Lobbying for Industrialization: Theory and Evidence*

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Abstract

Industrial policies, such as infrastructure investments and export tariffs, affect the allocation of labor and incomes across sectors, attracting substantial lobbying efforts by special interest groups. Yet, the link between structural change and lobbying remains underexplored. Using more than 150 years of data on parliamentary petitions in USA and Britain, we measure historical lobbying and document several stylized facts. First, lobbying over industrial policies follows a hump-shaped path in the course of structural change, while agricultural lobbying steadily declines. Second, big capitalists (manufacturers, merchants) are most active in lobbying for industrialization. Third, industrial concentration increases progressive lobbying, while concentrated landownership slows it down. We explain these patterns in a simple model of structural change augmented with a heterogeneous agents lobbying game.

Keywords: political economy, structural change, lobbying, wealth distribution, growth

JEL codes: D33, D72, N10, N41, O14, O41, O43, P00

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1 Introduction

Structural change - the reallocation of economic activity from agriculture to industry and services - is a key driver of economic growth.[1] The effects of government policies on structural change, via relative prices and productivity across sectors, have been well documented.[2] Equally well understood is that, both historically and nowadays, government policies create winners and losers, attracting significant lobbying by special interest groups.[3] Despite the importance of structural change and lobbying surrounding it, we thus far lacked both theory and evidence linking the two phenomena (Martinez-Bravo and Wantchekon (2023)), especially in the long-run perspective.

In this paper, we explore theoretically and document empirically the links between structural change, lobbying, and wealth distribution during the key period of structural change: industrialization of the 18th-19th centuries. During this period, early capitalists lobbied for railroad construction, education reforms, changes in tariffs, and other policies, challenging the status-quo and the established landed elites. How does lobbying over such pro-industrial policies co-evolve with the reallocation of labor and incomes between sectors? And being a club good, how does lobbying depend on the distribution of capital and land wealth? Concentrated wealth can spur unproductive lobbying (Gutiérrez and Philippon (2019), Akcigit et al. (2023)) creating political barriers for growth. On the other hand, under landed elites' dominance and government inaction (Hanlon (2024)), concentrated capital can help push for reforms.

To address these questions on structural change and lobbying, we use data on petitions to the British Parliament and the US Congress from the late 18th to early 20th centuries, Huzzey and Miller (2020) and Blackhawk et al. (2021). Petitions were the key lobbying tool at the time[4]: 70-90% of the US legislation in the 19th century originated from petitions, Ireland (2004), and they strongly affected the MPs' votes, Aidt and Franck (2019). Analyzing the contents of petitions - occupations of

[1] Seminal papers by Hansen and Prescott (2002), Restuccia et al. (2008), Gollin et al. (2014) show the link between structural change and growth, Herrendorf et al. (2014) review broader literature.

[2] E.g., Maloney and Valencia Caicedo (2022) for education policies, Heblich et al. (2022a) for tariffs, Bogart et al. (2022) for infrastructure, and Juhász and Steinwender (2024) for a review.

[3] E.g., Comin and Hobijn (2009), Bogart (2018), Figueroa and Fouka (2023) for historical evidence; Bombardini and Trebbi (2012), Kang (2016), Akcigit et al. (2023) for contemporary evidence.

[4] We acknowledge there were other means of historical lobbying. We discuss this in Section 2.

petitioners, words they used, committees addressed - we identify petitions related to industrial policies (infrastructure, tariffs, human capital, etc.), and calculate how the share of industrial petitions varies over time and across space. Similarly, we identify agricultural petitions and calculate the relative intensity of agricultural lobbying.

With these measures of lobbying, we document several stylized facts. First, both in the US and in Britain, lobbying over industrial policies follows a hump-shaped path, peaking in the mid-to-late 19th century, when structural change was the fastest. We confirm this regularity in the panel of US states: industrial lobbying increases with local modern-sector employment share until it reaches 65-70%, and then declines. In contrast, lobbying over agriculture steadily declines with local structural change.

Second, using data on petitioners' occupations, we show that big capitalists - such as merchants, manufacturers, and bankers - were most active in lobbying over commerce, infrastructure, tariffs and other industrial topics. Modern-sector workers and landed individuals were less focused on industrial topics. In the course of structural change, however, landed individuals were gradually switching to industrial topics.

Third, we link data on petitions with data from the US manufacturing censuses of 1850-1880, Atack et al. (2008), and document that, both in levels and in changes, lobbying intensity of capitalists increases with local capital concentration at the top. Land concentration, in contrast, correlates negatively with industrial lobbying and positively with agricultural lobbying. Thus, the effects of wealth concentration on lobbying for policy change depend on the type of asset.[5]

To explain these regularities on structural change, lobbying, and wealth concentration, we augment a simple "labor-pull" model of structural change (e.g., Galor et al. (2009), Alvarez-Cuadrado and Poschke (2011)) with a lobbying game between heterogeneous agents (e.g., Kang (2016), Blanga-Gubbay et al. (2021)). Traditional sector employs land and labor, while modern sector employs capital and labor. In each period, government policy can boost modern-sector productivity, increasing capital incomes and pulling labor from agriculture.[6] Such a policy also reduces agricultural

[5]There are many other important questions one could ask with this data. Does lobbying map into actual policy? (Aidt and Franck (2019) show it does) How do shocks, such as recessions or wars, affect lobbying? For the sake of clarity and focus, we leave these questions for future research.

[6]Progressive policies reduced agricultural employment: Bogart et al. (2022) show the effects of construction of railway stations, and Heblich et al. (2022a) focus on the 1846's Corn Laws Repeal.

rents, so landowners may prefer status-quo, depending on stocks of land and capital they own.[7] To sway the outcome in one's favor, individuals can invest into lobbying for/against a policy change. Thus, lobbying affects policy and the allocation of labor, and the latter feeds back into future wealth distribution and lobbying.

The first prediction is that, consistent with the data, the intensity of lobbying over industrialization follows a hump-shaped path in the course of structural change. At the early stages, when the capital stock is small, capitalists lack incomes and incentives to actively lobby for policy change. As the modern sector grows and stakes in reforms increase, lobbying for industrialization picks up, as does the opposition from landowners. Over time, traditional sector contracts, landowners become more invested in capital, and returns to lobbying for (or against) industrialization decline.[8]

The second set of predictions links lobbying over industrial policies with the underlying distribution of (capital and land) wealth. At the earlier stages of industrialization, a higher concentration of capitalists' wealth increases lobbying for pro-growth policies, and speeds up development. The reason is that lobbying for policy change is a local public good: smaller capitalists free-ride, so a higher concentration of capital at the top increases overall lobbying for reforms. At the later stages, positive effects of capital concentration vanish: incomes and policy gains increase, so smaller capitalists can join the lobbying process (moreover, landowners no longer resist policy change). Importantly, a higher concentration of land ownership increases opposition to industrial reforms and has a negative effect on the pace of structural change.

To examine our model's quantitative fit, we calibrate it to the British economy from 1690 to 1930. We match closely the joint dynamics of structural change, wealth concentration, and industrial lobbying. Using changes in slave trade capital gains from Heblich et al. (2022b), we show that a shock to capital concentration accelerates industrial lobbying and growth. Thus, Heblich et al. (2022b) probably capture a lower bound of the slave trades' effect on British industrialization. To further support our results on the effects of capital concentration, Appendix G shows two case studies: from Prussia, Becker and Hornung (2020), and the Middle East, Kuran (2012).

[7] Landowners accumulated more capital as structural change progressed, Mokyr and Nye (2007), Boberg-Fazlic et al. (2023), so divisions between landed and capitalist elites dissipated over time. This mechanism is one of the key drivers in our model.

[8] In a model with three sectors, or with intra-sector competition, lobbying would continue.

Contribution to the literature This paper contributes to several strands of research. First is the political economy of development, which has long emphasized the importance of parliamentary institutions, e.g., North and Weingast (1989), Acemoglu and Robinson (2012). However, in the 19th century USA and Britain (and many developing countries today) parliaments represented interests of the elites and did not guarantee growth.[9] Special interests blocked education reforms, infrastructure projects, technology adoption, and other key policies (Krusell and Rios-Rull (1996), Desmet and Parente (2014), Galor et al. (2009), Bogart (2018)). Despite the importance of pressure by special interest groups, both theory and data on lobbying during the key period of structural change is missing. We address this gap both theoretically and empirically, using more than 150 years of data on petitions in the US to measure the grassroots demand and pressure for policy change.[10].

Our second contribution is connecting two previously disjoint strands of research: on the long-run structural change and on lobbying. Herrendorf et al. (2014) review structural change literature, but do not discuss lobbying over key policies, while Bombardini and Trebbi (2020) review lobbying, but do not give a long-run perspective. To the best of our knowledge, this is the first paper to integrate lobbying over industrial policies (modelled à la Kang (2016), Blanga-Gubbay et al. (2021), Cole et al. (2021)) into a simple model of structural change, e.g., Hansen and Prescott (2002), Alvarez-Cuadrado and Poschke (2011), Comin et al. (2021). Our model explains the joint dynamics of structural change, industrial lobbying, and inequality between classes.[11]

Third, we expand on the political and economic effects of wealth concentration. Contemporary evidence suggests that capital concentration at the top is detrimental for innovation and growth, Bessen (2016), Gutiérrez and Philippon (2019), Akcigit et al. (2023), due to unproductive lobbying and political connections. We find, in contrast, that historical capital concentration increased lobbying for industrial reforms.

Relatedly, this paper speaks to the inequality-growth debate. Early papers found

[9]In Britain, structural change and TFP growth did not accelerate right after the Glorious Revolution of 1688, Clark (1996), Ogilvie and Carus (2014).

[10]Data on petitions in Britain were used by Aidt and Franck (2019) and Figueroa and Fouka (2023) to measure pressure on specific policy dimensions.

[11]In our modelling approach, we do not take a stance on the specific mechanism of how lobbying affects decision-making: via an exchange of favors, information, or other channels.

negative effects of inequality on growth, Bénabou (1996). Concentration of land ownership was shown to be particularly harmful, Galor et al. (2009), Rajan and Ramcharan (2011), Cinnirella and Hornung (2016). Our paper adds that the effects of wealth concentration on progressive lobbying (and thus growth) depend on (i) the asset (land vs. capital) and (ii) the stage of development. As the share of land decreases over time, the effect of wealth concentration on progressive lobbying changes from negative (driven by land concentration) to positive (by capital concentration), and potentially back to negative again, when landowners pose no political barriers.

The remainder of the paper is organized as follows. Section 2 gives historical context on petitioning in Britain and USA. Section 3 documents new empirical regularities on lobbying, structural change, and wealth concentration. Section 4 sets up the model to explain these patterns, and Section 5 derives model's main predictions. Section 6 calibrates and simulates the model with the British data, and conducts a counterfactual exercise to show the role of wealth concentration. Section 7 concludes.

2 Petitions in Britain and USA: context and data

In this section, we provide historical context from Britain and USA justifying the use of petitions to measure lobbying, and describe how we use the petition-level data from Blackhawk et al. (2021) to construct our measures of lobbying for industrialization.

2.1 Petitions in Britain

The Glorious Revolution of 1688 significantly increased the role of the British Parliament, but the franchise remained highly limited up until well into the 20th century. Petitioning the parliament was thus the key way of exerting political pressure in the post-Glorious Revolution Era, Loft (2019) and Huzzey and Miller (2020). The British Parliament History website summarizes the point:

> "By the 18th century, people used their Members of Parliament to raise their problems and concerns with those powerful enough to make changes. ... **The most common way people tried to influence Parliament was to present MPs with petitions.** They often demanded changes

> in the law and could be presented by individuals, whole communities or organised groups. ... The number of petitions ... grew rapidly from the end of the 18th century. In 1839 13,657 public petitions were presented on more than 90 different subjects with ... over 4.5 million signatures."[12]

Many petitions in this period were reflecting demands of the emerging capitalist elites (merchants, bankers, factory owners) trying to challenge the policy status-quo. One of the biggest battlefields were sector-specific tariffs, with the most famous example being the Corn Laws. Miller (2012) shows that petitions against the Repeal came from landowners in agricultural places like Lincolnshire. Petitions for the Repeal came from regions with concentrated industry, such as Lancashire and West Midlands.[13] From 1839 to 1846, crucial years before the Repeal, there were more than 33000 Corn Laws petitions, containing more than 8 million signatures.

Other important examples of lobbying over industrialization revolved around infrastructure. Petitions against the old Navigation Laws in 1849 were coming from textiles, engineering, and mining industries. Construction of canals was crucial for industrialization, and yet fiercely contested, as modern-sector interests lobbied for, and status-quo supporters against the local Canal and Navigation Acts. Petitioning was costly, as it involved demonstrations, printing, collecting signatures, and delivering documents to the Parliament. The Great Northern Railway Bill during the "Railway Mania" of 1845-46 costed £590,355 on Parliamentary expenses alone.

Petitioning over education was another key area. National Education League petitioned for the expansion of elementary schooling exempt from religious influence, while National Educational Union of Manchester lobbied against such reforms. The struggle resulted in the passage of the Elementary Education Act of 1870. Petitioning over secondary schooling (Balfour act of 1902) was equally intense.

[12]Surely, there were other means of historical lobbying. Arguably, however, only the elites could use those other means (e.g., meeting with MPs). Moreover, if some of the lobbying by the rich was not going through petitions, then the effects of wealth concentration on petitioning by capitalists (in Section 3) likely give a lower bound of the true effect. Finally, our model includes a status-quo bias that explains why landed elites petitioned less actively than the capitalists in the data.

[13]Schonhardt-Bailey (2003) shows that local economic interests were crucial for the MPs' voting on the Corn Laws. The Anti-Corn Law League spent large sums of money collecting petitions in the years 1839-1846, and many local subsidiaries of the League helped collecting petitions, Figure A1.

Were petitions effective in changing policy outcomes? Aidt and Franck (2019) show that constituency-level intensity of petitioning strongly increased local MPs propensity to support the Great Reform Act of 1832. Moreover, Huzzey and Miller (2020) argue that large petitions presented in the Parliament posed a potential threat: there were many precedents when unsatisfied petitioners resorted to protests and violence. Loft (2019) further notes that number of signatures and references to petitioners' skills conveyed local information and knowledge to the Parliament. Overall, we argue that petitions on infrastructure, education, trade, etc. are a good measure of "lobbying for industrialization": demand for industrial policy change.

Since petitions data we have from Britain are mostly tabulations from Huzzey and Miller (2020) and the Parliamentary Papers database, we use British data to test the dynamic performance of our model, Section 6.3. For the main empirical analysis we rely on petition-level data from the US.

2.2 Petitions in the US

In the late 18th - early 20th century United States, petitions were the main lobbying tool. Under limited franchise and with no other means to systematically exert influence over public policy and demand more government action[14], petitioning was the key infrastructure to participate in lawmaking, McKinley (2018), Blackhawk et al. (2021). Similar to litigation contests, special interest groups submitted claims to specific Committees in the Congress (mostly the House where 70% of petitions were addressed), attempting to sway the outcome in their favor. As emphasized by Ireland (2004), legislation in the US was mostly local at the time, and 70-90% of legislation in the 19th century originated from petitions.

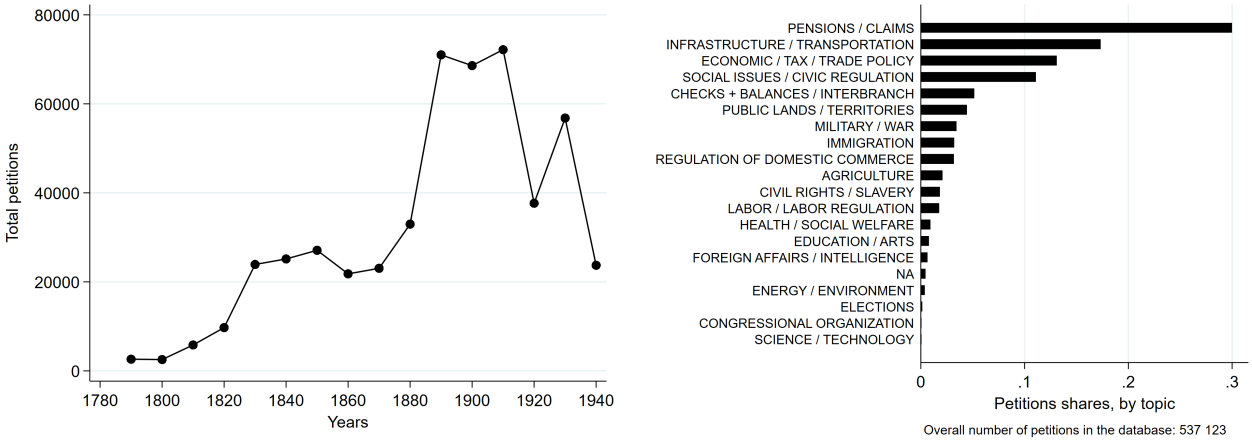
Key topics were similar to those in Britain: infrastructure, trade and tariffs, education, technological and commercial development, and so on. Large manufacturers, traders, and even landowners lobbied for the expansion of railways and highways (postal roads), as well as for changes in trade duties to boost their profits. Landowners tried to block private banking, Rajan and Ramcharan (2011), and education, Galor et al. (2009), to maintain their land rents. Lay people, e.g., skilled profes-

[14]Lobbying was not institutionalized until mid-20th century, but the right to petition was part of the US Constitution, remaining the only way to exert systematic pressure on the policy making.

sionals, teachers, laborers, etc., lobbied for private relief, pensions, and many other policies, all of which we explore in more detail below.

2.2.1 Petitions data in the US

To measure historical lobbying in the US, we use the petition-level database assembled by Blackhawk et al. (2021). This data contains information on 537 123 petitions submitted to the US Congress from 1789 to 1949. This data (i) allows classifying petitions into detailed topics, (ii) provides identities and/or occupations of petitioners, and (iii) gives the state and location of petitioning. Figure 1 shows the aggregate dynamics and broad-topic breakdown of petitions.



(a) Dynamics over time

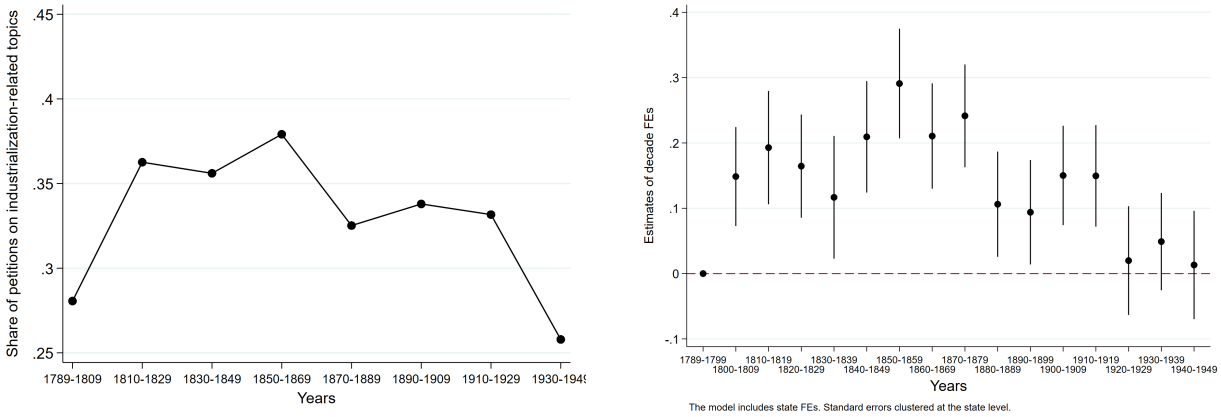
(b) Breakdown by broad topics

Figure 1: Descriptive data on petitions in the US.

To identify petitions related to industrialization, we use three criteria. First, we code petitions as "industrial" if they fall into one of the following topics provided by Blackhawk et al. (2021): (i) Banking and Finance, Tariffs and Trade Regulation, Tax Rates (broad category "Economic/Tax/Trade policies"); (ii) Bridges, Canals, Post offices/roads, Public Works, Railroads, Roads/Turnpike Companies, Shipping/Maritime ("Infrastructure/Transportation"); (iii) Charters/Incorporations, Intellectual Property, Interstate Commerce/Anti-trust, Manufacturers/Manufacturing Companies, Price Controls ("Regulation of Domestic Commerce"), and (iv) Education, and Schools/Universities. All these topics address key policies supporting (or

opposing) industrial development, Juhász and Steinwender (2024). Moreover, we show on Figure A3 that petitions in these topics mention disproportionately specific keywords related to industrialization.[15] The exception is education, which we add following substantial evidence on human capital and industrialization, Galor et al. (2009), Squicciarini and Voigtländer (2015), Valencia Caicedo (2018) (the results are similar if we drop education-related petitions from the list of "industrial" topics).[16].

