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THE ECONOMIC CONSEQUENCES OF THE OPIUM WAR

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ABSTRACT

This paper studies the economic consequences of the West's foray into China after the Opium War (1839-42), when Western colonial influence was introduced in dozens of so-called treaty ports. We show, first, that this had a positive influence, both by lowering the costs of capital and by increasing the pace of industrialization, compared to other Chinese regions, and it occurred both through the ports themselves as well as through Western consulates in their vicinity. Second, while strongest at the ports the effect was geographically dispersed over hundreds of kilometers and affected most of China. We identify independent channels of influence from the ports and extraterritorial legal systems in China that led to foreign market access gains, security spillovers, as well as technological learning.

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1 Introduction

For nearly one hundred years, from 1842 until 1943, China was semi-colonized by Western countries. The Treaty of Nanjing in 1842 that concluded the First Opium War started to force China to open dozens of cities to Western traders, dramatically ending centuries during which China developed in relative isolation from the West. These so-called treaty ports were notable because it was in these areas that Western residents established themselves most forcefully in China. The impact of the Treaty Port Era (1842-1943) has been deeply controversial. The Opium War is presented in China as a cautionary tale of Western involvement and a dark period of destruction and national humiliation. It has been, and is still, regarded as a portentous reminder of lost political sovereignty for Chinese leadership and forms what can be described as the dominant narrative.[1] At the same time, many 19th century treaty ports areas are among the most advanced regions of China today.[2] While Western nations did not attempt to usurp the seat of government in China, after the Opium War, foreign firms, banks, and missionaries essentially welcomed themselves into China, Western management thoroughly re-organized China's tariff and trade policy, and Western-style courts were established in order to resolve conflicts among foreigners and between foreigners and Chinese. This paper revisits this period to better understand the economic consequences for China. This is important not only in its own right but also to create an accurate historical account of how shared global events of the past continue to connect those same countries today.

We employ novel data together with a difference-in-differences approach to assess the economic effect of Western influence[3] in China over the roughly eight decades from 1821 to 1899. Our analysis exploits China's relatively large size with regional, within-country variation in order to isolate the impact of different aspects of Western influence. Reliable income statistics are not available for this period. However, in addition to several measures of industrialization we employ regional interest rate data obtained through an asset pricing approach. We postulate that the Western intervention not only expanded China's foreign trade at the ports but it also reduced risk and diffused new knowledge, compared to other regions. A

[1] "China used to be a world economic power. However, it missed its chance in the wake of the Industrial Revolution and the consequent dramatic changes, and thus was left behind and suffered humiliation under foreign invasion. Things got worse especially after the Opium War, when the nation was plagued by poverty and weakness, allowing others to trample upon and manipulate us. We must not let this tragic history repeat itself" (Xi Jinping 2014). Kaufman (2011) explores the role of this dominant narrative in China today.

[2] Today's R&D projects are comparable to 19th century industrial firms in China as an indicator of economic prowess. Based on China's Provincial Statistical Yearbooks, the correlation of the two across provinces is high at 0.85.

[3] "West" or "Western countries" for the purposes of this paper is defined as the set of countries that signed treaties with China giving them extraterritorial rights, with the exception of Japan and Russia. See Appendix A.4 for the full list.

spillover analysis is performed to study how geographically dispersed the effects were. We end our sample period in 1899, before the start of the 20th century reforms, in order to focus on the more immediate impact.[4]

If the Western impact was relatively small, any effect would have been confined to the treaty ports themselves. But this is not what we find. We show that compared to regions without Western influence, interest rates are lower by more than a quarter at the ports and by still almost ten percent even at distances of up to 450 kilometers, far beyond the treaty port itself. The West's effect on interest rates is geographically dispersed to an extent that it affected the majority of China's regions. There are also geographic spillovers affecting the pace of China's industrialization but we find them to be more localized compared to interest rate spillovers.

We examine plausible channels of Western influence in China. The treaty ports increased China's foreign market access, making it a possible mechanism through which the West's intervention affected China's economy. In addition, the influx of western firms and banks to the ports may have sped up industrialization through learning spillovers, or increased the supply of local capital, thereby lowering the costs of capital. Western presence may also have increased the local supply of public goods, not only through the lighthouses and other infrastructure that the Western-led Chinese Maritime Customs (CMC) service provided but also in terms of security spillover and reduced transactional risk brought about by foreign legal institutions. These mechanisms may operate not only at the ports themselves but they might govern as well the geographic dispersion of Western influence in China. Evaluating these channels, our analysis highlights learning spillovers and lower transactional risk as important factors, as well as the change in foreign export market access. Finally, we examine the role of a domestic policy response of the 19th century called the Self-Strengthening Movement (1861-1894).

Our results are robust to concerns that the areas selected to be treaty ports might be quite different in terms of their fundamentals compared to areas that were not selected, and that regions that were directly exposed to Western influence had already distinct development paths before that exposure. In addition, key results are confirmed for a subsample of regions that are all located in the vicinity of China's coast. Our analysis also accounts for instances of mass violence during the 19th century, including the Taiping Rebellion (1850-64), as well as the staggered roll-out of treaty ports in China by employing recent advances

[4] After more than 250 years, the Qing dynasty ended in the year 1911.

in difference-in-differences estimation.

As far as we know, this is the first paper to provide quantitative evidence on affected versus unaffected regions showing that during the period that China calls its century of humiliation the West had a sizable positive impact on China's economy in the 19th century. The finding revises earlier work including Murphey (1974), Dernberger (1975), Fairbank (1978), and Feuerwerker (1983), which saw the Western presence typically as not harmful to China's development because it was not sufficiently impactful. A metaphor that aptly captures the conventional wisdom likened the treaty ports to "a fly on an elephant" (Murphey 1974). The view was that the structures of Chinese society were ultimately impermeable to change, and on the whole, Western influence was too trivial to matter one way or another to China's economy. Far from being impervious to change, this paper shows that the West had a sizable effect on the treaty ports compared to other regions, and that the effect was sufficiently dispersed to be observed throughout China in the immediate aftermath of the Opium War.

Some readers might be skeptical of the significance of the year 1842 for positive change. And yet, some suggestive evidence pointing in this direction does already exist. For example, it is well-known that there were "self-opened" ports in China, which presumably would not have occurred had the ports that were forced to open not generated substantial benefits. Case studies indicate benefits from Western institutions in China in the early 20th century (So and Myers 2013), and by the 1920s Western Protestant missionaries had contributed to the modernization of hospitals and schools in parts of China (Bai and Kung 2015). Former treaty port regions also experienced disproportionately high economic growth in the post-1978 reform period (Jia 2014). China could borrow internationally at lower interest rates during the Treaty Port Era than before because Western-collected tariff revenue served as collateral (Horowitz 2006). And the Chinese government eventually sought to improve the Chinese legal system after 1842 both to satisfy the demands of foreigners doing business in China, and to do away with extraterritoriality, the practice by which foreigners in China would be tried according to their home countries' laws (Commission on Extraterritoriality in China 1926). What has been missing is a demonstration of sizable effects beyond the relatively small area of roughly two dozens of treaty ports. This paper adds to the literature by showing geographically widespread impacts following China's forced opening and Western involvement in establishing treaty ports that went far beyond the ports.

We contribute to a large literature concerning the economic effects of colonialism in many parts of the

world (Acemoglu and Robinson 2017, Nunn 2009). Our focus on Western colonialism in China highlights colonialist trade interests affecting globalization in the past (Findlay and O'Rourke 2007, O'Rourke 2019), and documents the beginning of China's catching-up after the West's divergence from Asia (Broadberry 2021, Broadberry and Gupta 2006). We know that the West had a substantial effect on the structure of China's economy, in that parts of China were diminished in importance from core to periphery as inland transportation on the Grand Canal gave way to steam ships operating on the coast (Pomeranz 1993). We complement this work by quantitatively investigating effects of the West's intervention on Chinese capital markets and industrial development. Our analysis pointing to a shift in primacy from northern-inland to southern-coastal regions in China is consistent with what we know about the regional standards of living from the 18th to the 20th century based on wage data (Allen, Bassino, Ma, Moll-Murata, and Van Zanden 2011). Relative to other work on the impact of Western colonialism in Asia, in particular British railroad building in India (Donaldson 2018), our focus is on foreign trade in a setting of semi-colonialism, not domestic trade in a fully colonized country, though we share the approach of studying short-run effects instead of long-run consequences.

In the remainder of the paper, section 2 gives context for our setting and provides an overview of plausible channels of Western influence in China. Section 3 describes our estimation approach, discusses identification, and summarizes the data employed in this study. Section 4 presents empirical findings on the consequences of the West's intervention on the regions' rates of industrialization and capital markets, compared to other regions, and we examine the extent of geographic dispersion. Section 5 provides evidence on the specific mechanisms through which Western influence operated in post-Opium War China. Section 6 summarizes the results and provides a number of concluding thoughts. Supplemental material describing the data as well as additional robustness checks is provided in the Appendix.

2 The Opium War as a Watershed

2.1 Setting and Channels

In the decades before the First Opium War, China developed in relative isolation from the West and limited Sino-Western trade to a single port, open for only part of the year, in the south of China at Canton (Guangzhou). British traders–who had the largest trade interests–gained increased access to China after

provoking a war over the destruction of foreign opium, which had been brought to China without the consent of the Qing Emperor.[5] After China's defeat in the First Opium War, the Treaty of Nanjing (1842) liberalized trade and opened four additional ports (Amoy (also known as Xiamen), Foochow, Ningbo, and Shanghai). In subsequent years over the 19th century, additional ports were opened, which came to be known as treaty ports because they were opened by treaty.[6]

The immediate purpose of the treaties was to allow Western traders to better safeguard their persons and property while doing business in China (Fairbank 1978). Significant changes were introduced in especially two areas: trade policy and legal jurisdiction. Trade policies were tied to the opening of ports for foreign trade, with low tariff rates, as well as more specifically to the foreign-run customs houses, while legal jurisdiction was centered on consulates, where extraterritorial disputes were resolved through consular courts. Specifically, the channels we consider are the following:

Trade Policy–The immediate implication of the treaty port designation was that Western countries could legally trade at the port. Foreign ships transported the bulk of China's foreign imports and exports (CMC 1933), and this initial trade contact between Westerners and Chinese became expanded to include the right to establish firms in China. By the year 1891, for example, there were 345 British-owned firms in Chinese treaty ports (CMC 1933). The establishment of firms meant also that foreign residents and their families created organizations such as foreign municipalities, schools, and clubs.

Customs System–After the foundation of the Western-led Chinese Maritime Customs (CMC) Service in 1854 that took over the assessment and collection of customs duties, the first CMC customs house was opened in 1859 in Shanghai. The tariff revenue was transferred to the Qing court after deducting the CMC's costs of tariff collection, which improved the fiscal stance of Qing China. The CMC was important because it supervised the locations where foreign trade actually took place, and therefore where Western trade interests were concentrated.

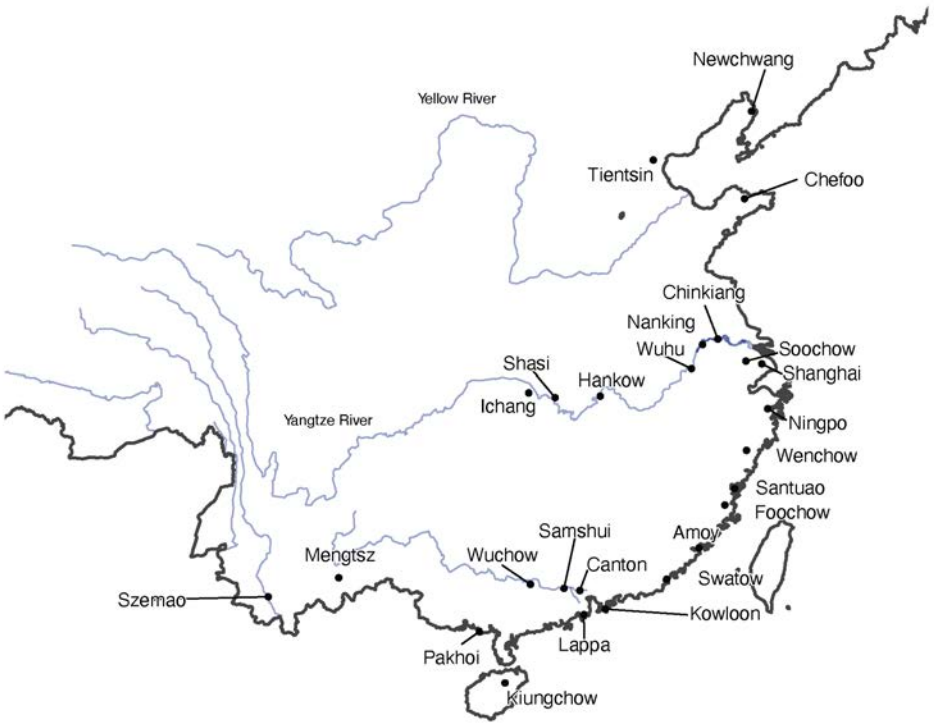
Legal Jurisdiction–The treaties stipulated that foreigners were subject to the legal jurisdiction of their own country rather than to Chinese laws (extraterritoriality). By 1847, 19 nations had extraterritoriality provisions with China. The consulate was key to the enforcement of foreign laws in legal disputes, because the court of first instance was typically the consular court, with the foreign consul as the judge. By the

[5] China was ruled by the Qing dynasty from 1644 to 1911.
[6] See Keller and Shiue (2022) for a broader discussion.

end of the 19th century there were 273 foreign consulates in our sample.[7]

Figure 1 gives the regional dimension of Western influence in China by showing the location of CMC customs stations in the last year of our sample period (1899). Given the importance of waterway access, Western influence is primarily found on China's coast, but also on the Yangzi and Pearl rivers, which would empty into the sea near Shanghai and Canton (Guangzhou), respectively. Moreover, customs stations are located further inland in certain areas, e.g. in China's southwest. In addition to geographic variation we exploit that foreign influence in China has grown over the sample period at several key dates, called waves (see Figure A.3).

Figure 1: Chinese Maritime Customs Stations



Notes: Shown are all ports with positive net foreign imports in the year 1899; source: CMC (n.d.).

CMC customs stations were established in all important treaty ports, although some of the smaller treaty

[7]Of these, eight were Russian and fifteen Japanese, the most important non-Western colonizers in China; our analysis below will account for this.

ports did not have customs stations. Consulates were typically located near treaty ports, and as we show below treaty ports and consulates had separate effects on China's economy. Over time, trade and legal dimensions evolved to become more distinct, in particular with the foundation of the Western-led Chinese Maritime Customs Service (1854).

While it is challenging to trace out all channels of the West's impact on China's economy, some of the following factors might play a role. First, the increase in foreign market access through the opening of new ports may lead to new patterns of specialization, triggering structural change and efficiency gains.[8] In addition, the West's intervention in China might have generated technological learning that increased the set of locally produced goods. Further, the lack of a medium of exchange and credit instruments was a serious weakness of China's financial system (Rawski 1989), and employees at Chinese banks in Shanghai that encountered Western banks may have borrowed ideas for financial instruments, increasing efficiency and security in the banking system. By the early 19th century, financial development had fallen behind that of leading Western countries (Keller, Shiue, and Wang 2021). Organizational innovations were also imported into China – for example, the first stock exchange in China, the Shanghai Share Broker's Association, was introduced in 1891 by foreign business residents of China (Goetzmann, Ukhov, and Zhu 2007). The treaties may also have increased China's access to capital because foreign banks established branches in China.

Second, Western influence in China may have increased the supply of public goods, especially given that government-supplied functions in China during the 19th century at most levels were limited. In contrast, the Western-led Chinese Maritime Customs (CMC) service not only built and operated lighthouses and wharves, but also dredged the harbors, modernized the postal service, and monitored smuggling. A particularly important public good might be security, because it could translate into reduced risk. Treaty ports provided an increased level of security from rebel and pirate activity through the presence of additional police and military units. This generated positive security spillovers, which may manifest themselves as lower risk premia for capital market transactions and hence interest rates.

The introduction of Western law in China–extraterritoriality– may have increased the incentives of Western firms to do business in China. The British company Jardine, for example, extended loans to Chinese merchants secured with stock deeds and titled property and extraterritorial rights in China made it

[8] On foreign market access in 19th century Argentina, see Fajgelbaum and Redding (2021).

possible to enforce contracts in ways familiar to British banking firms.[9] Furthermore, treaty provisions included landholding rights that played a potentially important role in foreign settlements. Not only did this decrease the risk for Western residents but it benefited also Chinese property owners. Since disputes related to property registered to foreigners would be heard in Western courts, many Chinese placed their land under foreign protection indirectly by leasing the property to foreigners, with one estimate suggesting that half of the cases did not involve foreign interests at all (Willoughby 1920).

The West's intervention in China might also have been impactful by triggering a domestic policy response. An important element of this might be the so-called Self-Strengthening Movement (SSM; 1861-95), a set of reforms initiated following China's defeats in the Opium Wars. Projects of the SSM were particularly in the areas of military and industrial technology.

Evidence on the importance of these channels will be presented in section 5 below.

2.2 Data[10]

Table 1 shows summary statistics. This paper estimates the effect of Western influence in China using regional measures of industrial development and financial markets conditions. We employ both indicator variables and the number of open treaty ports, customs stations, and consulates in a prefecture.[11] Our analysis abstracts from Chinese ports that were opened unilaterally by China ("self-opened" ports) because given the underlying difference in origin, their implications for China's economy might be different. Information on the timing of treaty port openings is based on CMC (1938). Data regarding the location and timing of opening of consulates is based on Yunglong (1986).

[9] Also, new business laws, such as the Company Law of 1865 enacted in British Hong Kong, had the effect of creating incentives for more and more Chinese to register their businesses in order to be allowed use of the Western court system in the event of disputes.

[10] See also Appendix, section A.

[11] While the mean number of consulates in a prefecture is larger than the number of treaty ports (see Table 1, Panel A), conditional on the presence of foreign influence, the mode for the number of consulates and the number of treaty ports is the same, namely one.

