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Financial Boom and Bust in the 19th Century: How Bad Was Germany's *Gründerkrise*?

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Financial Boom and Bust in the 19th Century: How Bad Was Germany's *Gründerkrise*?

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ABSTRACT: The *Gründerkrise* of the 1870s marks Germany's first major experience with financial boom and bust. The assessment of its real impact has, however, been hampered by the non-ability of comprehensive and reliable national accounts data for the 19th century. This short paper seeks to overcome such difficulties by combining common factor analysis as proposed by Sarferaz and Uebele (2009) with financial filtering a la Borio et al. (2013) and Berger et al. (2015). The results confirm that the *Gründerkrise* was by far modern Germany's worst peacetime economic crisis prior to the Great Depression in the late 1920s. Financial and monetary forces amplified the boom of 1871-73, deepened the downturn in 1874-79, and acted as a drag on the recovery until well into the 1880s. The pattern resembles modern 'balance sheet recessions', i.e., protracted economic weakness in the aftermath of financial crises.

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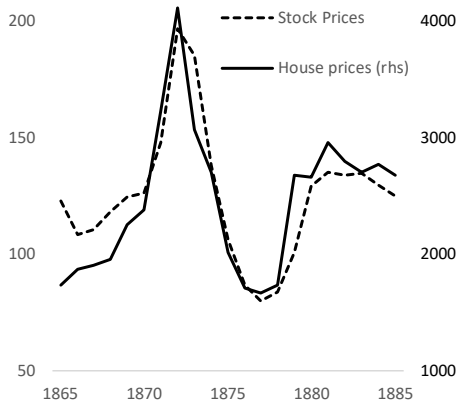
Introduction and Historical Context

The *Gründerkrise* of the 1870s marks Germany's first major, traumatic experience with financial boom and bust (Figure 1). Following the founding of the German Empire in 1871, an enormous financial boom unfolded: commercial credit expanded rapidly, hundreds of new companies sprung up and were listed on the stock market, and corporate stock and real estate reached hitherto unknown valuations.[1] Only two years later, fortunes reversed sharply. In May 1873, the stock market in neighboring Vienna collapsed, bringing financial expansion in Germany to a hold. In October, the—only recently established—*Quistorp'sche Vereinsbank* collapsed. Its bankruptcy was followed by a broad-based crash in equity valuations and a series of high-profile bank and corporate failures.

Figure 1: Berlin Asset Prices, 1865-85 (Indices)



Sources: Donner (1934) for stock prices, the JST (2017) macrohistory database for houseprices, complemented with various editions of the Berlin Statistical Yearbook.

As events unfolded, it gradually sank in to observers that they were facing not only a financial collapse, but also a *Handelskrise*: a protracted economic downturn that lasted at least for the remainder of the 1870s and possibly even longer (see e.g. Wirth, 1882)[2]. Systematic attempts at business cycle dating carried out in the 20th and 21st centuries have, for the most part, confirmed this assessment.[3] At the same time, these studies used different data and methodological approaches, and it is therefore no surprise that a consensus about the *Gründerkrise'*s intensity and length has not yet emerged.

At the core of these difficulties lies the absence of reliable national accounts data for the 19th century. One strand of research has sought to estimate macroeconomic aggregates ex-post. The best-known attempt are Hoffmann's (1965) Net National Product estimates. Hoffmann's work represents a heroic effort, which has gifted a rich database to generations of researchers studying Germany's economic history. At the same time, the incompleteness of the underlying data forced Hoffmann to make many assumptions and approximations that introduced distortions when data needed to be aggregated (see, e.g., Fremdling 1988, Ritschl and Uebele 2009, Sarferaz and Uebele 2009). Discounting induced more errors, as Hoffmann, for lack of alternatives, often discounted aggregates with price indices obtained for a different aggregate. Attempts to improve Hoffmann's estimates—for example by Burhop and Wolff (2005)—failed to solve the underlying conundrum and have attracted similar criticism.

