Online Appendix

Factory Productivity and the Concession System of Incorporation in Late Imperial Russia, 1894-1908

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1 Additional Information on the Context and Database Contents

1.1 Description and Sources

The database used in this paper includes information from the 1894, 1900, and 1908 Imperial Russian factory surveys. The 1894 factory survey was conducted by the Ministry of Finance Department of Commerce and Manufacturing, and the 1900 and 1908 factory surveys were conducted by essentially the same department, which was then housed in the Ministry of Trade and Industry Division of Industry.

The following is the list of original sources used to compile the database:

[1] Ministry of Finance Department of Trade and Manufacturing of the Russian Empire. *Russian Factory Production: List of Factories and Plants* [Фабрично-заводская промышленность России: Перечень фабрик и заводов]. St. Petersburg: Tipografia E.A Efrona, 1897.

[2] Ministry of Finance of the Russian Empire. *List of Factories and Plants of European Russia* [Список фабрик и заводов Европейской России]. St. Petersburg: Tipografia Kirshbaum, 1903.

[3] Ministry of Trade and Industry of the Russian Empire, Industrial Division. *List of Factories and Plants of the Russian Empire.* [Список фабрик и заводов Российской Империи]. V.E Varzar, ed. St. Petersburg: Tipografia Kirshbaum, 1912.

[4] Ministry of Finance of the Russian Empire. Statistical Results on Factories and Plants by Industries Not Subject to the Excise Tax for 1900. [Статистические сведения о фабриках и заводах по производствам необложенным акцизом за 1900 год.] V.E. Varzar, ed. St. Petersburg: Tipografia Kirshbaum, 1903.

[5] Ministry of Trade and Industry of the Russian Empire, Industrial Division. Statistical Results on Factory Production in the Russian Empire for 1908. [Статистические сведения по обрабатывающей фабрично-заводской промышленности Российской Империи за 1908 год]. V.E. Varzar, ed. St. Petersburg: Tipografia Kirshbaum, 1912.

[6] Archive: Russian State Historical Archive [Российский государственный исторический архив] (Abbreviated RGIA). St Petersburg, Russia.

1.2 Coverage

The 1894 census volume describes factories in every industry in the entire Russian Empire. The census included establishments that had factory tools or at least fifteen employees.[1] "Factory tools" did not necessarily mean large machines; there are many factories with fewer than fifteen employees and no listed machines in the census volume. The census only covered industrial factories; mines, farms, and oil refineries were excluded.[2]

Generally, the census's authors wanted the survey to include only true factories, not small workshops. The census's scope suits the purposes of this project, since only potential corporations are included. A small shoe repair booth, for example, would not be included in the census, nor would it consider becoming a corporation.

The 1900 census volumes describe factories in the sixty-eight provinces of European Russia and excludes farms, mines, oil refineries, and factories subject to the excise tax. The excise tax was levied on factories in certain industries, mostly alcoholic beverages.[3] Similarly to the 1894 census, factories with fewer than 15 workers that did not use mechanical motors or had a general "handicraft character" were excluded.[4]

[1] "Questionnaires should be drawn up for all establishments that have at least fifteen workers, as well as those who, with fewer than fifteen workers, have a steam boiler, steam engine, or other mechanical engines and machines or factory or manufactory devices." Author's translation. RGIA F. 20 O. 12 D. 164 L.90.

[2] The 1850-1880 U.S. Census of Manufacturers used a cutoff based on output. The census excluded factories or workshops with less than $500 annual output, including the cost of materials (Atack and Bateman 1999). The 1900 U.S. Census of Manufacturers excluded hand trades similarly to the Russian censuses: "no hand trades were to be canvassed which were not carried on in a shop of some character" (Census of Manufactures, xxxix).

[3] Table 6 shows counts of the number of factories subject to the excise tax, and hence exempted from the 1900 census, by industry.

[4] Those operations "...not recognized as factories, usually included establishments: having fewer than fifteen workers (manual), not making use of mechanical engines, carrying a pronounced "shop character" (bakeries, [whites tailors], shoemakers, tailors, workshops, etc.), or the character of small agricultural and artisan establishments." Author's translation. 1900 Statitischeskiie Svedeniia, Page I-II.

The 1908 census volumes describe factories from all manufacturing industries in the entire Russian Empire. Like the 1894 and 1900 volumes, however, the census excludes small handicraft and agricultural enterprises.[5]

1.3 Variables Listed in Each Volume

The Russian Ministry of Finance published a factory-level volume for 1894 that lists for each factory a description of what the factory produced; the factory's name and street address; total value of production in rubles; values of each kind of fuel; type, number, and horsepower of machines; number of adult, adolescent, and younger men and women; and number of working days per year.

The 1900 and 1908 censuses, on the other hand, have factory-level volumes which list a few variables for each individual factory but also have aggregate volumes that list a large number of variables by finely-defined industries and by province. The 1900 factory-level volume lists each factory's name, street address, industry, total value of production, and total number of workers; the 1908 volume also lists types and total horsepower of machines.

The 1900 and 1908 aggregate volumes list almost fifty variables for province-industry groups of factories. The volumes list total revenue, number of workers by age and gender, total value of fuels, number and power of machines, and expenditures such as the the total value of materials, total wage bill, taxes, insurance, and machine maintenance.

[5]This census included factories subject to the excise tax, oil refineries, and smelting as well as factories in Siberia and the Caucasus, but I excluded these categories from data collection for consistency.

1.4 Additional Variables from Supporting Sources

The published factory level volumes only list total revenue, but value added (revenue minus materials) is a more standard measure of production. The total value of materials, as well as some additional information on the labor input, can be collected from a few supporting sources. The Russian State Historical Archive holds approximately fifteen hundred of the original completed factory questionnaires, from which I collect total value of materials and working hours.[6] The Imperial government also published aggregate volumes at the province-industry level for the 1900 and 1908 factory censuses. From the aggregate volumes, I collect total value of materials. I use this information in the additional robustness checks described in Table A10.

1.5 Definition of an Establishment

The enumerators listed two factories owned by the same firm separately if there was a significant difference between the establishments, for example they were located in different parts of the city or performed different parts of the production process in each establishment. The introductions to these census volumes do not indicate a systematic rule used by the enumerators to decide the boundaries of a factory.

Factories with similar names have different listings when two factories' owners share the same last name but not first names, often because they are descendants of the same

[6]The archive holds manuscripts for almost every factory in certain province industry groups and no manuscripts at all for most province industry groups, which suggests that the archivists chose to keep manuscripts only for certain industries and locations. The archive holds no manuscripts for the 1900 or 1908 censuses.

entrepreneur. Two factories may share the same firm name if they are located close to one another but are located in separate buildings that perform distinct activities.

1.6 Matching Factories Across Years

The database also contains identifiers that match factories across time. Every factory in the 1894 factory list is matched to factories in the 1900 factory list, and factories in 1908 factory list are matched back to the 1900 list.

A factory is a definite match to another factory if it has the same name, is located in the same place, has the same founding date, and produces the same product. When any of these matching criteria is not satisfied but the factories are still a likely match, I encode the deviation in a dummy variable. It is possible to perform robustness checks, then, by the degree of certainty about the match.

1.7 The Enterprise Form Menu

Table A1 summarizes Imperial Russia's enterprise form menu, as described in Section I of the main text.

2 A Simple Model of the Decision to Incorporation

Consider the following simple model of a firm's incorporation decision.[7] Suppose there are two kinds of firms: corporations (subscript C) and non-corporations ("partnerships," subscript P). Firms are price-takers in the price of output p, the cost of labor w, and

[7]Many of the implications would be similar in a model adapting Melitz (2003), in which firms pay a fixed cost to access additional input markets rather than paying a fixed cost to access export markets.

the cost of capital (r_c or r_p). Corporations have a lower cost of capital than partnerships ($r_c < r_p$), but partnerships can only become corporations by paying a fixed cost T. Profits for corporations and partnerships are thus given by:

$$\pi_c = pQ(A, L_c, K_c) - wL_c - r_cK_c - T \text{ [1]}$$

$$\pi_p = pQ(A, L_p, K_p) - wL_p - r_pK_p \text{ [2]}$$

A firm chooses to be a corporation if $\pi_c > \pi_p$. Suppose that the quantity of output is given by $Q = AF(L, K) = AL^{\alpha}K^{\beta} = AL^{7/10}K^{2/10}$, and set $p = 1$.[8] To find a firm's optimal use of labor and capital, take first order conditions, which yields two equations in two unknowns.

$$.7AL^{-.3}K^{.2} = w$$

$$.3AK^{-.8}L^{.7} = r$$

Solving for L and K, we obtain:

$$L = \left[A\left(\frac{\beta}{r}\right)^{1-a}\left(\frac{\alpha}{w}\right)^{\alpha}\right]^{\frac{1}{1-\alpha-\beta}} = \left[A\left(\frac{2/10}{r}\right)^{3/10}\left(\frac{7/10}{w}\right)^{7/10}\right]^{10}$$

$$K = \left[A\left(\frac{\alpha}{w}\right)^{1-\beta}\left(\frac{\beta}{r}\right)^{\beta}\right]^{\frac{1}{1-\alpha-\beta}} = \left[A\left(\frac{7/10}{w}\right)^{8/10}\left(\frac{2/10}{r}\right)^{2/10}\right]^{10}$$

Thus we have $Q = A^{10}\left(\frac{7/10}{w}\right)^{7}\left(\frac{2/10}{r}\right)^{2}$. Notice that, since $r_c < r_p$, corporations tend to use more of both inputs and produce more output. Also, since $\frac{K}{L} = \frac{\beta w}{\alpha r}$, corporations will use relatively more capital per unit of labor than non-corporations.

[8] I use these values for α and β because they are approximately equal to the coefficients on log labor and capital in an OLS log Cobb-Douglas production function, including controls for a factory's legal form of organization.