To test the robustness of our classification, we apply two additional criteria. First, we use information on Committees to which petitions are addressed: we hand-code each of the dozens of Committees into dealing with industrial topics or not, based on the Wikipedia descriptions of each Committee's functions. Second, we conduct text analysis of petition prayers (petition texts), searching for words associated with industrialization according to external dictionaries: "manufacture", "textile", "merchant", "trade", "duties", "bank", "industry", "corporation", "rail", "steam", "canal", etc. Figure A7 confirms strong pairwise correlations between the three criteria.



(a) Aggregate share of industrial petitions

(b) With state FEs

Figure 2: Dynamics of lobbying over industrial policies in the US.

[15]For each topic, we calculate an odds ratio between (i) the share of this topic conditional on having specific keywords (related to industrialization, commercialization, etc., as defined by external dictionaries, more below) in petition text, and (ii) the unconditional share of this topic. Figure A2 shows the word-clouds for most frequent words in two biggest topics, infrastructure and trade.

[16]In the Appendix, Figure A4 shows the dynamics of some of the key topics: petitions on infrastructure and trade are most numerous and accelerate early in the 19th century, while petitions over education and commerce/banking pick up later on.

Using the first classification method, Figure 2a shows that the country-level share of petitions coded as industrial follows a hump-shaped path: this measure of lobbying over industrial policies increases from late 18th century, reaches its peak in the mid-19th century, and declines thereafter. The "inverted-U" dynamics of industrial lobbying is evident in the panel of states too: on Figure 2b, we control for state FEs and plot the estimates of decade FEs, documenting a clear hump-shaped dynamics.[17]

3 Lobbying for industrialization: Stylized facts

In this section, we establish several stylized facts on historical lobbying. First, we document how the intensity of lobbying over industrial/agricultural topics co-evolves with structural change. Second, we identify petitions by capitalists, agricultural, and non-agricultural workers, and show on which topics they concentrate their lobbying efforts. Finally, we show how the underlying wealth (capital and land) distribution is associated with lobbying by capitalists and landowners at the state $\times$ decade level.

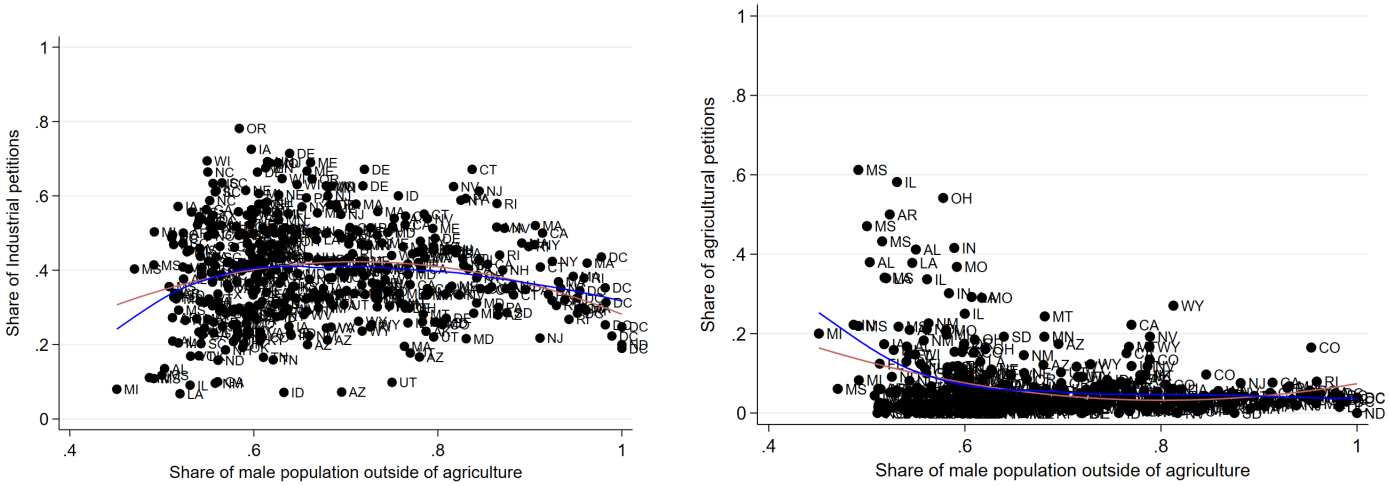
3.1 Structural change and lobbying for industrialization

How does lobbying for industrialization co-evolve with the process of structural change? To address this question, we merge the Blackhawk et al. (2021) petitions dataset with the state $\times$ decade level data on sectoral employment shares from Craig and Weiss (1996) for 1800-1900 and IPUMS USA for 1910-1940. In what follows, we mostly focus on the years from 1790s to 1910s to avoid the periods of Great Depression and WWII, which fall outside of the time when petitions were the key lobbying tool.[18]

On Figure 3a we document that there is an inverted-U relationship between in-

[17] Figure A5 shows the dynamics of industrial petitions by state, while Figure A6 shows the maps of 1789-1949 average state-level (a) shares of industrial petitions, and (b) numbers of such petitions per 1000 population. States that rapidly industrialized during the 19th century were more active in industrial lobbying. A few states - e.g., Texas and North Carolina, - have low per capita petitions, but high shares of industrial petitions. Since the use of petitions for lobbying was changing over time (declining after 1910s), we focus on the shares of industrial petitions.

[18] Petitioning the Congress began to decline after the Seventeenth Amendment allowed voters to cast direct votes for U.S. senators. More generally, petitioning started to decline after WWI, driven by the rise of the administrative state, McKinley (2018).



(a) Industrial topics

(b) Agricultural topics

Figure 3: Industrial and Agricultural petitions vs M-sector employment, by state × decade. Quadratic fit (red) and lowess fit (blue).

dustrial lobbying and employment outside of agriculture: industrial petitions share peaks around 65-70% of non-agricultural employment share. Table B1 shows that the hump-shape is robust to (i) state and time FEs (results are not driven by franchise extensions, end of slavery, etc.); (ii) alternative definitions of industrial petitions, (iii) extending the sample to 1949. Excluding DC does not change the results.

3.2 Lobbying over agricultural policies and topics

Does structural change away from agriculture decrease lobbying over agricultural topics? Is there a switch from agricultural to industrial lobbying? To address these questions, we identify agricultural petitions based on, as before, (i) topics assigned by Blackhawk et al. (2021), (ii) Committees petitions addressed, and (iii) occurrence of specific words (such as "land", "agriculture", "cultivation", "farm", "irrigation", etc.) in petition prayers. The three criteria are strongly correlated, Appendix Figure A8. As one can see on Figure 3b, the intensity of agricultural petitioning declines in the process of structural change (similarly with state and decade FEs).[19]

[19]Figure A9 in the Appendix also shows a substitution away from agricultural to industrial topics.

3.3 Who lobbies for industrialization?

To see who submits petitions on industrial, agricultural, and other topics, we use data on petitioners' identities and occupations. Many petitions come with clear identifiers, e.g., "Cape Cod Railroad Company" or "Chamber of Commerce of Cincinnati, Ohio", or "John Hunt and James Hunt, merchants of New Haven, CT". We use this data to locate petitions from merchants, manufacturers, banks, companies, trusts, owners of stores, etc. - henceforth "capitalists". From that list, we exclude petitions from unions/employees/workers/laborers (e.g., "unions of manufacturing workers") and from landed agents (e.g., "agricultural companies") to focus on clear capital owners. This leaves us with 60,824 (or 11.4%) petitions coming modern-sector capitalists.

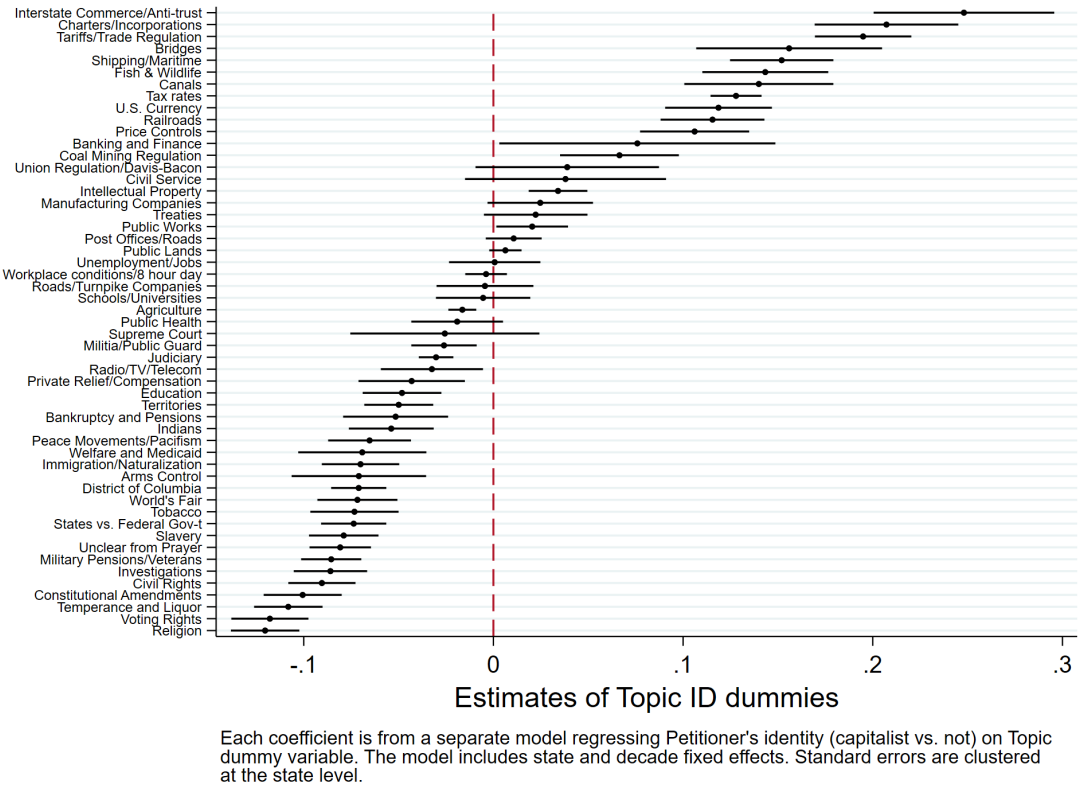
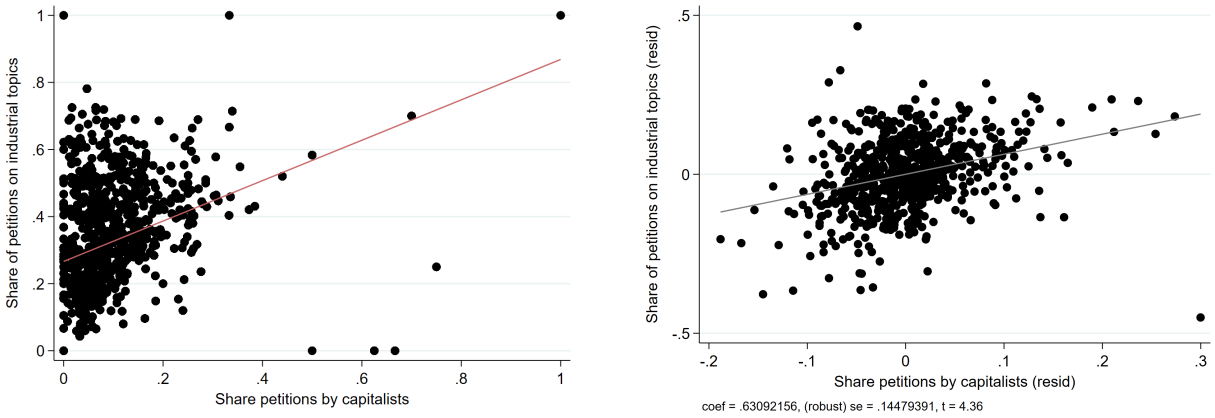


Figure 4: Estimates of β from a model $Capitalist_{i,k,s,t} = \beta \cdot Topic_k + \gamma_s + \tau_t + \varepsilon_{i,k,s,t}$.

What do capitalists lobby for? On Figure 4 we show that capitalists are disproportionately more likely to petition on topics related to commerce (anti-trust, banking, incorporations), tariffs and trade, infrastructure (bridges, canals, etc.), taxes, etc. -

all closely tied to industrial policies.[20] On Figure 5, we calculate the state × decade shares of petitions by capitalists and find a strong positive correlation with the shares of petitions on industrial topics (both raw, and with state and decade FEs).[21] Thus, naturally, capitalists are more likely to demand policy changes on industrial topics.



(a) Baseline correlation

(b) Residuals after state and decade FEs

Figure 5: Share of industrial petitions vs. share of petitions by capitalists

Using the 1880 census occupation lists (from IPUMS-USA), we also locate petitions by various groups of workers, professionals (school teachers, professors, health professionals, mechanics) and clerks employed outside of agriculture. Similarly, we identify petitions from landed individuals (farmers, landowners, freeholders, grazers, agricultural / pastoral associations, and so on). We find a much weaker intensity of petitioning on industrial topics for workers/professionals and landed individuals. However, while Figure A12 shows no overall correlation at the state x decade level, we find that in the course of local structural change, landed individuals increase their focus on industrial topics.

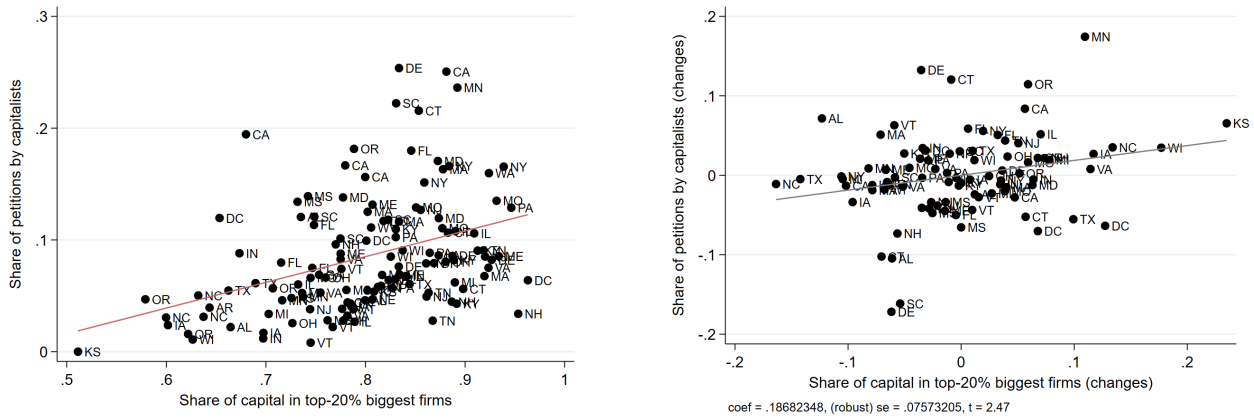
[20]Here, we drop all topics with less than 0.1% of observations each, which removes a total of 44 smaller topics (about 5000 observations), leaving 53 bigger topics. Figure A10 shows that the ranking of topics among capitalists remains the same when topic FEs are estimated jointly. Moreover, Figure A11 shows that petitions by manufacturers (one of the biggest subgroups of capitalists) cover a wide range of topics, e.g., tariffs, intellectual property rights, and commerce. Finally, if we omit the 1920-40s from the sample, results do not change.

[21]We omitted top 1% observations for both variables on Figure 5b to make sure the results are not driven by outliers (results are very similar on the full sample).

3.4 Role of capital and land distribution

How does the intensity of lobbying for industrialization depend on the local distribution of capital and land wealth? Do capitalists in places with more concentrated industry lobby more intensely? To address these questions, we merge data on petitions with four US manufacturing censuses, from 1850 to 1880 (Atack et al. (2008)). To measure capital concentration, we use data on the values of capital invested[22] by each firm in the sample. Aggregating over the distribution of capital, we calculate the share of total capital in the top-20% largest firms in each state and decade.

Figure 6a shows a strong positive association between the share of capital in the top-20% largest firms and the intensity of lobbying by capitalists. Figure 6b reveals similar results from a model in first differences, with decade FEs. We control for the state x decade average capital stock (or capital to labor ratio, for robustness). Thus, even conditional on the average firm size[23], a higher concentration of industrial capital implies more intense lobbying by capitalists. Table 1 shows the robustness of this result. In particular, columns (4)-(5) show that the number of petitions submitted by capitalists, controlling for the state x decade population count, is also strongly increasing with local capital concentration.



(a) Baseline correlation

(b) Model in first differences

Figure 6: Intensity of petitions by capitalists vs. top-20% capital concentration

[22]The variable specifically describes "Capital invested, in real and personal estate, in business"

[23]We also find that in a cross-section of states in 1850s-1880s, there is a positive correlation between the share of petitions on industrial topics and capital-to-labor ratio (or average capital).

Table 1: Lobbying by capitalists and capital concentration

VARIABLES	(1) Share petitions by capitalists	(2) Share petitions by capitalists	(3) Share petitions by capitalists	(4) # petitions by capitalists	(5) # petitions by capitalists
Share capital in the top-20%	0.230***	0.203**	0.215**	107.907**	93.727**
	(0.043)	(0.087)	(0.083)	(39.391)	(38.377)
Observations	127	121	121	121	121
Adjusted R-squared	0.144	0.453	0.484	0.882	0.885
State FE	No	Yes	Yes	Yes	Yes
Decade FE	No	Yes	Yes	Yes	Yes
Controls	No	No	Yes	No	Yes
State male pop	No	No	No	Yes	Yes

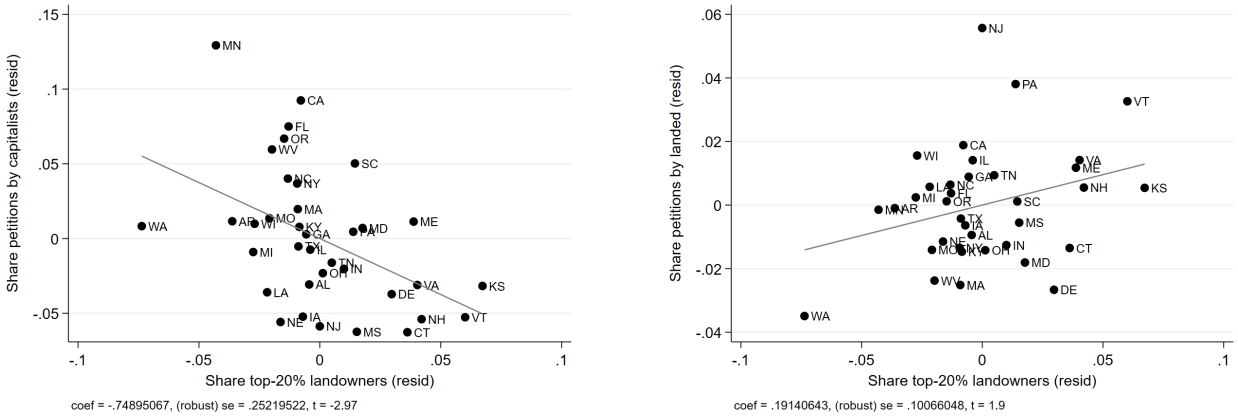
The outcome in columns (1)-(3) is the state x decade share of petitions submitted by capitalists, while in columns (4)-(5) it is the number of petitions submitted by capitalists. Main explanatory variable is the share of capital concentrated in the top-20% largest firms. The sample is limited to 1850s-1880s (manufacturing censuses data, Atack et al. (2008)). Six singleton state observations are dropped when state FEs are absorbed in columns (2)-(5). Controls include state x decade values of (i) average capital per firm, (ii) share of male population employed outside of agriculture, and (iii) share of petitions on industrial topics. In columns (4) and (5), we also control for total male population in a state, since the outcome is a number, not a share. Standard errors, clustered at the state level are in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

As documented above, capitalists address predominantly industrial topics, so we interpret these results as the evidence that higher local capital concentration in the second half of the 19th century USA increased political support for industrial policies[24]. One may wonder whether capitalists demand changes that support - as opposed to block - growth (e.g., opposing railroad construction). When analyzing which topics drive the effect of capital concentration on lobbying activity of capitalists, we find that the bulk of the effect comes from intensified lobbying over infrastructure. In this topic, about 80% of petitions support the construction / improvement of canals, railroads, postal roads, bridges, etc. (see also the word cloud, Figure A2a), which clearly precipitates structural change. This further supports our argument.

