

Financing Industrialization in Russia and Germany

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Abstract

A large literature debates what system best promotes the accumulation and allocation of capital, especially in countries that industrialized relatively late and where capital market imperfections may be especially severe. Russia and Germany serve as the classic cases to argue that developing economies may successfully employ unusual strategies to promote industrialization, for example an outsized role for banks or state intervention. Law and finance analysis, moreover, attributes financial system differences to variation in legal system design. Such assertions, however, have relied largely on anecdotal evidence, country-level aggregates, or small collections of firms. New research into Germany and Russia has reshaped thinking about these two cases individually, but we still lack rigorous comparative analysis. We therefore present new evidence directly comparing Russian and German corporate performance and financial strategies based on firm-level microdata from Russian and German sources around turn of the twentieth century and compare key stipulations of corporate law and their implementation. Contrary to the standard “economic backwardness” and “law and finance” literatures we argue that corporations in both countries used similar strategies to finance operations and expansion but that tight entry restrictions fundamentally distorted patterns of corporate governance and finance in Russia.

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1. Introduction

Research over the past twenty years—largely focusing on Germany (and to some extent other western European countries), the UK, the US, and Japan—has gradually altered views on financial system development. Relatively few studies, however, consider additional contexts or employ rigorous comparative historical analyses to test theories of financial development and growth.¹

To further these lines of questioning historical patterns of finance, corporate law, and economic growth, this paper investigates how corporations financed industrial development by comparing two quintessential late-industrializing countries with varying degrees of “backwardness”: Russia and Germany. Such backwardness extends to political, legal, and financial development, and these factors interact and often mutually reinforce each other. At the same time, both countries operated under civil law, and the Russian legal system developed with some German influence (though with mostly French influence). Thus, comparing these countries allows us to hold the legal origin close to constant while examining differences in corporate law, political interest groups, and the impact of politically-influenced regulations on the financing of industry. Our research also provides the first opportunity to evaluate Alexander Gerschenkron’s comparisons of the role of banks and the state in the German and Russian cases empirically using corporation-level data.

¹ In one early study, Fohlin (1994) collected and analyzed firm-level financial accounting data for German and Italian firms and their relationships to universal banks. Fohlin argued that bank relationships related most significantly to firms’ stock market listings, suggesting that the capital markets in fact played a key role in those “bank-based” financial systems. Fohlin (2007) deepened the study of German corporate finance and Fohlin (2012) extended the analysis across several other countries. On Russia, Gregg (2020) collects a factory-level panel database of Imperial Russian manufacturing establishments and argues that firms that incorporated gained access to long-term financing that allowed them to purchase productivity-enhancing machines.

In this analysis, we combine panel micro datasets detailing corporate financial accounting to consider the consequences of each country's political, legal, and financial system environments for the organization, capital structure, and performance of corporations in the two countries at the turn of the twentieth century. Imperial Russia's relatively small and underdeveloped financial sector and the government's tight restrictions on limited liability incorporation influenced corporate structure and performance, which we compare to Germany's relatively well-developed financial system, capital markets, and liberalized incorporation regulations.

We find that both Germany and Russia operated systems fundamentally built on principles of finance capitalism. In both countries, large companies took advantage of joint-stock incorporation to expand operations and ensure survival, partly by using outside financing in the form of bank debt, bonds and equity shares. Furthermore, equity and bonds in both countries traded on freely accessible stock exchanges in major cities. However, as theorized in the more recent strands of financial development literature, legal and institutional idiosyncrasies between the two contexts yielded key differences between their corporate populations. Fundamentally, we argue that tight restriction on incorporation in Russia hampered firms' access to capital and impeded financial development and industrial growth compared to Germany. The Russian corporations that did form did not seem to be fundamentally primitive or purely rent-seeking, suggesting that restrictive chartering regulations prevented Russia from achieving a fully-functioning system of finance capitalism. In the long run, authoritarian regimes destroyed both systems in the 1930s, and only Germany regained a significant level of corporate capitalism and active financial markets.

We begin by comparing the structure of the corporate financial systems and each government's role in regulating incorporation, securities issues, and trading. We then examine the makeup of the corporate population, compare how corporations financed themselves, and evaluate corporate performance in each context. Our findings demonstrate that congruent legal systems produced divergent corporate law and regulation, which in turn created wide disparities in the development of financial institutions, capital markets, and industrial corporations. Nonetheless, our results also undermine Gerschenkron's hypothesis that Russia's weak industrial base caused its failure to develop and employ an advanced financial system in the late 19th and early 20th centuries.

2. Finance, Institutions, and Economic Growth

Economists have long debated the role of financial development in economic growth. The debate has unfolded along a few distinct lines: at the broadest level, does generalized financial development promote economic growth? In light of the variation in financial systems among the world's advanced economies, do certain types of financial systems (broadly, "banks v. markets") promote economic growth? Finally, Do legal system origins influence financial system design- Is the political or economic system more important than the legal system?

The "Law and Finance" literature beginning in the late 1990s probed the idea that legal origin dictated a country's financial system structure and ability to promote high functioning financial markets (La Porta et al 1997 and 1998) and supportive financial institutions like stock markets and banks (Levine and Zervos 1998, King and Levine 1993, Levine 2004, Rajan and

Zingales 1998). Much of this literature relies on cross-country evidence, limited timespans, and modern examples.

Furthermore, the Law and Finance literature largely ignores institutional nuances and history. Rajan and Zingales (2003) point out that the relationship between legal origin and financial development appeared very different in 1913. They emphasize that political factors explain major changes in financial development in the twentieth century, arguing that states that protected incumbents against competition tended to oppose financial development. This corresponds well to the Russian case, where incumbents opposed the introduction of general incorporation in the late nineteenth century, a major reason the Imperial government abandoned efforts to reform the concession system (Owen 2002). Economic historians have also highlighted how, despite the emphasis on corporations and formal legal rules stressed in much of the law and finance literature, most medium-size firms chose non-corporate limited liability forms (Guinnane et al. 2007), and the formal rules are only part of the story, given the enormous flexibility corporations could enjoy in writing their corporate charters (Acheson et al. 2019).

