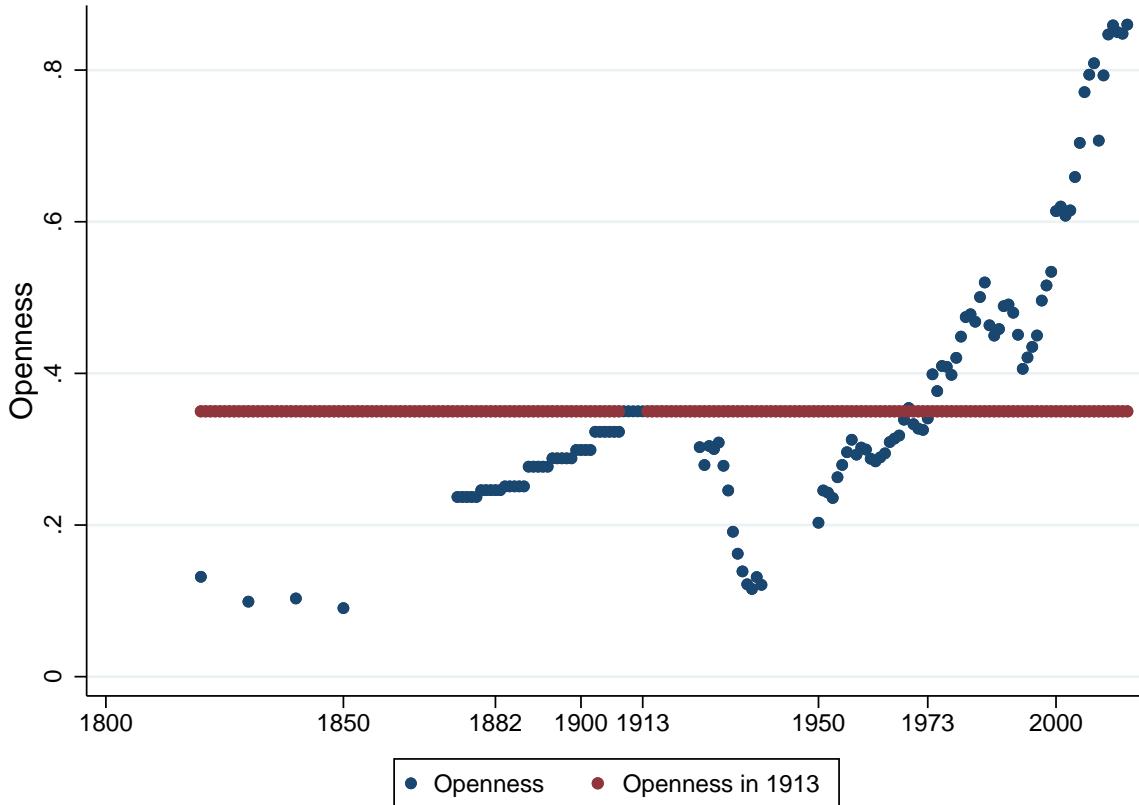


## VII Online Appendix

### Figures

Figure A.I: Openness in Germany from 1820 to 2015



Notes: The variable openness is defined as share of exports plus imports over GDP. The red line illustrates the level of openness reached in 1913 and the graph shows that this level was passed sustainable only sixty years later. The data steam from different sources with possibly different price indices. GDP data for 1820, 1830, 1840, and 1850 interpolated from Fremdling (1995) and nominal trade data from Bondi (1958). The data for 1874-1913 are five-year averages taken from Torp (2014). Torp (2014) measures openness normalized by GNP. The data for 1925-1938 taken from Ritschl (2002). Observations from 1950-2015 calculated from statistics published by Federal Statistical Office of Germany (2016).

Federal Statistical Office of Germany (2016) online sources retrieved on 20 September, 2016:

[https://www.destatis.de/DE/ZahlenFakten/Indikatoren/Globalisierungsindikatoren/Tabellen/01\\_02\\_03\\_AH.html](https://www.destatis.de/DE/ZahlenFakten/Indikatoren/Globalisierungsindikatoren/Tabellen/01_02_03_AH.html)

[https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/VGR/Inlandsprodukt/Tabellen/Volkseinkommen1925\\_pdf.pdf?\\_\\_blob=publicationFile](https://www.destatis.de/DE/ZahlenFakten/GesamtwirtschaftUmwelt/VGR/Inlandsprodukt/Tabellen/Volkseinkommen1925_pdf.pdf?__blob=publicationFile)

<https://www.destatis.de/DE/ZahlenFakten/Indikatoren/LangeReihen/Aussenhandel/lrah101.html>