Land concentration We take data on the share of top-20% landowners in each state in 1880s (the only decade with data on both capital and land concentration) from Galor et al. (2009). While only cross-sectional, Figure 7 shows that in 1880s, a higher concentration of land corresponded to (a) less lobbying by capitalists, and (b) slightly more lobbying by landed individuals (farmers, landowners, agricultural unions, and

[24]For robustness, we calculated an alternative measure of lobbying for industrialization: the share of petitions from capitalists addressing industrial topics. The effects of capital concentration are very similar, which is natural given that 63% of all petitions by capitalists address industrial topics.

so on). In these regressions, we control for incomes per capita, share of Black and urban population, and capital concentration (the results are somewhat weaker w/o controls). Thus, in contrast to capital, a higher land concentration is expected to delay progressive lobbying for industrial policy change.



(a) Capitalists

(b) Landed individuals and entities

Figure 7: Top-20% land concentration vs. petitions by capitalists and landowners

Results in this section are robust to: (i) definitions of industrial/agricultural petitions, (ii) excluding states (DC, states admitted later), (iii) a placebo test, where we verify that non-industrial and non-agricultural petitions do not correlate with either structural change or capital/land concentration.

Overall, we have documented several stylized facts. First, lobbying over industrial policies follows a hump-shaped path in the course of structural change, while lobbying over agriculture steadily declines. Second, big capitalists - such as merchants, manufacturers, and banks - are particularly active in lobbying over topics falling into the category of industrial (infrastructure, tariffs, commercial reforms, etc.), while modern-sector workers, professionals, and landed individuals are much less active in these topics. Finally, in places with more concentrated capital ownership, capitalists display significantly more intense lobbying. Since capitalists mostly lobby over industrial topics, and tend to support pro-industrial changes (such as railroad or canal construction), we interpret this as a positive effect that capital concentration had on political pressure for pro-growth policies during the peak period of industrialization in the US. Land concentration, however, tends to delay progressive lobbying.

4 The model set-up

In this section, we set up a model to explain (i) the joint dynamics of structural change and lobbying, and (ii) the effects of capital and land concentration. We augment a simple OLG model of "labor pull" and "labor push" structural change with a lobbying game between individuals with heterogeneous wealth endowments.

4.1 Population and endowments

Total population of size N (constant over time) is divided into three classes: N_l landowners, N_b big capitalists, and N_s small capitalists.[25] The initial amount of capital, K_0, is distributed between the landowning elite and the landless capitalists: κ_0 is the share that belongs to capitalists ($1-\kappa_0$ belongs to landowners). Within-group distribution of capital is governed by θ_0: the share of $\kappa_0 \cdot K_0$ that belongs to big capitalists. The individual endowment in this group is $\frac{\theta_0 \cdot \kappa_0 \cdot K_0}{N_b}$. In the group of small capitalists, individual wealth is $\frac{(1-\theta_0) \cdot \kappa_0 \cdot K_0}{N_s}$. Values of κ_t and θ_t evolve endogenously.

Assume for now that all land belongs to landowners. Moreover, they are all equally endowed with both types of assets: each landowner owns $(1-\kappa_0)K_0/N_l$ of capital and T/N_l of land initially. Moreover, land is fixed over time and is non-tradable, so within a lineage of landowners, land is inherited without any changes in size: $T_t^i = T^i$.[26]

4.2 Production and factor incomes

The economy consists of two sectors, traditional (T) and modern (M). Traditional sector employs land T and labor L_T, and uses the following Cobb-Douglas technology:

$$Y_{T,t} = A_{T,t} T^{\beta} L_{T,t}^{1-\beta}, \tag{1}$$

where $A_{T,t}$ is the T-sector productivity. Modern sector employs physical capital K and labor L_M, and uses the following Cobb-Douglas technology:

$$Y_{M,t} = A_{M,t} K_t^{\alpha} L_{M,t}^{1-\alpha}, \tag{2}$$

[25] Population growth, e.g., like in Voigtländer and Voth (2006), does not qualitatively affect our main results. We allow for dynamic social class sizes in Appendix E.3.

[26] Bertocchi (2006) and Heldring et al. (2021) show that selling land was rare until the end of 19th century in Britain. Primogeniture was common because large estates transmitted political power.

where $\alpha, \beta \in (0, 1)$.

The aggregate product is $Y_t = Y_{M,t} + p_t Y_{T,t}$, where p_t is the endogenous relative price of the agricultural product. Whereas the agricultural good can be only consumed, the manufacturing/services product can be consumed, saved in the form of a bequest to an offspring, or invested in lobbying.

Factors are paid their marginal products in both sectors. We assume that workers are perfectly mobile between the two sectors, so in the equilibrium, wages of the T- and M-sectors ($w_{M,t}$, $w_{T,t}$) are the same. For simplicity, we assume that everyone supplies their labor inelastically, so both landowners and the landless receive wage incomes.[27] The total land income of each landowner is given by $T^i \rho_t$, where the rent is equal to $\rho_t = \beta A_{T,t}(L_{T,t}/T)^{1-\beta}$, and the total capital income is given by $K_t R_t$, where the rate of return on capital $R_t = \alpha A_{M,t}(L_{M,t}/K_t)^{1-\alpha}$. The capital income is shared among all capital owners proportionally to their capital stock: each individual gets $k_t^i R_t$. As is common in the OLG models, capital fully depreciates between periods.[28]

4.3 The political economy and lobbying

We allow for two types of lobbying in the model. The first type concerns public policies that affect productivity and incomes at the sectoral level: e.g., Corn Laws (or their repeal), infrastructure investments in railroads, public education, etc. (see also Llavador and Oxoby (2005), Seim and Parente (2013)). The second type of lobbying pushes for private interests of specific firms or industries: e.g., taxes on specific goods, restricting competition, private compensation, and so on.

Lobbying over public policies In each period, there is an opportunity to advance M-sector productivity $A_{M,t}$ via a public policy that makes the M-sector more pro-

[27] Restrictions on labor mobility do not change the main results. M-sector progress boosts labor demand, so landowners either increase (costly) coercion or pay higher wages to retain labor. Landowners' opposition to M-sector reforms stems from the potential loss of labor.

[28] We use the OLG framework in the baseline model for several reasons: (i) To account for the finite planning horizons of agents when making lobbying or bequest decisions. In our setup, agents consider only one period ahead (e.g., 25 years) and do not anticipate the consequences of their behavior for the distant future (see Galor et al., 2010; Cervellati et al., 2021). (ii) The model remains tractable even in the presence of qualitative changes in economic and political dynamics (e.g., shifts in the extent and composition of lobbying).

ductive relative to the T-sector.[29] Individuals can invest part of their incomes into lobbying to affect the probability of such progressive policy.

More formally, the outcome of political struggle is a realization of a reform (R) policy or a status-quo (S) policy. In case of a reform policy, modern-sector productivity improves $\gamma_{R,t}$ times.[30] In case of a status-quo policy, it improves only γ_S times, and $\gamma_{R,t} > \gamma_S \geq 1$. Thus, the dynamics of productivity in the modern sector is:

$$A_{M,t} = \begin{cases} \gamma_{R,t} \cdot A_{M,t-1} & \text{if R (probability } q_t) \\ \gamma_S \cdot A_{M,t-1} & \text{if S (probability } 1 - q_t). \end{cases} \tag{3}$$

We also assume that there is a spillover effect from the M-sector TFP to the T-sector TFP in the next period, such that $A_{T,t+1} = A_{M,t}$.

We model the process of lobbying over industrial policies following the literature on public policy contests, Baik (2008), Nitzan and Ueda (2014), with more recent applications to trade policies in Cole et al. (2021) and Blanga-Gubbay et al. (2021). The probability q_t that the M-sector productivity is advanced via a policy/reform is given by the standard contest success function (CSF), with efforts of individual members of one interest group being perfect substitutes:

$$q = (\sum e_R^i)/(\sum e_R^i + \sum e_S^j + \overline{e}), \tag{4}$$

where we intentionally suppress time subscripts for the sake of tractability. We denote by $E_R = \sum e_R^i$ the combined political lobbying of reform supporters and by $E_S = \sum e_S^j$ the combined political lobbying of status-quo supporters. The overall lobbying expenditures for/agains public reforms are given by $E_P = E_R + E_S$.

A "status-quo bias" in lobbying $\overline{e}$ (Blanga-Gubbay et al. (2021), Cole et al. (2021)) accounts for the fact that (i) to persuade a government to implement a given policy,

[29] Appendix E.2 offers a richer model that considers various kinds of policies separately. We could also incorporate lobbying over T-sector productivity, A_T. For example, landed elites had large stakes in enclosures (boosting A_T), and played a key role introducing new agricultural technologies, such as cooperative creameries in Denmark, Lampe and Sharp (2019). Adding lobbying over the T-sector policies would not change our main predictions, as one can reformulate lobbying over A_M as one over any productivity increase in the M-sector above and beyond that in the T-sector.

[30] In our model simulations, we allow for the agglomeration and market size effects on M-sector productivity, as in Brunt and García-Peñalosa (2021) and Cervellati et al. (2022).

a certain minimal level of signal needs to be sent. Historically, capitalists were often pushing against government inaction (Hanlon (2024)), and (ii) for most of the 18-19 centuries, landed elites had an incumbency advantage in politics due to their social status and other (private, non-official) means of lobbying.[31]

Lobbying is chosen non-cooperatively. Each individual takes into account that increasing his or her contribution increases the chances of a preferred policy outcome. However, since the group-level contribution is effectively a local public good, the standard free-rider problem affects individual lobbying efforts.

An alternative way to model lobbying is using the Grossman and Helpman (1994) "Protection for Sale" framework. We use the "Tullock contest" in this paper for three reasons. First, the menu-auction lobbying literature implies a democratically elected government, where lobbying / campaign contributions are channeled to the government to help fight future elections.[32] In the 18-19 centuries, however, neither the UK nor the US were consolidated democracies. Moreover, the lobbying expenses we model were not channeled to the government, but were instead used to advertise the campaign, print petitions, collect signatures, and so on. Second, larger and more numerous petitions presented a stronger argument in the parliament, which brings it closer to the litigation process - one of the main motivations behind the CSF approach. Finally, the ease of integrating the CSF into a growth model is an advantage.[33]

Lobbying for special / private interest

Above we described lobbying for sectoral interests, where a given policy advances the productivity of the entire sector. However, not all policies have such broad range benefits as the repeal of the Corn Laws, education reforms, or infrastructure investments. Lobbying might also be directed towards purely personal gain, often at someone's other expense.[34] Thus, another type of lobbying in our model is the lobbing

[31]Skaperdas and Vaidya (2012) show that this standard Tullock's CSF has microfoundations in a game where the parties expend resources to persuade the audience. Integrating petitions into the lawmaking process in the Congress fits nicely into this description, see also Langtry (2024).

[32]It thus makes sense for the government to trade off campaign contributions against the public welfare, both entering the government's payoff function.

[33]It is also easy to show that an alternative framework yields similar predictions for how the concentration of capital affects the intensity of lobbying, see Bombardini (2008) among others.

[34]For example, big capitalists might lobby in favor of restricting competition in their markets, or against taxes on their products, and so on.

for special ("vested") interests.

Each individual can invest e_v^i into lobbying to obtain non-market benefits that add to their family wealth.[35] Specifically, individual level of tax is a function of private lobbying expenditures, $\tau^i = f(e_v^i)$, with the following properties: $f'(e_v^i) < 0, f(0) = \tau_{MAX}, f(\infty) = 0$,

Lobbying for private interests creates several distortions: (i) it amplifies inequality, as wealthier individuals possess more resources to lobby for their vested interests; (ii) it undermines the state's capacity to finance public expenditures and diverts resources from public to private needs, and (iii) it redistributes wealth from less to more wealthy individuals, thereby lowering social welfare (as indirect utilities are concave in wealth).

Total lobbying expenditure E is the sum of vested interest lobbying and lobbying for/against public policies $E = E_v + E_P$.

Government's budget constraint

The government runs a balanced budget, using all tax revenues, $T = \sum \tau^i b^i$, to finance productive spending G—such as infrastructure investment, education, and similar public goods.

Public spending positively affects productivity growth in the modern sector. This holds under both the reform and status-quo policy regimes. Moreover, for any level of G_t, we have: $\gamma_{R,t} = f_R(G_t) > \gamma_{S,t} = f_S(G_t)$ and $\gamma'_{R,t} = f'_R(G_t) > \gamma'_{S,t} = f'_S(G_t)$.

These conditions imply that public spending is more productive—both in level and marginal effect—when the reform policy is implemented.

4.4 Individual preferences and budget constraints

Individuals live for two periods, and value consumption and bequest to their children. Lifetime utility is:

$$U(\hat{c}_{t,1}^i, \hat{c}_{t,2}^i, b_t^i) = (1-\beta) \cdot ln(\hat{c}_{t,1}^i) + \beta \cdot ((1-\eta) \cdot ln(\hat{c}_{t,2}^i) + \eta \cdot ln(b_t^i \cdot (1-\tau_t^i)) \quad (5)$$

where $\hat{c} = (c_A^i - \overline{c}_A)^a \cdot (c_M^i + \overline{c}_M)^{1-a}$ is a Stone-Geary consumption aggregate, where individuals value agricultural and manufacturing/services goods (Alvarez-Cuadrado and Poschke (2011), Herrendorf et al. (2014)). Thus, individuals face subsistence

[35] Historically, income taxes were much less common; see, e.g., REFERENCE.

constraint in agricultural goods ($\overline{c}_A$) and are endowed with a non-market supply of manufacturing/services goods ($\overline{c}_M$).[36]

In the first period of their lives, individuals do not take any economic or political decisions, and simply receive their capital and land bequests, k^i and T^i. Capital bequests are taxed at a rate τ_t^i (as described above) and then invested in the modern sector to become productive capital in the next period, i.e., $k_t^i = b_{t-1}^i(1-\tau_t^i)$.

The second period of life is divided into two sub-periods: lobbying (indexed by 1) and bequest (indexed by 2). In the lobbying sub-period, individuals try to sway the outcome of public policies in their preferred direction, while in the bequest sub-period, they split their (policy-affected) incomes between consumption and bequest. We describe the two periods starting from the latter, bequest sub-period, as this is also how we solve the model (by backward induction).

Last decision period: Bequest sub-period Once the policy outcome is realized, individuals supply their production factors and receive their factor incomes (for the second time). In the bequest sub-period, incomes are given by $I_{t,2}^i = w_{t,2} + k_t^i R_{t,2} + T^i \rho_{t,2}$. Individuals optimally allocate this income between consumption and bequest: $I_{t,2}^i = c_{t,A,2}^i \cdot p_{t,2} + c_{t,M,2}^i + b_t^i$.

The Stone-Geary formulation of the utility function implies that in the bequest sub-period, the optimal consumption of agricultural goods is $c_{t,A,2}^i = (1-\eta)\cdot a \cdot \hat{I}_{t,2}^i/p_{t,2} + \overline{c}_A$, the optimal consumption of manufacturing goods is $c_{t,M,2}^i = (1-\eta)\cdot (1-a)\cdot \hat{I}_{t,2}^i - \overline{c}_M$, and the optimal bequest is $b_{t,2}^i = \eta \cdot \hat{I}_{t,2}^i$, where $\hat{I}^i = I^i - p_{t,2}\cdot \overline{c}_A + \overline{c}_M$. Thus, the indirect utility of the bequest sub-period is $ln(\hat{I}_{t,2}^i) - (1-\eta)\cdot a \cdot ln(p_{t,2}) + \bar{\eta}$, where $\bar{\eta}$ is a constant.

First decision period: Lobbying subperiod

In the lobbying sub-period, individuals optimally allocate their initial incomes (inherited wealth times first-period prices), $I_{t,1}^i = w_{t,1} + k_t^i R_{t,1} + T^i \rho_{t,1}$, between consumption and two types of lobbying, so $I_{t,1}^i = c_{t,A,1}^i \cdot p_{t,1} + c_{t,M,1}^i + \kappa \cdot e_{j,t}^i + \kappa \cdot e_{v,t}^i$ is the budget constraint, $j \in \{R, S\}$. The exogenous cost of lobbying is κ.

[36] We abstract from splitting the non-agricultural sector into manufacturing and services due to the fact that until 1910s (the time period we focus on), the dynamics of manufacturing and service sectors were almost identical, e.g., Kongsamut, Rebelo and Xie (2001) and Acemoglu (2009).

Incomes and prices in the bequest sub-period are the reason why individuals lobby: $I^i_{t,2}$ and $p_{t,2}$ depend on the policy outcome, reform or status-quo. Denote by $I^i_{2,R}$ future incomes under the reform policy, and by $I^i_{2,S}$ future income under the status-quo policy, and denote by $p_{t,2,R}$ and $p_{t,2,S}$ - the prices of the agricultural good under the reform and the status-quo policy, respectively. Define agent i's utility gain from the reform policy as $\Delta^i_R = ln(I^i_{2,R}/p^{a\cdot(1-\eta)}_{2,R}) - ln(I^i_{2,S}/p^{a\cdot(1-\eta)}_{2,S})$. Thus, $\Delta^i_R < 0$ for status-quo supporters. Combining this definition of policy gains with the utility function in (5), and the indirect utility in the second subperiod, the individual expected utility maximization problem boils down to

$$\max_{\{c^i\geq 0, e^i\geq 0\}} \quad \mathbb{E}V(c^i, e^i) = (1-\beta)\cdot ln(\hat{c}^i) + \beta\cdot[p_R(e^i)\cdot\Delta^i_R + ln(I^i_{2,S}/q^{a\cdot(1-\eta)}_{2,S})] + \\ +\beta\cdot\eta\cdot ln(1-\tau^i(e^i_v))]$$
$$\text{subject to} \quad c^i_A p_1 + \kappa\cdot e^i_J + \kappa\cdot e^i_v = I^i_1 \tag{P}$$

where the penultimate term in (P) is a constant not affecting the maximization problem, and the last term underlines the role of vested interests in increasing the utility by pushing down the level of an individual level of tax.

Thus, each individual chooses c^i_A, c^i_M and e^i_J, e^i_v to balance the gains from an increase in the probability of his preferred policy or from the lower level of individual taxes on bequest against the costs of lobbying (forgone consumption).

5 Model equilibrium and main predictions

In this section, we first describe the economic equilibrium for a given policy outcome. Then we analyze individual policy preferences, and define a Nash Equilibrium of the non-cooperative lobbying game that determines the policy outcome. We then show how (i) wealth concentration affects the intensity and success of lobbying for industrialization and lobbying of vested interests, and (ii) how lobbying intensity co-evolves with structural change.

5.1 Labor market clearing and factor prices

The labor market clears when $w_{T,t} = w_{M,t}$, as labor is perfectly mobile between the two sectors. Using the simple Cobb-Douglas labor demand equations, together with the labor supply $L_{T,t} + L_{M,t} = N$, and the market clearing condition, we derive the equilibrium number of workers employed in the modern sector:

$$\frac{L_{M,t}^{\alpha}}{(N - L_{M,t})^{\beta}} = \frac{(1-\alpha) \cdot K_t^{\alpha} \cdot A_{M,t}}{p_t \cdot (1-\beta) \cdot T^{\beta} \cdot A_{T,t}}. \tag{6}$$

In equilibrium, $\sum c_A^i = Y_T$, and using the demand for agricultural goods in the bequest period from above, we deduce that

$$p_t = \frac{(1-\eta) \cdot a \cdot (Y_{M,2} + \overline{c}_M N)}{(1 - a \cdot (1-\eta)(Y_{T,2} - \overline{c}_A \cdot N)} \tag{7}$$

Combining equations (6) and (7), we get an implicit equation for an equilibrium level of employment in the bequest sub-period.

$$\frac{L_{M,2}}{L_{T,2}} = \frac{(1-\alpha) \cdot (1 - a(1-\eta) \cdot (Y_{M,2}/(Y_{M,2} + \overline{c}_M)}{(1-\beta) \cdot (1-\eta) \cdot a \cdot Y_{T,2}/(Y_{T,2} - \overline{c}_A)}. \tag{8}$$

As $dL_{M,2}/dA_{M,2} > 0$, A higher A_M increases M-sector wages and pulls workers from agriculture, despite the rise of p_t, the price of agricultural goods, which partially offsets the positive effect on the modern sector employment.[37]

Importantly, from (6) the ratio of the value of agricultural output to the modern sector output (pY_T/Y_M) is a declining function of employment in the modern sector. This fact is consistent with stylized facts of structural change.