Table 1: Summary Statistics

	N	Mean	Standard Deviation
Panel A: Industrial Development Sample (Prefecture by Year)			
Number of Industrial Firms	24,727	0.034	0.225
Capital Investment	24,727	0.152	0.919
Steam Engines	24,727	0.010	0.097
Machinery Adoption	24,727	0.019	0.156
Number of Treaty Ports	24,727	0.037	0.193
Number of Consulates	24,727	0.317	2.361
Number of Foreign Banks	24,727	0.021	0.169
Foreign Direct Investment	24,727	0.084	0.496
Missionaries	24,727	0.047	0.153
Number of Self-Strengthening Projects	24,727	0.017	0.125
Panel B: Interest Rate Sample (Prefecture-Grain by Year)			
Interest Rate	64,620	7.449	10.934
Treaty Port Indicator	64,620	0.053	0.224
Customs Station Indicator	64,620	0.041	0.199
Consulate Indicator	64,620	0.048	0.214
Treaty Port or Consulate Indicator	64,620	0.059	0.236
Mass Violence	64,620	0.820	1.537
Treaty Port Indicator (0, 150 km]	64,620	0.164	0.370
Treaty Port Indicator (150, 300 km]	64,620	0.323	0.468
Treaty Port Indicator (300, 450 km]	64,620	0.360	0.480
Treaty Port Indicator (450, 600 km]	64,620	0.440	0.496
Consulate Indicator (0, 150 km]	64,620	0.163	0.370
Consulate Indicator (150, 300 km]	64,620	0.323	0.468
Consulate Indicator (300, 450 km]	64,620	0.380	0.485
Consulate Indicator (450, 600 km]	64,620	0.424	0.494
Share of Foreign Exports	64,620	0.006	0.040
Share of Foreign Imports	64,620	0.006	0.054
Max. Extraterritorial Legal Influence	64,620	0.030	0.171

Notes: Panel A: Number of Industrial Firms, Capital Investment, Steam Engines and Machinery Adoption give the cumulative number operating in Chinese-owned firms in prefecture i and year t; Foreign Banks is measured by their headquarters; Foreign Direct Investment is the total number of foreign-owned firms, all in logs after adding one. Missionaries is the fraction of counties of prefecture i in year t with at least one Protestant missionaries. Panel B: Interest rate is derived from grain prices over the seasonal cycle as part of the costs of storage, see Appendix A; there are multiple interest rates for a given prefecture-year combination, one for each grain. Share of foreign exports and imports is the fraction of a customs station in all of China's foreign trade of the year 1882. Max. Extraterritorial Legal Influence is an indicator variable based on four legal dimensions, see Appendix section A.4.

In addition, we employ information on trade and legal characteristics to explore the mechanisms through

which Western influence mattered in post-Opium War China. First, there is the share of China's foreign imports that a particular port accounted for, as well as its share of China's foreign exports. The port of Canton (Guangzhou), for example, accounted in 1882 for 19% of China's foreign exports, while Amoy (Xiamen) accounted for 8% of China's foreign imports (CMC n.d.). We also employ an indicator variable on the maximum extraterritorial legal influence present in a region based on legal practices, which varies by each consulate's country of origin as well as over time (see Appendix A.4). Panel B shows summary statistics on this variable towards the bottom.

Starting in the middle of the 19th century, a new type of firm emerged in China. The earliest firms were not factory-style firms, but they were in trade and shipping industries. Because of their relation to the initial phase of industrialization we refer to them as "Industrial" firms. Other firms were in the silk reeling, oil drilling, as well as mining industries. By the end of our sample period in 1899, there were 356 of such firms in 65 different prefectures. We also have information on these firms' capital investments. The source is Du (1991).

Information on the diffusion of industrial technology is employed as well. There are two variables, the number of industrial machinery and the number of steam engines (source: Chang 1988a, 1988b, 1989). By the end of our sample period, industrial machinery was employed in 26 Chinese prefectures, while steam engines were utilized in 13 prefectures. Shanghai accounted for 27% of the steam engines and 36% of the industrial machinery by the end of the 19th century.

We also utilize information on foreign-owned banks and firms in China. Because they are closely related to the opening of the ports, these variables may be considered mechanisms of Western influence. The bank measure is the number of foreign-owned headquarters and offices in prefecture i and year t, from Jiang (2014). By the year 1899, there were 933 foreign firms in the treaty ports of China, more than double the number in the year 1882 (440 firms).[12] These foreign firms were a form of foreign direct investment (FDI) that might have affected the supply of capital in China. Our information on foreign firms in China comes from CMC (1933).

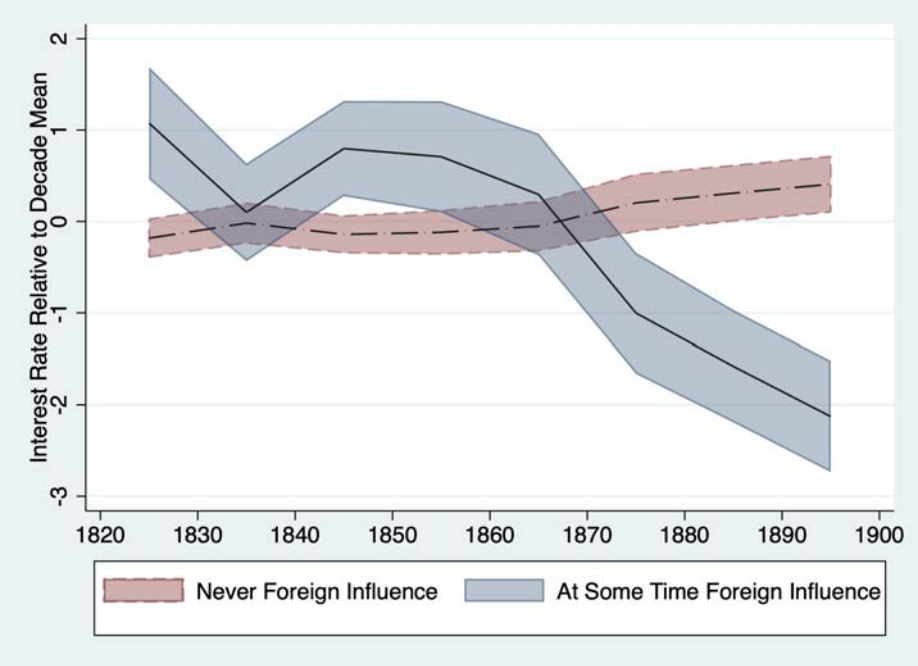
Protestant missionaries from Western countries were active in China in the 19th century. The work of a large share of these missionaries was enabled by the treaties that opened the ports for trade. As a result,

[12]The number of Japanese firms increased in the last years of our sample period, after the First Sino-Japanese War (1894-95), but this does not have a major influence on our results.

Protestant missionaries may have been a potential mechanism through which Western influence operated. Missionary activity in prefecture i and year t is measured by the fraction of counties that had at least one Protestant missionaries (information from Stauffer 1922).

We examine China's financial markets by examining regional interest rates. In the absence of comparable interest rate figures from other sources, our data are obtained by exploiting cyclical fluctuations in the price of grain over the harvest cycle, where in a storage equilibrium grain prices will reflect interest rates as part of the storage costs (Kaldor 1939, Working 1949). Our approach is described in the Appendix, section A. Because locals account for the largest share of participants in these grain markets, our interest rates should be viewed as the typical risk-inclusive costs of capital to local Chinese in the region.

Figure 2: Regional Interest Rates by Foreign Influence



Notes: Shown is average interest rate by decade for (1) prefectures that never hosted one or more foreign consulate between 1821-1899 and for (2) prefectures that did. Consulate openings from year 1842 to 1897 (Figure A.3); 95 percent confidence intervals shown.

Interest rates were on average about 7.5% per year, see Panel B of Table 1. Typical interest rates went from about 6 percent in the early years to about 9.5 percent in the final twenty years of the sample. This suggests a general increase in the cost of capital in China, which may reflect a weakening of the Chinese economy or a deteriorating security situation towards the end of the Qing (the dynasty fell in 1911).[13]

[13]We limit our sample to the 19th century in part because data quality deteriorated at the end of the Qing dynasty.

Figure 2 shows relative interest rates in two sets of prefectures, which are areas of foreign influence, versus areas in which foreign influence was never present. Notice that typical interest rates in the latter set of prefectures were close to the sample mean because such control regions are in the majority in the sample. In contrast, regions that were eventually subject to foreign influence had similar or somewhat higher interest rates in the first decades while by the end of the sample period their interest rates fell to about 2 percentage points below those in control regions. This preliminary evidence is consistent with foreign influence having an interest-lowering effect relative to regions without foreign influence. Furthermore, if the general trend of increasing Chinese interest rates would have been due to foreign influence, one would expect that the increase is stronger in regions with foreign influence than in regions without–however, Figure 2 shows interest rates in regions that had at some point foreign interest rates–solid line–trends lower compared to regions never having been treaty port areas (dashed line).

A potentially important alternative determinant of interest rates in China during the 19th century was mass violence, including one of the largest civil wars in human history, the Taiping Rebellion. Such incidents might change local interest rates by either affecting capital supply or risk premia. Our analysis thus incorporates information from the *Veritable Records of the Qing Emperors* prepared by Chan (1983) that cover any riot with more than 5 participants, as well as the extents of property damage and subsequent government action.

3 Estimation Approach

We use a difference-in-differences approach in which a measure of industrial development in prefecture i and year t, Y_{it}, is related to a foreign influence variable, FOR_{it}, using the following linear regression:

$$Y_{it} = \beta_1 FOR_{it} + \gamma' \Gamma + \delta_{p(i)t} + \mu_t + \theta_i + \varepsilon_{it}, \tag{1}$$

where Y_{it} is the number of industrial firms, their capital investment, the number of steam engines, and the number of pieces of industrial machinery (each in logs after adding one), while FOR_{it} is an indicator that equals one if there is at least one treaty port, foreign consulate, and customs station in prefecture i and year t (alternatively, we employ the number of treaty ports, consulates, and customs stations). The terms θ_i and μ_t are prefecture- and year fixed effects, respectively. Equation (1) is the well-known two-way fixed

effects model. The term $\delta_{p(i)t}$ are province-year fixed effects, and the vector Γ includes other variables that might affect Y_{it}. We are interested in the parameter β, which gives the average sample difference in terms of Y_{it} that is caused by foreign influence.

The inclusion of prefecture fixed effects means that our approachs allows for for differences between prefectures that are constant over time as estimation of β is based solely on variation within prefectures over time. Province-year fixed effects pick up shocks to industrial development at the province-level, such as geographical advantages of coastal areas as transport technology changes, while μ_t captures national shocks.[14] Furthermore, to account for the effect of more persistent influences that cross province boundaries, such as harvest failures, the vector Γ consists of geo-trends, defined as decadal fixed effects for nine macro regions of China (3 x 3 regions based on latitude and longitude). When estimating equation (1) we also employ inverse-probability regression weight adjustment (IPWRA) to sharpen identification; see the probit results underlying the IPWRA weights below in Table 3. The error ε_{it} in equation (1) is assumed to have mean zero. We account for possible heteroskedasticity by clustering at the prefecture level, which allows for arbitrary serial correlation of annual observations for the same prefecture. The analysis below also addresses possible spatial dependence.

To analyze the effects of foreign influence on Chinese capital markets, the following estimation equation is used:

$$r_{igt} = \beta_1 FOR_{it} + \gamma' \widetilde{\Gamma} + \widetilde{\delta}_{p(it)t} + \mu_t + \theta_{ig} + \varepsilon_{igt}, \tag{2}$$

where r_{igt} is the interest rate in prefecture i and year t based on grain g.[15] Equation (2) is similar to our approach to industrial development, equation (1), in that it is also a two-way fixed effect model. The differences between equations (1) and (2) are as follows. First, in addition to geo-trends the vector $\widetilde{\Gamma}$ includes a measure of mass violence. Mass violence might affect capital supply or demand, as well as local risk, which means if not included mass violence could be a relevant omitted variable. Second, given that climate affects grain storage costs and therefore our interest rates, instead of the province-year fixed effects from above, here we include province-year effects that vary for each of the five weather categories in the data; these province-year-weather fixed effects are denoted by $\widetilde{\delta}_{p(i)t}$ in equation (2). Third, because we employ interest rates derived from all available grains, the interest rate sample is larger than the industrial

[14] National shocks μ_t are identified separately from $\delta_{p(i)t}$ because not all provinces are included in the sample in all years.
[15] The derivation of these interest rates from grain prices over the harvest cycle is discussed in Appendix A.

development sample (see Table 1). Fixed effects in the cross-sectional dimension are now θ_{ig}, compared to θ_i before. While using a larger sample improves inferences given noise in the interest rate data, it does not drive our results as will be shown in Table A.4.

We extend equations (1) and (2) to study geographic dispersion by adding measures of foreign influence at some distance away. Our approach is to form circular bands (or, donuts) at certain distances around prefecture i and to define geographic spillover variables based on the number of treaty ports, consulates, or customs stations in each band. In the case of equation (2), the specification becomes

$$r_{igt} = \beta_1 FOR_{it} + \sum_d \beta_{2l} \left[\sum_{j \neq i} 1_{ij}\{l = d\} \times FOR_{jt} \right] + \gamma' \widetilde{\Gamma} + \widetilde{\delta}_{p(it)t} + \theta_{ig} + \mu_t + \varepsilon_{igt}, \tag{3}$$

where d indicates a certain distance bracket in kilometers, such as four brackets of 150 kilometers width each, from zero to 600 kilometers, $d = \{(0, 150], (150, 300], (300, 450], (450, 600]\}$, and 1_{ij} is an indicator function on the distance between prefectures i and j. For example, the term in hard brackets in equation (3) is the number of treaty ports in a particular distance band d surrounding prefecture i when the measure of foreign influence is treaty ports. As an alternative we also employ indicator specifications, such as whether in distance band d of prefecture i there is any open treaty port, that is, $1\left(\left[\sum_{j \neq i} 1_{ij}\{l = d\} \times FOR_{jt}\right] > 0\right)$. As before, the coefficient β_1 gives the causal impact of FOR_{it} on interest rates; however, to the extent that $\beta_{2l} \neq 0$ for any distance d in addition to a non-zero coefficient β_1, there is evidence that foreign influence affects prefecture i from some distance away. Equation (3) is similar to the analysis of geographic dispersion in other contexts, e.g., Feyrer, Mansur, and Sacerdote (2020, 2017), James and Smith (2020).

A central identification assumption of the differences-in-difference approach is that in the absence of treatment, outcomes in treatment and control regions would have followed parallel trends. An ideal setting for estimating causal effects would have treaty ports and consulates randomly allocated. The historical record shows, however, that actual locations were not random. The following provides analyses to gauge the impact of this on our empirical findings.

Balance Checks Note that there are no differential pre-trends in terms of our industrial development variables. This is trivially so because before 1842, there were no steam engines–or industrial machinery, or

industrial firms–in any region of China. In Table 2 we compare treatment and control regions in the pre-treatment period for interest rates and other variables. Panel A shows that interest rates in regions that were eventually subject to foreign influence were similar to interest rates in other regions. The difference in average interest rates is not statistically significant.

Panel B of Table 2 compares the two set of regions in terms of interest rate growth before the beginning of the Treaty Port Era. Differences in interest rate growth between treated and control regions are relatively small and not significant.

Table 2: Pre-Treatment Characteristics of Treated versus Control Regions

	Years 1821-1842						Years 1776 - 1820		
	A. Interest Rate Level (%)			B.Interest Rate Growth			C. Population Growth		
	Treated	Control	Difference	Treated	Control	Difference	Treated	Control	Difference
Treaty Port	6.254	6.586	−0.332 [0.212]	0.130	0.196	−0.067 [0.142]	0.227	0.293	−0.065 [0.000]
Consulate	6.412	6.554	−0.141 [0.607]	0.169	0.189	−0.019 [0.678]	0.269	0.288	−0.019 [0.007]

Notes: Table gives means (growth) for the period 1821 to 1842 in panel A (B), and growth from 1776 to 1820 in panel C. Treaty Port and Consulate are defined as having ever at Treaty Port or Consulate, respectively. p-value of a test of equality in brackets. Population data from Cao (2000), interest rate data see text and Appendix A.

Panel C extends the analysis by comparing population growth in the two sets of prefectures in more than four decades before our sample begins (1776-1820). We see that for both definitions of treatment, population growth in the treatment regions tends to be lower than in the control regions. The relatively low pre-sample growth in treated regions is consistent with Fairbank's (1978) assessment that Shanghai, which arguably became the most strongly Western-influenced Chinese city during the treaty port era, had been a relatively small city since the Yuan (1279-1368) period, with hardly any growth during the early 19th century. At the same time, if the relatively strong pre-sample performance of treated regions extended into our sample period it would bias the results *against* finding a positive relative impact from Western influence.

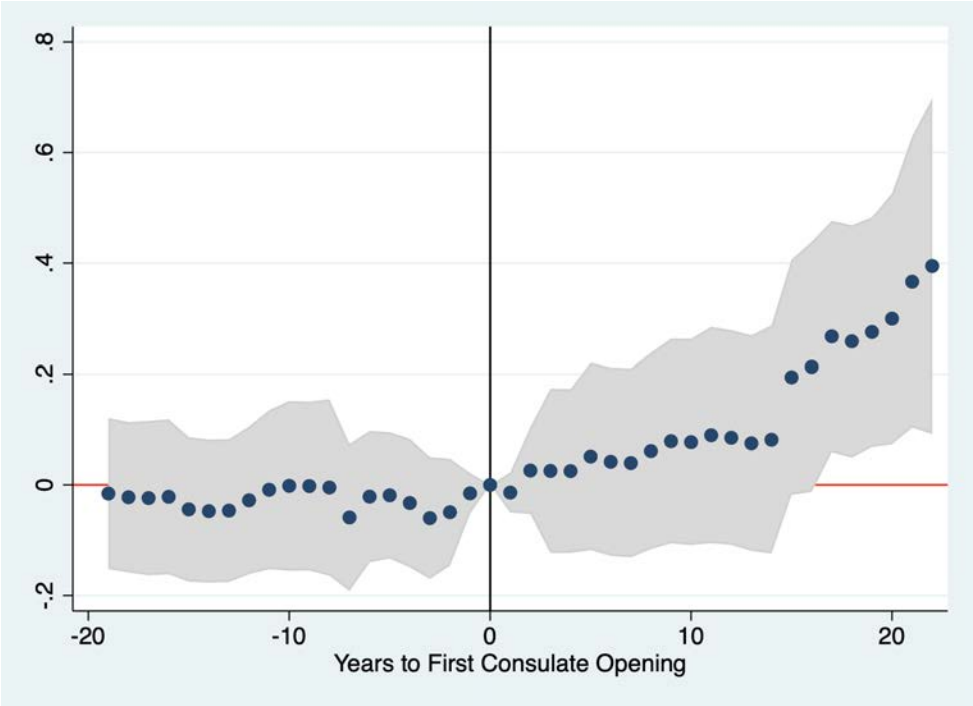
In sum, based on analyses going back to the year 1776, there is little evidence that the regions that were eventually subject to substantial foreign influence were the most promising regions of China. Thus, it is unlikely that our analysis overestimates the impact of Western influence because the regions with eventual Western influence were favored already before the Opium War.

