



Financing industrial corporations in a developing economy: panel evidence from Imperial Russia

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This article explores the financing of early industrial corporations using newly constructed panel data from Imperial Russian balance sheets. We document how corporate capital structures and dividend payout policies reflected internal agency issues, information asymmetries with external investors, life cycle considerations, and other frictions present in the Russian context. In particular, we find that widely held, listed and more profitable corporations were less reliant on debt financing. Asset tangibility was associated with lower debt levels, suggesting that Russian corporate debt was short-term, collateral was largely irrelevant, or agency problems dominated. Finally, we find that many of these same issues, for example ownership structure and access to securities markets, also mattered for financial performance and that dividends may have compensated investors for poor legal protections.

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I

Despite a wealth of evidence suggesting that well-developed financial markets improve prospects for economic growth (e.g. Levine 1997), we know relatively little about firm financial strategies in less developed economies, especially in the past. This article investigates corporate finance in such a setting, late Imperial

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Russia, through the analysis of a novel panel database of annual balance sheet information, governance characteristics and stock prices. Russian corporations faced a number of institutional constraints, such as restricted entry into the corporate form, weak investor protections and thin markets for long-term financing. Yet, despite these obstacles, recent evidence suggests that incorporated firms were particularly important drivers of early industrial modernization in the Russian context (Gregg 2020). We, therefore, address the following question: how did firm characteristics and features of the Imperial legal and financial systems impact corporate financial strategies?

Our unique panel data allow us to link corporate fundamentals and institutional features to their capital structures and (dividend) payout policies. In doing so, we focus on how these firm decisions may have reflected internal agency issues, information asymmetries with external investors, life cycle considerations and other frictions present in the Russian context. Our results demonstrate that Imperial corporations adjusted their financial strategies in the face of these forces and did so in the directions consistent with theory and evidence on firms in more advanced economies. We further show how these factors underlying capital structure and dividend policies played a role in financial performance.

As financial development occurred, leading industrial economies also reduced barriers to forming corporations over the late nineteenth and early twentieth centuries. However, Imperial Russia retained a costly system of incorporation, where each application was potentially subject to intense and heterogeneous scrutiny by Ministry of Finance officials, similar in spirit to entry barriers faced by firms in many developing countries today (e.g. Djankov *et al.* 2002). Owen (1991) and others have argued that these constraints on forming corporations significantly impeded late Imperial Russian economic growth, as Russian firms could not fully benefit from the legal form's possible financial advantages to adopt modern capital-intensive production technologies.¹ Indeed, the recent work of Gregg (2020) finds a causal relationship between incorporation and firm growth. However, what is missing from that analysis, and from much of the literature on the corporation, is evidence on how this growth was financed. This motivates our exploration of novel balance sheet information to document and analyze Russian corporate finance in this period.

Costly chartering was one factor that limited the number of corporations in Imperial Russia, relative to countries with more liberal incorporation mechanisms.² The individualized chartering process, moreover, also resulted in substantial firm-specific differences in activities, governance and managerial characteristics, each of which may have influenced subsequent capital structure and payout decisions. How did these organizational elements interact with the specifics of the Imperial

¹ The corporate form is often associated with modern economic growth (e.g. Chandler 1977; Rosenberg and Birdzell 1986).

² In 1910, there were 10 corporations for every million people in Russia. In contrast, the United States had 2,913, France had 306, and Germany had 403 (Hannah 2015, p. 558).

financial system to generate such outcomes? Using a single cross-section from 1914, Gregg and Nafziger (2019) conclude that incorporated firms in Imperial Russia showed considerable adaptability with respect to capital structure (i.e. debt vs. equity) and dividend payout decisions by focusing on variation across three dimensions: governance structure, age and sector.

Taking advantage of our richer balance sheet panel data, merged to stock market information and information on founder characteristics, we first verify that Russian corporations could adjust their capital structures and payout policies according to their needs. Then, this article unpacks financial, agency, signaling and other motivations for using credit and issuing dividends, and we document how these particular dimensions mattered for the financial performance of industrial corporations. Our analysis considers all chartered non-financial corporations in the Russian Empire between 1899 and 1914. We compile the panel of financial data from yearbooks of the Ministry of Finance and match these to the characteristics of corporate founders and basic governance indicators from the RUSCORP database of corporate charter information (Owen 1992), and with the final monthly share prices for listed firms on the St. Petersburg stock exchange (Yale ICF). Relative to our earlier article that examined a single-year cross-section of fewer than 1,500 observations, this much larger panel dataset of almost 20,000 observations over more than 14 years enables more rigorous evaluations of different corporate finance theories in the Russian context, improves statistical inference and offers a sharper picture of the development of the corporate sector during a key period of economic change.³ Thus, these data present a unique opportunity to explore the linkages between corporate structure and financial behavior among early industrial corporations.

Though Imperial Russia had a substantial banking system and active securities exchanges and was well integrated with European capital markets, Russian corporations still faced significant information asymmetries, agency issues, and missing markets. In this context, we show that corporations that were closely held, that were younger, that listed on stock exchanges and that were larger in terms of total assets all tended to rely more on debt financing. Moreover, corporations with more tangible assets tended to have less debt, suggesting that tangible assets did not help Russian corporations access less expensive loans. These findings suggest the kinds of external conditions and internal fundamentals that motivated Russian corporations to choose particular capital structures. In particular, the Russian stock markets functioned to allow those corporations that listed to reduce their leverage, credit institutions helped to finance short-term expenses like inventories but not fixed property, and asymmetric information within the firm impacted capital structure in ways similar to what is emphasized in the modern corporate finance literature (i.e. Harris

³ In contrast to our earlier paper (Gregg and Nafziger 2019), our panel data allow us to evaluate the 'stickiness' of capital structure and payout policies in this context (as emphasized by Graham (2022) for modern corporate financial decision-making).

and Raviv 1991; Graham 2022). Corporate dividend issuance similarly reflected trade-offs emphasized in the broader literature: corporations with higher levels of debt had lower payout ratios, corporations at later stages of the life cycle tended to pay out a greater proportion of profits and more closely held corporations used dividends as a means of returning profits to owners. Furthermore, we show, using a dynamic model of dividend smoothing, that corporations adjusted how they issued dividends in response to changes in earnings.

We conclude by showing that variation in a firm's ownership structure, age and interactions with securities markets mattered for two measures of financial performance: firms' return on assets and market-to-book ratios. Corporations that listed shares on the St. Petersburg stock exchange had higher returns on assets, which reflected positive selection into listing or the need for additional equity in making productivity-enhancing investments. Firms with a more closely held corporate form had higher average returns on assets but smaller market-to-book ratios. Moreover, corporations that issued higher dividends saw greater subsequent returns on their assets, which suggests that dividends embodied a signal about future performance. Furthermore, higher dividends as a share of profits were also associated with a higher market-to-book ratio. We interpret such findings to mean that corporations with more tightly controlled structures, likely facing fewer costly principle-agent governance problems, enjoyed higher returns on assets (potentially paid out via dividends). Moreover, higher market returns compensated for agency issues in widely held corporations, and dividends compensated for poor investor protections.

In this article, we first outline the relevant institutional, economic and financial characteristics of the late Imperial economy and the nascent corporate sector. This provides a starting point for thinking about the underlying drivers of Russian corporate capital structures and payout policies as suggested by the context and modern corporate finance theory. We then present our new database and document patterns in balance sheet characteristics across different types of corporations and over time. The empirical work that follows investigates the determinants of corporate leverage and dividend payout strategies. We close by considering how corporate governance, life cycles and other factors influenced financial performance. Our conclusion offers some broader takeaways for the financing of early industrialization and suggestions for future research.

II

We focus on the Russian economy between the late 1890s and World War I. According to the national income and business cycle research of Gregory (1982) and Owen (2013), over this period the Russian economy experienced a mid-decade boom, followed by a downturn (bottoming out in 1901), growth to 1905, a massive contraction with the 1905 Revolution, and a slow, erratic recovery leading up to World War I (see Figure 1, Panel A). While per capita income changed little over the period and the economy remained largely agrarian, this period did see substantial

early growth of Russian industry (Gregory 1982). A long line of scholarship interprets this early industrial development as a consequence of various state initiatives in the economy, supported by growing foreign investment (e.g. Von Laue 1965).⁴

At the same time, Cheremukhin *et al.* (2017) assert that late Imperial industrialization was constrained by excessive market power. This is consistent with the research of Owen (1991) and Gregg (2020), who argue that the absence of general incorporation constrained firm expansion and output growth in this period. In this interpretation, corporations possessed numerous advantages relative to other firms, particularly when it came to addressing agency issues and accessing cheaper sources of external funding. Indeed, incorporated firms were at the heart of the modernizing subsectors of Russian industry, and they were prominent participants in the nascent Russian financial system (Kulikov and Kragh 2019; Shepelev 1973). However, we know very little – especially quantitatively – about how Imperial industrial corporate finance worked in practice. To contextualize and motivate our effort to do just that, we outline key features of the historical environment and connect these to insights drawn from modern corporate finance theory.

The corporation in Imperial Russia

We study the factors that impacted the capital structures, payout policies and financial performance of a key subset of all firms in late Imperial Russia: industrial corporations. Imperial Russia failed to introduce either general incorporation or a private (non-corporate) business form that offered complete limited liability (e.g. the PLLC, as defined by Guinnane *et al.* 2007). Rather, the corporate chartering (and re-chartering) of firms was a costly and politicized processes, which likely limited access to this potentially beneficial legal form (Gregg 2020). Moreover, the legal framework and processes of charter application and approval generated considerable variation in corporate characteristics among otherwise similar firms.⁵ The resulting heterogeneity among firms that did manage to incorporate, especially with respect to their internal governance, provides an important source of variation to explore how agency issues and information asymmetries impacted financial strategies in this context.