[1] *Gründen* means 'setting up' or 'establishing' in German.

[2] Wirth characterized the *Gründerkrise* as follows: „The crisis of 1873 had more varied and powerful causes, spread more extensively, had a more traumatic impact, with aftereffects more painful and longer lasting than all preceding, similar catastrophes. Having broken out on the stock market, it caused sequentially harm for trade, industry, and finally also agriculture in the entire occident. First erupted in Vienna in the first half of the month May of 1873, it lasted with its afterpains until the fall of 1879, and pulled all of Austria and Hungary, the German Empire, Italy and Switzerland into its shackles of doom" (p. 450).

[3] Including Wagenführ (1933), Burns and Mitchell (1946), Spiethoff (1955), Hoffmann (1965), Spree (1977, 78), Ritschl and Uebele (2009), Sarferaz and Uebele (2009), and Grabas (2011).

A seminal paper by Sarferaz and Uebele (2009—in the following S/U) adopted a new, promising approach. Building on work by Spree (1977, 78), the authors used common factor analysis to identify a business cycle. Instead of aggregating incomplete and potentially mismeasured activity data, their method extracts a common signal from them, which avoids the consistency issues that plague incomplete national accounts.

For analyzing economic activity around financial crises such as the *Gründerkrise,* S/U's approach suffers from a shortcoming, however, which is rooted the uniformity of the detrending procedure. S/U detrend activity data with the Hodrick-Prescott (HP) filter. The HP filter mechanically minimizes fluctuations around a trend subject to a limit on the degree of smoothing, without permitting substantive factors to influence the fluctuation pattern. Recent research—much of it conducted in the aftermath of the global financial crisis—shows though that financial factors can both accelerate growth and lengthen and deepen downturns (e.g., Claessens et al. 2012, Borio 2014, Yan and Huang, 2020), which suggests that the fluctuation pattern varies with the state of finance. To incorporate this feature, the paper adopts a modified approach that builds on S/U (2009), but combines it with a *financial filter* as developed by Borio et al. (2013) and Berger et al. (2015).

Before proceeding, some historical context is in order. First, the *Gründerkrise* happened at a relatively early stage of Germany's industrial development. The onset of Germany's industrialization is often dated in the 1840s (see, e.g., Fremdling, 1977), the *Gründerkrise* occurred one generation later. In the 1870s, agriculture and housekeeping services still accounted for more than half of employment and close to half of value added (Hoffmann, 1965). Moreover, many institutions that could have propagated financial shocks were still underdeveloped. According to Hoffmann (1965), bank credit, for example, was perhaps 30 percent of GNP in the 1870s. Deposit banking was in its infancy—private banks lent out mostly their own capital. Even joint stock banks, legalized in Prussia only in 1870, operated with equity ratios of 50 percent or more, granting them substantial loss-absorbing capacity (Burhop, 2004).

Second, *Gründerboom* und *Gründerkrise* occurred in parallel with large monetary dislocations. First the introduction of the gold Mark in 1871-73, which replaced the silver currencies that had prevailed in most German states prior to unification. The exchange triggered a large albeit short-lived monetary stimulus, as the federal government brought the new gold coins into circulation without withdrawing silver coins first—issuance was financed from the indemnity imposed on France after the Franco-Prussian war. Then the 'scramble for gold' from 1873: several countries—notably France, later also the United States—followed Germany in adopting the gold standard, which greatly increased global demand for monetary gold and triggered deflationary pressures (see e.g. Gallarotti, 1993, Flandreau, 1996, Wiegand, 2019, 22).

