DISCUSSION PAPER SERIES

DP15988

The Panopticon of Germany's Foreign Trade, 1880-1913. New facts on the First Globalization

Nikolaus Wolf and Wolf-Fabian Hungerland

ECONOMIC HISTORY

INTERNATIONAL TRADE AND REGIONAL ECONOMICS

CEPR

ISSN 0265-8003

The Panopticon of Germany's Foreign Trade, 1880-1913. New facts on the First Globalization

Nikolaus Wolf and Wolf-Fabian Hungerland

Discussion Paper DP15988
Published 31 March 2021
Submitted 29 March 2021

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programmes:

- Economic History
- International Trade and Regional Economics

The Panopticon of Germany's Foreign Trade, 1880-1913. New facts on the First Globalization

Abstract

Between 1871 and 1914 Germany became the second largest exporter in the world, just behind the UK. In this paper, we present and analyze the panopticon of Germany's foreign trade expansion before the First World War. Our new data covers historical trade data in terms of imports and exports of all traded products, all trade partners and both quantities and values of trade, at annual frequency for the years 1880 to 1913. To allow for comparisons over time and in the cross-section, historical product categories are re-classified according to the Standard International Trade Classification (SITC). This granular data reveals three new insights. First, nearly all trade growth before 1914 took place along the extensive margin, in line with trade models based on within-sector heterogeneity. Second, a substantial share of foreign trade before 1914 was intra-industry, measured at five-digit SITC classification. Third, by 1914 Germany had firmly established a dominant international position in chemicals, machinery and transport equipment, particularly within Europe. We argue that this has broader implications for our understanding of the First Globalization.

JEL Classification: F14, N70, N73

Keywords: German Empire, SITC, international trade, first globalization

Nikolaus Wolf - nikolaus.wolf@wiwi.hu-berlin.de
Humboldt University Berlin and CEPR

Wolf-Fabian Hungerland - w.f.hungerland@gmail.com
Federal Ministry of Economic Affairs and Energy, Humboldt-University of Berlin

The Panopticon of Germany's Foreign Trade, 1880 – 1913. New facts on the First Globalization*

Wolf-Fabian Hungerland[†‡] Nikolaus Wolf[†§]

April 23, 2021

Abstract

Between 1871 and 1914 Germany became the second largest exporter in the world, just behind the UK. In this paper, we present and analyze the panopticon of Germany's foreign trade expansion before the First World War. Our new data covers historical trade data in terms of imports and exports of all traded products, all trade partners and both quantities and values of trade, at annual frequency for the years 1880 to 1913. To allow for comparisons over time and in the cross-section, historical product categories are re-classified according to the Standard International Trade Classification (SITC). This granular data reveals three new insights. First, nearly all trade growth before 1914 took place along the extensive margin, in line with trade models based on within-sector heterogeneity. Second, a substantial share of foreign trade before 1914 was intra-industry, measured at five-digit SITC classification. Third, by 1914 Germany had firmly established a dominant international position in chemicals, machinery and transport equipment, particularly within Europe. We argue that this has broader implications for our understanding of the First Globalization.

JEL classification: F14, N70, N73
Keywords: German Empire, SITC, international trade, first globalization

* This poject was generously funded by the Deutsche Forschungsgesellschaft (grant no. WO 1429/5-1). Matthias Qian, Philipp Keßler and Christoph Altmeppen did excellent prior research. We thank Ulrike Unterhofer, Hefeng Fang, Felix Mihram and Iris Wohnsiedler for their assistance, and Markus Lampe for helpful comments.
[†] Institute of Economic History, School of Economics and Business, Humboldt-University of Berlin, Spandauer Strasse 1, 10178 Berlin, Germany.
[‡] Federal Ministry of Economics and Energy, Berlin, w.f.hungerland@gmail.com
§ nikolaus.wolf@wiwi.hu-berlin.de.

Highlights

• We present a first complete dataset on Germany's foreign trade from 1880 to 1913, covering imports and exports in all available product categories to all trade partners, with quantities and values, and at annual frequency.

• We are the first to integrate data for the largest ports Hamburg and Bremen to German foreign trade for 1880 to 1888.

• We re-classify historical product categories to SITC, to allow comparison over time and across countries.

• We describe trade growth in its basic dimensions: growth in values, growth in the number of products, and growth in the number of trade partners.

• We find that German trade grew 1880-1913 mostly along the extensive margin, due to a combination of new products and new trade partners.

• While running an overall trade deficit before 1914 due to imports of food and raw materials, Germany had a growing trade surplus with Europe.

• Models of the First Globalization need to take the large within-sector heterogeneity into account.

1 Introduction

'*German trade statistics before 1906 are a booby trap.*'
—Lewis (1978, p. 26)

By 1914 Germany had risen to the second largest exporter in the world, just behind the UK. Ever since, Germany has been a major player in international trade. A large literature explores the country's integration and role in the world economy. The merchandise trade dimension of Germany's globalization alone has been subject of research for more than a century.[1] In particular, researchers have been trying to understand how Germany could develop from a backward, predominantly agricultural economy around 1850 into the industrial core of the global economy by 1914. The dominant explanation is one of declining trade costs that facilitated a specialization along the lines of comparative advantage. According to this view German trade expanded in line with advantages in physical and human capital at the expense of labor- and land-intensive sectors, notably textiles and agriculture.

However, research on the history of foreign trade for any country before 1945 had often to rely on aggregated data or focus on limited case studies. Still today, researchers struggle with imprecise, not fully comparable data of international trade. Using historical trade data comes with even bigger problems: product categories are entirely unstandardized, the degree of detail varies, and misreporting is widespread. The quote by Arthur Lewis above indicates that handling historical trade data from Germany is particularly difficult. Indeed, the German data are highly incomplete before 1880, they lack a harmonized product classification and the trade of Germany's two largest ports (Hamburg and Bremen) was excluded from official statistics before 1889. On

[1] See Torp (2005) for a survey and Sensch (2010) for a collection of many databases compiled in this regard.

the other hand, the data contained in original historical sources are comparatively granular and thus rather rich. They are a treasure not lifted until now.

In this paper we present a new dataset that provides what we call the "panopticon" of Germany's foreign trade 1880-1913. We show that this new evidence challenges the traditional perspective on the First globalization in several ways. In the first part of this paper, we briefly describe our main sources and methods to construct the new dataset. We digitalized all available historical records from original sources, integrated Hamburg and Bremen into the German customs union (*Zollverein*) data,[2] and re-classified all data according to the Standard International Trade Classification (SITC). In the second part of the paper we are thus able to describe and analyze Germany's integration into the world economy during the first globalization in a way that was impossible before. This connects our work to a growing literature that re-examines economic history with newly digitalized, much bigger datasets (Mitchener, 2015; Abramitzky, 2015). Moreover, the way how the data are compiled allows direct comparison to modern trade data – and thus lays the foundation for a disaggregated long-term series on Germany's international trade. Doing so, we contribute to some major revisions the historiography of international trade is currently experiencing (for example Meissner 2015, Huberman et al 2017). Specifically, we use our new data to provide a basic decomposition of trade growth along the logic of product-country trade relations. We decompose total trade into growth along the intensive margin and growth along the extensive margin.

Our evidence challenges the existing narrative for the first globalization, based on variants of the Heckscher-Ohlin-Vanek model (O'Rourke and Williamson 1999). We show that virtually all growth in German exports, 1880-1913 and about 80 percent of total growth in German imports took place along the *extensive* margin of trade. This strongly suggests that *within-sector*

[2] We use the terms '*Zollverein*', 'German customs union' and 'German tariff area' interchangeably.

heterogeneity was crucial already during the first globalization, possibly due to monopolistic competition with fixed costs and economies of scale. Second, we document that intra-industry trade was important, for both exports and imports but also for manufacturing and non-manufacturing trade. Again, this points to a role for heterogeneity within sectors, but even within "products" (which we define as a five-digit SITC category). Third, while running an overall trade deficit for each year in our data (1880-1913), Germany achieved a growing trade surplus with rich and neighbouring trade partners. To a large extent, this surplus was due to growing exports in manufacturing sectors of the "second industrial revolution", which dominate German exports until today: chemicals, machinery and transport equipment. Overall, this suggests that we need to revise our view on the first globalization. Germany did broadly specialize in manufacturing products, but both imports and export dynamics suggest a large role for within-sector heterogeneity. This matters, because it affects our interpretations about the gains from trade, their distribution and industry reallocations before 1914.

We proceed as follows. Section 2 discusses the major challenges with German trade statistics, our sources and how we constructed the new data set. In section 3 we use the data to describe German trade growth along four basic dimensions. In section 4 we decompose trade growth in terms of intensive and extensive margin trade and show the role of intra-industry trade. In section 5 we analyze the patterns of specialization and diversification over time. Section 6 summarizes the evidence and discusses some broader implications.

2 Constructing German Trade Data before 1914: Problems and Solutions

Our main data sources are the import and export tables for special trade in various volumes of the *Waarenverkehr des Deutschen Zollgebiets mit dem Auslande*, published by the Imperial Statistics Office (*Kaiserliches Statistisches Amt*).[3] As we explain below, for the years 1880-1888, we

[3] All sources are listed in Appendix A, Section A.1.

augment this with data for Hamburg from from the *Tabellarische Übersichten des Hamburgischen Handels*, published by *Handelsstatistisches Bureau* and Bremen from the *Statistik des Schiffs- und Waarenverkehrs in the Jahrbücher für Bremische Statistik* published by *Bureau für Bremische Statistik.* We re-compile, re-arrange and re-classify this data to arrive at a disaggregated but harmonised trade dataset ready for economic analysis. The major challenges for work with German trade statistics before 1914 relate to the incompleteness of data before 1880, the manifold changes in product categories over time and the fact that Germany's two largest ports were treated as *foreign* trade partners in the statistics, because they stayed outside the German customs union until the end of 1888 (Torp, 2005). We show that despite these problems, a complete disaggregated trade dataset is obtainable from 1880 onwards. In the following, we discuss three fundamental problems in the data at hand and the solutions we apply to these problems.

First, German trade data before 1880 is patchy. Before the German Empire was founded, the only German source on Germany's international trade are records on tariff collection by the different member states of the German Customs Union (Zollverein), the so-called *Kommerzialnachweisungen* (commercial certificates). These records are, however, very crude. They capture only goods subject to tariffs, refer only to observed quantities not values, and countries of origin are largely missing (only the entry point to the Zollverein is recorded).[4] After the foundation of the German Empire in 1871, the first unified trade statistics, and generally, more encompassing official statistics emerged.[5] However, under a largely free-trade regime there was little need to specify the observation of external trade, and only trade subject to tariffs was systematically recorded. Related, the early German trade data suffers from misdeclarations. Instead of the actual trade partner, the data report the country that hosts the last port of entry. Due

[4] Attempts to create values go back to Junghanns (1848), cited in Bondi (1958).

[5] The federal Imperial Statistical Office (*Kaiserliches Statistisches Reichsamt*) was founded in 1872. It thus began publishing the *Statistik des deutschen Reichs*, the key source to this and many other works.

to the introduction of protectionist tariffs in 1879, Germany started to collect data on all trade flows, covering all goods and trade partners from 1880 onwards. Overall, given that statistical information on trade before 1880 is incomplete or altogether missing, we start our data reconstruction in 1880.

Second, the number of product categories in the trade statistics changed and grew repeatedly over the years for several reasons. The number of products increased, either because actually new products were traded or because the statistical authorities changed the degree of detail to which product categories were differentiated. The most important impulse were new tariff laws, which required more detailed statistical information, notably the tariffs reforms of 1879 and 1906. As a result, the number of categories quadrupled between 1872 and 1906, from 457 import positions to 2030 and from 403 export items to 1879 (see also Torp, 2005, p. 55). Previous authors who attempted to make use of the granularity of the German trade data relied on rather crude, typically non-hierarchical re-classifications or they picked individual goods that they then compared. Therefore, two most detailed previous accounts of Höpfner (1992) and Jasper (1996) fail to provide an adequate image of the product structure of Germany's trade growth during the first globalization. Our approach is to use the Standard International Trade Classification (SITC), because it allows comparison to other countries and more recent trade data. We refer to the reader to Hungerland and Altmeppen (2021) for details in the re-classification of goods.

Third, until 1888 some parts of the German Empire stayed outside of the German customs union (*Zollverein*). More precisely, the port cities Cuxhaven and Geestemünde, and the important Hanseatic cities Hamburg and Bremen joined the *Zollverein* only in 1888 (the '*Zollanschluss*').[6] These trading hubs kept own trade records – at varying levels of detail – while the federal tariff area statistics treated these cities as foreign countries. The Hanseatic port cities were, however,

[6]Entry to the tariff area statistics was only fully consummated by 1906, except for some small areas in Baden (*Badische Zollausschlüsse*) which remained outside the tariff area.

very relevant to Germany's external trade: They commanded roughly a fifth of Germany's trade. As a result, the geographical (and commodity) structure of Germany's trade was distorted, as Buchheim (1982, p.24) notes: Countries that were the major trading partners of the Hanseatic cities are underrepresented in the statistics of the German tariff area while countries that traded relatively less with the Hanseatic cities are overrepresented.[7] To deal with this, we first reclassify all data from the German Zollverein, Hamburg and Bremen based on the SITC system. Next, we combine the three data sets extending the quota method suggested by Buchheim (1982). For further details on the method, underlying assumptions and a discussion of the quota approach see appendix B and Hungerland (2018). Applying the quota method to our data yields a new regional structure of Germany's trade: Trade with Europe decreases while trade with all other regions increases, both in absolute and in relative terms (see Table 1). Overall, the share of exports to Europe decrease by 14 percentage points (from 90 percent to 76 percent) while the share of imports decreases by 9 percentage points (from 91 percent to 82 percent). Once we differentiate further between Eastern and Western Europe, trade with the former increases, while trade with the latter decreases. The changes on the country level are even larger. For example, imports from Brazil increase by 614 percent in 1888 while exports increase by 263 percent. Other large changes (say more than 200 percent) occur for Asia, China, Japan as well as Peru and Portugal.

[7] Two examples: In 1885, 48 percent of exports from Hamburg went to the United Kingdom, but only 6 percent of exports from the German tariff area. In 1889, after Bremen's and Hamburg's entry, exports to the United States grew allegedly by 67 percent.

TABLE 1
COMPARISON OF TRADE BETWEEN 1880 AND 1888 BY REGION

	Imports				Exports			
	Uncorrected		Corrected		Uncorrected		Corrected	
	Value	Percent	Value	Percent	Value	Percent	Value	Percent
Europe	33,008	90.93	30,010	82.67	31,189	90.12	26,785	77.40
W. Europe	28,324	78.03	25,009	68.89	28,941	83.63	24,071	69.56
E. Europe	4,684	12.9	5,001	13.78	2,248	6.5	2,714	7.84
N. America	1,690	4.65	2,872	7.91	2,419	6.99	3,877	11.20
S. America	841	2.32	1,965	5.41	421	1.22	2,338	6.76
Asia	459	1.26	764	2.1	407	1.18	951	2.75
Africa	173	0.48	263	0.72	92	0.27	318	0.92
Oceania	108	0.3	171	0.47	70	0.2	238	0.69
NA	21	0.06	256	0.7	7	0.02	99	0.29
$\sum$		100.00		100.00		100.00		100.00

Values in milion 1913-marks. 'NA' denotes accounting items ('*Sonderposten*') with no geographical direction like 'ships' supplies' or the like. See Table A4 in the Appendix for a classification of countries into Western and Eastern Europe. Source: own calculations.

Overall, this leaves us with a new data set on German Foreign trade, covering all years 1880 – 1913, including the major ports Hamburg and Bremen for imports, exports, quantities and values (with some qualification on the latter). We can observe trade flows between Germany and 86 trade partners in 834 SITC (Rev. 4) five-digit product categories.

3 The basic dimensions of Germany's trade growth

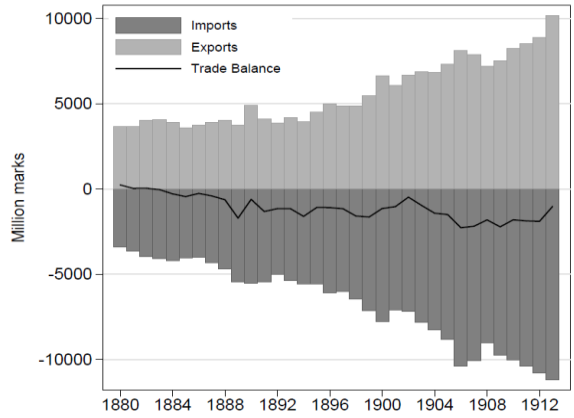
Let us start exploring the new data. Conceptually, we can distinguish between five dimensions of a country's foreign trade. Trade can vary in terms of quantities, prices (or unit values), the direction of trade, products traded, and trade partners. In this paper we will focus on values of imports and exports at the level of trade partners and products. We start with an aggregate view on trade values and the balance of trade.

3.1 Imports and Export Values and the Balance of Trade

Figures 1a and 1b display the background for all what follows below: the development of

FIGURE 1a

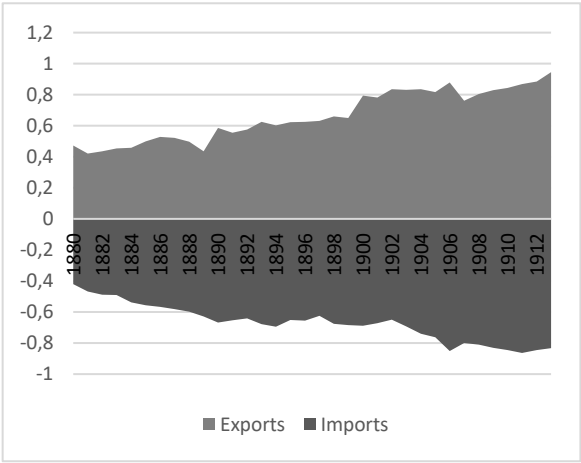
AGGREGATE IMPORTS, EXPORTS, TRADE BALANCE



In 1913-marks. Statistical items excluded. Source: Own calculations.