According to an older but widely-adopted view developed by Alexander Gerschenkron, English firms of the early phases of the industrial revolution tended to be financed privately through partnerships, while those in continental Europe's later industrialization employed large financial institutions and centralized government to funnel resources into heavy industry. Germany and Russia represented central cases Gerschenkron's works. In Gerschenkron's (1962) paradigm of "relative backwardness," these countries' industrial sectors developed at different rates and in very different financial and legal environments; distinct both from England and from each other. Gerschenkron argued that while Germany's more advanced economic development

of the mid-nineteenth century supported the emergence of large, private industrial firms financed by banks, Russia's more agrarian economy and limited industrial base required government programs to promote industrial development.

For decades, the notion persisted that "backward" economies failed to develop strong capital markets, and that they instead depended on large-scale, universal banks to funnel capital to industrial firms. On the other side of the banks v. market dichotomy, highly-developed economies presumably marshalled prodigious resources via financial markets and generally relied less on banks to finance long-term investment. In the years of the post-WWII Wirtschaftswunder and the largely high-growth era prior to German reunification, the German banks did hold a significant measure of control of the German corporate economy. The idea met with little question that the banks had controlled industry, and had caused the high growth rates for most of the prior century. Moreover, since German and Russian financial markets trailed those in New York and London during those post-WWII years, the hypothesis that the large universal banks (in Germany) and government (in Russia) dominated and impeded arms-length financial markets seemed plausible.

More recent work among financial economists, such as Allen et al (2018), offer a new version of the basic Gerschenkronian idea, arguing that "the structure of an economy exerts an influence on the direction of the evolution of the financial system." This line of reasoning pushes the banks versus markets dichotomy, suggesting that countries with "asset-intensive" industries develop bank-heavy financial systems, whereas countries with dominant service sectors tend to create market-based systems. According to this line of reasoning, economies

that evolve from manufacturing to service industries should experience a parallel evolution of their financial system from banks toward markets.

Song and Thakor (2013) theorize otherwise, studying the role of political intervention in financial systems and accounting for the complementarities between and generating coevolution of banks and markets. The key link is securitization, and the creation of risky bank capital, whereby banks connect investors to markets, and therefore market development promotes and shapes bank development and vice versa. Furthermore, Song and Thakor argue, governments intervene most during the early and later stages of development, using capital subsidies and state ownership in the former case and regulation in the latter. At the same time, they suggest that political intervention increases financial system risk without enhancing its development.

This theoretical analysis echoes historical findings. Fohlin (2007, 2012) repeatedly emphasizes the ideas of complementarities among and complexities of financial institutions and markets in Germany and more broadly in numerous countries that industrialized in the 19th and early 20th centuries. Moreover, Verdier (2001) studies the relationship between political and financial development and suggests that the extent of state centralization influences the extent to which financial systems develop large, universal banks.

3. Comparative financial systems and economic development: Germany v. Russia

Germany led most of continental Europe in economic and financial development, already building substantial capital base in the first half of the nineteenth century and establishing

relatively large-scale universal banking in the early 1850s. Prussia and other German states developed legal and political institutions relatively early that could foster economic development. With the liberalization of incorporation law in Prussia and then the German Reich in the 1860s and early 1870s, Germany's corporate economy boomed, and stock markets grew rapidly to facilitate corporation finance via both bonds and equities marketed to outside investors. By World War I, Germany ranked among the most technologically and financially advanced economies in the world, with a sophisticated and highly-successful corporate finance system.

By contrast, the Russian economy began industrializing rapidly at the turn of the twentieth century but still lagged far behind Germany. Russian per capita income in 1912 was less than a third of that in Germany in 1905 (Gregory 1974). The Russian financial sector was small, only representing 26.9 percent of national assets in 1913, compared to 39.5 percent in Germany, 39.3 percent in France, or 42.9 percent in the United States. In that year Russian bank activity comprised 22.3 percent of national income, compared to 31.1 percent in Germany (Goldsmith 1985).²

The industrial entities that became corporations in Germany were fundamentally different from those that incorporated in the Russian Empire because of divergent levels of regulation over incorporation. Table 1 provides a summary of the most important legislative

² In Alexander Gerschenkron's view, Germany's "great banks" provided the key force in mobilizing the prodigious capital necessary for the country's industrialization. In particular, he argued that these universal banks took direct ownership and control of corporate capital--including on the boards of directors of the industrial firms they financed--and provided crucial monitoring and advising services that insured the most efficient use of that capital. Gerschenkron argued that Russia, however, was too backward and possessed too small a banking sector to be financed this way, so the Imperial Russian government substituted for lack of domestic demand and took a more active role in the economy.

changes introduced in Russia and Germany, and many key differences are apparent. Most crucially, the Russian Empire never introduced general incorporation, in stark contrast to more successful industrializers, such as Germany, France, the United Kingdom, and the United States. Firms in the Russian Empire wishing to incorporate submitted charters to the Ministry of Finance and agreed to any changes requested, which represented an important source of inefficiency in the Russian economy (Gregg 2020). In Russia, all companies wishing to incorporate needed to apply to the Ministry of Finance for a special Imperial concession, the final step of which required them to obtain the Tsar's or Minister of Finance's personal signature. In Germany, unification into the second empire (*Kaiserreich*) brought about nationwide liberalization of incorporation with the passage of the 1870 company law, similar to the Prussian company law already in effect in the 1860s. While Germany revised its corporate law and regulation multiple times before World War I, Russian corporate law remained essentially unchanged after an 1836 law outlining the details of the concession system.

The Russian concession system of incorporation permitted significant variation across corporate charters. Over time, however, corporations tended to adopt two broad patterns of corporate organization and called themselves either "A-Corporations" (*Aktsionernye obshchestva*) or "Share partnerships" (*Tovarishchestva na paiakh*), probably to signal these differences to potential shareholders. Russian A-Corporations tended to be larger firms that issued smaller-denomination shares to wider circles of investors, while share partnerships tended to be existing firms that incorporated and wanted to maintain control of their enterprises. Thus, share partnerships tended to be smaller overall and to issue shares of larger denominations to smaller groups of investors. Critically, however, both types of Russian

corporations still faced the same concession process, provided all investors with limited liability, could sell shares on stock markets (though share partnerships were less likely to do so), and were subject to the same rules in the commercial code.