Third, the *Gründerkrise* had important political repercussions. In the late 1860s and early 1870s, Chancellor Otto von Bismarck governed in an uneasy alliance with liberal parties that dominated parliament—first the *Bundestag* of the Northern German Federation, then the *Reichstag* of the Empire—and therefore controlled the budget.[4] The liberals lost several elections in the late 1870s/early 1880s, however, as voters blamed them for financial bust and economic hardship. This allowed Bismarck to pursue his *konservative Wende* (conservative turnaround): the removal of liberals from his cabinet (e.g., the head of the chancery Rudolf Delbrück, or finance

[4] In the early and mid-1860s, Bismarck and the liberals in Prussia had been antagonists in the *Verfassungskonflikt* (constitution conflict), in which government and parliament quarreled about the authority over the military budget. Both sides entered into a truce after victory over Austria in the war of 1866 and the establishment of the Northern German Federation of 1867, steps that satisfied liberal aspirations of advancing German unification.

minister Otto Camphausen) and their replacement with conservatives. The *Wende* ended liberal aspirations of transforming the German Empire into a constitutional monarchy, in which parliament and not the monarch would control government. Overall, the political developments post-*Gründerkrise* are well consistent with the pattern identified by Funke et al. (2016), i.e. politics moving to the right in the aftermath of financial crises.

Methodology and Data

As in Saferaz and Uebele (2009), economic activity is measured by a common factor Y_t that is extracted from detrended, disaggregated real activity time series y_{it}:

(1) $y_{it} - y_{it}^* = Y_t{}'\mu_i + u_{it}.$

y_{it}^* is an unobserved trend and μ_i is the factor loading of activity index y_{it}. Y_t is a prinicpal factor, i.e., the linear combination of the detrended activity variables that accounts for a maximum of the variables' variance. In line with standard practice, scale invariance is addressed by setting the standard deviation of the common factor to one, and sign invariance by restricting one factor loading to be positive.

Different from S/U, the underlying activity indices y_{it} are detrended with a financial filter, which is described by the following equations:

(2) $y_{it} - y_{it}^* = \Phi_t'\beta_i + \varepsilon_{it}^o.$

(3) $\Delta^2 y_{it}^* = \varepsilon_{it}^*$

(4) $\lambda = \frac{\sigma_{io}^2}{\sigma_{i*}^2}.$

The innovation is in equation (2), which allows the cylical component to vary with the state of financial variables Φ_t. β_i is a reduced-form coefficient that captures linkages between finance and the business cycle. $\Phi_t'\beta_i$ is the *financial accelerator* for activity variable *i*.[5] ε_t^o and ε_t^* are *iid* with standard deviation σ_o and σ_*, respectively. (3) describes the trend's law of motion, and λ is a smoothing parameter.[6]

In modern studies, 'finance' is often proxied with credit or an asset price index. With 19th century data, it can be risky to rely on individual indicators, as also financial data can be incomplete and measured with error. This paper therefore uses again factoring to extract a common *financial factor F* from several nominal time series f_j:

(5) $f_{jt} = F_t'\gamma_j + v_{jt}.$

[5] Unlike S/U, this approach distinguishes clearly between real and nominal variables. (1) treats economic activity as a real concept, (2) uses information embedded in nominal/financial data *to the extent that it matters* for the properties of the business cycle.

[6] λ is tied to a pre-specified value of 6.25 with an iterative maximum likelihood procedure, following both S/U (2009) and Ravn and Uhlig's (2002) recommendation for annual data. Borio et al. (2013) and Berger et al. (2015), working with quarterly GDP data, add an auto-regressive term to (2), which turns out to be dispensable with annual data.

Finance can affect economic activity both instantenously and with lags:

(6) $\Phi_t^{'}\beta = F_t^{'}\beta_0 + F_{t-1}^{'}\beta_1 + \cdots + F_{t-\tau}^{'}\beta_\tau.$

(1) and (5) are estimtated as simple static factors.[7] In (6), τ is set at 2, informed by Ritschl and Uebele's (2009) finding that in imperial Germany, stock valuations led real activity by one to two years.

