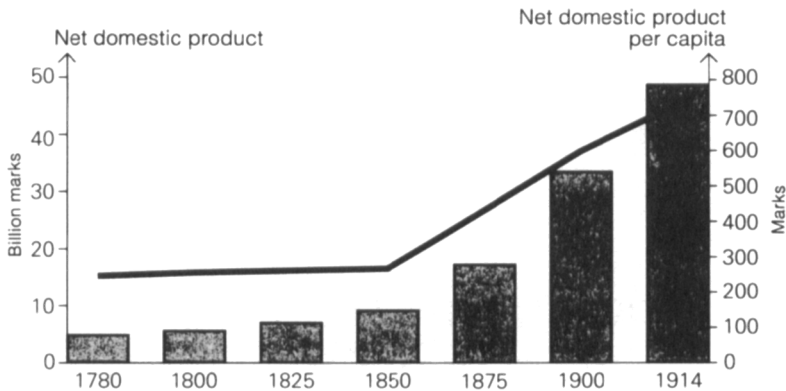


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The German Economy in the Second Half of the Nineteenth Century

The founding and early development of the Siemens & Halske firm, “the history of which also reflects the history of German electrical technology,” since “none of the competing firms matched it as regards size, qualification, reputation, business connections, control of the market, and power,” took place during the period of high industrialization in Germany and of the development of the world economy.¹ These conditions created the prerequisites for the expansion of the company. In turn, the forms the overall economic development took were decisively influenced by the inventions and the economic activities of Siemens & Halske. Initially investing in the telegraph, Siemens & Halske promoted a telecommunications revolution that allowed businesses to alter their operations in fundamental ways and to generate enormous gains in wealth. The following sketch of the most important features of the German economy in the second half of the nineteenth century provides a framework for understanding the dynamic relationships between the growth of the German economy and the particular contributions of Siemens & Halske to that growth.

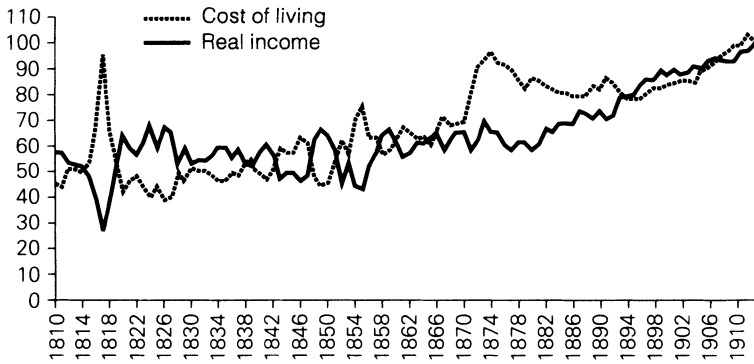


Net domestic product (columns) and net domestic product per capita (line), 1780–1914

Overall Economic Development in Germany

The industrialization that began in Germany between 1834 and 1849 was marked by several economic, technological, and political features. That fifteen-year period saw the beginning of railroad construction and the establishment of textile companies. Germans designed and constructed new machinery for those industries, and for the coal mining and iron processing businesses as well. Politically, the founding of the German Tariff Union (*Deutscher Zollverein*) was important, bringing a common market to Germany for the first time. With the foundation laid, German industrialization gathered momentum after 1850. With the exception of the period between 1874 and 1880, the process of growth of the German economy took an uninterrupted course from the middle of the nineteenth century until the outbreak of World War I.