When submitting their initial charters, the vast majority of corporations defined themselves as either ‘A-corporations’ or ‘share partnerships’. Although the commercial code did not formally distinguish the two variants, these identifications allowed corporations to signal the nature of their enterprise to investors (and perhaps to

⁴ Such policies included a revised tariff regime, the adoption of the gold standard in 1897, several financial reforms, and investment return guarantees in railroads and other sectors.

⁵ The bargaining and idiosyncrasies of the approval process, perhaps involving bribery and political imperatives, meant that the details of charters could substantially differ between otherwise similar firms. When corporations wished to change elements of their charter, such as their system of governance or capitalization level, they had to obtain a formal revision through the same mechanism (Dayton *et al.* 2022).

regulatory authorities).⁶ Larger, newer and more widely held enterprises tended to define themselves as A-corporations and issue (more) smaller par-value shares, while existing partnerships and more tightly held firms that incorporated (perhaps to add a small number of new investors) chose the share partnership label and issued larger par-value shares (Dayton *et al.* 2022). For this article, we focus on these two classes of corporations as indicative of possible underlying differences in governance structures, using A-corporation status as a proxy for wider ownership and a greater separation between ownership and control.

The Imperial Russian financial system

The financial environment in late Imperial Russia structured the options faced by corporations. In practice, Russian companies could finance operations or expansion through retained earnings, informal sources of credit and equity investment, formal loans from a nascent banking sector, or access to thin but growing bond and stock markets. For particularly large and successful firms, limitations of domestic sources of financing led them to turn to Western European banks and securities markets. While the options available to Russian corporations resembled those in other industrializing economies of the time, context-specific conditions likely impacted the relative and absolute costs of financing through different sources, with implications for financial strategies.

In general, Imperial Russia is commonly viewed as possessing weak financial markets and institutions. According to Rajan and Zingales (2003), Russia had a low bank deposits-to-GDP ratio, few exchange-listed firms, and low stock market capitalization-to-GDP ratio in 1913.⁷ Alexander Gerschenkron famously doubted Russian banks' ability to provide meaningful financial assistance to industrial enterprises (1962, pp. 19–20). Yet, when we consider the Imperial financial system in a broader comparative perspective (Table 1), we find that Russia occupied a position similar to other European countries and ahead of many peripheral ones. For example, Russia's ratio of financial assets to GDP was greater than or similar to that in the United States, Canada, the United Kingdom and France, larger than in Spain, Argentina and Brazil, and significantly behind only Germany and Sweden.⁸ Despite constraints of the concession system, corporations' high levels of capitalization and outsized role in the economy meant that Russia's ratio of equity issues to total capital formation in 1913 was the second highest of the countries in Table 1. Finally, though its deposits-to-GDP ratio was low in 1913, Russia's ratio of total

⁶ Contemporaries noted that the share partnership was a 'not a legal, but merely a practical form' (Rozenberg 1912, p. 42).

⁷ See Table 1. The Russian savings + commercial deposits-to-GDP ratio was 0.21 (sample mean = 0.38), and the stock market capitalization-to-GDP ratio was 0.18 (sample mean = 0.57).

⁸ Russia's deposit ratio exceeded Japan's, Spain's and the UK's. Russia's stock market capitalization ratio was on par with that of Argentina, Italy and Norway, although an order of magnitude below that of France (0.78) and the UK (1.09).

Table 1. *Comparative indicators of financial development c. 1913*

	Russia	USA	Canada	UK	Belgium	Germany	France	Sweden	Spain	Japan	Argentina	Brazil
Financial system												
Financial institution assets / GDP, 1913 ^b	0.93/1.00 [#]	0.91	0.96	1.03	1.09	1.58	1.04	1.36	0.35	0.97	0.66	0.36
Equity markets												
Stock market capitalization / GDP, 1913 ^a	0.18	0.39	0.74	1.09	0.99	0.44	0.78	0.47	–	0.49	0.17	0.25
Equity issues / Total capital formation, 1913 ^a	0.17	0.04	–	0.14	0.23	0.07	0.14	0.08	0.01	0.08	–	–
Listed companies / million people, 1913 ^a	2.02	4.75	14.65	47.06	108.7	27.96	13.29	20.64	–	7.53	15.29	12.43
Development of equity markets, c. 1913 ^b	1	2	1	2 ^B	1	2	2	1	1	1	1	1
Banking												
Deposits / GDP, 1913 ^a	0.21	0.33	0.22	0.10	0.68	0.53	0.42	0.69	0.07	0.13	0.29	0.12
Total loans / GDP, 1913 ^c	1.06	0.60	–	0.78 ^A		1.59	1.12	–	–	0.56	–	0.24
Universal banking, c. 1913 ^{**}	2	1	1	0 ^B	1	2	1	1	2	1	1	2
Equity holdings by banks, c. early 20th century ^b	Yes	Yes	Some	Few ^B	Yes	Some	Some	Some	Yes	Few	Few	None

^aRajan and Zingales (2003). Deposits are commercial + savings deposits.

^bFohlin (2012, tables 6.1, 6.2 and 8.2); for universal banking and equity markets, this table reproduces the subjective ranking of 0, 1, or 2 (0 – least; 2 – most; latter) from that source. ‘Financial institution assets’ include those of banks, other credit institutions, insurance companies, savings societies (including pensions), insurance companies and others.

^cGoldsmith (1969a) as reported in Musacchio (2009, p. 66), or derived directly from the former (UK, Russia); ‘loans’ are from all financial institutions and include mortgages

- The first number includes the Polish contribution to the Russian Empire’s GDP in the denominator; the second does not. The Russian entry for this variable is derived directly from Goldsmith (1969b) and Gregory (1982).

^AGreat Britain; ^B England

loans to GDP is among the highest in Table 1, only falling behind what prevailed in Germany and France.⁹ Thus, Russian banks and securities markets apparently generated a significant supply of financing by the early twentieth century.

Recent research suggests that Gerschenkron may have underestimated the efficacy of the Russian banking and financial systems. Investment banks provided industrial firms with payment and discounting services, and with special drawing accounts (*onkoli*) collateralized by various securities (see below).¹⁰ In contrast, longer-term bank credit played a relatively minor role in firm finance, although the rolling over of short-term financing was prevalent. The State Bank and affiliated entities took deposits, issued some loans, and discounted bills of exchange for industrial firms through provincial branches and local treasury offices. Municipal banks, credit societies and other savings institutions played a more limited role in industrial finance, although they did hold corporate securities on their balance sheets. However, despite these varied sources of credit available to Russian firms, credit in the Russian Empire remained expensive relative to other nearby European markets. For example, in 1900, the market discount rate in St. Petersburg was 6.68 percent, where the open market discount rate that year was about 4.41 percent in Berlin and 3.04 percent in France (Homer and Sylla 2005, pp. 228, 265 and 605).

Imperial Russian securities markets were dominated by government and land-related securities, including state-backed railroad debt, notes issued by land banks and the mortgage-like bonds that financed serf emancipation. However, commercial banks facilitated the placement of corporate debt and equity, often executing this by holding such assets on their books and issuing ‘shares’ in these accounts to the public (Crisp 1976, pp. 144–6). This form of intermediation likely eased the costs of information asymmetries between firms and investors, especially for firms with less tangible (and therefore collateralizable) assets. The period from 1861 to 1914 saw steady growth in the number of formally listed securities and the total market capitalization of firms whose shares were traded on domestic exchanges.¹¹ Supporting these developments, from the mid 1890s, state banking institutions increased deposits in joint-

⁹ This high loan ratio likely reflected mortgage lending in the agricultural sector. Salomatina (2004) suggests that Russian commercial banking resembled Continental Europe’s. Further work is necessary to diagnose how Russian intermediaries influenced the financial conditions for industrial firms, as Capie and Collins (1992) argue, negatively, for the UK, and Fohlin (2012) and Goldsmith (1969b) examine for other turn-of-the-century economies.

¹⁰ See Crisp (1976, ch. 5) on connections between banking and Russian industrialization. Anan’ich (1996) and Salomatina (2004) describe the development of commercial banking.

