the main centres of British coal sales.

From the late 1870s more and more Ruhr coal reached Hamburg so that the British market share had shrunk considerably by 1881, and sectors in particular British suppliers were nearly driven out of the market entirely. In the middle of the 1890s, for example, the bituminous coal, which formerly was supplied from South Wales, now came almost exclusively from Westphalia. It was used for large boiler installations, especially ships' engines. The market for semi-bituminous coal was divided, whereas British suppliers still dominated the market for gas and house coals.[97] In 1890 Westphalian colliery owners even established their own marketing organisation for retail trade in Hamburg.[98] Freight rates for special trains were still declining or had stabilised at a low level, but ocean freight rates had also declined considerably (see Table 1). Zentgraf even states that, after the turn of the century, freight rates shifted again to the advantage of British suppliers in the Hamburg market.[99] Furthermore, the price policy of the *Rheinisch-Westfälische Kohlensyndikat* helped British coal sales to stabilise in the rapidly expanding Hamburg market in the early twentieth century.[100] Table 8 clearly shows that Britain remained the major supplier of coal, with market shares fluctuating at around 60 percent.

The crude import figures do not reveal how much of the coal was passed on to other regions. In 1912 nearly two million tons of hard coal were sent to inland consumers by ship.[101] About a quarter of this had been transfered from rail to ship. Hence large quantities

[96] Erläuterungen 1865, p. 72.
[97] Hamburgs Handel 1897, pp. 243 *et. seq.*
[98] Hamburgs Handel 1897, pp. 242 *et. seq.*; Entwickelung 1904, pp. 85 *et. seq.*
[99] Zentgraf 1913, pp. 495 *et. seq.*
[100] Zentgraf 1913, p. 500; Krziza 1912, pp. 121 *et. seq.*; see also the report of the British consul in *Parliamentary Papers* 1904, vol. 52
[101] Verkehr 1912, p. 269. Patent fuel and coke are omitted.

TABLE 8. Coal Imports into Hamburg, 1894-1911

Year	British %	German %	Total 1000 metric tons
1894	58.2	41.8	2,853
1895	56.2	43.5	2,981
1896	56.0	44.0	3,208
1897	59.8	40.2	3,608
1898	55.4	44.6	3,707
1899	59.5	40.5	4,066
1900	65.3	34.6	4,622
1901	60.8	38.9	4,430
1902	61.0	38.8	4,577
1903	62.1	37.9	4,942
1904	59.0	41.0	4,889
1905	64.3	35.7	5,525
1906	61.8	38.2	6,070
1907	66.9	33.1	7,417
1908	63.1	36.9	7,842
1909	65.9	34.1	7,958
1910	61.9	38.1	8,400
1911	59.4	40.6	7,973

Source and notes: 1894-1903, *Parliamentary Papers*. Vol. 16, 1905, p. 884; 1904-1911, Zentgraf 1913, p. 502.
Between 1900 and 1902 small quantities of American coal reached Hamburg. For the overlapping years (1900/1903) Zentgraf gives slightly different figures.

of Ruhr coal reached their final destination through rail and water transport combined.[102] 71.6 percent of the 2 million tons were shipped to the Berlin region. The remaining part was sent to river ports in Schleswig-Holstein, Hanover, Oldenburg, the province and the Kingdom of Saxony and the Mark Brandenburg. Some the coal, having reached Hamburg on sea-going vessels, also left the city by train. In 1912 this amounted to 300,000 tons, 50 percent of which was sent to Schleswig-Holstein and a third to the province of Hanover and the state of Oldenburg. Less than 1 percent left for Berlin by train.[103] The proportions revealed in the transport

[102] Verkehr 1912, p. 1 XXVII; Zentgraf 1913, pp. 460, 497.
[103] Güterbewegung 1912, p. 103. Patent fuel and coke are omitted.

statistics for 1912 are likely to be representative of the transit function of Hamburg during the two decades before World War I.[104] Accordingly, about one third of Hamburg's coal imports were transhipped, mainly to the Berlin region.

