Dual revolution and Saxon cotton industry fixed geographical distribution, guild regulation, and quality improving spirits

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Abstract

Economic history studies often assume that the guild system has a negative impact on economic development and technological innovation. Some argue that the spillover introduction of liberal institutions from the French Revolution into Germany had a lasting effect on the latter country's economic development. However, Saxony is a good counterexample to their argument. This paper shows that in both the short and the long run, geographical distribution of cotton production remained unaffected and emerged as a powerful center for the textile industry. In terms of production volume, the indirect impact of the French Revolutionary War and the direct impact of the Industrial Revolution were enormous. In the short run, institutional aspects such as guild regulations did not have a significant impact on the Saxon textile industry. However, in the long run, it is likely that the regulations restricted the industry's development. Despite guild regulations, industrial promotion policy by government can stimulate "quality improving spirits." Saxony's trade policy is not a story that can be concluded by the dichotomy of the introduction or non-introduction of freedom of trade. Therefore, dummy variables such as 0 or 1 for the introduction or non-introduction of freedom of trade trivialize the discussion.

Keywords: guild, cotton industry, French Revolution, Industrial Revolution, entrepreneurship

1. Introduction

Economic history studies often assume that the guild system had a negative impact on economic development or technological innovation. Although guilds are generally considered to be averse to technological change, this assumption is an overgeneralization (Pfister 2008). The last decade of the eighteenth century witnessed one of the most important revolutions in history, the French Revolution. It sought to spread liberal ideas throughout Europe and led to much debate on whether this was the economic driving force behind the abolition of the guild system in parts of Germany following the French occupation (Kopsidis and Bromley 2016; 2017). However, looking for a single determining factor, be it Napoleon, Prussian reformers or otherwise, to attribute economic growth to does not yield useful academic insight (Kopsidis and Bromley 2017). The history surrounding guilds is much more complex than how economists explain it using data. Therefore, there is a lack of consensus among scholars on the causal relationship between the liberal ideas introduced by the French Revolution and Germany's economic development. The experience of Napoleon's occupation resulted in the differentiated introduction of liberal institutions in Germany, which had a lasting effect on the country's economic development during the nineteenth century (Acemoglu et al. 2010). However, a good counterexample to their argument is Saxony, where freedom of trade was not introduced until 1861 (Kopsidis and Bromley 2016). It should be noted that the French Revolution initiated not only long-term societal changes but also the French Revolutionary War from 1792, as well as the subsequent Napoleonic Wars. It is worthwhile to clarify not only the effects of economic ideas but also the direct and indirect consequences of warfare and its attendant economic circumstances on economic development.

Another significant event that occurred in the latter half of the eighteenth century was the Industrial Revolution. This revolution's influence on the Saxon cotton industry has been widely debated (Forberger 1958; 1982; Kiesewetter 1989; Karlsch and Schäfer 2006; Schäfer 2015). Although it is a well-known fact that the influx of low-priced English cotton products into continental Europe had a devastating impact on the Saxon cotton industry (Oshima 1963; Horii 2020), there were also some positive impacts. An example was the improvement in the quality of cotton products in Saxony (Schäfer 2015; Horii 2023). This was not achieved through "laissez-faire" policies because the government supported industry and did not apply liberal economic policies. For industrialization, the focus should be more closely related to people's lives and the industries they depend on for their livelihood. In Saxony, the cotton industry was considered the most important industry nationwide (Forberger 1958; Kiesewetter 1989; 2007; Ogilvie 1996; Schäfer 2016).

This paper's discussion focuses primarily on economic influence of "dual revolution" on geographical distribution of production. One of the arguments presented in this paper is that the geographical distribution of cotton production in Saxony was already firmly established in the eighteenth century and was not affected by the ravages of the dual revolution. The Saxon government adopted a flexible approach and delayed the introduction of "Gewerbefreiheit," which could have led to an economic lag in Saxony. However, its industrial promotion policy, even within the context of regulation, created a human capital base for manufacturers and weavers. This was especially useful in improving the quality of their products and was explained as "quality improving spirits." It represents a spirit of trying to improve the quality of products in the profession in which one is currently engaged, rather than starting a business. Guild compulsions in Saxony did not necessarily apply to all industries, and the cotton industry was partially exempt from guild compulsions. Therefore, a dummy variable analysis of whether the industry entered French rule is likely to trivialize the discussion considering the actual situation.

2. Textile production data on historical materials and geographical distribution

Quantifying the industrial development in eighteenth-century Europe is a challenging task. It was not until the nineteenth century that European countries, including Prussia and Saxony, began collecting comprehensive government statistics. Little statistical data existed up to the mid-eighteenth century (Rätzer 1914, S. 39; Nagaya 2014). In early quantitative studies, König (1899) clarified the production of cotton products throughout Saxony from 1805 to 1811, and Rätzer (1914) clarified the production of cotton products in Voigtland Kreis from 1774 to 1791, based on primary historical materials. Owing to the limited historical materials, there have been few new discussions on production volumes. An analysis of the archives mentioned in this study allowed us to report the Saxon cotton industry's production status, albeit with significant limitations.

To quantitatively examine the production status of eighteenth-century Saxony, this study utilizes portions of the Landes- Ökonomie-, Manufaktur-, und Kommerzien Deputation's historical records held at Stadtarchiv Dresden. The deputation collected national information on various industries to determine the economic position of Saxony.[1] In addition to domestic information, it collected information on industries in Prussia, England,

[1] The main unpublished historical records in this study are "03.01. Statistik Hauptberichte. Hauptbericht

France, Spain, Italy, Poland, Turkey, and other European countries. The method of organizing the data used in this historical material was equivalent to that of König (1899) and are presented in "Locat 2240, Der Landes-Ökonomie- Manufaktur und Kommerzien-Deputation Hauptbericht auf die Jahre 1807 bis 1811, vol. XXI."

They provide information on the production status for the restricted periods toward the end of the eighteenth century, which were from 1792 to 1795 and from 1799 to 1800. Information is available not only for the textile industry but also on the overall national economy and several industries. Unfortunately, the veracity of the quantitative data presented in the historical materials remains questionable. As stated in the historical materials, for example, in the case of linen production, data on canvas production contained in other tables are considered to have been overlooked, as they appear incomplete and unreliable in many aspects (HZBLGH1793, S. 77). Therefore, it is not possible to accurately reconstruct production distribution at the end of the eighteenth century using these historical materials. One reason is that the production data comprised only those submitted by the various districts or Kreis. In other words, even with new historical data, it is difficult to determine the production of the entire eighteenth century. Nevertheless, attempts to collect statistical data began in the eighteenth century, and thus it was possible to gain a general understanding of the production distribution.