¹¹ Roughly 400 different corporate shares were traded by 1913 in larger exchanges in the Empire (St. Petersburg, Moscow, Warsaw, Riga, Khar’kov and Odessa – see Borodkin and Konovalova 2010, tables 2 and 5). The domestic markets for corporate shares appear to have been well integrated by the last decades of the Tsarist era (Borodkin and Konovalova 2010, pp. 50–3; also see Lizunov 2004; Papp 2001). Total market capitalization was comparable to national income at that time. Ol’ (1983, p. 256) estimates that foreign entities owned 43% of the stock in Russian companies and credit institutions in 1914, although McKay (1970, p. 31) argues that this is probably an overstatement.

stock banks, thus fostering an implicit guarantee for many of the securities held on the books of the banking system.¹² In combination with the concession system of incorporation and the possible role of government procurement policies, this is suggestive that the political and social ties of corporations could impact their financing options, which we explore with our data.¹³

Thus, Imperial Russian non-financial corporations could raise funds for expansion or operations through ‘family and friends’, retained profits, direct credit (often in the form of short-term drawing accounts), the issuance of debt securities, or the selling of new equity. Given the apparent prevalence of foreign capital in these channels (e.g. Crisp 1976), substantial parts of the Russian financial system accessible by the corporate sector were linked to intermediaries and securities’ markets in Western Europe. Large geographic distances, high transportation costs and relatively thin trading potentially meant that external informational constraints were significant for corporations facing both foreign and domestic potential investors. Such information asymmetries were likely only partially mitigated by the financial press and the monitoring (and underwriting) of financial intermediaries. Moreover, these frictions were compounded by the general lack of de facto legal protection for small and medium investors, even after a 1901 reform explicitly addressed this issue (Gregg 2017).¹⁴

Unfortunately, we have little direct evidence on how expensive the different sources of available financing really were (or, alternatively, how financially constrained firms were in practice). However, our panel balance sheet data make it possible to document how capital structure, payout policies and financial performance varied over time (and over the business cycle), across industries and among corporations of different ages, sizes, asset compositions, governance structures, political connections and profitability. These empirical relationships can be plausibly linked to underlying agency issues, investment opportunities, external information asymmetries, transaction costs, or financial supply-side conditions faced by corporations.

Reporting requirements, profit taxation and commercial bankruptcy

Several other aspects of the historical context matter for structuring and interpreting our empirical work on capital structure, payout policies and financial performance. The enforcement of financial reporting requirements, evolving corporate income tax policies, and the nature of Imperial bankruptcy law potentially impacted the costs and/or benefits of different firm financial decisions.

¹² The expansion of private commercial banking was furthered by the increase in State Bank deposits from 287 million to over 4.5 billion rubles between 1895 and 1913 (Kahan 1989, pp. 56–60).

¹³ The implications of corporate political connections are explored by Okazaki and Sawada (2017) for prewar Japan and by Ferguson and Voth (2008) for Germany in the 1930s.

¹⁴ Corporations founded after 1901 tended to issue larger shares to a tighter group of shareholders (Gregg 2017). Year of founding effects and controls for corporation ‘type’ partially take this reform into account.

The Russian commercial code required corporations to submit financial reports to their shareholders and to the public on a regular basis. Corporations reported public accounts in commercial newspapers, especially the *Vestnik finansov i trgovli*, a periodical sponsored by the Ministry of Finance. The Ministry of Finance then collected such balance sheet information and summarized it in tabular form in the Ministry's Yearbooks (*Ezhegodniki*). But did Imperial Russian corporations report their balance sheet information truthfully? This was a period when accounting norms and practices were still in flux, despite guidelines issued by the Ministry of Finance to firms and government offices (e.g. *Pravila*, 1897) and a growing number of manuals on proper methods (e.g. Konev 1901), although there was little formal training or professional certification. Moreover, as far as we can tell based on reading into contemporary accounts, government officials engaged in practically no auditing beyond tracking of correspondence between reported profits and the fulfillment of corresponding tax obligations.

Even if proper reporting rules were followed, financial strategies and corresponding accounting practices were plausibly influenced by corporate income tax policies.¹⁵ Beginning in 1885, Russian corporations were subject to a proportional tax on their net profits. A measure in 1898 introduced a 0.15 percent tax on nominal share capital and a progressive taxation scheme based on net profits as a proportion of share capital: firms whose reported profits represented a greater proportion of share capital faced higher tax rates. A further reform in 1906 increased the tax on share capital to 0.2 percent, raised baseline profit tax rates and added an additional tax on 'excess' profits (Bowman 1993). However, Russian tax law provided vague definitions for taxable net profits, allowed a multitude of deductions and, as far as we have been able to tell, mandated no regular auditing process for corporations.¹⁶ Regardless of whether auditing occurred, this system incentivized Imperial Russian corporate managers and directors to reduce taxable profits by increasing debt (and interest payments) and allocating cash flows to 'sinking funds' for paying off current and future investments.¹⁷ Such funds – subsumed into the category of 'Amortization' in the published data that we draw on – could also serve as additional precautionary reserves beyond required levels.

Finally, the law and practice of corporate bankruptcy in a given setting can change the costs of financial distress. By the beginning of the twentieth century, Russia

¹⁵ Liu (2014) and Onji and Tang (2017) provide evidence on the impact of corporate income taxation in the early twentieth-century US and late nineteenth-century Japan, respectively. In our context, non-incorporated firms were subject to various fees, excise taxes and turnover taxes, but there was no personal income tax.

¹⁶ See Bowman (1993, p. 264) on the definition of net profits in this context. Most corporate charters mandated the formation of an Editing or Accounting Committee of shareholders to check managerial accounts.

¹⁷ Solov'ev (1984) argues that late Imperial Russian corporations reacted to profit taxation in these ways, as dividends were often treated as deductible.

possessed a comparatively generous commercial bankruptcy regime with wide debt moratoriums, the possibility of (judicial) receiverships with considerable financial and decision-making authority, and considerable contractual flexibility within related legal proceedings (Sgard 2006; Antonov 2016, ch. 3). Thus, Imperial Russian bankruptcy may have reduced the costs of financial distress, making it relatively attractive to borrow more and increase leverage.

III

How can we interpret evidence on the financial decisions of Imperial Russian corporations? This section highlights theoretical and empirical work in modern corporate finance that may help explain how firm fundamentals and features of the Russian historical context mattered for capital structure and dividend issuance. Variations in these two attributes are important indicators of the ways that firms address internal and external constraints on financing their operations and growth, with potential implications for corporate valuation and performance.

Capital structure

An immense literature studies whether and how various factors including income taxation, bankruptcy conditions, asset tangibility, profit levels (and volatility), investment opportunities, underlying agency and information issues influence the weight that firms place on equity versus debt within their capital structures.¹⁸ Two broad frameworks are typically referenced: a tradeoff between the costs and benefits of financing via debt or equity, implying a target level of debt or leverage that firms may adjust towards over time; and a pecking-order theory of how firms respond to cashflow deficits or surpluses. Rather than identify which of these or other models are most applicable in the Russian context, which can be difficult even with modern financial data, we outline a number of plausible empirical hypotheses drawn from across the literature.¹⁹ By exploring the sources of variation in reported capital structure, we hope to shed light on possible (and possibly costly) inefficiencies in how Imperial industrial corporations financed themselves.

‘Tradeoff’ models of capital structure emphasize the balancing of benefits and costs of taking on debt. In environments like late Imperial Russia with a corporate income tax, no personal income tax and likely imperfections in various markets, corporations would plausibly utilize debt financing and interest deductions to ‘shield’ their profits (for Russian examples, see Solov’ev 1984). However, as debt increases, the probability of financial distress rises, suggesting a possible target level of leverage conditional on

¹⁸ For examples, see Deloof and Van Overfelt (2008), Rajan and Zingales (1995) and Graham (2022).

¹⁹ Graham (2022) emphasizes factors like high investment hurdle rates and conservatism in the face of uncertainty in constraining adjustments of capital structures, leading to ‘stickiness’ in the face of shocks to revenue, productivity, or costs.

other firm characteristics.²⁰ Such costs of financial distress can be partially mitigated through bankruptcy procedures.²¹ Firms with higher or less volatile profits may be less likely to experience distress, implying that debt can be increased. Relatively more tangible (and therefore, collateralizable) assets may reduce the costs of financial distress and be associated with greater leverage, although this is contingent on the term structure of debt and the nature of liquidation processes in a given setting (Degryse *et al.* 2012; Rajan and Zingales 1995). Moreover, if principals (shareholders) are concerned that managers may exploit intangible assets for their personal benefit, companies with relatively larger holdings of such assets may take on comparatively more debt to discipline managers by reducing their control of cash flows (Grossman and Hart 1982). Given limited protections afforded to investors, the probable difficulty of liquidating assets in the face of relatively thin markets (despite the relatively liberal bankruptcy policies), and the possibility for agency issues within firms, the link between asset tangibility and debt levels could plausibly be negative in our setting.²²

Agency concerns also factor into ‘pecking order’ models of capital structure. Such frameworks emphasize how changes in cash flows and differences in the transaction costs of issuing debt vs. equity interact with asymmetric information about the firm between insiders vs. outsiders (e.g. Myers 1984). Separation between owners and managers (implying the need to discipline managerial control over cash) and greater potential adverse selection in equity issuance make debt more attractive as a form of external finance. The result is a hierarchy of financing investment or operations, where a firm will first turn to internal funds, then to debt (first safer than more risky issues) and then new equity. Thus, firms with higher profits, suggesting more abundant internal sources of financing, may actually take on lower relative debt levels (e.g. Shyam-Sunder and Myers 1999), rather than the higher levels implied by the tradeoff model.²³ More widely held firms (A-corporations in our context), where ownership was separated from control, potentially have more incentive to take on debt, although, if this ownership structure was also a signal to investors in other ways, it might reduce the relatively costliness of equity as well.

A firm’s capital structure might depend on its size or vary over its life cycle. Larger and older firms may face fewer or lower risk investment opportunities (Myers 1977), be relatively diversified (and, therefore, have less volatile earnings), or may possess more collateralizable assets. In simple versions of the pecking order framework, these features would reduce the relative cost of obtaining credit or increase the

²⁰ Modern settings show evidence of ‘dynamic’ debt targets, where shorter-term debt addresses liquidity shocks or investment opportunities, including needs for working capital (e.g. DeAngelo *et al.* 2011).

²¹ Procedures include liquidation or renegotiation, and deciding which parties retain control rights during proceedings. On leverage considerations in bankruptcy, see Harris and Raviv (1991).