Russian A-corporations were most similar to German Aktiengesellschaften (AGs). During this period, Aktiengesellschaften could be publicly traded or remain closely held, as long as they met the required minimum number of shareholders. Most smaller firms used private partnerships or, after its introduction in 1892, the limited liability partnership (*Gesellschaft mit beschränkter Haftung*, GmbH). AGs wishing to trade on a German stock exchange had to meet preliminary requirements, most crucially that the firm's share capital be fully paid up. Even for companies not seeking public market trading, the 1870 company law required the full amount of an issue to be subscribed and at least 25 percent to be paid up before a new joint-stock company could be founded. The payment rose to 50 percent for shares issued at higher than nominal value. The 1870 law also required greater uniformity and consistency in corporate accounting, reporting, and governance, compared to earlier standards (Hopt 1998). In particular, the law stipulated the creation of the dual board structure, in part as a means of protecting shareholders and the public interest, independent of the management of the company.

In 1884, Germany added new regulations on corporate governance: prohibiting members of the executive board (Vorstand) from simultaneously holding positions on the same company's supervisory board (Aufsichtsrat) and explicitly requiring supervisory board members to obtain information about the company. At the same time, the 1884 law released supervisory board members from the obligation to own equity stakes; opening the door to proxy voting by

banks and other shareholder representatives. A similar law in Russia, the 1901 corporation reform, removed bankers from corporate boards (a provision with many loopholes) and improved and formalized many important shareholder rights, such as the need for regular and well-publicized shareholder meetings. Gregg (2017) argues that this new reform changed the structure of corporate charters for corporations founded after the law was enacted.

Due to the very different requirements for incorporation in Germany and Russia, many more corporations were formed in Germany, and these companies tended to be less selected than Russian Corporations. In 1910, for example, there were 403 corporations per million people, and the market value of domestic securities represented 44% of German GDP. In Russia, by contrast, there were only 10 corporations per million inhabitants. However, in Russia the total market value of equity represented 18% of GDP, which while a smaller percentage than Germany's, is quite high considering the much smaller number of corporations per million people in Russia.³ These comparative statistics point to the fact that Russian stock corporations tended to be very large enterprises, more so than German AGs.

While the corporate populations differed between the two countries, both Germany and Russia developed a set of active stock markets. By the early twentieth century, exchanges operated in most large cities: St. Petersburg, Moscow, Kiev, and Odessa in Russia and Berlin, Dresden, Hamburg, Frankfurt, and at least a dozen others in Germany. The St. Petersburg exchange was Russia's most active and has been the best studied. Throughout most of its history, the St. Petersburg stock exchange operated without much government intervention,

³ Statistics on corporations per million inhabitants is from Hannah (2015). Rajan and Zingales (2003) provides stock market capitalization over GDP.

though the Ministry of Finance began to take a more active role in its operation in the twentieth century (Lizunov 2015). By the turn of the twentieth century, about two hundred corporations were listed on the St. Petersburg Stock Exchange (Goetzmann and Huang 2018). At the same time, with its significant lead in publicly-traded corporations, Germany naturally surpassed Russia in stock market activity, such that Germany's largest stock exchange, in Berlin, dealt in at least a thousand corporate stocks.

German corporations accessed a wide range of debt, from overdrafts, to longer-term loans, to bonds. The larger corporations typically used all three sources, though debt structure varied considerably in cross section. Russian corporations, meanwhile, faced a more limited financial menu. Very few corporations used bonds, for example, and the banking sector was mainly focused on providing short-term and medium-term credit in forms such as bills of exchange (Crisp 1976). The Russian banking sector, however, was quite well integrated and supported industrial enterprises much more than Gerschenkron had argued (Salomatina 2004).

Though available sources do not permit direct comparisons of the costs of credit or capital for Russian and German corporations, data on historical discount rates in both countries suggest Russian corporations borrowed more expensively than their German counterparts. The market discount rate in St. Petersburg in 1897 was approximately 5.24 percent, while that in Berlin was 3.09 percent.⁴ Thus Russian corporations faced both less-developed stock markets and higher costs of credit.

4. Hypotheses and Methodology

⁴ Homer and Sylla, *History of Interest Rates*, p. 605 and 262, respectively.

One of the key issues in financial history is the availability of capital to firms. During the late 19th and early 20th century industrialization period, the leading sectors tended to engage in heavy industry: mining, smelting, large-scale metal working and heavy machinery, for example. The advent of electrification and internal-combustion engines expanded the scale of industry, requiring massive amounts of capital in order to operate efficiently. The use of limited liability, joint-stock corporations facilitated capital mobilization as it tended to open up ownership to a broader range of investors--both corporate and individual.

Russia's relatively fixed system of corporate law provides an interesting base for comparison with Germany's more liberalized system with increasing corporate governance protections toward the end of the 19th century. These differences in the legal environment for corporation finance lead, in theory, to significant differences in the use of the joint-stock corporate form, reliance on market-based versus bank financing, and potentially in the cost of capital and firm investment. Specifically, we hypothesize that regulatory constraints in Russia led to that country creating fewer large-scale industrial firms, especially using joint-stock incorporations. Further, because of the constraints on incorporation, we would expect to see fewer and less active stock markets. The lack of joint-stock corporations and fewer stock markets would constrain firms' sources of capital, leading to less access to outside equity shares and potentially also to securitized bond finance. Thus, even among joint-stock corporations, we would expect to see less equity and potentially more bank lending in the capital structure.⁵

⁵ In our future work, we hope to examine corporate banks in both countries to understand whether some of the same factors that induce differences in the corporate sector also impacted how banks operated.

With these institutional differences in mind, we start by comparing the industrial (corporate) sectors and their patterns of financing. We compare the distribution of corporations by sector to get a sense of the industries in which incorporation was most valuable. We then consider corporate capital structure between our two cases and across industries, for example the relative importance of debt vs. equity in corporations' financial strategies. Finally, we consider some important differences between corporations that listed on stock markets vs. those that did not, to further understand how corporations' differences in performance may have interacted with the decision to list.