5.3.2. Magdeburg

Conveniently situated on the river Elbe, Magdeburg was also connected by railway trunk lines to all four points of the compass as early as 1847. By then the high price of wood had forced industry and households to use mainly brown and hard coal as fuel.[105] In particular, the processing of sugar-beet consumed much fuel, so Magdeburg rapidly became one of the major coal consuming places outside the mining areas.[106] Nearby brown coal collieries competed there against distant suppliers of German, British and Bohemian coal, but around 1850 this local brown coal was still solely used by sugar-beet factories located close to the collieries. Brown coal was regarded as inferior and, as it was not processed into compact patent fuel, high overland transportation costs confined its market to the locality. Therefore, hard coal from Britain and Saxony as well as brown coal from Bohemia was transported to Magdeburg by ship. To weaken the dependency on foreign coal businessmen in Magdeburg were eager to get Prussian coal from Westphalia. In 1849 they complained about the "foreign" Hanoverian state railway not being willing to agree to special low tariffs.[107] That was grist to the mills of the Westphalian colliery owners and, in a pamphlet dated 1858, they recommended increased sales outside the mining area as the only remedy for the expected overproduction of coal. They considered Magdeburg the most important sales market in the east, a place where they had not as yet sold any coal.[108]

[104] These statistics concerning inland waterways and railways were consistent with each other in 1912 for the first time.
[105] Voss 1904, p. 13.
[106] Erläuterungen 1860, pp. 13 *et. seq.*
[107] Voss 1904, pp. 16 *et. seq.*
[108] Absatz 1858, pp. 10 *et. seq.*

Although the *Einpfennigtarif* was actually not introduced in this connection until 1862, considerable quantities of coal were already sold there in 1860 and 1861. The then high price of British coal aided these sales, for which the coal was transported on special trains. But as Westphalian coal possessed some unknown properties, there was still a certain preference for British coal, which held back the sales of Westphalian. The data compiled by the Prussian Minister of Trade reveal that Westphalian coal from the Ruhr had won a market share of a mere 6.3 percent in 1860 (Table 9). Although British sales actually had dropped by half in 1860 as compared to 1859,[109] British coal still dominated the market sector for hard coal. The continuing high freight rates on the railway even hindered Westphalian coal from outstripping Saxon hard coal, most of which reached Magdeburg via the Elbe.[110] As the large factories had gradually learned how to use their local brown coal it soon gained an advantage over Bohemian brown coal.[111]

TABLE 9. Coal Imports into Magdeburg, 1860-1881 (per cent)

Type of coal	1860	1862	1865	1871	1881
British hard coal	25.7	17.4	5.7	18.1	1.0
Westphalian hard coal	6.3	18.2	35.6	20.9	19.9
Bohemian brown coal	24.5	19.9	15.8	26.3	44.8
Local brown coal	34.2	36.5	38.4	27.4	31.1
Saxon hard coal	8.2	6.3	3.7	5.5	1.4
Bohemain hard coal	1.1	1.4	0.3	-	-
Upper Silesian hard coal	-	0.3	0.4	0.6	0.4
Lower Silesian hard coal	-	-	-	-	0.0
Hanoverian hard coal	-	-	-	0.3	1.4
Local hard coal	-	-	-	0.9	-
Total (1.000 metric tons)	395.1	408.7	544.4	622 .4	945.1

Source: Erläuterungen. 1860, pp. 25 *et. seq.*; 1862, p. 38; 1865, p. 45; 1871, pp. 37 *et. seq.*; 1881, p. 41.

[109] Voss 1904, pp. 18 *et. seq.*

[110] Three quarters of the coal travelled in this way, see Erläuterungen 1860, p. 25.

[111] Voss 1904, p. 18.

Table 9 shows how rapidly the share of British hard coal declined. A brief recovery occurred in 1871, brought about by favourable business cycle conditions. In 1881 Westphalian coal had driven off nearly all competitors in hard coal, but Bohemian brown coal had greatly increased its market share. This was probably due to better loading facilities (steam cranes) at the Elbe after 1878 which allowed a speedy transfer from ships to railway waggons. This improved Magdeburg's transfer facilities considerably.[112] During the 1880s British coal disappeared from this market. But in 1890, when prices increased and Ruhr collieries could hardly meet the demand, the gap was closed by hard coal from Saxony, Upper Silesia and, once again, from Britain. Although this was just a short-term cyclical shortage, British coal featured permanently in the 1890s due to the price policy of the *Rheinisch-Westfälische Kohlensyndikat.* Although British market share may not have been very large, the buffer function of British coal with its price-depressing effect was highly esteemed by contemporaries: "This competition has a charitable effect, since undoubtedly the Westphalians would have asked for completely different prices."[113] Unfortunately there are no exact statistics available to document the origins of Magdeburg's coal imports until 1913 and even figures for the total amount of coal which arrived on the Elbe are obscure.[114] Shortly before World War I it is likely that the British market share probably amounted to 10 percent of the entire hard-coal market. This can be concluded indirectly from statistics for 1912. They do not cover the Magdeburg market completely, however, and furthermore they deal with a much larger region than the city of Magdeburg.[115] During the period from 1850 to 1913 the British market share in Magdeburg followed a U-shaped curve, with a capital U in the first half and a small u in the second half.