Next, we solve the expression $\pi_c > \pi_p$ for the fixed cost T to determine the characteristics of firms that should obtain an Imperial concession. We have: $T \leq [Q_p(A, L_p, K_p) - Q_C(A, L_c, K_c)] - (wL_p - wL_c) - (r_cK_c - r_pK_p)$

Plugging in the expressions above, I find that:

$$Q_c - Q_p = A^{10}\left(\frac{7/10}{w}\right)^7\left[\left(\frac{2/10}{r_c}\right)^2 - \left(\frac{2/10}{r_p}\right)^2\right] = A^{10}\left(\frac{7/10}{w}\right)^7(2/10)^2\left[\frac{r_p^2 - r_c^2}{r_p^2 r_c^2}\right]$$

$$L_c - L_p = A^{10}\left(\frac{7/10}{w}\right)^8\left[\left(\frac{2/10}{r_c}\right)^2 - \left(\frac{2/10}{r_p}\right)^2\right] = A^{10}\left(\frac{7/10}{w}\right)^8(2/10)^2\left[\frac{r_p^2 - r_c^2}{r_p^2 r_c^2}\right]$$

$$r_cK_c - r_pK_p = A^{10}\left(\frac{7/10}{w}\right)^7\left(\frac{2}{10}\right)^3\left[\frac{r_p^2 - r_c^2}{r_p^2 r_c^2}\right]$$

Thus, putting all of the pieces together, we have:

$$T \leq A^{10}\left[\frac{r_p^2 - r_c^2}{r_p^2 r_c^2}\right]\left\{\left(\frac{7/10}{w}\right)^7\left(\frac{2}{10}\right)^2 + w\left(\frac{7/10}{w}\right)^8\left(\frac{2}{10}\right)^2 + \left(\frac{7/10}{w}\right)^7\left(\frac{2}{10}\right)^3\right\} = \left(\frac{19}{10}\right)\left(\frac{2}{10}\right)^2 A^{10}\left(\frac{7/10}{w}\right)^7\left[\frac{r_p^2 - r_c^2}{r_p^2 r_c^2}\right]$$

The fixed costs that firms are wiling to pay to incorporate increase in productivity A and in corporations' capital cost advantage $r_p - r_c$. Finally, notice that the 2/10 is β, the weight on capital. Elsewhere, β appears in the denominator of powers with a negative sign. Thus, the fixed cost firms are willing to pay in increasing in β.

3 Maps: Russian Corporations' Geographic Concentration

While entrepreneurs founded corporations in even the most remote parts of the Russian Empire, Figures A1 and A2 show how corporations' number and concentration varied by

province.[9] The Empire's industrial center (including Moscow and Vladimir Provinces), St. Petersburg Province, and parts of Poland had both the highest numbers and highest concentrations of corporations. Corporations also owned large numbers of industrial enterprises in the Baku oil region (Bakinskaia Province).

4 Additional Estimates and Robustness Checks

4.1 Differences Across Industries: Additional Dimensions

4.1.1 Incorporation Rates by Industry

Table A2 breaks down the counts of incorporations by industry included in the Ruscorp Database (Owen 1989) by three periods: the entire history of incorporation in Russia (1700 to 1914), the period of most intense corporation formation (1980 to 1914), and the period of interest for this article (1894 to 1908). In all three periods, the manufacturing sector attracted the most incorporations, followed by transportation, financing, mining, and wholesale. Within manufacturing, I further classify incorporations into the industry classification present in the factory data. Between 1894 and 1908 the metals, foods, textiles, and chemicals industries attracted the most incorporations, which somewhat explains the prevalence of these industries in the factory data.

4.1.2 Capital Intensity by Industry

Table A3 lists each industry's average number of workers per factory, average total horsepower of machines in each factory, and average power per worker in each factory. The

[9] I am grateful to Andre Zerger for sharing GIS maps of the Russian Empire.

cotton, flax, metals and machines, wool, and chemicals industries required the most capital per factory, though these industries' factories also tended to include large numbers of workers in production. The most capital-intensive factories in terms of capital per worker were the foods, wood, chemicals, paper, cotton, and wool industries though the foods and wood industries appear more capital-intensive by this measure because those factories tended to be exceptionally small in terms of number of workers. Throughout the paper, I speak of the cotton, metals, and chemicals industries as highly capital-intensive because they appear capital-intensive in terms of total capital or capital per worker and because of how these industries are described in the historical record.

4.1.3 Descriptive Statistics: Cotton Industry

Cotton production in Imperial Russia was capital-intensive, which made incorporation particularly vital for firm expansion. The cotton industry had the largest proportion of corporation-owned factories. Table A4 reports that corporation-owned cotton factories had greater revenue, workers, total machine power, and revenue per worker than non-corporation-owned factories and that these differences are statistically significant (the smallest t-score from a two-group mean comparison test for any of these variables is 4.4313). Significantly, in the cotton industry, corporations had more machine power per worker than non-corporations in a comparison of unconditional means: the use of machine power varied greatly across industries.

4.1.4 Additional Regressions with Industry, Region, and Year Interactions

Table A5 presents OLS estimates of log revenue per worker or log power per worker differences between corporation-owned factories and non-corporate factories, including some additional interactions between form and industry (Columns 1 and 3) and between form and region (Columns 2 and 4). Because these interactions may only consider a small number of corporations per cell, the estimates tend to be noisy, but some interesting differences emerge. For example, Columns 1 and 2 show that incorporation seems to imply the smallest revenue per worker differences in the flax and wood industry (and, oddly, metals and machines in Column 1), though all differences are estimated with a great deal of noise. Columns 3 and 4 demonstrate that, in the foods and woods industry, incorporation implied the smallest differences in log machine power per worker. Columns 2 and 4 include region interactions, which show that the Northwestern region, which was relatively sparsely populated, implied the smallest differences between corporations and non-corporations in terms of revenue per worker, while those regions most developed industrially (Central Blacksoil, Central Industrial, Prebaltic, and Previslitskii) implied the largest differences between corporations and non-corporations in machine power per worker.

4.2 Incorporation in a Production Function Context

4.2.1 Log Cobb-Douglas Production Function Estimates

The paper shows that Russian corporations had more revenue per worker and more power per worker than unincorporated factories. Furthermore, while productivity in the form of

revenue per worker motivated selection into incorporation, incorporation allowed factories to add more physical capital, which led to further gains in labor productivity.

The production functions shown in Table A6 present evidence that much of the increase in productivity that firms experience after incorporating comes through the addition of physical capital. The OLS regression in Column 1 presents the log Cobb-Douglas production function generating the residuals used as TFP in the main text. The OLS regressions in Columns 2 through 5 include controls for each factory's location, industry, and year of observation and use standard errors clustered by region-industry-year groups. Columns 2 and 3 present estimates of the production function without including controls for a factory's enterprise form. Column 4 regresses a factory's total revenue on its number of workers, enterprise form, and controls. The coefficient on the Corporation dummy is large, positive, and statistically significant. The coefficient is slightly smaller in size in Column 5, which includes factories' total machine power. The coefficient on log machine power in Column 5 is also much smaller than it was in Column 3, reflecting the strong relationship between incorporation and capital intensity.

In Column 6, I instrument for a factory's inputs using lagged inputs. In these regressions, labor share becomes smaller and the capital share much larger than under OLS. When inputs are endogenous, we expect the capital share to be small under OLS, since factories adjust capital so much more slowly than they adjust labor. However, the difference in this case is larger than seems reasonable, and the coefficient on machine power has even become negative, perhaps because the instruments are weak. The coefficient on the dummy variable for whether a factory is owned by a corporation in Column 6, however, has become negative, which may also be the result of weak instruments or may further support the result in the

main text that incorporation has a negative effect on total factor productivity (and hence revenue, when controlling for inputs).

Table A9 and Figure A3 show residuals from Columns 2 and 4 of Table A6. Residuals of the production function measure each factory's total factor productivity. Table A9 shows that corporation-owned factories had higher average total factor productivity than their non-corporate peers (Row Group 1), unless the regression controls for factories' total machine power (Row Group 2). Figure A3 shows the same pattern. The residuals from Column 2 of Table A6 show great differences between corporations and non-corporations. The distribution of residuals for corporations is shifted to the right and does not include much of the long lower tail of unproductive factories that characterizes the non-corporate factories' distribution. The residuals from Column 4, however, show much smaller differences between corporations and non-corporations, though corporations' distribution still has a less pronounced lower tail. Thus, again, much of the difference in productivity between corporations and non-corporations is due to the fact that corporations have more total machine power.

4.2.2 Production Function Sensitivity to the Inclusion of Small Factories

Table A7 shows how the log Cobb-Douglas production function estimates change when the smallest factories are excluded from the regression. Estimates change because there are very few corporations that have a small number of employees. Recall from Table A6 that the coefficient on the Corporation dummy becomes slightly smaller in a regression that includes all factories and controls for labor and capital inputs. However, as small factories are excluded, the coefficient becomes larger and maintains statistical significance. In all but

Column 5, however, the coefficient on Corporation is still smaller than it was in regressions excluding machine power. As Table A7 reports, factories with fewer than 15 employees show considerable production function differences. The Corporation coefficient here is positive because firms with higher total factor productivity were more likely to choose to incorporate.

4.2.3 Translog Production Functions

Table A8 considers a more flexible production function form, the translog Cobb-Douglas production function, which allows for interactions among the labor and capital measures. The translog production function in this setting is given by:

$$log(Revenue_{ijk}) = \alpha + \beta_L log(Workers) + \beta_K log(Power) + \beta_{LL} log(Workers)^2$$

$$+\beta_{KK} log(Power)^2 + \beta_{LK} log(Workers) log(Power) + \epsilon$$

Table A8 presents results from estimating this translog form of the production function. Columns 1 and 2 present estimates of the translog form without including a dummy variable for whether the factory is owned by a corporation or not.