5. Data on Russian and German Corporations and Empirical Strategies

For Germany we analyze a panel of more than 300 joint-stock corporations (*Aktiengesellschaften*) from 1895-1912, with very detailed information on location, year, industry, bank interlocks, financial statements (balance sheets and income statements), and stock exchange listings and share prices. The panel represents a sample of corporations in existence in 1904, matched backwards and forwards in time to create the panel structure.

The Russian data are less detailed than the German corporation data but represent a larger number of corporations and still permit key comparisons. The core of the Russian data consists of balance sheets (share capital, assets, liabilities), income statements, and dividends for every corporation (roughly 1,000) in the Russian Empire from 1899 to 1914, collected from data printed in the Ministry of Finance Yearbooks. The dataset is matched to the RUSCORP Database (Owen 1992), which provides additional information collected from corporate charters, including

some governance provisions, a proxy for whether the company is widely-held, and information on any restrictions on raising capital.

The Russian data is also matched to the St. Petersburg Stock Exchange Project database, which provides monthly securities prices for all corporations listed on the St. Petersburg Stock Exchange. For the Russian data, corporations are said to be “listed” in years where a price for their securities can be located in the St. Petersburg Stock Exchange data. This contrasts with the German data, which provide separate information on stocks that are listed vs. traded. However, most German securities that are listed in a year are also traded, so the measures are approximately equal. This method of measuring listing rates slightly underestimates Russian listing.

We combine these datasets and harmonize their information by identifying corresponding variables between the Russian and German balance sheets and by creating new industrial categories that best span key differences across corporations in both countries.⁶ Because many of the variables are an imperfect match, in our analyses we present versions of our results with all corporations combined but also consider analyses that treat each country separately.

In these analyses that follow, we consider the industrial breakdowns and financing patterns of German and Russian corporations. We begin by considering simple tabulations, descriptive statistics, and comparisons of mean to get a sense of the broad differences and similarities between German and Russian corporations. Since these crude comparisons can be due to many underlying differences between corporations in these two very different countries,

⁶ Appendix Table A1 presents these variable definitions and industry breakdowns.

we proceed by conducting multivariate analyses of corporate debt-equity ratios and capitalization ratios. Following much of the literature, particularly the example of historical balance sheets presented by De Loof and Van Overfelt (2008) and Fohlin (2007), we analyze leverage ratios using random effects regressions, which allow us to consider these corporations' fixed characteristics.

6. Results

Key Differences Between Russian and Germany Corporations: Sectoral Distributions and Descriptive Statistics

We begin our analysis by considering how Russian and German corporations were distributed across industrial sectors. Such a breakdown reveals an equilibrium outcome connecting the demand for incorporation and the overall industrial composition of each country.

Table 2 reveals the scale of each panel dataset while displaying the sector distribution of corporations in each context. In both places, capital-intensive industries like metals, mining, chemicals, and transportation were well-represented in the corporate sector. German and Russian corporations, however, do show important differences with respect to representation across industries. For example, corporations were well-represented in the Russian textiles industry, especially in cotton, but only accounted for a total of 4.66 percent of the German sample. Remarkably, alcohol production (particularly breweries) constituted approximately 15 percent of German joint-stock corporation observations. In Russia, alcohol production

(especially vodka production) accounted for about 6 percent of corporate observations, which while a smaller percentage than that in Germany still represented a substantial share of corporations.

Russian and German corporations differed along several dimensions, including size, age, listing rates, and capital structure. Because Russian corporations faced much stronger entry barriers than German corporations, the average Russian corporation was larger than the average German corporation, whether size is measured as total share capital or income (converted to rubles).⁷ German corporations, however, tended to be older, and were more likely to be listed.⁸ Interestingly, profit rates (return on assets) for companies in both countries are relatively similar at about five percent. The second page of Table 4 presents descriptive statistics for listed Russian and German corporations, which adds another layer of selection. For both countries, listed companies were older and larger, though Russian listed corporations seem even more selected than German listed corporations. Still, however, for this subset, profits rates are about the same, at between six and seven percent, with German corporations achieving just slightly higher profit rates. The next sections investigate the divergent capital structures corporations in each country use to achieve these similar profit rates, given the other dimensions upon which the corporations differ.

Capital structure: Leverage

⁷ Currencies are converted using Denzel (2010).

⁸ Recall that the numbers reported in Table 3 underestimate Russian listing rates, since they represent years in which a corporation's price appears in the St. Petersburg Stock Exchange data. The proportion of Russian corporations that ever trade a security, though, is only 7.85 percent, which is far below the German number.

The comparison presented in Table 4 shows that corporate firms in the two countries used relatively little debt finance, compared to modern firms. As we hypothesized, given the more advanced development of the Germany securities markets in the pre-WWI era, German corporations accessed a larger share of their financial needs from the capital market, compared to Russian firms. Russian debt-equity ratios are much higher than German debt-equity ratios, and German firms are more capitalized, where capitalization is measured as the book value of share capital and reserves divided by the book value of total assets. The difference does not just hold because Russian corporations include a close-held type: the third group presented on the table, Russian A-corporations, also have very high debt-equity ratios. However, the overall means and medians presented in Table 4 likely hide important sources of heterogeneity between the Russian and German corporations, including their different industrial composition and corporate ages. Given the many differences between Russian and German corporations, our analysis continues with multivariate regressions in Table 5.

Table 5 considers a wider set of correlates of German and Russian firm leverage, as measured by the log of debt divided by equity.⁹ The first regression, reported in Column 1, replicates our finding from Table 4: Russian corporations have much higher debt-equity ratios than German corporations. Moreover, though that difference is indeed reduced when industry controls are introduced in the second column, the difference has not disappeared.

⁹ Appendix Table A1 provides additional information on how we harmonized the Russian and German variables for these regressions.