[112] Voss 1904, p. 21. The price of brown coal was relatively low during the 1880s.

[113] Voss 1904, pp. 24 *et. seq.*, quotation on p. 26.

[114] Voss 1904, p. 33; Verkehr 1912, p. 2 VII.

[115] I have used these statistics already for the case study of Hamburg. For further details, see Fremdling 1989. My calculations are based on Verkehr 1912, pp. 2 181, 170; Güterbewegung 1912, p. 213 *et. seq.*

5.3.3. Berlin

Berlin is situated at the point of intersection of two rivers, which had already been connected by canals before the beginning of the XIXth century. In the 1840s railways improved the city's convenient location even more. With its developing suburbs, Berlin rapidly became Germany's largest and most densely populated industrial city. Without any local coal resources Berlin had to rely on imports from mostly very distant mining areas in order to satisfy its needs for primary energy. Towards the end of the XIXth century this locational disadvantage became less severe because transportation costs had declined. Suppliers from different mining areas competed with each other in Berlin, which thus suffered less than many other regions in Germany from the price policy of cartels.

But in the middle of the XIXth century the lack of locally available coal resources was still a severe handicap. Transportation costs then were so high that even as late as 1860 wood and peat were the major fuels for domestic use.[116] During the early 1840s Berlin had imported far more wood than hard coal, measured in quantities. Hard coal came exclusively from Great Britain.[117] Transported via Swinemünde/Stettin (on the Baltic) and inland waterways, most of it was used to produce coke and town gas as well as coal for forges. Upper Silesian hard coal arrived there for the first time in 1848. This coal probably had a share of barely 10 percent in the estimated 200,000 tons of hard coal consumed in 1853.[118] The available information, although scanty, suggests that the consumption of coal increased rapidly from 1840 onwards. Apart from hard coal, Berlin also imported much brown coal. More than 6 percent of about 73,000 tons consumed in 1853 came from Bohemia by ship.[119]

[116] Erläuterungen 1860, p. 13.
[117] Berlin 1896, pp. 355 *et. seq.*
[118] Zentgraf 1913, pp. 450 *et. seq.*
[119] Zentgraf 1913, p. 452.

TABLE 10. Coal Imports into Berlin and adjoining Factory Districts, 1861-1881

Year		1860	1862	1865	1871	1881
British hard coal	%	57.4	41.9	20.6	23.0	4.9
Saxon hard coal	%	0.6	2.1	1.1	0.3	0.9
Upper Silesian hard coal	%	18.5	32.1	53.9	52.4	49.8
Lower Silesian hard coal	%	7.8	6.4	6.6	11.0	9.1
Westphalian hard coal	%	-	3.2	4.7	1.1	6.2
Hanoverian hard coal	%	-	-	-	-	0.2
Bohemian brown coal	%	2.8	2.3	3.6	6.1	16.3
German Brown coal	%	12.8	11.9	9.4	6.1	12.7
Total (1.000 metric tons)		354.2	431.7	652.4	1,073.1	1,545.7

Source: Erläuterungen. 1860, p. 37; 1862, pp. 37 *et. seq.*; 1865, pp. 42 *et. seq.*; 1871, pp. 33 *et. seq.*; 1881, p. 37 *et. seq.*

Better data are available from 1860 onwards (see Table 10).[120] The tendency in the long run is clearly visible: British coal, which reached Berlin almost exclusively by water, lost considerable market shares until 1881 and Upper Silesian coal profited heavily from this loss. Except for 1860, most of the coal was transported by railway. Coal from both Upper and Lower Silesia was able to gain increasing market shares because the railway had reduced its freight rates drastically. Whereas Saxon hard coal hardly achieved much significance, after initial difficulties Westphalian coal even outstripped British coal in 1881, reaching Berlin by rail. Except for 1871, German brown coal mantained a high market share. Bohemian brown coal increased its market shares considerably both in 1871 and 1881. In those years it was partly transported on inland waterways but the last section was covered by rail.