Data cover the years 1865-1913 and are taken from the following sources:

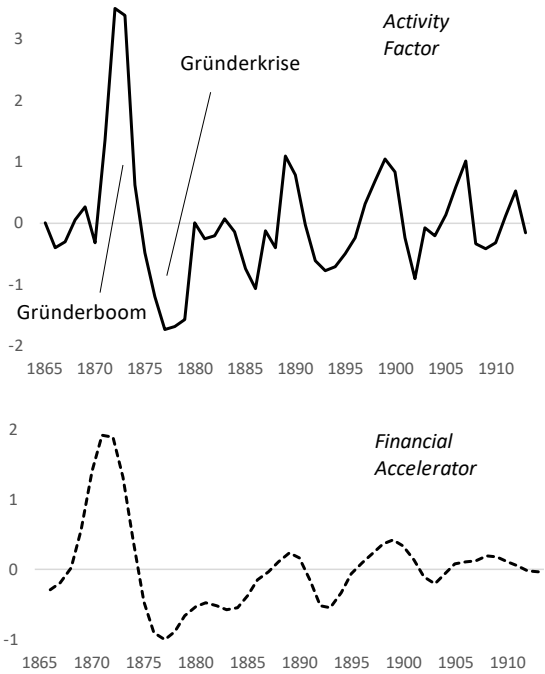
- For real *activity*, Spree (1978) reports population size, births, deaths and marriages per 100.000 people, corporate bankruptcies, net production of plants in constant prices, sugar consumption and coal production in tons, per-capita coal production in the city of Dortmund, and yarn production by cotton mills in tons. Mitchell (1992) provides iron ore production, pigiron production, cotton consumption, beer production, and freight and passenger transport. Gömmel (1978) reports the number of employed in the city of Nürnberg.
- For *financial/nominal* data, Spree (1978) reports the discount rate in Berlin/Hamburg, bills of exchange held by credit banks, wholesale price indices for industrial raw materials and for plant-based foodstuffs, import prices for Scottish raw iron, and gross investments and profit margins of cotton mills. Hoffmann (1965) provides data on net bank financing, net financing by joint stock corporations, other net financing (including from insurance companies, the public sector, and private railway corporations), and a price index for rural dwellings. Donner (1934) provides stock prices, and the Jordà-Schularick-Taylor (2017) macro-history database reports a house price index for Berlin from 1870, which is expanded to 1865 with data from the Statistical Yearbook of the City of Berlin.

Main Results

Figure 2 shows the main results. The first graph displays the estimated common activity factor. *Gründerboom* and *Gründerkrise* clearly stand out as extraordinary episodes in imperial Germany. The *Gründerkrise* is remarkable not only for its depth—at least twice as severe as later recessions—but also its length: five consecutive years of sub-par activity, followed by only a weak recovery in the early 1880s, and then by another downturn in 1884-87.

The second graph displays an *aggregate financial accelerator*, computed as the sum of variable-specific accelerators weighed with their scoring coefficients (scoring coefficients and financial factors are reported in

Figure 2: Activity Factor and Financial Accelerator, 1865-1913



Sources: author's calculations, based on the data sources and methods described in the text.

[7] Following S/U (2009), this author experimented with adding lags to factor and/or error term, but this has no discernible impact on the estimates (as S/U report themselves).

the Annex). It provides a metric for the impact of finance on the business cycle. The accelerator shows that financial forces amplified both *Gründerboom* and *Gründerkrise*. Moreover, even after the *Gründerkrise* ended in 1880, finance continued to act as a drag on activity for many more years, thereby inhibiting the recovery. This pattern resembles modern 'balance sheet recessions' in the aftermath of financial crises (Koo, 2013).

The pattern of the financial accelerator ties in well with the monetary developments described in the introduction. In particular, the late 1870s and early 1880s are the years of the 'scramble for gold', when deflationary pressures in gold standard countries exerted upwards pressure on real interest rates, which weighed on profits and investment. Monetary conditions eased only from the late 1880s, when large gold discoveries in South Africa fed into global money supply and allowed gold standard countries to reflate.