We proceed by exploring a wider range of characteristics that might differ between the German and Russian corporations, including how they perform, how large they are, whether they access stock markets, and the year in which we observe their balance sheets. Column 3 begins by introducing controls for fixed assets over total assets, the return on assets, corporate age, and whether the corporation is listed on the Berlin or St. Petersburg Stock Exchange. Broadly, for corporations in both countries return on assets (profit divided by total assets) is strongly negatively related to leverage, suggesting that plowing back profits represented an important financing strategy. There is no systematic relationship with size or age, reflecting the often-muddy predictions one can make about the impact of these variables. Finally, stock markets appear quite important: German and Russian firms that listed on relevant stock exchanges had lower leverage. Most likely, firms that could list on exchanges were able to more easily obtain equity financing. However, given the correlational nature of our analysis here, we cannot rule out that listed firms were simply selected on dimensions correlated with having lower leverage, for example profitability.

Column 4 of Table 5 represent additional efforts to establish harmony between the German and Russian datasets. Column 4 tries to correct for differences in the timing and survival rates of corporations in the two datasets by introducing year controls and a year trend and by establishing a balanced panel, removing any corporation that does not appear for at least the ten years of 1899 to 1909 (inclusive). Now, the Russia dummy has greatly diminished in size and has lost statistical significance. Therefore, much of the difference between these two countries' corporations was due to differences in timing and differences in those corporations that did not

survive for this entire time window. Note, however, that this sample of long-lived corporation is itself a rather selected group.

Column 5 includes additional control for firm size, as measured by log income. Log income is measured in currency units, which we convert to rubles using Denzel (2010). Though including such a control may be fraught with difficulties given fine fluctuations in exchange rates between Russian and Germany, both countries' adherence to the Gold Standard in this period somewhat restores our confidence that including this control for corporation size is reasonable. We find that including these size controls, and an interaction of log income with the Russia dummy, has an important impact on the results. Russian corporations were larger than German corporations, and once these key variables are included, the difference between Russian and German corporate leverage becomes very large, even in a balanced sample. Additionally, Column 5 investigates whether the very different use of fixed assets on Russian balance sheets, explained below, could also restore the difference between Russian and German corporations in the balanced sample, but it does not.

There remains an additional fundamental difference between the German and Russian datasets: the German data represents a random sample, while the Russian dataset consists of all corporations for which the Ministry of Finance printed data. Column 6 checks this difference in sample structure generates any of the differences we see. Here, the Russian data are sampled in a similar manner to the German: a random sample of 300 Russian corporations in 1904 is matched backwards and forwards in time. Column 6 shows that this alteration makes very little difference in the results, though given the new balance between the German and Russian

observations, the relationship between tangible assets and log debt is positive, as one would usually predict.

The final columns of Table 5 present split-sample regressions German and subsequently for Russian corporations. These clearly demonstrate one important difference between the financing of Russian and German corporations: While German corporations show the usual relationship between fixed assets and leverage, Russian corporations with more fixed assets (as measured by their property column) have less leverage. This could reflect the fact that, while German firms could use debt to finance the purchase of fixed assets, Russian firms could not rely on debt to finance property.

Capitalization Ratios

A further set of results, presented in Table 6, considers the correlates of German and Russian corporations' capitalization ratios, which in essence are the mirror image of leverage. Similarly to the results displayed in Table 5, we find that Russian corporations have smaller capitalization ratios, even controlling for industry, year, age, and return on assets. Corporations' capitalization ratios are positively correlated with return on assets in both countries, but only for corporations in Russia is the relationship statistically significant at the ten percent level.

In future work, we plan to consider the determinants of corporations' changes in capital over time, though in both countries, share capital seemed to change quite slowly. This is especially true of corporations in the Russian Empire, who needed to formally revise their charters in order to change the company's total amount of share capital.

ROA, Dividends, and Listing

In this paper, we focus on financial differences between German and Russian firms, rather than differences in performance. However, the profits firms may plow back into their ventures, or their ability to offer generous dividends to potential shareholders, could influence their financial outcomes. As we have already documented, whether firms listed on stock exchanges can be strongly related to the degree to which a corporation relies on debt vs. equity. We examine these dimensions briefly in Table 7.

We first consider how return on assets, dividends as a proportion of profits, and the dividend adjusted stock return differ between German firms listed or not on the Berlin stock exchange. Firms listed on the Berlin stock exchange are different on many dimensions: they have higher ROA and higher dividends compared to unlisted corporations or those listed elsewhere, and higher dividend-adjusted stock returns compared to corporations listed elsewhere. We find similar patterns for Russian corporations listing on the St. Petersburg Stock Exchange (though, of course, we have no dividend-adjusted stock return for unlisted companies in the Russian case, since we only know whether corporations were listed in St. Petersburg). In both countries, listed corporations were quite different from unlisted corporations, likely due to both positive selection and the financial advantages enjoyed by corporations listing on stock exchanges.

As a final analysis, we perform a similar comparison of Russian A-corporations vs. share partnerships, the secondary literature often asserts that A-corporations were much more likely to list on stock exchanges like St. Petersburg's. Similar patterns hold, except for return on assets:

Russian A-corporations actually enjoyed smaller returns on assets, which may have reflected additional governance costs associated with this more widely-held corporation type. A-corporations compensated their investors for these added costs, though, in their higher dividends and stock returns.

7. Concluding Remarks

Our fine-grained analysis of two of the key cases in the Gerschenkron 'backwardness' paradigm contributes to the long-standing debate in both economic history and contemporary development economics over the role of political and legal institutions in financial development and economic growth. The novel, in-depth comparative analysis of Russian and German firm-level financial statements confirms our hypotheses regarding the relative availability of equity finance. In the process, we highlight the role of corporate law and regulation in promoting information transparency, safeguarding investors, and promoting market-based industrial finance. These details supersede legal origin or stage of development in explaining success or failure in promoting industrial development. These key country cases from financial history may provide important implications for understanding corporate and capital market regulation and performance today.