Beginning in Column 3 of Table A8, I include a dummy variable for whether a factory is owned by a corporation. In general, the coefficient is positive and statistically significant. Significance is lost in Column 4 when I include an interaction term for whether a factory is corporation-owned and the number of workers and total machine power.

Figure A3 shows kernel density estimates for the residuals of Columns 1 and 2 for factories owned by corporations and factories owned by other kinds of firms. As in the regressions using the Cobb-Douglas form, the difference is more pronounced without controls for total machine power. For both sets of distributions, the p-value of a Kolmogorov-Smirnov test comparing

distributions for corporation-owned factories and non-corporation-owned factories is approximately zero. The cumulative distributions make the differences between corporation-owned factories and other factories even more apparent.

Table A9, row groups [3] and [4] show summary statistics for these residuals. Row group [3] shows the statistics for residuals from Column 1 of Table A8, and row group [4] shows the statistics for the residuals for Column 2 of Table A8. (Provided for comparison, row groups [1] and [2] come from the residuals of Columns 2 and 4 of Table A4). A two-group mean comparison test for the first set of residuals (row group [3]) has a t-score with an absolute value of 15.8192. The t-score of the second set of residuals (row group [4]) is much smaller, though the difference in means is still statistically significant (the t-score is 5.5223). Thus, when a translog specification is used, though much of the difference in the residuals between corporation-owned factories and non-corporation-owned factories comes through machine power, a significant difference still remains.

4.2.4 Value Added Production Functions

This paper's estimates of the relationship between corporate ownership and productivity have assumed the following underlying model:

$$r_{ijt}/l_{ijt} = \beta^c Corp_{ijt} + \epsilon_{ij}$$

In terms of value-added, then, I have estimated:

$$r_{ijt}/l_{ijt} = (m_{ijt} + va_{ijt})/l_{ijt} = \beta^c Corp_{ijt} + \epsilon_{ij}.$$

Here, va_{ijt} is value-added and m_{ijt} is the total value of materials. Let m_{ijt}^C denote the total value of materials for corporation-owned factories and m_{ijt}^{NC} denote the total value

of materials for other kinds of factories. If I find $m_{ijt}^{C} > m_{ijt}^{NC}$, then revenue is higher for corporations than for non-corporations with the same value-added. In this case estimation using revenue alone overstates the performance of factories owned by corporations relative to other kinds of factories in terms of value added. If, on the other hand, we have $m_{ijt}^{C} < m_{ijt}^{NC}$, I understate corporations' performance.

Data on total value of materials are known at the enterprise-level for a subset of the factories in the 1894 census. The Russian State Historical archive holds approximately 1,500 census manuscripts for the 1894 census. It appears that they selected to keep manuscripts from certain industries and certain provinces. In the sample of about 250 factories currently matched and entered, Moscow province and the cotton industry are overrepresented. Results using the 1894 manuscripts data suffer from some selection bias.

Aggregate volumes for the 1900 and 1908 census also describe factories' total value of materials at the province and industry level. I run regressions on the aggregate measures from the 1900 aggregate volume.

Using the available data on materials, it is possible to estimate regressions that use value added per worker as the dependent variable on a selected sample of the factories in the 1894 census and on the aggregate data for 1900 and 1908. In Table A10, I present regressions for the 1894 factories with manuscripts and for the 1900 aggregate data. These regressions largely confirm the patterns seen in the paper, and some coefficients are even larger. The larger coefficients seen in the 1894 micro data may be entirely due to sample selection bias in the manuscript records.

4.3 Main Performance Regressions: Additional Sensitivity Analysis

4.3.1 FE and IV Regressions: Additional Specifications

Table A11 presents additional versions of the fixed effects and instrumental variables regressions presented in the main text, which attempt to distinguish differences due to selection into the corporate form from the effects of incorporation on a firm's methods of production and performance. Columns 1 through 3 in this table differ from those presented in the main text in the treatment of time trends. The regression in the text include time fixed effects and time-form interactions. The regressions in Table A11 include a single linear time trend and an interaction between that time trend and enterprise form. Due to the short panel, these specifications are very similar, and in fact it is not possible to include both time fixed effects and a single time trend. The results presented here in columns 1-3 are very similar to those presented in the main text, though the coefficient on Corporation for the TFP regression is now small and positive, and with robust standard errors it is possible to reject the null hypothesis that the slope is zero at the ten percent significance level.

The main text reports results from two-stage least-squares regressions with included Herfindahl index controls. The results presented in Table A11 differ in two ways: first, these regressions do not include Herfindahl index controls, and second, I report an estimate in column 5 that only includes observations with positive (and nonmissing) values for machine power, to show that the result for revenue per worker is the same when estimated using the same sample as the regressions for power per worker and tfp. All results are remarkably similar to those presented in the text.

4.3.2 Calculating Productivity by Imposing Shares

All production functions estimated so far in the paper have a rather large labor coefficient relative to the size of the capital coefficient. Log Cobb-Douglas production function estimates typically find labor coefficients of approximately .7 and capital coefficients of about .3. Here I calculate productivity by imposing these shares in a Cobb-Douglas production function and estimating total factor productivity as:

$$TFP_{ijk} = log(Revenue_{ijk}) - .7log(Workers_{ijk)}) - .3log(Power_{ijk})$$

In Table A12, I show estimates in which I regress this measure of total factor productivity on similar variables as I did previously. Column 1 regresses total factor productivity on a dummy variable for corporation-owned factories alone. The coefficient is positive and statistically significant at the .001 level. In the second column, the coefficient on *Corp* is statistically significant when I control for industry, year, and province.

4.3.3 Quantile Regressions

Corporation-owned factories tended to be more productive and more capital-intensive than non-corporation-owned factories. Whether a factory was owned by a corporation, however, might be most relevant at higher or lower quantiles of log revenue per worker or log power per worker. Quantile regressions presented in Table A13 show that incorporation is most relevant at the lower quantiles of revenue per worker, perhaps because revenue per worker tends to level off as factories become larger. On the other hand, incorporation is more relevant at higher quantiles of power per worker. Incorporation was critical for factories wishing to attain the highest levels of capital intensity.

4.3.4 Additional Corporation Type Comparisons

Section IV.F presents results that compare Russia's two corporation types: A-corporations and share partnerships. This section reexamines these corporation types to determine whether one type seems to drive the paper's main regression results. Table A14 presents additional regressions that include the full sample of non-corporations but include only corporations of one type (A-corporations or share partnerships). Columns 1-4 demonstrate similar results to those shown in the main text, which suggests that the original results are not particularly driven by one corporation type. However, the results presented in Columns 5-8, which include factory fixed effects, show that factories that switch form to become A-corporations appear to add more revenue and horsepower per worker, while factories that became share partnerships experienced much noisier changes. These results should be interpreted with great caution, however, since the number of switchers in each corporation type is very small.

4.3.5 Controlling for Factories per Firm

In the paper I consider each factory as an independent observation. However, factories belonged to firms; and some firms owned more than one factory. Corporations commonly owned more than one factory. Ignoring the correlation among the factories owned by the same corporation could introduce an upward bias in the coefficient on the corporation dummy variable. I find, however, that I understate differences between corporations and non-corporations by omitting controls for the number of factories each firm owns.

Matching partnership or single-proprietorship-owned factories to firms is difficult, because these factories take the name of the owner, and many of the names of these owners are common Russian surnames. However, since I have already matched corporations to the RUSCORP database to identify which factories are owned by corporations, I have already matched factories to firms for those factories that are corporation-owned. Controlling for the number of factories per firm in corporations, however, addresses the relevant bias.

Columns 1 and 2 of Table A15 show how controlling for firm size changes estimates of the determinants of revenue per worker and power per worker. In both regressions, the coefficient on factories per firm is approximately zero and statistically insignificant. Furthermore, introducing the control for the number of factories per firm increases the size of the Corporation coefficient. Thus, not controlling for the number of factories per firm actually understates the differences between corporations and non-corporations.[10]

4.3.6 Sensitivity to Including 1894 Putting-Out Workers and 1894 Taxed Industries

The 1894 database includes describes factory workers somewhat differently and includes factories not included in subsequent waves of the factory database. In particular, the 1900 and 1908 databases include workers outside the factory in their calculations of the total workforce, and these years exclude factories subject to the excise tax. Results presented in the main paper make no labor force adjustments but do exclude factories that had taxed activities. Table A16 shows that the paper's results are not very sensitive to these choices. Adding back putting-out workers only increases the differences between corporations and

[10]Clustering standard errors by corporation also does not change any of the results (not reported).

non-corporations, since corporations were more likely to operate with formal labor forces. Thus, excluding the 1894 putting out labor exaggerates the size of corporations' workforces. Columns 3 and 4 show that including taxed factories from 1894 makes almost no difference in the point estimate of the differences between corporations and non-corporations in log revenue per worker and log power per worker.

4.4 Growth and Survival

4.4.1 Median Regressions: Corporations Grew Faster

The model implies that corporations should grow faster because of the corporations' advantages in raising the long-term capital necessary for firm expansion. This section compares growth in revenue and machine power for corporations and non-corporations. Table A17 shows that the median percentage changes in revenue and power are higher for factories owned by corporations. Median regressions are appropriate due to the large number of very small factories that grow quickly relative to their small size by adding very small amounts of revenue or capital.[11]

4.4.2 Survival

Incorporation allowed firms to avoid the problem of untimely dissolution, because corporations existed outside the identities of their founders, unlike partnerships, which died if any partners decided to leave the firm.[12] Thus, differences between corporation-owned factories

[11]For example, a factory with one worker and one horse (and hence one horsepower) that adds one horse doubles its capital.