FIGURE 1b

GERMAN TRADE RELATIVE TO UK



Source: Own data and Federico-Tena World Trade Historical Database

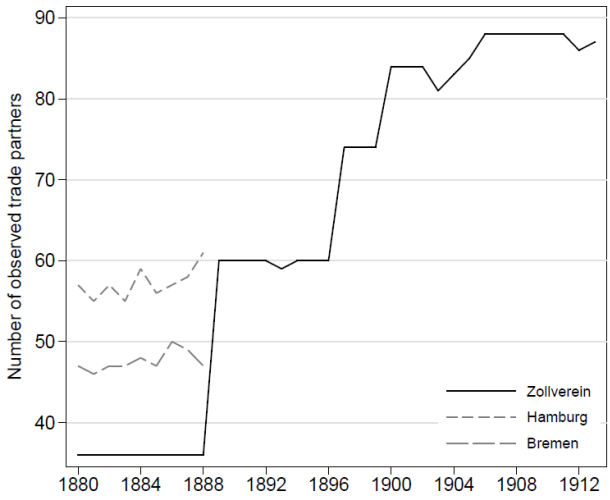
aggregate exports and imports, and the trade balance between 1880 and 1913 (1a), and Germany's exports and imports relative to the UK (1b). Germany's foreign trade more than tripled in the period we look at. During this period, Germany underwent its 'second industrialization' with industrial growth especially in machinery, chemicals and electro-technical goods. Figure 1a suggests that substantial trade growth in both imports and exports accompanied this industrial

growth. Nonetheless the German Empire was running a persistent trade deficit throughout the period. Moreover, figure 1b shows that Germany was catching up to the biggest trader in the world before 1914, the UK. In 1880 the value of goods exported by the German Empire was about 47 percent of the UKs exports, by 1913 this figure had reached 95 percent. Similarly, the value of German Imports increased from 42 percent (1880) to 83 percent (1913). While this evidence on the growth of German trade is not really new, our data allows us to explore the underlying changes in the structure of trade. We first discuss evidence on the "country space", that is the number and importance of trade partners over time, followed by a discussion of the "product space".

3.2 Country Space

According to our data, the German Empire traded between 1880 and 1913 with up to 86 trade partners. Within this "country space", the number of active trade relations was changing, and generally growing over time. On average, Germany had positive trade flows with 66 of them. Figure 2 and table 2 show how the number of active trade partners developed over time, where we distinguish by our source for the years 1880 - 1889.

FIGURE 2
NUMBER OF ACTIVE TRADE PARTNERS OVER TIME



Statistical items excluded. Source: Own calculations, see text.

These changes in the number of trade partners are due to an "extensification" of trade, where new markets were entered and thus only started to be documented in the records once trade flows with them turned non-zero. Another reason might have been an "intensification" of trade and, in turn, a more precise recording of existing trade partners. In our discussion of growth along the extensive margin below, we will attempt to distinguish between these two possibilities.[8]

TABLE 2
DESCRIPTIVE STATISTICS ON THE NUMBER OF COUNTRIES PER YEAR

Source	Mean	Median	Max	Min
Zollverein	72	83	88	36
Hamburg	57	57	61	55
Bremen	48	47	50	46

From 1880 to 1913. Statistical items excluded. Source: Own calculations.

Figure 3A shows the evolution of trade shares by continents. While Europe always made up more than 60 percent of total trade (dashed horizontal line), its share declined over time. On the other hand, trade with non-Europe grew. This points to growing regional diversification in Germany's foreign trade and it suggests that comparative advantage might have varied regionally. Panel 3B displays the regional trade balances, shown as averages over the entire period. Trade with the Americas was most in deficit, while trade with Europe but also Africa and Oceania much was less so.

[8] See Appendix C for a full list of trade partners.

FIGURE 3
REGIONAL TRADE RELATIONS

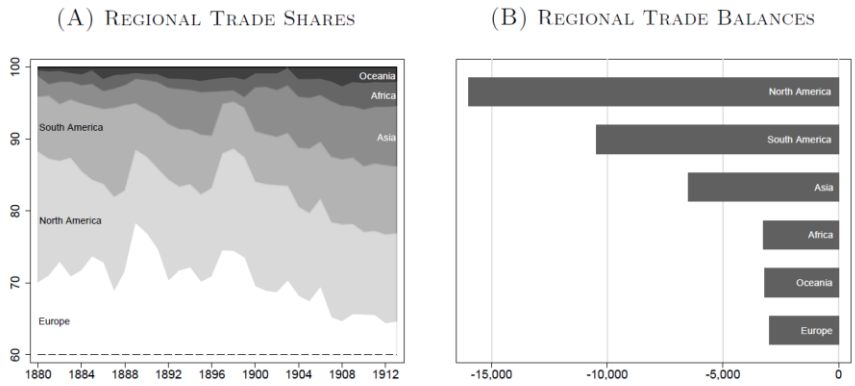
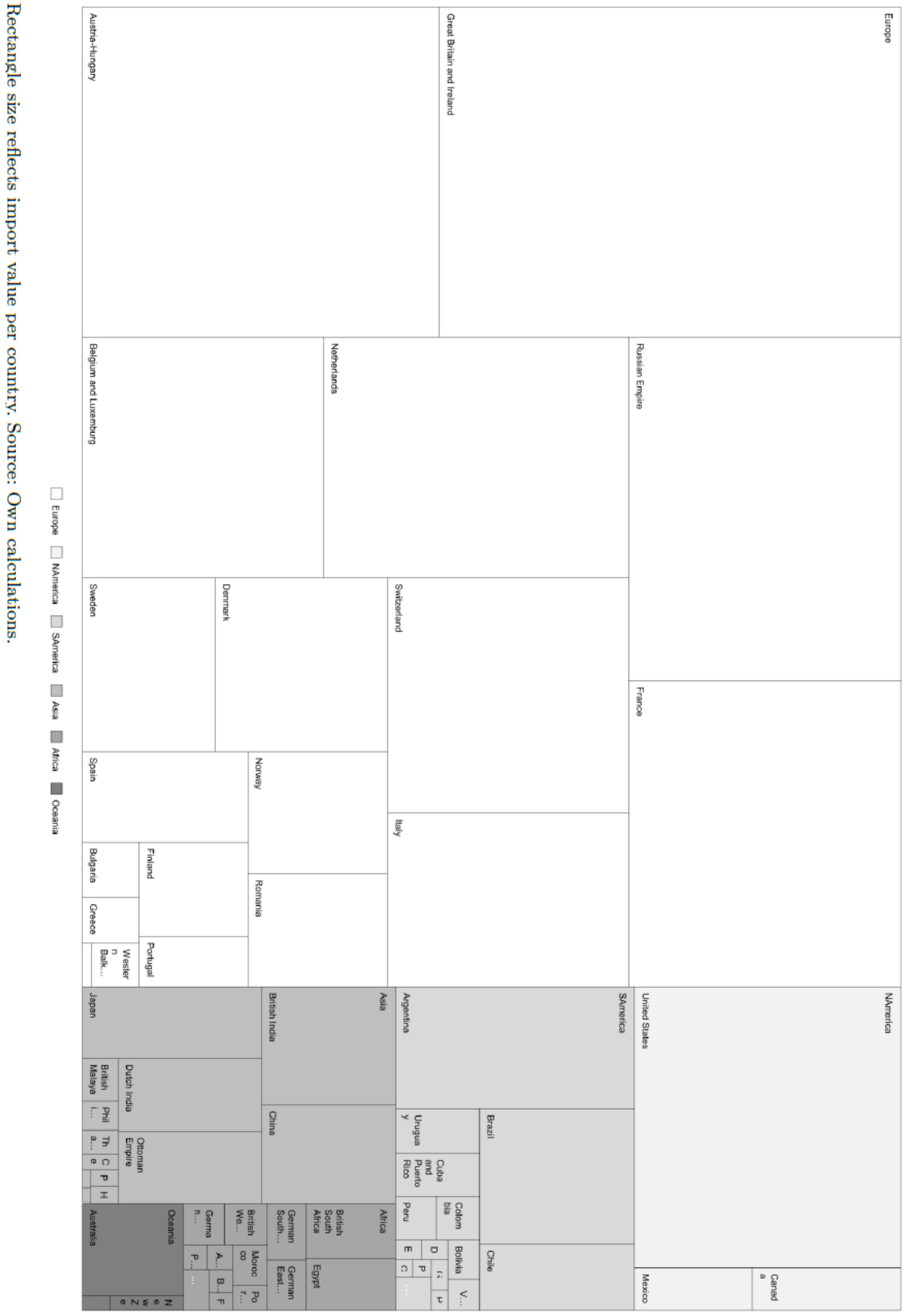


Figure 3A: Trade (imports and exports) per continent in percent of total trade. Figure 3B: Trade balance (imports minus exports, pooled over entire period) in million marks per continent. Source: own calculations.

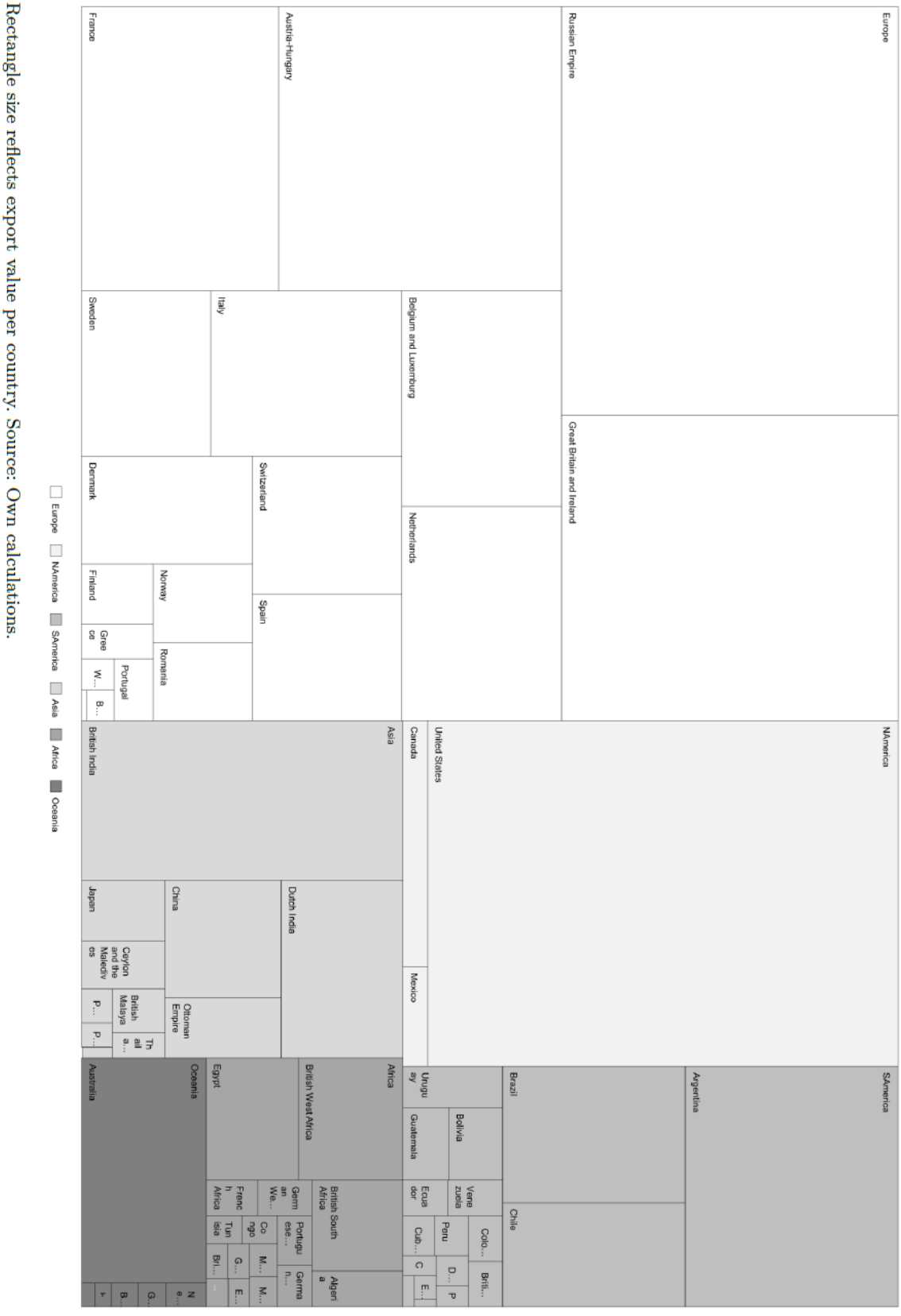
Figures 4 and 5 unfold the country space in terms of imports and exports, for 1913 as the last year before the First World war.

FIGURE 4
GERMANY'S IMPORTS IN 1913 BY TRADE PARTNER



Rectangle size reflects import value per country. Source: Own calculations.

FIGURE 5
GERMANY'S EXPORTS IN 1913 BY TRADE PARTNER



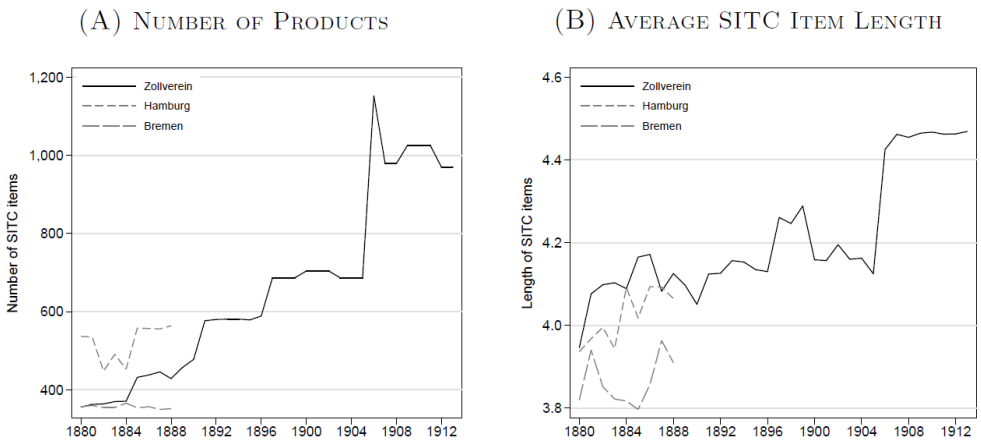
Rectangle size reflects export value per country. Source: Own calculations.

The figures show that import supply (figure 4) was less diversified than export markets (figure 5), a common finding for European trade relationships (e.g. Federico and Wolf 2012). Note that imports are strongly dominated by Europe, in spite of substantial agricultural trade with the Americas. A bit less than half of exports, however, went outside Europe. Next to the unsurprising dominance of Europe, we see that Germany also traded with many small and distant places, often in minor volumes. This suggests that "gravity" (the influence of distance and size of trade partners) may not solely drive trade, especially regarding exports.

3.3 Product Space

The most valuable feature of our data is its enormous detail on the product space. We observe trade at the "product" level, which we define here as the lowest (namely five-digit) level of the SITC system. With the data classified according to the SITC, we can aggregate the data from the product level up to sectors. Moreover, we are able to apply other classifications compatible with SITC to our data and make comparisons to modern data for Germany and other countries available in SITC format. Figure 6 gives the basic characteristics of the product space. In Panel 6A we show that the number of SITC items observed in the data grows over time. This corresponds to a growing number of original product categories in our source data.

FIGURE 6
DESCRIPTIVES OF THE PRODUCT SPACE



The latter, however, varied more wildly from year to year as Hungerland and Altmeppen (2021) discuss in great detail. But the growing number of items is also a function of technological

progress and political economy that occurs in modern trade data as well: innovations generate new goods, lobbies successfully initiate the creation of special product categories that enjoy a special status in a country's tariff scheme. Panel 6B gives an indication of the precision with what we observe product-level trade. It shows the average (trade-weighted) length of an SITC code we were able to assign. Most trade flows are captured at the four- or even five-digit level. This makes our data one of the most granular data sets on trade available for the period before World War I. Moreover, the precision grows over time and remains high after the Bülow tariff of 1902, which was implemented in 1906.[9] The figure also shows that Hanseatic data are less precise than the *Zollverein* data.

Figure 7 describes the evolution of trade shares at the level of broad (one-digit) sectors. The first impression is that endowment effects (such as a relative abundance of physical and human capital) appear to structure Germany's foreign trade, as we would expect from a Heckscher-Ohlin logic: imports (panel 7A) are dominated by SITC sectors 0 to 3, i.e. food, beverages and raw materials. These items make roughly three quarters of Germany's imports. Exports (panel 7B), on the other hand, are dominated by manufactured products, that is SITC sectors 5 to 8. And their share grew over time. The data thus broadly confirm that Germany was increasingly specializing in exporting manufactured goods, while importing rather raw or less processed or more primary goods.

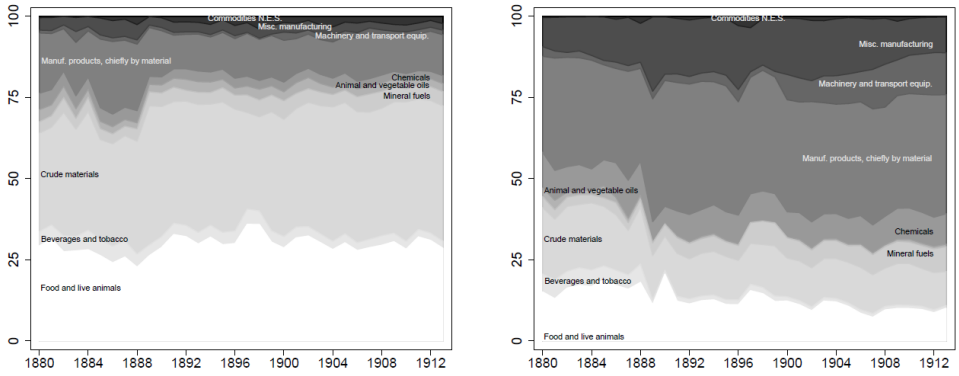
Table 3 below reports the growth rates of sectoral trade from 1880 to 1913. The data shows substantial variation in sectoral growth in both directions of trade, and clearly modifies the evidence from figure 7. Trade grew in nearly all sectors (except for imports of beverages and tobacco and animal and vegetable oils). The biggest growth rate is that of imports of commodities not elsewhere specified, which however makes only a small part of the overall imports, as

[9] The blip in 1906 is due to the implementation of the "Bülow-tariff". In this year two entirely different classification systems had to be harmonized: While the tables from January to March 1906 observe trade, by and large, according to the classification of earlier years, the rest of the year is covered by an entirely new, more detailed classification, which only very partially corresponds to the earlier one.

indicated by figure 7A. More tellingly, exports of machinery and transport equipment grew by a whopping 733 percent. But also, we see that imports of manufacturing goods grew very substantially and the export of mineral fuels and lubricants increased, probably as a result of the growing role of the chemical industry, which is not solely covered by SITC sector 5. Hence, there is evidence for trade dynamics - notably in the manufacturing sector - that are not easily explained by neoclassical trade models.