Production is listed by category from nine regions: (1) Kurkreis (KK), (2) Thüringischer Kreis (TK), (3) Meißnischer Kreis (MK), (4) Leipziger Kreis (LK), (5) Erzgebirgischer Kreis (EK), (6) Vogtländischer Kreis (VK), (7) Neustädtischer Kreis (NK), (8) Niederlausitz (NL), and (9) Oberlausitz (OL). However, records for all regions are not available for the years reported. KK, TK, MK, and VK data are provided for all years. Data are missing for LK for 1794 and 1795, EK and NK for 1799 and 1800, NK for 1792 and 1793, and OL for 1792-1795. One point that augments the value of this historical material is that the production statistics are broken down into urban and rural units, which is rarely found in previous studies. It should be noted that the data categorized by urban and rural areas are also incomplete. The types of goods produced can be broadly classified into wool, cotton, linen, and silk. Additionally, wool products, for example, were classified in detail according to the characteristics of the product. The goods produced from the four raw materials listed above are all indicated in Stück units, enabling comparison. Conversely, inkle weaving, socks, hats, and gloves have been reported in Dozen and cannot be compared in the same way as the products mentioned above, even if they are described as being made from the aforementioned four materials.

It is generally accepted that industrialization in Saxony developed in rural areas rather than in urban centers. This is because Saxony had abundant waterpower from rivers, and the economic advantage from utilizing steam power was low during the industrialization period, up to the first half of the nineteenth century (Kopsidis and Bromley 2016, p. 32). Figure 1 illustrates a plot of areas where at least one or more types of cotton textile production were reported during the period 1792-1800 in both the historical materials and in Forberger's (1958) Fabrikation Tabelle. Textile production occurred not only along streams but also in Dresden and Pirna in the

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über den Zustand der Bevölkerung, der Landwirtschaft, der Gewerbe und des Handels auf das Jahr 1793" (HZBLGH1793), and "Hauptbericht über den Zustand der Bevölkerung, der Landwirtschaft, der Gewerbe und des Handels auf das Jahr 1795," (HZBLGH1795), "Hauptbericht über den Zustand der Bevölkerung, der Landwirtschaft, der Gewerbe und des Handels auf das Jahr 1800" (HZBLGH1800).

Elbe Basin.

[Figure 1 around here]

2.1 HHI analysis on all textile goods

Table 1 presents the HHI (Herfindahl-Hirschman Index) to show the geographic concentration of production by raw materials and ready-made products (Hirschman [1945]1980; Herfindahl 1950). The HHI was originally intended to measure the state of competition among firms in an industry's market but is now used as a measure of geographic concentration. However, due to deficiencies in the historical materials, it was not possible to calculate HHI on a year-by-year basis. Therefore, HHI was calculated using the average of that for the years 1792-1800 for the eighteenth century from the historical materials, and the years 1805-1811 of the early nineteenth-century data by König (1899). Although it is desirable to use individual data, including the location information of establishments, to investigate spatial distribution (Ellsion and Glaeser (1997), such historical materials are not currently available. The proximity between individual establishments should be explicitly addressed; however, it is not possible to examine the relationship between factory managers or even the effects of spillover owing to the geographic distribution of improvements. Nevertheless, it is useful to determine the geographic distribution of textile products. AP_{ik} is defined as the average value of raw material i for the specified period in Kreis k, and then its share of production is defined as

$$s_{ik} = \frac{AP_{ik}}{\sum_{k=1}^{n} AP_{ik}}$$

Therefore, HHI_k for each Kreis is defined as

$$HHI_k = \sum_{k=1}^{n} (s_{ik})^2$$

In general, HHI in this case takes the value $0 \leq HHI \leq 1$, and the closer it is to 1, the higher is the geographical concentration. Additionally, HHI_j for each urban/rural area level obtained from the historical materials can be calculated. That is, AP_{ij} is defined as the average value of raw material i for the specified period in urban/rural j, and then its share is defined as

$$s_{ij} = \frac{AP_{ij}}{\sum_{j=1}^{n} AP_{ij}}$$

Therefore, HHI_j for each Kreis is defined as

$$HHI_j = \sum_{j=1}^{n} (s_{ij})^2$$

In obtaining HHI by the size of the regional category, the degree of agglomeration bias increases as the regional category becomes larger (Rosenthal and Strange 2001).

The production concentration in each Kreis can be classified as unipolar, bipolar, or decentralized. The production of wool, cotton, and sock knitting was most concentrated in EK, as shown in Table 2. Wool textiles were widely produced throughout Saxony, with EK playing a central role in terms of their output. Conversely,

MK, LK, and OL accounted for approximately 10% of the total and were not highly concentrated in any particular region. The HHI_k of wool is lower than that of the other goods. In other words, although they showed a certain degree of concentration in EK, they were primarily goods produced in a widely dispersed manner (decentralized Kreis level). Cotton products, however, presented a different trend. Cotton products were produced in all Kreis, as indicated in the historical materials. Although imprecise and with missing data, nearly half of the production was in EK. This was followed by VK with approximately 35% of the production, indicating that more than 80% of the production was concentrated in these two regions. The production of cotton was lower in the remaining regions. The HHI_k value of cotton was higher than that of wool. The production structure is concentrated in two regions, EK and VK, whereas in the rest of the country it is dispersed (bipolar Kreis level). The production of socks is highly concentrated in EK, with the region producing more than 60% of the socks. OL reported a production distribution of approximately 15%, while in the remaining regions it was below 10%. This is also evident in the HHI_k, which is high for socks, etc. Thus, only one region, EK, recorded a high concentration for socks, while in the rest of the structure, it was dispersed (unipolar Kreis level). The production of inkle and linen was concentrated in MK, with more than 70% of inkle production located in MK. It also had the highest HHI_k except for silk and lace making (unipolar Kreis level). Approximately 40% of linen production was concentrated in MK, followed by about 25% in EK. Approximately 10% was produced in LK and less than 10% in the other regions. Production was concentrated in two regions, MK and EK, and dispersed in the rest. Despite the high 40% concentration, the other regions also accounted for a significant share of production, resulting in a low value of 0.2757 for HHI_k compared to the high values for socks and inkle (bipolar Kreis level). All quantitative data of silk that appear in the historical materials are concentrated in TK. However, silk production was not concentrated exclusively in TK; it was produced in some parts of EK and MK as well, where a manufacture/workshop to produce silk was established in Leipzig (Forberger 1958) (polar unknown-Kreis level).

At the HHI_j level, detailed distribution can be examined in Table 1. For wool, HHI_j shows the lowest value. At the Kreis level, distribution is scattered, and even more so at urban/rural level. Therefore, wool was produced in all regions of Saxony in a dispersed manner. Similarly, linen production also showed a dispersal tendency in HHI_j. It was mainly produced in MK and EK, as indicated in the HHI_k index, but was found to be highly dispersed at the HHI_j index level. This indicates that in MK and EK the production areas were widely distributed. However, at urban/rural level, not much difference is seen in the production volume in each area. Cotton and socks knitting are two examples of bipolar production that acquired some centrality relative to the two raw materials. Cotton production was regionally concentrated in Chemnitz (EK) and Plauen (VK). The above-mentioned calculation result, which suggests that cotton production was concentrated in EK and VK at the Kreis level, indicates production concentration in Chemnitz and Plauen. Sock production was bipolar, with production concentrated in Chemnitz and Budißin/Bautzen (OL). While showing a concentrated structure in the EK, Budißin is the second most concentrated area of production. A major center of socks production is observed in Chemnitz, and some production is observed in the surrounding areas. However, unlike Chemnitz, although Budißin was at the center of OL, production did not expand in its surrounding areas. Unlike other goods, the centrality of inkle production was extreme. The production of inkle was highly concentrated in Radeberg and

Radeberg Amtsbezirk, becoming the center of production in all of Saxony.