Event Study Evidence on Pre-Trends Equation (1) is generalized to an event-study framework, in which we estimate one coefficient for each period τ relative to treatment time:

$$Y_{it} = \sum_{\tau} \beta_\tau \, 1\{t - \widetilde{FOR}_i = \tau\} + \beta' \Gamma + \delta_{p(i)t} + \mu_t + \theta_i + \varepsilon_{it}, \tag{4}$$

where the year when prefecture i receives a particular binary treatment is $\widetilde{FOR}_i$, and $\tau = t - \widetilde{FOR}_i$ is the year relative to treatment.

Figure 3: Number of Industrial Firms: Event Study



Notes: Figure shows estimates of β_l (equation (4)) for the number of industrial firms as Y_{it} and $\widetilde{FOR}_i$ as the year of first consulate opening in prefecture i. N = 24,727; 95% confidence intervals shown.

Figure 3 shows no evidence for differential trends for treatment and control regions before treatment. Before the first consulate opening, there is no clear trend in the β_τ estimates, and coefficients are not significantly different from zero. This provides evidence that pre-trends were not very different in treatment and control prefectures. Similar results are obtained for other measures of industrial development as well as interest rates.[16] Moreover, we have conducted event study analysis also for the geographic distance band variables of equation (3), and did not find evidence for significantly different pre-trends.[17] Figure 3 also shows that

[16] See Figures A.5 to A.8 in the Appendix.

[17] The event study figure for foreign influence in the 150 to 300 kilometer distance band is shown in Figure A.9.

after treatment, the β_τ estimates turn more and more positive.

Recent research has recently addressed a number of concerns with OLS in the context of difference-in-differences estimation, in particular the assumption of homogeneous effects.[18] In our case this may lead to bias because Western influence in China became stronger over time (Figure A.3), for example. Therefore, we present results from methods that are consistent with heterogeneous effects below as well.

Selection of Regions We employ inverse-probability weighted regression adjustment (IPWRA) as a first step to address non-random selection of locations of foreign influence. Our approach is based on the predicted probability that a prefecture would be treated based on information such as geography and pre-sample characteristics. Table 3 shows results from this probit regression.

Table 3: Foreign Locations: Where?

	Coefficient	Standard Error
Latitude	-4.76^{**}	0.95
Longitude	-1.50	3.06
Population in 1776	0.65^{**}	0.18
Population Growth 1776 - 1820	0.19^{*}	0.08
Northern Coast	3.00^{**}	0.57
Southern Coast	0.28	0.38
Grand Canal	-0.43	0.47
Yangzi Delta	0.64	0.50
Yangzi River	0.72^{*}	0.33
Pearl River	-0.45	0.64

Notes: Dependent variable is one if a prefecture ever had one or more treaty ports or consulates, and zero otherwise. Estimation by probit regression. Latitude, Longitude, and Population in 1776 in logs. Coastal and waterway access variables are indicators. Standard errors are heteroskedasticity-consistent. **/* indicates significance at the 1/5 percent level.

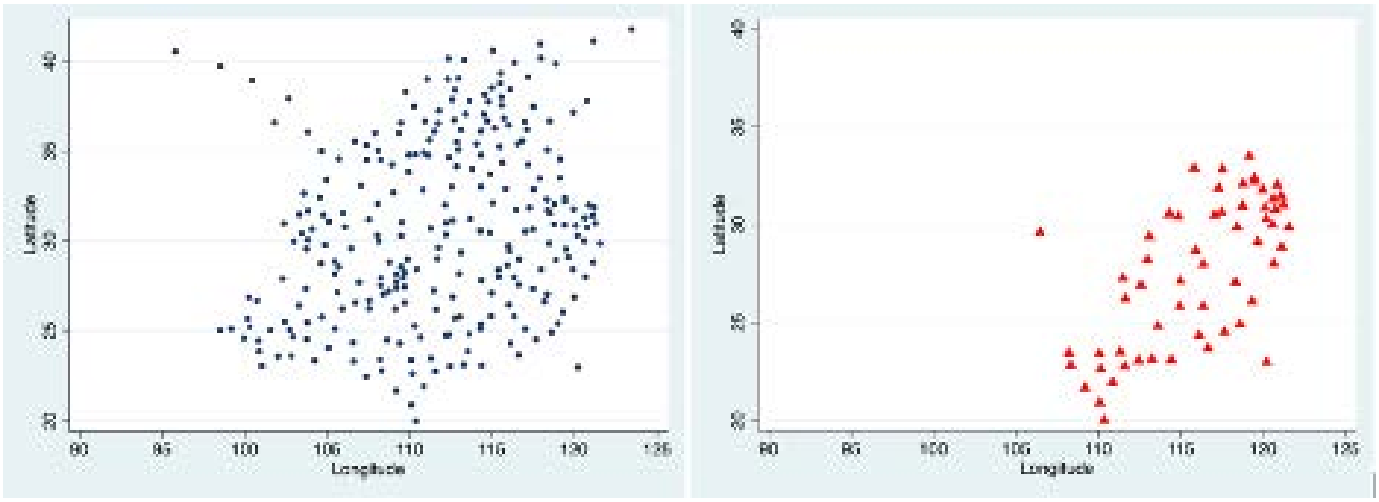
Among the important predictors is the North-South dimension, with the negative coefficient on latitude indicating that the West tended to select locations in the Southern part of China. We also see that regions with relatively large or fast growing population in the pre-sample period were more likely to be selected by Westerners than other regions. Also, consistent with a market access motive, locations on the Northern coast were more likely than inland regions of the North. Finally, location on the Yangzi river significantly

[18] See Borusyak, Jaraval, and Spiess (2021), Callaway and Sant'Anna (2021), de Chaisemartin and D'Haultfoeuille (2020), and Sun and Abraham (2020); de Chaisemartin and D'Haultfoeuille (2022) is a review.

increased the probability that a region would be chosen. This is in line with the historical importance of the Yangzi for low transport-cost access to China's central heartland. The coefficients of Table 3 yield regression weights for the IPWRA adjustment, which ensures that the regression places relatively more weight on treatment and control regions that are relatively similar in terms of likelihood of being a foreign location.

We also pursue a more drastic approach towards selection by focusing on a subsample of prefectures, namely those locations that were most similar to locations actually picked by foreigners. We estimate separately the likelihood that a prefecture is selected as a location for a treaty port and a consulate using the predictors of Table 3, and then focus the analysis on those prefectures that are in the top third of both probabilities.

Figure 4: All Regions versus Likely Foreign-Selected Regions



Notes: Shown on the left are all prefectural capitals (N = 245) and on the right prefectural capitals that are in the highest third of the predicted probability of having both one or more treaty ports and consulates based on probit regressions with the independent variables reported in Table 3 (N = 59).

Figure 4 shows the full sample of 245 prefectures in the interest rate sample on the left, while the 59 prefectures most likely to have Western influence are on the right. Notice that prefectures most likely to have Western influence tend to be located in the coastal South and East of China (right panel). Confining our analysis on the latter reduces the possibility that results are due to differences between prefectures that have treaty port characteristics and those that do not.

4 Impact of Foreign Influence

Results of estimating equation (1) are presented in Table 4.

Table 4: The Impact of Western Influence on Industrial Development

	(1) Industrial Firms	(2) Steam Engines	(3) Industrial Machinery	(4) Capital Investment	(5) Capital Investment	(6) Industrial Firms	(7) Industrial Firms
					No Japan or Russia	Coast	Heterogeneous (BJS)
Panel A.							
TP or Consulate	0.133**	0.049*	0.084*	0.494+	0.496*	0.141**	0.124**
	(0.048)	(0.021)	(0.033)	(0.258)	(0.244)	(0.048)	(0.043)
Panel B.							
Treaty Port Indicator	0.127**	0.092*	0.090+	0.528**	0.356*	0.139*	n/a
	(0.049)	(0.043)	(0.052)	(0.190)	(0.149)	(0.065)	
Consulate Indicator	0.041	−0.035	0.008	0.085	0.226	0.059	n/a
	(0.051)	(0.040)	(0.050)	(0.238)	(0.238)	(0.067)	
N	24,727	24,727	24,727	24,727	24,414	8,374	24,727

Notes: Dependent variable given on top of column, in logs after adding one; estimation of equation (1). All specifications include prefecture and year fixed effects, province-year fixed effects, as well as geo-trends; IPWRA applied. Column (5) drops observations with consulates from Japan or Russia from the sample; column (6) limits the sample to the coastal prefectures with the highest probability to be areas of Western influence, see Figure 4, right panel; column (7) applies Borusyak, Jaraval, and Spiess's (2021) estimator. TP stands for treaty port. Robust standard errors clustered at the prefecture level reported in parentheses. **/*/+ indicates significance at the 1/5/10 percent level.

We first employ an indicator variable of foreign influence that is equal to 1 if the prefecture has one or more treaty ports or one or more foreign consulates (Panel A). Note that this raises the number of industrial firms, see column (1). This result is consistent with the event study evidence of Figure 3. There is also evidence that foreign influence led to the adoption of steam engines as well as industrial machinery, see columns (2) and (3). Furthermore, foreign influence spurred the capital investment of industrial firms, see column (4). Quantitatively, according to the coefficient in column (1), the opening of the first treaty port or consulate increases the number of industrial firms by about half of a standard deviation of that variable.

Next, we examine whether the effects are due to all foreign countries or primarily Western countries. The two most important non-Western countries here are Russia and Japan. We therefore examine how the results change when we define an alternative consulate variable after dropping observations with Japanese

or Russian consulates. This does not qualitatively change the results, compare columns (5) and (4), respectively, and we conclude that the impact of foreign countries in China was primarily a Western effect. Column (6) limits the sample to those regions on the coast that were most likely subject to Western influence, as shown in Figure 4. The point estimate on the Western influence variable is similar to that for the full sample (compare columns (6) and (1), respectively). Thus, our results are not driven by regions that were unlikely to come under Western influence to begin with. Finally, specification (7) employs the Borusyak, Jaraval, and Spiess (2021) difference-in-differences estimator consistent with heterogeneity. In our setting, it turns out to lead to similar results as using OLS.

Panel B of Table 4 analyzes the strength of different aspects of Western influence. We use separate measures for treaty ports and consulates and show that China's industrial development was more strongly affected by treaty ports than by consulates. While the point estimate on the consulate indicator tends to be positive, only the treaty port variable is significant at standard levels (Panel B, Table 4). Overall, the West's intervention had a positive effect on industrial development relative to regions without Western intervention, and this was more strongly associated with treaty ports than with consulates. In the Appendix, we show that findings are similar with a number modifications, including specifications that account for spatial dependence or that drop the Shanghai region from the analysis (see Table A.3).

Table 5 displays the West's influence on the relative performance of China's capital markets. Both treaty ports and consulates lead to lower local interest rates, see columns (1) and (2). Further, the point estimate of the consulate variable is larger than three while the treaty port coefficient is closer to two. Given the high correlation between these variables we define an indicator variable that captures both, and it enters with coefficient of about -2.3 (column (3)). A simple quantification compares this to the mean sample interest rate, which is about 7.5 percent, see Table 1. This indicates that foreign influence typically reduces local interest rates by more than one quarter compared to regions without foreign influence. The mass violence coefficient is positive, in line with the hypothesis that mass violence raises interest rates (Table 5, column (3)).

Table 5: Local Capital Markets and Western Influence

	(1)	(2)	(3)	(4) No Japan or Russia	(5) Hetero-geneous (BJS)	(6)	(7)	(8)	(9)	(10)	(11) Coast
Treaty Port Indicator	−1.867**										
	(0.483)										
Consulate Indicator		−3.142**									
		(0.459)									
Treaty Port or Consulate			−2.365**	−2.701**	−2.362**	−2.795**	−3.135**	−3.159**	−3.155**	−3.394**	−2.285**
			(0.438)	(0.479)	(0.384)	(0.460)	(0.451)	(0.452)	(0.452)	(0.460)	(0.627)
TP Indicator (0, 150 km]						−2.119**	−2.164**	−2.261**	−2.260**		
						(0.492)	(0.481)	(0.485)	(0.487)		
Consulate Indicator (0, 150 km]						−1.453**	−1.491**	−1.429**	−1.438**		
						(0.454)	(0.442)	(0.438)	(0.443)		
TP Indicator (150, 300 km]							−1.105*	−1.131*	−1.109*		
							(0.479)	(0.477)	(0.473)		
Consulate Ind. (150, 300 km]							−0.737	−0.792+	−0.834+		
							(0.455)	(0.458)	(0.458)		
TP Indicator (300, 450 km]								−0.767+	−0.808*		
								(0.396)	(0.396)		
Consulate Ind. (300, 450 km]								0.272	0.277		
								(0.385)	(0.385)		
TP Indicator (450, 600 km]									0.195		
									(0.443)		
Consulate Ind. (450, 600 km]									−0.535		
									(0.416)		
# TPs + Consul's (0, 150 km]										−1.170**	−1.414**
										(0.155)	(0.249)
# TPs + Consul's (150, 300 km]										−0.487**	−0.925**
										(0.101)	(0.188)
# TPs + Consul's (300, 450 km]										−0.276**	−0.925**
										(0.076)	(0.155)
Mass Violence	0.084+	0.082+	0.082+	0.098*	0.081+	0.088+	0.094*	0.094*	0.097*	0.086+	0.096
	(0.047)	(0.047)	(0.047)	(0.046)	(0.047)	(0.047)	(0.047)	(0.047)	(0.046)	(0.047)	(0.083)
N	64,620	64,620	64,620	63,329	64,635	64,620	64,620	64,620	64,620	64,620	20,055
R-squared	0.227	0.229	0.228	0.230	0.228	0.233	0.234	0.234	0.234	0.232	0.298

Notes: Dependent variable is interest rate; estimation of equation (2). TP stands for treaty port, Ind. for Indicator, and Consul's for Consulates. Specifications include prefecture-grain fixed effects, year-province-weather fixed effects, and geo-trends; IPWRA applied. Column (4) drops observations with consulates from Japan or Russia; column (5) applies the Borusyak, Jaraval, and Spiess (2021) estimator; column (11) restricts the sample to the coastal prefectures in China's South and East, see Figure 4. Robust standard errors clustered at the prefecture-grain level. **/*/+ indicates significance at the 1/5/10 percent level.

To re-examine whether this result is a general foreign or more narrowly a Western effect, we drop observations with Russian or Japanese consulates. Again, our results do not drastically change, see column (4). This confirms the industrial development result from Table 4 that Western influence, rather than a broadly foreign impact, was important. Furthermore, employing a difference-in-differences estimator consistent with heterogeneous effects yields results similar to OLS, see columns (5) and (3), respectively. Heterogeneity does not appear to strongly affect our results.

The remaining columns of Table 5 extend the specification of column (3) to include geographic spillover terms (as in equation (3)). In the following, we will refer to column (3) as estimating the prefecture-i effect. First, we add separate indicator variables for treaty ports and consulates at distances larger than 0 and up to 150 kilometers from prefecture i.[19] Both variables enter with negative coefficients. This indicates that the prefecture-i effect of column (3) is not the total effect. Rather, Western influence had a geographically dispersed effect of at least 150 kilometers beyond the ports themselves.

Another important finding is that the prefecture-i coefficient *increases* upon adding the (0, 150 km] spillover variables, see columns (6) and (3), respectively. This suggests that the prefecture-i effect is stronger than the interest-rate lowering effect at distances between 0 and 150 kilometers.[20] Because the prefecture-i coefficients increase at the same time when there are additional interest-rate lowering effects outside of prefecture i, the specification without spillover terms underestimates the total Western effect on interest rates relative to regions without Western influence.

To further assess the geographic scope of this effect on capital markets, columns (7), (8), and (9) add spillover variables at an increasing distance. At distances between 150 and 300 kilometers, treaty ports lower interest rates (column (7)). The prefecture-i point estimate increases further, from -2.7 to -3.1, and also the spillover point estimates for distances between 0 and 150 km increase (in absolute values). This confirms, again, that including spillover terms at higher distances tends to increase coefficients at lower distances. Column (8) shows that compared to regions without Western influence, treaty ports reduce local interest rates at distances of up to 450 kilometers and consulates lower interest rates at distances of

[19] These distance bands do not include treaty ports or consulates in prefecture i itself. Distance is measured between prefectural capitals.

[20] Without separate (0, 150 km] bands, the total effect must be captured by the prefecture-i variable, and if the impact at distances between 0 and 150 km is lower than in prefecture i itself the coefficient of the former will be relatively low. By including a separate variable for the (0, 150 km] distance band the prefecture-i coefficient can reflect the relatively strong effect in prefecture i itself.

up to 300 kilometers. Based on this, the geographic scope of the treaty port effect to lower interest rates is larger than that through consulates. At distances above 450 kilometers, neither treaty port and consulate indicators are significantly different from zero.

These results indicate that Western influence through both consulates and treaty ports went beyond the immediate vicinity of the ports. For treaty ports the maximum distance is 450 kilometers while for consulates it is 300 kilometers. Furthermore, allowing for these dispersed spatial effects yields a larger overall difference-in-differences impact.

The coefficient patterns also yield further insights on the nature of the Western effect. Both in terms of magnitude and statistical significance, we estimate spatial decay in the impact of Western influence on interest rates in China's regions. The effect is strongest at the port, it becomes weaker as distances increase, and it approaches zero at large distances (here, above 450 kilometers, column (9)). This is *not* the pattern that one would expect if the West's impact had led to a reallocation of resources. Notably, we do not see a pattern suggesting that treaty port prefectures benefit at the expense of non-treaty port prefectures. For example, if the West's intervention had triggered the influx of capital from other regions, one would expect that the negative prefecture-i coefficient is accompanied by positive coefficients in prefectures that are nearby prefecture i. However, there is little evidence for a mix of significant negative and positive coefficients, as the reallocation hypothesis would imply (see the spillover coefficients in columns (6) and (7) of Table 5).[21]

Rather, the geographic decay in the interest-rate lowering effect are consistent with positive externalities that decline in distance. For one, capital market transactions become less frequent as distance increases. Transaction costs rise because transportation, time, and food costs rise with distance, since in our setting transactions would typically be made in person. Given that distance is a barrier, improvements leading to lower risk in a particular prefecture i will benefit agents less and less who live at an increasing distance away from i. Furthermore, lower interest rates might lead to the diffusion of ideas as agents travel to these locations of low rates from elsewhere, bringing back these new ideas to their points of origin. Generally, the diffusion of new ideas exhibits geographic decay because knowledge is not perfectly codifiable and its diffusion facilitated by in-person demonstration (Jaffe, Trajtenberg, and Henderson 1993).