FIGURE 7
SECTORAL TRADE SHARES

(A) IMPORTS (B) EXPORTS



Shares of total annual export value per SITC one-digit sector. N.E.S. = not elsewhere specified. Source: Own calculations.

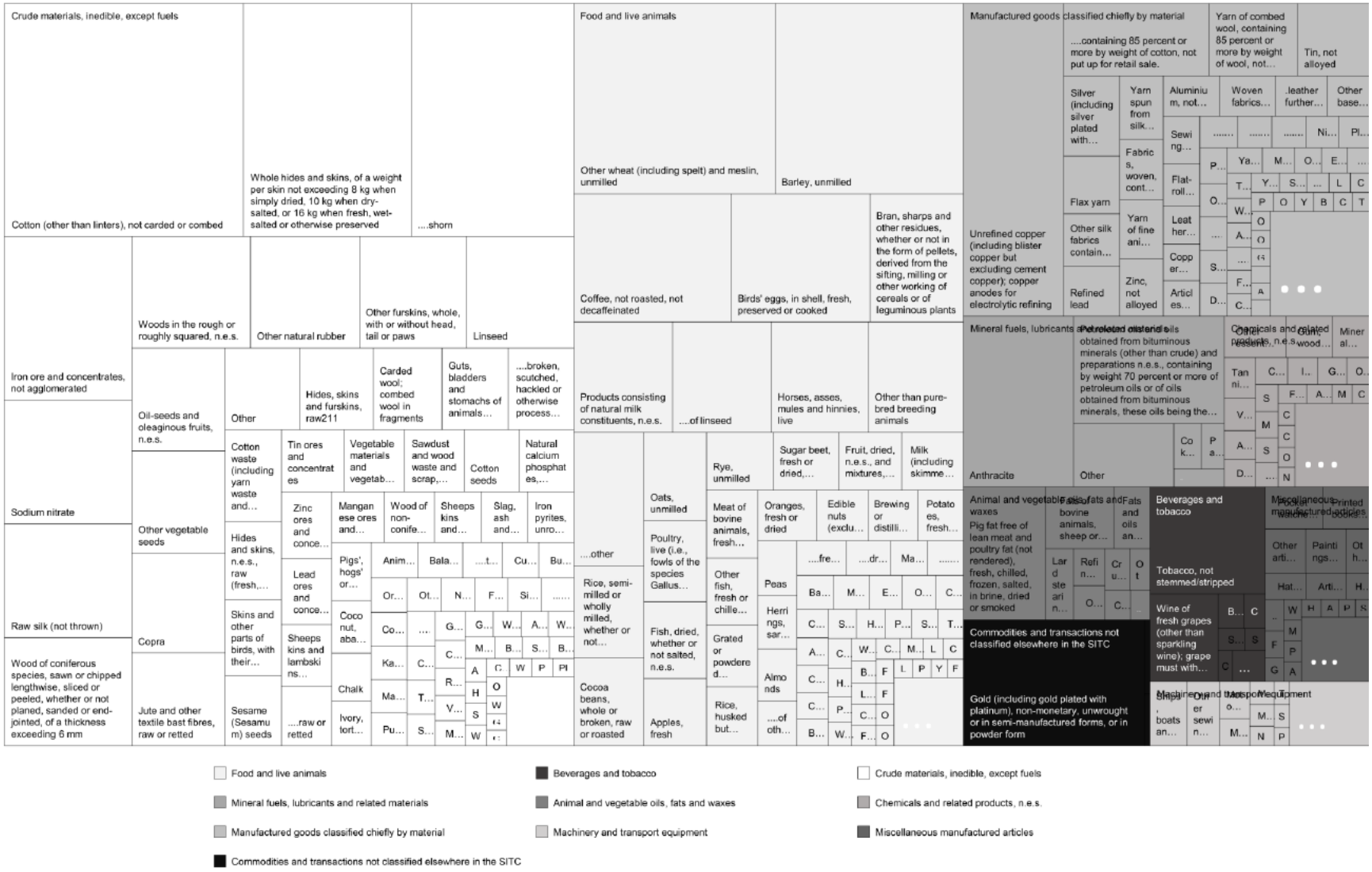
Figures 8 and 9 display the product space in terms of imports and exports in the year 1913. More precisely, it shows the total of trade organized by SITC one-digit sectors but with the product range at the five-digit level within each sector. In this way a more nuanced image emerges. Imports (figure 8) are generally characterized by larger trade flows distributed over a fewer number of goods. Some goods such as cotton, hides, wheat or copper particularly stand out in that they command big chunks of the import volume. Moreover, the share of goods associated to SITC sector 9, i.e. commodities not elsewhere specified, is comparatively large. Exports (figure 9), by contrast, are much more diversified. Individual export goods generally command a smaller share in total trade than specific import goods. What remains striking, however, is that Germany also exported a range of goods we would not necessarily expect to be exported if we would follow a simple Heckscher-Ohlin prediction.

TABLE 3
SECTORAL TRADE GROWTH

One-digit	Sector	Imports	Exports
0	Food and live animals	159.3	121.4
1	Beverages and tobacco	2.8	-58.6
2	Crude materials, inedible, except fuels	161.7	39.3
3	Mineral fuels, lubricants and related materials	141.4	431.2
4	Animal and vegetable oils, fats and waxes	36.4	-32.3
5	Chemicals and related products, n.e.s.	50.2	102.1
6	Manufactured goods classified chiefly by material	113.7	140.3
7	Machinery and transport equipment	258.5	733.6
8	Miscellaneous manufactured articles	133.2	132.7
9	Commodities and transactions n.e.s. in the SITC	2,541.8	44.1

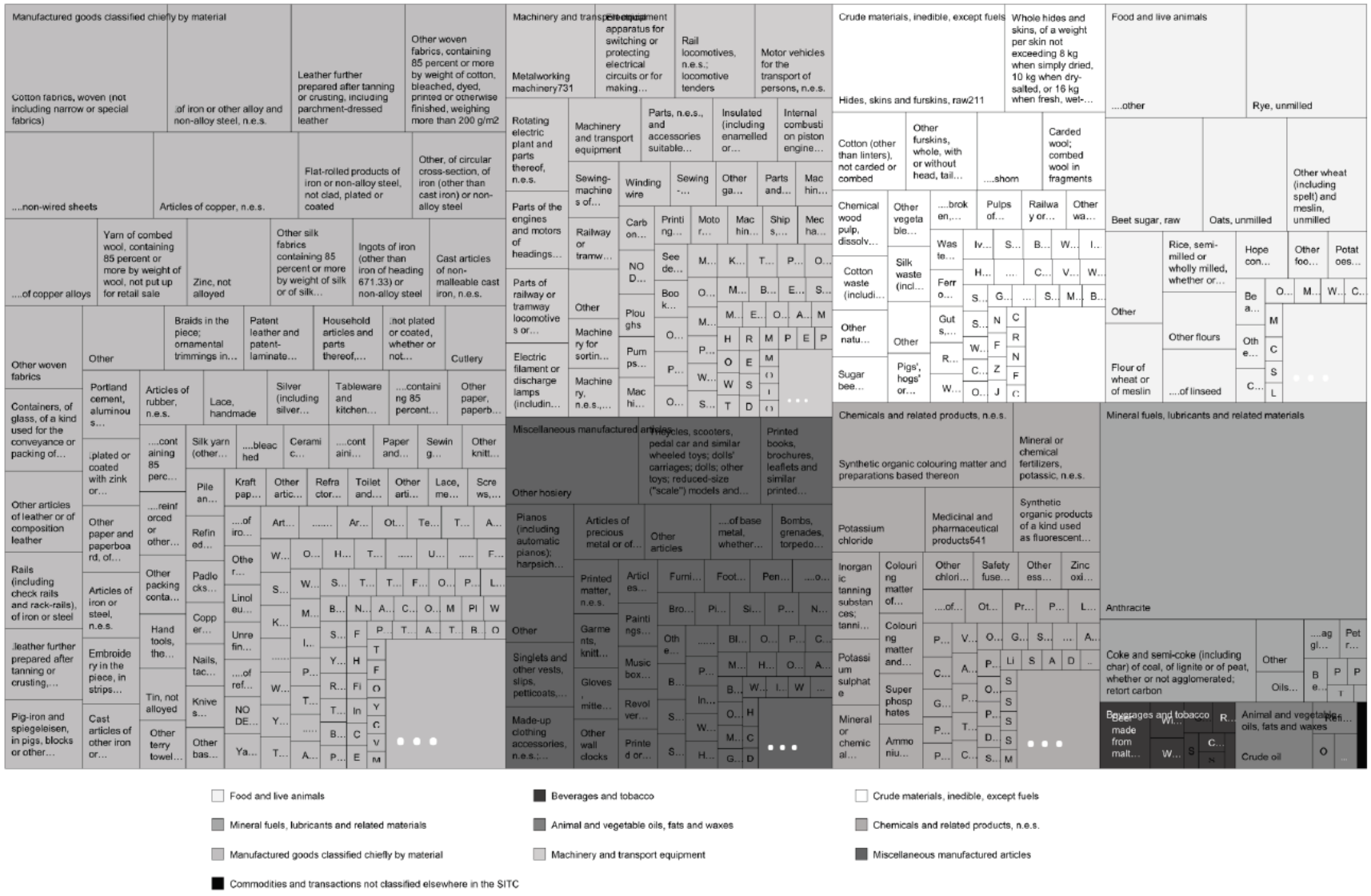
Growth rates of trade value from 1880 to 1913, in percent. Based on SITC revision 4. Item codes in parentheses. Source: Own calculations.

FIGURE 8
GERMANY'S IMPORTS IN 1913 BY TRADE PRODUCTS



Rectangle size reflects export value per SITC five-digit item. Broad categories are SITC one-digit sectors. Source: Own calculations.

FIGURE 9
GERMANY'S EXPORTS IN 1913 BY TRADE PRODUCT



Rectangle size reflects export value per SITC five-digit item. Broad categories are SITC one-digit sectors. Source: Own calculations.

4. The Product-Country-Space

4.1 Varieties and Margins Decomposition

Our new data allows us to show that not only the value of aggregate exports and imports grew, but that the number of trade partners and traded products changed very substantially over time. The total value of German trade grew from around seven billion Mark (1880) to 21 billion Mark (1913). Over the same period, the number of trade partners grew from 34 (1880) to 86 (1913) and the number of traded products increased from 334 SITC five-digit "products" (1880) to 834 (1913). To describe this more systematically, we define country-product combinations as "varieties". To what extent did trade grow, because Germany imported or exported more of the same varieties – hence more of the same products with the same trade partners, and to what extent because new varieties showed up, or old ones disappeared?

Table 4 provides summary statistics on the number of varieties over time. We distinguish here between potential and active varieties. We define potential varieties as the number of observable country-product combinations given by all product classes and countries listed in the trade statistics in a given year. In 1880, we actually observe 245 different products being imported, and 248 being exported, out of a total 334 different product classes listed. Hence, many products must have been both imported and exported. Together with the fact that imports and exports are listed with the same 34 trade partners in 1880, we can calculate a potential of 11356 varieties as of 1880.

TABLE 4
ACTIVE AND POTENTIAL VARIETIES, 1880 and 1913

	1880		1913	
	Imports	Exports	Imports	Exports
Products Observed	245	248	776	782
Products listed	334	334	834	834
Countries Observed	34	34	85	86
Countries listed	34	34	86	86
Active Varieties	971	1482	10145	29263
Potential Varieties	11356	11356	71724	71724
Active out of Potential 1880	971	1482	563	1017
Share Active in Respective Potential	0.09	0.13	0.14	0.41
Share Active in Potential 1913	0.01	0.02	0.14	0.41
Share Active in Potential 1880	0.09	0.13	0.05	0.09

Source: own calculations.

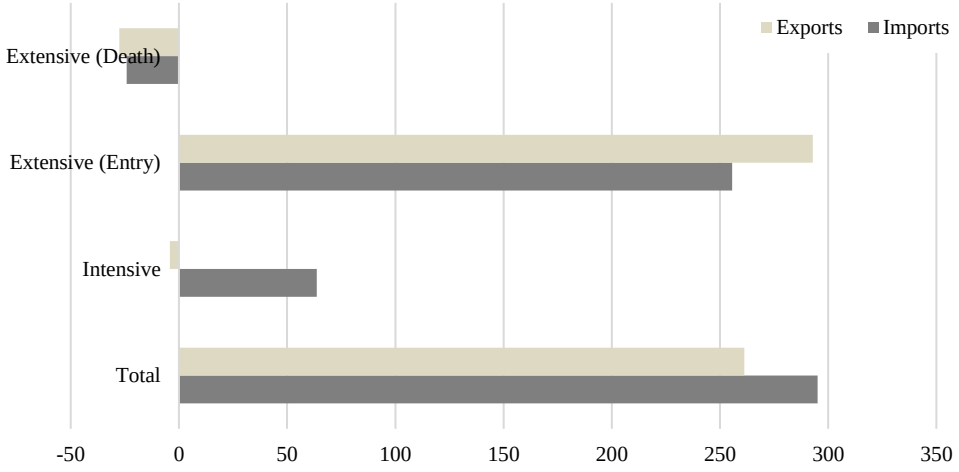
The table reveals three things. Most obviously, the number of varieties increased over time. Second, at any point in time we observe non-zero trade for only a small share of "potential varieties", however defined. If we consider only varieties listed in 1880 as potential, the share of active in potential varieties in imports in 1880 was 9 percent, in exports 13 percent. Instead, if we assume that all countries and products listed in 1913 were in principle already available back in 1880 (but not yet listed), the share of active varieties in potentials in German imports in 1880 was just 1 percent, in exports 2 percent. Conversely, if we condition on the varieties listed in 1880, we see that for imports only 5 percent of those were active in 1913, and 9 percent for exports. This leads us to the third point: while the total number of varieties increased over time very substantially, we also need to take into account that many varieties disappeared.

Following Amiti and Freund (2010) we can decompose the total growth of trade into three margins: 1) growth along the intensive margin, where trade in existing varieties is expanding ("more of the same"), 2) growth along the extensive margin, where new varieties enter, and finally 3) growth along the extensive margin, where old varieties disappear. Formally,

$$\frac{\sum_i V_{it} - \sum_i V_{it-1}}{\sum_i V_{it-1}} = \frac{\sum_{i \in I} V_{it} - \sum_{i \in I} V_{it-1}}{\sum_i V_{it-1}} + \frac{\sum_{i \in I_t^N} V_{it}}{\sum_i V_{it-1}} - \frac{\sum_{i \in I_{t-1}^D} V_{it-1}}{\sum_i V_{it-1}} \quad (1)$$

where the first term captures trade growth in existing varieties between t-1 and t, the second growth in new varieties I^N, and the third the disappearance of varieties I^D. Figure 10 shows the result of this exercise.

FIGURE 10: MARGIN DECOMPOSITION, 1880-1913

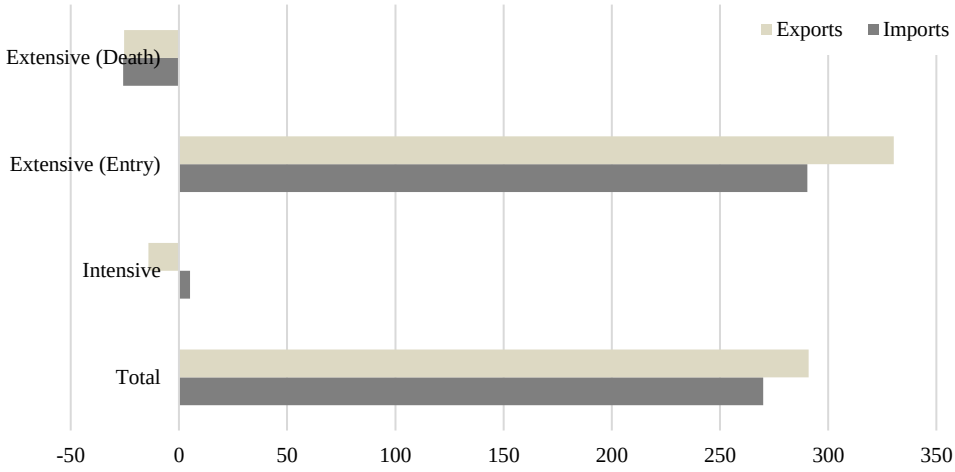


Margins in percent of total trade according to eq. 1. Source: own calculations.

We see that the total increase in imports (by 295 percent) can be decomposed into growth along the intensive margin (64 percent), growth along the extensive margin (entry) of 256 percent and decline along the extensive margin (death) of -24 percent. For exports, a total of 261 percent growth is exclusively due growth along the extensive margin, with -4 percent (intensive), +293 percent (extensive, entry) and-28 percent (extensive, death). This dramatic growth along the extensive margin reflects the diversification in traded products and the growing penetration of foreign markets. Books were traded to the US, furs to Romania, toys to the UK and silk to France. The largest trade partners showed also the biggest increase in traded varieties, notably the UK, Austria-Hungary, Russia, France and the Netherlands. While we do not have firm-level trade data, this evidence corresponds well with predictions of new trade models based on *within-sector* heterogeneity, such as Melitz (2003).