Figure A.II: Map of districts

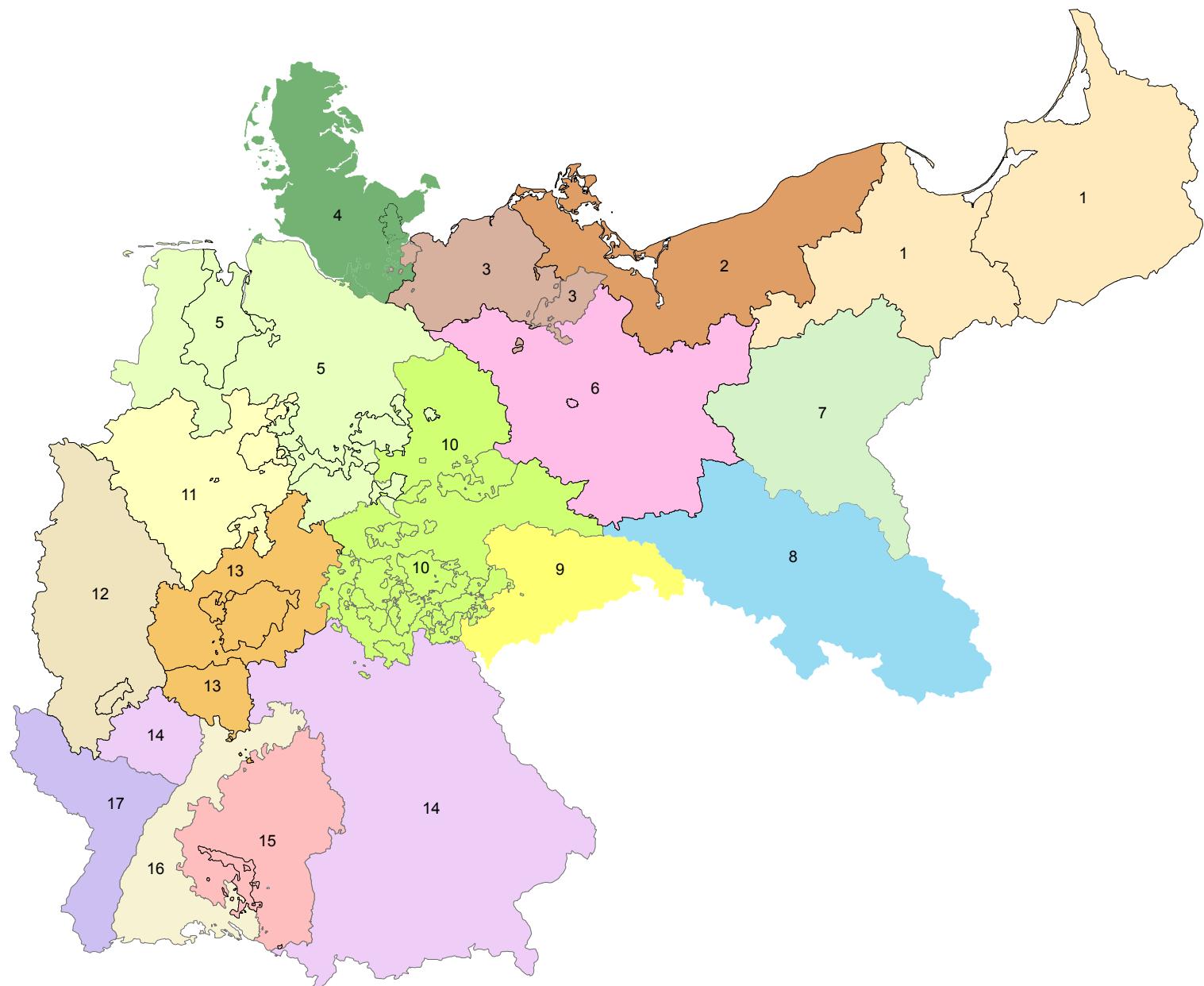


Figure A.III: Sample bilateral trade flow

Verkehrsbezirk Nr. 1a.												
Nr.	Bezeichnung der Verkehrs-Bezirke.			Eisen- und Stahldraht				Eisen- und Stahlwaren		19a		
		18		V.		E.		V.			E.	
		1a	Prov. Ostpreußen . . . . .	I.		91		3127				
1b	Prov. Westpreußen . . . . .	3		8		354		1835				
2a	Ostpreußische Häfen . . . . .	36		421		992		7848				
2b	Westpreußische Häfen . . . . .	4		78		269		1347				
3	Prov. Pommern . . . . .	—		5		33		119				
4	Pommersche Häfen . . . . .	—		1		21		18				
5	Großh. Mecklenburg ic. . . . .	—		—		4		2				
6	Häfen Rostock bis Flensburg . . . . .	—		1		—		208				
7	Prov. Schleswig-Holstein ic. . . . .	—		—		5		—				
8	Glibhäfen . . . . .	—		—		2		15				
9	Weierhäfen . . . . .	—		—		—		2				
10	Emshäfen . . . . .	—		—		24		424				
11	Prov. Hannover, Oldenburg ic. . . . .	—		—		92		742				
12	Prov. Posen . . . . .	10		9		—		—				

Verkehrsbezirk 136												
Nr.	Bezeichnung der Verkehrs-Bezirke.			Eisen- und Stahldraht				Eisen- und Stahlwaren		19a		
		18		V.		E.		V.			E.	
		1a	Prov. Ostpreußen . . . . .	I.		9		10			742	
1b	Prov. Westpreußen . . . . .	58		24		3248		2147				
2a	Ostpreußische Häfen . . . . .	—		5		335		48				
2b	Westpreußische Häfen . . . . .	4		2		206		476				
3	Prov. Pommern . . . . .	—		4		459		682				
4	Pommersche Häfen . . . . .	—		106		43		199				
5	Großh. Mecklenburg ic. . . . .	—		—		44		56				
6	Häfen Rostock bis Flensburg . . . . .	—		5		—		127				
7	Prov. Schleswig-Holstein ic. . . . .	—		—		8		34				
8	Glibhäfen . . . . .	—		2		26		50				
9	Weierhäfen . . . . .	—		—		2		—				
10	Emshäfen . . . . .	—		—		9		11				
11	Prov. Hannover, Oldenburg ic. . . . .	—		20		197		636				
12	Prov. Posen . . . . .	—		540		—		9401				

Notes: The figure shows a bilateral trade flow between one trade district of district 1 and district 7. The "V" at the top of the column indicates exports and the "E" represents imports. It shows for the industry "Iron and steel products" (framed in red at the top of both pages) in 1907. The red framed boxes illustrate exports of trade district one correspond to the imports of trade district twelve and vice versa. Source: Statistik der Güterbewegung auf Deutschen Eisenbahnen im Jahre 1907.