In the late 1870s contemporaries believed that British hard coal would disappear completely from the Berlin market.[121] As shown in Tables 11 and 12, however, it recovered until 1913: British coal increased its market share from just over 5 percent in 1881 to about

[120] The source used for Table 10 also discriminates between water and rail transportation.

[121] Zentgraf 1913, p. 452.

TABLE 11. Coal Consumption in the City of Berlin, 1881-1911

	Hard Coal, Coke, Patent Fuel					Brown Coal, Patent Fuel			Total
Year	British %	Westphalian %	Lower Silesian %	Upper Silesian %	Saxon %	Bohemian %	Prussian and Saxon %		1,000 metric tons
1881	5.1	6.4	9.4	50.0	1.6	13.1	13.7		1,029
1882	6.4	6.8	10.1	50.0	0.5	10.9	15.2		1,024
1883	6.4	5.3	9.3	49.6	0.8	10.9	17.7		1,022
1884	7.5	4.9	8.8	48.6	0.6	10.1	19.4		1,065
1885	6.6	4.5	9.0	48.3	0.5	11.2	19.9		1,139
1886	6.7	4.2	9.3	48.5	0.4	9.0	21.9		1,191
1887	5.9	3.9	9.8	47.6	0.2	9.2	22.2		1,203
1888	5.8	4.2	9.0	47.3	0.1	10.2	21.8	1.5	1,292
1889	5.6	4.4	9.0	47.0	0.1	9.8	23.1	1.0	1,320
1890	5.0	4.0	9.2	48.3	.0	8.4	24.1	1.0	1,407
1891	6.9	3.9	7.1	45.0	0.2	8.9	27.2	0.8	1,332
1892	5.1	3.7	9.1	42.3	0.4	8.7	30.1	0.7	1,270
1893	7.6	3.5	9.0	43.8	0.4	7.3	27.7	0.7	1,420
1894	8.6	3.9	9.5	43.9	0.6	5.7	27.1	0.7	1,458
1895	9.2	4.5	9.1	39.7	0.5	5.0	29.9	1.0	1,427
1896	13.1	5.8	8.7	37.2	0.3	4.1	30.1	0.8	1,635
1897	12.5	7.3	8.0	37.6	0.3	3.7	29.9	0.7	1,689
1898	11.3	7.0	8.2	40.4	0.2	3.0	29.4	0.5	1,693
1899	9.2	8.6	9.6	39.5	0.1	2.5	30.0	0.6	1,707
1900	12.9	6.5	7.8	36.7	0.1	1.7	34.0	0.4	1,793
1901	14.4	5.9	7.8	36.5	0.2	1.4	33.3	0.5	1,948
1902	11.8	6.1	8.3	36.5	0.6	0.8	35.1	0.3	1,762
1903	11.8	6.2	9.3	37.2	0.3	0.6	34.3	0.3	1,875
1904	14.6	5.5	10.1	30.7	0.3	0.8	37.7	0.2	1,819
1905	17.5	6.0	6.5	32.9	0.2	0.8	35.9	0.3	2,045
1906	14.5	7.7	5.5	33.8	0.2	1.0	37.2	0.2	2,037
1907	20.2	7.7	5.6	31.1	0.2	0.8	34.2	0.1	2,332
1908	22.5	7.2	4.9	26.9	0.3	0.3	37.7	0.2	2,228
1909	25.4	7.9	4.2	25.9	0.3	0.2	36.2	0.1	2,372
1910	25.2	8.5	5.0	25.9	0.1	0.1	35.0	0.1	2,159
1911	24.4	7.9	5.3	23.3	0.8	0.1	38.0	0.1	2,062

Source and notes: Zentgraf 1913, p. 453. After 1888 Prussian and Saxon brown coal are split up into patent fuel and other coal.