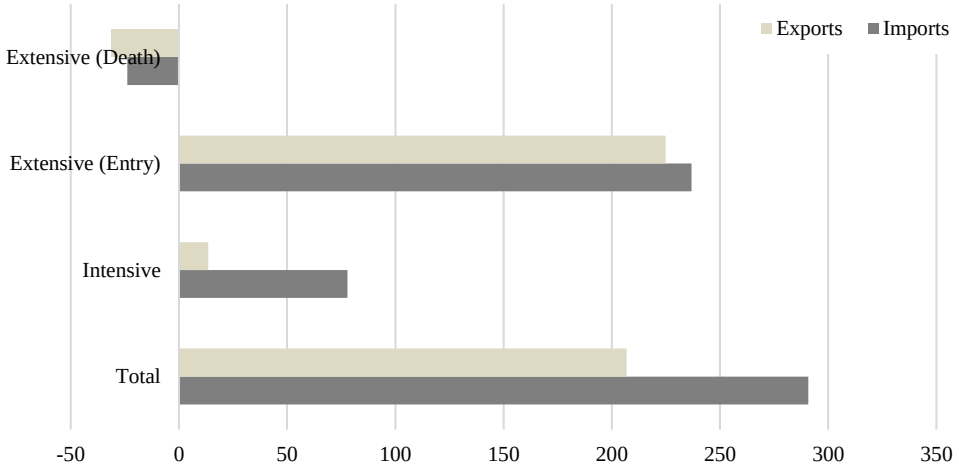
But is it really plausible to find that *all* growth in exports took place along the extensive margin? We first show that the margin decomposition is different depending on sectors and trade partners, in line with an intuition building on new trade models in the wake of Melitz (2003). Next, we show that our results are unlikely to be driven by statistical artefacts such as changes in trade classification due to an "intensification" of trade. Figures 11a and 11b show our margin decomposition separately for manufacturing and non-manufacturing trade. As expected, growth along the extensive margins matters most for trade in manufacturing sectors, growth along the intensive margin plays a larger (but still very limited role) for non-manufacturing sectors.

FIGURE 11A: MARGINS, MANUFACTURING, 1880-1913



Margins in percent of total trade according to eq. 1. SITC sectors 5 to 8. Source: own calculations.

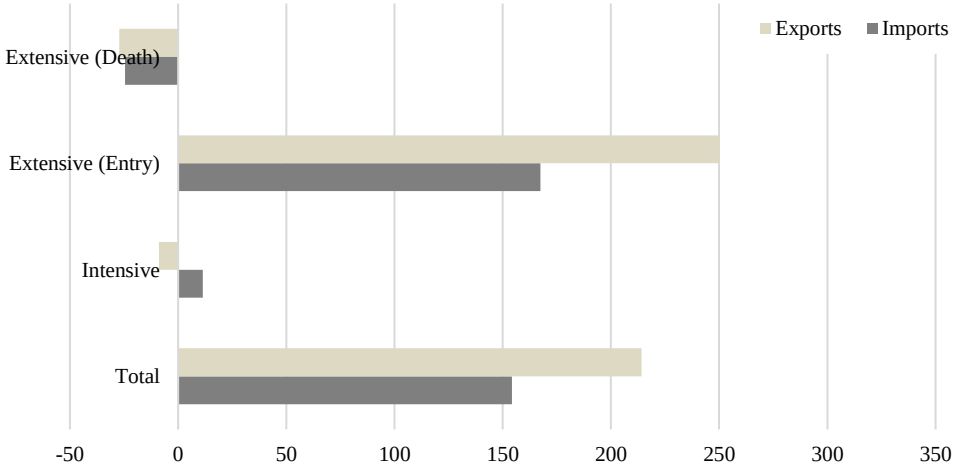
FIGURE 11B: MARGINS, NON-MANUFACTURING, 1880-1913



Margins in percent of total trade according to eq. 1. SITC sectors 0 to 4. Source: own calculations.

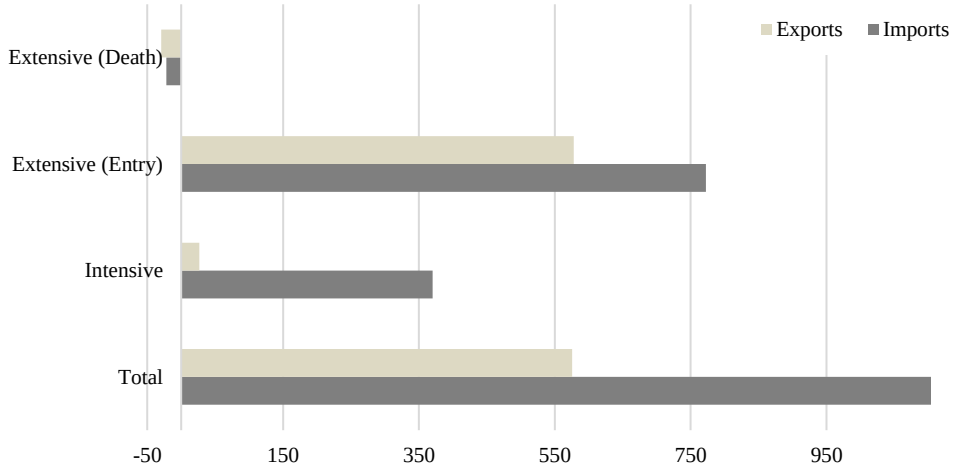
Next, figures 12a and 12b distinguish between Germany's trade with European and Non-European partners. Intuitively, growth along the extensive margin should matter more for trade with the more similar European neighbors, while growth along the intensive margin should characterize trade with non-European partners, due to specialization effects (as suggested by Heckscher-Ohlin type models).

FIGURE 12A: MARGIN DECOMPOSITION, EUROPE, 1880-1913



Margins in percent of total trade according to eq. 1. Source: own calculations.

FIGURE 12B: MARGINS DECOMPOSITION, Rest of the world, 1880-1913



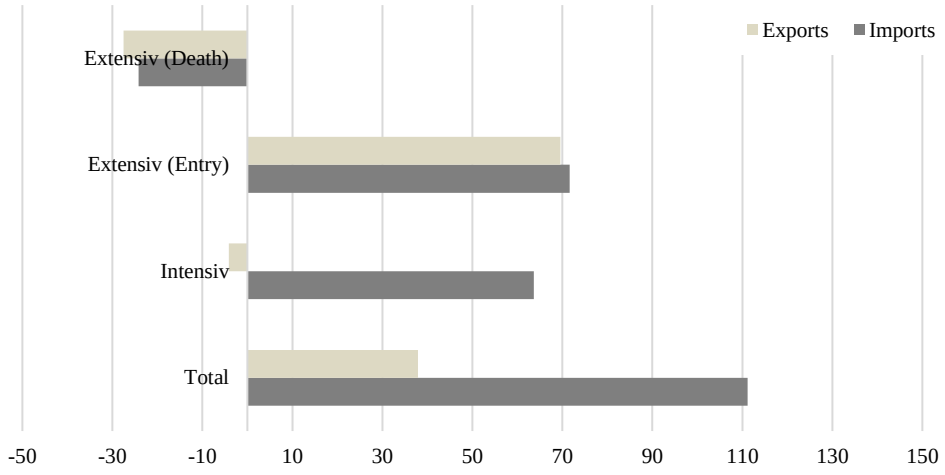
Margins in percent of total trade according to eq. 1. Source: own calculations.

Again, we find our intuition confirmed. The importance of the extensive margin is impressive overall and in all these subsamples of the data. Even for the growth of imports from non-European trade partners, which would be paradigmatic for the well-known narrative of the first globalization, we find only 1/3 of total growth explained by the intensive margin.

An altogether different explanation for our findings would be that they are due to a statistical artefact. What if most of our extensive margin growth stems from the mentioned "intensification" of trade, which led to a more detailed statistical description of existing trade flows? If so, the new products and trade partners observed in the data, might have been present before, but were not properly documented. How can we judge the relevance of this? We suggest restricting our data to growth in those products and trade partners, which were observed already in 1880, hence the set of potential varieties as of 1880 shown in table 4 above. Based on this, we can calculate a lower bound of growth along the extensive margin, where we exclude all trade flows that we observe after 1880 in new products and with new trade partners as a statistical artefact. Note that the total growth in terms of imports and exports is much lower. Also note that in this exercise, growth along the intensive margin remains by definition unchanged (e.g. compared to the evidence in

figure 10), as it always refers to growth in varieties, which existed already in 1880. Figure 13 shows the result.

FIGURE 13: MARGIN DECOMPOSITION, 1880-1913 (CONDITIONAL ON 1880 Varieties)



Margins in percent of total trade according to eq. 1. Source: own calculations.

For imports, we see that the intensive margin now accounts for just above 50 percent of all trade growth. However, for exports we still find that virtually all trade growth took place in terms of extending the range of trade partners (out of those observed in 1880) for products listed in 1880 or the range of products (out of those observed in 1880) to a wider range of trade partners. This almost certainly underestimate the extensive margin. Hence, we can safely conclude that the extensive margin played a crucial role for the overall growth of German imports 1880-1913 and totally dominated the dynamics of German exports 1880-1913.

4.2 Intra-Industry Trade

So far, we considered exports and imports separately, following a logic of differences along country characteristics (as in Armington 1969). In this section, we drop this and explore the extent to which the same "products" were both imported and exported by Germany. The sectoral growth rates of exports in sectors other than manufacturing in table 3 and the shares shown in figure 7 already suggested that this might have been an important phenomenon. We calculate indices of

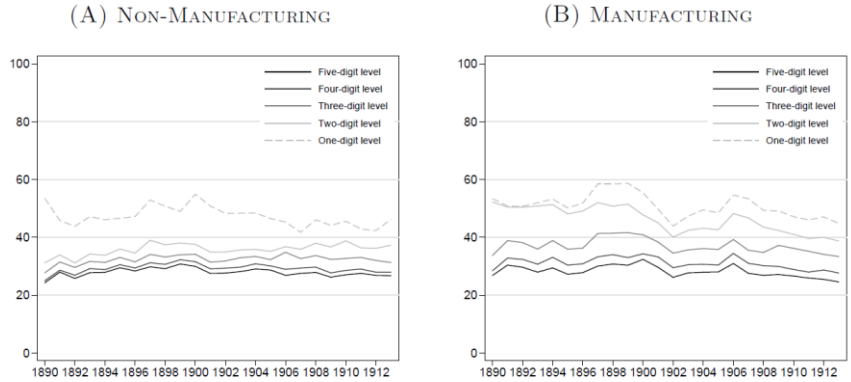
intra-industry trade (trade within a given product category) as in Grubel and Lloyd (1971):

$$GL_{kt} = \frac{(X_{kt} + M_{kt}) - |X_{kt} - M_{kt}|}{X_{kt} + M_{kt}} \times 100 \tag{2}$$

with *k* being the SITC level, *t* the year, *X* being exports and *M* denoting imports. The index gives the share of trade that takes place within a given sector. Figure 14 plots this index once for non-manufacturing (SITC sectors 0 to 4, panel 14A) and manufacturing (sectors 5 to 8, panel 14B) over all levels of aggregation.[10]

FIGURE 14

INTRA-INDUSTRY TRADE



Intra-industry trade in percent of total trade according to eq. 2. Figure 14A: SITC sectors 0 to 4. Figure 14B: SITC sectors 5 to 8. Source: Own calculations.

As we would expect, the more aggregated the flows are, the more intra-industry trade we find. Interestingly, the data reveal that roughly a quarter of trade happened within the most narrowly defined category, that is, the five-digit level. If we look at the one-digit level we see that this share grows to about 50 percent of all trade. The figures also show that intra-industry trade was remarkably stable over time, for both manufacturing and non-manufacturing trade. Germany

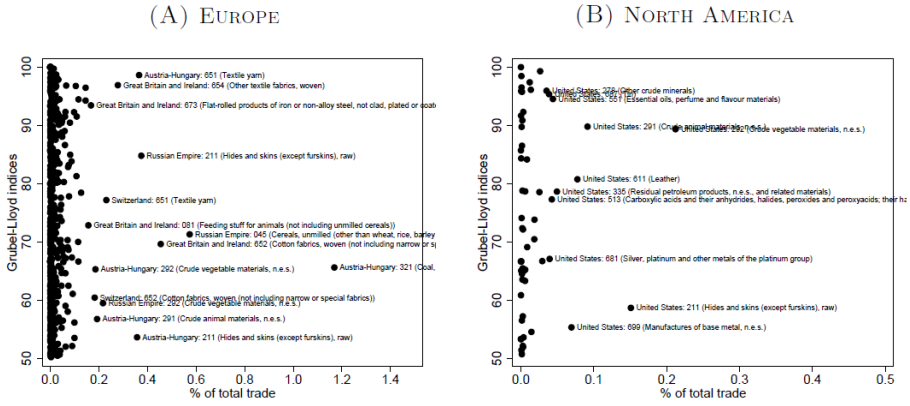
[10] We ignore sector 9 due to its mixed, residual nature, which complicates interpretation.

exported many non-manufacturing goods, such as coal or hides and skins. At the same time, Germany imported a wide (and growing) range of manufacturing goods before 1913. If Germany's foreign trade had followed simple comparative advantage alone, we would not see these trade flows in the data. They make up, however, a non-negligible share of Germany's trade value, particularly with Europe, as we show below.

Figure 15 provides a more nuanced image of intra-industry trade. The figure contains all three-digit industries in which there was more than 50 percent intra-industry trade and shows their share in total trade as of 1913. It only considers trade with Europe and North America since intra-industry trade with other continents was much less intense. Also, note that not all industries received a label to avoid clutter.

FIGURE 15

ZOOMING INTO INTRA-INDUSTRY TRADE



Intra-industry trade in percent of total trade according to eq. 2. Dots reflect trade within a three-digit industry in 1913. Source: Own calculations.

Exposing the data in this way uncovers that some industry-level trade with certain trade partners was almost entirely characterized by intra-industry trade – notwithstanding that they may have made up only a small fraction of total trade. Most of these industries were manufacturing industries (they make up most of the unlabeled dots). But this is only part of the story, because

some industries with high intra trade were not based in classic manufacturing: Trade in hides and skins with Russia was over 80 percent percent intra-industry, and quantitatively nontrivial. So was yarn trade with Austria-Hungary. Firewood trade with France was even 99 percent intra-industry. This means that while there was generally more intra-industry trade in manufacturing industries, even some non-manufacturing industries traded with each other at least with certain trade partners. It also emerges that intra-industry trade was more prominent with rich economies—i.e. mostly European trade partners. All this re-affirms our conjecture that models of imperfect competition (that allow, for example, for branding or quality differences) might help explain international trade especially between European trade partners already in the first globalization.

5. Changes in Diversification and Specialization, 1880-1913

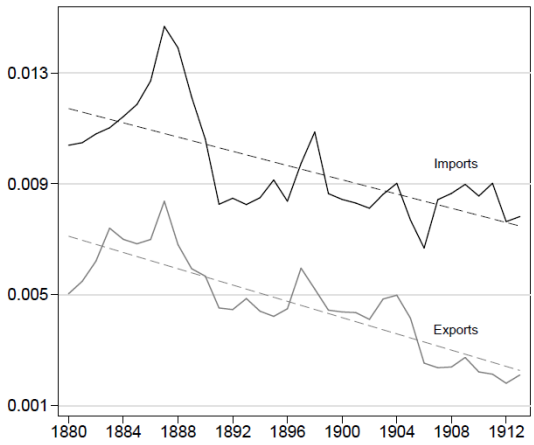
We have seen that Germany's trade was growing in absolute and relative terms, but also that this growth was a rather complex process with growth in new goods, trade partners and substantial intra-industry trade. The literature on the link between growth and international trade suggests that the diversification of exports corresponds to better growth perspectives (Hausmann et al., 2007). More diversified imports, on the other hand, mean less dependence on single suppliers, which can moderate business cycle fluctuations (Calderón et al., 2007). So, how did diversification change over time? Consider a simple Herfindahl-index, as

$$H_{dt} = \sum \left(\frac{v_{dikt}}{\sum v_{dikt}} \right)^2, \qquad (3)$$

with v_{dikt} being trade in 1913-marks in direction *d* with partner *i* and SITC-three digit sector *k* in year *t*. Figure 16 plots the indices for imports and exports.

FIGURE 16

DIVERSIFICATION IN IMPORTS AND EXPORTS



Herfindahl indices based on country-sector pairs with sectors being SITC three-digit items. Dashed lines = trend line based on linear fit. Source: Own calculations.

Both indices fall over time suggesting growing diversification. The dashed trend lines are almost identical. But the indices suggest that exports were already in 1880 more diversified and they diversified a bit more strongly than imports over the 33 years we are looking at. This diversification was likely both the result of German economic growth and contributed to it.

How can we square all this evidence on the role of the extensive margin, intra-industry trade and increasing diversification with the notion that Germany became specialized in manufacturing? In figure 7, we saw that very broadly, Germany did export far more manufacturing products than it imported. To summarize this specialization and its changes over time, we suggest using a Lafay-index (Lafay 1992, Federico and Wolf 2012). The index is based on the difference between normalized net-exports for sector (or trade partner) *k* and the total normalized net-balance weighted with the share of the product on total trade.