## **Definitions**

### **Product group definition**

- Product group 1:
  - Iron ore
  - Iron and steel
  - Hard coal
  - Brown coal
  - Iron and steel products
- Product group 2:
  - Stone
  - Earth, gravel, and sand
  - Lime and cement
  - Glass
- Product group 3:
  - Chemistry products
  - Fertilizer
  - Fat and oils
  - Petroleum and other mineral oils
- Product group 4:
  - Wool
  - Cotton
- Product group 5:
  - Paper
  - Leather
  - Timber

## List of districts (Tables III-IV and Tables A.VI-A.IX)

- 1: Provinces of East and West Prussia and seaports Memel, Pillau, Königsberg, Elbing, and Neufahrwasser
- 2: Province of Pomerania and seaports Stolpmünde, Rügenwalde, Colberg, Stettin, Swinemünde, Wolgast, and Stralsund
- 3: Grand Duchies of Mecklenburg-Strelitz and Mecklenburg-Schwerin and seaports Rostock, Warnemünde, and Wismar<sup>28</sup>
- 4: Province of Schleswig-Holstein, City of Lübeck, City of Hamburg, Principality of Lübeck and seaports Flensburg, Kiel, Lübeck, Hamburg, Altona, and Glückstadt<sup>2829</sup>
- 5: City of Bremen, Province of Hanover, Duchy of Oldenburg, Duchy of Braunschweig, Principality of Schamburg-Lippe, counties Pyrmont and Rinteln, and seaports Harburg, Stade, Cuxhaven, Bremen, Vegesack, Geestemünde, Bremerhaven, Nordenham, Brake, Elsfleth, Emden, Leer, and Papenburg<sup>2829</sup>
- 6: Urban district of Berlin and Province of Brandenburg
- 7: Province of Posen
- 8: Province of Schlesien
- 9: Kingdom Saxony
- 10: Province of Saxony, Grand Duchy Sachsen-Weimar, Duchies of Sachsen-Meiningen, Sachsen-Altenburg, Sachsen-Coburg-Gotha, Anhalt, Principalities of Schwarzburg-Sonderhausen, Schwarzburg-Rudolfstadt, Reuss-Greiz, and Reuss-Gera, and county Schmalkalden
- 11: Province of Westphalia, Principality of Lippe, Principality of Walbeck without county Pyrmont
- 12: Province of Rhineland and Principality of Birkenfeld without county Wetzlar<sup>29</sup>

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<sup>28</sup>Two trade districts defined in the railway statistics include seaports from two of the seventeen districts: railway district “Seaports Rostock, Wismar, Flensburg, Kiel and Lübeck” contains seaports from districts three and four. Railway district “Seaports Hamburg, Altona, Glückstadt, Harburg, Stade and Cuxhaven” contains seaports from districts four and five. As allocation rule to proxy trade in each district, I assign the share of the trade flow to each district according to their share of the number of ships trading goods in each of these ports.

<sup>29</sup>The Grand Duchy Oldenburg consisted of separate territories Duchy of Oldenburg, Principality of Birkenfeld, and Principality of Lübeck, which by construction belong to three different districts. For 1882 it is feasible to correctly allocate the number of firms to each spatial unit. For years 1895 and 1907 this study makes use of industry census data that contain information about the number of firms of each spatial unit. Firms are allocated according to the corresponding industry shares taking into account the differences in total employment within each industry.

- 13: Province of Hesse-Nassau and Grand Duchy of Hesse with county Wetzlar but without counties Rinteln and Schmalkalden
- 14: Kingdom of Bavaria and Bavarian Palatine<sup>30</sup>
- 15: Kingdom of Württemberg and Province of Hohenzollern
- 16: Grand Duchy of Baden<sup>30</sup>
- 17: Alsace Lorraine

Districts in railway statistics assign the following counties different from census data which follow administrative boundaries:

- County Pyrmont in Waldeck located in district eleven is assigned to district five
- County Rinteln located in district thirteen is assigned to district five
- County Schmalkalden located in district thirteen is assigned to district ten
- County Wetzlar located in district twelve is assigned to district thirteen

The administrative structure divided the German Empire into 1,049 counties in 1900. I cannot correct for this assignment, because firm size distribution data are not available at the county level. However, this departure from administrative boundaries does not induce any systematic measurement error given the size of these counties.

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<sup>30</sup>Mannheim belonged to Grand Duchy Baden and Ludwigshafen to Kingdom of Bavaria. Hence, the railway district “Mannheim and Ludwigshafen” contains parts of two districts. Trade flows of the railway district are apportioned according to the share of employment of Mannheim (Grand Duchy Baden) and Ludwigshafen (Kingdom of Bavaria) of total employment of Mannheim and Ludwigshafen in the corresponding industry group.