[Tables 1 and 2 around here]

2. 2 HHI analysis by product type of cotton

Next, upon further examination of cotton cloth, we observe that cotton production was at the bipolar Kreis level, yet the geographical distribution of different types of goods presents a contrasting picture (Table 3). The cotton industry produced varying quality goods, ranging from the inferior to the high-end textile products such as pique (Schäfer 2015, p. 121). HHI for each Kreis indicates that it is skewed by product.

The historical materials reveal that cotton products were primarily distinguished by their quality, with low/middle-quality cotton cloth, such as *Cottonade*, being produced in Kreis KK, TK, LK, and NK. As can be observed from Figure 1, only 9 locations in the entire Saxony produced *Cottonade* at the end of eighteenth century. However, their production was dispersed within each Kreis, indicating a lack of concentration. Another cotton fabric of low/middle quality, Rohe Cattun or coarse cotton, was produced in 36 locations in LK, EK, and VK. In addition, Parchend or fustianwas produced as a low/middle-quality cotton product. It was produced in EK, LK, and OL, especially in Wolkensteiner Amtsbezirk, Stolberg, Hartha, and Geithain. The cotton products classified as Cottonade in KK and TK appeared to include some parchend, but the ratio of these two goods cannot be determined from the historical material. Further, Baumwollen Tücher was produced in LK. It was not considered a high-quality cotton cloth and was comparable to Cottonade, Rohe Cattun, and Parchend. Another example of low/middle-quality cotton production was Cattun, which was produced only in NK in small volumes. A combined calculation of five goods indicates that more than 65% of production occurred in EK, followed by just over 30% in LK, and other Kreis showing moderate production. As shown in Table 3, low/middle-quality cotton had a lower HHI_k than goods produced in other extremely concentrated areas. An interesting fact emerges on examination of low/middle-quality cotton production at the urban/rural level. The HHI_j of 0.0997 is low and indicates decentralized distribution. However, Frankenberg (20.6%) and Chemnitz (13.0%) in EK accounted for more than 30% of the total production. As depicted in Figure 2, they are geographically adjacent. Mittweida in LK exhibited a concentration of 16.8% and is adjacent to the two aforementioned regions. Conversely, none of the remaining areas showed a concentration greater than 10%. If the three regions are calculated as one region, the value of HHI_j is 0.2475. This indicated that low/middle-quality cotton cloth was moderately concentrated but relatively decentralized (decentralized-urban/rural level).

Pique and muslin are typical examples of high-quality products. Pique was primarily produced in central–southern Saxony (Figure 1). A small proportion of pique was also produced in Mittweida (LK). Notably, Chemnitz reported particularly high concentrations of pique production, with the next largest producer, Zschopau, producing approximately one-fifth of Chemnitz, indicating a high concentration of production. As shown in Table 3, the HHI_j for urban/rural level was as high as 0.6255, suggesting a concentration of production from this perspective as well (unipolar urban/rural level). The region where muslin production was highest is VK. Production was also reported in Mittweida, but this figure was a negligible percentage considering the low production volume. The statistical treatment of muslin is difficult. Muslin, was produced in various parts of VK,

is concentrated in Plauen and Oelsnitz, where the products were inspected and shipped. Although the statistics show the production volume by region, the production volume in Plauen and Oelsnitz includes the production in other regions before it is collected and shipped. Consequently, this must be excluded from the calculation to determine the true production volume of the two regions. However, determining from which region to which city, and how much was transported proved difficult. Therefore, when calculating the HHI_j, it should be noted that Plauen and Oelsnitz, which are geographically adjacent, are treated as one region. They indicate a concentration of more than 70% in production. HHI_j shows 0.6167, and this can also be regarded as a unipolar-Plauen and Oelsnitz-concentration type (unipolar-urban/rural level). Furthermore, Kannefas was produced entirely in EK, with Chemnitz occupying a particularly important position. This is because more than 80% of the production occurred here. HHI_j shows the same high value as pique and muslin. It must be pointed out that Chemnitz production was also of unipolar type (unipolar-urban/rural level). Several goods, whose quality could not be determined from the product name, were also reported. Printed cotton cloth was produced in a dispersed manner over a wide area including MK, EK, VK, and NL. Among them, production was particularly concentrated in Chemnitz and Frankenberg. Chemnitz recorded more than half of the total production. Frankenberg is geographically adjacent to Chemnitz, and these two regions accounted for more than 70% of the total production. Therefore, the HHI_j calculations were based on these two regions being considered as one. Consequently, concentration in this region is high. Cotton with linen was produced only in VK. Production was also reported in two regions, Adorf and Reichenbach, but the production volume was much smaller.

Did these trends hold in the nineteenth century? Although slight improvements in statistical data collection brought subtle changes in the HHI, trends in regional distribution have not changed significantly. As indicated in Table 3, HHI_j changes of approximately 0.1 were observed for muslin, Kannefas, cotton with linen, and printed cotton at the urban/rural level.

[Table 3 around here]

Muslin production declined except in 1799 and 1810 (Figure 2). The graph shows the main muslin-producing regions and the total regional production. In the nineteenth century, the Saxon government was able to quantify production in NK (Aume and Weida) and TK (Münchenbernsdorf), albeit in small quantities (König 1899, S. 255). In the last decade of the eighteenth century, only Plauen and Oelsnitz showed a production of more than 10%. However, in the first decade of the nineteenth century, Mylau exceeded 10% production, and Reichenbach and Falkenstein had more than 5% production. However, Mylau's production should be viewed more as a success in gathering more accurate information than as an increase in production. In fact, it has been confirmed that production in Mylau was underestimated (HZBLGH1800, S. 70). Although some numerical changes were seen in the geographical distribution of production, there was little change around the turn of the century.

[Figure 2 around here]

Production transitions of pique and Kannefas are indicated in Figures 3 and 4. Both Chemnitz and Zschopau indicated a constant decrease in the production of pique from 1792, with a particularly rapid decline in the first decade of the nineteenth century. The decline in Zschopau was substantial. Nevertheless, the central production center in Chemnitz was retained. Conversely, in Stollberg, although production increased during the nineteenth

century, it was not comparable to that of Chemnitz and Zschopau. It therefore could not be considered the third player. Although production declined in many areas, there was no change in centrality. Some changes were observed in the production of Kannefas. During the eighteenth century, Chemnitz and Wolkenstein either maintained or expanded their production, with a particularly increasing trend observed in Wolkenstein between 1792 and 1793. Production in Crimmitschau began to be reported in 1810, and with the decline of production in the central region and an increase in Crimmitschau, the HHI values were also affected. Production in Wolkenstein, in particular, was at a standstill, while Crimmitschau boasted decent production and came to occupy the second position. However, the center of production remained in Chemnitz. This can be seen from the fact that the production volume transition in Chemnitz and total production in Figure 4 is almost synchronous.