[12]See Guinnane et al (2007) for a discussion of the untimely dissolution problem

and other factories may simply reflect that these factories are more likely to survive long enough to be counted in more than one factory census.[13]

However, the data show that factories owned by corporations have very different characteristics from factories owned by similarly-lived non-corporation-owned factories. Figures A4 and A6 compare corporation-owned factories to non-corporation-owned factories. In Figure A4, I present kernel density estimates for revenue, number of workers, machine power, and revenue per worker for all factories that live one year, two years, and three years in the data; and I also plot the density for all corporations, regardless of lifespan. For all variables, the distribution for corporations is to the right of that of other factories, no matter how long they live. Thus, it is unlikely that the differences between corporation-owned factories and other factories shown in this paper is merely the result of differences in lifespan. This is confirmed by Figure A6, which shows differences between corporation-owned factories and other factories for each year of lifespan. Again, no matter how long the factories live, corporation-owned factories have higher revenues, more workers, more machine power, and greater revenue per worker.

Finally, Table A18 presents survival rates by enterprise form. In the factory-level panel, a firm can be observed in one, two, or all three waves of the database. Factories that appear in the 1894 data could be observed in one that year, in 1894 and 1900, or in all three years. The table's first column shows that 61.43 percent of non-corporations are only observed in 1894, compared to 21.87 percent of corporations. Meanwhile, 63.14 percent of corporations survive from 1894 to be counted as late as 1908, while only 23.59 percent of non-corporations

[13]Or, corporations are not more likely to survive but are just more conspicuous and hence counted in more than one census. I cannot distinguish between being counted because of survival or because of not being missed by enumerators.

survive that long. I also follow factories observed in 1900 forward to 1908. Of those non-corporations observed in 1900, 67.61 percent of factories are observed in 1908, while 79.94 percent of corporations are observed in both 1900 and 1908. Overall, therefore, corporations have much higher survival rates than non-corporations.

Tables

Table A1: Menu of Enterprise Forms in the Russian Empire

Form	Requirements for Establishment	Liability
Single Proprietorship	Registration	Unlimited Liability
Ordinary Partnership	Written Contract among Partners, Registration	Unlimited Liability for All Partners
Limited Partnership	Written Contract among Partners (usually with a description of investors), Registration	Unlimited Liability for All Partners, Limited Liability for Investors
Corporation	Special Permission: Law (Charter) Signed by the Tsar	Limited Liability for All Investors

Thomas Owen, *The Corporation under Russian Law*, *Polnoe Sobraniie Zakonov Rossiiskoi Imperii* [Complete Collection of Laws of the Russian Empire], *Svod Zakonov Rossiiskoi Imperii* [Code of Laws of the Russian Empire].

Table A2: Incorporations by Industry

Panel A: Incorporations by Industry, Overall

	1700-1914		1890-1914		1894-1908	
Industry	Number	Percent	Number	Percent	Number	Percent
Agriculture	55	1.21	29	0.87	15	0.79
Construction	87	1.92	69	2.06	19	1.00
Finance	345	7.60	180	5.37	69	3.62
Manufacturing	2,884	63.50	2,188	65.29	1,349	70.70
Mining	260	5.72	220	6.57	131	6.87
Not Classified	3	0.07	3	0.09	3	0.16
Retail	10	0.22	10	0.30	6	0.31
Services	106	2.33	88	2.63	50	2.62
Transportation	532	11.71	333	9.94	170	8.91
Wholesale	260	5.72	231	6.89	96	5.03
Total	4,542	100	3,351	100	1,908	100

Panel B: Incorporations by Industry within Manufacturing

	1700-1914		1890-1914		1894-1908	
Industry	Number	Percent	Number	Percent	Number	Percent
Animal Products	74	2.57	52	2.38	27	2.00
Chemicals	367	12.73	304	13.89	187	13.86
Foods	697	24.17	481	21.98	305	22.61
Metals and Machines	578	20.04	489	22.35	313	23.20
Minerals	228	7.91	200	9.14	128	9.49
Miscellaneous	57	1.98	45	2.06	27	2.00
Paper	215	7.45	173	7.91	95	7.04
Textiles	532	18.45	327	14.95	196	14.53
Wood	136	4.72	117	5.35	71	5.26
Totals	2,884	100	2,188	100	1,349	100

Source: RUSCORP Database, which is based on corporate charters accepted by the Russian Ministry of Finance.

Table A3: Average Capital Intensity by Industry

Industry	Average Number of Workers	Average Machine Power	Average Power per Worker
Animal	39.04	10.11	0.20
Chemicals	91.83	58.63	0.68
Cotton	569.71	401.99	0.56
Flax	208.47	106.02	0.27
Foods	26.15	40.54	2.88
Metals and Machines	125.55	68.61	0.40
Mineral Products	78.74	19.67	0.24
Mixed Materials	79.52	17.84	0.19
Paper	63.83	56.66	0.62
Silk	95.49	16.61	0.10
Wood	47.36	37.08	1.40
Wool	133.80	68.03	0.56
Total	98.39	61.60	1.12

Gregg Imperial Russian Factory Database.

Table A4: Descriptive Statistics for the Cotton Industry: All Factories, Corporate Factories, and Non-Corporate Factories

		n	Mean	Std. Dev	Median	Min	Max	|t|
Revenue:	All Est.	1,585	1,127,911.00	2,513,876.00	126,510.00	126.00	26,000,000.00	
	Non-Corporate	1,150	289,620.30	665,258.60	52,650.00	126.00	6,013,964.00	
	Corporate	435	3,344,084.00	3,886,964.00	2,039,195.00	1,400.00	26,000,000.00	25.685
Number of	All Est.	2,076	569.71	1,301.11	90.00	1.00	13,498.00	
Workers:	Non-Corporate	1,608	193.54	438.59	53.00	1.00	5,512.00	
	Corporate	468	1,862.18	2,167.66	1,125.50	12.00	13,498.00	28.9167
Revenue	All Est.	1,561	1,633.09	1,811.49	1,153.15	1.02	19,375.00	
per	Non-Corporate	1,127	1,466.34	1,779.92	949.15	1.02	19,375.00	
Worker	Corporate	434	2,066.11	1,823.08	1,511.09	6.33	13,233.48	5.9245
Total	All Est.	1,388	401.99	1,059.34	20.00	0.00	10,423.00	
Machine	Non-Corporate	1,083	95.29	305.63	6.00	0.00	3,330.00	
Power:	Corporate	305	1,491.03	1,806.25	925.00	0.00	10,423.00	24.2475
Machine	All Est.	1,347	0.56	1.03	0.35	0.00	24.00	
Power per	Non-Corporate	1,043	0.47	1.06	0.17	0.00	24.00	
Worker	Corporate	304	0.85	0.83	0.68	0.00	9.50	5.7297
Factory	All Est.	1,260	25.14	22.57	20.00	0.00	182.00	
Age (Years):	Non-Corporate	990	22.97	20.71	18.00	0.00	144.00	
	Corporate	270	33.10	26.95	28.50	0.00	182.00	6.6472

Note: Gregg Imperial Russian Factory Database. Corporation-owned factories are identified by matching to the RUSCORP Database. $|t|$ denotes the absolute value of t obtained from a two-group mean comparison test, where the groups are corporate and non-corporate factories.

Table A5: Regressions with Interactions

OLS Dep. Var:	Log Rev per Worker [1]	Log Rev per Worker [2]	Log Power per Worker [3]	Log Power per Worker [4]
Corporation	0.829***	0.932***	0.565**	-0.060
	(0.125)	(0.215)	(0.285)	(0.240)
Corporation *	-0.060	0.030	-0.225	-0.126
Chemicals	(0.168)	(0.144)	(0.327)	(0.247)
Corporation *	-0.174	-0.039	-0.275	-0.110
Cotton	(0.181)	(0.193)	(0.298)	(0.225)
Corporation *	-0.522***	-0.456***	0.103	0.170
Flax	(0.144)	(0.131)	(0.350)	(0.296)
Corporation *	0.102	0.216	-1.152***	-1.057***
Foods	(0.207)	(0.172)	(0.350)	(0.304)
Corporation *	-0.269*	-0.106	-0.143	-0.074
Metals/Machines	(0.139)	(0.129)	(0.298)	(0.221)
Corporation *	-0.236	-0.007	-0.036	0.112
Mineral Products	(0.145)	(0.141)	(0.328)	(0.271)
Corporation *	0.157	0.267	-0.052	0.092
Mixed Materials	(0.212)	(0.171)	(0.321)	(0.244)
Corporation *	-0.154	0.102	0.075	0.265
Paper	(0.136)	(0.131)	(0.347)	(0.273)
Corporation *	-0.095	-0.046	-0.824**	-0.701**
Silk	(0.182)	(0.268)	(0.404)	(0.347)
Corporation *	-0.452***	-0.152	-0.919***	-0.790***
Wood	(0.155)	(0.148)	(0.314)	(0.264)
Corporation *	-0.171	-0.027	-0.717**	-0.464*
Wool	(0.158)	(0.138)	(0.335)	(0.280)

Table Cont...				
Corporation *		-0.180		0.566***
Central Blacksoil		(0.214)		(0.174)
Corporation *		-0.063		0.398***
Central Industrial		(0.203)		(0.140)
Corporation *		-0.171		0.144
Eastern		(0.230)		(0.300)
Corporation *		-0.275		0.412
Northern		(0.224)		(0.280)
Corporation *		-0.828**		-0.261
Northwestern		(0.344)		(0.301)
Corporation *		-0.210		0.437***
Prebaltic		(0.203)		(0.153)
Corporation *		-0.271		0.433***
Previslitskii		(0.202)		(0.142)
Corporation *		-0.372*		0.209
Southern		(0.213)		(0.166)
Corporation *		-0.356		0.226
Southwestern		(0.276)		(0.199)
Corporation *		-0.228***		
1900		(0.082)		
Corporation*		-0.208**		0.200**
1908		(0.083)		(0.087)
Intercept	7.227***	7.341***	-1.537***	-1.046***
	(0.085)	(0.167)	(0.128)	(0.196)
Industry Controls	Yes	Yes	Yes	Yes
Prov, Year Controls	No	Yes	No	Yes
1900 Included?	Yes	Yes	No	No
Obs	35,177	35,177	17,716	17,716
R2	0.210	0.269	0.373	0.402

Source: 1894, 1900, and 1908 factory lists. Standard errors clustered by Region-Industry-Year groups in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.