**List of 17 countries and regions outside of German Empire included as trading partners  
in international exports and imports on railway**

- Russia
- Poland
- Galicia and Bukovina
- Romania
- Hungary, Slavonia, Croatia, Transylvania, Bosnia and Herzegovina
- Serbia, Bulgaria, Turkey, and Greece
- Bohemia
- Austria (without Bohemia and Galicia)
- Switzerland
- Italy
- France
- Luxembourg
- Belgium
- Netherlands
- Great Britain
- Sweden and Norway
- Denmark

### **List of districts (Table VI and Table A.X)**

- Provinces of East and West Prussia; Province of Pomerania;
- Grand Duchy of Mecklenburg-Strelitz; Grand Duchy of Mecklenburg-Schwerin;
- Province of Schleswig-Holstein; City of Lübeck; City of Hamburg<sup>31</sup>; City of Bremen<sup>31</sup>;
- Province of Hanover; Grand Duchy Oldenburg; Duchy of Braunschweig; Principality of Schaumburg-Lippe;
- Berlin and Province of Brandenburg; Province of Posen;
- Province of Schlesien; Kingdom Saxony;
- Province of Saxony; Grand Duchy Sachsen-Weimar; Duchy of Sachsen-Meiningen; Duchy of Sachsen-Altenburg; Duchy of Sachsen-Coburg-Gotha; Duchy of Anhalt;
- Principality of Schwarzburg-Sonderhausen; Principality of Schwarzburg-Rudolfstadt;
- Principality of Reuss-Greiz; Principality of Reuss-Gera;
- Province of Westphalia; Principality of Lippe; Principality of Walbeck;
- Province of Rhineland; Province of Hessa-Nassau; Grand Duchy of Hessa;
- Kingdom of Bavaria; Kingdom of Württemberg;
- Province of Hohenzollern; Grand Duchy of Baden; Alsace Lorraine

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<sup>31</sup>The cities of Bremen and Hamburg joined the Zollverein in 1888. Observations for these districts are included in the sample from 1895.

## Details on Industry Census Data

Industry surveys were conducted at the municipality level. Municipalities were divided into counting districts and one assistant was responsible for each counting district. Assistants distributed and collected the surveys and checked their consistency. Assistants were asked to survey not more than 50 households and companies in a counting district such that distribution and collection of surveys was feasible within a time frame of one week.<sup>32</sup> Information about the counting was announced early and no public events should take place two days prior, on the day of the counting, and one day after the counting. Assistants filled out control lists passed to the head of the municipality. Thereafter, the head of the municipality had to confirm the consistency of the counting by signature before the results were transferred to the county and then to the regional statistical office. Not only summaries were transferred, but also the questionnaires themselves were shipped to the responsible statistical office of the state in which a county was located. Companies were forced by law to participate in the survey and the director of each company had to confirm the truthfulness of their information by signature. Misreporting was punished by 30 Mark in all census years which corresponds to a nominal value in 2015 of 213 Euro (1882) and 174 Euro (1907). Hence, measurement error stemming from untruthful reporting is unlikely to be an issue.<sup>33</sup> On the other hand, municipalities were offered an incentive to provide full coverage of industry and occupation census. For each inhabitant, they received one Pfennig before the counting, one Pfennig three and a half months after the counting day, and one Pfennig on January 1st in 1895 in the case of the 1895 census.<sup>34</sup>

To the best of my knowledge, the availability of data in the German Empire provides an unparalleled opportunity to combine trade and industry census data at the regional level in this historical context, particularly in contrast to the other two largest economies in terms of GDP in this period - the United Kingdom and the United States. In the United Kingdom, no industry census was conducted for the period under consideration. In the United States, information on companies was collected early on incidentally to the collection of population data with a frequency of decennial census. However, only companies with a value of production of more than 500 dollars were counted. According to Hesse (1914), a significant fraction of factories and small companies had not been counted arbitrarily. In addition, Hesse cites Francis Walker, who in 1869 was chief of the statistical office in Washington and census superintendent for the 1870 and 1880 censuses. According to Walker, respondents had little incentives to report truthfully due to fear of the use of census data by tax authorities or simply to escape counting.

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<sup>32</sup>Information on the counting procedure is exemplary presented for 1895 but it was similar in other census years.

<sup>33</sup>Information retrieved from [https://www.bundesbank.de/Redaktion/DE/Downloads/Statistiken/Unternehmen\\_Und\\_Private\\_Haushalte/Preise/kaufkraftaequivalente\\_historischer\\_betrage\\_in\\_deutschen\\_waehrungen.pdf?blob=publicationFile](https://www.bundesbank.de/Redaktion/DE/Downloads/Statistiken/Unternehmen_Und_Private_Haushalte/Preise/kaufkraftaequivalente_historischer_betrage_in_deutschen_waehrungen.pdf?blob=publicationFile). (accessed on 31 March, 2016), values are purchasing power equivalent of the average value of one Euro in 2015.

<sup>34</sup>100 Pfennig corresponded to one Mark, the currency of the German Empire. Payment before the counting was based on the recent population census data. For 1895 the reference year was the population census in 1890.