After 1850 economic growth in Germany was much more rapid than it was in England or France. Between 1850 and 1913 the average annual growth rate of the gross domestic product (GDP) in Germany was 2.6%. In part, this spectacular long-term growth was a result of the fact that industrialization began later in Germany than it had in France and England,

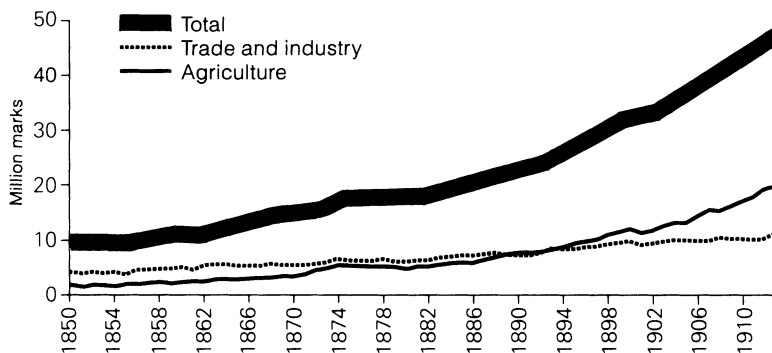


Cost of living and real income, 1810–1913 (1913 = 100%)

and the German economy was therefore “catching up” to more mature neighbors in Europe. The growth in the GDP per capita, with an average annual increase of 1.6%, was also spectacular, all the more so because Germany witnessed an unprecedented population growth from about 35 million people in 1850 to about 67 million in 1913. Industrialization brought about a long-term increase in real income and in the standard of living for the German people. Industrialization, moreover, meant not just that there was a larger volume of goods available for the consumer, but that there were more funds for investment and more goods for export. In sum, the economic growth associated with industrialism was without precedent in Germany.

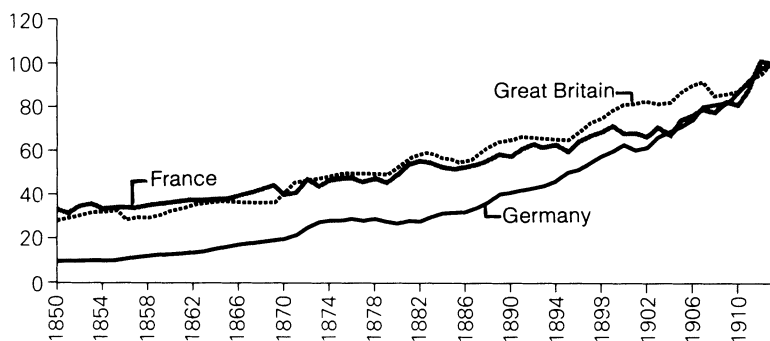
Economic growth also changed the relationship between agriculture and manufacturing. Paralleling the rapid growth of trade and industry in Germany was a considerable rise of productivity in the primary sector, that is, agriculture and forestry, which had been predominant in the preindustrial period. The growth of agricultural productivity meant that Germany could feed its growing population and release labor for the developing industrial sector. As a result, before World War I the contribution to the GDP by the secondary sector already amounted to more than 45%.

Although at the beginning of the nineteenth century more



Value added in the German national economy, 1850–1913

than two-thirds of all persons employed worked in agriculture and forestry, this percentage had decreased by the middle of the century to a little over one-half and by 1913 to one-third of the working population, despite an absolute growth of the primary sector that lasted until after the turn of the century. The decreasing percentage of persons employed in the agricultural sector corresponded to an absolute and relative increase of industrially employed persons (the increase in the services sector, which since the 1960s has featured the largest proportion of the total employment, was still lagging far behind).



The growth of industrial production (1913 = 100%)

Industrialization in Germany centered on the capital goods industries, industries that made goods for business customers, not individual consumers. The rise of large-scale enterprises was advanced and accelerated by the development of new financing instruments. The German consumer goods industry did not enjoy such favorable conditions for production and sales as did its English competitors, who in the middle of the nineteenth century dominated the world market with inexpensive products of good quality.

The Role of the Electrical Industry in German Industrialization

The electrical industry, which developed from small-scale enterprises, increasingly contributed to the upward trend in trade and industry. Quantitatively, the initial development in the electrical field cannot be fully substantiated. Government statistics that could illustrate the different stages of the electronics industry in the course of total industrial development are not available until after 1900, and then only for the number of persons employed, some of whom have to be classified instead as belonging to the electrical trades.² Governmental surveys on the net output for German industry were not carried out until 1936. As a result, the data on the productivity of the German electrical industry for the years 1890, 1895, 1898, and 1913 are based on estimates and surveys carried out by the electrical industry itself.