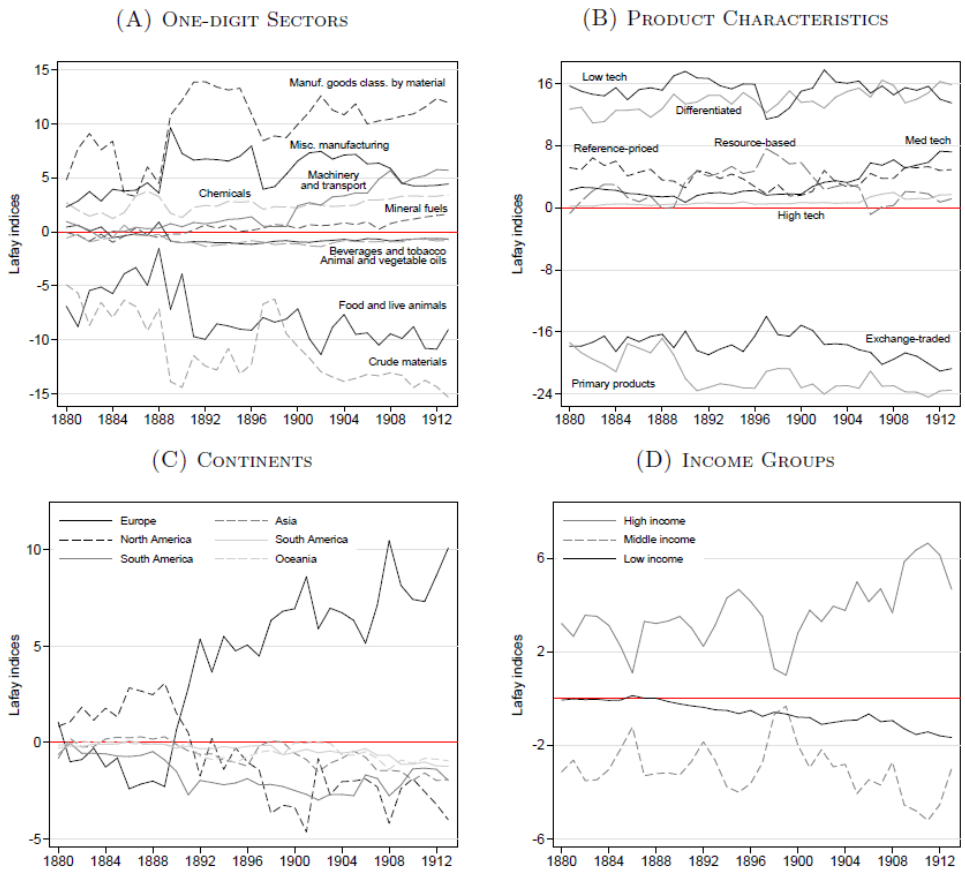
Formally,

$$RCA_{kt} = \frac{(X_{kt} - M_{kt})}{(X_{kt} + M_{kt})} - \frac{\sum_{kt}(X_{kt} - M_{kt})}{\sum_{kt}(X_{kt} + M_{kt})} \times \frac{(X_{kt} + M_{kt})}{\sum_{kt}(X_{kt} + M_{kt})} \times 100, \tag{4}$$

with *X* denoting exports and *M* denoting imports. All *k*-wise indices sum up to zero and are defined between [-200, 200]. A positive value for trade in k points to "success" in terms of positive net-exports, normalized by the total trade balance and the weight of k in total trade.[11] Figure 17 plots the Lafay-indices with respect to four different dimensions. The upper panels consider specialization along the product space. Figure 17A shows that Germany specialized in manufacturing products, including chemicals, machinery and transport equipment. More detailed evidence at the three-digit level (not shown) suggests that in 1913 Germany had a strong comparative advantage in synthetic dies (SITC 531), fertilizers (SITC 562), railway vehicles (791), cars (781), but also agricultural machinery (SITC 721) or sugar (SITC 601), among many other goods. Figure 17B disaggregates comparative advantage according to the product characteristics of Rauch (1999) and Lall **(**2000**)**. We see that Germany did specialize increasingly in differentiated goods, and those that embody technology (notably medium-technology according to Lall 2000, which largely reflect the technology frontier before 1914): meters and counters, non-domestic refrigerators and refrigerating equipment, refracting telescopes (something that is considered high-tech even today), electrical apparatus, radio-broadcasting transmitters, or clock and watch parts. The data also shows very clearly that it was simpler goods, where Germany de-specialized. Examples include zinc, tin or lea and alloys thereof.

[11] In contrast to Balassa's (1965) concept of Revealed Comparative Advantage (RCA), this simpler index comes with some advantages. First, it requires only import and export data from one country, and we only have German data. Second, it also controls for distortions from an overall net deficit, which was the case for Germany before 1913 and, above all, it takes the level of imports into account. Third, it measures the contribution of different k to changes in total comparative advantage also when k's share is small, but it holds a monopoly – in such case the traditional RCA may yield erroneous results.

FIGURE 17
GERMANY'S COMPARATIVE ADVANTAGE



RCAs according to eq. 4. Figure 17A: SITC one-digit level. Figure 17B: Lall's (2000) and Rauch (1999) classifications. Figure 17C: See Table A4 in the appendix for full list of countries. Figure 17D: Income classification based on textiles over income estimates; see Table A5 in the appendix for full list of countries. Source: Own calculations.

Finally, the lower panels of figure 17 consider the Lafay-index with respect to Germany's trade partners. Figure 17C shows that Germany was increasingly successful within Europe but was in disadvantage with the rest of the world. Germany had the biggest thus defined comparative advantage (in 1913) with Great Britain and Ireland, the Netherlands, Austria-Hungary, Switzerland, France as well as Belgium and Luxembourg, among others: all rich neighbors of Germany. Germany also had a comparative advantage against Japan or the Ottoman Empire. On the other hand, Germany had comparative disadvantages with British India and the Russian Empire, i.e. two of the major 'emerging markets' of the time (at least from a German perspective),

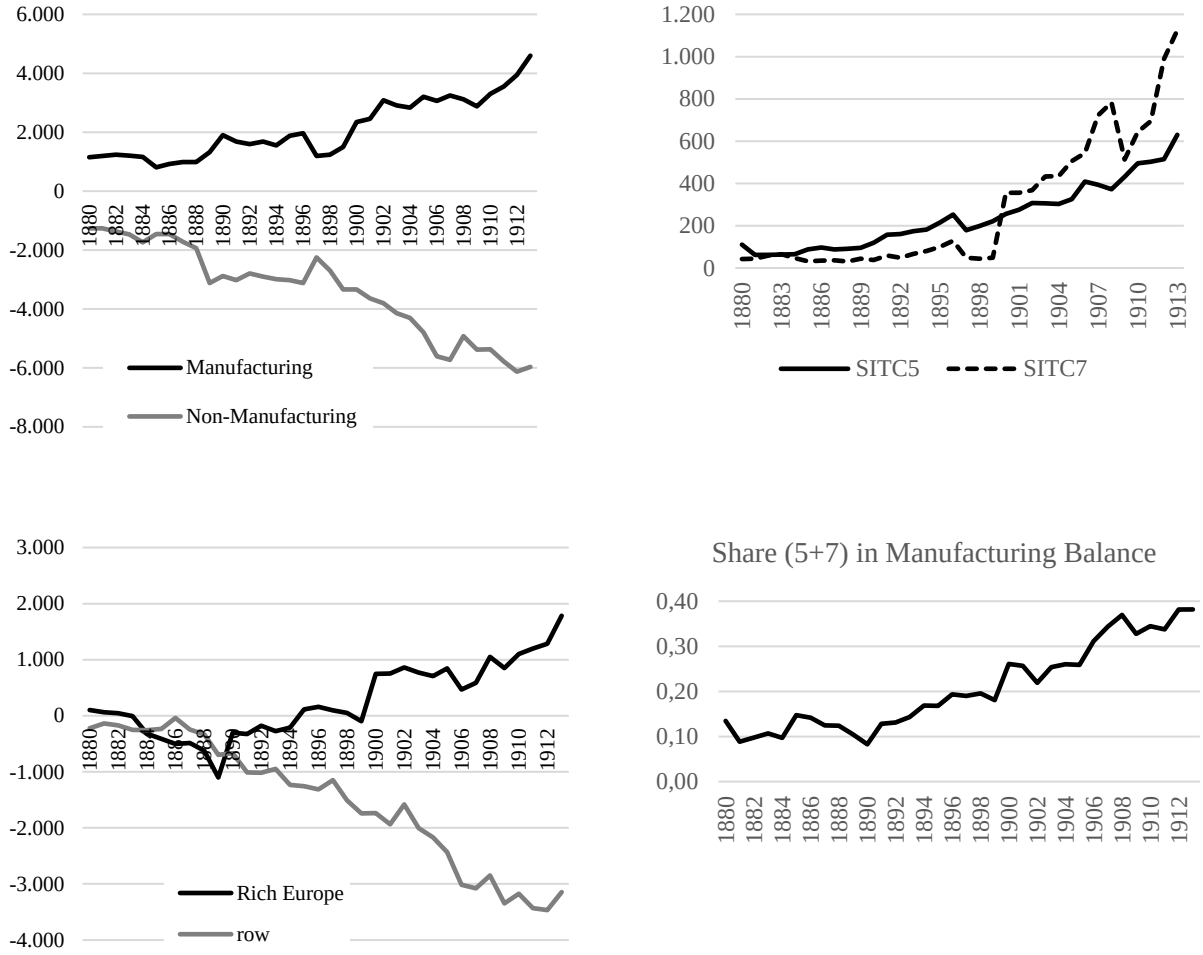
as well the United States and Argentina – the two largest overseas economies.

Similarly, when differentiating by income groups, figure 17D shows that German trade was successful in the rich world, particularly in the richer parts of Europe. In 1880 Germany had started with a near balanced trade result with "rich" Europe.[12] By 1913 Germany was running a very large trade surplus. This in turn was mostly due to a trade surplus in manufacturing products, where two broad sectors made a growing contribution: chemical (sector 5) and machinery and Transport equipment (sector 7). Hence, while the overall trade balance of Germany stayed negative for each year before 1914, this hides the fact that the country had become the dominant industrial power within the rich world. In figures 18A-D we show the trade balances of particular sectors and regions 1880-1913, comparable to the overall trade balance shown in figure 1A above.

[12] We define "rich Europe" here as Belgium and Luxemburg, France, Austria-Hungary, Italy, Netherlands, Great Britain and Ireland, Switzerland, Denmark, Sweden, and Norway.

FIGURE 18

TRADE BALANCES, 1880-1913 (million Marks)



Sources: see text.

Taken together, German trade growth over the 33 years before the First World War was largely driven by expansion along the extensive margin, with new products conquering new markets in the world. This was reflected in a substantial diversification of both exports and imports. Yet, Germany specialized, with a growing trade surplus in manufacturing products, notably chemicals, machinery and transport equipment. It is remarkable that this success was most pronounced in trade with Germany's rich neighbors within Europe – a finding that resembles the German trade patterns over the last decades.

6 Summary, Implications and Outlook

Our new data allows researchers to revisit old debates and test many new hypotheses. Let us summarize the evidence before we discuss some of its implications. During the first globalization Germany experienced very substantial growth in exports and imports, catching up to the UK as the world's largest exporter just around 1914. We confirm that Germany specialized in manufacturing products, notably in chemicals, machinery and transport equipment, and generally in differentiated products with substantial technological content. Moreover, Germany established a very strong position within Europe, particularly in trade with her rich neighbors. However, we also show that nearly all of this trade growth took place along the extensive margin, with an expanding range of products and trade partners. Our evidence strongly suggests that this is not a statistical artefact, but rather reflects the very nature of trade even before 1914, clearly for manufacturing but also for many non-manufacturing products. Related, we found that imports and exports grew much more diversified over time, with a substantial (but quite stable) share of intra-industry trade across all types of sectors and trade partners for all years 1880-1913.

Given that the country was one of the largest economies in the world before 1914, our evidence suggests that we need to revise our perspective on the first globalization. What theory do we need to guide our empirical work? While the standard factor proportions models in the wake of Heckscher-Ohlin can capture the broad structure of trade, they clearly miss nearly all of the underlying dynamics of growth and reallocation and likely also the political implications of trade liberalization. Apparently, heterogeneity *within* even narrowly defined sectors was very high and needs to be considered.

One rather straightforward way to integrate our new findings into the established narrative of the first globalization is to consider theoretical frameworks that allow for *within-sector* heterogeneity in some type of factor proportions model. Bernard et al (2007) provide such a framework and spell out its implications. Drawing on previous work by Helpman and Krugman (1985), their

model integrates the factor-proportions framework of the Heckscher-Ohlin model with new trade theory assumptions about imperfect competition and economies of scale as in Melitz (2003). Such a framework can explain why some countries export more in certain sectors and industries (due to endowment driven comparative advantage), why we nonetheless observe intra-industry trade even at the level of narrowly defined industries (due to product differentiation with increasing returns to scale), and why most trade growth takes place along the extensive margin (due to within-sector heterogeneity in terms of productivity and market entry costs). Moreover, Bernard et al. (2007) show that the four well-known theorems of the Heckscher-Ohlin model (including the Stolper-Samuelson theorem) still apply, but with some important qualifications. For example, the interaction between within-sector heterogeneity and comparative advantage gives rise to additional welfare gains from trade. Among other things, such gains will limit the decline of the real price of scarce factors, and hence mitigate the distributional effect of trade liberalization according to the Stolper-Samuelson theorem. Depending on parameters and endowment differences, the real reward of scarce factors can even increase in response to declining trade costs. This clearly invites new empirical work.

Finally, our evidence on heterogeneity within sectors and industries points to the role of firms as major actors in international trade already during the First globalization. While this has long been recognized by business historians and documented in excellent case studies (e.g. Brown 1992, Brown 1995), it was difficult to reconcile with the big picture along the lines of Heckscher-Ohlin. Unfortunately, we lack systematic firm level data on trade, but our findings on the importance of the extensive margin suggest searching for related firm-level evidence, such as firm sizes (see for example Biermann, forthcoming). High-productivity firms probably benefitted much more from declining trade costs, notably in sectors with a comparative advantage as suggested by Bernard et al (2007). This opens a new perspective on the rise of German multinationals before 1914 such as Bosch, Siemens or BASF to name a few.

References

Abramitzky, R. (2015). “Economics and the Modern Economic Historian”, *The Journal of Economic History*, 75 (04), 1240–1251.

Amiti, M. and C. Freund (2010), "The Anatomy of China's Export Growth," NBER Chapters, in: China's Growing Role in World Trade, pages 35-56, National Bureau of Economic Research, Inc.

Bernard, Andrew B., Stephen J. Redding and Peter K. Schott (2007), “Comparative Advantage and Heterogeneous Firms”, *Review of Economic Studies*, 74, 31–66.

Biermann, Marcus (forthcoming), “Trade and the size distribution of firms: Evidence from the German Empire”, *German Economic Review*.

Bondi, G. (1958). *Deutschlands Aussenhandel 1815-1870*. Berlin: Akademie Verlag.

Brown, John C. (1992), „Market Organization, Protection, and Vertical Integration. German Cotton Textiles before 1914”, *The Journal of Economic History* 52 (2), 339-351.

Brown, John C. (1995), „Imperfect Competition and Anglo-German Trade Rivalry. Markets for Cotton Textiles before 1914”, *The Journal of Economic History* 55 (3), 494-527.

Buchheim, C. (1982). *Deutsche Gewerbeexporte nach England in der zweiten Hälfte des 19. Jahrhunderts*. Ostfildern: Scripta Mercaturae.

Calderón, C., Chong, A., and Stein, E. (2007). “Trade Intensity and Business Cycle Synchronization: Are Developing Countries any Different?” *Journal of International Economics*, 71 (1), 2–21.

Federico, G. and Wolf, N. (2012). “A Long-run Perspective on Comparative Advantage”, In: G. Toniolo (Ed.), *The Oxford Handbook of the Italian Economy since Unification*, Oxford: Oxford University Press, chap. 12. 327–350.

Grubel, H. G. and Lloyd, P. J. (1971). “The Empirical Measurement of Intra-Industry Trade”, *Economic Record*, 47 (4), 494–517.

Hausmann, R., Hwang, J., and Rodrik, D. (2007). „What You Export Matters”, *Journal of Economic Growth*, 12 (1), 1–25.

Höpfner, B. (1992). *Der deutsche Außenhandel 1900-1945. Änderungen in der Waren- und Regionalstruktur*. Frankfurt: Peter Lang.

Huberman, M. C. Meissner and K. Oosterlinck (2017), "Technology and Geogrpahy in the Second Industrial Revolution: New Evidence from the Margins of Trade", *The Journal of Economic History* 77 (1), 39-88.

Hungerland, Wolf-Fabian and C. Altmeppen (2021), "What is a product anyway? Applying the Standard International Trade Classification (SITC) to historical data", *Historical Methods: A Journal of Quantitative and Interdisciplinary History*.

Jasper, R. (1996). *Die regionalen Strukturwandlungen des deutschen Außenhandels von 1880 bis 1938*. School of Business and Economics, Free University of Berlin, PhD thesis.

Junghanns, C. (1848). *Der Fortschritt des Zollvereins*. Lepzig: Sauerländer.

Lafay, G. (1992). „The Measurement of Revealed Comparative Advantage" In: M. G. Dagenais and P.-A. Muet (Eds.), *International Trade Modelling*, London: Chapman and Hall, chap. 10, 209–234.

Lall, S. (2000). "The Technological Structure and Performance of Developing Country Manufactured Exports, 1985-1998". *Queen Elizabeth House Working Paper Series*, Working Paper Nr. 44.

Lewis, A. W. (1978). *Growth and Fluctuations, 1870-1913*. London: Allen and Unwin.

Meissner, C. M. (2015). "New Perspectives on the First Wave of Globalization", *National Bureau of Economic Research Report*, Nr. 1: Research Summary. URL http://www.nber.org/reporter/2015number1/meissner.html.

Melitz, M. J. (2003). „The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica*, 71 (6), 1695–1725.

Mitchener, K. J. (2015). "The 4D Future of Economic History: Digitally-Driven Data Design", *The Journal of Economic History*, 75 (4), 1234–1239.

O'Rourke, K. H. and Williamson, J. G. (1999). *Globalization and History: The Evolution of a Nineteenth-century Atlantic Economy*. Cambridge, MA: MIT Press.

Rauch, J. E. (1999). "Networks Versus Markets in International Trade", *Journal of International Economics*, 48 (1), 7–35.

Torp, C. (2005). *Die Herausforderung der Globalisierung*. Göttingen: Vandenhoeck and Ruprecht.

Appendix

A Primary Sources

A.1 Reich ('Zollverein)

The following volumes of the *Statistik des Deutschen Reichs* were compiled by the Imperial German statistical office (*Kaiserliches Statistisches Amt*) and published by *Puttkammer and Mühlbrecht* in Berlin. The spelling resembles that in the sources.