²² The use of secured debt, which parallels the collateralization of tangible assets, is more common among firms lacking financial flexibility and facing a greater likelihood of distress (Graham 2022).

²³ Highly profitable firms might also reduce leverage to maintain the capacity to take on debt in the future under pecking order and more dynamic versions of the ‘tradeoff’ model (e.g. Byoun 2008).

likelihood that future debt costs would not lead to distress. In many empirical settings, the availability of profitable investment opportunities is proxied by a firm's market-to-book ratio (itself a proxy for Tobin's Q), although this requires information on the market values, which is typically only available for listed firms. As this is only a subset of corporations in our data, we rely on size and age to help proxy for this investment channel. However, larger and older firms may be more 'visible', which can also make it easier to attract equity finance.²⁴ Moreover, some pecking order theories tend to emphasize that growing financing needs of larger firms may exceed the capacity of lenders or debt markets, leading to a greater reliance on equity (e.g. Myers 1984). Thus, the association between leverage and size or age might go in either direction.

Finally, it is likely that a number of historical factors related to the financial system were associated with variation in the relative reliance on debt or equity in the Russian context. While not exogenous, listing on the St. Petersburg stock exchange, conditional on size, industry and other characteristics of the firm, was plausibly associated with a lower cost of equity finance given the reduction in asymmetric information that might have entailed. In the case of thin credit markets, information costs, and the weaknesses of the legal and administrative capabilities of the Imperial state, the identity of corporate insiders plausibly mattered for the firm's access to external financing. Firms with well-connected insiders could possibly obtain cheaper relational credit, preferential underwriting services, or plug in to networks of potential wealthy equity investors (e.g. as in Victorian Britain – see Braggion and Moore 2013). Thus, though we suspect insider connections have a relationship with how corporations chose to finance expansion and operations, the net effect of such insider connections for corporate leverage could be positive or negative.

Dividends and payout policies

We also consider Imperial Russian corporate dividend policies.²⁵ As with capital structure, the corporate finance literature on payout policies is immense, with much of it centering on the connection between dividends and information asymmetries within and external to the firm.²⁶ When ownership is separate from control, managers may make use their control of cash flows in ways that are at odds with shareholder preferences. Thus, issuing higher dividends to reduce residual cash flows can reduce the costs of such agency issues, which may be more relevant in larger or less tightly held corporations, such as A-corporations in our setting.

²⁴ Rajan and Zingales (1995) consider the modern relationship between size and leverage. Deloof and Van Overfelt (2008) stress how older firms are better known to creditors, suggesting a positive relationship between age and leverage.

²⁵ We do not observe share buybacks or other types of payout policies. Russian dividends (and coupon payments) were typically issued annually, although some corporations provided more frequent payouts. We treat the reported amounts as representing an aggregate annual dividend.

²⁶ See Farre-Mensa *et al.* (2014) and Fernau and Hirsch (2019).

Moreover, if new equity issues are avoided as a relatively expensive way to finance investment, as pecking order theories would suggest, then associated dividends may be lower for newer or smaller firms with more ongoing and potential projects.²⁷

At the same time, dividends are also a mechanism for extracting income from firms. Higher and less volatile profits offered more opportunities to do this, leading to greater payout ratios. Within tightly held corporations such as share partnerships, where ownership and control overlapped, higher dividends may have been a particular viable mechanism for generating individual returns, particularly in absence of any sort of personal income taxation.²⁸ Moreover, in many settings, including Imperial Russia (e.g. Solov'ev 1984), issuing debt reduces taxable profits, suggesting a potential trade-off between debt liabilities and the relative size of dividends.

With respect to external sources of finance, the size and volatility of dividends can have important signaling roles for unobserved quality, productivity, or even profitability if reporting requirements are lax.²⁹ This has been a prominent theme in the payout literature from Lintner (1956) onwards, often within a framework of a long-run target payment ratio. Older, larger, or otherwise better-known corporations may have seen less need to employ dividends in this way, as was evident in Victorian Britain (e.g. Campbell and Turner 2011). On the other hand, and in contrast to earlier models and historical evidence, recent empirical papers have found that dividend smoothing behavior is more prevalent for firms with greater cash flows, less concentrated ownership (thereby subject to potential agency costs of free cash flows), fewer investments and lower levels of external information asymmetries (Fernau and Hirsch 2019; Leary and Michaely 2011). While these findings may be related to the recent rise in share repurchases in lieu of dividends, they do suggest that documenting factors associated with smoothing behavior in our setting may be a useful complement to our analysis of payout ratios.

IV

This article draws on a panel of newly compiled balance sheet data on all Imperial Russian non-financial corporations active from 1899 onwards.³⁰ We collected data for individual corporations as reported in the Ministry of Finance Yearbooks

²⁷ If incentivizing managers to undertake risky projects is important, firms may pursue lower dividends and allow greater managerial control of assets (La Porta *et al.* 2000). Older firms, likely facing fewer and lower risk projects, may see less need to incentivize managers. This may also apply to larger firms with more complicated governing structures and, therefore, larger agency issues.

²⁸ Alternatively, the more complicated structure and diffused ownership of A-corporations may have induced greater dividends to attract distant, anonymous investors unable to directly monitor management.

²⁹ As with capital structure, this has implications for the observed 'stickiness' of dividends and our estimated elasticities in the panel setting.

³⁰ The Appendix (available online) provides additional detail on how we constructed the dataset.

published from 1900 through 1915. Then, we matched companies over time by hand to form the panel. We also matched companies by corporation name to the RUSCORP database (Owen 1992) to exploit the information on initial chartered characteristics of the corporations in that source, such as the corporation's type (A-corporation vs. share partnership, as denoted by the use of different terms for 'share') and the location (region) of the headquarters. RUSCORP also provides data on the personal characteristics of all corporations' founders, as listed in the charters, which can be used to define whether a corporation has a founder who is a government official, noble, or member of the gentry.³¹ Finally, we match by corporation name to the monthly security prices on the St. Petersburg stock exchange.³² From these observations, we calculate within-year share price volatility and average yearly share prices, and estimate the annual corporate valuation as that price times the number of shares at founding.³³ While this may introduce some measurement error, as corporations could have changed their numbers of shares after founding, unfortunately, we have found no source listing both a company's market share price and its current number of shares.

As we noted above, the Ministry of Finance compiled the balance sheet information in their yearbooks from the official commercial periodical *Vestnik finansov i tor-govli*, in which corporations issued financial statements required by the commercial code and by their individual charters. Figure A1 in the online Appendix presents entries for the Martens and Daab Partnership in the 1901 accounting year, which show that the publicly announced information matches what we find in a codified form in the 1902 yearbook. Other such spot checks suggest that the yearbooks did accurately consolidate data from the *Vestnik* periodical, although we have no way to check the underlying quality of the publicly issued balance sheets in the latter source.³⁴

We construct our panel dataset from balance sheet information for the accounting years 1899–1914, with some observations from earlier years. We extract variables related to assets, liabilities and cash flows (including profitability); details and summary statistics are provided in the online Appendix (Tables A2–A5). In its entirety, the resulting dataset describes 2,874 unique corporations observed in at least one year for 19,817 observations. This represents almost 70 percent of the total non-financial

³¹ 'Nobility' and 'gentry' are denoted as such in Owen (1992). In general, the former refers to titled central government officials or military officers. The 'gentry' held local or provincial positions (including in the local noble associations), or were simply denoted as 'landowners'.

³² These data were compiled by researchers at the Yale International Center for Finance. See <https://som.yale.edu/centers/international-center-for-finance/data/historical-financial-research-data>

³³ When the data report bid, ask and close prices or high, low and close prices we select the closing price when reported or the average of bid and ask or high and low, otherwise. For corporations that issue multiple securities, we select the most recently issued.

³⁴ Regulatory oversight and formal audits were limited in our period, but we have no evidence that accounting practices were better or worse than in other historical contexts, even with the presence of the corporate income tax.

corporations established in Imperial Russia.³⁵ The implied annual number of corporations in our database was relatively stable (1,100–1,700) except for some reporting of earlier accounting years in the 1900 Ministry of Finance yearbook and the low numbers for the disrupted year of 1905.³⁶ Textiles, foods and metals represent the largest industrial categories, reflecting required capital intensity and the large size of the food sector. Mining, which was also capital-intensive, is well represented in the database.

Our data include corporations in a variety of sectors with very different capital requirements, market structures and demand patterns. As such, we expect to find substantial differences in financial strategies across industries, scaling by underlying differences in firm size (total assets). Table 2 shows that this is the case. Corporations varied greatly in their property, credit, assets (relative to share capitalization) and profits across industries. The industries with the most property relative to total assets were the municipal services (infrastructure), mining and transportation industries, but those industries did not necessarily have a large amount of credit relative to assets, suggesting a greater reliance on equity and retained earnings. The most profitable industries tended to be newer, more technologically advanced industries of the Second Industrial Revolution, such as chemicals and transportation, though textiles was also quite profitable. These key balance sheet items also changed quite a bit over time, as demonstrated in the figures of Panel B.³⁷ Corporate property declined after the 1905 Revolution, while, in general, total assets and credit increased each year. The pre-1910 profits as a share of assets showed a downward trend until 1905, when it began to increase steadily until the end of the period. All of these trends may reflect significant credit expansion and investment in building firm assets over this early period of industrial development. Finally, Panel C indicates the large average financial differences between the two Russian corporation types. Unconditionally, closely held corporations (share partnerships) were much more likely to finance operations out of credit, despite having lower levels of real property. Moreover, even without controlling for industry or age, closely held corporations appear slightly more profitable on average. Given the large differences across industry, year and corporation type demonstrated by Table 2, we turn to examine these dimensions in a multivariate regression framework below.