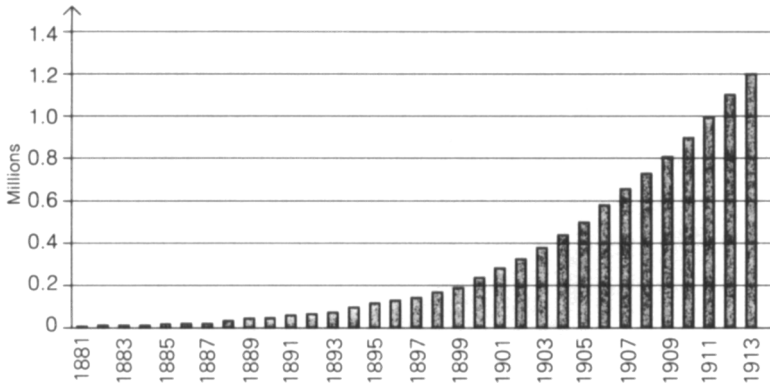
Growth of Employment in the Electrical Industry

Year	No. of people employed	Proportion of total no. of people employed in trade and industry (%)
1875	1,157	
1882	1,815	
1895	24,343	0.4
1907	118,963	1.3

The growth of the electrical industry, and consequently its contribution to German economic growth during this period, was quite steady. Political events sometimes intruded on business activity, including the *Gründerkrise*, a business slump that began in 1873 following a bank crash in Vienna that spread to Germany. This slump hardly affected the young electrical sector, however. Business with telegraphs continued on a favorable course, particularly following unification of the general Postal Authority and the Telegraph Office by the new postmaster general, Heinrich von Stephan, in 1875. For 1890 the volume of production of the electrical industry was estimated at 45 million marks.³

Then the technology of the industry changed dramatically. The increasing awareness of the enormous technical potential of the three-phase system of alternating current resulted within a few years in a quantum leap in the development of new applications. In 1895 sales amounted to 155 million marks, and in 1898 the value of production already reached 228.7 million marks. The ratio of sales of 211.1 million marks for electrical power products versus 17.6 million marks for low-current equipment illustrates to what extent electrical power technology had changed the character and importance of the electrical industry in general. In 1913 the value of electrotechnical production in Germany was estimated to be 1,300 million marks, a value approximately equaling one-third of the world's electrotechnical production. Germany's share in the world's electrical trade amounted to almost 47%.