Table A6: Production Function Estimation

Pooled OLS	Dependent Variable: Log Revenue					
						(IV)
	[1]	[2]	[3]	[4]	[5]	[6]
Log (Workers)	0.757***	1.100***	1.075***	0.905***	0.902***	0.874***
	(0.00731)	(0.0165)	(0.0186)	(0.0245)	(0.0255)	(0.0509)
Log (Machine Power)	0.365***			0.269***	0.266***	0.381***
	(0.00663)			(0.0229)	(0.0236)	(0.0485)
Corporation			0.363***		0.0722	-0.121**
			(0.0436)		(0.0506)	(0.0476)
Intercept	6.923***	7.109***	7.126***	7.467***	7.470***	6.977***
	(0.0225)	(0.204)	(0.198)	(0.250)	(0.250)	(0.174)
Industry, Year, Prov. Dummies	N	Y	Y	Y	Y	Y
1900 Included?	N	Y	N	N	N	N
N	15,435	35,177	35,177	15,435	15,435	9,353
R2	0.685	0.734	0.736	0.770	0.770	0.771

* p < .10, ** p < .05, *** p < .01. Standard errors in parentheses in Column 1. Standard errors, clustered by Region-Industry-Year groups, in parentheses for Columns 2 through 5. In Column 5, inputs are instrumented with lagged inputs: the instrument for logWorkers is the factory's logWorkers measured in the previous year, and the instrument or logPower is the factory's logPower in 1894. Robust standard errors in parentheses in column 6.

Table A7: Production Function Sensitivity to Inclusion of Small Factories

Pooled OLS					
	L > 5	L > 10	L > 15	L > 20	L > 50
	[1]	[2]	[3]	[4]	[5]
Log (Workers)	0.832***	0.812***	0.795***	0.791***	0.758***
	(0.0218)	(0.0238)	(0.0260)	(0.0292)	(0.0338)
Log (Machine Power)	0.280***	0.276***	0.270***	0.264***	0.258***
	(0.0242)	(0.0239)	(0.0243)	(0.0250)	(0.0216)
Corporation	0.150***	0.190***	0.220***	0.232***	0.278***
	(0.0396)	(0.0369)	(0.0360)	(0.0358)	(0.0341)
Intercept	7.781***	7.937***	8.085***	8.127***	8.376***
	(0.226)	(0.218)	(0.228)	(0.236)	(0.242)
Industry, Year, Prov. Dummies	Y	Y	Y	Y	Y
1900 Included?	N	N	N	N	N
N	14,112	12,407	10,855	9,529	5,428
R2	0.750	0.745	0.740	0.739	0.727

* p < .10, ** p < .05, *** p < .01. Standard errors, clustered by Region-Industry-Year groups, in parentheses.

Table A8: Production Function Estimation (Translog)

Pooled OLS	Dependent Variable: Log Revenue			
	[1]	[2]	[3]	[4]
Log (Workers)	1.173***	1.351***	1.365***	1.377***
	(0.0731)	(0.0652)	(0.0652)	(0.0647)
Log (Machine Power)		0.154***	0.163***	0.140***
		(0.0411)	(0.0407)	(0.0408)
Log (Workers)^2	-0.00974	-0.0423***	-0.0443***	-0.0482***
	(0.00868)	(0.0111)	(0.0111)	(0.0112)
Log (Machine Power)^2		0.0541***	0.0531***	0.0571***
		(0.00646)	(0.00658)	(0.00648)
Log (Power) * Log (Workers)		-0.0498***	-0.0523***	-0.0498***
		(0.0140)	(0.0140)	(0.0138)
Corporation			0.205***	0.196
			(0.0298)	(0.169)
Corp. * Log (Workers)				0.110***
				(0.0410)
Corp. * Log (Power)				-0.124***
				(0.0311)
Intercept	7.015***	6.838***	6.797***	6.806***
	(0.232)	(0.218)	(0.214)	(0.220)
Reg., Ind., Prov. Controls	Yes	Yes	Yes	Yes
1900 Included?	Yes	No	No	No
N	35,177	15,435	15,435	15,435
R2	0.734	0.778	0.779	0.779

* p < .10, ** p < .05, *** p < .01. Source: 1894, 1900, and 1908 factory lists. Standard errors clustered by Region-Industry-Year groups in parentheses.

Table A9: Summary Statistics for Residuals

		Corp.-Owned Factories	Non-Corp.-Owned Factories	Specification: Controls Included	Years Included
[1]	Mean	0.274	-0.019	Labor	1894,
	Std. Dev	0.845	0.955		1900,
	Median	0.270	0.0044		1908
	Smallest	-5.451	-16.096		
	Largest	4.581	6.212		
	N	2,288	32,890		
	|t|	14.2806			
[2]	Mean	0.050	-0.005	Labor, Capital	1894,
	Std. Dev	0.795	0.918		1908
	Median	0.045	0.054		
	Smallest	-5.492	-7.008		
	Largest	3.110	5.883		
	N	1,310	14,125		
	|t|	2.0798			
[3]	Mean	0.303	-0.021	Labor, Labor^2	1894,
	Std. Dev	0.840	0.955		1900,
	Median	0.303	0.002		1908
	Smallest	-5.472	-15.770		
	Largest	4.572	6.244		
	N	2,288	32,890		
	|t|	15.8192			
[4]	Mean	0.130	-0.012	Labor, Capital	1894,
	Std. Dev	0.776	0.901	Labor^2, Capital^2,	1908
	Median	0.161	0.051	Labor*Capital	
	Smallest	-5.779	-7.142		
	Largest	3.094	6.209		
	N	1,310	14,125		
	|t|	5.5223			

|t| comes from a two-group mean comparison test.

Table A10: Value Added per Worker

OLS	Dependent Variable: Log ((Revenue - Value of Materials)/Total Workers)			
	1894	1894	1900	1900
	Micro	Micro: Cotton	Agg	Agg: Cotton
	[1]	[2]	[3]	[4]
Corporation	0.488***	0.913***	0.592***	0.872***
	(0.188)	(0.225)	(0.0421)	(0.156)
Intercept	7.641***	5.456***	6.669***	7.129***
	(0.332)	(0.299)	(0.134)	(0.156)
Industry Controls	Y	N	Y	N
Province Controls	Y	Y	Y	Y
N	1,051	112	7,152	313
R2	0.252	0.080	0.238	0.304

Sources for Columns 1 through 4 are the 1894 factory list and 1894 archival manuscripts. The source for Columns 5 through 8 is the 1900 Aggregate volume. For the columns using the aggregate data, all values are per establishment, and "Corporation" is the proportion of enterprises in that cell that are owned by corporations. Robust standard errors in parentheses. * p < .10, ** p < .05, *** p < .01.

Table A11: FE and IV Regressions

	FE: Single Linear Time Trend			IV: 2nd Stage (No Herfindahl Index Controls)			
				$HP > 0$			
Dep. Var.:	log(R/L)	log(HP/L)	TFP	log(R/L)	log(R/L)	log(HP/L)	TFP
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Corporation	0.17**	-0.08	0.19*	0.38	0.02	3.17**	-1.37
	[0.07]	[0.11]	[0.10]	[0.89]	[0.64]	[1.29]	[0.65]
	(0.07)	(0.13)	(0.12)	(5.26)	(3.85)	(3.71)	(3.24)
Intercept	6.70***	-0.65***	-0.12**	7.24***	7.30***	-1.64***	0.60***
	[0.01]	[0.02]	[0.02]	[0.02]	[0.04]	[0.06]	[0.038]
	(0.04)	(0.04)	(0.05)	(0.14)	(0.22)	(0.18)	(0.17)
Regional Form				.0049***	0.015***	0.0097***	0.015***
Differences IV				[.00090]	[0.0024]	[0.0025]	[0.0024]
				(0.002)	(0.0048)	(0.0043)	(0.0048)
F-Stat:				29.7171	37.3049	14.4022	37.3049
Prov., Ind. Ctrls	No	No	No	Industry Only			
Year Ctrls	No	No	No	Yes	No	Yes	Yes
Year Trend	Yes	Yes	Yes	No	No	No	No
1900 Included?	Yes	No	No	Yes	No	No	No
Factory F.E.	Yes	Yes	Yes	No	No	No	No
N	34,800	17,457	15,232	35,168	15,431	15,486	15,431
N Corps	2,246	1,329	1,277	2,287	1,309	1,364	1,309
R2	0.03	0.05	0.01	0.2062	0.1900	0.0000	0.0000

Imperial Russian Factory Database. * p < .10, ** p < .05, *** p < .01 Robust standard errors in parentheses. Standard errors clustered by region-industry-year groups in brackets. Stars here refer to the robust standard errors. L (Workers) denotes the total number of workers the factory, HP (Power) denotes the total horsepower of machines in the factory, and R (Revenue) is the total value of output produced by the factory in that year, measured in Rubles. The R2 value in Column 7 is negative, which does not carry much meaning (see Wooldridge 2013 p. 523).

Table A12: Determinants of TFP (Calculated by Imposing Shares)

Pooled OLS	Dependent Variable: Log (TFP)	
	[1]	[2]
Corporation	0.372***	0.335***
	(0.0502)	(0.0333)
Intercept	7.290***	8.189***
	(0.0669)	(0.198)
Ind., Year, Prov. Dummies	N	Y
1900 Included?	N	N
N	15,435	15,435
R2	0.009	0.251

* p < .10, ** p < .05, *** p < .01. Source: 1894, 1900, and 1908 factory lists. Standard errors clustered by Region-Industry-Year groups in parentheses.