³⁵ From 1700 to 1915, the Russian Ministry of Finance chartered 4,542 corporations (Owen 1992), of which 345 were finance corporations and hence not covered by our current database. Railroads, under heavy state control if not outright ownership in our period, typically did not report their financial information in the same way, and so we largely exclude them.

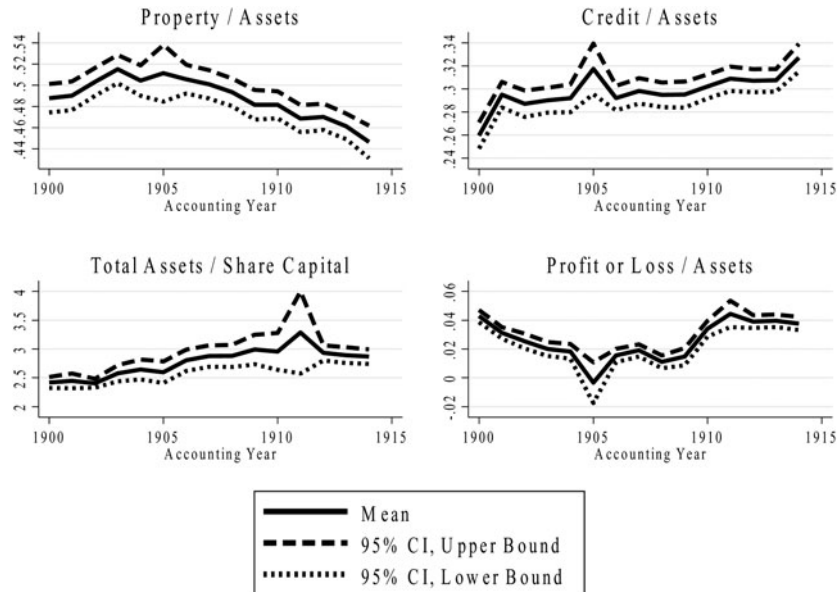
³⁶ We provide a breakdown of the accounting years in each Ministry of Finance yearbook in Table A4 in the online Appendix.

³⁷ We verify these data by examining whether the balance sheet information tracks the Russian business cycle, as measured by sources external to our dataset. See Figure A2 in the online Appendix. Though the dividend/profit ratio fluctuates after the 1905/1906 downturn, corporate profits or losses follow the overall business cycle.

Table 2. *Summary statistics by industry, year, and corporation type: balance sheet items*

Industry	Property/Assets		Credit/Assets		Assets/Share C.		Profit or loss/Assets	
	Mean	St. dev	Mean	St. dev	Mean	St. dev	Mean	St. dev.
Agriculture	0.343	0.265	0.330	0.203	1.989	0.718	-0.015	0.101
Animals	0.363	0.179	0.329	0.200	2.561	1.647	0.017	0.121
Ceramics	0.602	0.181	0.201	0.151	1.888	1.217	0.013	0.105
Chemicals	0.448	0.197	0.262	0.179	2.255	1.125	0.037	0.088
Food	0.463	0.180	0.359	0.189	3.258	4.271	0.038	0.065
Metals	0.454	0.194	0.278	0.180	2.391	2.675	0.023	0.098
Mining	0.659	0.216	0.201	0.185	2.137	1.600	0.008	0.117
Miscellaneous	0.453	0.247	0.326	0.202	2.543	2.568	0.022	0.072
Mun. serv.	0.706	0.271	0.194	0.203	2.394	4.364	0.038	0.172
Paper	0.518	0.185	0.303	0.165	2.973	2.830	0.024	0.073
Textiles	0.406	0.167	0.340	0.175	3.046	1.722	0.039	0.064
Trade	0.188	0.267	0.401	0.240	3.638	14.452	0.030	0.091
Transportation	0.667	0.232	0.218	0.206	3.856	7.050	0.036	0.109
Wood	0.422	0.229	0.349	0.202	2.341	1.118	0.026	0.076

Panel B: By year



Panel C: By type

Corp. type	Property/Assets		Credit/Assets		Assets/Share C.		Profit/Assets	
	Mean	St. dev	Mean	St. dev	Mean	St. dev	Mean	St. dev
Closely held	0.399	0.225	0.359	0.359	3.200	6.216	0.036	0.072
Widely held	0.543	0.232	0.260	0.260	2.415	2.431	0.025	0.091

Source: *Ezhegodnik ministerstva finansov* [Ministry of Finance Yearbook], 1900–15. In all panels, Profit in 1910 is ‘Balance profit’, and Profit after 1911 is ‘Profits for distribution’. Here, a ‘widely held’ corporation is one that uses the word *aktsiia* for ‘share’. Corporations with values of 0 for total assets are excluded.

V

In this section, we examine a variety of standard debt ratios to understand the basics of Imperial Russian corporate capital structures. Our analysis is not exhaustive in examining every factor driving capital structure decisions, but we focus on key dimensions that are reflected in our data and suggested by the modern corporate finance literature. Moreover, these exercises are descriptive in nature, as our outcomes and a number of the right-hand-side variables were likely jointly determined by corporations making their capital structure decisions. Following our discussion in Section III, we estimate variants of:

$$\begin{aligned}
 y_{it} = & \beta_0 + \beta_1 \log Assets_{it} + \beta_2 \left(\frac{Profits}{Assets} \right)_{it} + \beta_3 \log Age_{it} + \beta_4 Listed_{it} \\
 & + \beta_5 \left(\frac{Property}{Assets} \right)_{it} + \beta_6 WidelyHeld_{it} + Industry'_{ij} \boldsymbol{\gamma} + Region'_{ij} \boldsymbol{\delta} + \boldsymbol{\mu}_i + \boldsymbol{\zeta}_i \\
 & + \boldsymbol{\epsilon}_{it}
 \end{aligned} \tag{1}$$

In this regression, y_{it} is a measure of corporation i 's leverage in year t , defined as versions of the credit/asset ratio. In the online Appendix (Table A7, Panel D), we consider the book value of leverage and an estimate of the market value of leverage. Our main right-hand-side variables represent factors suggested in Section III as important for a Russian corporation's capital structure: size (total assets), profitability, age, asset tangibility, whether the corporation lists shares on the St. Petersburg stock exchange, and whether the corporation is widely held (proxied by A-corporation status). We control for industry and region to account for differences in fixed sectoral and geographic components of the demand for and supply of financing. To condition on macroeconomic factors and changes in reporting, we also include accounting year fixed effects ($\boldsymbol{\zeta}_i$). We estimate this regression using random effects and fixed-effect ($\boldsymbol{\mu}_i$) panel specifications, where in the random effects regressions we cluster standard errors by firm ID, and, in the fixed effects regressions, we cluster by industry.³⁸

Additionally, we investigate how founder connections and market-to-book ratios relate to corporate capital structure. It may be the case that corporations with members of the government, nobility, or gentry had access to additional sources of financing, whether credit or equity, which impacted capital structure. Furthermore, as a proxy for investment opportunities, we utilize the market-to-book ratio, measured as the firm's total market valuation divided by the par value of share capital, where valuation is the current share price times the corporation's number of shares at founding. We use the initial number of shares in both numerator and denominator because we do not

³⁸ The use of random effects allows for the inclusion of fixed corporate characteristics (e.g. DeLoof and van Overfelt 2008). OLS or logit models yield similar results. Unfortunately, we are unable to estimate target leverage, which constrains our evaluation of capital structure dynamics.

know how many new shares the firm issues after its initial chartering. This variable is defined for those corporations listed on the St. Petersburg exchange.

Table 3, Panel A presents our baseline regressions for Imperial Russian corporate leverage, measured with debt and credit ratios.³⁹ We find that whether a corporation was listed on the St. Petersburg exchange and whether it was widely held were both negatively associated with credit and debt ratios; implying that such corporations relied relatively more on equity finance (confirmed in columns 1 and 2 of online Appendix Table A6). On average, listed corporations held almost 18 percent less credit as a share of assets, and widely held corporations held almost 24 percent less credit as a share of total assets (column 1). A corporation's age is negatively related to its use of credit, which is consistent with its role as a proxy for (declining) investment opportunities. For the subset of corporation-year observations for which we can construct the market-to-book ratio, we find little relationship with our leverage measure (column 5), although our sample size is greatly reduced. Size, as measured by the logarithm of total assets, is strongly and positively associated with credit and debt ratios.⁴⁰ Larger firms may have engaged in less risky projects, had more collateral on hand, or faced relatively greater short-term financing needs. Across Panel A, profits as a share of assets is negatively related to credit or debt, which echoes pecking order theories of capital structure rather than the tax concerns of tradeoff models. The relationships we find between leverage and size, profitability, and listing also hold in regressions controlling for corporation fixed effects (column 4), though the relationships with age and tangible assets lose statistical significance.⁴¹ Finally, column 6 presents estimates that use a 10-year balanced panel, with similar results to the baseline estimates.

In Table 3, Panel A, we find that asset tangibility is associated with a lower credit and debt ratio. This may be indicative of the prevalence of short-term borrowing (and the potential importance of maintaining short-run financial flexibility for such firms) or the significant role that agency issues may have played in these corporations.⁴² To further explore these hypotheses, we consider several additional definitions of tangible assets in Table 3, Panel B, where column 1 repeats Panel A's column 1 for comparison. For reference, the average value of property as a share of assets was 0.486. Column 1 shows that increasing property/assets by 0.10, or 20 percent of the average value, is associated with a decline in credit/assets of 2.81

³⁹ We study the factors associated with changes in share capital (as our measure of equity financing) in online Appendix Table A6.