[21] Furthermore, at distances between 500 and 600 kilometers, the typical correlation of prefectural interest rates in China as late as 1860 was only 0.08 (Keller, Shiue, and Wang 2021). Given this level of capital market integration, it is unlikely that there would have been a substantial reallocation of capital at distances above 600 kilometers.

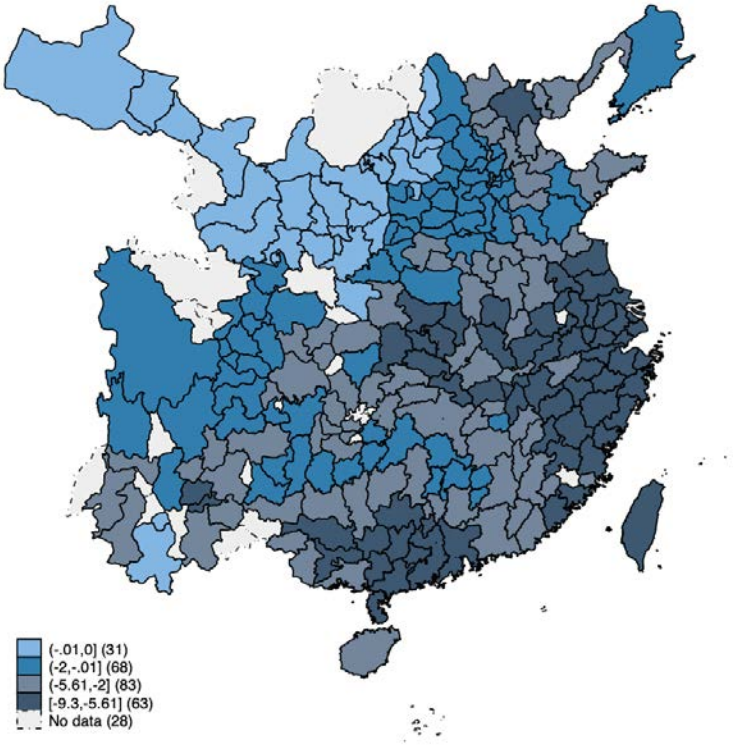
Finally, we ask if these results hold even within a sample consisting only of prefectures within coastal access. Given the smaller sample, we adopt a more parsimonious specification that combines treaty port and consulate indicators in a single variable. We generalize the earlier specification of column (3) by adding three spillover variables that capture Western influence at distance brackets up to 450 kilometers. Column (10) confirms earlier findings that including spillover terms increases the size of the West's effect on capital markets relative to regions in which Western influence was absent in that the prefecture-i coefficient increases (in absolute value) from -2.4 to -3.4 (see columns (3) and (10), respectively). Column (11) of Table 5 reports results for China's coastal prefectures, those that were most likely selected as locations for treaty ports or consulates (see Figure 4, right panel). Even though the sample is limited to coastal prefectures, we find that Western influence has reduced interest rates relative to regions without Western influence (column (11)). Moreover, quantitatively our findings are similar for coastal regions and for China's regions as a whole, except a somewhat smaller prefecture-i effect combined with less geographic decay with distance in the coastal sample (compare columns (10) and (11)). Overall, the results suggest that Western influence mattered even within regions that had low cost access to shipping.

Plotting these effects on a map illustrates the full scope of Western influence in China. In Figure 5 the strength of the West's relative effect on regional interest rates is shown using different colors, with darker shades indicating stronger effects. The results of Figure 5 are in line with conventional wisdom that Western influence was relatively high in the coastal regions of China's Southeast and the Yangzi delta. However, the figure also shows that the West's influence reached well beyond coastal regions, resulting in eighty-seven percent of all Chinese regions in our sample being significantly affected. Only a minority of regions, mostly in China's Northwest, experienced no Western influence. Furthermore, in a large fraction of regions the West brought interest rates down by a quarter or more compared to unaffected regions.[22] The West after the Opium War affected most of China. Central to the finding of a relatively dispersed effect is that we extend our difference-in-differences analysis to include geographic spillovers.[23] The West's effect is sizable not only in terms of territory but also in terms of the population impacted since China's Northwest is not an area with relatively high population compared to other parts of China.

[22] In 146 out of 245 prefectures (a share of 60 percent), the predicted interest rate effect is larger than two percentage points, which is about one quarter of the typical interest rate level during our sample period.

[23] Employing no spillover variables one might indeed conclude that the West's effect was small because then only 12% of the Chinese regions are affected.

Figure 5: Western Influence and Chinese Capital Markets in the late 19th Century



Notes: Figure 5 gives predicted effects of the specification underlying Table 5, column (8) for the latest possible sample year (typically in the 1890s). First parentheses gives the range of the interest rate reduction (in percentage points), second parentheses reports the number of prefectures in the particular bin. Lightest color indicates no data.

Additional analysis indicates that the main spillover findings of Table 5 are confirmed for various subsamples, alternative definitions of foreign influence, as well as differently-sized distance bands, see Table A.4. Furthermore, while the exact rendition of Figure 5 depends on certain particulars, alternative spillover specifications show that the main message of Figure 5 is robust.[24] This strong effect on relative interest rates of affected versus non-affected regions and the contribution of this is largely consistent with historical accounts that describe changes in the economy towards an emphasis on the coast and away from China's capital in the Northern hinterland (Pomeranz 1993).

We now turn to geographic spillovers on industrial development, see Table 6. These results are based on specifications similar to equation (3) above; one difference is that the prefecture-i analysis is combined with the first distance bracket because industrial development at this time took place in a relatively limited

[24]See Figure A.11 and Figure A.12 for specifications underlying Table 5, column (10) and Table A.4, column (11), respectively.

set of locations.

Table 6: Industrial Development Spillovers

	(1)	(2)	(3)	(6)	(7)	(8)
	Industrial Firms			Machinery Adoption		
# Treaty Port + Consulates [0, 150 km]	0.022*	0.027*	0.028*	0.021**	0.025**	0.025**
	(0.010)	(0.011)	(0.011)	(0.007)	(0.008)	(0.007)
# Treaty Ports + Consulates (150, 300 km]		0.033*	0.042*		0.023*	0.028*
		(0.014)	(0.014)		(0.011)	(0.012)
# Treaty Ports + Consulates (300, 450 km]			0.018			0.010
			(0.011)			(0.008)
R-squared	0.460	0.468	0.472	0.485	0.492	0.495

Notes: Dependent variable x given on top of column as ln(x+1); estimation of equation (2). All specifications include prefecture fixed effects, geo-trends, and year-province fixed effects. Robust standard errors clustered at prefecture level in parentheses. N = 24,727. **/*/+ indicates significance at the 1/5/10 percent level.

Notice that there are both similarities and differences compared to the interest rate spillover results of Table 5. A similarity is that the positive Western influence at the ports does not come at the expense of other regions, in the sense that none of the spillover variables has a significantly negative coefficient. This provides additional evidence that the West's intervention did not primarily reallocate resources between Chinese regions. A difference is that industrial development spillovers do not reach beyond 300 kilometers (see Tables 5 and 6). This suggests that the West's impact on the regions' capital markets may have been greater than on their industrial development, compared to regions not affected by the West's intervention. A map of the industrial development spillovers in China based on results in Table 6, column (2) is presented in Figure A.10.

5 Mechanisms

To understand the mechanisms through which the West affected financial markets and industrial development in China, we augment equation (3) with additional variables. At this point, the mechanism analysis is exploratory, not causal. Nonetheless, having demonstrated that the West's intervention in China produced sizable effects, it is useful to ask what are the most likely channels through which these effects took place. We look for non-zero correlations with the newly added variables, as well as the change in

the coefficients for the treaty port, customs stations, and consulate variables, in order to delineate these factors.

5.1 Foreign Market Access

A central Western motive for expanded presence was to increase trade with China, and foreign market access improvements may have been a mechanism for change in the Chinese economy. While we do not have sufficient information to fully separate foreign market access from other mechanisms, the following employs variation in foreign trade across CMC customs stations to provide some evidence. This information enables us to distinguish more from less important ports of foreign trade in China. If changes in foreign market access are a mechanism behind our results, one would expect that the impact of the West's intervention in China is larger in treaty ports that account for a higher share of foreign trade. Conversely, if the share of foreign trade that a port commands is uncorrelated with the strength of the West's effect, then foreign market access is unlikely of primary importance. Table 7 shows results for specifications that extend equation (1) to include an interaction variable $FOR_{it} \times TRADE_i$, where $TRADE_i$ is a measure of prefecture i's share of all foreign trade of China, either imports or exports; $TRADE_i = \{imports_i, exports_i\}$.[25]

Table 7: Western Influence and Market Access

	Industrial Firms				Machinery Adoption			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Customs Indicator	0.269**	0.206**	0.160*	0.154*	0.173**	0.118*	0.066+	0.048
	(0.083)	(0.069)	(0.064)	(0.067)	(0.060)	(0.049)	(0.038)	(0.039)
Customs x Imports		2.721**		−0.716		2.393**		−2.136**
		(0.195)		(1.201)		(0.173)		(0.497)
Customs x Exports			4.339**	5.232**			4.230**	6.894**
			(0.508)	(1.894)			(0.554)	(0.736)
R-squared	0.458	0.499	0.512	0.513	0.448	0.510	0.551	0.560

Notes: Dependent variable is given on top of column, in logs after adding one. Estimation of equation (1). Imports (Exports is the fraction of all of China's foreign imports (exports) at that port in 1882; N = 24,727; robust standard errors clustered at the prefecture level in parentheses. **/*/+ indicates significant at the 1/5/10% level.

The analysis of Table 7 yields several interesting results. First, there is strong evidence that the West's

[25]Trade shares are for the year 1882; results are similar if additional years of data are employed.

impact on China's industrial development was related to foreign market access in the sense that the interaction variables tend to enter with a positive coefficient (columns (2), (3), (6), and (7)). The impact on industrial development in China is larger, the higher is the share of foreign trade accounted for by a particular port. Second, there is evidence that foreign market access accounts for a sizable part of the overall effect. For example, including the interaction variable reduces the linear customs coefficient by almost one third for machinery adoption, see columns (5) and (6).

Third, we see that exports are more strongly associated with industrial development than imports. Even though interaction point estimates are positive for both imports and exports, the latter appear to be more important for industrial development based on coefficient size and explained variation. Indeed, when both export and import interactions are included simultaneously it is exports, not imports that are positively correlated with industrial development. An explanation is that a high foreign export share attests to the regional capability to produce and ship goods that are competitive on world markets.[26]

Overall, Table 7 provides evidence that the increase in foreign market access is one of the mechanisms through which the West impacted China's relative industrial development.

5.2 Capital Supply, FDI Spillovers, and Policy Response

Earlier results showed the West had an interest-rate lowering effect. The reduction in interest rates due to the West's intervention shown above, compared to other regions without, could be due to a number of reasons. One is that interest rates fall because the West provided additional capital. While systematic figures on domestic capital are not available, there is information on annual foreign direct investment (FDI) as well as the number of foreign banks, both of which should be positively correlated with foreign capital supply in a region. Table 8 shows that neither FDI nor foreign banks are negatively correlated with interest rates (see column (2)). In contrast, the coefficients of the Treaty Port & Consulate variables remain significantly negative.[27]

If the West's effect on capital markets had operated primarily through additional capital from Western countries, one would expect that including FDI and foreign bank variables would move the treaty port and

[26]For some years China's foreign trade statistics allow to distinguish locally produced from all foreign exports of a port, where the latter includes entrepot trade. Exploring this data, we find the strongest evidence for a foreign market access mechanism for locally produced foreign exports. This is consistent with the export capabilities hypothesis.

[27]The somewhat larger coefficients–in absolute value–on the Treaty Ports and Consulates variables in column (2) may reflect positive correlation with foreign banks.

consulate coefficients towards zero. Therefore, these findings in Table 8 suggest that the estimated interest-lowering effect is not primarily due to changes in capital supply relative to demand.[28] An alternative explanation for lower interest rates that does not rely on changes in capital supply and demand is that the West influenced the efficiency of capital markets, in particular risk, or more generally, the wedge between capital demand and supply. This is consistent with the historical record that the West provided security spillovers that lowered risk in capital markets, compared to regions without Western influence.

Next, we turn to the West's effect on relative industrial development in China (columns (3) to (10), Table 8). In the case of Chinese-owned industrial firms, it is natural to interpret the positive coefficient on FDI as evidence for technological learning (see column (4)). The probability of learning how to establish and operate an industrial firm is larger in the presence of a large number of foreign-owned industrial firms (so-called FDI spillovers).[29] That FDI spillovers are part of the mechanism of Western influence on China's industrial development is also supported by the finding that the treaty port and consulate coefficients in column (4) shrink towards zero, compared to column (3). The finding that the foreign bank variable enters with a positive sign may be due to foreign banks supplying additional information to industrialize, even if these banks do not significantly increase capital supply (column (2)). The adoption of industrial machinery is also positively correlated with the presence of foreign banks, see column (8).

Missionaries have played a role in parts of China during this time by improving schools and hospitals. However, missionary presence does not seem to be strongly correlated with the number of industrials firm and machinery adoption during the 19th century (see columns (5) and (9) of Table 8). Turning to the domestic Self-Strengthening Movement (SSM), there is a positive correlation between measures of self-strengthening projects and industrial development, see columns (6) and (10). At the same time, the inclusion of the SSM variable tends to shrink the Western influence coefficients towards zero, probably because SSM projects involved not only military but often also industrial technology. This suggests that another channel through which Western influence affected industrial development in China is the domestic policy response of the Self-Strengthening Movement.

[28] To the extent that domestic capital flows are governed by the same incentives as foreign capital flows, our finding that lower interest rates are not primarily due to an influx of foreign capital indicates that the relatively low interest rates in regions of Western influence are not due to domestic changes in capital supply relative to demand either.

[29] They can materialize for example through labor turnover, which is the movement of workers from foreign-owned to domestically-owned firms; see Keller (2021).

Table 8: Mechanisms of Western Influence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Interest Rate		Industrial Firms					Machinery Adoption		
# Treaty Ports + Consulates [0, 150 km]	−0.186**	−0.337**	0.027**	0.010	0.027*	0.015*	0.025**	0.009	0.024**	0.016**
	(0.044)	(0.0.63)	(0.009)	(0.013)	(0.007)	(0.007)	(0.008)	(0.009)	(0.008)	(0.004)
# Treaty Ports + Consulates (150, 300 km]	−0.196*	−0.261**	0.033*	0.023	0.033+	0.012	0.023*	0.013	0.022+	0.008
	(0.095)	(0.095)	(0.016)	(0.016)	(0.010)	(0.010)	(0.011)	(0.010)	(0.012)	(0.006)
FDI		−0.077		0.098*				0.039		
		(0.264)		(0.038)				(0.026)		
Foreign Banks		3.846**		0.284*				0.333**		
		(0.678)		(0.123)				(0.094)		
Missionaries					−0.021				0.024	
					(0.134)				(0.088)	
Self-Strengthening Projects						0.858**				0.617**
						(0.177)				(0.136)
Mass Violence	0.085+	0.081+								
	(0.047)	(0.047)								
N	64,620	64,620	24,727	24,727	24,727	24,727	24,727	24,727	24,727	24,727

Notes: Dependent variable x given on top of column, in columns (3) to (10) as ln(x+1); estimation of equations (2) in columns (1), (2), and (1) in columns (3) to (10). FDI is the number of foreign-owned firms; Foreign Banks is the number of headquarters and offices of foreign-owned banks; Missionaries is the fraction of counties in the prefecture with one or more Protestant missionaries; Self-Strengthening Projects is the number of self-strengthening projects in the prefecture. # Treaty Ports & Consulates is the sum of treaty ports and consulates in the prefecture. All specifications include prefecture fixed effects and geo-trends; columns (1) and (2) include year x weather x province fixed effects, while columns (3) to (10) include year-by-province fixed effects. Robust standard errors clustered at prefecture-grain (columns (1) and (2)) and prefecture level (columns (3) to (10)) in parentheses. **/*/+ indicates significance at the 1/5/10 percent level.

5.3 Explaining Geographic Dispersion

To shed more light on the mechanisms that are behind the geographic dispersion of the West's effect, compared to other regions, our approach extends equation (3) as follows:

$$r_{igt} = \beta_1 FOR_{it} + \sum_d \beta_{2l} \left[\sum_{j \neq i} 1_{ij}\{l = d\}\, FOR_{jt} \right] + \sum_d \beta_{3l} \left[\sum_{j \neq i} 1_{ij}\{l = d\}\, M_{jt}\, FOR_{jt} \right] + \Lambda + \varepsilon_{igt}, \quad (5)$$

where mechanism M_{jt} is a measure of prefecture j in year t, and $\Lambda \equiv \gamma' \bar{I} + \widetilde{\delta}_{p(it)t} + \theta_{ig} + \mu_t$. Equation (5) asks whether spillovers for a particular distance bracket d is related to a particular mechanism M_{jt}. Table 5 above shows that treaty ports and Western consulates had separate spillover influences on capital markets in China. Table 9 unpacks this result by sequentially examining treaty port and consulate mechanisms one at a time. In Panel A of Table 9, on the left, we begin with exports at the treaty ports as the mechanism. The null hypothesis is that the West's spillover influence in China is not related to a port's foreign exports share, that is, $\beta_{3l} = 0$ in equation (5) for any distance band l.[30]

In column (1) the constrained specification, with $\beta_{3l} = 0$, is shown. We estimate a treaty port coefficient of about -3 at the port itself, and coefficients of about -2, -1, and -0.6 for the distance bands (0, 150], (150, 300], and (300, 450], respectively (see Table 9). This pattern confirms earlier results on geographic dispersion. Including interaction variables with $exports_i$ for all three spillover distance bands yields the results of column (2). The treaty port-export interaction variables come in with negative coefficients. This provides evidence that the extent to which treaty ports lower interest rates, compared to unaffected regions, tends to be increasing in the share of China's foreign exports that each port commands.

[30] We focus on exports as the trade mechanism due to the findings in Table 7; here, $M_{jt} = M_j$ since shares of foreign exports are for a single year, 1882.