A comparison across years and regions before 1900 is hardly reasonable. Only from 1900 did the quality of data improve and did industry censuses comprise full coverage of all firms.<sup>35</sup>

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<sup>35</sup>Walkers' concerns are also discussed in Atack and Bateman (1999). The quality of the US census data at the aggregate level is doubtful. Atack, Haines, and Margo (2011) use digitized original firm surveys. However, for the same industries as considered in this paper their sample contains 2,567 establishments in 1880 compared to 167,767 establishments in the 1882 census data deployed here.

## Tables

Table A.I: Firm number across size categories

Number of employees	(1) 1-50	(2) >50
1875	356,493	3,187
1882	163,942	3,825
1895	176,537	5,941
1907	186,653	8,862

Notes: The table shows the distribution of firms by size category aggregated across districts and industries. The category 1-5 employees includes self employment in 1875. Author's calculations based on various volumes of Statistik des deutschen Reichs.

Table A.II: Employment across districts

District Number	(1) 1882	(2) 1895	(3) 1907
1	22,457	30,426	48,970
2	18,321	23,283	30,783
3	7,356	9,790	12,112
4	26,154	39,178	64,155
5	61,925	86,074	121,060
6	98,294	145,924	202,948
7	10,089	14,652	20,050
8	135,555	201,906	284,813
9	149,207	218,240	300,201
10	120,570	154,649	211,147
11	148,009	225,042	372,090
12	255,638	346,811	546,836
13	58,036	93,204	122,288
14	108,678	185,385	238,849
15	43,736	66,083	85,581
16	35,424	55,505	80,467
17	90,647	99,973	146,698
Sum	1,390,096	1,996,125	2,889,048

Notes: Total employment across industries by district. Author's calculations based on various volumes of Statistik des deutschen Reichs.

Table A.III: Population across districts

District Number	(1) 1882	(2) 1895	(3) 1907
1	3,302,528	3,450,746	3,633,579
2	3,434,972	4,409,244	5,706,576
3	1,517,712	1,575,052	1,702,286
4	1,665,617	1,774,046	1,964,806
5	3,998,782	4,355,477	4,993,098
6	3,754,116	4,328,073	4,889,295
7	1,689,621	2,080,890	2,599,051
8	2,922,288	3,364,889	3,986,105
9	2,234,514	2,850,951	3,980,652
10	4,147,917	5,090,825	6,697,844
11	5,268,761	5,779,176	6,598,168
12	3,014,822	3,753,262	4,585,500
13	2,023,843	2,136,572	2,406,659
14	1,558,598	1,719,238	2,057,561
15	2,474,327	2,768,928	3,351,508
16	674,160	709,836	747,592
17	1,539,580	1,623,079	1,820,249
Total	45,222,158	51,770,284	61,720,529

Notes: Population across districts and time. Author's calculation based on Statistik des deutschen Reichs Volume 111 and Statistik des deutschen Reichs Volume 213.

Table A.IV: Growth in aggregate trade flows by industry

Industry	(1) 1895	(2) 1907	(3) Growth 1907-1895
Iron ore	6593530.5	17571503	166.50
Iron and steel	8388174.5	18715335.5	123.12
Hard coal	62952158	119445599.5	89.74
Brown coal	8897812.5	20767049	133.40
Stone	7775992	19756658.5	154.07
Earth, gravel, and sand	2973685	9270452.5	211.75
Lime and cement	3117064	7340835.5	135.50
Glass	571520	1150965.5	101.39
Iron and steel products	877290.5	2604348	196.86
Chemistry products	328992.5	1424734.5	333.06
Fertilizer	3288050	9176433.5	179.08
Fat and oil	415939	824169	98.15
Petroleum and other mineral oil	706633.5	1586558	124.52
Wool	374385.5	447877.5	19.63
Cotton	613178.5	1089256.5	77.64
Paper	799640.5	2005809	150.84
Leather	317944.5	556044	74.89
Timber	7976467	14792960.5	85.46

Notes: The table displays aggregate trade flows by industry in 1895 and 1907. Column (3) shows the growth rate in this period. Author's calculation based on bilateral trade flows digitized from various volumes of Statistik der Güterbewegung auf deutschen Eisenbahnen.

Table A.V: Extensive margin for domestic and international trade

	(1) 1883	(2) 1895	(3) 1907	(4) Difference 1907-1883
Panel A: Mean across industries				
Domestic destination/source	11.81	13.40	14.71	2.90
Foreign destination	5.04	6.53	8.17	3.13
Foreign source	3.77	4.95	6.95	3.18
Panel B: Median across industries				
Domestic destination	12.39	14.06	15.50	3.11
Domestic source	12.11	13.56	14.83	2.72
Foreign destination	5.17	7.06	8.78	3.61
Foreign source	3.78	5.11	7.11	3.33

Notes: Panel A displays the mean number of destinations for seventeen districts defined in the Online Appendix across industries. Panel B shows average of the median number of destinations by industry. Domestic destination is the number of domestic regions that import from a domestic district including the district itself. Domestic source is the number of domestic regions that exports to a domestic district including the district itself. Foreign destination is the number of foreign regions that import from a domestic district. Foreign source is the number of foreign regions that export to a domestic district. The number of domestic and foreign regions is seventeen, respectively. Author's calculation based on bilateral trade flows digitized from various volumes of Statistik der Güterbewegung auf deutschen Eisenbahnen.