TABLE 12. Coal Imports of Berlin and Suburbs, 1904-1913

Year		1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
British hard coal	%	13.9	15.0	13.0	19.2	22.2	24.2	24.7	24.7	20.3	24.6
Saxon hard coal	%	0.8	1.0	0.3	0.3	0.3	0.3	0.2	0.7	1.0	0.3
Upper Silesian hard coal	%	33.5	36.3	38.6	35.0	32.9	31.2	32.0	28.5	35.9	29.5
Lower Silesian hard coal	%	10.4	7.9	6.1	5.2	4.2	3.8	4.5	4.8	4.8	5.2
Westphalian hard coal	%	5.8	6.0	7.8	8.4	6.9	8.4	8.1	7.2	6.8	7.9
Bohemian brown coal	%	0.8	0.8	1.0	0.8	0.6	0.5	0.4	0.5	0.4	0.4
German brown coal	%	0.5	0.4	0.5	0.5	0.3	0.1	0.1	0.3	0.2	0.2
Patent fuel (brown coal)	%	34.3	32.5	32.8	30.6	32.7	31.6	30.0	33.3	30.6	31.9
Total (1,000 metric tons)		4,328.9	4,870.6	5,082.7	5,689.0	5,831.5	6,150.9	5,739.0	5,719.2	7,010.8	6,719.7

Source: Berliner Jahrbuch, 1906, p. 181; 1907, p. 203; 1908, p. 199; 1909, p. 182; 1910, p. 198; 1911, p. 215; 1912, p. 207; 1913, p. 213.

one quarter shortly before World War I. This strong recovery was due both to the unfavourable price policy of the German coal cartels and to the favourable development of water freight rates compared to those of the railway. The market shares of both Silesian mining areas suffered a relative decline in those late years, but in absolute terms Silesia now, as earlier, supplied most of the hard coal to Berlin. Ruhr coal did finally gain a footing in the Berlin market. Concerning other German mining areas, it was mainly their patent fuel (brown coal) which won extraordinary market shares. Bohemian brown coal, which had done well in the 1870s and 1880s, could not stand up to this competition and was nearly pushed out of the Berlin market before World War I. In the early XXth century Berlin was the major consumer of coal outside the coal fields and at least[122] five different mining districts competed to supply this market.

5.3.4. Synopsis on Northern Germany

The analysis of regional coal markets in northern Germany revealed clear-cut developments in the long run. In the middle of the XIXth century hard coal from Great Britain predominated, frequently being the only supply to hand. Declining transportation costs of overland haulage by rail enabled suppliers from German mining areas to penetrate these markets and by the 1880s they had succeeded in undermining the British predominance. British suppliers even seemed to have disappeared from some markets for good. But this trend was uneven: up to 1913 British coal recovered strongly without ever regaining its former preponderance. There were two main reasons for the British recovery: first, freight rates by sea and inland waterways decreased more than those on railways and second, cartelisation tended to raise the prices of German coal more than proportionately compared to those for British coal.[123]

[122] One could further differentiate various German brown coal-producing areas and British hard-coal districts.

[123] On this point, however, I have not yet gathered any quantitative evidence.

For 1913 the competitive relation between British and German coal can be summarised in the following figures:[124]

British coal marks per ton		German coal marks per ton	
price at pit-head			
Durham gas best unscreened	13.45	Rhenish-Westphalian gas slack[125]	14.50
		Upper Silesian gas slack	14.40
freight rates			
Tyne-Hamburg	3.85	Gelsenkirchen-Hamburg	5.60
Tyne-Bremen	4.10	Gelsenkirchen-Bremen	4.50
Tyne-Stettin	5.49	Gelsenkirchen-Stettin	7.40
costs of transhipment			
ship to railway	0.70		
ship to ship	0.50		
railway to ship	0.30		
local prices			
Hamburg	17.60-18.00	Hamburg	19.70-20.10
Bremen	17.85-18.25	Bremen	18.60-19.00
Stettin	19.24-19.64	Stettin	21.40-21.80

6. Conclusion

Industry in the XIXth century was widely based on coal-using techniques. Hence, those regions poorly endowed with coal started with a handicap. They could overcome this through importing coal, this is true, but - *ceteris paribus* - the higher price of coal still made industries outside the mining areas less competitive. Nevertheless, the lack of local coal was not altogether prohibitive for successful industrialisation, as several cases show. After all indigenous coal

[124] Regul 1933, p. 80.
[125] In German: Gasförderkohle.

resources did not in any case guarantee cheap supplies, for successful cartelisation could raise the price well above competitive levels. But lower transportation costs enabled some regions to draw on the coal resources of competitive mining areas and thus avoid the price raising policies of cartels. Thus from the start neither the lack of local coal resources nor the dependency on powerful indigenous suppliers debarred a region from industrialisation if transportation was cheap enough to overcome these locational disadvantages.

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