An Activity Factor for 1820-1913 and an Illustration

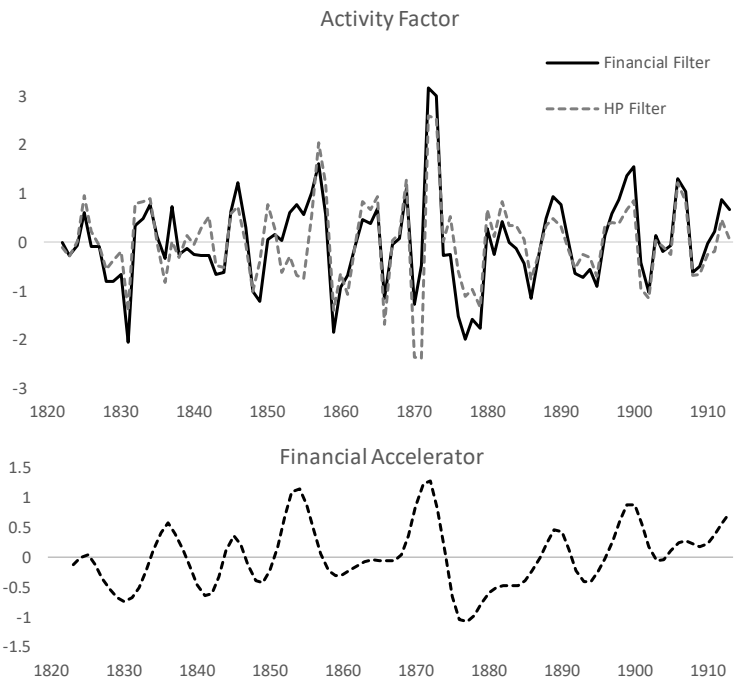
If one uses only Spree's (1978) data—as S/U's reference study does—one can stretch the analysis back to the 1820s. The activity factor then covers an enormous period, during which Germany transformed from a rural, pre-industrial economy to an industrial powerhouse. The downside though is that one loses almost half of the underlying activity and financial variables from which the common factors are extracted.

Figure 3 shows the results. Besides the activity factor estimated with the financial filter, it also displays a factor based on HP-filtering, which mimics S/U's approach.

Despite the loss of many underlying variables, the activity factor post-1865 resembles closely that of the previous section—implying that Spree's narrower data set contains almost the same information about economic activity as the richer data used for Figure 2, and pointing to a high degree of robustness of the common factor approach.

In terms of substantive results, *Gründerboom* and *Gründerkrise* stand out again as the largest boom and bust episodes—not only of the German Empire (1871-1913), but for a period stretching almost a century.

Figure 3: Activity Factor and Financial Acelerator, 1820-1913



Sources: author's calculations, based on the data sources and methods described in the text.

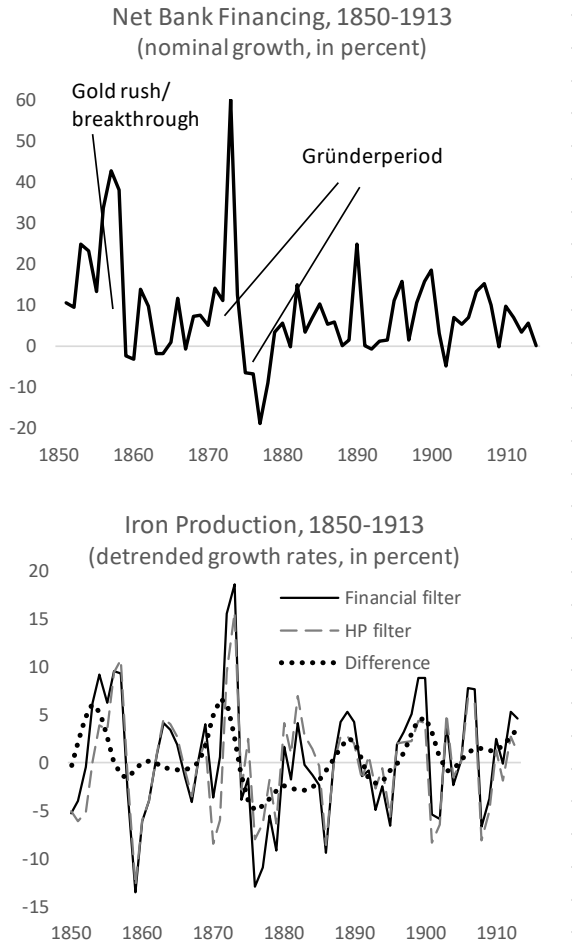
The comparison of the financial with the HP-based activity factor shows similar results for many years. There are two main exceptions, however: (i) the HP-based factor underestimates the severity of the *Gründerkrise*, and (ii) it misses a sustained boom in the early 1850s—years that are often considered the breakthrough period of German industrialization. By implication, the 1850s and the 1870s are also the years during which the financial accelerator displays the largest oscillations.[8]