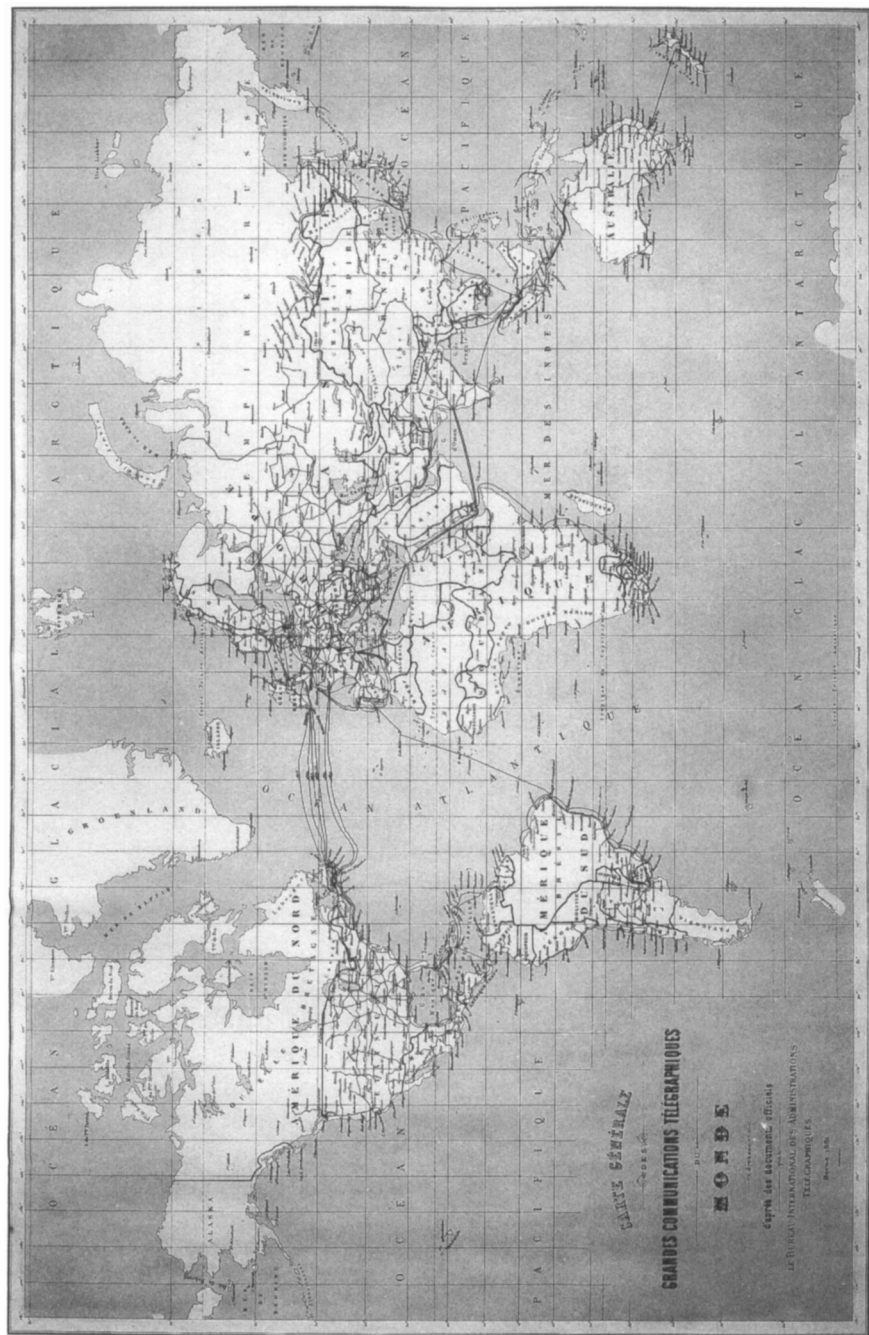
Indirectly, the upward trend of the electrical industry was also reflected in the development of the consumption of electric energy. Before 1914 the consumption of electricity was affected above all by the rapid adoption of electric streetcars, which rapidly replaced horse-drawn streetcars after 1890.⁴ The changes in the transportation and communication systems, which justify describing the nineteenth century in terms of a "communications revolution," are closely connected with the preconditions and consequences of an economic growth previously unknown for either the German national economy or the global economy.⁵ Until 1867 individual postal authori-



Number of telephones in Germany, 1881–1913

ties existed in the larger German states, but these services were subsequently centralized in a nationally operated and organized postal system entrusted with the monopoly for all telegraph, telephone, and letter mail services. As a consequence, the public services of the German post and telegraph offices increased fiftyfold from 1850 to 1913 and by World War I amounted to almost one-fifth of the value added by all transport services.⁶ In addition to the continuing expansion of the electrical telegraph service, the expansion of the telephone network after 1880 contributed substantially to the figures quoted above.⁷

As demand rose for the new telecommunications services, the prices charged for using the telegraph and the telephone went down. The new means of communication contributed decisively to the reduction of the considerable interregional differences in prices for material goods and particularly for services within Germany. The convergence of interest rates in different parts of Germany indicated the general convergence of prices for goods and services fostered by the dramatic changes in communication technology. The new communication facilities had an even greater influence on the development of the international exchange of goods and services, as the speed of telecommunication traffic far exceeded the speed