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Tables

Table 1: Institutional Framework Facing German and Russian Corporations

	Germany	Russia
Enterprise Forms / Company Law	1870 Company Law (Requirements if company wants to issue shares) 1892: GmbH created	1836: Formalization of the Concession System
Taxes	1885: Institution of percentage tax on stock transfers	1885: proportional tax on net profits as reported in public accounts 1898: 0.15% tax on nominal share capital and a progressive taxation scheme based on net profits as a proportion of share capital: 1906: increased the tax on share capital to 0.2%, raised baseline profit tax rates, and added an additional tax on "excess" profits.
Shareholder Protections	1884 Law: New regulations on corporate governance; provisions creating possibilities for proxy voting	1901 Law: Increases rights of small shareholders, removes bankers from boards of directors (many loopholes)
Stock Exchange Law	1896: Stock exchange law: prohibition on futures trading, waiting period. Formalization of unified price system, tighter requirements, and broader liability on new issues 1908: New stock exchange law; reinstating futures trading	1836 corporation law banned futures trading. 1893: futures trading restored, but other restrictions on trading implemented 1900: order creating a "securities department" at the St. Petersburg Exchange, overseen by the Ministry of Finance (further rules in 1902 and 1909)

Sources: Fohlin (2002) for German taxes, shareholder protections, and stock exchange law; Guinnane et. al (2007) for German company law; Owen (2002) for Russian concession system; Bowman (1993) for Russian corporate income tax; Owen (2002) and Gregg (2017) for 1901 law on shareholder protections; and Lizunov (2015) for Russian stock exchange laws.

Table 2: Distribution of Russian and German Corporation-Year Observations by Industry

Industry	Germany		Russia		Both	
	No.	Col. %	No.	Col. %	No.	Col.%
Agriculture (including hunting and fishing)	10	0.2	104	0.54	114	0.47
Alcohol Production	815	16.51	695	3.59	1,510	6.22
Animal Products (Leather,etc)	18	0.36	284	1.47	302	1.24
Ceramics and Porcelain	286	5.79	477	2.47	763	3.14
Chemicals	303	6.14	768	3.97	1,071	4.41
Construction	0	0	573	2.96	573	2.36
Cotton	100	2.03	1,625	8.4	1,725	7.1
Entertainment	152	3.08	117	0.6	269	1.11
Foods Processing (Sugar, flour mills, etc.)	453	9.18	2,946	15.23	3,399	14
Infrastructure	0	0	685	3.54	685	2.82
Metals, Machinery, Shipbuilding	879	17.81	2,923	15.11	3,802	15.66
Mining and Fuel Production	806	16.33	1,992	10.3	2,798	11.52
Misc	39	0.79	901	4.66	940	3.87
Paper and Printing	382	7.74	713	3.69	1,095	4.51
Textiles, Except Cotton	108	2.19	2,202	11.38	2,310	9.51
Transportation	442	8.95	1,201	6.21	1,643	6.77
Warehousing, Trade, and Wholesale	24	0.49	622	3.22	646	2.66
Wood	119	2.41	517	2.67	636	2.62
Total	4,936	100	19,345	100	24,281	100

Notes: Source for Germany is Fohlin's (2007) panel of German corporations. Source for Russia is Russia, Ministry of Finance Yearbooks (1900-1915). Industries in the Omitted category (see Appendix Table A2 are not included).

Table 3: Descriptive Statistics for German and Russian Corporations (Non-Zero Values Only)

	N	Mean	Standard Dev.	Median	Minimum	Maximum
All Corporations						
Debt-Equity Ratio	18,135	0.8680	2.1248	0.5475	0.0000	206.7053
Capitalization Ratio	24,444	0.5818	2.2668	0.5323	0.0019	342.0428
Fixed over Total Assets	24,215	0.5135	0.2425	0.5145	0.0000	1.0000
Return on Assets	13,866	0.0501	0.1278	0.0416	-0.9556	9.6047
Income in Rubles	13,936	1,183,007.0	3,511,743.0	359,264.9	-458.7	112,000,000.0
Share Capital in Rubles	20,717	1,664,975.0	2,610,421.0	800,000.0	1,123.0	74,800,000.0
Age	14,568	13.68	12.26	10.00	-1.00	86.00
Listed (Berlin or St. Petersburg)	24,639	0.05	0.23	0.00	0.00	1.00
Germany						
Debt-Equity Ratio	4,515	0.6293	0.6999	0.4503	0.0001	10.8154
Capitalization Ratio	4,747	0.6976	0.1967	0.7006	0.0846	1.9950
Fixed over Total Assets	4,671	0.6043	0.2195	0.6125	0.0004	1.0000
Return on Assets	4,554	0.0505	0.2135	0.0438	-0.9556	9.6047
Income in Rubles	4,041	420,892.2	1,063,196	160,863.3	-458.7	28,300,000
Share Capital in Rubles	1,014	1,191,626	2,232,640	503,800	19436	22,600,000
Age	4,933	15.82	12.50	13.00	-1.00	86.00
Listed (Berlin)	4,936	0.16	0.36	0.00	0.00	1.00
Russia						
Debt-Equity Ratio	13,620	0.9472	2.4133	0.5939	0.0000	206.7053
Capitalization Ratio	19,697	0.5539	2.5226	0.4947	0.0019	342.0428
Fixed over Total Assets	19,544	0.4918	0.2427	0.4904	0.0000	1.0000
Return on Assets	9,312	0.0500	0.0449	0.0407	0.0000	0.8652
Income in Rubles	9,895	1,494,245	4,071,064	500,198	5.00	112,000,000
Share Capital in Rubles	19,703	1,689,335	2,626,136	800,000	1,123	74,800,000
Age	9,635	12.58	11.98	8.00	1.00	83.00
Listed (St. Petersburg)	19,703	0.03	0.17	0.00	0.00	1.00

Germany, Listed

Debt-Equity Ratio	739	0.4508	0.3977	0.3770	0.0001	3.3176
Capitalization Ratio	761	0.7407	0.1738	0.7368	0.2316	1.9950
Fixed over Total Assets	733	0.5193	0.2238	0.5301	0.0004	0.9728
Return on Assets	740	0.0674	0.0549	0.0630	-0.4391	0.4721
Income in Rubles	648	1,256,595.0	2,299,766.0	584,340.4	7,263.5	28,300,000.0
Share Capital in Rubles	223	3,539,881.0	3,824,527.0	2,712,000.0	277,800.0	22,600,000.0
Age	769	20.21	11.98	19.00	-1.00	55.00