⁴⁰ We use $\log(x)$ to denote the natural logarithm of x .

⁴¹ The fixed effects regression controls for unobserved heterogeneity across corporations. A Hausman test comparing this regression to a random effects model rejects the null hypothesis that random effects is the preferred model. However, we estimate random effects regressions as our baseline because we are interested in the relationships between outcomes and fixed corporate characteristics.

⁴² Our measure of credit is likely dominated by short-maturity trade credit. We cannot separate longer-term bank credit, such as mortgages.

Table 3. *The underpinnings of imperial Russian corporate debt, credit, and leverage*

Panel A: Baseline regressions						
Model Dep. variable	RE	RE	RE	FE	RE	Balanced panel RE
	Log credit/ assets	Log credit/ share cap.	Log debt/ assets	Log credit/ assets	Log credit/ assets	Log credit/ assets
	(1)	(2)	(3)	(4)	(5)	(6)
Log (assets)	0.253*** (0.0263)	0.546*** (0.0344)	0.242*** (0.0272)	0.336*** (0.0464)	0.244** (0.108)	0.215*** (0.0447)
Profit or loss/ Assets	-0.954*** (0.177)	-0.988*** (0.211)	-0.870*** (0.179)	-0.923*** (0.216)	-2.754*** (0.826)	-1.782*** (0.355)
Log age	-0.0385** (0.0159)	0.0345* (0.0193)	-0.0298* (0.0160)	0.0153 (0.0298)	-0.209*** (0.0803)	-0.109*** (0.0407)
Listed	-0.177*** (0.0630)	-0.276*** (0.0779)	-0.145** (0.0605)	-0.171** (0.0616)		-0.329*** (0.124)
Property/ Assets	-0.281*** (0.0992)	-0.525*** (0.125)	-0.401*** (0.102)	-0.0855 (0.141)	-0.487 (0.401)	-0.538*** (0.158)
Widely held	-0.249*** (0.0565)	-0.352*** (0.0708)	-0.0994** (0.0476)		-0.496** (0.241)	-0.229* (0.118)
Corporation has noble	-0.0825 (0.0782)	-0.0996 (0.0972)	-0.0548 (0.0717)		0.0292 (0.246)	-0.0210 (0.135)
Corporation has gov't	-0.168*** (0.0615)	-0.169** (0.0748)	-0.138** (0.0569)		0.0386 (0.189)	-0.0201 (0.0932)
Corporation has gentry	0.115** (0.0542)	0.178** (0.0696)	0.128*** (0.0493)		0.293 (0.186)	0.0976 (0.108)

Continued

Table 3. *Continued*

Panel A: Baseline regressions						
Model Dep. variable	RE	RE	RE	FE	RE	Balanced panel RE
	Log credit/ assets	Log credit/ share cap.	Log debt/ assets	Log credit/ assets	Log credit/ assets	Log credit/ assets
	(1)	(2)	(3)	(4)	(5)	(6)
MB ratio					0.0264 (0.0234)	
Constant	-4.607*** (0.456)	-7.935*** (0.579)	-4.367*** (0.473)	-5.890*** (0.723)	-2.063 (1.492)	
Observations	16,459	16,459	12,717	16,506	649	4,645
R ²	0.166	0.234	0.165	0.043	0.395	0.287
No. of firms	2,275	2,275	2,183	2,280	144	477
Ind. controls	YES	YES	YES	YES	YES	YES
Year controls	YES	YES	YES	YES	YES	YES
Reg. controls	YES	YES	YES	YES	YES	YES

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors clustered by firm ID in parentheses, except in column 4, where standard errors are clustered by industry (fixed from the firm's first observation). The balanced panel in column 6 includes only observations present each year from 1899 to 1909. Column 4 reports the overall R². A corporation is 'listed' if its shares appear on the St. Petersburg stock exchange that year. A corporation is 'widely held' if it uses the term *aktsiia* for 'share'. Founder connections ('Corporation has noble', etc.) are coded by matching to RUSCORP (Owen 1992), which includes demographic information for corporate founders. The market-to-book ratio is calculated as the market share price times the number of shares at the corporation's founding divided by total share capital. Log() denotes the natural logarithm.

Panel B: Further detail on property			
Model Dep. variable	RE Log credit/ assets	RE Log credit/ assets	RE Log credit/ assets
	(1)	(2)	(3)
Log (assets)	0.253*** (0.0263)	0.265*** (0.0261)	0.244*** (0.0247)
Profit or loss/Assets	-0.954*** (0.177)	-1.120*** (0.167)	-1.195*** (0.175)
Log age	-0.0385** (0.0159)	-0.0368** (0.0160)	-0.0318** (0.0156)
Listed	-0.177*** (0.0630)	-0.182*** (0.0638)	-0.177*** (0.0627)
Property/Assets	-0.281*** (0.0992)		
(Property + inventories)/Assets		0.405*** (0.101)	
Inventories/Assets			1.245*** (0.104)
Widely held	-0.249*** (0.0565)	-0.276*** (0.0573)	-0.189*** (0.0559)
Corporation has noble	-0.0825 (0.0782)	-0.0987 (0.0787)	-0.0712 (0.0761)

Continued

Continued

Panel B: Further detail on property			
Model Dep. variable	RE Log credit/ assets	RE Log credit/ assets	RE Log credit/ assets
Corporation has gov't	-0.168*** (0.0615)	-0.183*** (0.0624)	-0.145** (0.0606)
Corporation has gentry	0.115** (0.0542)	0.0918* (0.0548)	0.122** (0.0533)
Constant	-4.607*** (0.456)	-5.163*** (0.465)	-4.946*** (0.415)
Observations	16,459	16,459	16,459
R-squared	0.166	0.145	0.185
No. firms	2,275	2,275	2,275
Ind. controls	YES	YES	YES
Year controls	YES	YES	YES
Reg. controls	YES	YES	YES

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors clustered by firm in parentheses. A corporation is 'listed' if its shares appear on the St. Petersburg stock exchange that year. A corporation is 'widely held' if it uses the term *aktsiia* for 'share'. Founder connections ('Corporation has noble', etc.) are coded by matching to RUSCORP (Owen 1992), which includes demographic information for corporate founders. Log() denotes the natural logarithm.

percent. In column 2 of Panel B, we use a definition of tangible assets that includes both Property and Goods and Materials (here abbreviated as ‘Inventories’). Now, the relationship between tangible assets and (log) credit/assets is positive in absolute magnitude and statistically significant. Increasing property plus goods and materials as a share of assets by 0.10 (where the average value is 0.671) raises the credit-asset ratio by 4.05 percent on average. In column 3, where our measure of tangible assets is only Goods and Materials (divided by assets), the relationship is unambiguously positive. Increasing inventories by 0.10 (out of an average of 0.185) raises the credit-asset ratio by 12.5 percent on average. Thus, Russian corporate balance sheets show a positive relationship between our scaled measures of credit and inventories, suggesting that the loans likely financed rolling, short-term production expenditures rather than spending on fixed assets like machines and real estate. This is suggestive of the critical importance of maintaining short-run financial flexibility in leverage decisions of Russian corporations in this period, a consideration emphasized by Graham (2022) for modern corporations.

Overall, we find the results in Table 3 (and those in the online Appendix) to be consistent with the capital structure relationships outlined in Section III, particularly those implied by pecking order theories. Asset tangibility was negatively associated with credit, which is consistent with the relevance of agency issues within the corporate sector. This is also supported by the differences in financing by corporation type.⁴³ Moreover, across specifications, there is some suggestive but noisy evidence that founder identity influenced access to credit, positively for gentry and negatively for government-affiliated founders. This is not surprising in a setting when personal relationships likely played an important role in corporate founding and in accessing the financial system: perhaps having a government-affiliated founder eased access to equity markets, while a gentry insider could more readily access private credit networks.⁴⁴

VI

Internal agency issues, external asymmetric information, profitability and investment are important considerations in corporate payout policies. Was this the case in Imperial Russia? Table A8 in the online Appendix documents how the payout ratio (dividends/profit) varied by industry, over time and by corporation type.⁴⁵

⁴³ Table A7 in the online Appendix breaks out the regression in column 1 of Table 3 by industry, corporation type and headquarter city. Table A7, Panel E explores additional covariates, including having headquarters located in St Petersburg, share price volatility and amortization.

⁴⁴ This is consistent with the role of status and personal connections in Imperial Russian credit and business relationships, as described by Antonov (2016). The negative credit coefficients on government-affiliated founders possibly reflects the relative weakness of such corporations, whose political connections allowed worse charters through (as shown in Gregg and Nafziger 2022)

⁴⁵ The payout ratios presented in the table trim the bottom and top 1% to account for extreme values in the original source. Profits in the denominator are net profit values as defined in the online Appendix.