Using (6) and the fact that factor prices are equal to marginal products, we get the equilibrium factor prices $w_t^* = w_t(L_{M,t}^*)$, $R_t^* = R_t(L_{M,t}^*)$, and $\rho_t^* = \rho_t(L_{M,t}^*)$. A higher $A_{M,t}$ increases R_t^* directly, and indirectly by pulling more labor to the industry. A higher $A_{M,t}$ also has an ambiguous effect on ρ_t^*, since it increases the prices of agricultural products and also decreases the employment in agriculture. As land and labor are complements in the traditional sector this consideration explains

[37] If $\overline{c}_M = 0, \overline{c}_A = 0$, there will be no structural change, as the labor-pull effect of advancement in the M-sector productivity is perfectly offset by the rising agricultural prices (also analyzed in other models of structural change with the Stone-Geary consumption aggregate, e.g., Alvarez-Cuadrado and Poschke (2011). To avoid such a case, in our baseline model $\overline{c}_M > 0, \overline{c}_A > 0$.

why landowners may oppose M-sector reforms, while landless individuals support them.[38] Below we focus on intra-period equilibrium and drop the * symbol for the sake of exposition.

5.2 Individual policy preferences

Individual policy preferences depend on how an increase in $A_{M,t}$ affects individual incomes, $I_t^i = w_t + k_t^i \cdot R_t + T^i \cdot \rho_t$, and relative price of the agricultural good p_A. Since $T^i = 0$ for landless individuals, all of them support reform policy because it increases wages and returns to capital. However, landowners may either support or oppose modern sector reforms, depending on the amount of land and capital they own and on the macroeconomic aggregates (which determine how factor prices and p_A react to policy changes).

Denote by $\Delta w = w^R - w^S > 0$, $\Delta R = R^R - R^S > 0$, and $\Delta\rho = \rho^S - \rho^R > 0$ changes in factor prices between the reform and the status-quo. Then $\Delta I = I^R - I^S = \Delta w + k_t^i \cdot \Delta R - T^i \cdot \Delta\rho$ is the change in income. We have the following proposition.

Proposition 1 (Policy preferences and gains from policy change)**.**

1. ***Policy preferences of landowners and the landless****. All landless individuals support reform policy. For negative $\Delta\rho$, landowners support reform policy when $k^i \cdot \Delta R + \Delta w \geq T^i \cdot \Delta\rho$, i.e., when their capital and wage gains surpass losses from land.*

   There exists a threshold level of aggregate capital $\bar{K}$, such that for all $K_t \geq \bar{K}$, all individuals support reform policy, i.e., $\forall i : \Delta_R^i \geq 0$.

2. ***Individual wealth and policy gains****. A higher k^i increases the gains from a reform policy, $(\Delta_R^i)'_{k^i} > 0$, Moreover, the strength of support for a reform (status-quo) policy is concave in the individual amount of capital*

Proof. See Appendix C □

[38] In our model, individuals are myopic to very long-run effects of the policy because they only live for two periods. However, even with longer horizons, our main results would not change qualitatively: future gains of landowners would be heavily discounted, and since progressive policies empower capitalists in the future, landowners' have more incentives to support status-quo than capitalists.

A larger individual capital stock increases support for reforms: an increase in the M-sector productivity increases profits, and this effect is proportional to k^i (part 2). An individual owning both capital and land wins from industrialization as a capital owner but may lose as a landowner. The relative endowment of capital and land determines the policy preferences of landowners (part 1).As the capital stock grows, labor moves to the industry, and the T-sector shrinks. When the share of land in landowners' portfolios is small enough, they become reform policy supporters.

For $\Delta\rho > 0$, M-sector policies, like infrastructure, and new technologies can also benefit agriculture, by boosting market access, prices of agricultural products, and hence land values.

5.3 Lobbying and its outcomes

Using the CSF from (4) and maximization problem defined in (P), we arrive at the following best response amount of e_R^i invested into lobbying for reforms.

$$e_R^i = \begin{cases} \frac{\hat{I}^i}{\kappa} - \frac{1-\beta}{\beta} \cdot \frac{E}{1-p_R} \cdot \frac{1}{\Delta_R^i} & \text{if } \hat{I}^i \cdot \Delta_R^i > \frac{1-\beta}{\beta} \cdot \frac{E}{1-q} \\ 0 & \text{otherwise.} \end{cases} \tag{9}$$

where$E = E_R + E_S + \overline{e}$. A similar optimization problem is solved for the status-quo supporters (if they exist), with a symmetric best response function. Figure 8 shows the best response for reform supporters. Small capitalists free-ride for some parameter values and lobbying investments of other players: $\hat{I}^i \cdot \Delta_R^i \leq \frac{1-\beta}{\beta} \cdot \frac{E}{1-q}$ simplifies to $k^i < \bar{k}$. The non-zero part of the best response is increasing and concave in individual capital stock.[39]

There is a standard free-rider effect in (9): if all other members of one's own group increase their lobbying efforts, q becomes higher, and individual incentives to contribute go down. Moreover, a more intense overall lobbying E_P makes individual contribution less important, which also lowers e_R^i. Of course, both E and q are endogenous and constitute a Nash Equilibrium of this game.

The best response e_R^i is a function of the aggregate choices of other players and exogenous parameters only, which means that this lobbying game is an "aggregative

[39]This is based on the fact that individual contribution to lobbying is increasing in own income (linearly) and in own gains from a reform policy (non-linearly), see part 2 of Proposition 1.

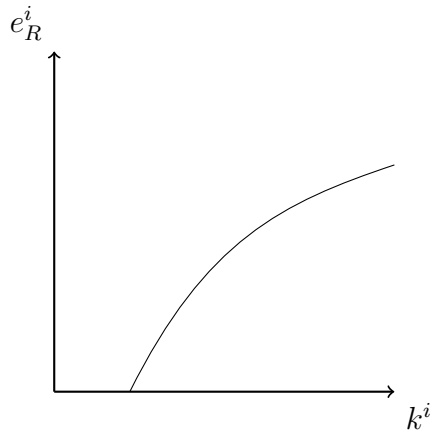


Figure 8: Individual contribution schedule w.r.t. capital

game", permitting the use of the "share function" approach, Cornes and Hartley (2005). Assume for now, that lobbying for vested interests is absent. To solve for the NE, we need to aggregate individual best responses for both sides of the contest. The combined lobbying by reform policy supporters is then

$$E_R = \sum_{i \in R_+} (\hat{I}^i - \frac{1-\beta}{\beta} \cdot \frac{E}{1-q} \cdot \frac{1}{\Delta_R^i}),$$

where the R_+ is the group of reform supporters for whom the participation constraint from (9) is satisfied. If we divide the total group investment E_R in political struggle by the overall contest intensity E, we get the so-called 'share function':

$$s_R = E_R/E = \frac{\sum_{i \in R_+} (\hat{I}^i - \frac{1-\beta}{\beta} \cdot \frac{E}{1-q} \cdot \frac{1}{\Delta_R^i})}{E}. \tag{10}$$

Using the share functions for both the supporters and the opponents of a reform policy, we can define and characterize the Nash equilibrium of the political struggle game. While the details are relegated to Appendix B, an equilibrium must satisfy:

$$s_R(E^*) + s_S(E^*) = 1, \tag{11}$$

and $q^* = s_R(E^*)$. With three classes of individuals in the economy, we can have two types of NE. In the first type, only the big capitalists participate in lobbying, while the small capitalists free-ride (participation constraint (9) is not satisfied for their relatively low k^i). In the second type of NE, both groups of capitalists participate in

lobbying.[40] Below we analyze how the distribution of wealth affects the equilibrium probability of reforms and the intensity of lobbying.

5.4 Lobbying for special interest

Using maximization problem defined in (P), we arrive at the following best response amount of e_v^i invested into lobbying for special interest.

$$e_v^i = \begin{cases} \frac{\hat{I}^i}{\kappa} - \frac{f(e_v^i)}{\beta \cdot \eta \cdot f'(e_v^i)} & \text{if } \hat{I}^i > \frac{\kappa \cdot f(0)}{\beta \cdot \eta \cdot f'(0)} \\ 0 & \text{otherwise.} \end{cases} \tag{12}$$

Only wealthy agents are ready to lobby for special interest. Moreover, the higher is the efficiency of lobbying in terms of the increase in the tax deduction $(f'(e_v^i)/f(e_v^i)$ the higher is the optimal investment in lobbying.

For each of social groups (landowners, big capitalists, small capitalists) there are two thersholds, $\bar{I}_1^i, \bar{I}_2^i$, for which there is a switch of the regime from zero lobbying to positive level of lobbying in public interest/special interest policy.

For the highest level of incomes, such that $I^i > max\{\bar{I}_1^i, \bar{I}_2^i\}$ indivials invest in both types of lobbying. In this case, from the problem (P), the marginal benefits from both types of lobbying should be equal and so, the following proposition holds.

Proposition 2.

1. *Only wealthy agents with $I^i > I_2^i$ invest in private interest lobbying.*

2. *If $I^i > I_2^i$, and so, $e_v^i > 0$, the higher gain from the reform policy (Δ_R^i) lowers the amount of private interest lobbying, and the higher equilibrium probability of the reform policy (q) increases the investment in private interest lobbying*

Proof. The first results follows directy from (**??**). To get the second result, we need to consider the case, when $I^i > max\{\bar{I}_1^i, \bar{I}_2^i\}$. From the problem, (P), the optimal

[40] Allocations with (i) both sides contributing zeros, or (ii) neither of the two capitalists groups participating, or (iii) landowners not participating, can not be an equilibrium. For case (i), note that in a zero total effort case, every individual has an incentive to contribute $\varepsilon > 0$ to tilt the policy outcome in own favor. For case (iii), $E_S = 0$, so for any $E_R > 0$, we have $p_R = 1$. Participation constraint (9) will not hold for reform supporters, and we are back to case (i). Case (ii) is analogous.

investment in private and public lobbying is determined by following two equations

$$\eta \frac{f'(e_v^i)}{f(e_v^i)} = \Delta_R^i \frac{1-q}{E} \tag{13}$$

$$e_J^i = \frac{\hat{I}^i}{\kappa} - e_v^i - \frac{b \cdot \Delta_R^i \cdot (1-q)}{E} \tag{14}$$

It is straigtforward to see that $\frac{de_v^i}{d\Delta_R^i} < 0$, $\frac{de_v^i}{dq} > 0$ □

5.5 Effects of wealth concentration on lobbying and reforms

In this section, we ask how changes in the concentration of capital affect lobbying intensity and chances for progressive reform in that period.

Proposition 3 (Capital concentration among the big capitalists)**.**

For relatively low (high) levels of the aggregate capital-to-land ratio, a marginal transfer of capital from smaller capitalists to bigger capitalists increases (decreases) the chances for reform policy. Thus, if $K_t \leq (>)\Phi$ *then* $\frac{\partial p^*_{R,t}}{\partial \theta_t} \geq (<)0$*, where* Φ *is a function of* Ω_{-K} *(all exogenous variables except capital stock).*

Proof. See Appendix C □

The intuition behind this result is based on two mechanisms. At the earlier stages of industrialization, smaller capitalists have very low incomes and low gains from M-sector reforms, so they remain non-contributors (see Figure 8 and individual best response from (9)), and only bigger capitalists lobby. In such a case, an increase in capital concentration (a higher θ_t) means transferring capital from non-contributors towards contributors: the combined policy gains of big capitalists increase, and so does the intensity of their lobbying and the equilibrium probability of reforms.

At the later stages, when the economy accumulates more capital, and land incomes decline, both smaller and bigger capitalists may find it optimal to participate in lobbying. When both groups participate, redistributing capital from smaller to bigger capitalists decreases the combined gains from policy change.[41] Thus, an increase in capital concentration decreases chances for reforms at the later stages of the process. Figures A15a and A15b illustrate the workings of Proposition 2.

[41] Policy gains are concave in individual capital. Thus, more capital owned by big capitalists does not compensate for a decrease in the incentives of smaller capitalists.

Moreover, in the general equilibrium at the later stages, the equilibrium q is higher, and hence capitalists divert their resources from public to private lobbying.

How does the intensity of lobbying respond to changes in incomes, policy gains, and capital concentration? Our next proposition characterizes these effects.

Proposition 4 (The intensity of lobbying)**.** *The NE lobbying intensity E^* has the following properties:*

- *Contributors' incomes increase E^*: $\frac{\partial E^*}{\partial I_Z^i} > 0$, for $Z \in \{R, S\}$*
- *Contributors' policy gains increase E^*: $\frac{\partial E^*}{\partial \Delta_Z^i} > 0$, for $Z \in \{R, S\}$*
- *Capital concentration (θ_t) increases E^* if and only θ_t increases p_R^*.*

Proof. See Appendix C □

Higher incomes make it easier to forgo consumption and invest in lobbying, while higher policy gains act as a return on investment in lobbying. Thus, both variables increase the overall lobbying intensity E^*. The fact that E^* is increasing in incomes and policy stakes of both capitalists and landowners generates a hump-shaped dynamics of lobbying intensity. Incomes and policy gains of capitalists increase over time, while landowners' gains from status-quo first increase and then decline with the accumulation of capital and migration of labor away from agriculture. An increase in capital concentration increases lobbying for industrialization by capitalists, as well as the resistance from landowners, at least at the early stages of the process.

Effects of land concentration What are the effects of land concentration on lobbying for industrial reforms and its success? It's easy to prove that a higher concentration of landownership increases resistance of landowners and slows down progressive reforms. A higher land concentration can be modeled as a decrease in the number of landowners in our baseline model. The free-rider problem weakens, incomes and stakes of each landowner increase, so total lobbying against reforms picks up, decreasing the equilibrium chance of reforms.[42]

The combination of a positive effect of capital concentration on reforms, and a negative effect of land concentration, implies that initially (when the share of land is

[42]With two groups of landowners, small and big, the proof is almost identical to Proposition 2.

high), a negative effect of land concentration dominates, while later on (as traditional sectors contracts), a positive effect of capital concentration dominates. Moreover, when landowners no longer pose a political barrier to development (Proposition 1), the positive effect of capital concentration disappears.

6 Model Dynamics: Calibration and Simulations

In this section, we calibrate our model to the British data from 1690 to 1930 to test how closely we can match the joint dynamics of structural change, wealth concentration, and industrial lobbying in the post-Glorious Revolution era.

6.1 Model dynamics

For the sake of exposition, in what follows we drop the sub-period indices. Aggregating over individual incomes, we get the following capital accumulation equation:

$$K_{t+1} = (1 - \tau_{t,l)} \cdot \eta_l N_l I_{t,l} + (1 - \tau_{t,b)} \cdot \eta_b N_b I_{t,b} + (1 - \tau_{t,s)} \cdot \eta_s N_s I_{t,s}, \tag{15}$$

where $I_{t,j}$ - is the income of individual from the group $j \in \{l, b, s\}$ in sub-period 2, and η_j, which determines propensity to bequest, differ across groups in our simulation. The expected M-sector productivity in the next period is given by

$$E(A_{M,t+1}) = A_{M,t} \cdot (\gamma_{S,t} + p_{R,t}(\gamma_{R,t} - \gamma_{S,t})), \tag{16}$$

and TFP growth in the T-sector is driven by the spillover effect

$$A_{T,t+1} = A_{M,t} \tag{17}$$

From there on, we focus on a deterministic trajectory of the economy. Namely, for each time period, actual TFP growth equals the expected growth from (16). An increase in the probability of reforms boosts M-sector TFP growth, pulls workers from agriculture, intensifies the accumulation of physical capital, and changes the distribution of wealth for the subsequent periods.[43] Note that for identical η, τ and

[43] An alternative approach is stochastic: letting the model run multiple times, and describing the distribution of trajectories the economy follows. We pick the deterministic approach to have a more tractable relationship between lobbying and structural change, and lobbying and wealth distribution.

constant TFP, equation (15) simplifies to:

$$K_{t+1} = \eta(1-\tau)Y_t = \eta A(1-\tau)(p_t T^{\beta} L_{T,t}^{1-\beta} + K_t^{\alpha} L_{M,t}^{1-\alpha}). \tag{18}$$

Definition 1 (Intertemporal equilibrium)**.** *A sequence of* $(K_t,\ L_{M,t},\ A_{M,t},\ A_{T,t},\ w_t,\ R_t,\ \rho_t,\ e^i_{R,t},\ e^i_{S,t},\ e^i_{v,t},\ q_t,\ k^i_t,\ I^i_t,\ \gamma_{R,t}),\ \gamma_{S,t}),\ G_t$ *is the inter-temporal equilibrium of the model, if for given values of* $(K_0, k^i_0, A_{M,0}, A_{T,0}, T^i)$*, the dynamics of physical capital is determined from the dynamic equation* (15)*, the dynamics of technology is determined from the equations* (16)*,* (17)*, the dynamics of individual levels of capital is determined from the equation* $k^i_{t+1} = \eta_j \cdot (1-\tau^i) \cdot I^I_{t,2}$*, where* $j \in \{l, b, s\}$ *is the social class of individual* i*, and the dynamics of lobbying expenditures is determined by the solution to optimization problem* (P)*. Moreover, labor market clearing conditions hold, factor prices are equal to marginal products, and* q *and* E *satisfy* (10) *and (11).*

6.2 Model calibration

As is common in the OLG set-up, one period lasts 20 years. We take some of our parameters from the existing literature (distribution of land, composition of social classes etc.), and calibrate the agglomeration effects in the M-sector to match the historical data on the dynamics of the share of employment in the modern sector (outside of agriculture). We also use data on relative incomes of social classes in 1688 and 1759 from Allen (2019) to calibrate the bequest rates (η_j).

Table 7 summarizes how we calibrate our parameters. We judge the performance of our simulations by how well we predict the dynamics of lobbying for industrialization (proxied by number of industriazation related petitions to the British parliament), TFP growth in the M-sector and the dynamics of individual incomes of landowners and bourgeoisie (relative to the average).

Production function We take the average over 1688-1867 share of labor incomes in total output from Allen (2019) and get an estimate for $1-\alpha = 0.57$.

The composition of social classes According to Allen (2019), big landowners (aristocracy) represented about 1.5% of all families in Britain in the 19th century, so $N_l/N = 0.015$. During the years 1688-1880, the share of the class of bourgeoisie including large-scale capitalists, bankers, merchants, lawyers, high officials and investors grew more than two-fold. However, since in the baseline model the share of

each group is fixed, we take an average years 1688-1867, which gives us $N_b/N = 0.05$. The rest (93.5%) are "small capitalists" in our simulations. We provide simulations of the model with dynamic social class sizes in Appendix E.3.

Distribution of land To match the historical dynamics of inequality between social classes, we acknowledge that not all of the land belonged to the rich elite in the pre-industrial era. Allen (2019) estimates that big landowners earned 66% of land rent in Britain in 1688, so this is the share of land belonging to big landowners in our calibration. The remaining land is distributed equally among the other two groups.[44]

Initial endowments of capital and technology We start our model simulation in 1690 (post-Glorious Revolution). In 1688, about 61% of the labor force was employed outside of agriculture, Allen (2019): we use it to calibrate the initial st. state values of $K(0)$ and $A(0)$. In Appendix F, we use alternative data from CAMPOP.

Bequests and capital accumulation Propensity to bequest and thus the speed of capital accumulation in our model is determined by the preference parameter η. We calibrate the bequest rates across social classes to match the historical data from social tables assembled by Allen (2019). More specifically, we set η_b to match the initial differences in income per capita between the big capitalists and the average person. We set $\eta_l = \eta_s$ to match the average savings rate over the entire period.[45]

M-sector TFP growth To take into account that growing M-sector employment increases potential productivity growth (market size effects, e.g., Cervellati et al. (2022) and Brunt and García-Peñalosa (2021)), we use the following functional form for the size of productivity boost when a reform happens:

$$\gamma_{R,t} = \gamma_{min} + a * ((L_{m,t} - L_{m,0})/N)^{\nu},$$

where ν determines the sensitivity to the level of employment in the modern sector, and $L_{m,0}/N$ is the initial share of employment in the M-sector. We choose ν to fit the employment structure at 1850, the period of the most intense lobbying[46], and normalize a to have $\gamma_{R,t} = 1.26$ for $L_{m,t} = 1$ (to match the modern era 2% long-run

[44]Heldring et al. (2021) shows that in 1407, aristocracy, gentry, church and crown owned 80% of land. By 1688, the share of smallholders increased to 25-33%, corroborating Allen's estimate.