Table A.VI: Firm share and aggregate trade - adding industry-time fixed effects

	(1)	(2)
	firmshare <sub>ijt</sub>	
Number of employees	> 50	> 200
Mean of dep var	0.1629	0.0599
ln(aggregate trade <sub>ijt</sub> )	0.0286 (0.0298)	0.0247* (0.0143)
Estimation method	Fixed eff.	Fixed eff.
R <sup>2</sup>	0.285	0.278
Number of districts	17	17
Number of industries	18	18
Observations	554	554

Notes: OLS estimates of equation (3) using industry-time fixed effects. The unit of observation is at the district-industry-class-size level at time t. The dependent variable in column (1) is the share of firms with more than 50 employees in industry i, district j at time t. The dependent variable in column (2) is the share of firms with more than 200 employees in industry i, district j at time t. The independent variable is the logarithm of aggregate trade as defined in equation (1) for the respective district-industry pair. The sample consists of all district-industry pairs in 1895 and 1907. All regressions include district-industry, district-time fixed effects, industry-time fixed effects, and the pre-trend of the dependent variable as control. Robust standard errors in parentheses. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.VII: Firm share and aggregate trade - beta regression

	firmshare <sub>i,jt</sub>
Number of employees	> 50
Mean of dep var	0.1629
ln(aggregate trade <sub>i,jt</sub> )	0.4098** (0.1944)
Estimation method	Maximum likelihood
log likelihood	1148.674
Number of districts	17
Number of industries	18
Observations	554

Notes: Maximum likelihood estimates of equation (3). The unit of observation is at the district-industry-class-size level at time t. The dependent variable is the share of firms with more than 50 employees in industry i, district j at time t. Following Smithson and Verkuilen (2006) the firm share is transformed such that it lies in between 0 and 1. The independent variable is the logarithm of aggregate trade as defined in equation (1) for the respective district-industry pair. The sample consists of all district-industry pairs in 1895 and 1907. The regression includes district-industry, district-time fixed effects, product-group-time fixed effects, and the pre-trend of the dependent variable as control. Robust standard errors in parentheses. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.VIII: Firm share and aggregate trade - heterogeneity across product groups

	firmshare <sub><i>ijt</i></sub>
Number of employees	> 50
Mean of dep var	0.1629
ln(aggregate trade <sub><i>ijt</i></sub> ) × (product group 1 <sub><i>i</i></sub> )	-0.0064 (0.0368)
ln(aggregate trade <sub><i>ijt</i></sub> ) × (product group 2 <sub><i>i</i></sub> )	0.2003** (0.0933)
ln(aggregate trade <sub><i>ijt</i></sub> ) × (product group 3 <sub><i>i</i></sub> )	0.0362 (0.0236)
ln(aggregate trade <sub><i>ijt</i></sub> ) × (product group 4 <sub><i>i</i></sub> )	0.0105 (0.0277)
ln(aggregate trade <sub><i>ijt</i></sub> ) × (product group 5 <sub><i>i</i></sub> )	0.1110*** (0.0417)
Estimation method	Fixed eff.
R <sup>2</sup>	0.222
Number of districts	17
Number of industries	18
Observations	554

Notes: OLS estimates of equation (3). The unit of observation is at the district-industry-class-size level at time t. The dependent variable is the share of firms with more than 50 employees in industry i, district j at time t. The independent variables are the logarithm of aggregate trade as defined in equation (1) interacted with five product group fixed-effects for the respective district-industry pair. The sample consists of all district-industry pairs in 1895 and 1907. All regressions include district-industry, district-time fixed effects, product-group-time fixed effects, and the pre-trend of the dependent variable as control. Robust standard errors in parentheses. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.IX: Firm share and aggregate trade - robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)
	firmshare <sub>ijt</sub>					
Number of employees	> 50					
Mean of dep var	0.1629					
ln(aggregate trade <sub>ijt</sub> )	0.0777*	0.0844*	0.1135*	0.0949*	0.0958*	0.0875***
	(0.0432)	(0.0453)	(0.0615)	(0.0561)	(0.0537)	(0.0289)
ln(aggregate trade <sub>ijt</sub> ) × (sea access <sub>j</sub> )	0.0118 (0.0536)					
ln(aggregate trade <sub>ijt</sub> ) × (intermediate <sub>i</sub> )	0.0533 (0.0618)					
ln(aggregate trade <sub>ijt</sub> ) × (top 3 coal <sub>j</sub> )	-0.0202 (0.0494)					
ln(aggregate trade <sub>ijt</sub> ) × (top 4 urban share <sub>j</sub> )	-0.0215 (0.0467)					
Estimation method	F.E. IV	F.E. IV	F.E. IV	F.E. IV	F.E. IV	F.E. IV
R <sup>2</sup>	0.183	0.176	0.099	0.171	0.166	0.172
Number of districts	17	17	17	17	17	17
Number of industries	18	18	18	18	18	18
Observations	554	554	554	554	554	554