- Vol. 50, Alte Folge (1881). *Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1880. Erster Abschnitt, II: Einfuhr, Ausfuhr und unmittelbaren Durchfuhr im Jahre 1880, geordnet nach den einzelnen Ländern der Herkunft bezw. Bestimmung, mit Angabe der Waarengattungen*.
- Vol. 51, Alte Folge (1882). *Waarenverkeehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1881. Erster Abschnitt, II: Einfuhr, Ausfuhr und unmittelbaren Durchfuhr im Jahre 1881, geordnet nach den einzelnen Ländern der Herkunft bezw. Bestimmung, mit Angabe der Waarengattungen*.
- Vol. 61, Alte Folge (1883). *Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1882. Erster Abschnitt, II: Einfuhr, Ausfuhr und unmittelbaren Durchfuhr im Jahre 1882, geordnet nach den einzelnen Ländern der Herkunft bezw. Bestimmung, mit Angabe der Waarengattungen*.
- Vol. 10, Neue Folge (1884). *Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1883. Erster Abschnitt, II: Einfuhr, Ausfuhr und unmittelbaren Durchfuhr im Jahre 1883, geordnet nach den einzelnen Ländern der Herkunft bezw. Bestimmung, mit Angabe der Waarengattungen*.
- Vol. 15, Neue Folge (1885). *Der auswärtige Waarenverkehr des deutschen Zollgebiets mit dem Auslande im Jahre 1884. 2. Theil: Der auswärtige Waarenverkehr des deutschen Zollgebiets, dargestellt nach den Ländern Herkunft bezw. Bestimmung und nach den Grenzstrecken des Eingangs und Ausgangs sowie überseeischer Waarenverkehr in den wichtigeren Seehäfen des Zollgebiets und den Zollausschlüssen*.
- Vol. 20, Neue Folge (1886). *Der auswärtige Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1885. Zweiter Theil: Der auswärtige Waarenverkehr des deutschen Zollgebiets, geordnet nach den Ländern Herkunft bezw. Bestimmung und nach den Grenzstrecken des Eingangs und Ausgangs sowie überseeischer Waarenverkehr in den wichtigeren Seehäfen des Zollgebiets und den Zollausschlüssen*.
- Vol. 26, Neue Folge (1887). *Der auswärtige Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1886. 2. Theil: Der auswärtige Waarenverkehr des deutschen Zollgebiets, geordnet nach den Ländern Herkunft bezw. Bestimmung und nach den Grenzstrecken des Eingangs und Ausgangs sowie überseeischer Waarenverkehr in den wichtigeren Seehäfen des Zollgebiets und den Zollausschlüssen*.
- Vol. 34, Neue Folge (1888). *Der auswärtige Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1887. 2. Theil: Der auswärtige Waarenverkehr des deutschen Zollgebiets, geordnet nach den Ländern Herkunft bezw. Bestimmung und nach den Grenzstrecken des Eingangs und Ausgangs sowie überseeischer Waarenverkehr in den wichtigeren Seehäfen des Zollgebiets und den Zollausschlüssen*.
- Vol. 41, Neue Folge (1889). *Der auswärtige Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1888. 2. Theil: Der auswärtige Waarenverkehr des*

deutschen Zollgebiets, geordnet nach den Ländern Herkunft bezw. Bestimmung und nach den Grenzstrecken des Eingangs und Ausgangs sowie überseeischer Waarenverkehr in den wichtigeren Seehäfen des Zollgebiets und den Zollausschlüssen.

- Vol. 48, Neue Folge (1890). *Der auswärtige Waarenverkehr des Deutschen Zollgebiets mit dem Auslande im Jahre 1889. 2. Theil: Der auswärtige Waarenverkehr des deutschen Zollgebiets, geordnet nach den Ländern Herkunft bezw. Bestimmung und nach den Grenzstrecken des Eingangs und Ausgangs sowie überseeischer Waarenverkehr in den wichtigeren Seehäfen des Zollgebiets und den Zollausschlüssen*.
- Vol. 55, Neue Folge (1891). *Auswärtiger Handel des Deutschen Zollgebiets im Jahre 1890. 2. Theil: Statistik des auswärtigen Handels nach Herkunfts- und Bestimmungsländern, auch nach Grenzstrecken und wichtigeren Seehäfen nebst Anhang: Waarenverkehr in systematischer Gruppirung der Waaren*.
- Vol. 61, Neue Folge (1892). *Auswärtiger Handel des Deutschen Zollgebiets im Jahre 1891. 2. Theil: Darstellung nach Herkunfts- und Bestimmungsländern*.
- Vol. 66, Neue Folge (1893). *Auswärtiger Handel des Deutschen Zollgebiets im Jahre 1892. 1. Theil: Darstellung nach Waarengattungen*.
- Vol. 73, Neue Folge (1894). *Auswärtiger Handel des Deutschen Zollgebiets im Jahre 1893. 1. Theil: Der auswärtige Handel nach Menge und Werth der Waaren-Gattungen und der Verkehr mit den einzelnen Ländern*.
- Vol. 79, Neue Folge (1895). *Auswärtiger Handel des Deutschen Zollgebiets im Jahre 1894. 1. Theil: Der auswärtige Handel nach Menge und Werth der Waaren-Gattungen und der Verkehr mit den einzelnen Ländern*.
- Vol. 85, Neue Folge (1896). *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*.
- Vol. 91, Neue Folge (1897). *Auswärtiger Handel des Deutschen Zollgebiets im Jahre 1896. 1. Theil: Der auswärtige Handel nach Menge und Werth der Waaren-Gattungen und der Verkehr mit den einzelnen Ländern*.
- Vol. 152, Neue Folge (1903). *Auswärtiger Handel des Deutschen Zollgebietes im Jahre 1905. 1. Teil: Der Verkehr mit den einzelnen Ländern im Jahre 1902 unter Vergleichung mit den Zahlen der Jahre 1897 bis 1901*.

  Abschnitt A: Europäische Länder.
  Abschnitt B: Außereuropäische Staaten.

- Vol. 172, Neue Folge (1906). *Auswärtiger Handel des Deutschen Zollgebietes im Jahre 1905. 2. Teil: Der Verkehr mit den einzelnen Ländern im Jahre 1905 unter Vergleichung mit den Zahlen der Jahre 1900 bis 1904.*

  Abschnitt A: Europäische Länder.
  Abschnitt B: Außereuropäische Staaten.

- Vol. 182, Neue Folge (1907). *Auswärtiger Handel des Deutschen Zollgebietes im Jahre 1906. 2. Teil: Der Verkehr mit den einzelnen Ländern.*

  Abschnitt A: Europäische Länder.
  Abschnitt B: Außereuropäische Staaten.

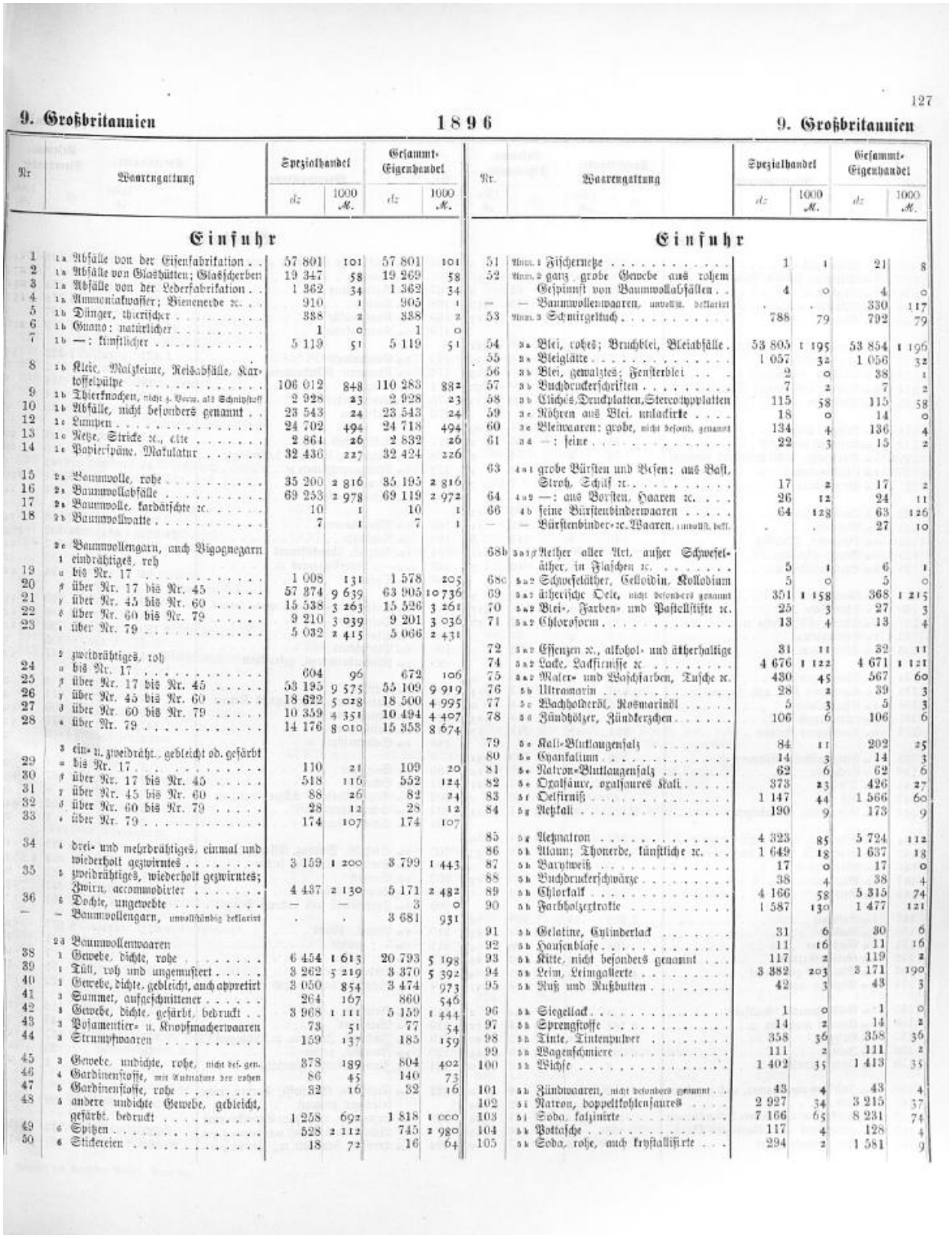
- Vol. 252, Neue Folge (1912). *Auswärtiger Handel im Jahre 1911. Der Verkehr mit den einzelnen Ländern im Jahre 1911 unter Vergleichung mit den vier Vorjahren.*

  Abschnitt A: Europäische Länder.
  Abschnitt B: Außereuropäische Staaten.

- Vol. 271, Neue Folge (1914). *Auswärtiger Handel im Jahre 1913. Der Verkehr mit den einzelnen Ländern im Jahre 1913 unter Vergleichung mit den vier Vorjahren.*

  Abschnitt A: Europäische Staaten.
  Abschnitt B: Außereuropäische Länder.

FIGURE A1
A SNAPSHOT OF ZOLLVEREIN TRADE STATISTICS: DATA



Nr	Warengattung	Spezialhandel dz	Spezialhandel 1000 M.	Gesammt-Eigenhandel dz	Gesammt-Eigenhandel 1000 M.
	Einfuhr				
1	1a Abfälle von der Eisenfabrikation	57 801	101	57 801	101
2	1a Abfälle von Glashütten; Glasscherben	19 347	58	19 269	58
3	1a Abfälle von der Lederfabrikation	1 362	34	1 362	34
4	1a Ammoniakwasser; Bienenerde ꝛc.	910	1	965	1
5	1b Dünger, thierischer	338	2	338	2
6	1b Guano: natürlicher	1	0	1	0
7	1b —: künstlicher	5 119	51	5 119	51
8	1b Kleie, Malzkeime, Reisabfälle, Kartoffelpülpe	106 012	848	110 283	882
9	1b Thierknochen, nicht z. Verw. als Schmiestoff	2 928	23	2 928	23
10	1b Abfälle, nicht besonders genannt	23 543	24	23 543	24
12	1c Lumpen	24 702	494	24 718	494
13	1c Netze, Stricke ꝛc., alte	2 864	26	2 832	26
14	1c Papierspäne, Makulatur	32 436	227	32 424	226
15	2a Baumwolle, rohe	35 200	2 816	35 195	2 816
16	2a Baumwollabfälle	69 253	2 978	69 119	2 972
17	2a Baumwolle, kardätschte ꝛc.	10	1	10	1
18	2b Baumwollwatte	7	1	7	1
	2c Baumwollengarn, auch Vigognegarn				
	1 eindrähtiges, roh				
19	α bis Nr. 17	1 008	131	1 578	205
20	β über Nr. 17 bis Nr. 45	57 374	9 639	63 905	10 736
21	γ über Nr. 45 bis Nr. 60	15 538	3 263	15 526	3 261
22	δ über Nr. 60 bis Nr. 79	9 210	3 039	9 201	3 036
23	ε über Nr. 79	5 032	2 415	5 066	2 431
	2 zweidrähtiges, roh				
24	α bis Nr. 17	604	96	672	106
25	β über Nr. 17 bis Nr. 45	53 195	9 575	55 109	9 919
26	γ über Nr. 45 bis Nr. 60	18 622	5 028	18 500	4 995
27	δ über Nr. 60 bis Nr. 79	10 359	4 351	10 494	4 407
28	ε über Nr. 79	14 176	8 010	15 358	8 674
	3 ein- u. zweidräht., gebleicht od. gefärbt				
29	α bis Nr. 17	110	21	109	20
30	β über Nr. 17 bis Nr. 45	518	116	552	124
31	γ über Nr. 45 bis Nr. 60	88	26	82	24
32	δ über Nr. 60 bis Nr. 79	28	12	28	12
33	ε über Nr. 79	174	107	174	107
34	4 drei- und mehrdrähtiges, einmal und wiederholt gezwirntes	3 159	1 200	3 799	1 443
35	5 zweidrähtiges, wiederholt gezwirntes; Zwirn, accommodirter	4 437	2 130	5 171	2 482
36	6 Dochte, ungewebte	—	—	3	0
—	— Baumwollengarn, unvollständig deklarirt	.	.	3 681	931
	2a Baumwollenwaaren				
38	1 Gewebe, dichte, rohe	6 454	1 613	20 793	5 198
39	1 Tüll, roh und ungemustert	3 262	5 219	3 370	5 392
40	1 Gewebe, dichte, gebleicht, auch appretirt	3 050	854	3 474	973
41	1 Sammet, aufgeschnittener	264	167	860	546
42	1 Gewebe, dichte, gefärbt, bedruckt	3 968	1 111	5 159	1 444
43	1 Posamentier- u. Knopfmacherwaaren	73	51	77	54
44	1 Strumpfwaaren	159	137	185	159
45	3 Gewebe, undichte, rohe, nicht bes. gen.	378	189	804	402
46	4 Gardinenstoffe, mit Ausnahme der rothen	86	45	140	73
47	5 Gardinenstoffe, rothe	32	16	32	16
48	5 andere undichte Gewebe, gebleicht, gefärbt, bedruckt	1 258	692	1 818	1 000
49	6 Spitzen	528	2 112	745	2 980
50	6 Stickereien	18	72	16	64
51	Anm. 1 Fischernetze	1	1	21	8
52	Anm. 2 ganz grobe Gewebe aus rohem Gespinnst von Baumwollabfällen	4	0	4	0
—	— Baumwollenwaaren, unvollst. deklarirt	.	.	330	117
53	Anm. 3 Schmirgeltuch	788	79	792	79
54	3a Blei, rohes; Bruchblei, Bleiabfälle	53 805	1 195	53 854	1 196
55	3a Bleiglätte	1 057	32	1 056	32
56	3b Blei, gewalztes; Fensterblei	2	0	38	1
57	3b Buchdruckerschriften	7	2	7	2
58	3b Clichés, Druckplatten, Stereotypplatten	115	58	115	58
59	3c Röhren aus Blei, unlackirte	18	0	14	0
60	3c Bleiwaaren: grobe, nicht besond. genannt	134	4	136	4
61	3d —: feine	22	3	15	2
63	4a1 grobe Bürsten und Besen: aus Bast, Stroh, Schilf ꝛc.	17	2	17	2
64	4a2 —: aus Borsten, Haaren ꝛc.	26	12	24	11
66	4b feine Bürstenbinderwaaren	64	128	63	126
—	— Bürstenbinder-ꝛc. Waaren, unvollst. dekl.	.	.	27	10
68b	5a1β Aether aller Art, außer Schwefeläther, in Flaschen ꝛc.	5	1	6	1
68c	5a2 Schwefeläther, Celloidin, Kollodium	5	0	5	0
69	5a2 ätherische Oele, nicht besonders genannt	351	1 158	368	1 215
70	5a2 Blei-, Farben- und Pastellstifte ꝛc.	25	3	27	3
71	5a2 Chloroform	13	4	13	4
72	5a2 Essenzen ꝛc., alkohol- und ätherhaltige	31	11	32	11
74	5a2 Lacke, Lackfirnisse ꝛc.	4 676	1 122	4 671	1 121
75	5a2 Maler- und Waschfarben, Tusche ꝛc.	430	45	567	60
76	5b Ultramarin	28	2	39	3
77	5c Wachholderöl, Rosmarinöl	5	3	5	3
78	5d Zündhölzer, Zündkerzchen	106	6	106	6
79	5e Kali-Blutlaugensalz	84	11	202	25
80	5e Cyankalium	14	3	14	3
81	5e Natron-Blutlaugensalz	62	6	62	6
82	5e Oxalsäure, oxalsaures Kali	373	23	426	27
83	5f Oelfirniß	1 147	44	1 566	60
84	5g Aetzkali	190	9	173	9
85	5g Aetznatron	4 323	85	5 724	112
86	5h Alaun; Thonerde, künstliche ꝛc.	1 649	18	1 637	18
87	5h Barytweiß	17	0	17	0
88	5h Buchdruckerschwärze	38	4	38	4
89	5h Chlorkalk	4 166	58	5 315	74
90	5h Farbholzextrakte	1 587	130	1 477	121
91	5h Gelatine, Cylinderlack	31	6	30	6
92	5h Hausenblase	11	16	11	16
93	5h Kitte, nicht besonders genannt	117	2	119	2
94	5h Leim, Leimgallerte	3 382	203	3 171	190
95	5h Ruß und Rußbutten	42	3	43	3
96	5h Siegellack	1	0	1	0
97	5h Sprengstoffe	14	2	14	2
98	5h Tinte, Tintenpulver	358	36	358	36
99	5h Wagenschmiere	111	2	111	2
100	5h Wichse	1 402	35	1 413	35
101	5h Zündwaaren, nicht besonders genannt	43	4	43	4
102	5i Natron, doppeltkohlensaures	2 927	34	3 215	37
103	5i Soda, kalzinirte	7 166	65	8 231	74
104	5k Pottasche	117	4	128	4
105	5k Soda, rohe, auch krystallisirte	294	2	1 581	9

A.2 Hamburg

The following volumes of the *Tabellarische Uebersichten des Hamburgischen Handels* were compiled by the Hamburgian statistical office (*Handelstatistisches Bureau*) and published by *H. A. Kümpel* until 1884 and by Schröder and Jeva thereafter, both based in Hamburg. The spelling resembles that in the sources.