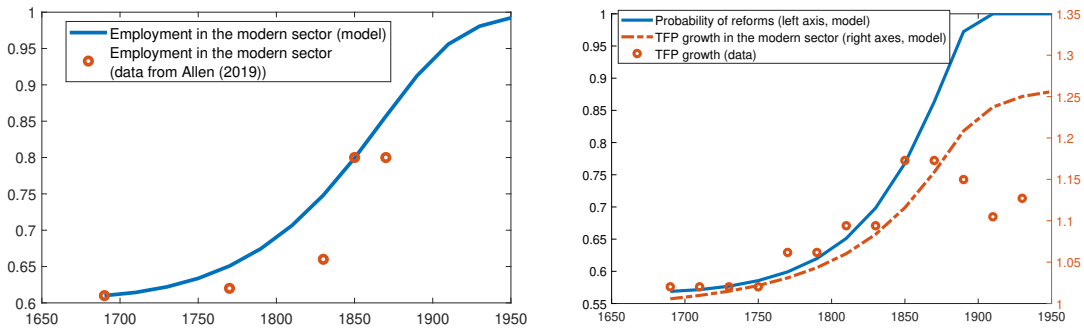
[45]We follow Doepke and Zilibotti (2008) assuming that capitalists save more than landowners.

[46]An alternative calibration for ν minimizes the sum of squared differences between model and data employment, 1690-1870. It produces similar results, shifting the peak of lobbying by 20 years.

growth rate, Crafts and Harley (1992)). We fix $\gamma_{min} = 1.01$, which is the lower bound estimate of the initial perspectives of technological development. In the baseline version, we normalize γ_S to 1. In Appendix E.4, we consider a more realistic case, with a small pace of endogenous growth even in the absence of reforms.

6.3 Model simulations: main results

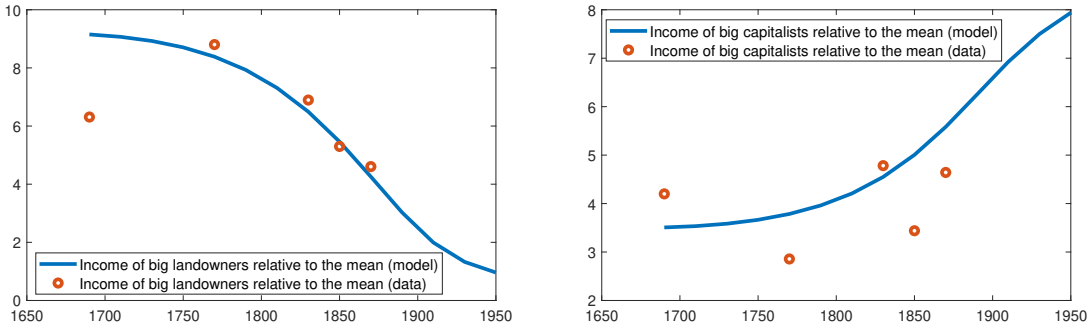
On Figure 9a, we show the model-based dynamics of the M-sector employment and compare it to data from Allen (2019). Figure 9b shows the model-based probability of passing progressive industrial policies in the course of industrialization. As capital accumulates, incomes and policy gains of capitalists increase relative to the incentives of landowners to maintain status-quo, so the probability of reforms increases. Moreover, our model picks up the intensification of TFP growth in the mid- and late-19th centuries, driven by lobbying for industrialization and accelerated structural change.



(a) Share of employment in the modern sector (b) Probability of reforms and TFP growth

Figure 9: M-sector employment, pace of reforms, and TFP growth: model and data

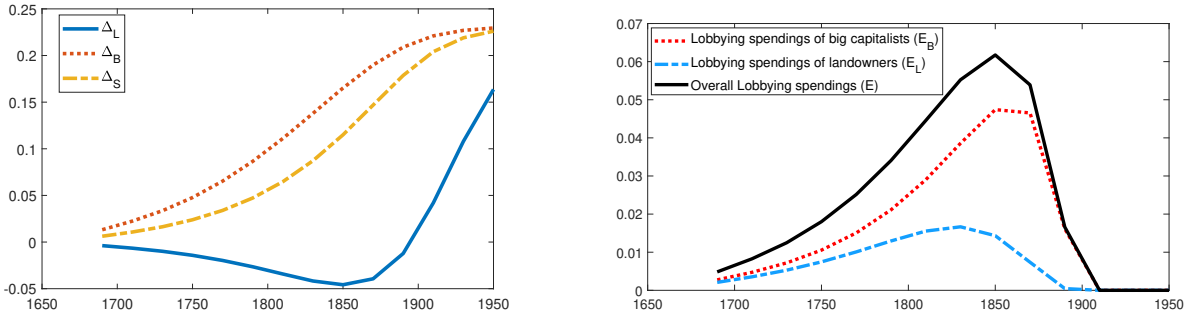
Turning to the dynamics of inequality, Figures 10a and 10b show relative incomes of big landowners, big capitalists, and the rest of the population, comparing our model-based dynamics to the data from social tables. The model fits well the steady decline of big landowners in the 18th-19th centuries due to falling land rents and growing labor and capital returns. It also matches the increase of the relative incomes of big capitalists in 19th century. Higher saving rates (η_b) and rising returns to capital (R) contribute to the transition from an agricultural society with a rich landowning elite to the industrial society with the bourgeoisie being the new elite.



(a) Big landowners, relative to the mean (b) Big capitalists, relative to the mean

Figure 10: Income concentration: Landowners and big capitalists, model and data

Changes in income levels and factor shares affect individual lobbying incentives. Figure 11a shows the dynamics of policy gains (Δ^i) for each of the three groups. Landowners' gains from status-quo are non-monotonic: as industrialization accelerates, land incomes become more sensitive to M-sector productivity, so landowners' incentives to block reforms increase. At the same time, landowners' capital stocks grow over time. Once Δ_L becomes positive, landowners switch to reform supporters. Policy gains of big capitalists are much larger than that of small capitalists. And since inequality between big and small capitalist grows over time, only two groups (landowners and big capitalists) participate in lobbying in our simulations.



(a) Gains from reforms. (b) Lobbying

Figure 11: Gains from reforms (Δ_L - landowners, Δ_B - big capitalists, Δ_S - small capitalists) and lobbying expenditures

Figure 11b shows the dynamics of lobbying over industrial policies: by big capi-

talists, E_R, landowners, E_S, and their sum, E. There is a clear hump-shaped path, which reflects the facts that (i) lobbying is more intense when (i) incomes and gains from a policy change are higher, and (ii) incomes and gains of the opposing groups are close to each other. In the early periods, stakes of both groups are low, and there is no intense lobbying. At the end, when the T-sector contracts, and landowners become more invested in the M-sector, lobbying is also negligible. In between, however, when both sides have a lot to gain from their preferred policies, and when capitalists accumulate sufficient incomes to oppose the established elite, lobbying peaks.

6.4 Model's fit to petitions data in Britain

Petitions Data in Britain To measure lobbying over industrial topics in Britain, we use data on petitions to the Parliament from Huzzey and Miller (2020) (1764-1832) and Parliamentary Papers database (1833-1918). Since we only have tabulations of petition topics by years, we do a keyword search over the list of topics searching for words related to infrastructure, education, trade, manufacturing, and commerce[47]. Figures A13-A14 show a hump-shaped path of industrial petitions in Britain, both in per capita terms and as shares of overall petitions, similar to that in the US.

Baseline model's performance To assess the fit of our model-based measure of lobbying over industrialization to historical data, we use the combined petitioning over infrastructure, education, trade, manufacturing, and commerce-related topics. Figure 12 shows that our model matches the peak period of lobbying in the mid-19th century quite closely, as well as the gradual decline in late-19th - early-20th century.

Notably, we over-predict the intensity of lobbying in the early periods. Appendix E.1 shows that acknowledging the status-quo bias existing in the political system reduces lobbying incentives of both groups in the early periods.

6.5 Capital concentration, lobbying, and reforms

To illustrate the effects of capital concentration on lobbying for industrialization, pace of reforms, and structural change, we focus on the role of slave trades in British

[47]Infrastructure includes words like "road", "rail", "navigation", etc. Education includes "school", "university", etc. Alcohol, wars, pensions, enfranchisement, all coded as "non-industrial".

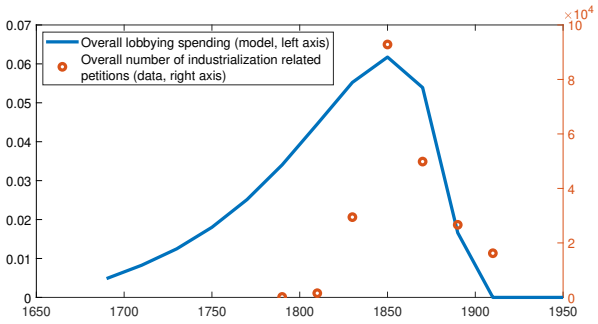
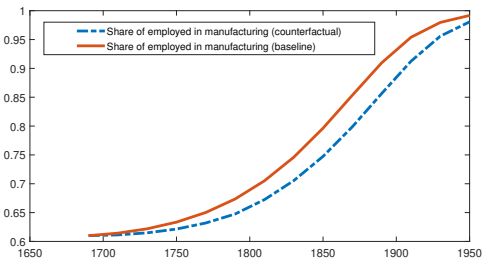
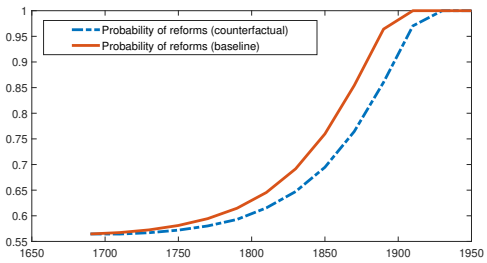


Figure 12: Lobbying for industrialization in Britain: model and data

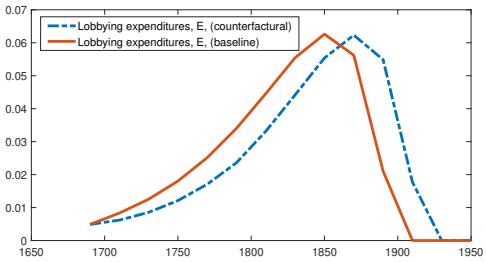
industrialization. According to Heblich et al. (2022b), incomes from slave trades in 1700-1807 were highly concentrated among big capitalists with enough resources to engage in international trade. We compare the baseline dynamics of wealth concentration calibrated to social tables (thus taking into account the effect of slave trade capital gains) against a counterfactual scenario, in which big capitalists do not have access to capital gains from slave trades.



(a) Share of employed in M-sector



(b) Probability of reforms



(c) Lobbying expenditures

Figure 13: Baseline dynamics vs. lower concentration of capital (no slave trade gains)

Specifically, we take estimates from Heblich et al. (2022b) showing that the slave

trade increased big capitalists' incomes by 11%.[48] In our counterfactual economy, we lower the capital stock of big capitalists' via a "tax": $k^b_{t+1} = \eta_b \cdot (I_{2,t}) \cdot (1-\tau)$, where τ is set to 2.3% from 1690 to 1790, the period of intense slave trade. This guarantees that by the the year 1810 (closest to the year of the actual abolition of slavery) big capitalists' incomes are 11% lower than in the baseline case. Figure 13 shows that a decrease in capital concentration has a negative effect on pro-growth reforms and structural change. Moreover, with less concentrated capital, most intense lobbying over industrialization starts and ends later: big capitalists have lower incomes and lower policy gains, which delays their lobbying efforts (Proposition 3).

These results underscore an additional channel for how slave trades might have accelerated the industrialization. Acemoglu et al. (2005) and Heblich et al. (2022b) show that Atlantic trade enriched capitalists, and we add that it was a growing concentration of capital that was especially beneficial for progressive lobbying and thus for industrialization.[49] This aligns with our evidence from petitions, Section 3.

7 Conclusion

Industrialization of the 18th-19th centuries is a crucial period of structural change, when the passage or blockage of key policies - infrastructure, mass education, free trade - set countries on different development paths, Juhász and Steinwender (2024). Despite the importance of lobbying for/against such policies, the link between structural change and political pressure surrounding it remained under-explored, Martinez-Bravo and Wantchekon (2023). To the best of our knowledge, this is the first paper to address this gap both theoretically and empirically. We document the links between structural change, industrial lobbying, and wealth distribution, using historical data on petitions - the main lobbying tool in the 18th-19th centuries USA and Britain - and propose a model that explains the regularities we observe.

[48] This is a lower bound estimate for our analysis, because at the sub-national level, the increase of capitalists' incomes was as high as 100%, in districts more exposed to the slave trade.

[49] In our counterfactual, the overall effect of big capitalists having smaller capital stocks combines both the "level effect" and "concentration effect". If we were to distribute the same capital gains such that capital concentration does not increase and there is only a "level effect" - the effect on lobbying intensity and reforms would have been much smaller.

Our first key result is that the intensity of lobbying for industrialization follows a hump-shaped path in the course of transition from agriculture to industry. This prediction finds support in the data on public petitions to the US Congress and the British Parliament. Moreover, lobbying over agricultural topics steadily declines in the course of structural change. Big capitalists are, as predicted by theory, most active in industrial lobbying, while landed individuals and groups lobby for agricultural policies and switch to industrial topics later in the course of industrialization.

Our second key result is that effects of wealth concentration on lobbying and thus the passage of pro-growth policies depend on (i) the type of asset (land vs. capital), and (ii) the stage of industrialization. At the early stages, a higher concentration of capital increases lobbying for industrialization, while a higher concentration of land ownership slows it down. These predictions find support in (i) data on petitions in the US, (ii) model simulations calibrated with British data, and (iii) cases from Prussia and the Middle East (Appendix). Thus, while today, capital concentration creates political barriers for development, this was not always the case.

We hope that this paper makes one step further towards understanding the demand for policy change during one of the most important critical juncture periods. We believe that using data on public petitions to measure historical lobbying is a promising path forward (see also Aidt and Franck (2019) and Figueroa and Fouka (2023)). There is much to be learned about whether empirical findings with contemporary lobbying data (e.g., Bombardini and Trebbi (2020)) hold in historical perspective. As we discussed above, the relative importance of capital vs. land changed over time, so the political effects of wealth concentration changed as well. Future research can shed more light on how various dimensions of wealth distribution affect lobbying, politics, and growth in the longer-run. Finally, while we mostly focused on the the general links between lobbying and local structural change / distribution of wealth, we think that exploring the response of lobbying to external shocks is very important too. Zooming into specific cases, such as wars, economic downturns, or new inventions can improve identification opportunities and be particularly valuable.

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Online Appendix

to

"Lobbying for Industrialization: Theory and Evidence"

A. Additional Figures and Tables

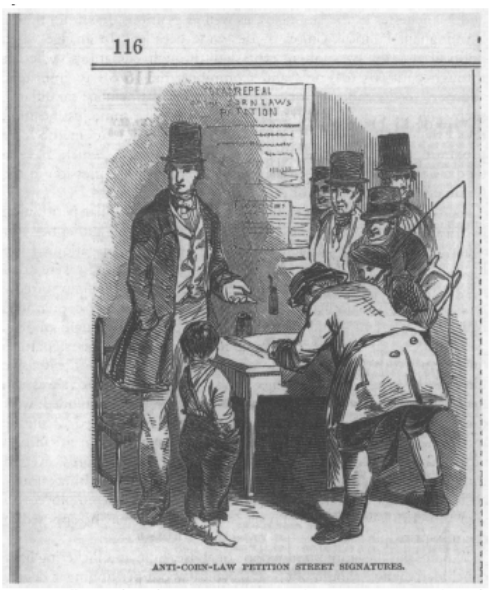
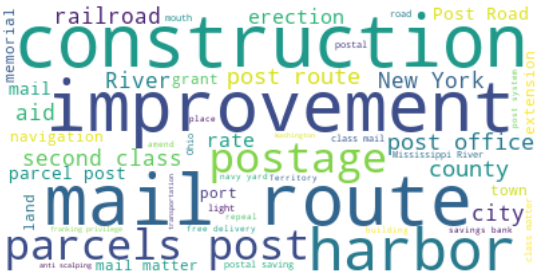
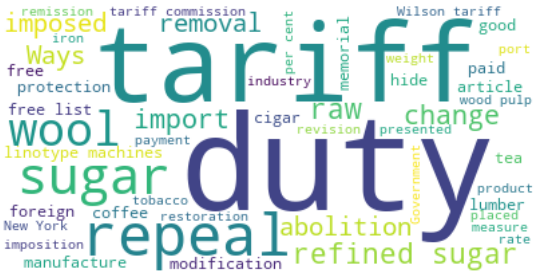


Fig. 1. *Illustrated London News*, viii. 116 (14 Feb. 1846). A correspondent of the protectionist MP for Knaresborough, William Busfeild Ferrand, drew his attention to this picture, depicting London free trade street petitioning, 'as a perfectly true representation of the manner in which the Anti-Corn-Law Leaguers procured signatures to their petitions': *3Hans lxxxiv* (2 Mar. 1846), 383. Reproduced with the permission of Senate House Library, University of London.

Figure A1: Anti-Corn Law League, gathering signatures, from Miller (2012)



(a) Infrastructure and transportation



(b) Tariffs and trade

Figure A2: Word-clouds for petitions in specific topics

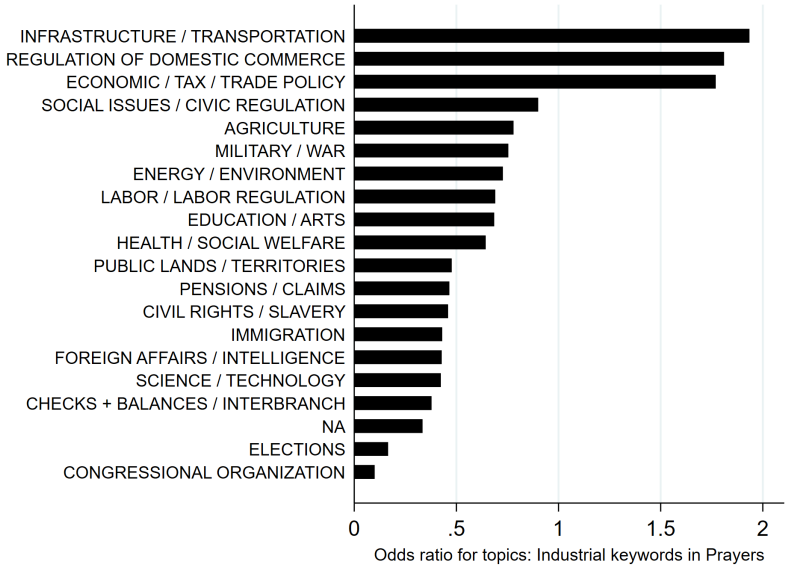


Figure A3: Likelihood to see a topic, conditional on having "industrial" keywords in petitions, relative to unconditional (odds ratio).