Table A13: Quantile Regressions

Dep Var:	log Rev / L	log HP /L	log Rev / L	log HP /L
	Quantile: .25	Q: .25	Q:. 75	Q: .75
	[1]	[2]	[3]	[4]
Corporation	0.719***	0.161***	0.475***	0.192***
	(0.0305)	(0.0437)	(0.0249)	(0.0402)
Intercept	6.397***	-2.398***	7.726***	-1.099***
	(0.0348)	(0.0599)	(0.0284)	(0.0551)
Ind., Year, Dummies	Y	Y	Y	Y
1900 Included?	Y	N	Y	N
N	35,178	17,716	35,178	17,716
Pseudo R2	0.1107	0.2150	0.2209	0.2551

* p < .10, ** p < .05, *** p < .01. Standard errors in parentheses.

Table A14: Additional Results Comparing Corporation Types

	Pooled OLS				Panel F.E.			
	A-Corporations		Share Partnerships		A-Corporations		Share Partnerships	
Dep. Var.:	log(R/L)	log(HP/L)	log(R/L)	log(HP/L)	log(R/L)	log(HP/L)	log(R/L)	log(HP/L)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Corporation	0.47***	0.29***	0.51***	0.23***	0.32***	0.51***	0.09	0.12
	(0.03)	(0.08)	(0.05)	(0.06)	(0.05)	(0.09)	(0.06)	(0.13)
Intercept	7.45***	-1.97***	7.37***	-2.06***	6.91***	-0.42***	6.91***	-0.42***
	(0.20)	(0.31)	(0.19)	(0.35)	(0.00)	(0.00)	(0.00)	(0.01)
Prov., Ind. Ctrls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Ctrls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1900 Incl?	Yes	No	Yes	No	Yes	No	Yes	No
Factory F.E.	No	No	No	No	Yes	Yes	Yes	Yes
N	33,890	16,922	34,176	17,145	33,542	16,689	33,812	16,896
N Corps	1,000	570	1,287	794	988	561	1,258	768
N Switchers	x	x	x	x	422	206	422	206
R2	0.32	0.43	0.32	0.44	0.00	0.01	0.00	0.00

Imperial Russian Factory Database. * p < .10, ** p < .05, *** p < .01 Standard errors, clustered by Region-Industry-Year groups, in parentheses (for f.e. regressions industry-region groups, where region is fixed from the first year of observation). L (Workers) denotes the total number of workers the factory, HP (Power) denotes the total horsepower of machines in the factory, and R (Revenue) is the total value of output produced by the factory in that year, measured in Rubles.

Table A15: Revenue per Worker and Power per Worker Controlling for Factories per Firm

	Pooled OLS	
Dependent Variable:	log (R/L)	log (HP/L)
	[1]	[2]
Corporation	0.50***	0.25***
	(0.03)	(0.05)
Factories	-0.00	0.00
per Firm	(0.00)	(0.00)
Intercept	7.37***	-2.07***
	(0.18)	(0.35)
Ind., Year, Prov. Dummies	YES	YES
1900 Included?	YES	NO
N	35,177	17,716
N Corps	2,288	1,365
R2	0.32	0.43

Imperial Russian Factory Database. * p < .10, ** p < .05, *** p < .01 Standard errors, clustered by Region-Industry-Year groups, in parentheses. L (Workers) denotes the total number of workers the factory, HP (Power) denotes the total horsepower of machines in the factory, and R (Revenue) is the total value of output produced by the factory in that year, measured in Rubles.

Table A16: Regressions Dealing with Peculiarities from 1894: Revenue per Worker and Power per Worker Including 1894 Putting Out Labor and Including Taxed Activities

Pooled OLS				
	With Putting-Out Labor in 1894		With 1894 Taxed Activities	
Dependent Variable:	log (R/L)	log (HP/L)	log (R/L)	log (HP/L)
	[1]	[2]	[3]	[4]
Corporation	0.52***	0.26***	0.47***	0.15**
	(0.04)	(0.05)	(0.04)	(0.07)
Intercept	7.31***	-2.13***	7.40***	-2.04***
	(0.19)	(0.35)	(0.18)	(0.34)
Ind., Year, Prov. Dummies	YES	YES	YES	YES
1900 Included?	YES	NO	YES	NO
N	35,177	17,716	38,145	20,161
N Corps	2,288	1,365	2,414	1,490
R2	0.33	0.43	0.32	0.35

Imperial Russian Factory Database. * p < .10, ** p < .05, *** p < .01 Standard errors, clustered by Region-Industry-Year groups, in parentheses. L (Workers) denotes the total number of workers the factory, HP (Power) denotes the total horsepower of machines in the factory, and R (Revenue) is the total value of output produced by the factory in that year, measured in Rubles.

Table A17: Median Regressions: Corporation-Owned Factories Grow Faster

Dependent Variable:	Median Regressions Percentage Change in Rev [1]	 Percentage Change in Rev [2]
Corporation	0.144***	0.405***
	(0.026)	(0.097)
Intercept	0.248***	0.288***
	(0.012)	(0.036)
Year Controls	Yes	No
N	12,143	3,340
Pseudo R2	0.0028	0.0089

Gregg Imperial Russian Factory Database. Standard errors in parentheses. * p < .10, ** p < .05, *** p < .01.

Table A18: Survival by Enterprise Form

	1894	1900
Percentage of Corporation-Owned Factories that Survive Only One Year	21.87	20.06
Percentage of Non-Corporation Owned Factories that Survive Only One Year	61.43	32.39
Percentage of Corporation-Owned Factories that Survive Two or More Years	78.13	79.94
Percentage of Non-Corporation Owned Factories that Survive Two or More Years	38.57	67.61
Percentage of Corporation-Owned Factories that Survive Three Years	63.14	x
Percentage of Non-Corporation Owned Factories that Survive Three Years	23.59	x

In the Column for 1900 in the category of factories that live two or more years, I only count the factories that survive to the next year, not those who have survived from 1894.

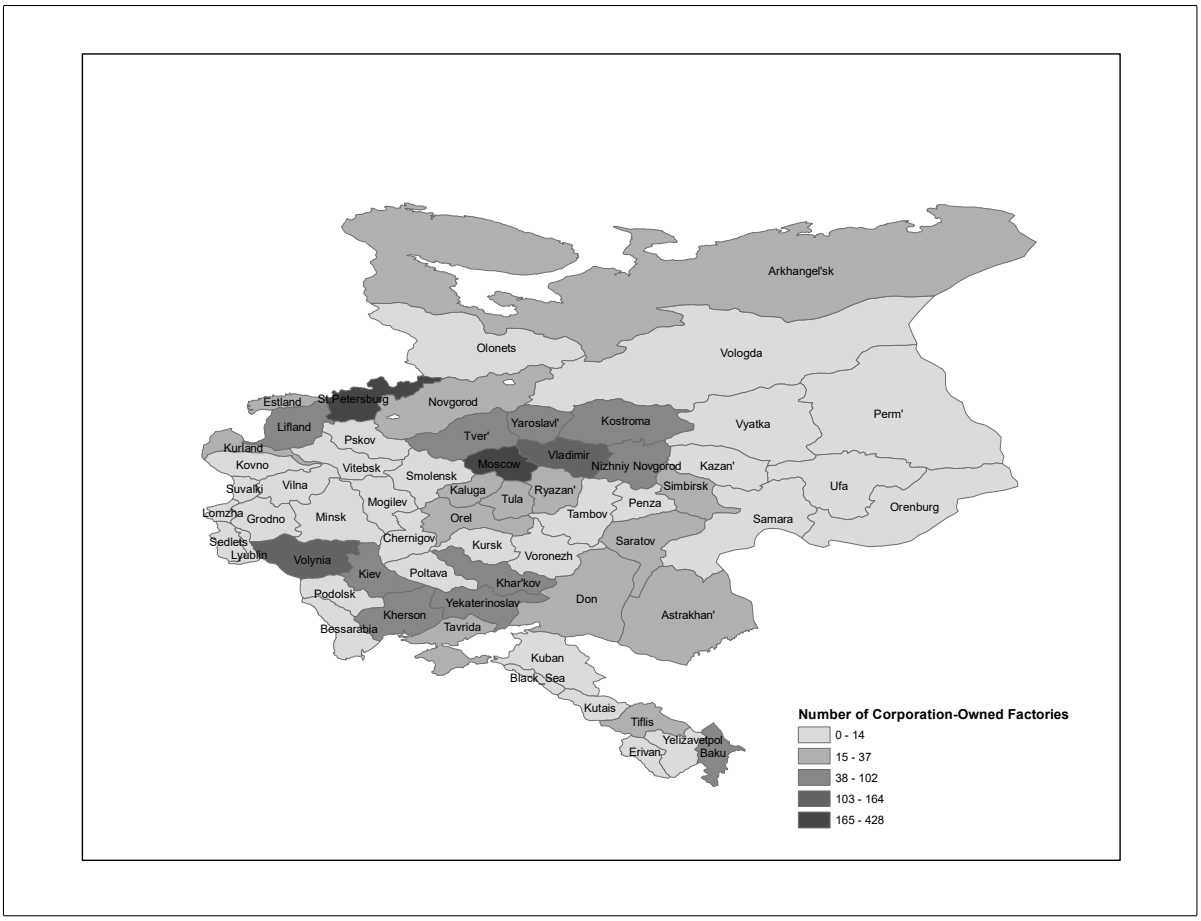


Figure A1: Map of European Russia: Number of Corporation-Owned Factories, by Province
Source: Gregg Imperial Russian Factory Database (2018) and GIS maps of the Russian Empire by Andre Zerger.