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1880 (1881).

> *Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1880 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.*
> *Tabulation: Die Ausfuhr. Die Ausfuhr im Jahre 1880 nach den Bestimmungsländern mit Unterscheidung der Waaren.*

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1881 (1882).

> *Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1881 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.*
> *Tabulation: Die Ausfuhr. Die Ausfuhr im Jahre 1881 nach den Bestimmungsländern mit Unterscheidung der Waaren.*

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1882 (1883).

> *Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1882 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.*
> *Tabulation: Die Ausfuhr. Die Ausfuhr im Jahre 1882 nach den Bestimmungsländern mit Unterscheidung der Waaren.*

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1882 (1883). II. Der Waarenverkehr.

> *Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1882 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.*
> *Tabulation: Die Ausfuhr. Die Ausfuhr im Jahre 1882 nach den Bestimmungsländern mit Unterscheidung der Waaren.*

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1883 (1884).

> *Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1883 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.*
> *Tabulation: Die Ausfuhr. Die Ausfuhr im Jahre 1883 nach den Bestimmungsländern mit Unterscheidung der Waaren.*

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1883 (1884).

> *Tabulation: Die Einfuhr.Die Einfuhr im Jahre 1883 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.*
> *Tabulation: Die Ausfuhr. Die Ausfuhr seewärts im Jahre 1883 nach den Bestimmungsländern mit nterscheidung der Waaren.*

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1884 (1885).

Tabulation: Die Einfuhr.Die Einfuhr im Jahre 1884 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.
Tabulation: Die Ausfuhr. Die Ausfuhr seewärts im Jahre 1884 nach den Bestimmungsländern mit Unterscheidung der Waaren.

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1885 (1886).

Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1885 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.
Tabulation: Die Ausfuhr. Die Ausfuhr seewärts im Jahre 1885 nach den Bestimmungsländern mit Unterscheidung der Waaren.

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1886 (1887).

Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1886 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.
Tabulation: Die Ausfuhr. Die Ausfuhr seewärts im Jahre 1886 nach den Bestimmungsländern mit Unterscheidung der Waaren.

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1887 (1888).

Tabulation: Die Einfuhr im Jahre 1887 nach den Herkunftsländern beziehungsweise Transportwegen mit Unterscheidung der Waaren.
Tabulation: Die Ausfuhr. Die Ausfuhr seewärts im Jahre 1887 nach den Bestimmungsländern mit Unterscheidung der Waaren.

• Tabellarische Uebersichten des Hamburgischen Handels im Jahre 1888 (1889).

Tabulation: Die Einfuhr. Die Einfuhr im Jahre 1889 nach den Herkunftsländern beziehungsweise Transportwegen mit UnTabulationterscheidung der Waaren.
Tabulation: Die Ausfuhr. Die Ausfuhr seewärts im Jahre 1889 nach den Bestimmungsländern mit Unterscheidung der Waaren.

FIGURE A2
A SNAPSHOT OF HAMBURGIAN TRADE STATISTICS: DATA

II. 34

Die Einfuhr im Jahre 1888 nach den Herkunftsländern

Tab. 56.

Russland, Schweden, Norwegen.

			M.
Transport			3 665 080
Süssholz	100 kg	35	2 190
Wurmsamen	„	140	4 810
medicinische Sämereien	„	88	24 260
and. med. Blätter, Blüthen etc.	„	113	12 650
Anisöl	kilogr	830	13 580
Albumin	100 kg	78	18 440
Phosphor	„	195	79 500
and. Droguen u. Chemikalien	„	89	12 480
Schlacken von Erzen	„	294	3 000
rohes Blei	„	546	6 370
Gold- und Silberkrätze	„	488	27 550
Quecksilber	„	259	113 300
rohes Zink	„	171	3 000
andere Metalle	„	276	6 320
rohe Rosshäute	„	730	44 720
Kalbfelle	„	195	33 810
Schaf- und Ziegenfelle	„	528	77 900
Rennthierfelle	„	12	3 500
Leder	„	30	18 980
Knochenasche	„	885	5 010
Gedärme	„	299	25 120
trockenes Blut	„	3 703	57 170
andere Abfälle	„	469	10 730
Pferdehaare	kilogr	850	2 400
Borsten	100 kg	13	15 790
Mineralschmieröle	„	11 315	190 960
Oleïn	„	134	10 710
Grassaat	„	295	17 200
Hanfsaat	„	6 564	104 440
Kleesaat	„	443	39 250
Leinsaat	„	1 431	28 390
Raps und Rübsaat	„	98	2 600
Oelkuchen	„	12 071	135 460
europäische Nutzhölzer	„	1 109	7 970
altes Tauwerk	„	580	7 850
Lumpen	„	1 790	23 930
Flachs	„	428	30 950
Hanf	„	242	11 070
Werg	„	326	12 610
Leinengarn	„	39	2 200
and. Rohstoffe u. Halbfabrik.			6 940
Segelleinen	100 kg	164	27 620
neues Tauwerk	„	3 685	287 120
Matten	„	420	6 400
Holzdraht	„	128	2 310
feine Holzwaaren	„	91	3 620
Gummischuhe	Paar	27 970	38 740
Papier	100 kg	1 222	37 680
Gemälde	kilogr	510	3 000
Hohlglaswaaren	100 kg	633	22 000
andere Industrieartikel			7 000
Passagiergut	100 kg	33	10 710
Total	100 kg	385 048	5 366 340
1887	„	394 329	5 862 360
1886	„	362 416	6 625 120
1885	„	252 383	4 429 340
1884	„	140 704	2 911 440

			M.
Transport			1 515 660
and. Droguen u. Chemikalien	100 kg	197	42 460
Kreide	„	1 790	4 190
Kupfererz, silberh.	„	167	188 860
rohes Blei	„	243	4 970
Roheisen	„	4 510	41 910
Stangen- und Schmiedeeisen	„	111 735	1 850 590
Stahl	„	5 284	178 270
rohes Kupfer	„	33	4 650
Gold- und Silberkrätze	„	24	3 320
Gelbmetall	„	42	3 390
Messing	„	202	16 380
rohes Zink	„	364	8 210
rohes Zinn	„	18	2 900
andere Metalle	„	638	55 860
gewalzte Eisenbleche	„	3 619	109 980
eiserne Platten	„	6 599	111 640
Stahlbleche und -Platten	„	272	7 330
Eisendraht	„	25 230	499 090
Stahldraht	„	516	58 630
trock. u. gesalz. Rindshäute	„	496	38 990
Kalbfelle	„	984	224 140
Leder	„	19	7 560
Wachs	„	89	20 050
Kleesaat	„	94	5 800
Holzstoff	„	8 441	106 060
Lumpen	„	857	15 850
Wollgarn	„	11	3 250
and. Rohstoffe u. Halbfabrik			14 800
Wollen- u. Halbwollenwaaren	kilogr	380	2 000
Baumwollenwaaren	100 kg	50	15 280
Säcke	Stück	12 290	4 520
Korke	Mille	2 805	7 450
Mobilien	100 kg	73	5 910
Fässer	Stück	686	4 260
grobe Holzwaaren	100 kg	9 978	230 890
feine „	„	462	24 260
Papier	„	8 679	299 050
Tinte	„	35	3 340
gedruckte Bücher	„	67	13 470
Gemälde	kilogr	720	18 630
Zündhölzer	100 kg	604	53 820
Glaswaaren	„	484	20 510
grobe Eisenwaaren	„	2 596	142 710
eiserne Nägel	„	330	49 100
feine Eisenwaaren	„	47	2 500
Locomotiven	„	48	4 450
Nähmaschinen	„	1 251	108 540
andere Maschinen	„	19 204	1 105 490
Zündhölzer			16 220
andere Industrieartikel	100 kg	62	9 130
Passagiergut	100 kg	629 649	7 286 320
Total	„	590 137	6 323 180
1887	„	465 529	6 069 370
1886	„	427 248	5 080 980
1885	„	315 325	4 932 020
1884			

			M.
Transport			6 858 980
Bauholz	100 kg	99 171	859 430
Stabholz	„	569	4 420
Sand- und Granitsteine	„	205 869	551 750
Fuselöl	„	224	3 720
Oxalsäure	„	251	17 890
Jod und Jodkalium	„	71	190 800
and. Droguen u. Chemikalien	„	32	4 620
Flussspath	„	392	3 600
phosphorsaur. mineral. Kalk	„	4 976	36 300
Kaolin	„	8 235	33 310
Schleifsteine	„	109	4 150
Gold- und Silbererz	„	1 819	94 850
Kobalt- und Nickelerz	„	474	77 080
Kupfererz	„	61	1 980
Stangen- und Schmiedeeisen	„	2 615	40 020
Stahl	„	69	4 090
Kupfer	„	613	93 490
Gold- und Silberkrätze	„	93	15 940
Gelbmetall	„	62	4 690
Messing	„	71	6 350
Nickel	„	48	10 000
andere Metalle	„	70	6 030
gewalzte Eisenbleche	„	185	4 440
trock. u. gesalz. Rindshäute	„	186	23 360
Kalbfelle	„	788	206 950
Schaf- und Ziegenfelle	„	351	76 450
Seehundsfelle	„	95	16 880
and. Felle zur Lederbereitung	„	49	9 410
Rennthierfelle	„	147	33 810
Pelzfelle	„	83	110 250
fertiges Pelzwerk	„	10	11 460
Leder	„	17	5 600
Hirsch-, Reh- etc. Hörner	„	157	5 960
Walfischbarten	„	285	40 900
rohe Knochen	„	1 514	12 670
Guano	„	33 094	439 050
and. thierischer Dünger	„	743	5 560
andere Abfälle	„	614	5 620
Bettfedern	„	14	31 640
Leim	„	502	39 270
Stearin	„	328	8 900
Knochenfett	„	92	4 300
Thran	Tonnen	52 623	2 199 120
europäische Nutzhölzer	100 kg	1 062	13 380
Holzstoff	„	5 737	130 330
Lumpen	„	1 499	20 980
rohe Schafwolle	„	55	5 380
and. Rohstoffe u. Halbfabrik			28 580
Wollen- u. Halbwollenwaaren	100 kg	35	27 040
Baumwollwaaren	kilogr	700	3 460
Säcke	Stück	22 220	13 140
and. Leinwand	100 kg	10	2 710
fert. Kleider u. Putzwaaren	kilogr	780	7 730
andere Manufakturwaaren			8 420
neues Tauwerk	100 kg	135	11 590
Korke	Mille	7 296	21 630
Fässer	Stück	1 802	17 590
grobe Holzwaaren	100 kg	352	9 930
feine „	„	84	4 130
Schirme	kilogr	520	3 440
Papier	100 kg	16 840	435 890
gedruckte Bücher	„	133	47 850
Gemälde	„	28	42 050
grobe Eisenwaaren	„	205	11 410
eiserne Nägel	„	6 930	269 140
and. feine Eisenwaaren	„	52	7 540
Waaren aus edlen Metallen	gramm	16 245	12 150
andere Metallwaaren	100 kg	29	4 610
Maschinen	„	825	86 190
mathemat. etc. Instrumente	100 kg	19	5 580
Taschenuhren	kilogr	13	2 600
Schiesspulver	100 kg	13	2 490
Zündhölzer	„	3 846	254 390
Naturalien	„	13	6 250
andere Kurzwaaren	„	25	16 780
leere Kisten und Körbe	„	119	4 020
andere Industrieartikel			21 160
Passagiergut	100 kg	92	26 230
Total	100 kg	658 406	13 300 880
1887	„	561 891	10 841 530
1886	„	512 505	10 360 440
1885	„	428 048	9 640 610
1884	„	885 916	11 559 720

Schweden

			Werth M.
getrocknetes Obst	100 kg	280	6 670
frisches Obst	„	777	14 590
Cognac	hl	24	5 460
Korn-, Kart.-Spiritus u. -Sprit	„	9 096	216 250
Liqueur u. and. Branntwein	„	116	21 980
Erbsen	„	1 971	24 970
Reisstaub und Kleie	„	209	2 300
Heringe	Tonnen	90	2 590
Anchovis	100 kg	100	7 560
andere zubereitete Fische	„	27	5 620
frische Fische	„	3 378	27 570
andere Verzehrungsartikel			8 040
Bauholz	100 kg	157 372	608 990
Stabholz	„	671	3 470
Sand- und Granitsteine	„	235 020	516 870
Holzkohlen	„	116	2 520
Farbewaaren	„	70	4 310
Fuselöl	„	364	10 000
gereinigter Schwefel	„	2 268	25 900
Transport M.			1 515 660

Norwegen

			Werth M.
Kaffee	100 kg	36	5 780
Kautabeck	kilogr	800	2 360
Wein	hl	14	2 370
Liqueur u. and. Branntwein	„	220	22 980
Bier	„	8 521	534 700
Kümmel	100 kg	146	10 780
Reisstaub und Kleie	„	8 972	82 660
Heringe	Tonnen	61 177	1 102 550
geräucherte Fische	100 kg	223	9 400
Sardinen	„	20	3 470
Anchovis	„	1 830	109 270
and. zubereitete Fische	„	793	92 790
getrocknete Fische	„	90 305	4 386 850
frische Fische	„	6 528	341 250
Hummer	„	474	97 820
Wild und Geflügel	„	79	8 560
gesalz. u. geräuch. Fleisch	„	46	3 310
and. zubereitetes Fleisch	„	112	12 080
Butter	„	61	8 340
condensirte Milch	„	36	3 560
Conserven	„	57	9 040
andere Verzehrungsartikel			9 060
Transport M.			6 858 980

A.3 Bremen

The following volumes of the *Jahrbuch für Bremische Statistik* were compiled by the Bremish statistical office (*Bureau für Bremische Statistik*) and published by *Kommissionsverlag von G.A. von Halem*, based in Bremen. The spelling resembles that in the sources.

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1880 (1881).

> *Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1880 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.*
> *Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1880 nach Quantum und Werth der einzelnen Artikel.*

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1881 (1882).

> *Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1881 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.*
> *Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1881 nach Quantum und Werth der einzelnen Artikel.*

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1882 (1883).

> *Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1882 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.*
> *Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1882 nach Quantum und Werth der einzelnen Artikel.*

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1882 (1883).

> *Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1882 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.*
> *Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1882 nach Quantum und Werth der einzelnen Artikel.*

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1883 (1884).

> *Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1883 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.*
> *Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1883 nach Quantum und Werth der einzelnen Artikel.*

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1884 (1885).

> *Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1884 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.*
> *Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1884 nach Quantum und Werth der einzelnen Artikel.*

• Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1885 (1886).

> *Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1885 aus den*

einzelnen Ländern und Plätzen, Werth und Waarengattungen.
Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1885 nach Quantum und Werth der einzelnen Artikel.

• Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1886 (1887).

Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1886 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.
Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1886 nach Quantum und Werth der einzelnen Artikel.

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1887 (1888).

Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1887 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.
Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1887 nach Quantum und Werth der einzelnen Artikel.

• I. Heft: Zur Statistik des Schiffs- und Waarenverkehrs im Jahre 1888 (1889).

Tabulation: Gesammt–Einfuhr see-, land- und flusswärts im Jahre 1888 aus den einzelnen Ländern und Plätzen, Werth und Waarengattungen.
Tabulation: Ausfuhr nach den einzelnen Ländern im Jahre 1888 nach Quantum und Werth der einzelnen Artikel.

FIGURE A3
A SNAPSHOT OF BREMISH TRADE STATISTICS: DATA

Ländern im Jahre 1887

der einzelnen Artikel. (Fortsetzung.)

Oesterreich.