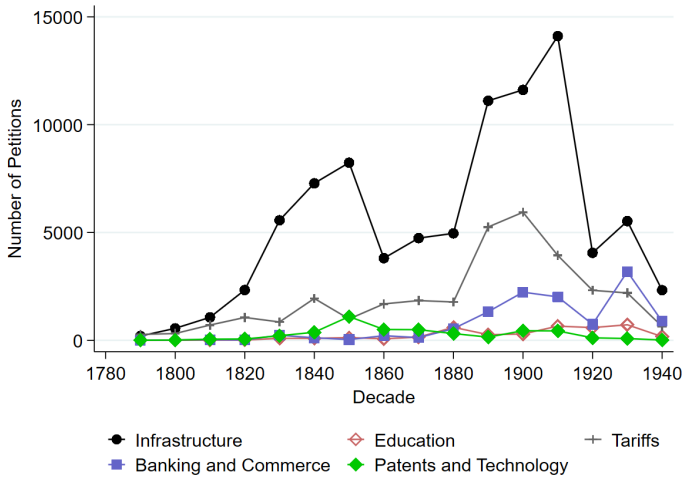


Figure A4: Dynamics of key industrial topics

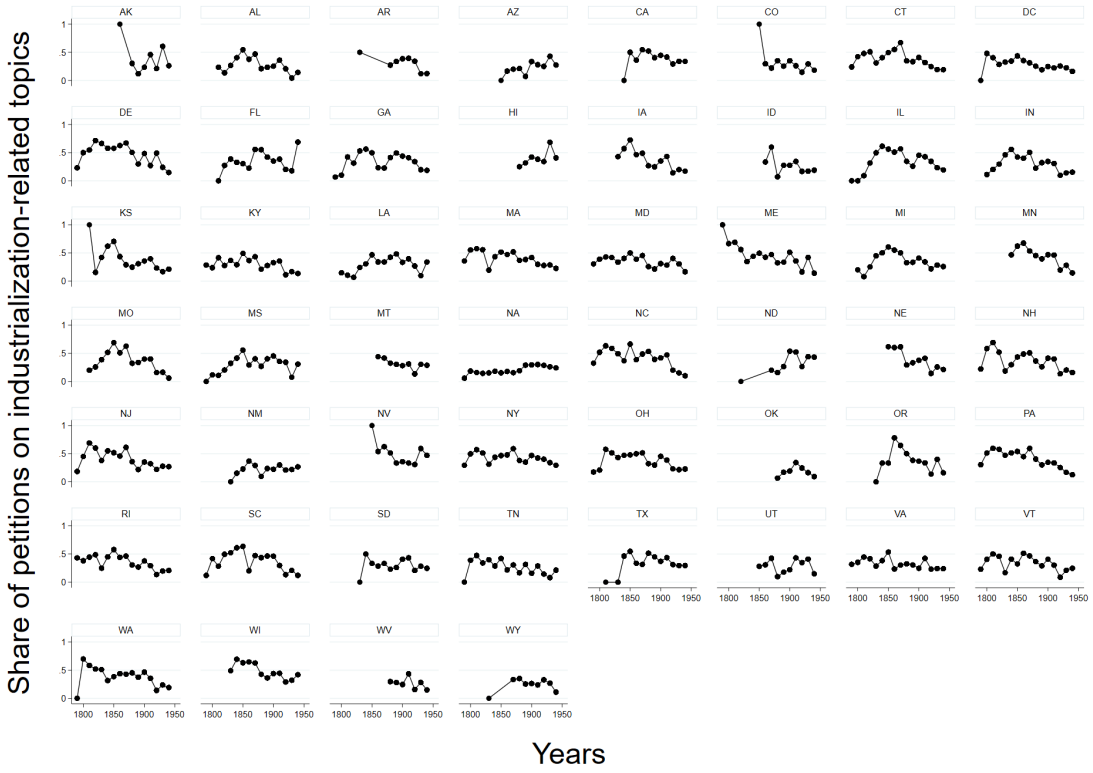
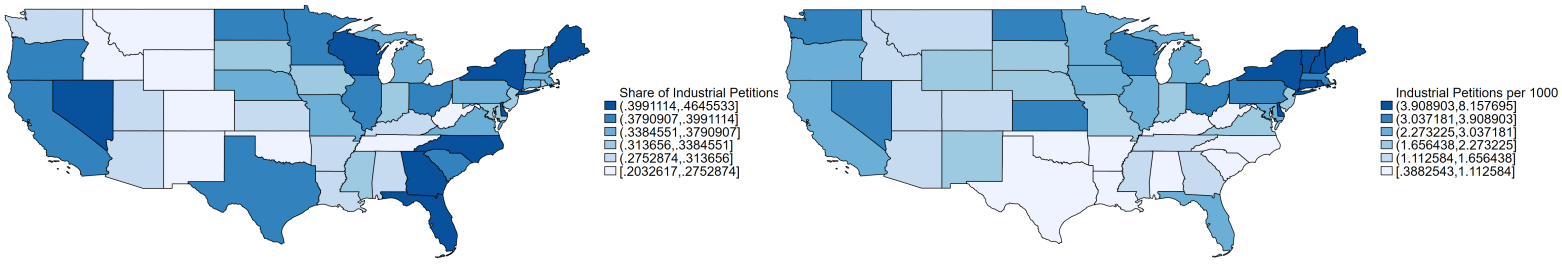


Figure A5: Dynamics of industrialization-related petitions by state and decade.



(a) Share of industrial petitions (b) Industrial petitions per 1000

Figure A6: Industrial petitions in the cross section of US states, 1789-1949.

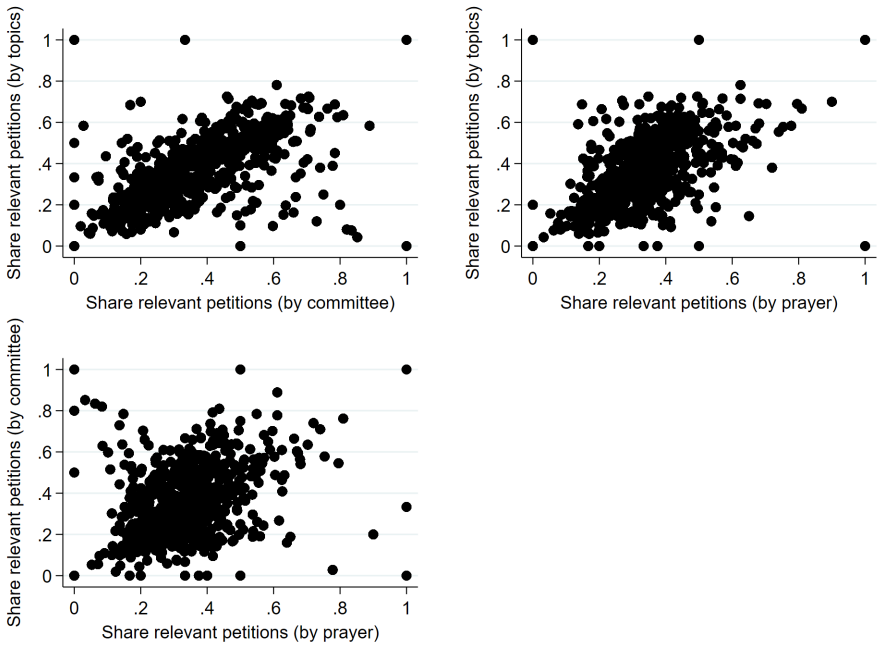


Figure A7: Industrial petitions, state × decade: correlations between criteria

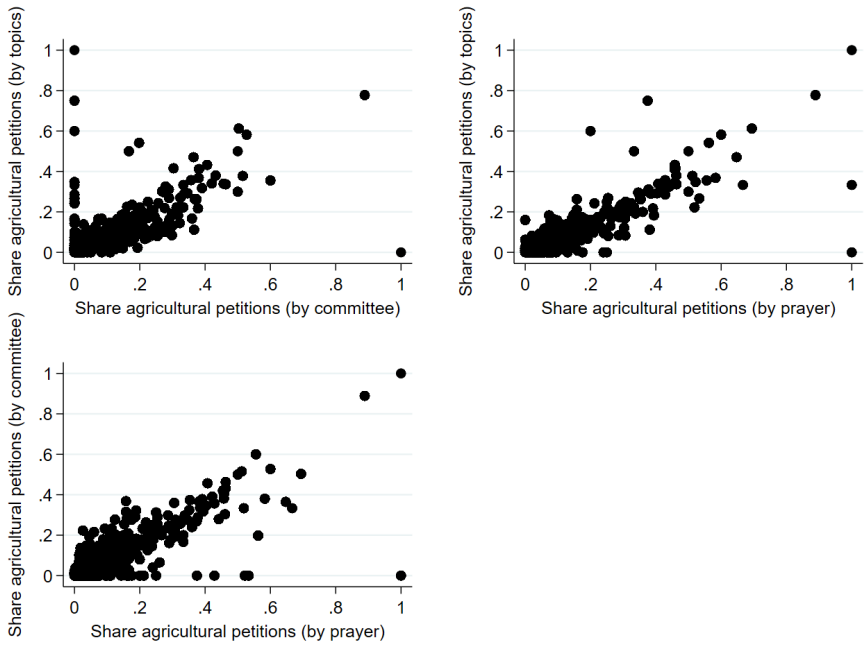
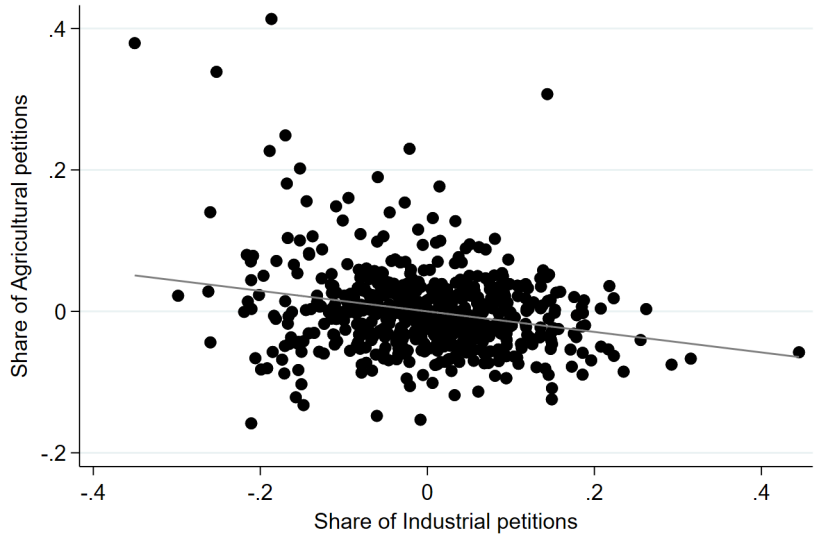
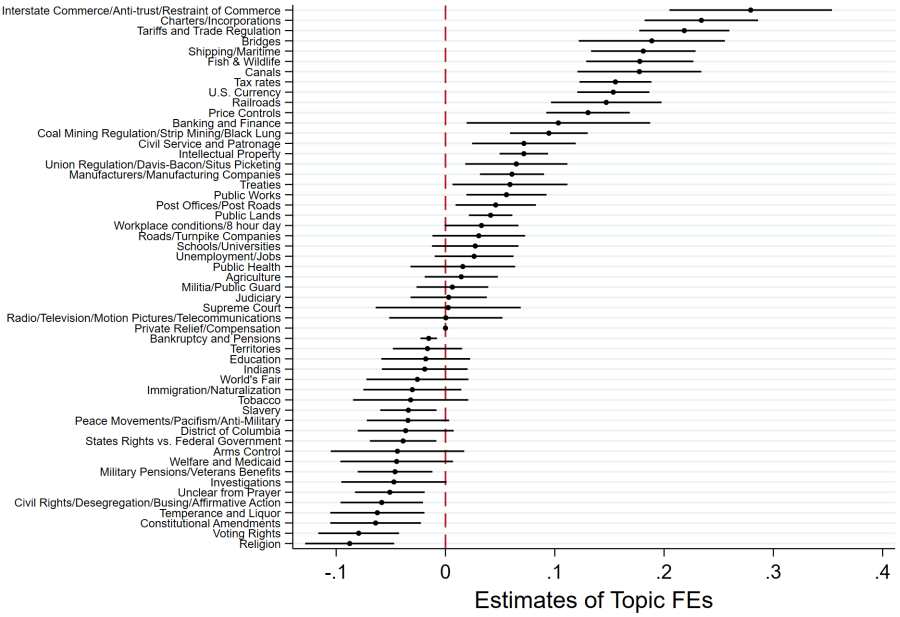


Figure A8: Agricultural petitions, state × decade: correlations between criteria



Coeff. = -.145, s.e. = 0.042, p-val = 0.001. The model accounts for state and decade FEs, and controls for the linear and squared M-sector employment (substitution stronger w/o added controls

Figure A9: Switch from Agricultural to Industrial petitions, with State, Decade FEs



The model includes state and decade FEs. Standard errors are clustered at the state level. Omitted topic is Private Relief/Compensation.

Figure A10: Estimates of β from a model $Capitalist_{i,k,s,t} = \beta \cdot Topic_k + \gamma_s + \tau_t + \varepsilon_{i,k,s,t}$.

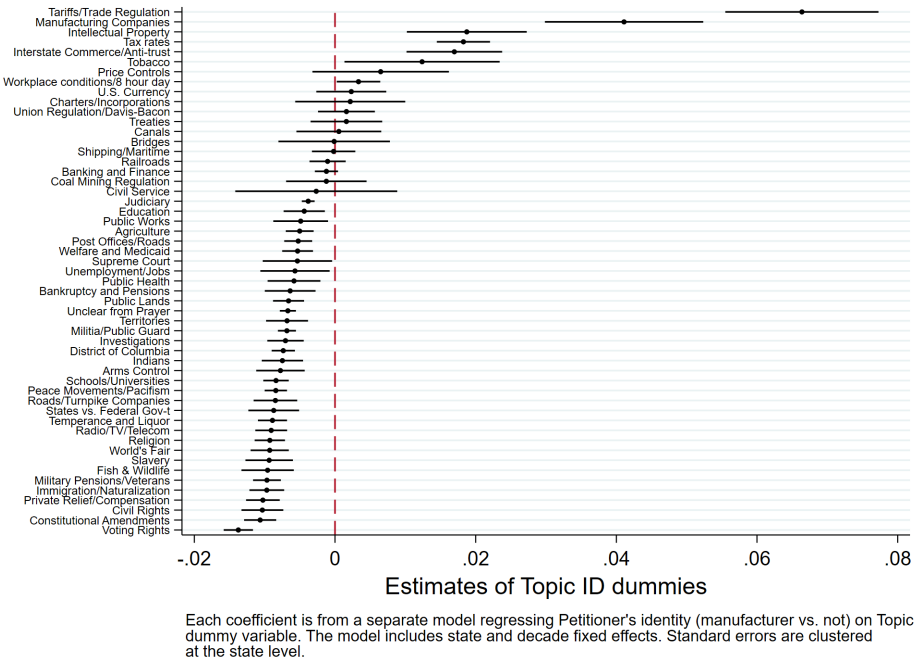
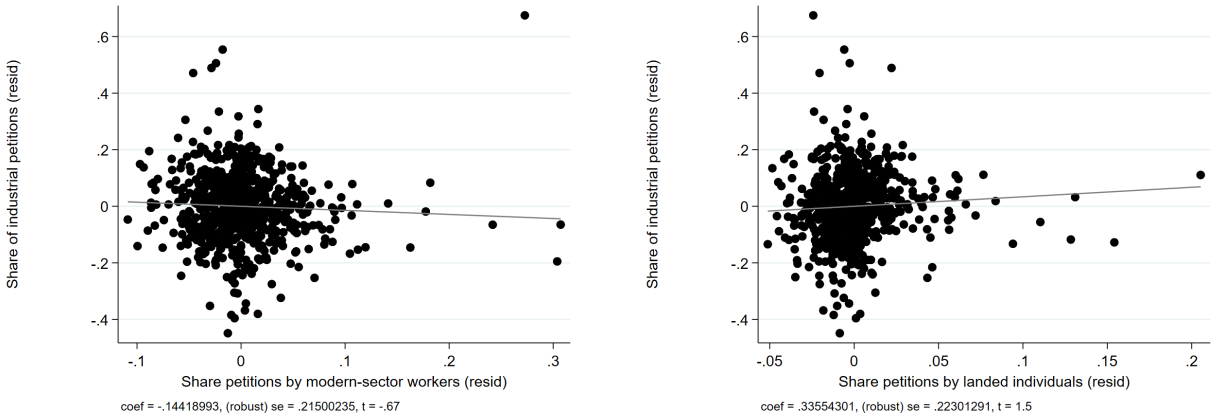
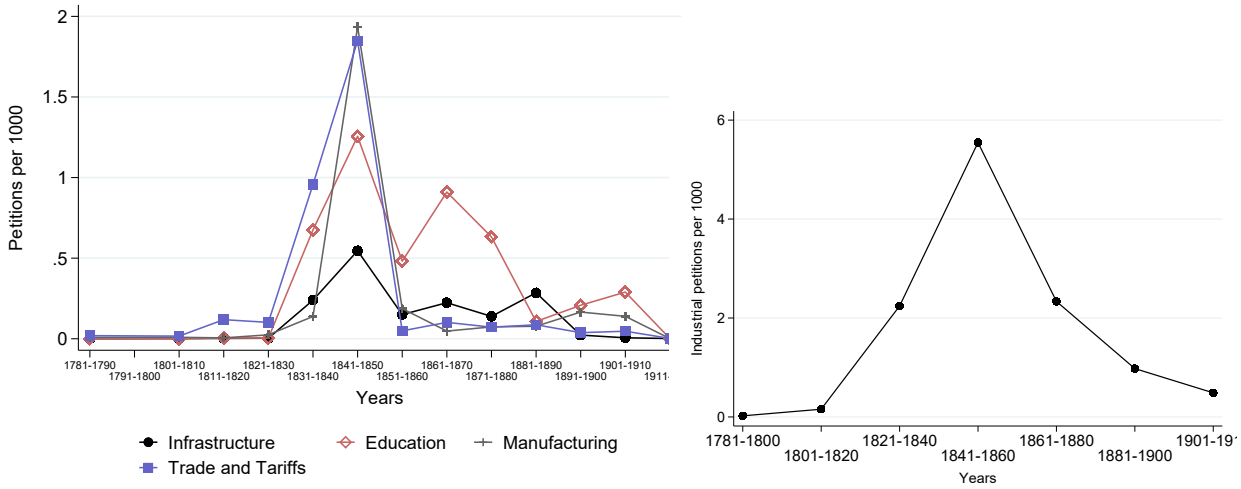


Figure A11: Estimates of β from $Manufacturer_{i,k,s,t} = \beta \cdot Topic_k + \gamma_s + \tau_t + \varepsilon_{i,k,s,t}$.



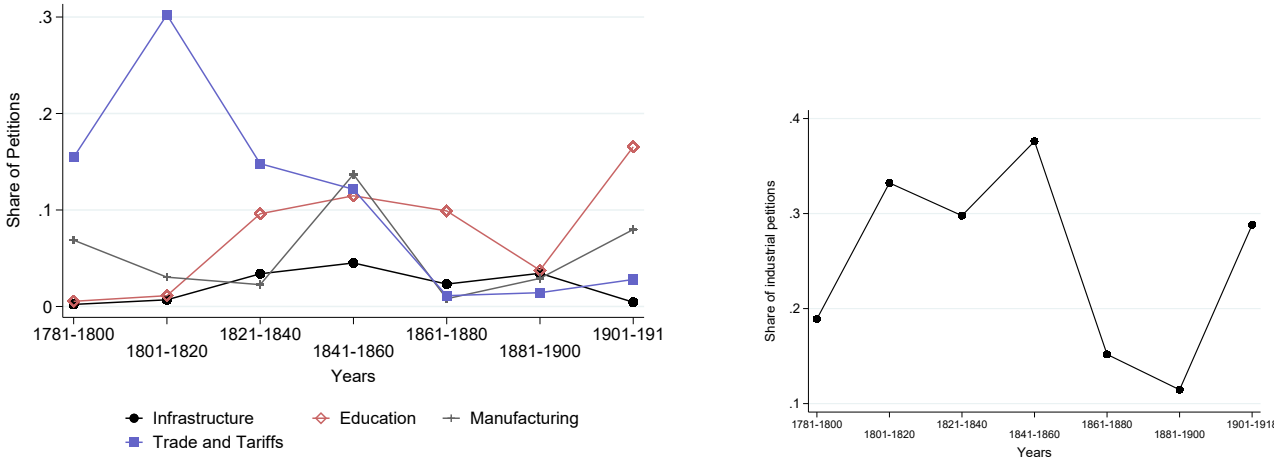
(a) Non-agricultural workers (b) Landed individuals and entities

Figure A12: Share of industrial petitions vs. share of petitions by modern-sector workers and landed agents (with state and decade FEs)



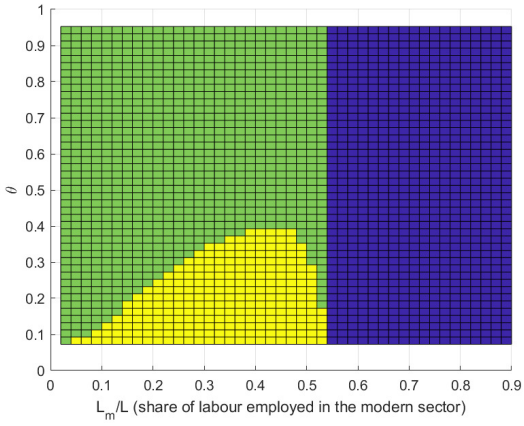
(a) By topics (b) All industrialization-related

Figure A13: Dynamics of petitions per 1000 population in Britain

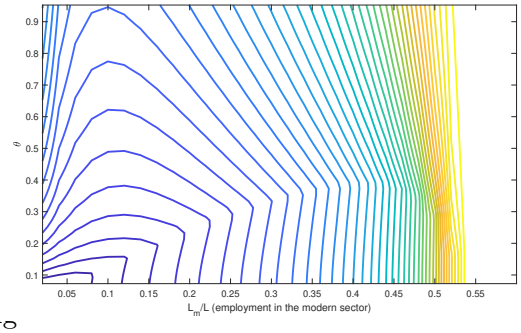


(a) By topics (b) All industrialization-related

Figure A14: Petitions over industrial topics in Britain: shares in total petitioning. The uptick on the right of (b) is due to a very small denominator (total petitions).