Table 9: Mechanisms of Geographic Dispersion

	(1)	(2)		(3)	(4)	(5)
					Max Legal Influence	Legal Origins
Panel A. Trade Mechanism			Panel B. Legal Mechanism			
Treaty Port Indicator	-2.983^{**}	-3.069^{**}	Consulate Indicator	-4.326^{**}	-4.448^{**}	-4.341^{**}
	(0.483)	(0.470)		(0.504)	(0.515)	(0.508)
Number of TPs (0, 150 km]	-1.997^{**}	-1.951^{**}	Number of Consulates (0, 150 km]	-2.324^{**}	-1.485^{**}	-1.811^{*}
	(0.281)	(0.287)		(0.296)	(0.317)	(0.877)
Number of TPs (0, 150 km] x Exports		-0.874	Number of Consulates (0, 150 km] x Extraterritoriality		-1.324^{**}	-0.546
		(2.726)			(0.372)	(0.926)
Number of TPs (150, 300 km]	-1.011^{**}	-0.878^{**}	Number of Consulates (150, 300 km]	-0.723^{**}	-0.551^{**}	-0.551
	(0.185)	(0.222)		(0.182)	(0.179)	(0.562)
Number of TPs (150, 300 km] x Exports		-1.358	Number of Consulates (150, 300 km] x Extraterritoriality		-0.245	-0.182
		(1.918)			(0.192)	(0.189)
Number of TPs (300, 450 km]	-0.619^{**}	-0.247				
	(0.155)	(0.207)				
Number of TPs (300, 450 km] x Exports		-5.255^{**}				
		(1.681)				
Mass Violence	0.089^{+}	0.088^{+}	Mass Violence	0.084^{+}	0.083^{+}	0.084^{+}
	(0.047)	(0.047)		(0.047)	(0.047)	(0.047)
R-squared	0.231	0.232	R-squared	0.232	0.233	0.232

Notes: Dependent variable is interest rate; estimation of equation (2). TP stands for treaty port. Exports is $exports_i$,the share of China's foreign exports in prefecture i in the year 1882. Max. Legal Footprint is an indicator variable based on maximal extraterritorial legal presence in a prefecture and year, see section A.4. Legal Origin is equal to one if prefecture i in year t has a British or US consulate, or both, and zero otherwise. Specifications include prefecture-grain fixed effects, year-province-weather fixed effects, and geo-trends; IPWRA applied. Robust standard errors clustered at the prefecture-grain level. **/*/+ indicates significance at the 1/5/10 percent level.

Furthermore, the treaty port-export interaction variable for the distance band (300, 450 km] has a significant coefficient of -5.2. Quantitatively, with Guangzhou accounting for 19% of China's foreign exports, this means that if prefecture i is located between 300 and 450 kilometers from Guangzhou, prefecture i has an interest rate about one percentage point lower than prefectures for which Guangzhou is not in their 300 to 450 kilometers distance band. For a region that is between 300 and 450 km from China's largest treaty port, Shanghai, a similar calculation yields an interest rate that is more than two percentage points lower than in other regions. At the same time, given that the linear treaty port spillover coefficient for the 300-450 km distance band is not significantly different from zero, we conclude that the trade mechanism at distances between 300 and 450 kilometers applies predominantly to larger treaty ports.

Turning to legal mechanisms that help to explain our geographic dispersion findings, the consulate specification yield a correlation coefficient of -4.3 for prefecture i itself, and coefficients of -2.3 and -0.7 for distances in the (0, 150 km] and (150, 300 km] bands, respectively (see Table 9, Panel B, column (3)).[31] We construct legal interaction variables as the product of having at least one consulate in a particular distance band multiplied with $MAXLEGAL_{it}$, defined as an indicator that prefecture i in year t is exposed to the maximum extraterritorial legal influence.[32] We find negative point estimates on interaction variables of up to 300 kilometers, and for the distance band (0, 150 km] it is significantly different from zero (column (4)). Quantitatively, a prefecture that is between 0 and 150 kilometers away from another prefecture with maximum extraterritorial influence has on average 2.81 percentage point (-1.49 + (-1.32)) lower interest rate compared to regions unaffected by the West's intervention, and of this almost half is due to being in the (0, 150 km] distance band of a region that is exposed to maximum extraterritorial influence (-1.32/-2.81 = 0.47). We conclude that particularly strong extraterritorial legal presence plays a role for the geographic dispersion of Western influence in China during the Treaty Port Era.

The final specification replaces the maximum extraterritorial influence variable with a legal origins indicator along the lines of La Porta, Lopez-de-Silanes, and Shleifer (2008) that focuses on Anglo-Saxon legal origins. Here, M_{it} is defined to equal to one if in prefecture i and year t there is either a British or an U.S. consulate, or there are consulates from both the USA and Britain. Results are shown in Table 9., column (5). In contrast to the maximum extraterritorial presence interactions, neither coefficients of the

[31] We limit this analysis to maximally 300 kilometers because legal spillovers based on consulate location do not go beyond 300 kilometers (Table 5).

[32] There are four dimensions in this extraterritorial variable–Appeals, No Limits to Jurisdiction, Prisons in China, and Presence of Assessors. See sections 2.2 and A.4.

legal origins interaction distance bands are significantly different from zero. Also, based on the countries' legal origin one would conclude that the scope of legal geographic dispersion is 150, not 300 kilometers (as shown in column (3) of 9, as well as in Table 5). Finally, compared to maximal extraterritorial presence, information on legal origins leads to somewhat weaker results in terms of empirical fit.[33]

Overall, these findings extend results on the difference between trade and legal channels for Chinese capital markets estimated earlier. While consulate and treaty port effects are broadly comparable in size, the West's influence through treaty ports is more geographically dispersed than through consulates (Table 5). Table 9 shows that exports are indeed particularly important for interest rate spillovers at a relatively large distance (300-450 km; column (2)), which also confirms our hypothesis that the treaty port variable captures primarily trade mechanisms. At the same time, we have seen that a large extraterritorial presence is particularly important for interest rate spillovers at relatively short distances of up to 150 km (column (4)).

6 Conclusions

Even if the West intervened in China's national self-determinism in ways that are not politically or morally justifiable today, it doesn't mean that Western semi-colonization could not have benefited China's economic development. This paper examines the economic consequences of China's defeat in the Opium War. While previous Western analysts of China argued that the impact of the Western presence in China was small and limited to treaty ports, we find large impacts that go well beyond the ports. These findings also weaken political perspectives that would claim the impact of the Opium War (1839-42) was that it only benefited Western nations and dealt great economic harm to China.

Comparing regions that were treaty ports to those that were not directly influenced by the West, we find the Western opening of Chinese borders had positive impacts. Although the Chinese government did lose sovereignty over who and what could pass through its borders, Western involvement increased the flow of international goods, foreign firms, and new technologies into China. We find regions with greater Western influence exhibited a higher rate of growth of modern firms, more exports, and greater investment into advanced machinery as well as steam engines. These results are robust to a variety of procedures that rule

[33]This may be due in part to British or U.S. consulates being present in most regions of foreign influence.

out the likelihood that Western nations simply picked the most promising regions. Our interpretation, based econometric analysis, is that the treaty port regions in China developed the way they did because they were selected for greater Western influence.

Western influence brought down local interest rates substantially, with evidence that much of this effect is due to enhanced security and lower risk. Importantly, we find the reduction in risk and increase in security reduced interest rates even beyond the cities designated as treaty ports, and created geographically broad spillovers. The impact was strongest in treaty ports and the immediate geographic vicinity of Western influence, where interest rates fell by more than 25 percent. The geographic scope of Western influence went far beyond as well—even at distances 450 kilometers away, the opening of a treaty port reduced interest rates by almost 10 percent. These estimates are for affected regions relative to unaffected, however, we do not find evidence for strong regional reallocation effects. Once the geographic spillovers of Western influence are considered, there is little doubt that the West's foray into China after the First Opium War influenced a large part of China.

In this paper, we also identified what we believe are the major mechanisms. Both legal influence centered on consular courts and trade influence through greater foreign market access played a role. Legal influence had a strong but more geographically limited impact, whereas trade influence reached further into Chinese areas away from the ports. While China had allowed trade intra-regionally for centuries, trade with Europe and the United States, which were the most advanced economies at the time, had been restricted. These constraints limited the flow of new ideas, new security arrangements in banking, FDI, and technologies—factors that increase positive economic development and yet were lacking in China at the time. Loosening these international trade barriers led to a shifting of the domestic Chinese economy less towards inland areas, and more towards coastal areas where the new good entered and exited. Furthermore, important though imports may have been, we find that Chinese exports to foreign destinations was even more strongly associated with Chinese industrial development than were imports.

While these factors contributed to why the impact on China was so large, it is worth noting in addition that although China had in many ways a flourishing economy well into the 18th century, by the early 19th century, as noted in section 2, its capital market development had fallen substantially behind that of the leading Western economies. The large impact of Western influence after the Opium War, which is here manifested partly in better capital markets as evidenced by lower interest rates, may have been so large

precisely because other aspects of the China's economy were functioning at a high level, even while capital markets were weak because the state up that that point was a balanced budget state that did not engage in borrowing and lending. While it is likely Great Britain had, at least in the initial decades, a leading role to play, an interesting question which we leave for future research is whether there were differential impacts made by the 19 countries that had established extraterritorial rights in China.

Another question for future research concerns the extent to which political reform is needed for economic reform. There is oftentimes skepticism on whether Western-style policy can be successfully grafted on the Chinese economy. The changes seen during its century of semi-colonialism suggests Western-type policies can create significant change, and that economic policies can work without an overhaul of the political system. The Qing Dynasty's emperor and hierarchy of imperial administration remained in place until 1911, after which China saw a period when competing regional strongmen vied for dominance. In 1921, the Chinese communist party was established, gaining momentum through the final decades of the Treaty Port Era, towards the 1949 founding of the People's Republic of China.

The changes after the Opium War would appear to foreshadow China's performance during the opening-up after the reforms initiated by Deng Xiaoping in 1978, which created more open borders, among other policy changes. During the modern reform era, China managed per-capita growth rates upwards of 5% per year for several decades. In the early 1980's fourteen coastal cities were designated as Economic and Technical Development Zones, where trade is prioritized, and foreign firms are given preferential treatment--all were former treaty ports or cities in the immediate vicinity of former treaty ports. Some of China's seemingly unorthodox institutional innovations during the 20th century, such export processing zones, appear considerably less novel in light of the country's history of the organization of foreign and domestic zones during the Treaty Port Era. Carrying the argument one step further, these connections suggest that China's modern trade history begins with the Opium War, pre-dating communist reforms by more than a century.

Perhaps the unusual concentration of trade and FDI in coastal regions of China today, around ten times the per-capita levels in central and western regions, are rooted in the Treaty Port Era. It is likely that Chinese entrepreneurs and the owners of firms and banks understood that there were benefits to foreign connections and investments. If Chinese political leaders were also aware of the benefits derived from Western investment in the Treaty Port Era, and if the modern-day Special Economic Zones were selected

because of their past successes as conduits of FDI, then it may not be far-fetched to consider that China's period of semi-colonization played a role in laying some of the policy directions that became conducive to China becoming one of the leading trading nations of the world today. If so, then the turning point of modern reform in China might not have been laid in 1978, but much earlier, in 1842. These are topics left to future research.

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For Online Publication

A Data

A.1 Regional Interest Rates, Storage Costs, and Grain Prices

In the storage cost approach, the interest rate in a given region and year is obtained from the gradient of the price movement over the harvest cycle. The gradient is informative because optimal storage requires that the price compensates for the storage costs of holding the commodity, of which the interest rate is a part. This method goes back to Kaldor (1939), Working (1949), and others, and has been employed for example by McCloskey and Nash (1984) to estimate medieval interest rates in England. The main advantage of the storage cost approach is that it can be applied whenever high-frequency data on stored commodities (including but not limited to grain) is available, and grain prices tend to be available before consistent and comparable interest rates are available.[34] The following gives an overview of the approach; see Keller, Shiue, and Wang (2020) for more discussion.

Consider a merchant in region i at time t who can buy Q_{it} units of grain from a farmer at price P_{it}. The merchant can store the grain for one period and sell it at time *t+1* at a price P_{it+1}. Instead of buying the grain, they can also invest the outlays of buying the grain ($P_{it}Q_{it}$) in a risk-free asset and receive $(1+\varrho_{it})$ times $P_{it}Q_{it}$ at time *t+1*, where ϱ_{it} is the rate of return on a risk-free asset. The merchant and the farmer would contract on an agreement that specifies the merchant's purchase price from the farmer P_{it} as well as the price at which the farmer buys back the grain from the merchant, F^j_{it+1}, where j denotes the particular transaction. The price F^j_{it+1} at which the merchant will store grain depends on the costs and benefits of grain storage.

We distinguish three types of costs. First, there is the opportunity cost of the risk-free rate, which is due to the fact that if the merchant does not buy grain from the farmer they have an income of no less than $(1+\varrho_{it})\,P_{it}Q_{it}$ at time t+1, whereas if the merchant stores the grain for one period, then no interest is earned. Second, when the merchant stores the grain the potential income is tied up in the granary and subject to risk. In particular, by storing grain the merchant faces the risk that the grain market between t

[34] In the case of China, various interest rate figures can be obtained from archival records, however, the rates are rarely comparable because conditions of each individual transaction vary but remain unspecified (Pomeranz 1993).

and *t+1* does not perform as expected. We denote the interest rate inclusive of risk factors by r_{it}^{j}, where $r_{it}^{j} \geq \varrho_{it}$. Third, grain does not store perfectly but is subject to spoilage (mold, mice, etc.). Per-unit storage costs are denoted by c_{it}. The benefit of storage is the value of the marginal unit of grain storage, which is often called convenience yield. We denote the convenience yield by b_{it}. Given b_{it}, c_{it}, and r_{it}^{j}, as well as the current price P_{it}, for the merchant to be indifferent between storing and the alternative investment, the price F_{it+1}^{j} in the contract between merchant and farmer would have to be

$$F_{it+1}^{j} = P_{it}\left(1 + r_{it}^{j} + c_{it}\right) - b_{it}, \tag{6}$$

or, the price has to be such that risk-inclusive interest and storage costs net of convenience yield are covered.

To apply this approach empirically, some assumptions are needed. First, we do not observe the risk specific to each transaction; consequently, the superscript j is dropped and we assume that price observations reflect the average level of risk, r_{it} (with $r_{it} \geq \varrho_{it}$). Second, since we do not observe the forward price F_{it+1}^{j}; we assume that it is equal to the spot price of grain in period *t+1*, that is $F_{it+1}^{j} = P_{it+1}$. Finally, we assume that the unobserved convenience yield b_{it} is equal to zero.

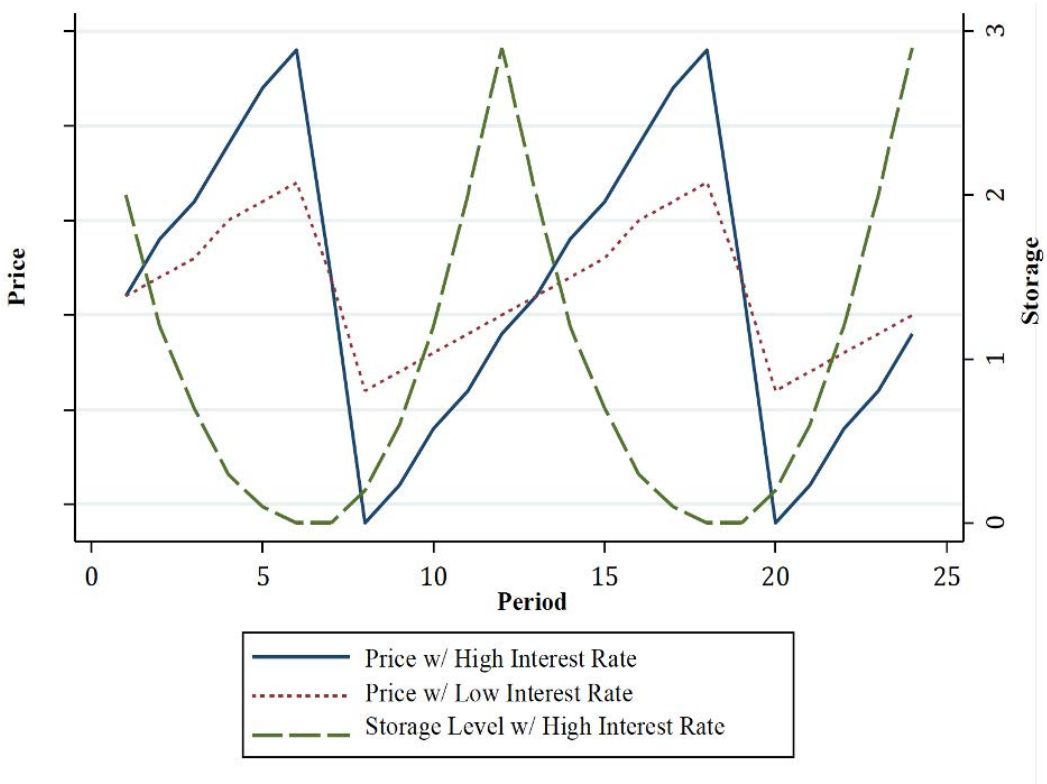
Under these circumstances, equation (6) can be rewritten as

$$\hat{p}_{it} \equiv \frac{P_{it+1} - P_{it}}{P_{it}} = r_{it} + c_{it}. \tag{7}$$

Equation (7) shows that in a storage equilibrium the rate of grain price change is equal to the risk-inclusive interest rate r_{it} plus storage costs, c_{it}. The term $\hat{p}_{it}$ in equation (7) is referred to as the carry cost of grain. We use historical weather records to address variation in physical storage costs, see below.

To illustrate the relationship between grain prices and interest rates we simulate a standard model of equilibrium commodity storage along the lines of Williams and Wright (1991). The equilibrium storage and pricing behavior of the model is shown in Figure A.1. Beginning with the first price series (solid line) we see that upon arrival of the new grain from the harvest, the price falls, reaching a minimum in period 8. This is the beginning of the new harvest year. The price then rises until the maximum in period 18, and the cycle repeats itself.

Figure A.1: Interest Rates and Grain Prices in a Storage Model



Notes: From Keller, Shiue, and Wang (2021).

Between period 8 and period 12, storage level and price rise together, while after period 12 the price increase is accompanied by declining storage. The last unit of stored grain is withdrawn just before the new harvest arrives. The new grain supply causes a fall in price; in this way, storage has the effect of dampening price fluctuations.