Cotton with linen is not worth analyzing statistically because of its low production volume, but the calculation results demonstrate a concentration in Reichenbach. Production in Adorf was no longer confirmed in the nineteenth century. Printed cotton also showed a change in value of about 0.1, but the structure centered on Chemnitz and Frankenberg remained strong.

[Figures 3 and 4 around here]

2.3 Fixed geographic distribution and short-term impact results

Notably, toward the end of the eighteenth century, which coincided with the outbreak of the French Revolutionary War, the geographical distribution of production remained unchanged. Conversely, numerous references are seen in the historical materials regarding the disruption of distribution channels immediately after the outbreak of the French Revolutionary War. It had a major impact on production. In the case of muslin production, for example, the deputation cites the complete disruption of muslin sales owing to the French Revolutionary War as one of the major causes for the decline in production from 1792 to 1793 (HZBLGH1793, S.53). Conversely, sales of pique and Kannefas were very favorable to foreign countries that had been liberated from the ravages of the French Revolutionary War (HZBLGH1800, S.80-81). Thus, for at least the first decade or so, the direct effects of the war, rather than its institutional effects, were enormous for the textile industry in the period after the French Revolution. It is arguable that a more liberal system would have allowed for a better response to such a situation, but no weavers or manufacturers could compete in a situation in which even sales at the Leipzig trade fair were sluggish because of disrupted distribution channels. In addition to the distribution disruption caused by the French Revolutionary War, the influx of low-priced cotton products due to the British Industrial Revolution also had a significant impact. The production of muslin in Saxony declined alongside the increase in cotton cloth imports from England (Oshima 1963). Other factors such as increased competition from East Indian muslin, the deterioration of the Turkish and Russian markets, the stagnant Vienna market, and restrictions on imports of Saxon products by France, Austria, and Russia all had a negative impact on Saxon cotton production toward the end of the eighteenth century (HZBLGH1793, S. 53; HZBLGH1800, S.70-72; Matera and Sokołowicz 2018, p. 19). In the short run, the major influences were the disruption of international conditions caused by war and the influx of destructive products from the Industrial Revolution, rather than the impact of institutional problems on production growth.

Given that the geographical distribution of the Saxon textile industry did not differ significantly from that depicted in previous studies, it can be inferred that production distribution remained fixed until the latter half of the eighteenth century. Previous studies have analyzed the output from different regions of Saxony. Ogilvie (1996) selected Chemnitz and its surrounding areas, as well as the Vogtland areas, as cotton production centers in Saxony. Schäfer (2015) further divided Saxony into six regions according to the regional production of goods in the textile industry. Of six regions, he selected Vogtland and Plauen, including Zwickau, Crimitchau, and Werdau; Chemnitz and Glauschau; and south of Oberlausitz, including Zittau and Löbau, as cotton centers (Schäfer 2015, p. 117). The geographic distribution of production, including the centrality of production goods in the nineteenth-century Saxon textile industry, as revealed by previous studies, has not changed since the end of the eighteenth century.

In both the short and the long run, geographical distribution remained unaffected and Saxony emerged as a powerful center for the textile industry. In the short term, the dual revolutions brought about changes in production volume. The establishment of the production center was facilitated by the foundation of human capital formed by craftsmen and manufacturers in the cotton industry. Despite changes over time, the foundation of human capital persevered and provided fertile ground for manufacturing.

3. Delay in introducing freedom of trade and its application to the textile industry.

The German “Gewerbefreiheit," the freedom of citizens to practice their own profession, was introduced in all regions that came directly or indirectly under French rule because of the French Revolution (Kiesewetter 1989; Acemoglu et al. 2010). However, freedom of trade was introduced in Saxony only in 1861, lagging all other regions in Germany. Despite this, Saxony’s industrialization progressed without introducing freedom of trade (Kiesewetter 2007). The Saxon government circumvented guild regulations by giving the manufacturing industry the monopolistic right to produce. To a simple dummy variable to explain the fact that Saxony did not come under French rule thus delaying the introduction of freedom of trade ignores the prevailing trade policy.

Until the introduction of freedom of trade, the craftsmen's guild, also called the zunft or innung in Saxony, was established in close connection with the state. Guild in Saxony is "an association of people who, with the approval of the central government, have the exclusive right to carry on some kind of business according to certain rules” (Herold 1835). Compared with zunfts in other regions, those in Saxony were less autogenous. The business activities of the handicraftsmen in the last decade of the eighteenth century are described in the "Mandat, die general- Innungs- Articul für Künstler, Profeßionisten und Handwerker hiesiger Lande betreffend, vom 8 Januar 1780" (GIA1780). The Saxon government regarded its enactment as fulfilling the requirements of the modern trade constitution and, hence, any fundamental change in the freedom of trade was considered redundant. This perception led to a delay in the introduction of freedom of trade.

However, these regulations were not equally applicable to all industries. Some manufacturing industries in rural areas were outside the scope of such provisions and non-zunft operations were run under government endorsement. Cotton weavers managed to operate their trade in a non-zunft manner (Kiesewetter 2007, S. 349; Takuma 1989). There was no provision in the trade law for manufacturing outside the zunft regulations, and they continued to operate through administrative measures. The French Revolution and the subsequent war

delayed Saxony's immediate adoption of a liberal trade policy. However, this did not mean that business was restricted in all of Saxony. In fact, the government's flexibility in balancing freedom and regulation continued for decades, even promoting various forms of fabrication (Takuma 1989; Kiesewetter 2007). In 1840, such manufacturers provided the impetus for the expansion of textile manufacturing outside the cities, for example, by exempting cotton fabric workers from journeys and by making fabrics in rural areas practically freedom of trade.

Given this reality, dummy variables such as 0 or 1 for the introduction or non-introduction of freedom of trade trivialize the discussion. When analyzing the development of the cotton textile industry in Saxony in the eighteenth and nineteenth centuries, it is necessary to consider not only the year 1861 but also other landmark years, such as 1840 and 1848. For example, in 1840, the "Gesetze, den Gewerbebetrieb auf den Lande betreffend" was introduced. Although this regulation did not go as far as introducing freedom of trade, it allowed skilled weavers to operate their own businesses more freely (Kiesewetter 2007, S. 147). Historical records also show that guild regulations had to be modified slightly in response to the unstable international situation caused by the French Revolutionary War. The regulations were amended to allow the active production of narrower, cheaper muslin, which was in relatively high demand, and weavers in Vogtland were allowed to produce goods under 70 cubits (HZBLGH1800, S. 73).