Russia, Listed

Debt-Equity Ratio	450	0.9433	2.9479	0.4172	0.0013	33.8554
Capitalization Ratio	593	0.5685	0.8234	0.5372	0.0272	19.8970
Fixed over Total Assets	591	0.5504	0.2169	0.5649	0.0016	0.9782
Return on Assets	366	0.0629	0.0503	0.0502	0.0002	0.4563
Income in Rubles	367	5,292,440.0	14,200,000.0	1,085,457.0	708.0	112,000,000.0
Share Capital in Rubles	593	3,952,397.0	4,638,445.0	2,000,000.0	120,000.0	41,200,000.0
Age	323	17.46	15.47	11.00	1.00	73.00

Notes: Marks are converted to Rubles using Denzel (2010).

Table 4: Mean and Median Debt-Equity Ratios and Capitalization for Germany and Russia

	Germany		Russia		Russia (A-Corps Only)	
	Mean	Median	Mean	Median	Mean	Median
Debt-equity ratio	0.5985	0.4272	0.9339	0.5816	0.7385	0.4541
Capitalization ((book value of share capital + reserves)/ total assets)	0.6972	0.7005	0.5539	0.4947	0.5667	0.5341

Notes: Source for Germany is Fohlin's panel of German corporations. Source for Russia is Russia, Ministry of Finance Yearbooks (1900-1915).

Table 5: Correlates of Firm Leverage: Germany and Russia (Random Effects Regressions)

Sample:	Dep Variable: Log (Debt / Equity)							
	All (1)	All (2)	All (3)	Balanced (4)	Balanced (5)	Samples (6)	Germany (7)	Russia (8)
Country = Russia	0.215*** (0.0778)	0.163** (0.0812)	0.199** (0.0844)	0.0382 (0.333)	6.273*** (1.971)	0.406*** (0.122)		
Fixed Assets / Total Assets			-0.0596 (0.160)	-0.729** (0.284)	2.068 (1.261)	0.619** (0.277)	1.251*** (0.324)	-0.778*** (0.139)
Return on Assets			-2.568*** (0.304)	-2.601*** (0.613)	-3.763*** (0.739)	-2.811*** (0.415)	-3.822*** (0.571)	-3.015*** (0.459)
Corporation Age			0.0249*** (0.00283)	-0.00224 (0.00346)	-0.00237 (0.00345)	0.0277*** (0.00441)	-0.0173*** (0.00472)	0.00480 (0.00330)
Listed on Berlin / St. Pete Stock Ex.			-0.184* (0.104)	-0.225 (0.139)	-0.242* (0.143)	-0.232 (0.159)	-0.303* (0.177)	-0.150 (0.0930)
Log (Income)					0.495*** (0.132)		0.225*** (0.0384)	0.128*** (0.0159)
Log (Income) * Russia					-0.403*** (0.133)			
Russia * Fixed / TA					-3.088** (1.284)			
Constant	-1.118*** (0.0717)	-0.763*** (0.207)	-1.353*** (0.331)			-2.466*** (0.611)	-6.036*** (0.354)	
Observations	18,135	17,880	13,705	4,248	4,007	6,335	3,851	8,595
R-squared	0.00601	0.0784	0.0880	0.211	0.256	0.0571	0.196	0.211
Number of firmid	2,385	2,369	2,012	537	537	605	310	1,656
Industry Controls	NO	YES	YES	YES	YES	YES	YES	YES
Year Controls	NO	NO	NO	YES	YES	NO	YES	YES
Year Trend	NO	NO	NO	YES	YES	NO	NO	NO

Notes: *** p<0.01, ** p<0.05, * p<0.1. Leverage is the ratio of book values of debt to equity. Standard errors clustered by firm id in parentheses. Age of firm is number of years since registration as a joint-stock company. The Russian natural log of income is the natural log of revenue. Income for both countries' corporations is converted to rubles using Denzel (2010). "Balanced" denotes that the sample included is a balanced panel, where we have removed any corporation that does not appear for at least the ten years of 1899 to 1909 (inclusive). "Samples" denotes that, for both countries, we have randomly sampled Russian corporations from 1904 and then matched them backwards and forwards in time, to bring the Russian data to parity with the German data.

Table 6: Correlates of Capitalization, Russia and Germany

Model: OLS						
Dep. Variable:						
Sample	Log Capitalization Ratio					
	All (1)	All (2)	All (3)	Samples (6)	Germany (4)	Russia (5)
Russia	-0.336*** (0.0182)	-0.309*** (0.0195)	-0.292*** (0.0221)	-0.353*** (0.0362)		
ROA			0.211 (0.146)	0.198 (0.147)	0.184 (0.137)	0.366* (0.211)
Age			-0.00393*** (0.000917)	-3.74e-05 (0.00124)	0.00456*** (0.00129)	-0.00786*** (0.00114)
Constant	-0.407*** (0.0158)	-0.258*** (0.0802)	-0.130 (0.0823)	-0.0591 (0.0535)	0.00911 (0.0257)	0.219** (0.0894)
Observations	24,444	24,086	14,049	6,575	4,655	9,394
R-squared	0.077	0.151	0.195	0.220	0.157	0.145
Industry Controls	NO	YES	YES	YES	YES	YES
Year Controls	NO	NO	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by corporation in parentheses.