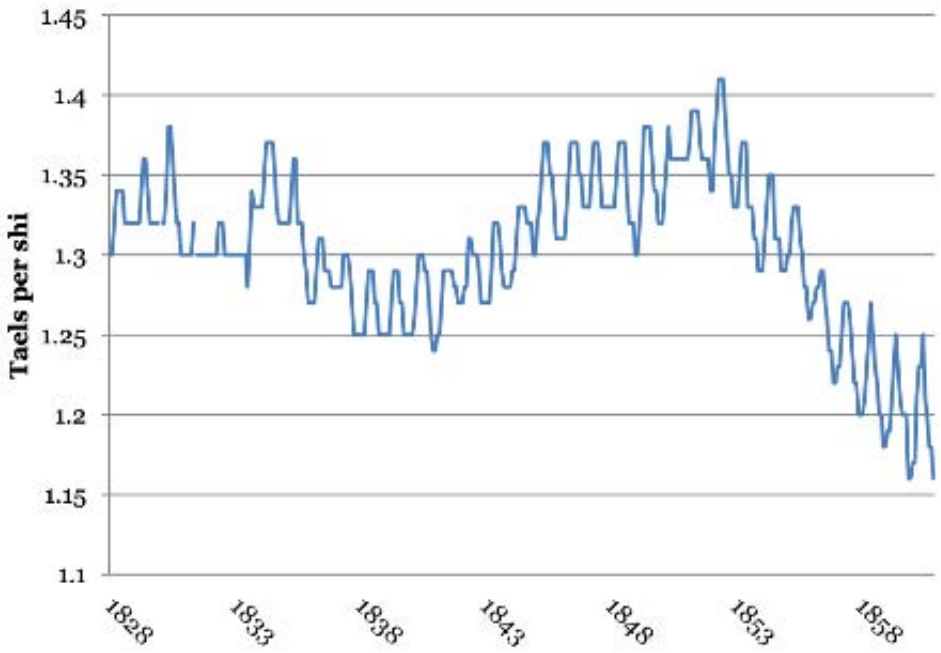
Figure A.1 shows a second price series, denoted with a dotted line. Notice that it has lower amplitude and is flatter than the first price series. This second price series is computed for a lower interest rate than the first series, with all else equal. The key result is that the steeper the increase of the price within the harvest year, the higher is the interest rate that agents face. This is the basis for our approach of computing interest rates from grain prices.

Of course grain prices are influenced also by factors other than interest rates and physical storage costs. To the extent that these factors are noise that introduces classical measurement error, this can be addressed by employing relatively large samples. In particular, we employ interest rates derived from all grains for which prices are available in each prefecture and year. Another concern is omitted factors. All our interest

rate regressions include prefecture, year, and province-year fixed effects that are allowed to vary by climate conditions (see below). These fixed effects amounts to taking differences in the respective dimension which reduces the influence of omitted factors.

While it is well-known anecdotally that Chinese farmers at this time engaged both in grain storage and in buying and selling grain forward, one might still be concerned that the level of development of grain markets, or limited rationality in 19th century China, might mean that the framework of optimal grain storage is inappropriate. Thus it is useful to examine actual grain price patterns for 19th century China. Figure A.2 shows three decades of monthly grain prices for the prefecture of Guilin. The price pattern is cyclical, not unlike those of the optimal storage model shown in Figure A.1 above. It is also apparent that the gradient of the price change over the seasonal cycle varies from year to year, consistent with the gradient providing information on the local interest rate.

Figure A.2: Cyclical Movements in the Price of Grain



Notes: Monthly rice price in Guilin prefecture, 1828 - 1860; from Keller, Shiue, and Wang (2021).

This suggests that the storage cost approach is useful for deriving local interest rates in 19th century China. Going one step further, the approach has recently been validated by showing that grain-price based interest rates using the storage cost approach yield similar results as bank interest rates (Keller, Shiue, and Wang 2020). For example, the correlation of bank interest rates and grain-price based interest

rates across regions in the 19th century United States is about 0.8. The storage cost approach has also allowed to compare capital market development across countries. In particular, it has been shown that in the late 18th and early 19th century, capital market development in Britain was substantially higher than in China, with important implications for explaining the so-called Great Divergence (Pomeranz 2001) that emerged between Britain and China in the 18th and 19th centuries (Keller, Shiue, and Wang 2021).

Grain Prices By the beginning of the 18th century, an extensive network of grain price reports had become a routine aspect of the Qing bureaucracy. The government did not set prices, but it did compile price reports. Prices originally were collected at markets serving the county towns, where the county represented the lowest level of government. Price reports at the county level were made every ten days to a month (Chuan and Kraus 1975), and sent to the next higher level of administration, the prefecture, where prefectural officials summarized the county reports. Because the county reports have for the most part been destroyed, today the prefectural prices are the most disaggregated data available. Prefectural price reports give the highest and lowest prices in each prefecture, at lunar-monthly intervals. The prices were recorded in copper cash per *sheng* and converted to silver *taels* (*kuping liang*) and bushels (*shi*). The price reports also record the cash-to-silver exchange rates used. Our source is the Chinese Academy of Social Sciences (2009), where the price series start in the year 1821.

Historical analysis and empirical studies both suggest that this data is generally of high quality. There are countless examples in the documentary evidence in which government officials refer to the grain prices to infer regional supply and demand, or compare price levels within and across provinces. These statements would have been illogical if people did not regard the prices to be reliable and comparable from region to region. Moreover, the price data was not only useful to Qing officials as an early warning system of areas of potential food crises, but another practical use of the price records was that the government was a major buyer of grain, and thus desired to know where prices were relatively low. Studies that have employed the Qing grain price data include Chuan and Kraus (1975), Wang (1992), Shiue (2002), and Shiue and Keller (2007).

This study employs monthly data for 14 different grain price series to compute the within-harvest year price gradient shown in Figure A.1. Our final interest rate sample covers 245 prefectures in 20 provinces of China during the period 1821 to 1899. The coverage and quality of the grain price data deteriorates

towards the end of the Qing dynasty (in 1911), which is in part why we choose 1899 as the final year of our sample. Regionally, the sample covers the major centers of residence and economic activity (Xinjiang province is missing). There is information on up to four types of grain in a prefecture, depending on what crops are indigenous for that region as well as data availability. Millet and sorghum are likely seen in the northern provinces, whereas rice is common in the central and southern provinces. Wheat is grown in many parts of China. Rice, when recorded, comes in 3 grades: high quality, standard, and low quality, and for one province (Zhejiang) our rice data is for early-ripening rice. We employ the series on the highest and the lowest price in a given prefecture-month for all available grain types. The sample of grain price records is unbalanced, and there is less coverage in some of the Northern areas of China; at the same time, our analysis of the available data gives no reason to believe that this systematically affects our results.

To compute the average price gradient for a given prefecture and year, we restrict the sample in a number of ways.[35] First, we drop months for which the one-month price change is typically negative-which may occur at harvest time–since these months do not aid in the estimation of the storage price gradient. Second, we focus on the central 98 percent interval of one-month price changes to reduce the impact of outliers. Taking the average of one-month price changes in a given year yields N = 64,620 carry costs which vary by prefecture, year, and the grain on which carry costs are based.

Using multiple observations for a given prefecture-year combination strengthens the analysis because the storage cost approach performs better as the sample size grows (Keller, Shiue, and Wang 2020). Instead of multiple interest rate observations for a given prefecture, alternatively we employ the mean of all available interest rates, in which case we have about 15,000 prefecture-year observations. This leads to similar results, see Table A.3, column (3).

Physical Storage Costs: Information on Weather We employ historical weather data to separate carry costs into the components of physical storage cost and risk-inclusive interest rates, see equation (7). Physical storage costs depend on weather because grain storage is sensitive to climatic conditions, and we exploit in particular that extreme weather is associated with higher storage costs for grain. Weather data come from State Meteorological Society (1981). Our source gives annual tables and maps of dryness and wetness in 120 regions, each region of which corresponds to one or two prefectures in the present

[35] See Keller, Shiue, and Wang (2020) for more discussion on implementing the storage cost approach.

administration of China. The degree of dryness and wetness in classified into 5 grades: grade 1 is very wet; grade 2 is wet; grade 3 is normal; grade 4 is dry; and grade 5 is very dry, normalized according to what is considered average for a particular region. For each of our prefectures and for each year, we take the weather, coded 1 to 5, of the nearest weather station of the 120 regions to be the weather of this prefecture in a given year. Table A.1 shows the mean carry costs by climatic condition:

Table A.1: Weather Conditions and Grain Storage Costs

	Carry Costs		
Weather Condition	N	Mean	Standard Deviation
Very Wet	6,630	7.856	11.677
Wet	17,538	7.187	10.582
Normal	23,753	7.227	10.877
Dry	12,976	7.450	10.629
Very Dry	3,723	9.368	12.319
All	64,620	7.449	10.934

Notes: Authors' calculations.

Table A.1 confirms the sensitivity of grain storage costs to extreme weather. While the means for moderate weather conditions are about 7.2 to 7.4 percent per year, for Very Wet weather the mean is closer to 8 percent and for Very Dry weather the mean is above 9 percent per year.

A.2 Information on China's Industrial Development, 1821-1899

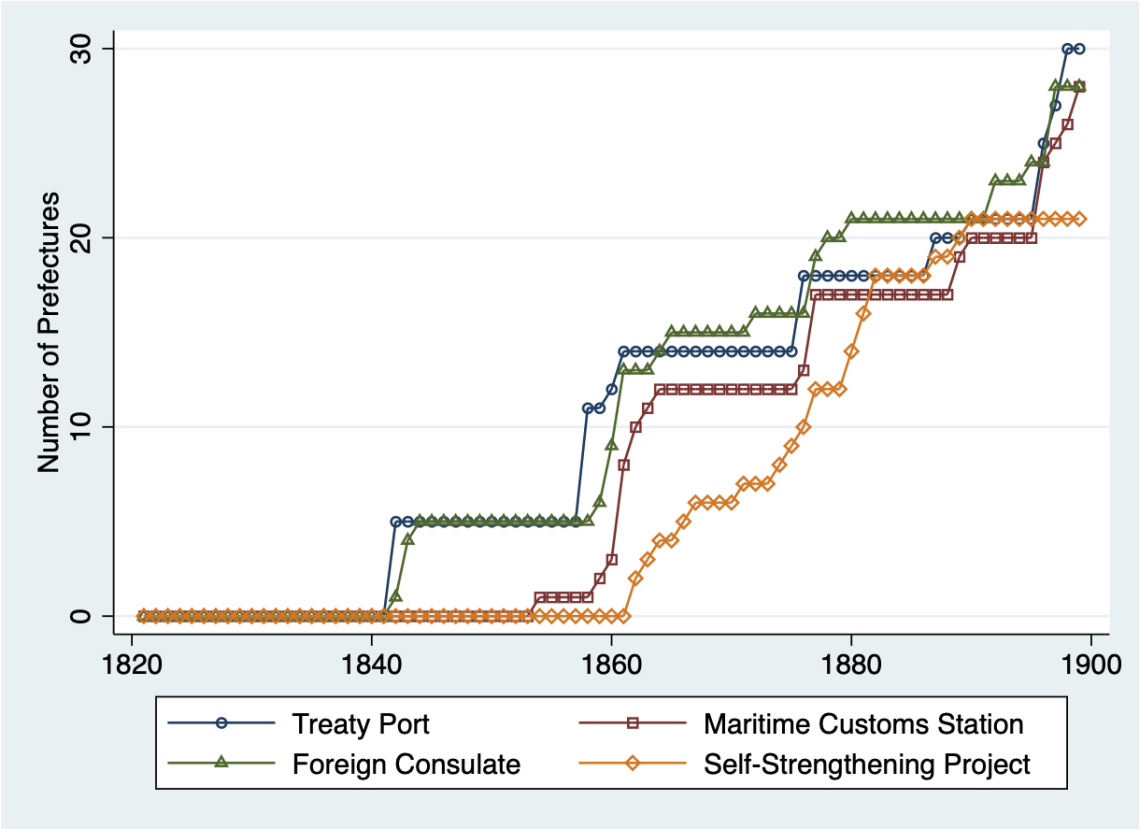
Our first variable is the number of firms in industrial sectors, which we define broadly. Many firms were in the silk-reeling sector (about one third), but also in sectors auxiliary to manufacturing, in particular energy production (oil drilling, mining), as well as in trade and shipping. Importantly, these all firms were Chinese-owned (on foreign-owned firms, see below). By the year 1899 there were 356 Chinese-owned industrial firms in China, with Songjiang prefecture (including Shanghai) accounting for 92, Guangzhou 71, and Hangzhou 15. Other prefectures with a sizable share of industrial firms are Dengzhou and Taibei. In addition to the number of these Chinese firms, we know their capital investment. Songjiang and Dengzhou firms account for more than 30% of capital investment each, but also Wuchang and Shunde prefectures account for more than 5%. The source of this information is Du (1991).

Further information on industrial development in 19th century China comes in form of the number of steam engines and the number of industrial machinery in a prefecture for a given year. During the sample period, firms in about 10% of the sample's prefectures had adopted industrial machinery, and about 5% of prefectures had steam engines. By the end of the 19th century, Songjiang prefecture had the largest number of steam engines, followed by Ningpo and Wuchang prefectures. Songjiang prefecture in particular, with the port of Shanghai, accounts for about one third of all steam engines and close to 40 percent of all industrial machinery during the sample period. Given the prominence of Songjiang we examine robustness by dropping this prefecture. Results are not sensitive to the inclusion or exclusion of Songjiang, see Table A.4. The source for information on steam engines and industrial machinery is Chang (1989, 1988a,b). Information on China's industrial development is available for up to 313 prefectures.

A.3 Measures of Foreign Influence

Figure A.3 summarizes the evolution of foreign influence in China based on the number of regions that were locations of (1) treaty ports, (2) CMC customs stations, or (3) foreign consulates. The timing of treaty port openings and the establishment of consulates is similar while customs stations are typically opened somewhat later.

Figure A.3: Evolution of Foreign Influence



Notes: Figure shows for different years the number of prefectures in which treaty ports, customs stations, foreign consulates, and self-strengthening projects were located. Authors' computations.

Our information on the timing of treaty port openings is based on CMC (1938). We abstract from Chinese ports that were opened unilaterally by China ("self-opened" ports) because given the underlying difference in origin their implications for China's economy might be different. Information on the opening of foreign consulates is based on Yunglong (1986). The year for customs station openings is the year in which they were announced by the CMC, even if it could take some time until the new station would be reporting annual trade in the CMC's *Returns to Trade*.

A.4 Extraterritoriality in China

This section summarizes key aspects of legal extraterritoriality in China.[36] Before 1842, the opportunities for friction between Chinese and Western traders were somewhat limited by the fact that this trade was tightly controlled and limited to one port (Canton), where only specially designated members of the

[36]For contemporaneous analysis during the Treaty Port Era, see Quigley (1926) and Commission on Extraterritoriality in China (1926); a more recent treatment is Cassel (2012).

Chinese Co-hong merchant guild could interact with the foreign traders. Almost immediately after the first additional ports of entry were opened in 1842, there arose the need for British and other foreign residents to have a way of resolving property disputes and conflicts of interest both with Chinese agents as well as amongst Western traders themselves. After having rejected the legitimacy of the Chinese system of law and justice, there was a vacuum of legal administration in the case of disputes between foreigners and between foreigners and Chinese. To achieve their goal that foreigners in China would be subject to the jurisdiction of their own country rather than to Chinese laws (extraterritoriality), Western countries thus had to introduce certain legal institutions from their countries in China.

Thus, already in the earliest of the treaties, the 1842 Treaty of Nanjing that concluded the First Opium War (1839-42), the provision for extraterritorial rights included the stipulation that allowed the British Consular Service in China to handle cases involving British residents in China, and within a few years of the opening of the first Treaty Ports, Britain established the position of a consul who represented the interests of the British citizen in China in judicial matters. A similar set of rights of extraterritoriality was made explicit in the American treaty of 1844 between the U.S. and China.[37] The treaty of 1844 with France, and the Treaty of 1847 with Norway and Sweden, substantially granted the same set of rights to these countries as well. By 1847, 19 nations had extraterritoriality provisions with China. They were, in chronological order or treaty establishment: Russia, Great Britain, the U.S. France, Sweden, Norway, the German Customs Union (later: Germany), Denmark, The Netherlands, Spain, Belgium, Italy, Austria-Hungary, Peru, Brazil, Portugal, Japan, Mexico, and Switzerland. The influence of legal institutions from foreign countries was centered on foreign consulates, since the first level of jurisdiction was a consular court where typically the consul himself served as judge.

The histories of foreign consular services in China reveal that there was a learning curve as Western nations tried to maneuver and establish new rules of engagement within China and with the nationals of other countries in China. Treaties marked the beginning of this process in which it was no longer the case that Westerners could consider themselves above the law. The Treaty of Nanjing of 1842 already marked a major change.[38] As a general rule, the laws that were applied in a case were those of the country of the

[37]Two key articles are Articles XXI and XXV: "Citizens of the United States who may commit any crime in China shall be subject to be tried and punished only by the Consul or other public functionary of the United States thereto authorized according to the laws of the United States" (Article XXI), and "All questions in regard to rights, whether of property or person, arising between citizens of the United States in China, shall be subject to the jurisdiction of and regulated by the authorities of their own Government" (Article XXV).

[38]The explicit mentioning of extraterritoriality and Western jurisdiction in treaties with China came sometimes later. For

defendant. Thus, the case of a British citizen accused of stealing from a Chinese national in Guangzhou would be brought before the British consular court. There were also so-called Mixed Courts, see below.

Several channels through which extraterritoriality might have affected China's regions' economic performance, relative to regions not affected, have been noted in the text. Another is that Western legal influence increased the incentives of Western traders to provide credit in China. Hao (1986) argues that interest rates were relatively low in the Treaty Ports because foreigners competed with each other to make loans to the Chinese. These loan offers were contingent on the security of capital. The British company Jardine extended loans to Chinese merchants secured with stock deeds and titled property—collateral that was easy to recognize, and extraterritorial rights in China made it possible to enforce contracts should default occur. Furthermore, the link between Western business practices and courts may have changed traditional ways of contracting, leading to efficiency gains through the reduction of risk premia. Case studies from Kirby (1995) and Chung (2010) give suggestive evidence of how this might have taken place.

Our analysis exploits information on consulates from more than a dozen individual foreign countries. Variation in extraterritorial legal influence in China emerged for several reasons. Table A.2 illustrates this based on the ports of Mengtze, Wuhu, and Shanghai. First, foreign legal influence arrived in some regions of China earlier than in others. For example, the first consulate in the area of Wuhu, located in central China on the Yangzi river, opened in 1877 whereas in Mengtze the first consulate opened only in 1892. Second, the number of foreign consulates varied considerably across regions. Table A.2 indicates that in the year 1892, the number of consulates in Shanghai was more than three times the number of consulates in Wuhu. It may be that extraterritorial foreign legal influence in China increases in the number of consulates, and our analysis accounts for this possibility.

example, example, US extraterritorial rights in China were explicitly granted only in the Sino-American Treaty of Tientsin of 1858, but this was only a formality. Even before Western courts were established in China, Western residents had rights of extraterritoriality from the beginning of the Treaty Port Era (starting in 1842) in which foreigners had the right to own property, trade and carry on manufacturing according to the laws of their own state rather than Chinese law.