The cotton industry in Saxony did not become central to Germany until the second half of the nineteenth century. This was largely due to guild regulations, but "how" was the industry affected? This can be traced to entrepreneurship. Despite being exempt from regulations and being flexibly promoted by the government, many industries exhibited an improvement only in the quality of their products.

4. Industrial promotion policy and quality improving spirits

The cotton textile industry in Saxony failed to emerge as a catalyst for industrialization when compared to its regional counterparts due to institutional hindrances (Kiesewetter 2007, S. 388). However, this decrease did not necessarily imply a static situation. Several changes were seen in industrial production around the turn of the nineteenth century, which were not perceptible within the system itself. Despite numerous challenges, steady progress was achieved. The Saxon government implemented a number of industrial promotion policies under the Electorate. This section focuses on the efforts to enhance product quality through Preisaufgabe or prize competitions. The textile industry's goal was to improve textile quality, produce products of comparable quality to imports, and provide education (Horii 2023). Mechanization also progressed steadily, despite the retention of the old social system during the eighteenth century (Forberger 1958; Yazawa 2006). The introduction of spinning and weaving machines was a noteworthy event, and the government made strong efforts to encourage this. These included the provision of substantial funding incentives.[2]

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[2] The achievements of Preisaufgabe will be discussed based on historical materials "Landes-Ökonomie-, Manufaktur- und Kommerziendeputation, 10078, Verzeichnisse über die nach den Preisaufgaben der Kommerziendeputation zuerkannten Prämiengelder 1764–1791, 220, and Verzeichnisse über die nach den Preisaufgaben der Kommerziendeputation zuerkannten Prämiengelder 1792–1810, 221" archived in the Sächsisches Hauptstaatsarchiv Dresden, and which were used in previous studies.

Table 4 provides examples of prizes awarded for cotton products during this period, excluding the cases where the raw material was unknown, or where the award was likely related to spinning machines, because they are not clearly identified as being to produce cotton products. A few cotton-related awards were identified in Preisaufgabe issued in 1782, mainly concerning the dyeing process. The number of awards exploded in 1788, which coincided with the industry's quantitative prosperity and quality improvements. These efforts were rewarded; cash awards averaged approximately 12 taler, and Kassenbillet bonds were also awarded. The wages of weavers dropped from 1 rh 18 grossen to 1 rh 8-4 grossen per piece. Weavers and spinners began to face financial difficulty, and the decrease in wages caused an exodus of workers (HZBLGH1793, S.54). While the occupation of the prize winner was almost unknown, the amount awarded exceeded the monthly salary of a weaver at that time, possibly providing some degree of incentive.

Nearly half the prizes (26 out of 53) were granted to individuals residing in Chemnitz, a prominent hub of the cotton industry. Plauen received the second highest number of awards, with five confirmed cases. Considering Plauen's privileged position in the cotton industry, the number of awards granted is relatively modest. Not surprisingly, these production centers witnessed the highest number of prize winners. This suggests that the accumulation of human capital may have been unevenly distributed due to the guild regulations and geographical distribution. Only one or two prizes were awarded to the other regions. The historical records do not allow us to explore the origins of the awardees. However, based on a few available examples, weavers, knitters, and dyers seem to have made significant advancements in their respective crafts.

A possible reason for this is that financial incentives or honor can stimulate “quality improving spirits” in the short run, even in situations where freedom of trade and occupational mobility are restricted. However, the improvement in product quality was only a stopgap achievement by existing weavers and manufacturers. No policy was adopted during the eighteenth and nineteenth centuries to foster a vigorous entrepreneurial spirit (Kiesewetter 2007). In Würtenberg, it was noted that legal monopolies made it extremely difficult for weavers to exercise true entrepreneurship (Soly 2008). Only two cases (No. 5 and No. 7) resulted in the establishment of a factory. The fact that some individuals received multiple awards suggests that such financial incentives were effective in encouraging repeated small inventions by the same individuals. However, eventually, this policy was inadequate to promote sustainable development in the industry. Moreover, the limited number of multiple awards and the weak spillover effects of inventions highlight this approach’s shortcomings. A more detailed analysis is necessary. The failure to create a chain of inventions and interactions is attributable to the lack of direct freedom to operate in cities, which hindered individuals’ entrepreneurial spirit.

[Table 4 around here]

5. Conclusion

The data reviewed in this paper, while fraught with inadequacies, have shed light on the production status of the cotton industry at the turn of the nineteenth century. The dual revolutions had both direct and indirect effects on the cotton industry’s production activities. In terms of production volume, the indirect impact of the French Revolutionary War and the direct impact of the Industrial Revolution were enormous. In the short run, institutional aspects such as guild regulations did not have a significant impact on the Saxon textile industry.

The geographical distribution of production remained unchanged. However, in the long run, it is likely that the regulations restricted industrial development (Kiesewetter 2007 S. 348; Forberger 1958, S. 225-298). Although not fully examined in this study, entrepreneurship did not appear to be widespread either. However, this is not always an indication of stagnation; flexible business licenses, quality improvements through industrial promotion policies by the government, and technological progress through mechanization were all evident. It is also possible that the regulations created an uneven distribution of human capital. However, Saxony's trade policy is not a story that can be concluded by the dichotomy of the introduction or non-introduction of freedom to trade. Although it is important to consider the macroeconomic perspective, if the specifics of each individual case are discarded, this may lead to a trivialization of the richness of history.

Therefore, it is necessary to examine the prevalence of entrepreneurship in the second half of the eighteenth century. Pioneering merchant entrepreneurs (e.g., Baumgertel) and engineers (e.g., M. Frey, C. G. Irmscher, and J. G. Pfaff) also appeared during this period. Their contributions were immense. The spillover effects, role of entrepreneurs, and government policies must be fully considered. One might debate whether "quality improving spirits" may have provided human capital for the achievements in nineteenth-century machine manufacturing.

Historical Materials

Sächsisches Hauptstaatsarchiv Dresden (SHD), *Landes-Ökonomie-, Manufaktur- und Kommerziendeputation, 10078, Verzeichnisse über die nach den Preisaufgaben der Kommerziendeputation zuerkannten Prämiengelder 1764–1791, 220, and Verzeichnisse über die nach den Preisaufgaben der Kommerziendeputation zuerkannten Prämiengelder 1792–1810, 221.*

Sächsisches Hauptstaatsarchiv Dresden (SHD), *Landes-Ökonomie-, Manufaktur- und Kommerziendeputation, 10078,* "Hauptbericht über den Zustand der Bevölkerung, der Landwirtschaft, der Gewerbe und des Handels auf das Jahr 1793," "Hauptbericht über den Zustand der Bevölkerung, der Landwirtschaft, der Gewerbe und des Handels auf das Jahr 1795," and "Hauptbericht über den Zustand der Bevölkerung, der Landwirtschaft, der Gewerbe und des Handels auf das Jahr 1800."