(a) Equilibria: all groups (yellow); capital-s vs land-s (green); consensus (blue)



(b) Probability of reforms, by L_m and θ.

Figure A15: Possible equilibria in the lobbying game and comparative statics.

Figures A15a and A15b illustrate the possible equilibria in the lobbying game and the workings of Proposition 2.[50] Figure A15a shows that small capitalists participate in lobbying at the later stages of industrialization (higher L_M) and if the difference between big and small capitalists is relatively limited (lower θ, i.e., lower capital concentration). Otherwise, when capital concentration is high, only bigger capitalists lobby, while smaller capitalists free-ride. From Figure A15b we see that in the region where only big capitalists participate in lobbying, a higher θ (capital concentration) increases the probability of reform policy. However, at the later stages, when all three groups participate in lobbying, the result reverses.

[50]The values of parameters here are chosen for illustrative purposes. There are three groups: 1 landowner, 1 big capitalist, and 18 small capitalists. For a given share of labor in the manufacturing aggregate capital and productivity levels are such that the labor market clears, and the economy is in the steady state for a constant level of technology ($K_{t+1} = K_t$ and $A_M = A_T = A$). Other parameters are the following: $\eta = 0.14$, $\beta = 0.95$, $\alpha = 1/3$, $\gamma_R = 1.56$, $\gamma_S = 1.056$, $T = 1$, κ=0.7.

Table B1: Industrialization-related petitions and M-sector employment: robustness

VARIABLES	(1) Industr. petitions (by topic)	(2) Industr. petitions (by topic)	(3) Industr. petitions (by committee)	(4) Industr. petitions (by prayer)	(5) Industr. petitions (two criteria)	(6) Industr. petitions (by topic)
M-sector employment	2.425***	3.564***	2.764***	3.746***	4.012***	1.862***
	(0.595)	(0.665)	(0.672)	(0.470)	(0.664)	(0.631)
M-sector employment sq.	-1.703***	-2.431***	-1.956***	-2.617***	-2.819***	-1.317***
	(0.396)	(0.460)	(0.477)	(0.308)	(0.458)	(0.433)
Observations	446	446	446	446	446	597
Adjusted R-squared	0.042	0.421	0.542	0.499	0.497	0.468
State FE	No	Yes	Yes	Yes	Yes	Yes
Decade FE	No	Yes	Yes	Yes	Yes	Yes
Sample	1789-1919	1789-1919	1789-1919	1789-1919	1789-1919	1789-1949

Main outcome variable is the state x decade level share of petitions coded as industrialization-related (coded by topics in columns (1), (2), and (6), coded by committee addressed to in column (3), coded by text of the prayer in column (4), and by satisfying at least two of these criteria in column (5)). Main explanatory variable is the share of male population employed outside of agriculture (from Craig and Weiss (2010) and IPUMS USA). The sample extends to 1949 in column (6). Standard errors, clustered at the state level are in parentheses, *** p<0.01, ** p<0.05, * p<0.1

B. Solving for the Nash Equilibrium

Define by Ω the list of all exogenous parameters for a given time period (wealth endowments, aggregate macroeconomic variables, preference parameters, etc.), i.e., $\Omega = \{K, T, A_M, A_T, \gamma_R, \gamma_S, N_l, N_b, N_s, \alpha, \beta, \theta, \kappa\}$.

Definition 2 (Share functions and Nash equilibrium in the political contest)**.**

Let $s_Z(E, \Omega)$ for $Z \in \{R, S\}$ from (10) be a share function of group Z that satisfies the following properties:

1. *s_Z is continuous w.r.t. $E>0$.*
2. *s_Z is strictly decreasing in E.*
3. *$\lim_{E->0} s_Z(E) = 1$, and $\lim_{E\to\infty} s_Z(E) = 0$*

Then, there exists a unique level of total contest intensity E^* satisfying $s_R(E^*, \Omega) + s_S(E^*, \Omega) = 1$ that is a Nash Equilibrium of the game. The equilibrium probability of reform policy is given by $p_R^* = s_R^*(E^*, \Omega)$. For each group, the equilibrium level of total investment in a contest is given by $E_Z^* = E^* \cdot s_Z(E^*, \Omega)$.

We now prove that the share function from (10) satisfies all the three properties in Definition 2 (see also Nitzan and Ueda (2014) for similar existence and uniqueness proofs). Using

$$e_R^i = \begin{cases} I^i - \frac{1-\beta}{\beta} \cdot \frac{E}{1-p_R} \cdot \frac{1}{\Delta_R^i} & \text{if } I^i \cdot \Delta_R^i > \frac{1-\beta}{\beta} \cdot \frac{E}{1-p_R} \\ 0 & \text{otherwise.} \end{cases} \tag{19}$$

and

$$s_R(E, p_R) = E_R/E = \frac{\sum_{i \in R} (I^i - \frac{1-\beta}{\beta} \cdot \frac{E}{1-p_R} \cdot \frac{1}{\Delta_R^i})_+}{E} \tag{20}$$

we can easily solve for $s_R(E)$, taking into account that $p_R = s_R(E)$. If we denote $\sum_{i \in Z} I^i$ as the sum of incomes over contributors from group $Z = \{R, S\}$, i.e., those with $I^i \cdot \Delta_Z^i > \frac{1-\beta}{\beta} \cdot \frac{E}{1-p_Z}$, and denote $\sum_{i \in Z} \frac{1}{\Delta_Z^i}$ as the sum over the same set of participants as above. With these notations, we obtain

$$s_R(E) = 1/2 + \frac{\sum_{i \in R} I^i}{2E} - \frac{\sqrt{(1 - \frac{\sum_{i \in R} I^i}{E})^2 + 4 \cdot \frac{1-\beta}{\beta} \cdot \sum_{i \in R} \frac{1}{\Delta_R^i}}}{2} \tag{21}$$

and the analogous expression for $s_S(E)$.

Value E^* is defined to be a unique Nash Equilibrium in this political contest game if an only if $s_R(E^*) + s_S(E^*) = 1$. We use this equilibrium condition together with (21) to get the following expression that defines E^*:

$$\frac{\sum_{i \in R} I^i}{E} - \sqrt{(1 - \frac{\sum_{i \in R} I^i}{E})^2 + 4 \cdot \frac{1-\beta}{\beta} \cdot \sum_{i \in R} \frac{1}{\Delta_R^i}} + \frac{\sum_{i \in S} I^i}{E} - \sqrt{(1 - \frac{\sum_{i \in S} I^i}{E})^2 + 4 \cdot \frac{1-\beta}{\beta} \cdot \sum_{i \in S} \frac{1}{\Delta_S^i}} = 0 \tag{22}$$

It is easy to prove (see properties of $s_Z(E)$ from Definition 1) that the solution to 22 is unique. Once the E^* is known, we use equation (21) to find the equilibrium probability of reform policy as $p_R^* = s_R(E^*)$ for any given distribution of capital and land, and any given time period.

It's important to remember that individual participation condition from equation (19) itself depends on the equilibrium lobbying intensity E^* and equilibrium probability of reform p_R^*. Since in our simplified set-up, there are only two groups of capitalists and one group of landowners, with all agents identical to each other within

those groups, we need to consider only two cases: (i) when all agents from the group of bigger capitalists participate, and all smaller capitalists are complete free-riders, and (ii) when all agents from both groups of capitalists participate.

C. Proofs

Proof of Proposition 1

Part 1 Recall that $\Delta^i_R = ln(I^i_{2,R}) - ln(I^i_{2,S})$. Consider inequality $\Delta^i_R \geq 0$ for a given i. This inequality simplifies to $I^i_{2,R} \geq I^i_{2,S}$, which further simplifies to $w_{2,R} + k^i R_{2,R} + T^i \rho_{2,R} > w_{2,S} + k^i R_{2,S} + T^i \rho_{2,S}$, and finally we arrive at:

$$k^i \cdot \Delta R + \Delta w \geq T^i \cdot \Delta \rho, \tag{23}$$

which is the condition for landowner to support reform policy. It's easy to show that $\Delta w = w^R - w^S > 0$, $\Delta R = R^R - R^S > 0$, and $\Delta \rho = \rho^S - \rho^R > 0$, which all follow from respective demand functions and (6).

Now let's prove that there exists a threshold level of aggregate capital $\bar{K}$, above which all individuals support reforms. We for now ignore that k^i_t is an increasing function of K_{t-1}. It is easy to show that $(\Delta R)'_K < 0$ and $(\Delta w)'_K > 0$: the effect of a policy on returns to capital is decreasing with K_t, but the effect on wages are getting larger. Moreover, $(\Delta \rho)'_K \geq 0$ if $K \leq \widetilde{K}$, but $(\Delta \rho)'_K < 0$ if $K > \widetilde{K}$ (the difference in returns to land between status-quo and reform outcomes is hump-shaped in K).

Using the continuity of all the functions involved, the signs of derivatives above, and the limits $\lim_{K\to\infty} \Delta\rho = 0$, $\lim_{K\to\infty} \Delta R = 0$, $\lim_{K\to\infty} \Delta w > 0$, and $\lim_{K\to\infty} \Delta\rho/\Delta R = 0$ one can apply the Intermediate Value Theorem. There exists a threshold $\bar{K}$, such that for $K_t \geq \bar{K}$, inequality $k^i \geq T^i \cdot \Delta\rho/\Delta R - \Delta w/\Delta R$ will hold for all i, so all initial status-quo supporters switch their preferences to reform policy after $K_t \geq \bar{K}$.

Part 2 From the inequality we need to prove, $(\Delta^i_R)'_{k^i} > 0$, it is easy to arrive at it's equivalent: $I^i_{2,R}/I^i_{2,S} < R_{2,R}/R_{2,S}$. Denote this inequality by $(*)$. The RHS in $(*)$ is always larger than 1. If i supports status-quo, i.e. $I^i_{2,R} < I^i_{2,S}$, then the LHS in $(*)$ is always less than 1, so $(\Delta^i_R)'_{k^i} > 0$ is true for i supporting status-quo. If i supports reform policy, i.e. $I^i_R > I^i_S$, then we need solve for $I^i_R/I^i_S < R_R/R_S$ explicitly.

Inequality $(*)$ simplifies to $T^i > (w_R R_S - w_S R_R)/(\rho_S R_R - \rho_R R_S)$, where the denominator is always larger than zero (since $\rho_S > \rho_R$ and $R_R > R_S$), while the numerator is always lower than zero (it follows from the fact that $w_R/w_S < R_R/R_S$, i.e., wages do not grow as fast as capital incomes after the reform policy is realized). Hence, $T^i > (w_R R_S - w_S R_R)/(\rho_S R_R - \rho_R R_S)$ is always true. Therefore, we have proven that $(\Delta_R^i)'_{k^i} > 0$. Inequality $(\Delta_R^i)'_{T^i} < 0$ can be proved along the same way.

To establish the signs of second derivatives, note that $(\Delta_R^i)'_{k^i} = (R_R/I_R^i - R_S/I_S^i)$. Therefore, $(\Delta_R^i)''_{k^i} < 0$ simplifies to $(w_R/R_R - w_S/R_S) + T^i \cdot (\rho_R/R_R - \rho_S/R_S) < 0$. Expression in the first brackets is negative since capital gains increase faster than wages with the M-sector productivity growth. Expression in the second brackets is negative because $\rho_R < \rho_S$, while $R_R > R_S$. Similarly, we establish that $(\Delta_S^i)''_{T^i} < 0$.

Proof of Proposition 2

We proceed in two main steps. First, we consider two types of NE: (i) only the bigger capitalists participate in lobbying (participation condition does not hold for the smaller capitalists); and (ii) both groups of capitalists participate in lobbying. We show that in the first equilibrium, redistributing capital from smaller to bigger capitalists increases p_R. However, the same redistribution in the second type of equilibrium decreases p_R. Second, we show that when $K_t \leq \Phi$, we have the first type of equilibrium, while for $K_t > \Phi$ we have the second type of equilibrium.

Step 1 The following Lemma adapted from Nitzan and Ueda (2014) is useful:

Lemma 1. *Given the properties of the share function $s_Z(E, \Omega)$ from Definition 2, and any initial equilibrium level of lobbying intensity E^*, any change of exogenous parameters from Ω to a new vector of parameters Ω_{new} that increases $s_Z(E^*, \Omega)$ (and does not affect the share function of the other group) will increase equilibrium p_Z. Thus, $p_Z^{**} = s_Z(E^{**}, \Omega_{new}) > p_Z^* = s_Z(E^*, \Omega)$. Moreover, $E^{**}(\Omega_{new}) > E^*(\Omega)$.*

Proof. See Nitzan and Ueda (2014), and replace the reference to 'stake vectors' with Ω (the result applies to a change in any parameter exogenous to a given individual within a given period). Our requirement that a change in Ω parameters affects the share function of only one group is important, but does not affect the proof (as in Nitzan and Ueda (2014) the proof is designed for this specific case). □

Lemma 1 is intuitive: any change in parameters that (for a given level of contest intensity E^*) increases the share of lobbying efforts coming from group Z also increases the probability of this group winning. The reason is that if a group spends more, it's share increases, and a new equilibrium total effort must also increase to ensure that $\sum s_Z = 1$. Thus, since s_Z is decreasing in E, in a new equilibrium, the share function of the second group goes down, which ensures it's winning probability becomes lower.

Now we can apply Lemma 1 to complete the first step Proposition 2 proof. Namely, consider a change in θ_t. A change in θ_t redistributes capital wealth between capitalists, and as θ_t increases, k_b increases, while k_s decreases, which means that incomes I_b and stakes in conflict Δ_b increase, while I_s and Δ_s decrease. To determine the direction of the effect of θ_t on p_R^* it is sufficient to determine $\frac{\partial s_R(E,\Omega)}{\partial \theta_t}$ - see Lemma 1.

Consider first an equilibrium $E_1^*(\Omega)$ where only bigger capitalists participate in lobbying, so the following system of inequalities must be satisfied:

$$\begin{cases} I_b \cdot \Delta_b^i > \frac{1-\beta}{\beta} \cdot \frac{E_1^*}{1-p_{R,1}^*} \\ I_s \cdot \Delta_s^i \leq \frac{1-\beta}{\beta} \cdot \frac{E_1^*}{1-p_{R,1}^*} \end{cases} \tag{24}$$

In this case, after substituting $\sum_{i \in R} I^i$ for $N_b \cdot I_b$, and $\sum_{i \in R} \frac{1}{\Delta_R^i}$ for $\frac{N_b}{\Delta_b}$, it is straightforward to see from (21) (Appendix B) that an increase in θ_t increases p_R^*. The reason is that $\frac{\partial s_R(E_1^*)}{\partial \Delta_b} > 0$ and $\frac{\partial s_R(E_1^*)}{\partial I_b} > 0$ (to see the latter one needs to consider two cases, $E_1^* > I_b \cdot N_b$ and $E_1^* \leq I_b \cdot N_b$, and verify that in both cases the sign of the derivative is unambiguous), and hence Lemma 1 guarantees that for the equilibrium with only the bigger capitalists participating, $\frac{\partial p_{R,1}^*}{\partial \theta_t} > 0$.

Next, consider an equilibrium $E_2^*(\Omega)$ such that both groups of capitalists participate in political lobbying, so the following system of inequalities must be satisfied:

$$\begin{cases} I_b \cdot \Delta_b^i > \frac{1-\beta}{\beta} \cdot \frac{E_2^*}{1-p_{R,2}^*} \\ I_s \cdot \Delta_s^i > \frac{1-\beta}{\beta} \cdot \frac{E_2^*}{1-p_{R,2}^*} \end{cases} \tag{25}$$

In this case, capital redistribution does not affect the combined incomes of reform supporters: $\frac{\partial (N_b \cdot I_b + N_s \cdot I_s)}{\partial \theta_t} = 0$. However, due to the fact that individual gains from preferred policy Δ_i are concave in individual capital k_i $\forall i$ (see Proposition 1), we have $\frac{\partial (N_b/\Delta_b + N_s/\Delta_s)}{\partial \theta_t} > 0$. Thus, again from (21), we can see that $\frac{\partial s_R(E_2^*)}{\partial \theta_t} < 0$. Hence, by

Lemma 1, in the equilibrium with both groups of capitalists participating, a higher concentration of capital decreases th chances of reform-supporters: $\frac{\partial p^*_{R,2}}{\partial \theta_t} < 0$.

Step 2 The second step is to establish how the type of equilibrium (whether only the bigger capitalists, or both groups, participate) depends on the set of exogenous parameters and dynamic variables Ω. We are especially interested in the effect of K_t.

First, note that I_b, I_s and Δ_b, Δ_s are all increasing in K_t. This can be seen from the definition of Δ^i and the fact that $k_b = \frac{\theta \kappa K_t}{N_b}$, $k_s = \frac{(1-\theta)\kappa K_t}{N_b}$, which allows one to express Δ^i in terms of $Y_{M,t}$. It is a simple differentiation from there.

As is evident from (24) and (25), the LHS in both systems, both inequalities, are increasing in K_t without bound. The RHS, however, is always smaller than the LHS for bigger capitalists, as we know that bigger capitalists always participate in the contest. Moreover, we know that as K_t approaches $\bar{K}$, E^* goes to zero, and p^*_R goes to one. Thus, using L'Hopital's Rule, one can verify that for $K_t \geq \Phi$, the RHS of systems (24) and (25) goes to zero. Thus, we have the type of NE with both groups participating, as system (25) is always satisfied for $K_t \geq \Phi$.

Proof of Proposition 3

Proposition 3 is easily proved using Lemma 1 and Proposition 2, step 1:

Part 1 Higher incomes I^i_Z increase $s_Z(E^*, \Omega)$, which means that (see Lemma 1) new equilibrium E^{**} will be higher. **Part 2** Higher gains from preferred policy Δ^i_Z increase $s_Z(E^*, \Omega)$, which means that (see Lemma 1) new equilibrium E^{**} will be higher. **Part 3** Again, from Lemma 1 and Proposition 2, as long as θ_t increases p^*_R, Lemma 1 guarantees that θ_t also increases $E*$, and vice versa.

Proof of the uniqueness of the conditional steady state

For every individual, $K^i_{t+1} = \eta^i I^i_t$. In a steady state, $(w + \rho T^i + RK^i_{ss})\eta_i = K^i_{ss}$. It follows that for each individual there is only one steady state level of capital for a given level of technology

$$K^i_{ss} = (w_i + \rho^i T^i)/(1 - R\eta^i) \tag{26}$$

By assumption $0 < \eta^i < 1/R$ for all individuals. Summing over all individual capital stocks, we get the stationary level of capital, $K_{ss} = \sum_0^N K^i_{ss} N^i$.

As $(K^i_{ss})'_A > 0$, an increase in TFP increases the steady state level of capital.

D. Parameter values for simulation

Parameters	Definition	Description
$\alpha = 0.43$	The share of capital in total income	The average in 1688-1867 from (Allen (2019) (page 108)).
$N = 1000$	The size of population	Normalisation
$N_l = 15$	The number of big landowners	to fit the average share of aristocratic families in Britain in 1688-1867 (Allen, 2019)
$N_b = 50$	The number of big capitalists	to fit the average size of large-scale capitalists, bankers, merchants, lawyers, high officials and investors in 1688-1867 (Allen, 2019)
$N_s = 935$	Remaining population	By construction, $N_s = N - N_l - N_b$
$T = 10$	The amount of land	Normalization
$T_l = 0.44$	The amount of land belonging to a big landowner	From Allen (2019) 66% of land rent earned by aristocrats in 1688
$T_b = T_s = 0.00345$	The amount of land belonging to a big capitalist or commoners	The rest of land is assumed to be equally distributed
$l_{m,0} = 0.61$	The initial share of employment in the modern sector	From Allen (2019) for the employment out of agriculture in 1688
$A_{M,0} = 1.1692$	The initial level of technology in M-sector	A steady state level for a given share of workers in the modern sector
$A_{T,0} = 1.1692$	The initial level of technology in traditional sector	Normalization to the level of technology in the modern sector
$K_0 = 15.641$	The initial aggregate capital	A steady state level for a given share of workers in the modern sector
$\beta = 0.5$	Intra-temporal discount rate	Assuming that agents value pre-lobbying and post-lobbying sub-periods equally
$\eta_b = 0.2022$	The intertemporal discount rate for big capitalists	to fit the average saving rate and to fit average relative income level of big capitalists in 1688, 1759 (from social tables, Allen, 2019)
$\eta_l = \eta_s = 0.03539$	The intertemporal discount rate for landowners and for commoners	to fit the average saving rate, assuming identical saving rates with commoners
$\nu = 0.795$	The shape of the TFP growth function	to fit the share of employed in the modern sector in 1850.
$a = 0.528$	The parameter of the TFP growth function	to fit the long-run growth rate of output per capita (2 percent)
$\gamma_{min} = 0.01$	The minimum level the TFP growth in the case of the reform policy	low-bound estimate of potential growth in pre-industrial age.