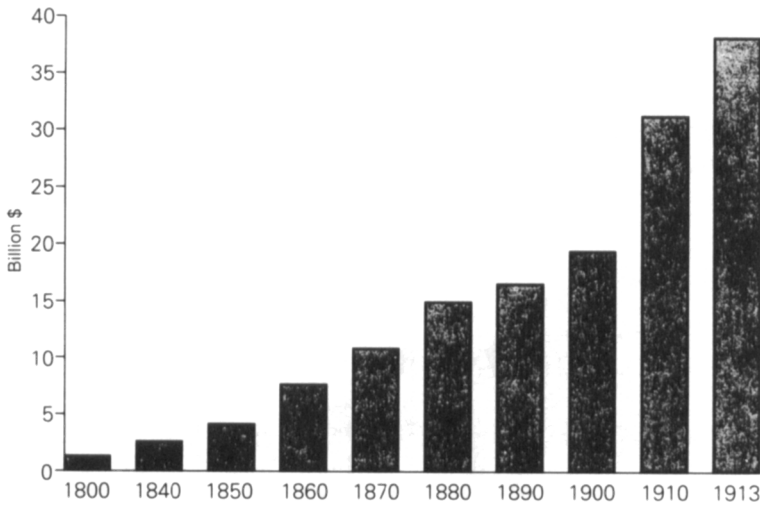
Worldwide telecommunication via cables, 1881

of transporting merchandise.⁸ The new systems of communication changed the conduct of economic transactions in a way that precluded the recurrence of economic downturns such as the severe crisis that had beset German agriculture in the 1840s. This crisis proved to be the last of the “old-style” type economic crisis in Germany, a type that the interregional or international exchange of commodities could now prevent.⁹

Germany's Role in World Trade

The volume of world trade grew spectacularly during the same decades in which Germany was undergoing industrialization. The growth of world trade had less to do with the improvements in manufacturing associated with the Industrial Revolution and the growing volume of manufactured goods than with other factors. The idea of free trade, first given full expression by Adam Smith in 1776, spread from England and had an impact on public policies, which led to pressures to reduce tariff barriers and to open markets. The technical innovations of monetary flows and the increasing liberalization of the international exchange of capital created a significant basis for the growth in world trade. The nineteenth-century trade boom was also stimulated by the prevailing period of peace, which was uncommonly long in the history of Europe. One result was the division of labor on an international scale. An international network of trade in products evolved, ultimately resulting in the establishment of prices extending across a world-wide market.

Developments in transportation and communication were central factors in the growth of world trade during the nineteenth century. The development of the railroad and the steamship created reliable systems for moving goods at higher speeds than ever before and at costs that dropped over the long term. The development of the telegraph, and later the telephone, allowed the speedy transmission and processing of orders, the analysis of markets, and the dissemination of market



Value of world trade (imports and exports). From Pohl, *Aufbruch*, p. 186.

information. Before the telegraph—capable of carrying messages almost instantaneously over vast distances and across international borders—exporters had been forced to conduct their business through middlemen. Telecommunications changed that situation, allowing exporters to deal directly with international customers. Trading across long distances became more efficient, opening export (and import) opportunities that were unprecedented.

The growth of foreign trade was especially significant for Germany, which by the middle of the nineteenth century was among the world's three leading exporters. The German export trade at the time was mostly in food and raw materials. As worldwide economic connections grew and Germany itself developed from an agricultural into an industrial nation, world trade became increasingly important as an agent of German prosperity. Between 1850 and 1913 German foreign trade increased on the average of 4% annually, even faster than overall economic production. As a result, Germany's share in the volume of world trade had reached 13% in 1913, while the ex-

port quota of the German Reich amounted to 17.5% of total industrial production. The increase in the importance of international trade for the German economy was comparatively steady up to World War I, except for fluctuations in the 1870s and 1880s. During the 1870s an economic depression slowed the growth of world trade, whereas during the 1880s protectionism hindered Germany's ability to participate in world trade. Protectionist measures were adopted by many nations in the 1880s, including Germany, which legislated protection for domestic agricultural production by imposing import duties.¹⁰