Mandat, die general- Innungs- Articul für Künstler, Profeßionisten und Handwerker hiesiger Lande betreffend, vom 8 Januar 1780 (GIA1780)

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Table 1. HHI and production concentration pattern, 1792–1800 average

Materials or goods	HHI_k	Concentration pattern Kreis level	HHI_j	Concentration pattern urban/rural level
Wool	0.1799	decentralized	0.0371	decentralized
Cotton	0.3814	Bipolar	0.1485	bipolar
Linen	0.2757	Bipolar	0.0567	decentralized
Silk	1.0000	-	1.0000	-
Inkle	0.5978	Unipolar	0.5063	unipolar
Socks, etc.	0.4742	Unipolar	0.1952	bipolar
Hat	0.2863	Bipolar	0.0460	decentralized
Lace making	1.0000	Unipolar	0.1487	bipolar

Source: Calculated by the author, using data from HZBLGH1793; HZBLGH1795; and HZBLGH1800.

Table 2. Ratio of production volume in each Kreis, 1792–1800 average

	Wool	**C**otton	**L**inen	**S**ilk	**I**nkle	**S**ocks, **etc.**
KK	7.12%	0.02%	7.37%	-	-	-
TK	5.22%	0.02%	0.98%	100.00%	-	0.28%
MK	11.35%	2.79%	41.62%	-	75.21%	6.44%
LK	18.91%	11.81%	10.37%	-	-	8.25%
EK	32.93%	48.63%	25.30%	-	15.08%	66.23%
VK	5.03%	35.60%	-	-	-	2.29%
NK	3.55%	0.02%	0.11%	-	9.71%	0.39%
OL	12.62%	0.50%	6.36%	-	-	15.51%
NL	3.28%	0.59%	7.90%	-	-	0.60%

Source: Calculated by the author, using data from HZBLGH1793; HZBLGH1795; and HZBLGH1800.

Table 3. HHI by product from the end of the eighteenth century to the beginning of the nineteenth century

Goods	HHI_k^{18th}	HHI_k^{19th}	concentration pattern	HHI_j^{18th}	HHI_j^{19th}	concentration pattern
Low/middle quality	0.5413	0.6344	bipolar	0.2475	0.1578	decentralized
Pique	0.9819	1.0000	unipolar	0.6255	0.6170	unipolar
Muslin	0.9999	0.9800	unipolar	0.6167	0.4078	unipolar
Kannefas	1.0000	1.0000	unipolar	0.6887	0.5753	unipolar
Cotton with linen	1.0000	1.0000	unipolar	0.6069	1.0000	unipolar
Printed cotton	0.6237	0.7460	unipolar	0.5525	0.6615	unipolar

Source: Calculated by the author, using data from HZBLGH1793, HZBLGH1795, and HZBLGH1800.

Table 4. List of cotton industry related prize winners

Promulgated	No.	Funds (Taler)	Kassenbillet (Taler)	Residence	Occupation	Process	Name of goods
1764	1	20	-	Löbau	N/A	Dyeing	N/A
1764	2	15	-	Krumhermersdorf	N/A	Dyeing	N/A
1770	3	10	-	Calau	Dyer	Dyeing	N/A
1782	4	25	-	Reinsdorf bei Plauen	N/A	Spinning	Gespinst (yarn)
1782	5	30	-	Bautzen	Mayer	Dyeing	N/A
1782	6	15	15	Chemnitz	N/A	Weaving	Cattun
1782	7	10	10	Schönau	Cotton weaver	Spinning	N/A
1782	8	10	10	Chemnitz	N/A	Weaving	Cattun
1788	9	10	0	N/A	Amtshauptmann	Spinning	N/A
1788	10	20	20	Zwickau	Hausverwalter	Weaving	Muslin and cotton cloth
1788	11	15	15	Weißenfels	N/A	(Import)	Socks
1788	12	15	15	Freiberg	N/A	Spinning	N/A
1788	13	9	6	Weißenfels	N/A	Socks knitting	Socks
1788	14	15	15	Chemnitz	N/A	Weaving	Pique, Westen, Prinzessin, Taffet
1788	15	13	12	Chemnitz	N/A	Socks knitting	socks
1788	16	13	12	Chemnitz	N/A	N/A	New cotton products
1788	17	20	20	Liebenwerda	N/A	Spinning and weaving	N/A
1788	18	20	20	Plauen	Master weaver	Weaving	muslin
1788	19	5	5	Zwickau	N/A	Weaving and dyeing	Nankins
1788	20	5	5	Zschopau	N/A	Weaving and dyeing	Pique styled Nankins
1788	21	5	5	Chemnitz	Weaver or linen weaver	Weaving	Muslin
1788	22	5	5	Chemnitz	Socks knitter	Socks knitting	Moleton socks
1788	23	10	10	Chemnitz	N/A	Socks knitting	Socks
1788	24	15	15	Pirna	N/A	Spinning and others	New cotton products

1788	25	10	10	Chemnitz	N/A	N/A	Cotton products
1788	26	15	15	Plauen	N/A	Weaving	Wallis
1788	27	10	10	Chemnitz	N/A	Ready-made goods	Beinkleid
1788	28	15	15	Chemnitz	N/A	Ready-made goods	New cotton products for women
1788	29	13	12	Liebenwerda	N/A	Weaving	Nankins
1788	30	10	10	Limbach	N/A	Socks knitting	Socks
1788	31	13	12	Plauen	N/A	Weaving	Muslin
1788	32	10	10	Chemnitz	N/A	Weaving	Muslin
1788	33	25	25	Plauen	N/A	Weaving	Cotton products
1788	34	25	25	Plauen	N/A	Weaving	Cotton products
1788	35	15	15	Chemnitz	N/A	Weaving	Muslin
1788	36	10	10	Chemnitz	N/A	Weaving	Nankins
1788	37	10	10	Mitweida	N/A	Weaving	Cattun
1788	38	10	10	Chemnitz	N/A	Weaving	Pique, Wallis, muslin
1788	39	15	15	Chemnitz	N/A	Weaving	Pique, Wallis
1788	40	10	10	Chemnitz	N/A	Socks knitting	socks
1788	41	10	10	Chemnitz	N/A	Dyeing	New cotton products
1788	42	10	10	Dresden	Socks knitter	Ready-made goods	Cotton and half-silk Hosenzeug
1788	43	5	5	Chemnitz	N/A	Weaving	Cotton products
1788	44	10	10	Chemnitz	N/A	Weaving	Cotton Atlas and pique
1788	45	5	5	Altenschönfels	N/A	Weaving	Cotton products
1788	46	10	10	Chemnitz	Weaver	Weaving	Pique
1788	47	8	7	Chemnitz	Weaver	Weaving	Wallis
1788	48	25	25	Seifhennersdorf	N/A	Weaving	Invention of weaving machine
1788	49	8	7	Chemnitz	Weaver	Weaving	Nankins
1788	50	8	7	Chemnitz	Weaver	Weaving	Nankins
1788	51	8	7	Dresden	N/A	Printing	N/A
1788	52	8	7	Chemnitz	Weaver	Weaving	Pique
1788	53	10	10	Chemnitz	Weaver	Weaving	Sommer-pique

Source: Verzeichnisse 1764–1791 and Verzeichnisse 1792–1810.