Table 4. *Factors associated with corporate payout ratios*

Model	OLS	OLS	F.E.	OLS	OLS
Dep. variable	Div/Prof	Div/Prof	Div/Prof	Change in dividends	Change in dividends
	(1)	(2)	(3)	(4)	(5)
Log (total assets)	0.0140*** (0.00460)	0.0196*** (0.00581)	0.0355*** (0.00842)		11,777*** (3,472)
Log (credit / total assets)	-0.0424*** (0.00493)	-0.0455*** (0.00600)	-0.0507*** (0.00909)		-6,022*** (1,273)
Widely held	-0.0740*** (0.0114)	-0.0383** (0.0167)			5,298** (2,577)
Log (amortization / total assets)		0.0130** (0.00549)	0.0291*** (0.00553)		-5,923*** (1,877)
Log (age)		0.0153** (0.00705)	0.00244 (0.00731)		2,613 (1,851)
Corporation has noble		-0.0361* (0.0205)			
Corporation has gov't		-0.0107 (0.0158)			
Corporation has gentry		-0.0182 (0.0171)			
Lagged dividends				-0.373*** (0.0707)	-0.384*** (0.0753)
Profit or loss				0.157*** (0.0286)	0.167*** (0.0354)
Constant	0.180** (0.0702)	0.169 (0.157)	-0.128 (0.105)	13,187*** (2,436)	-196,370*** (50,897)
Observations	13,825	10,091	10,098	14,796	9,639
R ²	0.028	0.112	0.0147	0.304	0.303
Industry controls	NO	YES	N/A	NO	NO
Year controls	NO	YES	YES	NO	NO
Region controls	NO	YES	YES	NO	NO
Unique firms	2,077	1,587	1,589	2,161	1,459
Mean of outcome	0.415	0.416	0.416	6,524	7,375

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Standard errors clustered by firm ID in parentheses in columns 1, 2, 4, and 5. Standard errors clustered by industry in parentheses in column 3. Column 3 reports the overall R². Here the payout ratio is defined as the ratio of dividends to profits, trimmed to remove the bottom and top 1% of values.

Profits are reported when revenues exceed expenditures. Profit in 1910 is 'Balance profit' and Profit after 1911 is 'Profits for distribution'. A corporation is 'widely held' if it uses the term *aktsiia* for 'share'. Founder connections ('Corporation has noble', etc.) are coded by matching to RUSCORP (Owen 1992), which includes demographic information for corporate founders. Change in dividends is the change in the value of total dividends. Log() denotes the natural logarithm.

Across industries, corporations paid roughly similar dividends as a proportion of profits, though trade and infrastructure corporations paid slightly higher dividends. The dividend/profit ratio varied over time, roughly following the business cycle (see online Appendix Figure A2). Closely held share partnerships tended to pay a greater proportion of profits as dividends than the widely held A-corporations, suggesting that the former rewarded their shareholders directly through dividends, though this type of corporation differed significantly along other dimensions. To better differentiate among the factors driving these bivariate relationships, we turn to multivariate analysis.

We consider the factors associated with corporate dividend/profit ratios in Table 4, where, controlling for industry, the accounting year and the headquarter region, we provide estimates of:

$$\begin{aligned} PayoutRatio_{it} = & \beta_0 + \beta_1 \log(Assets)_{it} + \beta_2 \log(Creditors/Assets)_{it} \\ & + \beta_3 WidelyHeld_{it} + \mu_i + \zeta_t + \epsilon_{it} \end{aligned} \quad (2)$$

Our regressions include plausibly important considerations underlying the variation in Imperial Russian corporate dividend ratios.⁴⁶ As we emphasized in Section III, corporate age, size, governance type, leverage and profitability may all have impacted the use of dividends to potentially incentivize managers, signal and/or reward outside investors, and respond to the firm's present financial conditions.⁴⁷

The results presented in Table 4 reveal several important sources of variation in Russian corporate dividend policies. The specification in column 1 focuses on three key correlates of dividend issuance: corporation size, credit divided by assets (leverage) and ownership structure, but without any controls for year, location, or industry. Here we see several fundamental relationships: larger corporations, corporations with less debt, and closely held corporations tended to have larger payout ratios. On average, doubling the size of total assets increases the payout ratio by 0.014, a relatively small change. More substantially, transitioning from a closely held to widely held corporation decreases the payout ratio by 0.074 (given an average payout ratio of about 0.415). Larger corporations may have seen more stable earnings and less need to invest out of earnings and hence could pay out more as dividends. The debt finding is consistent with standard debt deductibility stories. The finding on widely held corporations contradicts a simple theory of dividend issuance in this context (as with La Porta *et al.* 2000) in which corporations with greater agency

⁴⁶ Similar factors are emphasized in the literature on the determinants of corporate dividend payout policies (Allen and Michaely 2003; Braggion and Moore 2011; Campbell and Turner 2011; Farre-Mensa *et al.* 2014).

⁴⁷ These payout ratios are trimmed to remove the bottom and top 1% of observations to account for extreme values.

concerns would pay higher dividends to reassure shareholders. In this context, where most corporations did not list shares on stock markets, closely held corporations may simply pay higher dividends to the tighter circle of shareholders that both operates and owns the company.

Column 2 includes controls for industry, year and region as well as corporate age, amortization as a share of total assets and indicators for founder connections. We find mixed evidence that age, which could be thought of as a proxy for firm investment demand and firm reputation, impacted corporate payout policy. Similarly, founder connections are not strongly related to payout ratios. However, these estimates show that corporations that devoted more resources to saving for future capital purchases through amortization also tended to have higher payout ratios, since such corporations may pay into amortization when they do not pay down debts (hence decreasing net profits and leading to a higher payout ratio). Similar patterns are apparent in column 4, which includes corporation fixed effects.

Columns 1 through 3 take a static view of dividend payout ratios. To develop a more complete picture of whether corporations' dividend policies respond to shocks, we consider models of dividend smoothing.⁴⁸ Following Fernau and Hirsch (2019) and others, we estimate the following dynamic regression:

$$\Delta Dividend_{it} = \beta_0 + \beta_1 Dividend_{i,t-1} + \beta_2 ProfitLoss_t + \epsilon_{it} \quad (3)$$

Here, $-\beta_1$ is the speed of adjustment (SOA).⁴⁹ Leary and Michaely (2011) find speeds of adjustment ranging from 0.1 to 0.5 in modern data. We also augment this regression to consider additional key covariates: corporation size (log assets), the log of credit over total assets, ownership structure and the log of amortization over total assets.

In columns 4 and 5, we find speeds of adjustment that sit well within the range found by Leary and Michaely.⁵⁰ The additional covariates presented in column 5 suggest that larger, more widely held corporations and corporations that have less leverage and amortization adjust their dividends by larger amounts on average.⁵¹ The included covariates, moreover, have economically substantial relationships with the change in dividends, given the average change of approximately 7,000 rubles (column 5). These results show that, rather than adopting some static rule of dividend issuance, Russian corporations adjusted their dividends according to

⁴⁸ Dividends varied greatly even within corporations, suggesting that dividends were responsive to shocks. The standard deviation of corporate dividend amounts was around 50,000 rubles (where the mean was about 93,000), and the standard deviation of dividends as a percentage of share capital was 2.40% (mean was about 3%).

⁴⁹ Here we use profit or loss as a proxy for earnings, where the canonical model is written as $\Delta Dividend_{it} = \beta_0 + \beta_1 Dividend_{i,t-1} + \beta_2 Earnings_{it} + \epsilon_{it}$.

⁵⁰ We find similar estimates when we trim off the lowest and highest 1% of dividend values.

⁵¹ No differences are apparent when we interact widely held status with profit or loss (not shown).

financing conditions, much as documented for modern firms.⁵² Taken together, the results for payout ratios lend less support to a model of dividends as signaling mechanisms than to dividend policy as a response to agency concerns and cash flows.

VII

The previous sections have shown that corporations with different profitability, governance structure, access to stock markets and other fundamental characteristics pursued very different financial strategies with respect to capital structure and dividends. We next consider whether differences across firms in these attributes also mattered for their financial performance. While financial outcomes do not directly correspond to productivity or firm growth, reported profitability or market valuations are likely associated with real economic outcomes.⁵³

We consider three indicators of financial performance. First, we study the return on assets (ROA), as measured by the ratio of a corporation's profits or losses to its total assets. Second, we consider the return on equity (ROE), measured by the ratio of a corporation's profits or losses to its share capital.⁵⁴ Finally, we use the market-to-book ratio, measured as before by the corporation's market share price multiplied by the number of shares at founding, divided by share capital (at par value).

We first estimate the baseline model below, which relates a company's return on assets or equity to its age, a dummy for whether the corporation is listed on the St. Petersburg stock exchange, whether the corporation is widely held, whether the corporation has politically connected founders, and controls for region, industry and year.

$$\begin{aligned}
 ROA_{it} \text{ or } ROE_{it} = & \beta_0 + \beta_1 Listed + \beta_2 Log(Age)_{it} + \beta_3 WidelyHeld_{it} \\
 & + \beta_4 NobleFounder + \beta_5 GovernmentFounder \\
 & + \beta_6 GentryFounder + Industry'_{it} \boldsymbol{\gamma} + Region'_{it} \boldsymbol{\delta} + \boldsymbol{\mu}_i + \boldsymbol{\zeta}_t \\
 & + \boldsymbol{\epsilon}_{it}
 \end{aligned} \tag{4}$$

We investigate whether corporations listed on the St. Petersburg stock exchange or those with particular kinds of founders differed in their financial performance to better understand whether differential access to markets or financing mattered for profitability. Given the possibly higher agency costs in the more widely held A-corporations, we might expect such corporations to have lower returns. Firm

⁵² The magnitudes of many coefficients are large in this table, because the outcome variable is expressed in levels rather than logarithms or as a ratio.