Notes: Instrumental variable estimates of equation (3). The unit of observation is at the district-industry-class-size level at time t. The dependent variable is the share of firms with more than 50 employees in industry i, district j at time t. The independent variable is the logarithm of aggregate trade as defined in equation (1) for the respective district-industry pair. The first-stage regression is defined in equation (6). The sample consists of all district-industry pairs in 1895 and 1907. The regression in column (1) adds the share of railway trade as of trade on railway and waterway as control. Column (2) analyzes heterogeneity by sea access. Column (3) studies heterogeneity by intermediate producing industries. Column (4) tests for heterogeneity by the three largest coal producing districts. Column (5) examines heterogeneity by the top four districts in which the share of population in cities above 100k inhabitants as of the total population in 1895. Column (6) calculates HAC consistent standard errors following Conley (1999). All regressions include district-industry, district-time fixed effects, product-group-time fixed effects, and the pre-trend of the dependent variable as control. Robust standard errors in parentheses. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

Table A.X: Firm share and tariffs - robustness checks

	(1)	(2)	(3)	(4)
	$\Delta \text{firmshare}_{ijt}$			
Number of employees	$> 200$			
Mean of dep var	0.0095			
$\Delta \text{tariff}_{it}$	-0.1272*	-0.0929**	-0.1290***	-0.1256***
	(0.0666)	(0.0394)	(0.0459)	(0.0395)
$\Delta \text{tariff}_{it} \times (\text{agglomeration}_j)$	0.0321			
	(0.0775)			
$\Delta \text{tariff}_{it} \times (\text{population growth above median}_j)$		-0.0282		
		(0.0710)		
$\Delta \text{tariff}_{it} \times (\text{junker district}_j)$			0.0597	
			(0.0660)	
$\Delta \text{tariff}_{it} \times (\text{low import share}_i)$				0.0984
				(0.0663)
Estimation method	First diff.	First diff.	First diff.	First diff.
$R^2$	0.074	0.074	0.075	0.076
Number of districts	37	37	37	37
Number of industries	18	18	18	18
Observations	1,559	1,559	1,559	1,559

Notes: Estimates of equation (10). The unit of observation is at the district-industry-class-size level at time t. The dependent variable is the first difference of share of firms with more than 200 employees in industry i, district j at time t. The independent variable is the first difference in tariffs measured in percent for the respective industry. Column (1) analyzes heterogeneity by agglomeration with a dummy equal to one if the population density was above median in at least two census years. Column (2) investigates heterogeneity by population growth with a dummy equal to one if the population growth was above median between two censuses. Column (3) tests for lobbying with a dummy equal to one if the district was dominated by the Junker elite. The districts were Grand Duchy Mecklenburg-Schwerin, Grand Duchy Großherzogtum Mecklenburg-Strelitz, Berlin, Duchy Anhalt, Province of Saxony, Province of Pommern, Province of Posen, Province of Ostpreußen, and Province of Schlesien. Column (4) examines heterogeneity by the import share with a dummy equal to one if the industry import share from abroad via railway was below the median between 1883 and 1907. All regressions include district-time fixed effects as control. The regression in column (4) additionally controls for a dummy, which is equal to one if the industry import share from abroad via railway was below the median between 1883 and 1907. Robust standard errors in parentheses. \* p < 0.1, \*\* p < 0.05, \*\*\* p < 0.01.

## VIII Statistical Appendix

**Kaiserliches Statistisches Amt.** Auswärtiger Waarenverkehr des Deutschen Zollgebiets im Jahre 1875. Berlin, 1876, *Statistik des deutschen Reichs Alte Folge, Band 22*.

**Kaiserliches Statistisches Amt.** Die Ergebnisse der Deutschen Gewerbezählung vom 1. Dezember 1875. Berlin, *Statistik des deutschen Reichs Alte Folge, Band 34, Theil 1*.

**Kaiserliches Statistisches Amt.** Die Ergebnisse der Deutschen Gewerbezählung vom 1. Dezember 1875. Berlin, *Statistik des deutschen Reichs Alte Folge, Band 34, Theil 2*.

**Kaiserliches Statistisches Amt.** Die Ergebnisse der Deutschen Gewerbezählung vom 1. Dezember 1875. Berlin, *Statistik des deutschen Reichs Alte Folge, Band 35, Theil 1*.

**Kaiserliches Statistisches Amt.** Gewerbestatistik nach der allgemeinen Berufszählung vom 5. Juni 1882: 2. Gewerbestatistik der Staaten und größeren Verwaltungsbezirke. Berlin, 1886, reedition as *Statistik des deutschen Reichs, Volume 7*. Osnabrück, 1973.