The 1850s provide a good illustration of the forces that generate the differences between the financial and the HP-filter based factors. The upper graph in Figure 4 shows net bank financing by credit and reserve banks according to Hoffmann (1965). From 1851-57, bank financing grew at double-digit rates in every single year. The lower graph displays *one* detrended activity indicator: iron production.

The HP filter minimizes cyclical fluctuations regardless of circumstance, and therefore 'allows' only two strong years: 1856/57. The financial filter factors in that financial expansion can prolong and amplify upswings, and identifies five consecutive years of strong detrended iron production growth: 1853-57. This pattern is not only more in line with the 'breakthrough' narrative, the detrended times series also resembles more closely Spree's (1978) raw data (not displayed here)—implying that with the HP filter, some strong years got absorbed into the trend.[9]

The pattern of the financial accelerator in the 1850s has again a monetary interpretation. Gold discoveries in California and Australia around 1850 boosted the global supply of gold and created accommodative monetary conditions—not only in gold but also in silver countries, as the bimetallic system transmitted gold supply shocks to silver countries, which included most German states.[10] The accommodative stance created the conditions for finance to expand, which, in turn, helped fuel economic activity.

Figure 4: The Impact of Filtering: an Illustration



Sources: Hoffmann (1965), Spree (1978), and author's calculations.

[8] The most important difference between Figures 2 and 3 is that the financial accelerator displays a more muted spike during the *Gründerboom* in Figure 3. Closer inspection suggests that this owes mostly to the longer observation period from which the factor is extracted. For the *Gründerkrise*, both figures display an almost identical pattern.

[9] Note that Hoffmann's bank financing data displayed in Figure 4 do not enter the financial accelerator in Figure 3, as they do not reach back to the 1820s. However, the financial variables included in Spree (1978) evidently pick up the same information—again a demonstration of how factoring can produce robust results even with limited data.

[10] France was at the core of the bimetallic system: the French mint guaranteed fixed exchange values of the Franc vis-à-vis both gold and silver. Higher global gold production triggered gold inflows into France and silver outflows from France to silver countries, while keeping exchange rates between gold and silver countries stable (Gresham's law)—see Fisher (1894), Flandreau (2004). The bimetallic system existed until 1873, when France suspended the convertibility of silver coins.

In short: finance matters—sometimes. While business cycle analysis *not* informed by finance works well for many years, it provokes misleading results in times of rapid financial expansion or in the aftermath of financial crises. In this regard, the 19th century is no different from more recent, 20th and 21st century boom-bust episodes.[11]

I explored various other robust checks and extensions. Running the financial filter with only one indicator—for example, bank financing—yields similar but weaker results, confirming the advantages of factoring. A potentially interesting extension is sub-grouping variables in equations (5) and (6), to identify forces affecting the business cycle at a more granular level. For example, classifying variables as either "monetary" and "financial" suggests that financial forces had a larger share in firing up the *Gründerboom,* while monetary forces deepened the *Gründerkrise*. In practice, it is difficult though to distinguish cleanly between monetary and financial forces: falling real estate prices, for example, can be classified as 'monetary' in that they contribute to deflation, but also as 'financial' as they reduce collateral values and inhibit financial intermediation. This extension therefore requires more work before presenting results.