Despite the considerable long-term increase in domestic demand, which was further stimulated by the growth in population, after the 1870s German industry became increasingly dependent on the world market. Here the sales returns were mostly lower than on the domestic market, which was protected by tariffs, or sometimes also by cartels or internal agreements.¹¹

The organization of the export trade before the telecommunications revolution of the nineteenth century, and the institutions through which it was conducted, had the effect of retarding opportunities for German producers. Before 1850 German export trade was conducted in almost all classes of goods with the help of independent export agencies, unless business deals were concluded at fairs and exhibitions.¹² Trading firms primarily conducted what was an indirect export trade. The trading firms were specialized businesses engaging in the continuous and planned exchange of goods with foreign countries. Located in trade centers, these trading companies typically specialized in one nation's market and sought to satisfy customers in that market. Because of this geographical specialization, the attention of the trader focused less on the goods themselves than on the range of consumers. Particularly in overseas markets, the trader accordingly served more as a buying agent for foreign customers than as a selling agent for German industry. One important result was that the export trade showed little loyalty to particular German products and producers. In many cases German manufacturers sold their export goods under trademarks determined by the trading company,

not the manufacturer, leaving the initial producer unknown to the final user and keeping the manufacturer in total dependence on the trader. In this system, furthermore, the range of items traded, mostly consumer goods, was diverse. The trader, not the manufacturer, was responsible for the distribution of German goods abroad, storing them, advertising them, and servicing them. In this situation, there was often little reason for the trading firm to safeguard the interests of the German manufacturer. The livelihood of the trading firm depended on customers in the foreign market, not on the well-being of the German manufacturer. As industrialization progressed, the functions of establishing goods in markets and servicing those goods became more and more important. In particular, the more the share of capital goods in the export business increased, the more unsuitable the existing structure of the export trade proved for export industries. A manufacturer of an electrical machine, for example, found it desirable to have reliable agents abroad who focused on the product, the explanation of its advantages, and its servicing.

As German manufacturers began to replace specialized independent trading firms with agents under their direct control, they also found that having their own offices abroad was advantageous in the face of protectionism. The protectionism that began to take hold in the world economy in the 1880s created obstacles for German exporters, who consequently found it worthwhile to establish their own manufacturing and sales organizations abroad. The great variety of tariff increases repeatedly confronted German industrial enterprises with the question whether it was worth it, under the prevailing conditions, to export goods from Germany into the respective country or whether it would make more sense to move production into the area targeted for sales. Companies within the same branch of an industry reached quite different conclusions in this matter.

Solving the new organizational problems presented by world trade opportunities in the industrial age was not easy. Direct investments abroad were not always regarded as a positive step, for nationalistic reasons. There was also the problem

of selecting and delegating employees to post in foreign countries. Stationing employees abroad was usually the first step toward making direct investments in a foreign country. German companies allowed themselves to be guided by a large variety of considerations in any decisions about founding subsidiaries abroad. The increasingly protectionist trade policy around the world constituted the most important consideration, at least in cases where the German firm was not in a position, through a monopoly or other structure, to maintain its share of the market in the face of high import duties.¹³ Yet the size of the market, the anticipated development of sales, and the magnitude of the costs involved in a direct investment also had an influence on such a decision. Direct investments contributed to the rise of Germany by the end of the nineteenth century as one of the major creditor nations. For the year 1913 the volume of German direct investments is estimated to have amounted to approximately 10 billion marks and the value of foreign securities held to approximately 20 billion marks. These were significant sums, even if the share of national savings that went into export capital was much lower in Germany than in France or, especially, England.¹⁴

One of the firms that from the beginning not only methodically strove to sell their products outside German borders but also started production in foreign countries was the Siemens & Halske Company. One important reason for studying the life of Werner von Siemens and the origins of the company that bears his name is to appreciate the multinational character of German business even at an early stage of industrialization.