Table A.2: Determinants of Extraterritorial Legal Influence in China

Area	Province	Year of First Opening	Country of First Opening	Number of Consulates in 1892	Foreign Countries of Origin
Mengtze	Yunnan	1892	France	1	France
Wuhu	Anhui	1877	Britain	5	Britain, Norway, Sweden, USA, Austria-Hungary
Shanghai	Jiangsu	1843	Britain	16	Austria-Hungary, Belgium, Brazil, Britain, Denmark, France, Germany, Italy, Japan, The Netherlands, Norway, Portugal, Russia, Spain, Sweden, USA

Notes: Authors' calculations.

Third, while some areas –such as Shanghai– eventually had consulates from most if not all foreign countries with active colonial policies during the 19th century, in other parts of China there were only consulates from particular foreign countries. For example, the single foreign consulate in the city of Mengtse (Yunnan province) was French. This is likely related to the fact that Mengtse was located in relatively close proximity to French colonial interests in Indo-China. Whatever the reason that consulates of foreign countries were not uniformly distributed across China, it matters for aggregate extraterritorial influence because foreign countries exerted different levels of extraterritorial legal influence in China. Our analysis seeks to quantify the extraterritorial legal influence in China across regions. We also account for the role of non-Western countries in China. Japan and Russia were the most important non-Western countries, and we present analysis when observations with consulates from these countries are dropped. Results are similar, see Tables 4, 5.

One possibility is that the consulates' legal influence varied according to the legal origins of their respective countries (La Porta, Lopez-Silanes, and Shleifer 2008). At the same time, extraterritorial legal practices in China depended not only on legal origins but also on factors specific to the case of China. For example, the scope of jurisdiction of a foreign country's court in China depended on whether that country operated a higher-ranking court in relative geographic proximity to China. Our analysis quantifies foreign legal influence in China along four dimensions, based on information given in the *Report of the Commission on Extraterritoriality in China*, Commission on Extraterritoriality in China (1926), as well as Quigley (1926)

and Willoughby (1926). The dimensions are (1) the consular court's scope of jurisdiction, (2) whether there was an effective right to appeal, (3) whether a foreign country operated prisons in China, and (4) whether foreign assessors were present at the trial when the foreigner is plaintiff. The following describes these dimensions.

A.4.1 Scope of Jurisdiction

The extraterritorial legal system that countries maintained in China differed depending on the kinds of cases would be considered. A first distinction is whether a foreign country's legal system would consider only civil cases or also criminal cases. A second question is whether there are limits–in terms of the monetary value at stake in civil cases or the length of the sentence in criminal cases–to the cases that would be tried by the foreign country in China. The highest value for this legal dimension is assigned to countries that do not impose any limits to trials. A country for which this was the case was Britain, which operated a Supreme Court of China. In contrast, the consular court of the Netherlands sent relatively serious cases to its court in Java. Based on this dimension, the British legal influence in China was larger than Dutch legal influence. Our empirical analysis distinguishes consulates of countries with limited jurisdiction from those that had no limits. The countries belonging to the latter group are Britain, Sweden, the USA, and Spain.

A.4.2 Right to Appeal

The second dimension is whether the decision of the consular court can be appealed in China. For foreign countries where this is the case, we assign a relatively high value to this variable, both because there is recourse to the legal matter and because it was possible to take this action in China. For example, while the decision of the Portuguese consular court in China could in principle be appealed, the appeal had to go to the high judicial court of Goa (Portuguese India), with further appeals going to the Supreme Court of Justice in Lisbon for a final decision. The need to travel to Goa (or even Lisbon) for an appeal reduces the feasibility of this legal instrument. Being able to resolve an appeal without having to leave China reduces the costs of appeal, and we postulate that countries allowing for appeal in China had a higher extraterritorial influence in China. Our empirical analysis distinguishes consulates from countries that placed considerable (*de jure* or *de facto*) limits on the right to appeal, and those that did not. The two

countries that placed virtually no limits on the right to appeal in China are Britain and the USA.

A.4.3 Prisons

The decision of a foreign country to operate prisons in China quantifies an aspect of legal enforcement. It may be important for a country's extraterritorial legal influence in China because it demonstrates the commitment to carry out the sentence that has been decided upon by the court. In order to enforce a prison sentence, there would have to be some sort of prison facility. Since foreign countries determined that the conditions of Chinese prisons were extremely poor and inadequate, foreign prisoners were either sent to foreign-operated prisons in China, or to prisons outside of China. Our empirical analysis distinguishes between countries that operated prisons in China at some point during the Treaty Port Era from those countries that did not. The four countries in the former group are Britain, France, Japan, and the USA. Consulates from these four countries are coded as having the highest extraterritorial influence in this dimension.

A.4.4 Foreign Assessors

When the foreigner is the plaintiff, generally, the Chinese court has jurisdiction. Foreign countries with extraterritorial rights in China treated such cases in different ways. One possibility was to place the foreign national exclusively under the jurisdiction of the Chinese court, a practice that was adopted by one set of countries. A second possibility was that the settlement would be the result of mediation or arbitration by a Chinese official and the foreign consul. Such a court would typically be referred to as a mixed court, and this practice was followed by another set of foreign countries. The extraterritorial legal influence of countries following the second option was larger than that of the countries who placed their nationals under the jurisdiction of the Chinese court.

A third way of treating cases in which the foreigner was the plaintiff was to have a legally trained foreign assessor on behalf of the plaintiff present the case at the trial. Part of the job of the foreign assessor was to examine and cross-examine witnesses, as well as to protest, if need be, against the court proceedings. Because the system in which assessors act on behalf of the interests of foreign plaintiffs differs most strongly from the Chinese legal system, it corresponds to the largest extraterritorial legal influence in this dimension. Our empirical analysis distinguishes court proceedings with foreign assessors from those

without. It was British and US policy to routinely send assessors to the court after the years 1876 and 1880, respectively. Before these dates, Britain and the United States followed the practice of mixed court proceedings. We therefore code British and US consulates as having the maximal extraterritorial influence in a prefecture after the years 1876 and 1880, respectively.

Our empirical analysis in the text employs a simple indicator variable for maximal extraterritorial legal influence, which is equal to one if in region i in year t there is a consulate from a country that has the largest extraterritorial influence in China in all four dimensions, (1) no limits on the jurisdiction, (2) the right to appeal, (3) operation of prison, and (4) presence of foreign assessors. We have explored other ways of quantifying the size of the extraterritorial legal influence in China, finding qualitatively similar results.

A.5 Additional Data

Foreign Market Access We evaluate the role of foreign market access for our results by employing information on the share of each region in China's foreign exports and imports in the year 1882. Shanghai accounts for the largest share of both exports and imports (45% and 69%, respectively). Another important port is Guangzhou, with a share of 19% of foreign exports and 6% of foreign imports.[39] An example of a relatively small port is Ningpo, which despite being among the earliest treaty ports (opened in 1842) accounts by the year 1882 for less than 0.1% of either China's foreign imports or exports. Results are robust to employing trade shares for other years during the Treaty Port Era, or the average across all years during 1842-1899. Information on trade shares comes from CMC (n.d.).

Self-Strengthening Movement We employ information on thirty-six self-strengthening projects that were part of the so-called Self-Strengthening Movement (SSM for short), a set of reforms initiated following China's military defeats in the Opium Wars. The projects were primarily in the areas of military technology and shipbuilding, but industrial and mining projects were also common. These projects were placed in 21 different prefectures. The largest number of self-strengthening projects existed in Wuchang, Guangzhou, Songjiang, and Lanzhou prefectures. Information on the projects of the Self-Strengthening movement comes from Qian and Tan (1995), as reported by Elleman and Paine (2019).[40]

[39] Guangzhou's import share may be comparatively low in part because of its geographic proximity to Hong Kong, a British colony since the end of the First Opium War.

[40] For one project in the year 1874 we only know the province, Yunnan, and code this to be located in the capital city. This does not qualitatively affect our results.

Figure A.3 shows the timing of the SSM. It is widely thought that the SSM sought to implement Western ideas (see Kuo and Liu 1978). As such, the existence of the SSM is initial evidence for the influence of Western ideas, and the evolution of SSM between 1862 and 1895 is consistent with the hypothesis that it was a reaction to Western influence.

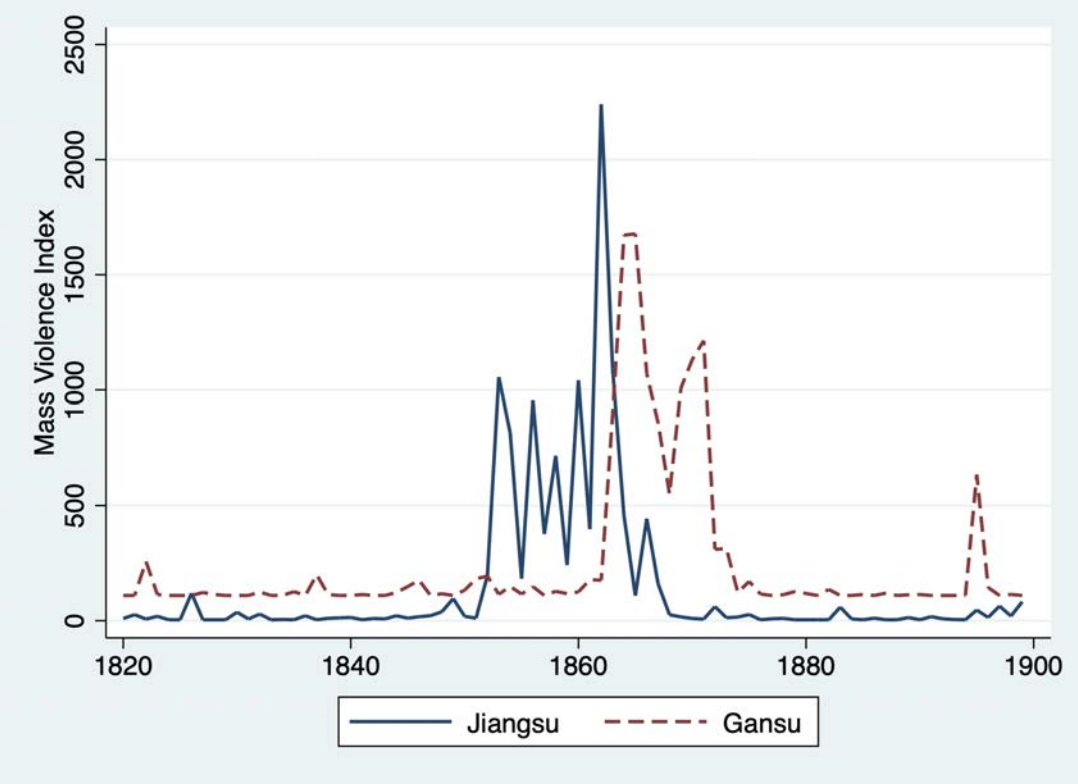
Protestant Missionaries Protestant missionary activity increased after the First Opium War in 1842, and by the end of the 19th century, Protestant missionaries were present in more than half of our sample prefectures. The measure of missionary activity in a particular year is the share of counties of a prefecture in which one or more Protestant missionary is present. Prefectures with the highest densities of Protestant missionaries are Xinghua and Quanzhou, located in Fujian province, followed by Shaoxing prefecture in Zhejiang and Yingkou in Liaoning. Guangzhou is ranked 11th and the Shanghai region is ranked 29th in terms of this variable. This information is based on Stauffer (1922).

Foreign Banks Our measure of foreign banks in China is a count of both headquarters as well as branch offices. By the end of the 19th century there were 49 such foreign banks, located in 15 different prefectures. Prefectures with the largest number of foreign banks in 1899 were Songjiang, Taiwan, and Tianjin prefectures, with 10, 7 and 6 foreign banks, respectively. Information on foreign banks comes from Jiang (2014).

Foreign Firms Foreign direct investment is measured by the number of foreign-owned firms. In the year 1872, there were 345 of these. Many of the early ones were related to foreign trade, followed by firms related to ship repair and other trade support services. Larger numbers of manufacturing firms emerged in the final quarter of the 19th century. By the year 1899 there were 925 foreign-owned firms in China, located in 17 different prefectures. The largest number of them was British, followed by firms from Germany, the United States, and France. By the end of the 19th century, more than half of all foreign firms were located in Songjiang prefecture (which includes Shanghai), followed by Tianjin, Guangzhou, and Fuzhou prefectures. In four percent of the cases, the number of foreign-owned firms before the year 1872 is estimated by linear extrapolation. Information on these foreign firms comes from CMC (1933).

Mass Violence Data on mass violence comes from the *Veritable Records of the Qing Emperors*. This is a standard reference for all memorials that the imperial court received regarding civil and military affairs—in short, news of all the events that crossed the emperor's desk. We employ information summarized by Chan (1983), who identifies 6,580 incidents over the period. Our variable is a composite measure based on riots of more than 5 participants, the extent of subsequent government action, as well as property damage; this measure varies by province and year.

Figure A.4: Mass Violence over the Sample Period



Notes: Authors' computations.

Figure A.4 shows that a large portion of the incidents of mass violence occurred around the middle of the century. This includes incidents of the Taiping Rebellion (1850-64) and the Nian Rebellion (1851-1868). There is evidence for regional variation in the timing of mass violence, in that incidents in Jiangsu tend to be in the 1850s and early 1860s while the bulk of mass violence in Gansu provinces takes place some years later. Furthermore, there is also a difference in mass violence levels in non-exceptional times: mass violence in Gansu tends to be higher than in Jiangsu. One reason for this might be that Jiangsu is in a core Han area of China whereas Gansu borders Mongol areas in the Northwest which might have had

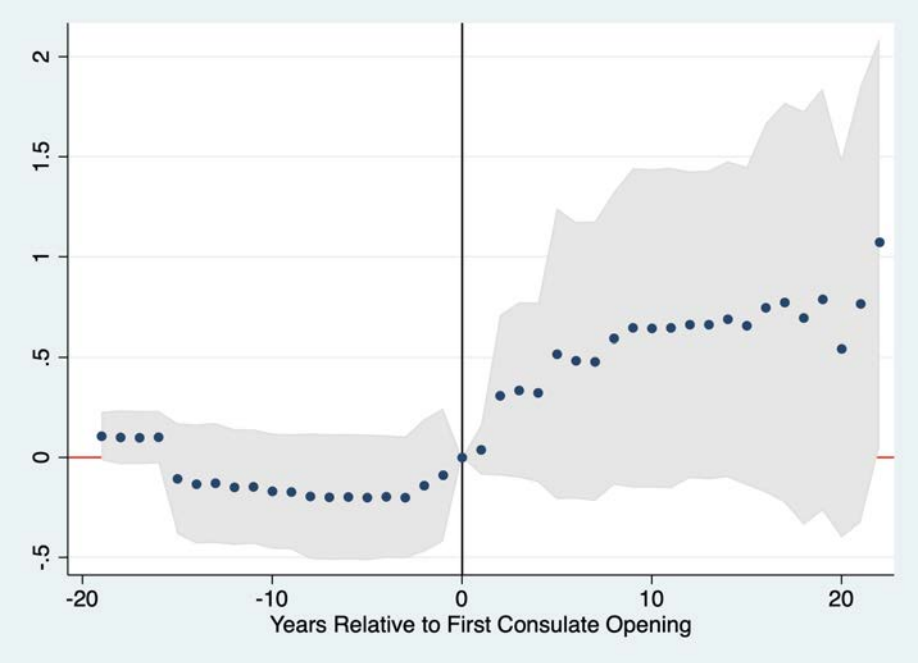
higher typical levels of riot and unrest.

B Additional Empirical Results

B.1 Pre-Trend Analysis

This section shows event study plots analogous to Figure 3 for additional left-hand side variables. We begin with capital investments, see Figure A.5.

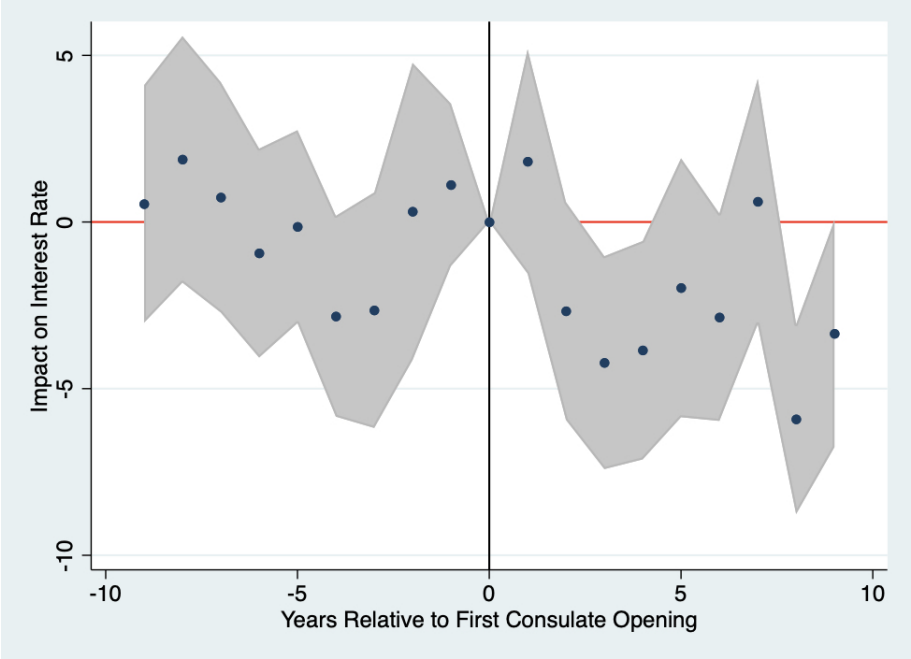
Figure A.5: Capital Investments: Event Study



Notes: Figure shows estimates of β_l in equation (4) for capital investment of Chinese industrial firms as Y_{it} and the year of first consulate opening in prefecture i as event E_i; N = 24,727; 95% confidence intervals shown.

As shown in Figure A.5, there is no evidence for significantly differential pre-trends in the case of capital investments. Next, we turn to a event study of interest rates, see Figure A.6.