⁵³ See Figure A2 in the online Appendix. Returns on equity or market-to-book measures may reflect underlying productivity and profit expectations, with the latter potentially affected by the presence of market power, as has been hypothesized for late Imperial Russia (Cheremukhin *et al.* 2017).

⁵⁴ The market-to-book ratio can be indicative of current financial performance or future investment potential, as was utilized in Section V.

age captures both selection and differences in the availability of new opportunities over a corporation's life cycle.

Column 1 of Table 5 presents results from estimating our baseline regression (Equation 4) using ROA as the dependent variable. We find a strong negative relationship between the widely held dummy and ROA, suggesting that agency issues may have played a role in lowering returns for corporations with more diffused ownership.⁵⁵ Widely held corporations have ROA that is lower than that of closely held corporations by 0.0188 (where the average ROA in the regression is 0.0302). Corporations that were listed on the St. Petersburg stock exchange had higher ROA. The positive relationship between ROA and *Listing* could simply indicate positive selection into listing, or it could imply that the additional financing provided by trading on the exchange allowed listed corporations to take advantage of high-return opportunities. Older corporations tended to have lower returns on assets, consistent with such corporations facing lower value investment projects. Finally, though corporations with noble or gentry founders do not appear to enjoy any differences in ROA, corporations with government-connected founders do exhibit lower returns. Such government-connected corporations may have faced lower entry barriers in the concession system; hence, such corporations might be observed with lower performance in any cross-section.

Next, we augment the baseline specification with additional dynamic (lagged) covariates. Columns 2 and 4 show that the level and changes in dividends scaled by total assets tend to predict future profits. In contrast to our findings in Table 4, this suggests that dividends may have conveyed a signal to investors about the corporation's future performance. Column 3 shows that the corporations that were more indebted in the previous period tended to have lower performance in the next period, consistent with the negative relationship between leverage and profitability we found in Table 3. In these columns that include lagged dividends and credit, the relationship between age and ROA changes direction and is even positive and statistically significant in column 4, suggesting that these additional covariates are correlated with age. Overall, the results of columns 2 through 4 suggest that in this context, capital structure and dividend policy were associated with differences in corporate financial performance.

Column 5 presents a baseline result where the dependent variable is ROE. Though the relationships with listing and widely held status are similar to those presented previously, here we see a positive relationship with age. This surprising relationship perhaps arises because older corporations grew in size and thus generated profits that were larger in magnitude; since corporations' share capital was somewhat fixed, return on equity cannot capture this change as well as return on assets.⁵⁶

⁵⁵ Gregg and Nafziger (2019) found no relationship between corporation type and ROE once firm age was included (which was *positively* associated with ROE in that cross-section).

⁵⁶ Table A9 in the online Appendix presents additional robustness checks, including a regression that replicates a specification from our previous study (Gregg and Nafziger 2019) by only including the 1914 accounting year.

Table 5. Performance regressions: corporate return on assets and return on equity

VARIABLES	(1) ROA RE	(2) ROA RE	(3) ROA RE	(4) ROA RE	(5) ROE OLS	(6) Log(MB) RE
Listed	0.0245*** (0.00491)	0.0155*** (0.00434)	0.0227*** (0.00485)	0.0173*** (0.00534)	0.0410** (0.0198)	
Log firm age	-0.00212** (0.00108)	0.000462 (0.00136)	0.00220 (0.00154)	0.00564*** (0.00206)	0.0114*** (0.00334)	-0.141 (0.112)
Widely held	-0.0188*** (0.00403)	-0.0112*** (0.00382)	-0.0167*** (0.00451)	-0.0165*** (0.00488)	-0.0561*** (0.0129)	1.110*** (0.363)
Corp. has noble founder	-0.00192 (0.00543)	-0.000219 (0.00507)	-0.00135 (0.00589)	0.00297 (0.00663)		0.196 (0.283)
Corp. has gov't official founder	-0.00897** (0.00456)	-0.00831* (0.00458)	-0.0118** (0.00511)	-0.0127** (0.00585)		0.331 (0.231)
Corp. has gentry founder	-0.00450 (0.00361)	-0.00301 (0.00349)	-0.00417 (0.00414)	-0.00314 (0.00478)		-0.218 (0.394)
Dividend/Assets _{t-1}		0.922*** (0.0506)				
Log (credit/assets) _{t-1}			-0.00600*** (0.00144)			
Dividend/Assets _{t-1}				0.435*** (0.0583)		
Div/Prof ratio, trimmed						0.608*** (0.155)
Share price volatility						0.467 (0.497)

Continued

Table 5. *Continued*

VARIABLES	(1) ROA RE	(2) ROA RE	(3) ROA RE	(4) ROA RE	(5) ROE OLS	(6) Log(MB) RE
Constant	0.0572** (0.0263)	0.0303 (0.0200)	0.0492** (0.0204)	0.0395 (0.0250)	0.0883 (0.0698)	-1.948*** (0.496)
Observations	16,623	13,006	12,865	10,021	16,637	419
R ²	0.0359	0.220	0.0573	0.0617	0.0350	0.379
Number of firms	2,281	1,832	1,829	1,586	2,282	119
Industry controls	YES	YES	YES	YES	YES	YES
Year controls	YES	YES	YES	YES	YES	YES
Region controls	YES	YES	YES	YES	YES	NO
Mean of outcome	0.0302	0.0311	0.0313	0.0317	0.0868	-0.595

*** p < 0.01, ** p < 0.05, * p < 0.1. Standard errors clustered by firm ID. Return on assets (ROA) is defined as the profit or loss divided by total assets. A corporation is ‘widely held’ if it uses the term *aktsiia* for ‘share’. Founder connections (‘Corporation has noble’, etc.) are coded by matching to RUSCORP (Owen 1992), which includes demographic information for corporate founders. A corporation is ‘listed’ if its shares appear on the St. Petersburg stock exchange that year. IHS of ROA denotes the inverse hyperbolic sine transformation of our ROA variable. Share price volatility is the annual coefficient of variation of monthly share prices. Log() denotes the natural logarithm. The market-to-book ratio is calculated as the market share price times the number of shares at the corporation’s founding divided by total share capital.

Finally, we investigate whether these corporate characteristics, along with dividend–profit ratios, were associated with market-to-book ratios. Campbell and Turner (2011) find that nineteenth-century British corporations with higher dividends also had higher market-to-book ratios. They argue that corporations distributed dividends to compensate investors for poor legal protections, thereby increasing demand for equity and raising firm valuations. We speculate that dividends may have served a similar function in the Russian context.

We estimate the following regression model:

$$MB_{it} = \beta_0 + \beta_1 DividendProfitRatio_{it} + \beta_2 Age_{it} + \beta_3 WidelyHeld_{it} + Industry'_{it} \gamma + Region'_{it} \delta + \mu_i + \zeta_t + \epsilon_{it} \quad (5)$$

We measure the market-to-book ratio as above. Column 6 of Table 5 shows that the dividend/profit ratio was positively related to the market-to-book ratio, suggesting that Campbell and Turner's (2011) argument may also be relevant in the Russian case. The average (trimmed) payout ratio was 0.40; increasing the payout ratio by 0.10 was associated with an increase in the market-to-book ratio of about 6 percent. Further, we find that widely held firms had higher market-to-book ratios. Though widely held corporations had lower ROA, investors in such corporations were apparently compensated with higher market-to-book ratios. Including share price volatility generates only a weak relationship with corporate market-to-book ratios (perhaps due to small sample size).

VIII

In this article, we document the basic financial structure and dynamics of all industrial corporations in the Russian Empire between 1899 and 1914. We find large differences in capital structures and payout policies across industries, over time, over firms' life cycles and between ownership structures. These patterns follow predictions of standard corporate finance theory and reflect what we know about the institutions, financial system and process of development in the late Imperial Russian economy. For example, Russian firms' profits and dividend payments largely followed the business cycle. The relative use of leverage or equity financing was associated with factors like asset tangibility and organizational form in ways consistent with the role of internal agency costs and external information asymmetries. Dividend payout policies appear to have addressed similar issues. While individual corporate founder identities had a measurable impact on funding choices (but not necessarily profitability), the evidence broadly suggests that early industrial corporations could address market imperfections and sustain growth through their interactions with the Imperial Russian financial system. Therefore, constraints on incorporation and on factor and product market development were likely binding considerations for early Russian industrial growth.

Our empirical work relies on a uniquely large and comprehensive panel dataset of corporate financial characteristics in an important historical emerging market. However, there are some important caveats to our results using these data. Although the panel structure, detailed balance sheets, and rich information on corporations' fixed characteristics substantially improves upon our earlier, cross-sectional work (Gregg and Nafziger 2019), we remain hesitant to make fully causal claims given the complicated and simultaneous interconnections between capital structure, governance, payment decisions and profitability. Furthermore, our results describe only industrial corporations, a relatively small subset of all firms in the Russian Empire. However, these were the leading firms of the Empire and were precisely those for which the choices of governance and financing were perhaps most relevant.

Additional research could further illuminate how early Russian industrialization unfolded. For example, available quantitative and qualitative sources may permit a more systematic examination of banking relationships in our context, thereby providing important clues about how Russian corporations interacted with the banking sector. In addition, historical studies of how Russian bankruptcy functioned in practice, or quantitative evaluations of the impact of changes in the tax code, could further reveal how Russian institutions impacted corporate financial outcomes. Each of these topics would benefit greatly from similar studies of early corporate finance in other economies, in order to understand what is specifically Russian and what is more broadly true about capital structure, payout policy and performance in late industrialization.

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