**Kaiserliches Statistisches Amt.** Berufs- und Gewerbezählung vom 14. Juni 1895. Die berufliche und soziale Gliederung des Deutschen Volkes. Berlin, 1899, reedition as *Statistik des deutschen Reichs, Volume 111*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Gewerbezählung vom 14. Juni 1895. Gewerbestatistik der Bundesstaaten. Erster Theil. Berlin, 1898, reedition as *Statistik des deutschen Reichs, Volume 114*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Gewerbezählung vom 14. Juni 1895. Gewerbestatistik der Bundesstaaten. Zweiter Theil. Berlin, 1898, reedition as *Statistik des deutschen Reichs, Volume 115*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Gewerbezählung vom 14. Juni 1895. Gewerbestatistik der Verwaltungsbezirke. Zweiter Theil. Berlin, 1898, reedition as *Statistik des deutschen Reichs, Volume 118*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Betriebszählung vom 12. Juni 1907. Berufsstatistik. Abteilung X. Berlin, 1913, reedition as *Statistik des deutschen Reichs, Volume 211*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Betriebszählung vom 12. Juni 1907. Gewerbliche Betriebsstatistik. Abteilung I. Berlin, 1910, reedition as *Statistik des deutschen Reichs, Volume 213*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Betriebszählung vom 12. Juni 1907. Gewerbliche Betriebsstatistik. Abteilung III. Berlin, 1910, reedition as *Statistik des deutschen Reichs, Volume 215*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Betriebszählung vom 12. Juni 1907. Gewerbliche Betriebsstatistik. Abteilung IV. Berlin, 1910, reedition as *Statistik des deutschen Reichs, Volume 216*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Betriebszählung vom 12. Juni 1907. Gewerbliche Betriebsstatistik. Abteilung VII. Berlin, 1909, reedition as *Statistik des deutschen Reichs, Volume 219*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Berufs- und Betriebszählung vom 12. Juni 1907. Gewerbliche Betriebsstatistik. Abteilung VIII. Berlin, 1914, reedition as *Statistik des deutschen Reichs, Volume 220*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Auswärtiger Handel des deutschen Zollgebiets im Jahre 1895. 1. Theil: Der auswärtige Handel nach Menge und Werth der Waaren-Gattungen und der Verkehr mit den einzelnen Ländern. Berlin, 1896, reedition as *Statistik des deutschen Reichs, Volume 85*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Auswärtiger Handel im Jahre 1907. Darstellung nach Waren-gattungen. Berlin, 1909, reedition as *Statistik des deutschen Reichs, Volume 189*. Osnabrück, 1976.

**Kaiserliches Statistisches Amt.** Auswärtiger Handel im Jahre 1907. Durchfuhr. Niederlage-, Veredlungsverkehr. Zollerträge usw. Seefischerei. Berlin, 1909, reedition as *Statistik des deutschen Reichs, Volume 191*. Osnabrück, 1976.

**Kaiserliches Statistisches Amt.** 1. Theil: Der auswärtige Waarenverkehr des deutschen Zoll-gebiets im Jahre 1882 geordnet nach den einzelnen Waarengattungen sowie der Vered-lungsverkehr. Berlin, 1883, reedition as *Statistik des deutschen Reichs, Alte Folge, Volume 60*. Osnabrück, 1969.

**Kaiserliches Statistisches Amt.** Der Verkehr auf den deutschen Wasserstraßen, insbeson-dere der Schiffs und Güterverkehr auf den deutschen Wasserstraßen nebst den beobachteten Wasserständen im Jahre 1874. Berlin, 1876.

**Kaiserliches Statistisches Amt.** Der Verkehr auf den deutschen Wasserstraßen, insbeson-dere der Schiffs und Güterverkehr auf den deutschen Wasserstraßen nebst den beobachteten Wasserständen im Jahre 1882. Berlin, 1883.

**Kaiserliches Statistisches Amt.** Die Binnen-Schifffahrt im Jahre 1895. Berlin, 1897, reedition as *Statistik des deutschen Reichs, Volume 88*. Osnabrück, 1975.

**Kaiserliches Statistisches Amt.** Monatshefte zur Statistik des Deutschen Reichs für das Jahr 1882. *Statistik des deutschen Reichs, Volume 59, No. 2*. Berlin, 1883.

**Kaiserliches Statistisches Amt.** Vierteljahreshefte zur Statistik des Deutschen Reichs für das Jahr 1895. *Vierteljahreshefte zur Statistik des deutschen Reichs, Volume 5, No. 4*. Berlin, 1896.

**Kaiserliches Statistisches Amt.** Vierteljahreshefte zur Statistik des Deutschen Reichs für das Jahr 1907. *Vierteljahreshefte zur Statistik des deutschen Reichs, Volume 17, No. 4*. Berlin, 1908.

**Kaiserliches Statistisches Amt.** Die Binnen-Schifffahrt im Jahre 1907 sowie der Bestand der deutschen Binnenschiffe am 31. Dezember 1907. Berlin, 1909, reedition as *Statistik des deutschen Reichs, Volume 192*. Osnabrück, 1976.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen III. Quartal 1883. Berlin, 1884.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen IV. Quartal 1883. Berlin, 1884.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen I. Quartal 1884. Berlin, 1884.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen II. Quartal 1884. Berlin, 1884.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen im I. Quartal 1895. Berlin, 1896.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen im II. Quartal 1895. Berlin, 1896.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen im III. Quartal 1895. Berlin, 1896.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen im Jahre 1895. Berlin, 1896.

**Königlich-Preußisches Ministerium der öffentlichen Arbeiten.** Statistik der Güterbewegung auf Deutschen Eisenbahnen im Jahre 1907. Berlin, 1908.

**Königlich-Sächsisches Statistisches Bureau.** Zeitschrift des K. Sächsischen Statistischen Bureaus. Die Ergebnisse der sächsischen Gewerbezählung vom 5. Juni 1882. Volume 32. Dresden, 1886.

**Königlich Statistisches Bureau in Berlin.** Zeitschrift des Königlich Preussischen Statistischen Bureaus. Volume 20. Berlin, 1880.

**Königlich Statistisches Bureau in Berlin.** Die Gewerbebetriebe im preussischen Staate nach der Aufnahme vom 5. Juni 1882. *Preussische Statistik*, Volume 83. Berlin, 1885.

**Königlich Statistisches Landesamt.** Statistisches Handbuch für das Königreich Württemberg. Jahrgang 1899. Stuttgart, 1900.