Oesterreich, seewärts

Früchte, getr.,			
Johannisbrod	7 844	Kg.No.	1 511
Rosinen	28 357	„	10 025
Getreide, Gerste	208 940	„	31 380
Hafer	141 335	„	15 998
Malz	192 390	„	48 745
Hülsenfrüchte,			
Vitsbohnen	62 293	„	10 580
Lebensmittel, Grütze	2 475	„	747
Weizenmehl	134 175	„	30 923
Wein	302 107	Liter	134 513
Zucker, raffinirter	49 650	Kg.No.	14 560
Droguerien, rohe,			
Gummi, Arabicum	21 879	„	27 780
and. Gummi	4 183	„	3 343
Lorbeeren u. Lorbeerbl.	5 294	„	1 435
Pottloh	512	„	50
and. rohe Droguen	500	„	53
Färbestoffe	9 973	„	1 795
Farbewaaren	263	„	53
Schildpatt	180	„	3 000
Hanfwaaren	532	Kg.Bo.	395
Steingut, feines	1 059	„	1 271
		ℳ	338 157

Oesterreich, landwärts

Bier	458 957	Liter	115 921
Cichorien u. a. Kaffee-surrogate	1 464	Kg.No.	1 205
Früchte, getr., Brünellen	13 474	„	11 069
Haselnüsse	2 560	„	2 252
Zwetschen	1 466 660	„	405 751
andere	6 410	„	2 155
Süd- u. einges. Früchte	468	„	599
Getreide, Gerste	20 050	„	3 087
Malz	2 569 050	„	723 086
Hülsenfrüchte, Linsen	34 851	„	14 284
Vitsbohnen	239 612	„	47 647
Gewürze, Pfeffer	618	„	1 348
Hopfen	32 249	„	143 813
Lebensmittel, Butter	21 869	„	27 771
Eier	56 634	„	53 970
Fleisch etc., Ochsenfl.	380	„	619
Schinken	337	„	509
Würste	284	„	503
Wild u. Geflügel	5 191	„	5 490
Grütze	1 980	„	620
Käse	12 230	„	6 108
Konserven	5 943	„	1 448
Weizenmehl	7 920	„	2 320
and. Lebensmittel	446	„	490
Mineralwasser	48 386/1	Krüge	
	2 500/2	u. Fl.	22 302
Obst, getrocknetes	2 573	Kg.No.	2 114
Spirituosen, Kognak	639	Liter	1 037
Kräuterbranntwein	3 560	„	3 568
Liqueur	151	„	350
Taback, ungarischer	29 367	Kg.No.	15 599
türkischer etc.	1 961	„	902
Cigarren	224,7	Mille	5 050
Vieh, Schlachtvieh	39	Stück	3 700
Wein	109 079	Liter	114 283
Champagner	130/2	Flsch.	375
and. Verzehrungsgegenst.	für		413
Droguerien, rohe, Gummi	184	Kg.No.	782
med. Blätter u. Blüthen	518	„	333
Pottloh	159 111	Kg.No.	20 682
and. rohe Droguen	1 709	„	2 990
präparirte, Salze	164	„	464
and. Chemikalien	7 165	„	6 198
Dünger	5 640	„	1 540
Farbewaaren, Zinkweiss.	19 359	„	7 551
Zinnober	279	„	1 431
and. Farbewaaren	2 964	„	3 424
Federn,			
Bettfedern u. Daunen	2 587	„	8 231
Felle, rohes Pelzwerk	2 727	„	21 581
Glycerin	232	„	292
Haare, Menschenhaare	5 161	„	101 672
Hasenhaare	220	„	2 851
Pferdehaare	131	„	330
Schweinsborsten	3 159	„	15 384
Holz, Tannen, Erlen etc.	2 123,39	Kbm.	88 141
Stabholz	600	Rumpf	1 391
Meerschaum, roher	1 652	Kg.Bo.	1 652
Naturalien	1 066	„	1 421
Oele, aetherische	766	Kg.No.	5 592
Samen, Hanfsamen	20 000	„	3 114
and. Sämereien	577	„	465
Schwämme, feine	1 610	„	9 011
Spinnstoffe, Schafwolle	204	„	316
and. Rohstoffe	für		566
Stahl	11 015	Kg.No.	11 880
and. Metalle	109	„	1 036
Garn, Baumwollengarn	622	„	1 412
Wollengarn	213	„	990
Leder, gegerbtes	10 761	„	68 871
Baumwollenwaaren	126 556	Kg.Bo.	278 598
Hüte u. Kappen	814	„	3 256
Leinen u. Leinenwaaren	41 481	„	120 293
Seiden- u. Halbseidenw.	24 701	„	666 927
Spitzen	275	„	1 953
Wollen Tuch	12 909	„	162 651
Wollen- u. Halbwollenw.	108 669	„	1 312 996
Manufakturw. überhpt.	7 902	„	78 085
Bücher u. a. Drucksachen	9 861	„	21 531
Bürstenwaaren	2 383	„	4 051
Eisenwaaren, Stahlwaaren	7 002	„	18 205
and. Eisenwaaren	25 263	„	36 004
Galanterie- u. Kurzew.	602 870	„	1 468 545
Gemälde, Statuen u. dgl.	4 622	„	21 955
Geräth, Mobilien	30 230	„	43 511
Wagen	8	Kolli	1 784
Glaswaaren	543 801	Kg.Bo.	600 849
Gummiwaaren	1 511	„	5 893
Hanfwaaren	826	„	857
Holzwaaren, Spielzeug	55 569	„	66 693
feine Holzwaaren überhpt.	21 080	„	31 300
ordinaire Holzwaaren	2 023	„	909
Instrumente, Fortepiani	2	Stück	1 347
mathem., opt. etc.	1 510	Kg.Bo.	5 510
Musikinstrum. überhpt.	5 432	„	11 319
Kleidung, neue	4 456	„	28 073
Korkwaaren	688	„	4 395
Lederwaaren, Handschuhe	13 687	„	298 377
and. Lederwaaren	119 189	„	500 701
Leim	252	Kg.No.	727
Lichte	797	„	852
Maschinen	8 644	„	7 777
Messingwaaren	162	Kg.Bo.	545
Metallwaaren	26 445	„	92 130
Papier	40 869	„	17 272
Papierwaaren	5 170	„	6 168
Parfümerien u. Essenzen	420	„	672
Pelzwerk	746	„	4 327

B Generating the Quota in Practice

In order to combine the trade data from Hamburg, Bremen and the German "Zollverein" for the years 1880-188, we extend the quota method suggested by Buchheim (1982). If, for example, in a given year the total export of grain from the *Zollverein* to Bremen was 100 units, and Bremen in turn exported 60 units of grain to England and 140 units to Sweden, we augment the grain export of Germany to England by 100 * (60/(60+140)) = 30 units to England and by 100 * (140/(60+140)) = 70 units to Sweden. More formally, we construct x_{dikt} , the corrected country-product trade flow between Germany and some trade partner (i) in direction (d), product category (k) and year (t) as

$$x_{dikt} = x_{dkt}^{\text{Ger}\to i} + R_{dkt}^{\text{Port}\to i} \times \sum_{\text{Ports}} x_{dkt}^{\text{Ger}\to\text{Port}}. \tag{A1}$$

Where the German *Zollverein* trade to country i is given by $x_{dkt}^{\text{Ger}\to i}$, the *Zollverein* trade with Hamburg and Bremen $x_{dkt}^{\text{Ger}\to\text{Port}}$, and in turn, the port cities' trade with country (i) by $x_{dkt}^{\text{Port}\to i}$. The quota R is defined as $R_{dtk}^{\text{Port}\to i} = \frac{x_{dkt}^{\text{Port}\to i}}{\sum_i x_{dkt}^{\text{Port}\to i}}$, with the necessary condition $\sum_i R_{dkt}^{\text{Port}\to i} \stackrel{!}{=} 1$.

Moreover, we apply upper bounds to the quota, because sometimes an unbounded application of the quota may yield impossible trade flows due to unobserved processing or consumption in the port cities (or simply due to misdeclaration). If *Zollverein* data exceeds the records of the Hanseatic data, they are cut back to this very amount:

$$x_{dikt} = \begin{cases} x_{dkt}^{\text{Ger}\to i} + R_{dkt}^{\text{Port}\to i} \times x_{dkt}^{\text{Ger}\to\text{Port}} & \text{if } R_{dkt}^{\text{Port}\to i} \times x_{dkt}^{\text{Ger}\to\text{Port}} \leqslant x_{dkt}^{\text{Port}\to i}, \\ x_{dkt}^{\text{Ger}\to i} + x_{dkt}^{\text{Port}\to i} & \text{else.} \end{cases} \tag{A2}$$

The Zollverein statistics differentiate between Bremen and Hamburg from 1880 to 1887, while in 1888 they solely refer to the *Zollausschlüssse Elbe und Weser*. We keep only corresponding country codes: 818 for Hamburg, 815 for Bremen and 846 for the *Zollausschlüsse*. This

separates the trade flows into three different parts: trade between the *Zollverein* and the Hanseatic cities to which the quotas will be applied, is the rest of the tariff area's trade, and the cleaned final trade flows.[13] For constructing the quotas, we only consider non-zero trade flows that have been assigned an SITC code. After that we drop all trade flows with summarizing categories (e.g. *'Holzwaaren, zusammen'*) which occur sometimes in the Bremen data. We generate the upper bounds as described in the text calculating the total value of trade flows by source, year, direction of trade, partner country and SITC product category. Since quantities are difficult to compare between the different volumes, we only create bounds for values. If the value of a trade flow exceeds its upper bound, we resize both its quantity and its value by the same factor.

We generate quotas in both the quantity and value dimension for every SITC level. For the levels four to one, we create a second set of extended quotas for each level, which include trade flows from lower levels, whose quotas were not used. If, for example, the quotas of a given SITC item were not used on the five-digit level matching round, we reuse these trade flows for creating the extended quotas on the four-digit level.

To calculate the 'pure' quotas, we first calculate simple quotas of quantity and value on the SITC-unit level. To get a single quota for each SITC code, the quotas must now be aggregated in case of several units per SITC category. We weigh the quotas by the sum of values each SITC-unit-segment has within an SITC category. We then aggregate the quotas so that only one quota per source, direction of trade, year, partner country and SITC category remains. At this point we check whether the quotas sum up to one as required. The quotas are now applied to the trade flows of the *Zollverein*. The latter were prepared by creating a port-variable that matches

[13]Technically, we replace the value of source dummy s_d for 1888, which creates an artificial volume. This simplifies matching the trade flows with the Zollausschlüsse in the Zollverein data later on.

the Hanseatic data and thereby can be matched with the quotas. They are not aggregated in any way; the historical product descriptions are kept. Doing so preserves information.

In bringing the quotas to the data, we first try to match five-digit trade flows level with quotas on the same level. Then we try to match the remaining five-digit trade flows with the pure four-digit quotas and so on until the one-digit level. After that, we take the five-digit quotas that have not been used and create the extended quotas on the four-digit level. Then we take the trade flows on the four-digit level and try to match them with the extended quotas on the four-digit level. The remaining four-digit trade flows are then matched with pure quotas on the three-, two- and one-digit level. This loop is repeated for three-, two- and one-digit level trade flows. Trade flows that could not be matched—which make up less than 1 percent of the data—stay in the dataset as trade flows to Hamburg or Bremen for the sake of completeness.

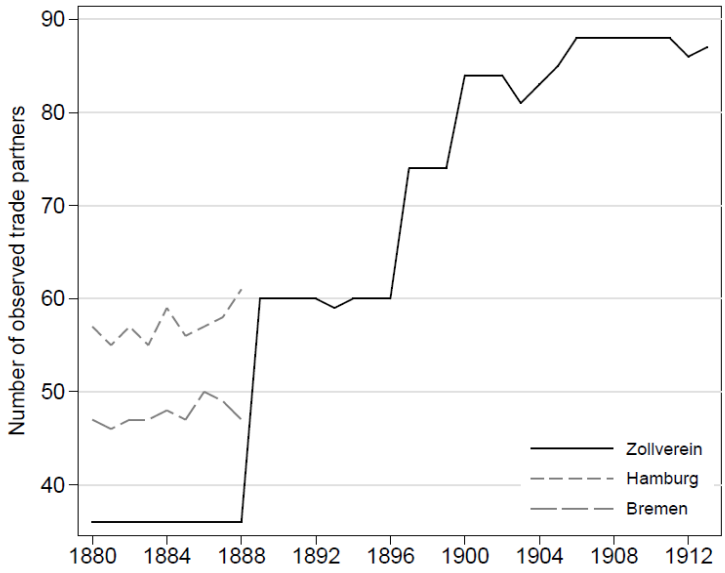
After appending the joint trade flows, the new values and quantities are calculated. If they exceed the upper bounds, values and quantities are resized by the same correction factor. About 26 percent of the newly calculated trade flows exceed the bounds and have to be resized.

Applying upper bounds alters the totals in some cases. Since the quota method only redirects *Zollverein* trade with Hamburg and Bremen to other trade partners, the sum of imports and exports should actually stay the same. Changes in total exports or imports do occur, however, by applying the upper bounds. Since exports shrank and imports rose after the *Zollanschluss*, the Hanseatic cities' net exports were apparently lower than those of the tariff area. This seems to result in tighter bounds on exports than on imports: The share of trade flow exceeding the upper bound is 19 percent for imports, but 29 percent for exports. Overall, imports shrink by 2.4 percent while exports shrink by 11.7 percent (taking all trade flows into account and using 1913 prices). Since exports decreased only by 3 percent after the *Zollanschluss*, the method of upper bounds might be too crude, but the results point in a plausible direction.

C Country Space

Figure A4 shows the growing number of trade partners occurring in the three different sources.

FIGURE A4
NUMBER OF TRADE PARTNERS OVER TIME, BY SOURCE



Statistical items excluded. Source: Own calculations, see text.

TABLE A4
TRADE PARTNERS IN THE DATA

Continent (+ ID)		Region (+ ID)		Trade Partner (+ ID)	
Europe	1	W. Europe	10	Belgium and Luxemburg	1001
Europe	1	W. Europe	10	France	1002
Europe	1	W. Europe	10	Austria-Hungary	1003
Europe	1	W. Europe	10	Italy	1004
Europe	1	W. Europe	10	Netherlands	1005
Europe	1	W. Europe	10	Great Britain and Ireland	1006
Europe	1	W. Europe	10	Portugal	1007
Europe	1	W. Europe	10	Spain	1008
Europe	1	W. Europe	10	Switzerland	1009
Europe	1	S. and E. Europe	11	Russian Empire	1101
Europe	1	S. and E. Europe	11	Greece	1103
Europe	1	S. and E. Europe	11	Romania	1104
Europe	1	S. and E. Europe	11	Bulgaria	1105
Europe	1	S. and E. Europe	11	W. Balkans	1106
Europe	1	S. and E. Europe	11	British Mediterrenean	1107
Europe	1	Northern Europe	12	Denmark	1201
Europe	1	Northern Europe	12	Finland	1202
Europe	1	Northern Europe	12	Sweden	1203
Europe	1	Northern Europe	12	Norway	1204
N. America	2	N. America	20	United States	2001
N. America	2	N. America	20	Canada	2002
N. America	2	N. America	20	Mexico	2003
S. America	3	S. America	30	Argentina	3001
S. America	3	S. America	30	Chile	3002
S. America	3	S. America	30	Brazil	3003
S. America	3	S. America	30	Peru	3004
S. America	3	S. America	30	Paraguay	3005
S. America	3	S. America	30	Uruguay	3006
S. America	3	S. America	30	Bolivia	3007
S. America	3	S. America	30	Ecuador	3008
S. America	3	S. America	30	Venezuela	3009
S. America	3	S. America	30	Colombia	3010
S. America	3	Central America	31	Costa Rica	3101
S. America	3	Central America	31	El Salvador	3102
S. America	3	Central America	31	Guatemala	3103
S. America	3	Central America	31	Honduras	3104
S. America	3	Central America	31	Nicaragua	3105
S. America	3	Central America	31	Panama	3106
S. America	3	Carribean	32	British West Indies	3201
S. America	3	Carribean	32	Danish West Indies	3202
S. America	3	Carribean	32	French West Indies	3203
S. America	3	Carribean	32	Dutch West Indies	3204
S. America	3	Carribean	32	Haiti	3205
S. America	3	Carribean	32	Dominican Republic	3206
S. America	3	Carribean	32	Cuba and Puerto Rico	3207
S. America	3	Rest of S. America	39	Rest of S. America	3999
Asia	4	Middle East	40	Ottoman Empire	4001
Asia	4	Middle East	40	Persia	4002
Asia	4	Indias	41	British India	4101
Asia	4	Indias	41	French India	4102
Asia	4	Indias	41	Dutch India	4103
Asia	4	Indias	41	Portuguese India	4104

Continued on next page

Table A4 – *Continued from previous page*

Continent (+ ID)		Region (+ ID)		Trade Partner (+ ID)	
Asia	4	Indias	41	Ceylon and the Maledives	4105
Asia	4	Non-India Asia	42	China	4201
Asia	4	Non-India Asia	42	Japan	4202
Asia	4	Non-India Asia	42	Hong-Kong	4203
Asia	4	Non-India Asia	42	Korea	4204
Asia	4	Non-India Asia	42	Philippines	4205
Asia	4	Non-India Asia	42	Thailand	4206
Asia	4	Non-India Asia	42	British Malaya	4207
Asia	4	Rest of Asia	49	Rest of Asia	4999
Africa	5	Arabia	50	Egypt	5001
Africa	5	Arabia	50	Algeria	5002
Africa	5	Arabia	50	Libya	5003
Africa	5	Arabia	50	Morocco	5004
Africa	5	Arabia	50	Tunisia	5005
Africa	5	Arabia	50	Aden and other Islands around the Arabian Peninsula	5006
Africa	5	E. Africa	51	Ethiopia	5101
Africa	5	E. Africa	51	British East Africa	5102
Africa	5	E. Africa	51	Portuguese East Africa	5103
Africa	5	E. Africa	51	Italian Africa	5104
Africa	5	E. Africa	51	German East Africa	5105
Africa	5	Southern Africa	52	Dutch South Africa	5201
Africa	5	Southern Africa	52	German South-West Africa	5202
Africa	5	Southern Africa	52	Congo	5203
Africa	5	Southern Africa	52	British South Africa	5204
Africa	5	W. Africa	53	French Africa	5301
Africa	5	W. Africa	53	British West Africa	5302
Africa	5	W. Africa	53	Portuguese West Africa	5303
Africa	5	W. Africa	53	Madagascar	5304
Africa	5	W. Africa	53	German West Africa	5305
Africa	5	W. Africa	53	Liberia	5306
Africa	5	Rest of Africa	59	Rest of Africa	5999
Oceania	6	Big Islands	60	Australia	6001
Oceania	6	Big Islands	60	New Zealand	6002
Oceania	6	Small Islands	61	British Oceania	6101
Oceania	6	Small Islands	61	French Oceania	6102
Oceania	6	Small Islands	61	American Oceania	6103
Oceania	6	Small Islands	61	German Oceania	6104

Domestic trade partners as well as statistical polities not reported. Source: see text.

TABLE A5
COUNTRIES BY INCOME COUNTRY

High	Medium	Low
Argentina	Brazil	Aden and other Arabian islands
Australia	British India	Algeria
Austria-Hungary	British Malaya	American Oceania
Belgium and Luxemburg	British Mediterrenean	Bolivia
Canada	British South Africa	British East Africa
Denmark	British West Indies	British Oceania
France	Bulgaria	British West Africa
Great Britain and Ireland	Chile	Ceylon and the Maledives
Hong-Kong	China	Congo
Italy	Colombia	Costa Rica
Netherlands	Cuba and Puerto Rico	Danish West Indies
New Zealand	Dutch India	Dominican Republic
Spain	Dutch South Africa	Dutch West Indies
Switzerland	Finland	Ecuador
United States	French India	Egypt
	French West Indies	El Salvador
	Greece	Ethiopia
	Japan	French Africa
	Mexico	French Oceania
	Norway	German East Africa
	Ottoman Empire	German Oceania
	Panama	German South-West Africa
	Paraguay	German West Africa
	Peru	Guatemala
	Philippines	Haiti
	Portugal	Honduras
	Romania	Italian Africa
	Russian Empire	Korea
	Sweden	Liberia
	Thailand	Libya
	Uruguay	Madagascar
	Venezuela	Morocco
	Western Balkans	Nicaragua
		Persia
		Portuguese East Africa
		Portuguese India
		Portuguese West Africa
		Tunisia

Based in terciles using income estimates from ? (who rely largely on the Maddison Project Database) and other income proxies. Source: Own calculations, see text.