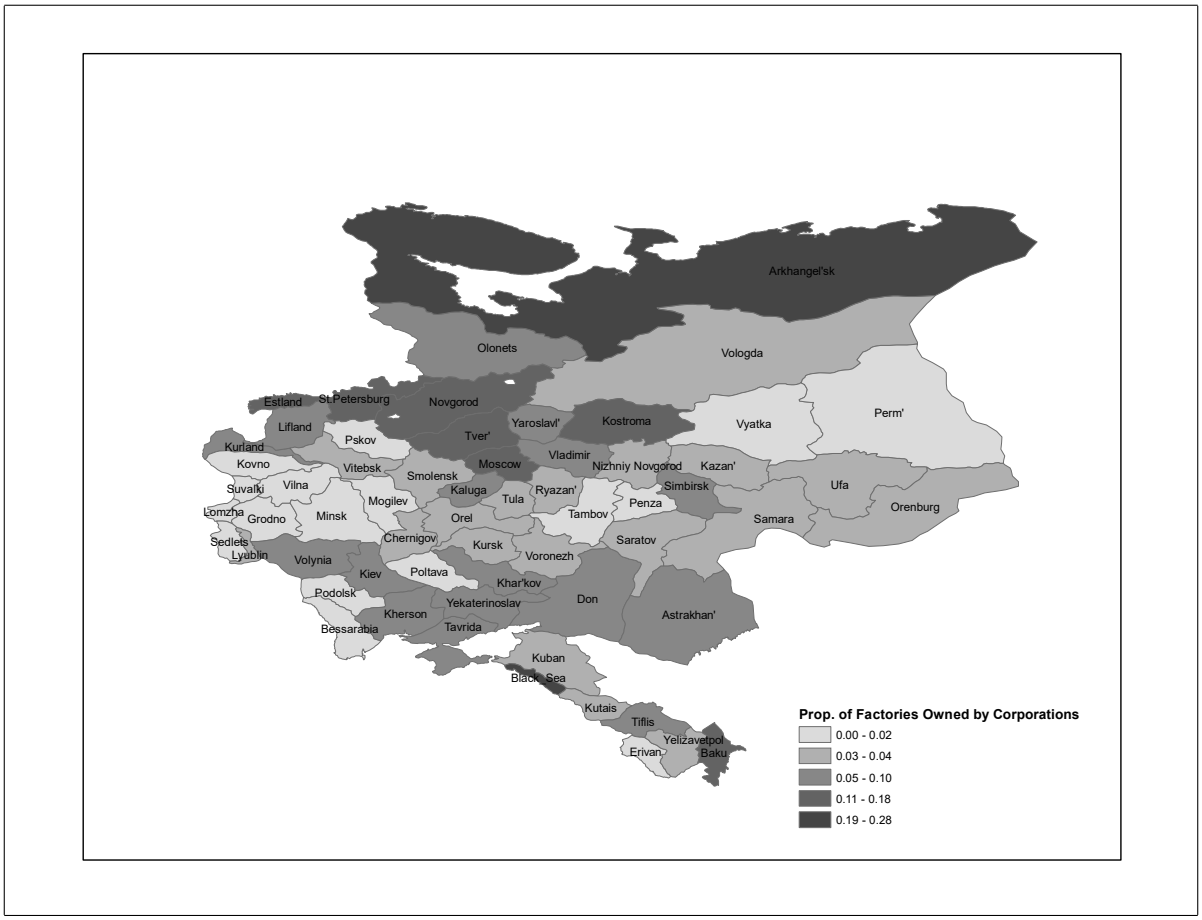
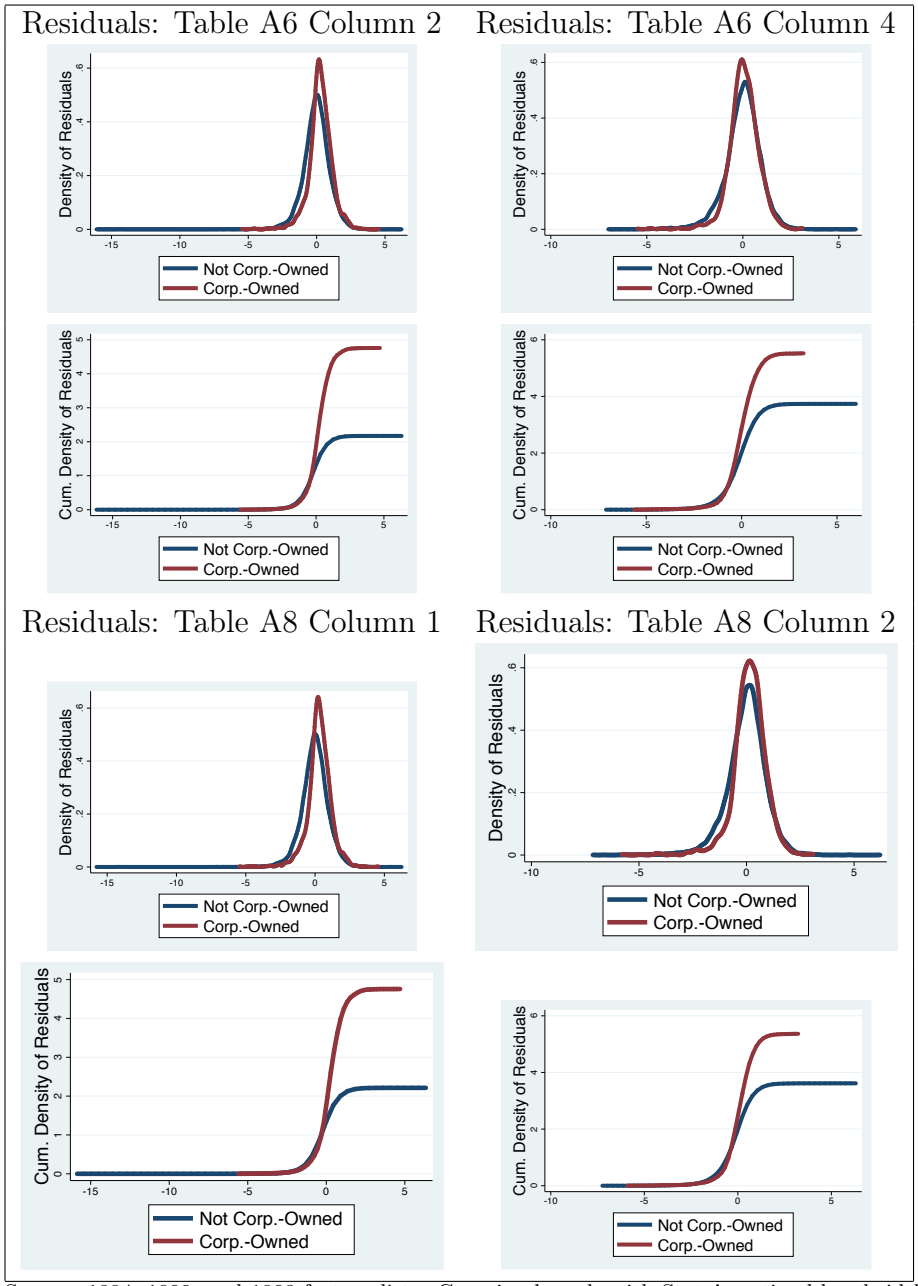


Figure A2: Map of European Russia: Proportion of Factories Owned by Corporations, by Province

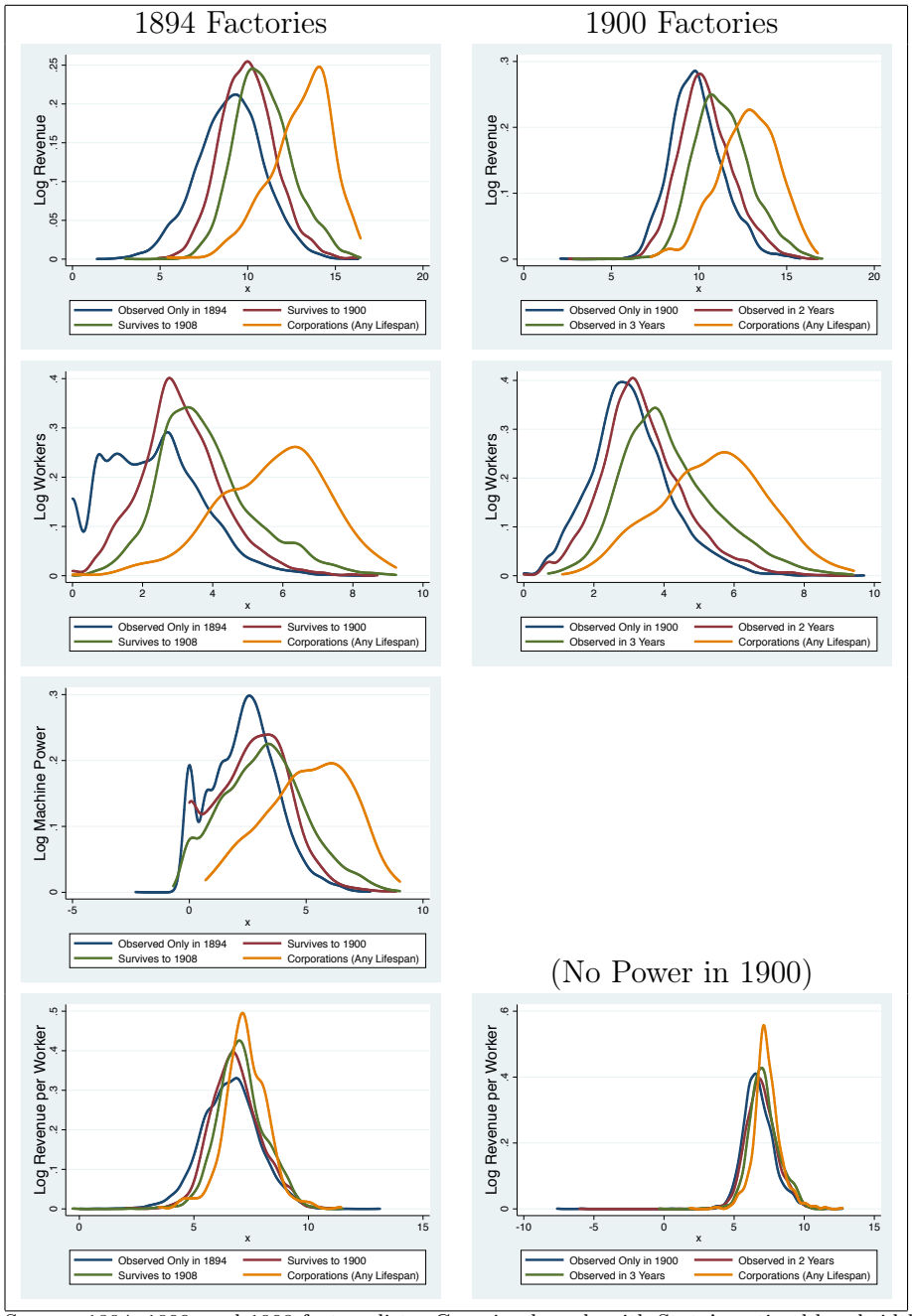
Source: Gregg Imperial Russian Factory Database (2018) and GIS maps of the Russian Empire by Andre Zerger.