Conclusions

The main objective of this short paper was to provide more clarity about the severity of Germany's *Gründerkrise* of the 1870s—an unresolved question in German historiography. Building on common factor analysis as proposed by Sarferaz and Uebele (2009) and combining it with financial filtering a la Borio et al. (2013) and Berger et al. (2015) shows that the *Gründerkrise* was easily modern Germany's worst peacetime economic crisis prior to the Great Depression. Its severity stands out not only during imperial Germany, but also for the entire period from 1820 to 1913, during which Germany transformed from a rural, pre-industrial economy to an industrial powerhouse. Financial and monetary forces—summarized in an estimated 'financial accelerator'—greatly contributed to the crisis: they amplified the boom of 1871-73, deepened and lengthened the downturn in 1874-79, and acted as a drag on the recovery until well into the 1880s. This pattern resembles modern boom-bust-cycles or 'balance sheet recessions'.

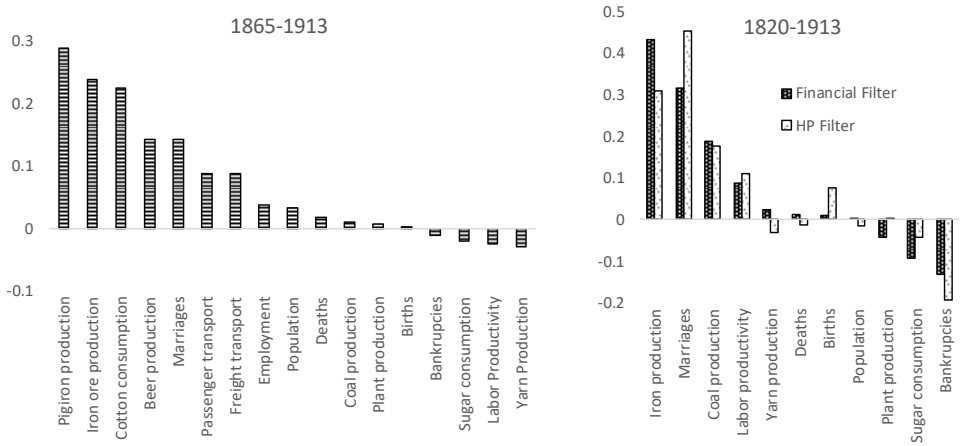
At a methodological level, Sarferaz's and Uebele's (2009) common factor approach displays remarkable robustness, generating very similar results even with large variations in the underlying variables from which the factors are extracted. In this author's view, this renders the approach an attractive alternative for business cycle analysis when reliable national accounts data are unavailable. This said, during financial expansions as well as during and after financial distress, it is important to account for the impact of finance on the business cycle. De-trending the underlying activity data with a standard Hodrick-Prescott filter instead of a financial filter delivers similar results for many years, but it underestimates the severity of the *Gründerkrise,* and it also misses a boom during Germany's industrial breakthrough phase in the early 1850s.

[11] An interesting question is why the 1850s expansion was not followed by a drawn-out financial contraction similar to the *Gründerkrise.* There are several plausible, non-mutually exclusive answers: first, the industrial sector was still too small in the 1850s to drag the financial system into contraction. Second, the *Gründerboom* contained a strong construction/real estate component (Burhop, 2005) that was missing in the 1850s. Third, monetary conditions remained accommodative after the 1850s boom ended, allowing credit to stabilize and recover—while the *Gründerboom* was followed by the deflationary scramble for gold. Distinguishing between these explanations is left for future research.

Finally, the pattern of the financial accelerator suggests a close association with monetary events. The accelerator has strong, positive values—indicating that financial forces supported growth—during the gold rush years of the early and mid-1850s, during Germany's messy transition from silver currencies to a common gold currency in the early 1870s, and (to a lesser extent) during the *belle epoque* from about 1895, when another round of gold discoveries allowed cash-strapped gold standard economies to reflate. By contrast, the accelerator is contractionary during the gold scramble years of the late 1870s and 1880s. While this evidence is far from conclusive, it suggests that the link between monetary developments and 19th century growth patterns may be a fruitful area for future research.