E. Model extensions and generalizations

E.1 Model with a "status-quo bias" in lobbying

Our model significantly over-predicts lobbying intensity at the early periods of industrialization. One of the potential reasons why historically capitalists and landowners were not engaged in active lobbying early on (despite the market potential for progressive reforms) is the "status-quo" bias present in the political system.

An important historical feature of a the political process in early democracies was that landed elites (and those close to them) held more political power, which gained their interests a head start in any political struggle. Moreover, the bureaucratic system, both historically and nowadays is often characterized by a tendency to avoid change. To account for these facts, we augment the CSF in the following way:

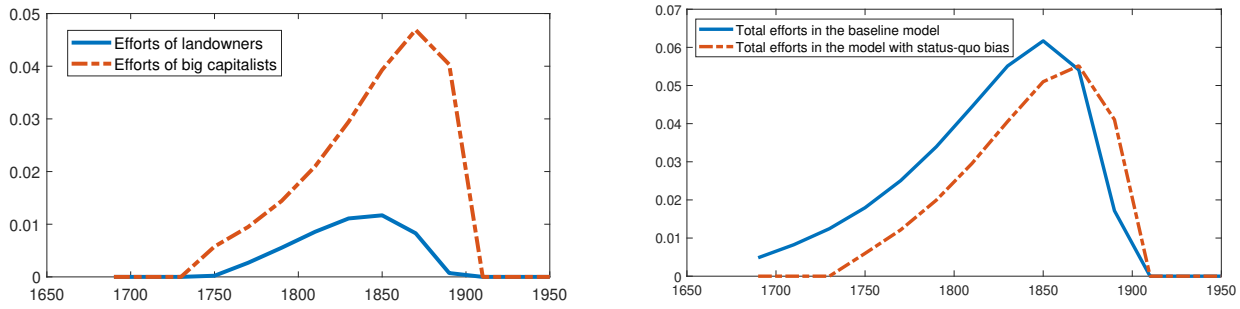
$$p_R = (\sum e_R^i)/(\sum e_R^i + \sum e_S^j + S_{bias}) = E_R/(E + S_{bias}), \tag{27}$$

where S_{bias} stands for the status-quo bias, and the remaining terms are same as before. The solution to a modified lobbying game is similar to the one described in the Appendix B, see also Cole et al. (2021) and Blanga-Gubbay et al. (2021). A crucial difference is that both $(0, 0)$ and $(E_R > 0, E_S = 0)$ equilibria are now possible. The pace of M-sector reforms and TFP growth is predicted to decrease with S_{bias}, as is the overall intensity of lobbying E^*.[51]

The existence of a status-quo bias can explain why the traditional elites do not participate so much in political lobbying (petitioning) - because the inherent advantage decreases lobbying incentives of the advantaged group. Most importantly, this version with a status-quo bias reduces the predicted model-based intensity of lobbying in the early periods of industrialization, bringing it closer to the data.

Figure A16a illustrates the dynamics of lobbying by landowners and big capitalists in a model with a status-quo bias. In this calibration, $\gamma_S = g_A = 1.005$ and $S_{bias} = 0.004$, and all other parameters remain the same as in the baseline case. We see

[51] The are two types of equilibria in a model with the status-quo bias. If $\gamma_S = g_A = 1$, then for high levels of status-quo bias, the model arrives at a corner solution where capitalists do not lobby, and so the development trap occurs. Since status-quo growth is set to $g_S = 1$, there is no structural change, no lobbying, and, hence, no long-run growth. If $\gamma_S > 1$, then even with large status-quo bias, there is no poverty trap.



(a) Lobbing by group, with st-quo bias (b) Overall lobbying: st-quo bias vs. baseline

Figure A16: Dynamics of lobbying in the model with a status-quo bias

that in the early 18th century, lobbying by both capitalists and landowners is zero: capitalists lack incentives to overcome the status-quo bias, since their incomes and gains from reforms are not yet high enough. Landowners free-ride on the status-quo bias. As one can see from figure A16b, this results in the overall lobbying intensifying later, which brings the model closer to the actual data on lobbying.

This version of the model also allows for a more flexible interpretation of the lobbying game. Namely, the emerging capitalist elites did not only lobbied against the landowners, but also against the inherent bias of the system towards inaction. In other words, to increase the chances that a local railroad or school is financed by the government, one needs to lobby, even if landowners do not resist.

E.2 Decomposing the policy "black box": infrastructure, education, trade

In our baseline version of the model, we consider as equivalent all sorts of policy changes that increase M-sector TFP more than the T-sector TFP. In reality, the government was responsible for various policies and investments that benefited the M-sector productivity more than that of the agriculture: (i) infrastructure projects, such as railroads and canals, let's call it G, (ii) education institutions and policies, such as primary schooling exempt from religious influences, universities, etc., call it H, (iii) relative prices of T-sector vs. M-sector goods, affected by duties and tariffs (e.g., Corn Laws), denote this by p_T/p_M. These policies enter the production and profit functions of M-sector and T-sector entrepreneurs, affecting both the lobbying incentives, and the pace of structural change.

An augmented model includes a production function $Y_{M,t} = F(A_{M,t}, G_t, H_t, K_t, L_{M,t})$, where infrastructure G complements capital K more than labor, while education H complements labor more than capital (a version of the CES function). Moreover, utility function with two consumption goods, agricultural c_T good with a subsistence constraint $\bar{c}$, and an industrial good c_M, ensures that relative prices affect utility levels, differently for richer vs. poorer individuals. Finally, as in Galor and Moav (2006), we can assume that the government taxes bequests and allocates the tax revenue between infrastructure G, or education H spending.

In each period, there is a lobbying game that determines one of the two types of policies (only one type, randomly, each period): (i) the tax rate and the allocation of spending, H vs G, or (ii) the tariff rates and thus the relative prices p_T/p_M.

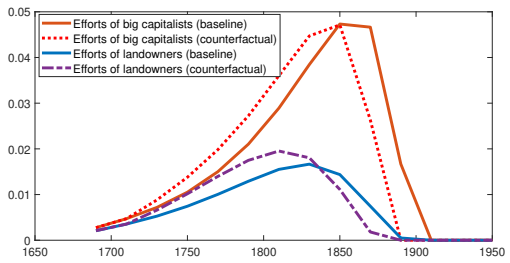
There are two key features of this extended model. First, lobbying for infrastructure projects kicks in earlier than lobbying for education, which is consistent with the data on petitions we have[52]. Second, such a model suggests that the decreasing part of the inverted-U shaped lobbying curve is partly driven by decreasing returns to additional, say, infrastructure projects, as more and more railroads and canals are built. Yet, different types of policies (G, H, etc.) keep lobbying going.

E.3 Model with dynamic social class sizes

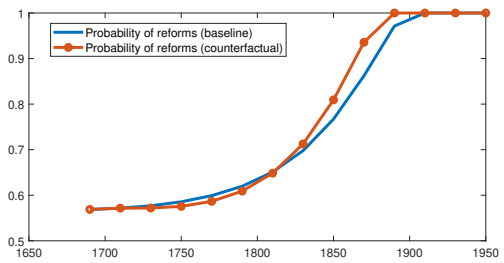
To make the dynamics of wealth distribution between social classes more realistic, we incorporate changes in the distribution of population between social classes. Allen (2019) documents that the share of bourgeoisie families (big capitalists) was steadily increasing from 3.4% in 1688 up to 7.8% in 1867. How does the rising population share of big capitalists affects our model dynamics? In this version of the model, the share of big capitalists increases at the expense of small capitalists, so as to match the data from Allen (2019). In each period, new big capitalists are randomly selected from the class of small capitalists, and receive the same amount of capital as the older generations of big capitalists. Accordingly, each of the small capitalists loses a small amount of capital, such that the total amount of capital in the economy remains

[52]Infrastructure G_t complements K_t, so while the returns to capital are large (K_t is small), capitalists prefer to spend taxes on infrastructure. As both K_t and G accumulate over time, returns to education H surpass that of infrastructure, and capitalists switch to lobbying for education.

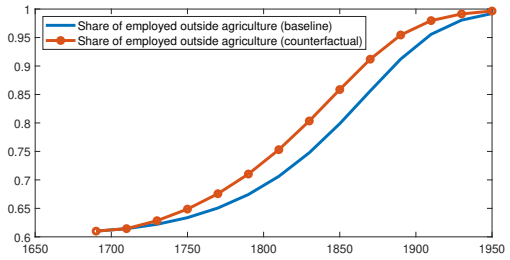
identical to the case with constant size of social classes.



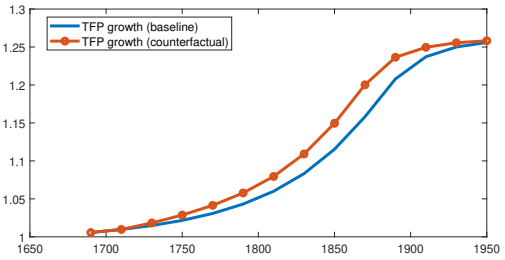
(a) Lobbying expenditures



(b) Probability of reforms



(c) Share of employed in M-sector



(d) TFP growth

Figure A17: Model dynamics under two scenarios: baseline vs. an increasing share of bourgeoisie from 3.4% to 7.8%

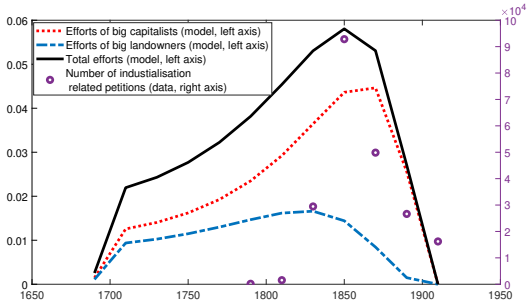
Figure A17 shows the model dynamics under this new assumption about class structure. Except for the population share of bourgeoisie, all other parameters remain the same as in the baseline model. As one can see on Figure A18a, as the numbers of big capitalists grow, their combined lobbying effort to push for industrialization reforms increases, as does the resistance from landowners. As Figure A18b shows, this gives an advantage to landowners at the early stages of structural change, but eventually capitalists overcome the status-quo earlier, bringing the model closer to the data, see Figure 12. Importantly, as big capitalists have higher savings rates, the overall capital stock grows faster, and despite the initial lobbying disadvantage of a bigger class of capitalists, the pace of structural change increases, Figure A18c, as does the pace of TFP growth in the modern sector.

E.4 Adding agricultural TFP dynamics and endogenous status-quo growth

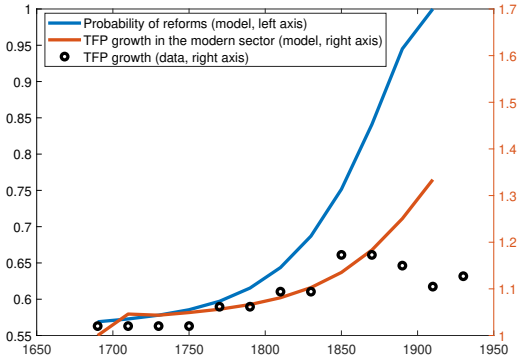
In this section, we introduce two additional features to the model. First, we allow for exogenous TFP growth in the T-sector, such that $g_{A,t} = 1.0345$, similar to Brunt and García-Peñalosa (2021) and consistent with the average growth rate of agricultural TFP from 1540 to 1860. Second, we assume that, realistically, even under a status-quo policy, the M-sector productivity increases with its employment share (due to knowledge spillovers and other agglomeration effects). Still, as before, $\gamma_S < \gamma_R$ for any t. Specifically, we assume that γ_S has the same functional form as γ_R:

$$\gamma_{S,t} = \gamma_{min,S} + a_S * ((L_{m,t} - L_{m,0})/N)^{\nu}, \tag{28}$$

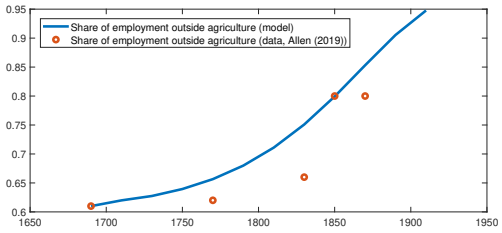
where ν determines the sensitivity to the level of employment in the modern sector, and $L_{m,0}/N$ is the initial share of employment in the M-sector.



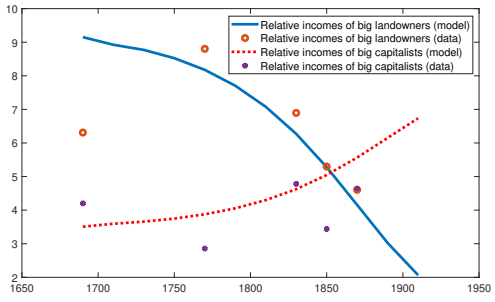
(a) Lobbying expenditures



(b) Probability of reforms and TFP growth



(c) Share of employed in M-sector



(d) Relative incomes of social classes

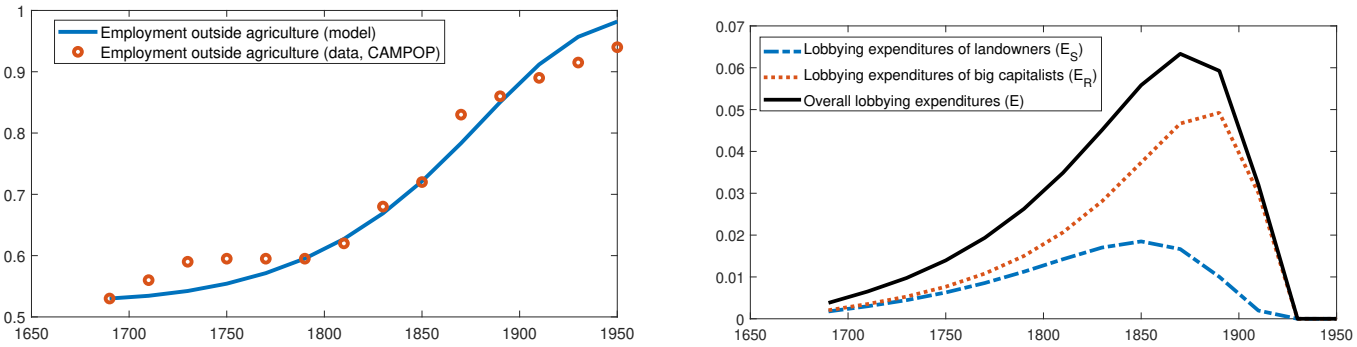
Figure A18: Model dynamics with exogenous technological progress in agriculture

As in the baseline, we choose ν to match employment shares in 1850. We choose a_S such that countries blocking reforms up until the modern period have their growth rate lowered by half, as compared to an economy with reforms ($p_R = 1$), which is consistent with the modern convergence clubs phenomenon[53]. In this calibration, $\nu = 0.939$. We also normalize $a_S = 0.2312$ to have $\gamma_{S,t} = 1.13$ for $L_{m,t} = 1$. We also calibrate $\gamma_{min,S} = 1.0345$ and $\gamma_{min,R} = 1.04$, which guaranties that $\gamma_S \geq g_A$ for all periods to avoid de-industrialisation. All other parameters remain the same.

Figure A18 illustrates our model dynamics with these new assumptions. As before, the lobbying expenditures have the inverted U dynamics, with a peak in 1850s. And overall, (i) historically accurate dynamics of agricultural TFP, and (ii) endogenous growth in the absence of reforms do not alter our main results.

F. Alternative employment data (CAMPOP) for calibration

An advantage of CAMPOP data from Shaw-Taylor and Wrigley (2014) is longer and more frequent time series on employment outside of agriculture. The disadvantage (for our purposes) is that it is less consistent with other variables that we take from Allen (2019), such as capital and land distribution across social classes.



(a) Share of employment in the M-sector

(b) Lobbying intensity

Figure A19: Model dynamics with alternative employment data used for calibration

On Figure A19 we illustrate the model dynamics calibrated with CAMPOP data:

[53]For example, from Angus Maddison database Argentina and Venezuela (the canonical examples of the growth failures in the second half of the XX century) average growth rates of incomes per capita are 30-60% of Western Europe average for the years 1950-2018.

the initial level of employment in the modern sector is lower than in the baseline calibration, followed by a period of relative stagnation of M-sector employment in the 18th century, before a rapid take-off in the 19th century. The relative income of landowners in 1690 in this calibration is higher than what documented by Allen (2019). Other variables display dynamics similar to the baseline calibration, except that the conflict peaks and ends 20 years (1 period) later than in the baseline case.

G. Case studies

To further support our model's predictions of a positive effect of historical capital concentration on progressive lobbying, we present two case studies. One focuses on differences in capital concentration across the 19th century Prussia. The other focuses on capital concentration and industrial lobbying in the Middle East.

G.1 Concentrated capital and support for reforms in 19th-century Prussia

The process of industrialization and political struggle in 19th century Prussia provides clear micro-level evidence supporting our theory. Several recent papers demonstrate how the distribution of wealth affected public policy outcomes in the 19th century Prussia under the three-class franchise,which ensured that wealthy elites, both landowning and landless, held most policy-making power.

In particular, Becker and Hornung (2020) show that support for pro-growth reforms in the period of early industrialization (1867-1903) in Prussia was stronger in constituencies with higher "vote inequality" - a proxy for wealth inequality at the time. Importantly, this result holds after accounting for land inequality. Moreover, the link between wealth inequality and progressive reforms was stronger in places with large-scale industry, which aligns with our model and data from the US. Additionally, Krieger (2023) shows that county-level provision of health public goods was increasing in the share of local political positions held by the landless elites, who had higher economic benefits from improving the health of urban workers. Capitalists' power precipitated the passage of reforms and policies necessary for industrialization.

G.2 Dispersed capital and failed reforms in the Middle East

The Middle East was ahead of Western Europe up until the 14th century, Kuran (2012) and Bosker et al. (2013), but from the 15th century onward, Western Europe began to gain lead in urbanization and incomes per capita. Lagging reforms is considered to be one of the main reasons for the long period of stagnation in the Middle East: e.g., Coşgel et al. (2012) document how the printing press was blocked by the elites for nearly three centuries. Pamuk (2004, 2009) argues that Middle Eastern merchants and industrialists could not overcome traditional elites and push for necessary policy changes[54]. But why did these groups not lobby more actively?[55]

Our theory shows that at the early stages, a higher concentration of capital among merchants and other big capitalists increases their incentives to lobby for industrialization. However, as emphasized by Kuran (2012), concentration of capital in the Middle East remained very low: in 17th-century Istanbul, 80% of partnerships had only 2 people, and "firms" with more than 5 persons were very rare. Several features of the Islamic law limited the concentration of capital.

One component of the Islamic law that kept capital concentration limited was related to inheritance law. The latter required any property or estate to be divided among all close and distant relatives, including both men and women. Another important feature was the absence of "corporation" as a legal institution – a form of property ownership distinct from a collection of individuals that form a joint venture. Under these conditions, incentives to pool large capital stocks together were low.

Recent evidence in Cinnirella et al. (2023) confirms that places subjected to Muslim institutions (in Spain) had significantly weaker merchant classes, inhibiting industrial development. This evidence supports one of our main predictions: lobbying for industrialization is weaker in places with historically low concentration of capital.

[54]Specifically, the influence of merchants and industrial elites was much lower than that of the central bureaucracy, who also owned most of the land in the Middle East. Pamuk stresses the inability of merchants and producers to oppose the interests of the landowning state in blocking technological and institutional reforms necessary for development.

[55]Lafi (2011) explores petitioning in late Ottoman Empire and shows that it was mostly coming from artisans and workers in the non-mechanized industries, facing automation and competition from Europe (e.g., the case of the Tunis province). While petitions were common in the pre-20th century Ottoman Empire, they were rarely coming from merchants or industrial groups.