Figure A3: Kernel Density Estimates of Residuals



Source: 1894, 1900, and 1908 factory lists. Gaussian kernels with Stata's optimal bandwidths. The line labeled "Corps" is for corporation-owned factories only. The line labeled "NonCorps" is for factories owned by partnerships or single proprietorships.

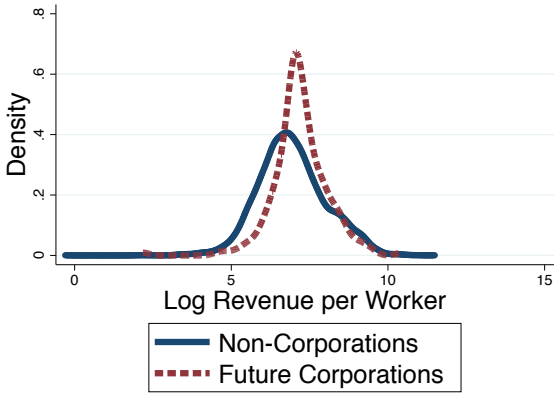
Figure A4: Variables by Years Survived and by Enterprise Form



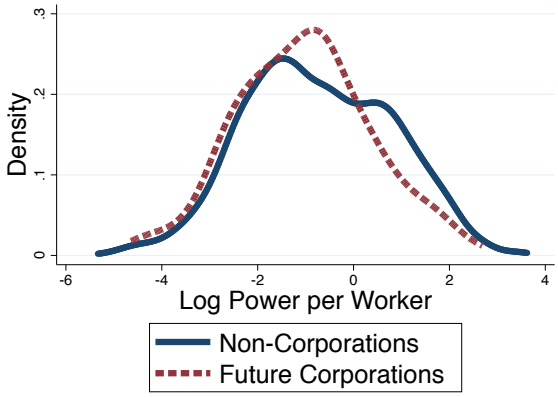
Source: 1894, 1900, and 1908 factory lists. Gaussian kernels with Stata's optimal bandwidths. The line labeled "Corps" is for corporation-owned factories only. The line labeled "NonCorps" is for factories owned by partnerships or single proprietorships. The 1900 volume has no information on power per worker, so any kernels describing machine power exclude 1900.

Figure A5: Comparisons: Future Corporations vs. Factories that Survive Two or More Periods (Densities)

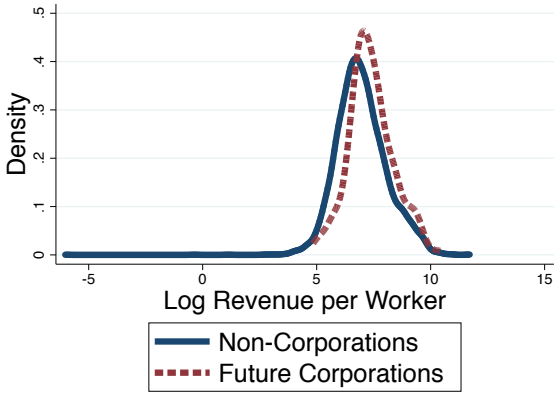
1894 log Revenue per Worker



1894 log Power per Worker

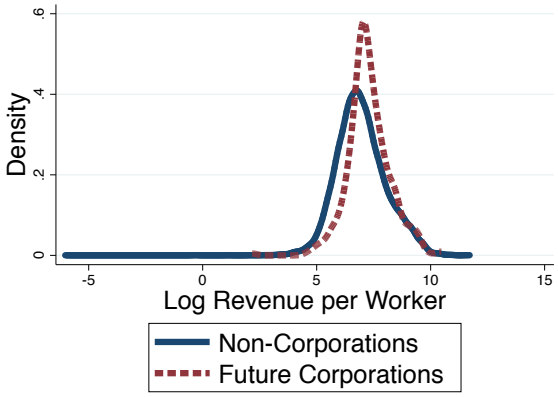


1900 log Revenue per Worker



(No Information on Power in 1900)

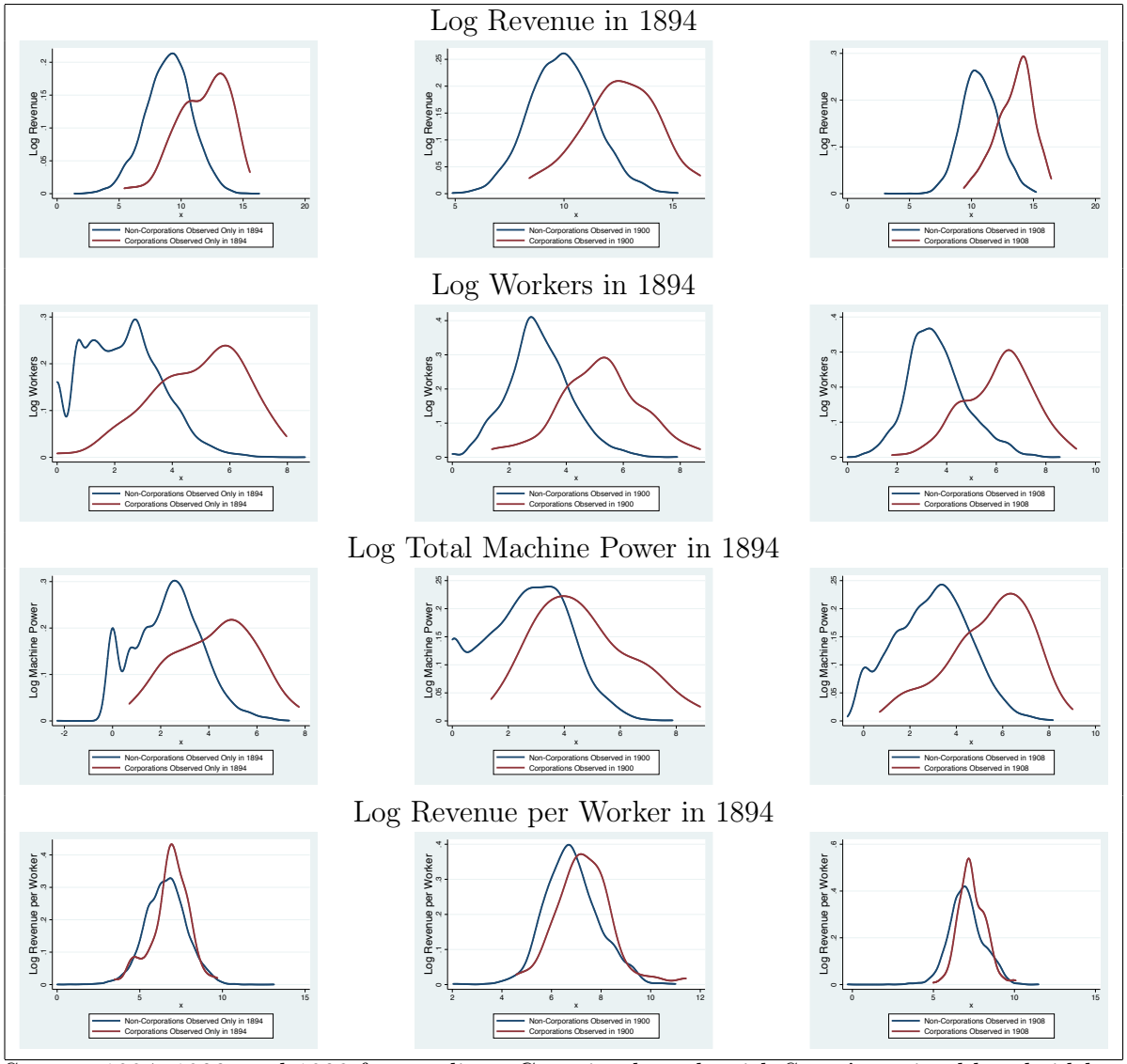
1894 and 1900: log Revenue per Worker



(No Information on Power in 1900)

Note: Gregg Imperial Russian Factory Database. Gaussian kernels with optimal bandwidths. The 1900 volume has no information on power per worker, so any kernels describing machine power exclude 1900.

Figure A6: Corporation-Owned Factories vs. Other Factories by Years Survived



Source: 1894, 1900, and 1908 factory lists. Gaussian kernels with Stata's optimal bandwidths. The 1900 volume has no information on power per worker, so any kernels describing machine power exclude 1900.