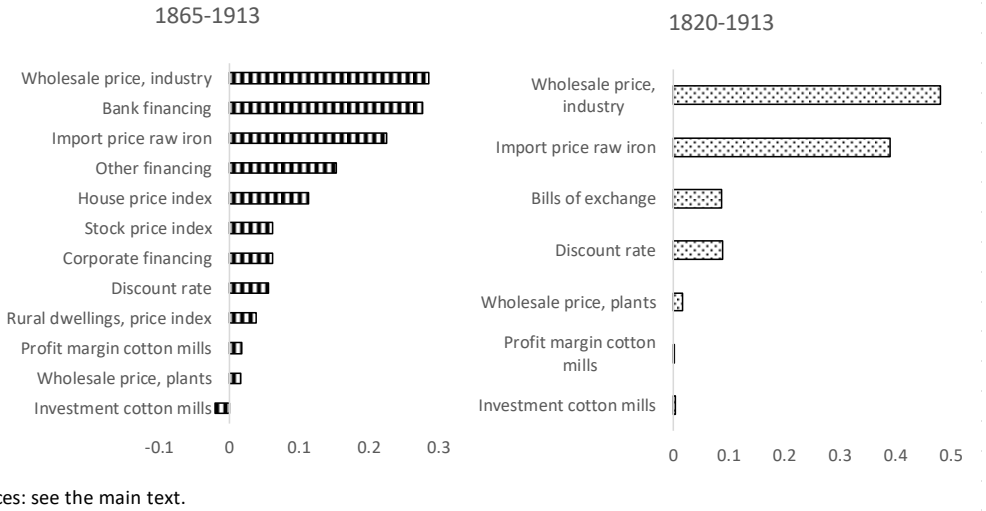
Annex: Scoring Coefficients and Financial Factors

Figure A1: Scoring Coefficients, Activity Factor



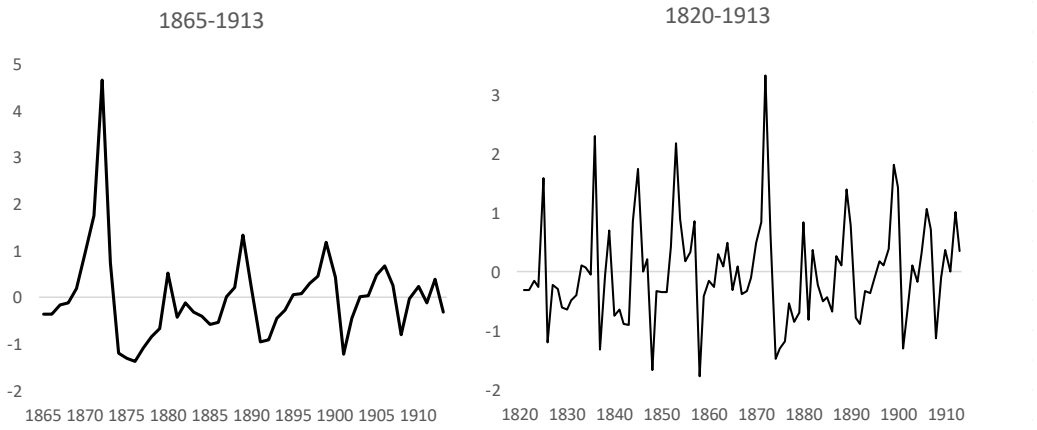
Sources: see the main text. Note that iron production is dropped from the 1865-1913 sample, as the latter already contains close proxies (pigiron production and iron ore production).

Figure A2: Scoring Coefficients, Financial Factor



Sources: see the main text.

Figure A3: Financial Factors



Sources: see the main text. Note that the financial factor - different from the financial accelertor - contains no lag structure, and therefore displays a less smooth pattern.

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