Figure 1

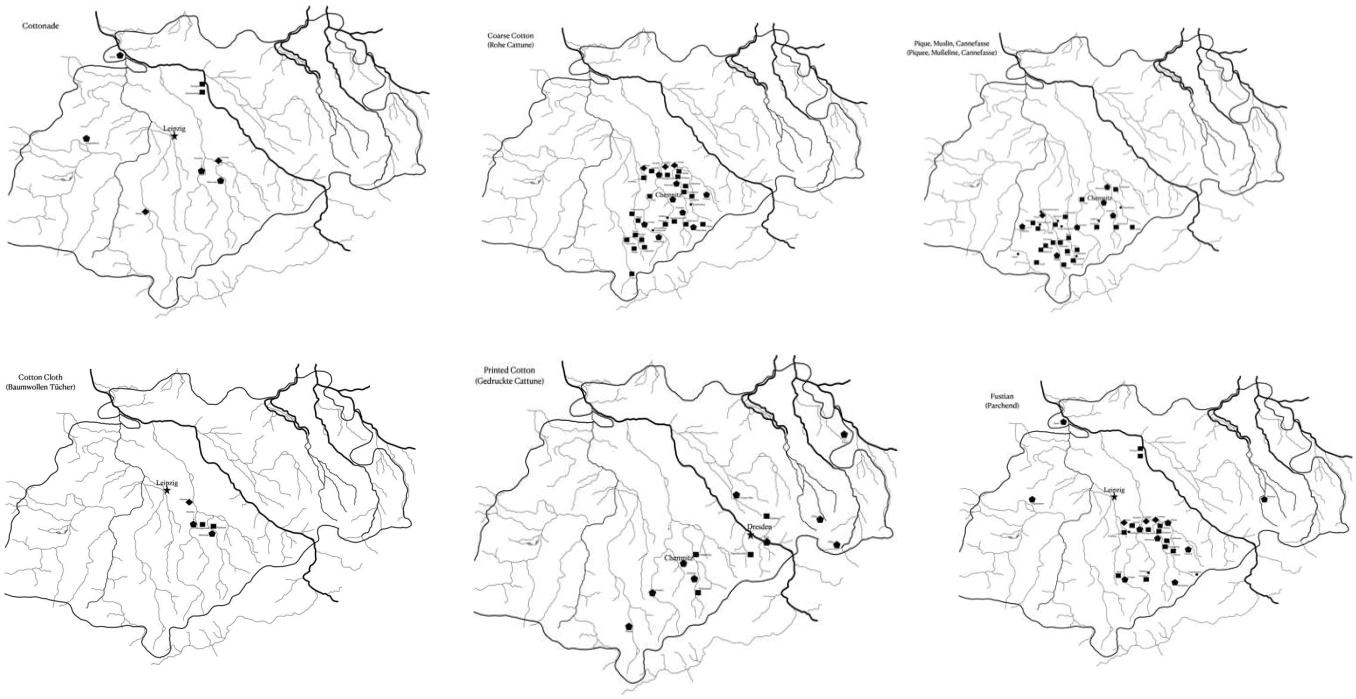

Figure 2

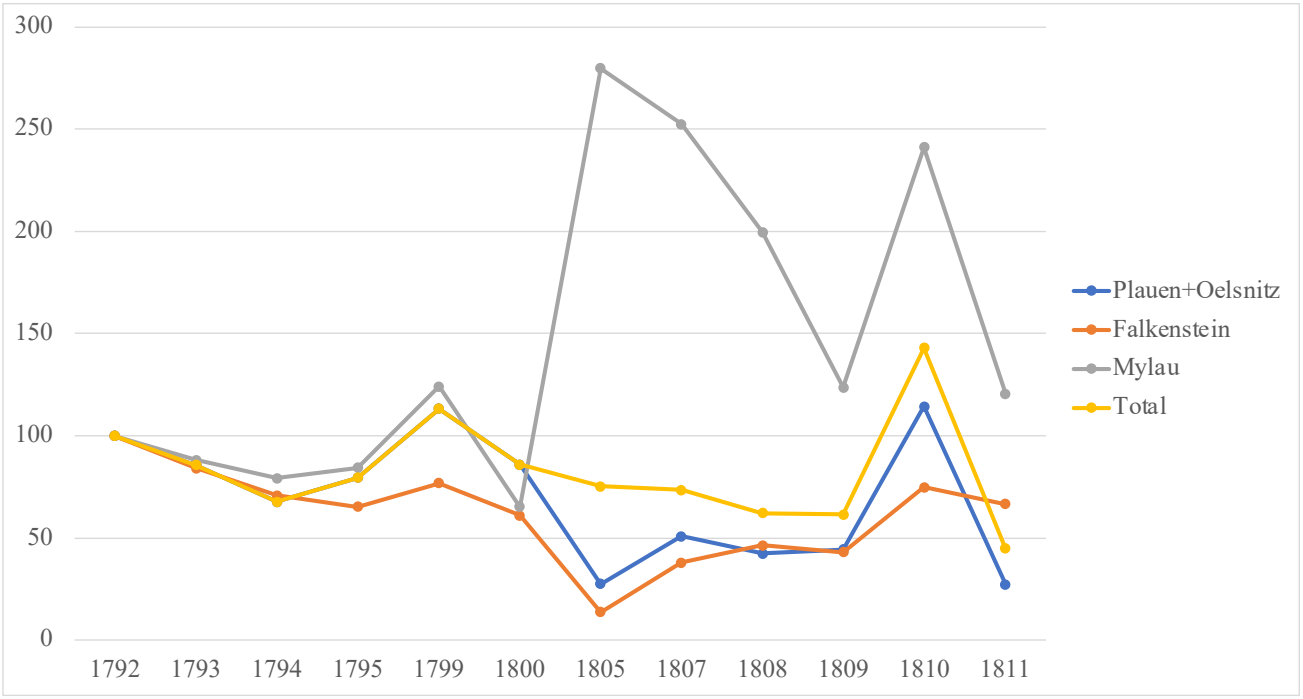

Figure 3

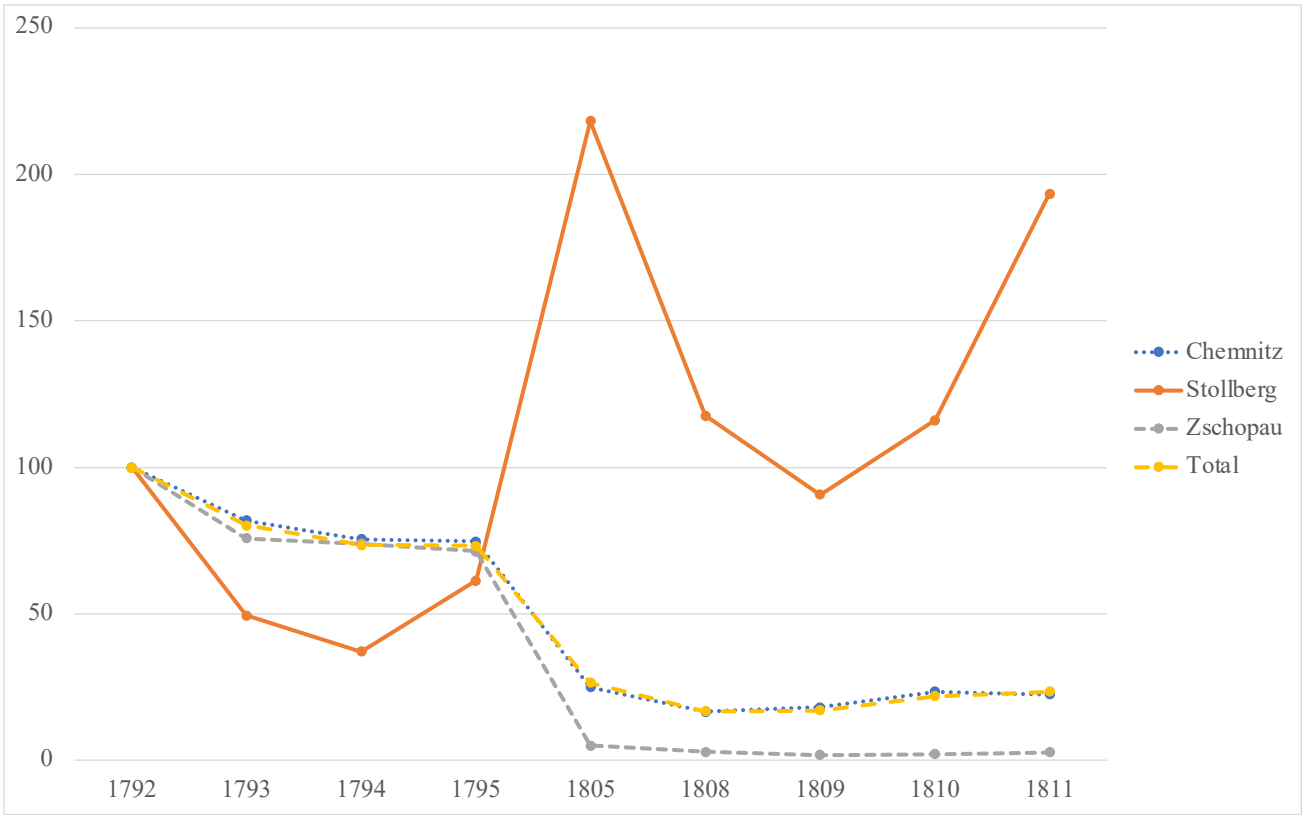

Figure 4

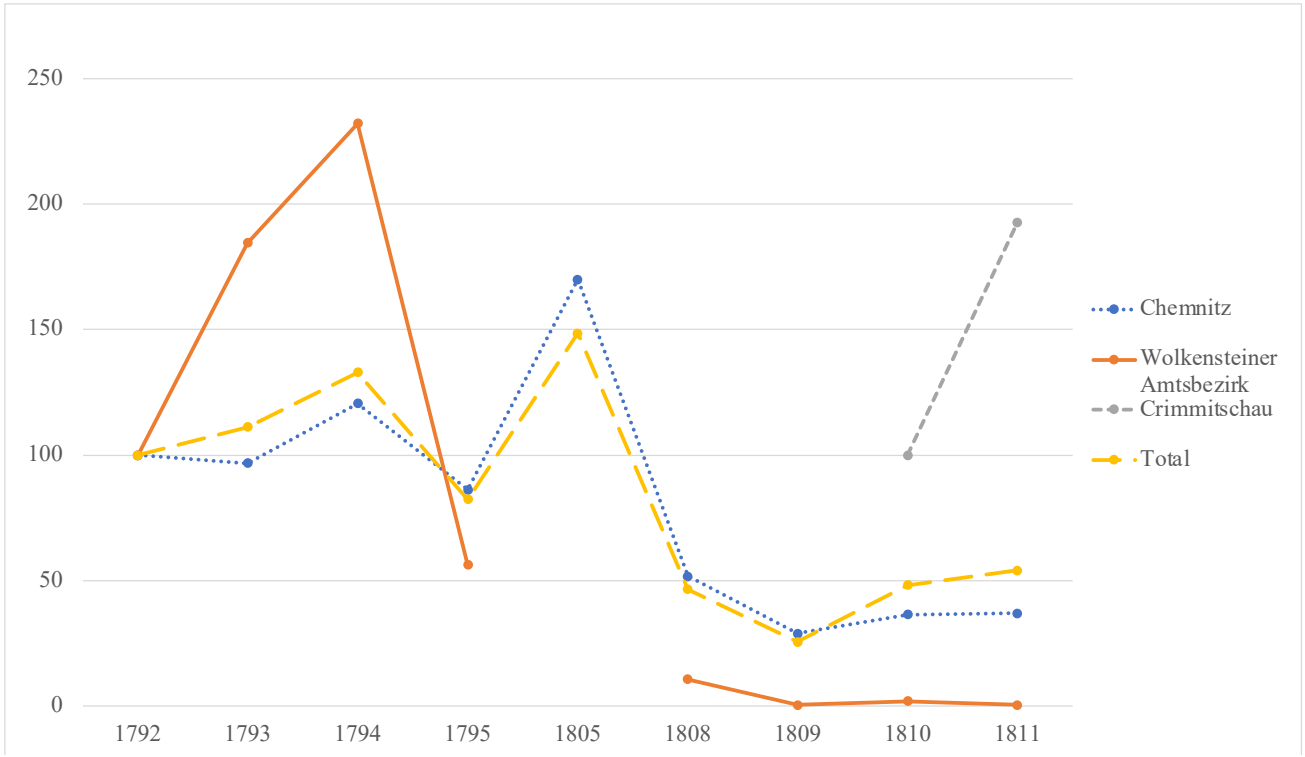

Figure 1. Map of geographic production distribution by cotton products at the end of the eighteenth century.
Source: Created by the author using data from HZBLGH1793; HZBLGH1795; and HZBLGH1800.
Figure 2. Production volume transition of pique (The production volume in 1792 is standardized as 100).
Source: HZBLGH1793; HZBLGH1795; HZBLGH1800; König (1899, S. 255).
Figure 3. Production volume transition of pique (The production volume in 1792 is standardized as 100).
Source: HZBLGH1793; HZBLGH1795; HZBLGH1800; König (1899, S. 253).
Figure 4. Production volume transition of kannefas (The production volume in 1792 is standardized as 100 and in 1810 is standardized as 100 for Crimmitschau).
Source: HZBLGH1793; HZBLGH1795; HZBLGH1800; König (1899, S. 254).