Table 7: ROA and Dividends in Russia and Germany

Panel A: German ROA and Dividends by Berlin Listing

		ROA			Dividend / Profit Ratio			Dividend-adjusted stock return		
		<i>Obs</i>	<i>Mean</i>	<i>Std Dev</i>	<i>Obs</i>	<i>Mean</i>	<i>Std Dev</i>	<i>Obs</i>	<i>Mean</i>	<i>Std Dev</i>
Berlin	0	3,913	0.046	0.239	748	0.60	2.48	533	0.12	0.41
	1	748	0.067	0.055	210	0.67	0.021	472	0.14	0.44
Total		4,661	0.049	0.003	958	0.61	2.20	1,005	0.13	0.43

Panel B: Russian ROA and Dividends by St. Petersburg Listing and Corporation Type

		ROA			Dividend / Profit Ratio			Dividend-adjusted stock return		
		<i>Obs</i>	<i>Mean</i>	<i>Std Dev</i>	<i>Obs</i>	<i>Mean</i>	<i>Std Dev</i>	<i>Obs</i>	<i>Mean</i>	<i>Std Dev</i>
St. Pete	0	11,582	0.038	0.044	8,947	0.83	14.41			
	1	411	0.056	0.051	366	0.83	4.90		n/a	
Total		11,993	0.039	0.045	9,313	0.83	14.16			
A-Corp	0	4,983	0.043	0.042	4,267	0.84	15.38	43	0.38	0.55
	1	4,789	0.038	0.046	3,608	0.94	15.10	169	1.09	7.20
Total		9,772	0.041	0.044	7,875	0.89	15.25	212	0.95	6.44

Notes: "Berlin" equals one if the firm lists on the Berlin Stock Exchange. "St. Pete" equals one if the firm lists on the St. Petersburg Stock Exchange. A-Corp equals one if the corporation is an A-Corporation, i.e. if the firm uses the word "Aktsiia" instead of "Pai" to denote "Share."

Appendix

Table A2: Precise Variable Definitions and Industry Categories to Harmonize German and Russian Data

Panel A: Definitions of Key Variables

Variable	German Definition	Russian Definition
Par Value of Share Capital	Total Current Share Capital at Par	Total Share Capital
Par Share Capital at Founding	Par Value of Initial Share Capital at Incorporation	Share Capital from charter
Outside Capital	Outside Capital	Creditors (debt on the balance sheet) plus Bonds (very rare)
Debt / Equity Ratio	Outside Capital / Inside Capital	(Creditors + Bonds) / (Share Capital + Reserves)
Fixed Assets	Fixed Capital	Property
Income	Total Income	Revenue
Capitalization Ratio	Inside Capital / Total Liabilities	Inside Capital / Total Assets
Dividend Profit Ratio		Dividend Amount / "Clean" Profits
Profit	Revenues minus Costs	"Clean" (i.e., net) Profits
Return on Assets (ROA)	Profit / Total Assets	Profit / Total Assets

Panel B: Industrial Categories

Industrial Category	German Component Industries	Russian Component Industries
Agriculture (including hunting and fishing)	Fisheries	Farming Fishing and Hunting
Alcohol Production	Breweries Spirits	Bear and Mead Wine Spirits Wine and Spirits
Animal Products (Leather, etc)	Leather working	Animal Products Fur Tannery Other (Animal Products)
Ceramics and Porcelain	Ceramic Ceramics Clay Porcelain	Porcelain Pottery Glass

	Glass Other Products (code group too)	
Chemicals	Chemicals Fertilizer (both) (Gun)Powder Dyes Rubber Potash	Charcoal Chemical Chemical Plants Laboratories Salts and Acids Soda Paints and Varnishes Oils and Ointments Gunpowder and Explosives Chemical Products Rubber Matches Mixed Production (Chemicals) Mixed (Chemicals)
Construction	(None)	Construction Materials Housebuilding
Cotton	Cotton	Cotton
Entertainment	Baths Theaters Zoos Sports	Bath House Gramophones and Cinemas Hotels
Foods Processing (Sugar, flour mills, etc.)	Chocolate Fats(for food,margarine,etc) Water and ice Sugar Malting Grain milling, bread	Confectionary Creamery Flour Food (check) Sugar Mineral Water Tobacco Other Products (Food)
Infrastructure	(None)	Water Supply Telephones Sanitation Mixed Lighting Lighting-Electric Lighting-Gas

Metals, Machinery, Shipbuilding	Machinery Metal working Ship building Electrical-technical	Machine Building Machines and Tools Mechanical Plants Metal Metal Factories Metal Products Ironworks Steel Rolling Stock Shipbuilding Elevators Jewelry Electrotechnical Plants Other Products (Metals)
Mining and Fuel Production	Mining Coal mining Gas Gas, petroleum Stone works Oil Petroleum Salt Marble Cement	Coal Extraction and Processing of Metal Other Than... Minerals Other Minerals Mining Kerosene Oil Salt Mixed (Foods)
Misc	Various	Miscellaneous
Paper and Printing	Printing Paper	Papermaking Papermaking and Printing Printing Other Products (code group too)
Textiles, Except Cotton	Flax / linseed Hat making Jute Textiles-specialty makers Wool Rope wares	Flax Flax, Hemp, and Jute Textiles Fabrics Hemp Silk Wool Mixed

Transportation	Steam ships Railroad Electric streetcar Street rail	Steamboat-Marine Steamboat-River Steamboats Tramways Transport Transportation Canalization Railroad Carriages Pavement
Warehousing, Trade, and Wholesale	Warehouse	Colonial Trade Commission Houses Retail Space Warehouse Other Products (Wholesale)
Wood	Wood	Sawmill Wood Wood Products Cellulose Other Products (Wood)
Dropped (Omitted) Industries	Musical Instruments Academic corps and student homes Charitable organizations Co-ops n/a Patent utilization licensing or sale of intellectual property) Housing, private and public	Lombards

Table A2: Number of Shares (*Dividendenpapiere*) Listed on Top German Exchanges, Circa 1910

	Domestic securities		Foreign securities	
	Entities	Issues	Entities	Issues
Berlin	914	996	56	62
Dresden	211	223	2	2
Duesseldorf	78	78	-	-
Essen	68	68	-	-
Frankfurt	269	291	45	51
Hamburg	131	143	17	17
Koeln	121	122	8	8
Leipzig	134	151	1	1
Muenchen	95	99	4	4

Sources: Calculated from Wormser (1919, from official *Kursblätter* of the respective exchanges), p. 221, and *Krupkes Konversationslexikon*, 1910-1912, adapted from Fohlin (2007, Table 7.2).