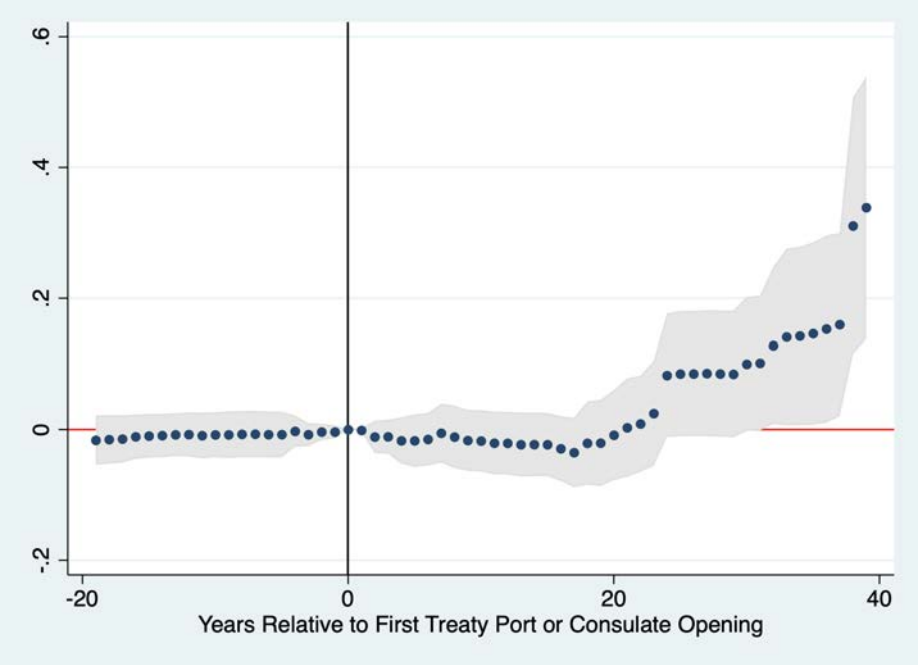
Figure A.6: Event Study for Regional Interest Rates



Notes: Figure shows estimates analogous to β_l (equation 4) for interest rates; event E_i is the year of first consulate opening in prefecture i; N = 64,420; 95% confidence intervals shown.

Figure A.6 shows no evidence that interest rates were significantly different in the years before the arrival of Western influence in a prefecture. The relatively large confidence intervals indicate that idiosyncratic factors affecting grain prices play a larger role than for our measures of industrial development.

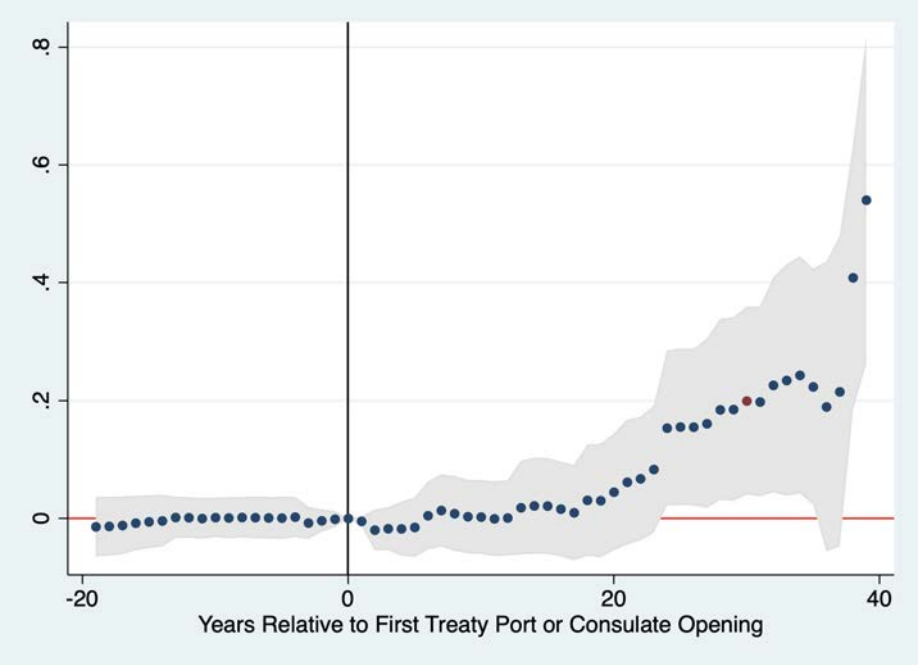
Figure A.7: Event Study for the Adoption of Steam Engines



Notes: Figure shows estimates of β_l in equation (4) for steam engine adoption of Chinese firms as Y_{it} and the year of first consulate or treaty port opening in prefecture i as event E_i; N = 24,727; 95% confidence intervals shown.

Finally, Figure A.8 shows event study results on the adoption of industrial machinery.

Figure A.8: Industrial Machinery Adoption: Event Study Results



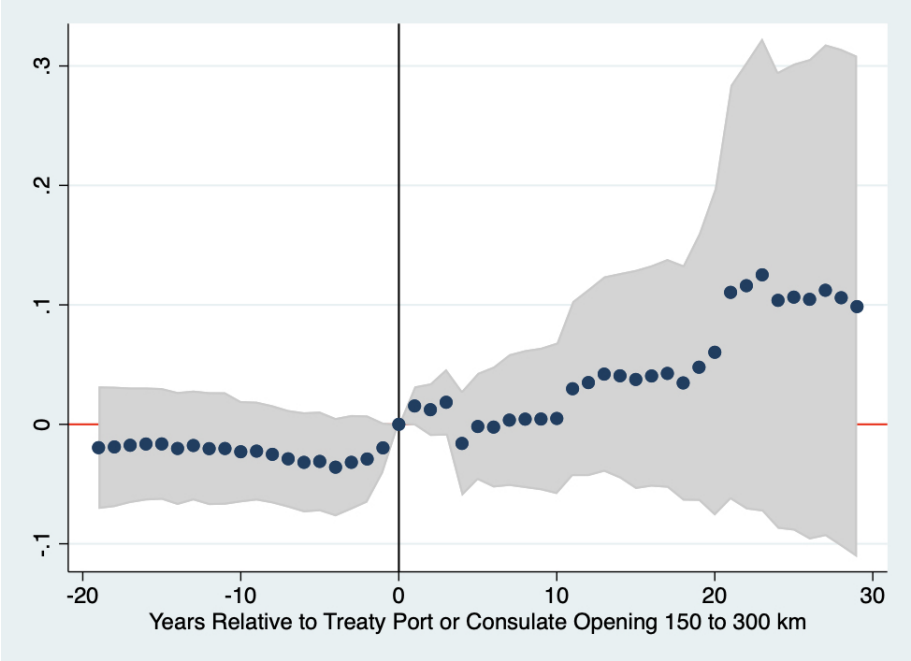
Notes: Figure shows estimates of β_l in equation (4) for machinery adoption of Chinese firms as Y_{it} and the year of first consulate or treaty port opening in prefecture i as event E_i; N = 24,727; 95% confidence intervals shown.

Notice that there is no evidence for significantly different pre-trends for either steam engine or industrial machinery adoption (Figures A.7 and A.8, respectively). Overall, these results of no different pre-trends parallel the findings in the text.

In the text we also employ spillover treatment variables, defined as a measure of treaty ports or consulates in a particular distance band around prefecture i. For example, Table (6), column (2) presents results on the relative impact of treaty ports and consulates at distances between 150 and 300 kilometers on the number of industrial firms. Analogous to the standard difference-in-differences estimation, identification of the coefficient of foreign influence in the (150, 300 km] distance band requires that in the absence of treatment, control and treated regions would have followed the same trend. In order to shed some light on how likely this is, Figure A.9 shows event-study results for the distance band between 150 and 300 kilometers in the case of industrial firms.[41]

[41]The event study approach requires us to employ a binary treatment variable; it is equal to one if any treaty port or consulate is present in the distance band, and zero otherwise.

Figure A.9: Industrial Firms and Treatment in Distance Band (150, 300 km]



Notes: Figure shows estimates of β_l in equation (4) for the number of industrial firms Y_{it} and the year of first consulate or treaty port opening in the distance band between 150 and 300 kilometers surrounding prefecture i as event E_i; controls for treaty port or consulate in prefecture i; N = 24,727; 95% confidence intervals shown.

Figure A.9 does not provide evidence for differential pre-trends of foreign influence at distances between 150 and 300 kilometers in the case of industrial firms.

B.2 Additional Results

B.2.1 Industrial Development

This section presents additional results on the West's impact on industrial development compared to other regions, extending the results of Table 4 in the text. Each cell of Table A.3 corresponds to a separate regression (equation (1)), with column (1) presenting findings from Table 4 for comparison.

Table A.3: The Effect on Industrial Development: Robustness

	(1)	(2)	(3)	(4)
		No Shanghai	Cluster Pref, Year	Spatial s.e.
Panel A: Number of Industrial Firms				
TP or Consulate Indicator	0.133**	0.124**	0.133*	0.274**
	(0.048)	(0.045)	(0.053)	(0.024)
Panel B: Capital Investment				
TP or Consulate Indicator	0.494+	0.473+	0.494+	0.866**
	(0.258)	(0.257)	(0.259)	(0.074)
Panel C: Steam Engines				
TP or Consulate Indicator	0.049*	0.044*	0.049*	0.117**
	(0.021)	(0.020)	(0.021)	(0.010)
Panel D: Industrial Machinery Adoption				
TP or Consulate Indicator	0.084*	0.076*	0.084*	0.210**
	(0.033)	(0.032)	(0.033)	(0.015)
IPWRA	Y	Y	Y	N
N	24,727	24,648	24,727	24,727

Notes: Estimation of equation (1). Each cell a separate regression, with dependent variable Number of Industrial Firms in Panel A, Capital Investment in Panel B, Number of Steam Engines in Panel C, and Pieces of Industrial Machinery in Panel D. Specification underlying column (2) drops Songjiang prefecture (including Shanghai) from the analysis. Robust standard errors in parentheses, clustered on prefecture in columns (1) and (2), on prefecture and year in column (3), and spatial-dependence consistent standard errors (Conley 1999) with distance cutoff at 450 kilometers in column (4). **/*/+ indicates significance at the 1/5/10 percent level. TP stands for treaty port.

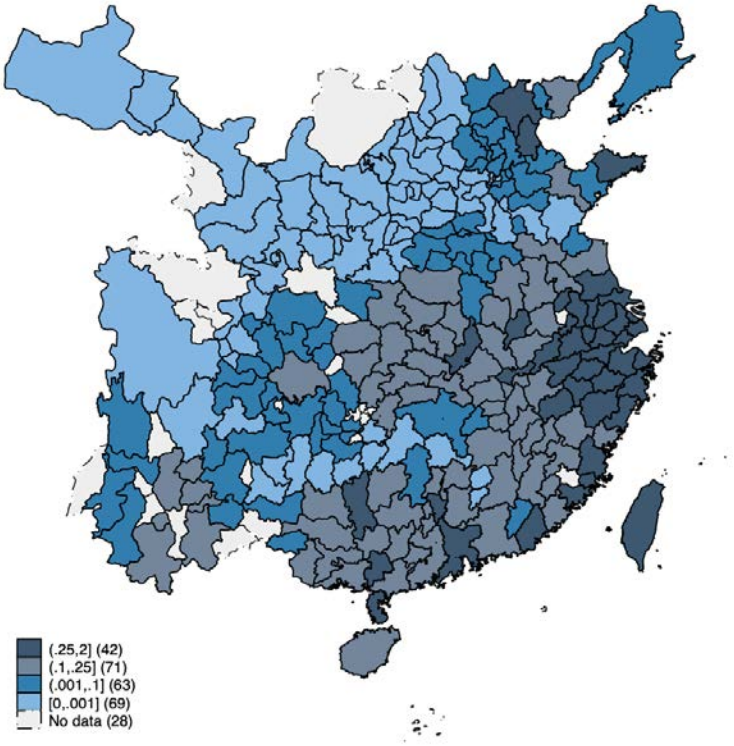
As noted above, Shanghai accounts for a substantial part of all industrial firms and technology in the sample, and it is useful to ask whether the findings are strongly affected by Shanghai. As Table A.3 indicates, point estimates are somewhat smaller without Shanghai, however, overall results are similar (column (2)). We are also interested in the role of spatial effects for statistical inferences. The baseline specification clusters on prefecture, which allows for serial correlation in the time series while maintaining the assumption of independence of observations in a given cross-section. We extend this by adding a second dimension of clustering at the level of the year, which allows for dependence of observations in the

cross-section. The effect of this is limited and does not affect inferences (column (3)). Another way of addressing possible spatial dependence is to employ standard errors consistent with spatial dependence as proposed by Conley (1999). We see that those standard errors leave inferences unchanged (Table A.3, column (4)).

B.2.2 Industrial Development Spillovers

Figure A.10 illustrates the dispersed effect on industrial development implied by our results; shown is the predicted relative impact on the number of industrial firms based on the specification in column (2) of Table 6.

Figure A.10: Geographic Dispersion of Industrial Development Spillovers



Notes: Figure gives predicted effects on the number of industrial firms, Table 6, column (2), for the latest possible year in each prefecture (typically the year 1899). First parentheses gives the range of the change in number of industrial firms, second parentheses reports the number of prefectures in each particular bin.

Figure A.10 confirms that the West's intervention triggered sizable industrial development spillovers in many parts of China. At the same time, the geographic dispersion of Western-induced industrial development was somewhat smaller compared to the dispersion of capital market effects. For example,

some coastal areas of China did not experience significant industrial development spillovers, in contrast to interest rate spillovers (compare Figures A.10 and 5, respectively).[42] This is in line with the larger scope of interest rate compared to industrial development spillovers, which is 450 versus 300 kilometers, respectively, see Tables 6 and 5.

B.2.3 The Effect on Interest Rates

Table A.4 shows further evidence on the West's effect on capital markets in Chinese regions. The first column shows the earlier results from Table 5, column (3) for comparison. Given Shanghai's importance during the Treaty Port Era, we begin with assessing the role of this region for our results. We see that dropping the Shanghai region from the sample does not strongly change the estimate (column (2)).

[42] For comparability we have restricted the sample to those regions in the interest rate sample.

Table A.4: Western Influence and Financial Markets: Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		No Shanghai	Aggregate	Cluster Pref	Cluster Pref-Grain, Year	Spatial s.e.		Inland	No Shanghai	Spatial s.e.	Alt. Distance Bands
TP or Consulate Indicator	-2.365^{**}	-2.392^{**}	-2.534^{**}	-2.365^{**}	-2.365^{**}	-1.440^{**}	-3.394^{**}	-3.019^{**}	-3.467^{**}	-2.369^{**}	-3.385^{**}
	(0.438)	(0.448)	(0.802)	(0.820)	(0.545)	(0.397)	(0.460)	(0.694)	(0.471)	(0.449)	(0.481)
# TP + Consulates (0, 150]							-1.170^{**}	-0.914^{**}	-1.213^{**}	-1.082^{**}	
							(0.155)	(0.227)	(0.157)	(0.170)	
# TP + Consulates (150, 300]							-0.487^{**}	-0.237^{+}	-0.491^{**}	-0.525^{**}	
							(0.101)	(0.143)	(0.102)	(0.113)	
# TP + Consulates (300, 450]							-0.276^{**}	-0.117	-0.278^{**}	-0.246^{**}	
							(0.076)	(0.093)	(0.077)	(0.083)	
# TP + Consulates (0, 100]											-1.683^{**}
											(0.257)
# TP + Consulates (100, 200]											-0.821^{**}
											(0.125)
# TP + Consulates (200, 300]											-0.335^{**}
											(0.112)
# TP + Consulates (300, 400]											-0.251^{*}
											(0.121)
# TP + Consulates (400, 500]											0.082
											(0.087)
Mass Violence	0.082^{+}	0.082^{+}	0.163^{*}	0.082	0.082	0.100	0.086^{+}	0.035	0.085^{+}	0.106	0.087^{+}
	(0.047)	(0.047)	(0.074)	(0.066)	(0.158)	(0.109)	(0.047)	(0.061)	(0.047)	(0.109)	(0.047)
IPWRA	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y
N	64,620	64,243	15,295	64,620	64,620	64,642	64,620	42.607	64,243	64,642	64,620

Notes: Dependent variable is interest rate; estimation of equations (2) in columns (1) to (6), and of equation (3) in columns (7) to (11). Distance bands in kilometer. Robust standard errors; clustered at prefecture-grain in parentheses, with the exceptions of columns (3) and (4) where clustering is at the prefecture level, column (5) which employs two-way clustering at the prefecture and year levels, and columns (6) and (10) which employ spatial-dependence consistent standard errors (Conley 1999) with a distance cutoff at 450 kilometers. **/*/+ indicates significance at the 1/5/10 percent level.

Next, we revisit our approach of employing all available interest rates, one for each grain price that is recorded. Alternatively, one can consider the mean interest rate for a given prefecture-year combination, which yields a lower number of observations (see column (3)). The prefecture and prefecture-grain level specifications lead to similar point estimates, indicating that results are not driven by utilizing multiple interest rates (coefficient of -2.46 and –2.34, see columns (3), (1)).

For inference in the interest rate regressions we have so far relied on clustering at the level of the cross-sectional unit, which is the prefecture-by-grain level in column (1). An argument for prefecture-level clustering is that assignment–whether a region has Western influence or not–is determined at the prefecture, not at the prefecture-grain level. However, an advantage of prefecture-grain clustering is that we do not need to assume that interest rates based on different grains are a random sample. This could be restrictive, for example, if the West's intervention affects local risk levels differently depending on the type of grain. To examine this question empirically, Table A.4 reports results for clustering at the prefecture level in column (4). While clustering at the prefecture level raises the standard errors, it does not qualitatively affect our inferences.

Clustering at the prefecture-grain level addresses possible correlation of cross-sectional units in the time series. Another concern is that observations in the same time period might not independent, perhaps due to geographically large shock such as the Taiping Rebellion that affected many parts of China. To allow for possible correlation in time series and cross-sectional dimension, we employ two-way clustering both at the prefecture-grain and year levels. This yields a modest increase in the standard errors that does not affect inferences (compare columns (5) and column (1), respectively).

An alternative approach is to allow for cross-sectional dependence as a function of geographic distance. We compute standard errors using Conley's (1999) method, which allows for arbitrary dependence of observations below some distance threshold.[43] As column (6) shows, employing spatial-dependence robust standard errors does not change our result that the West's treaty ports and consulates have lowered interest rates relative to regions without Western influence.

The remaining specifications of Table A.4 examine geographic spillovers, with column (7) presenting earlier results for comparison (from Table 5, column (10)). We first consider the geographic scope of the West's

[43] In our setting, a natural threshold is 450 kilometers, since that is the maximum spatial scope of spillovers estimated above (Table 5). We have experimented with larger and smaller distances, finding standard errors that are similar in size.

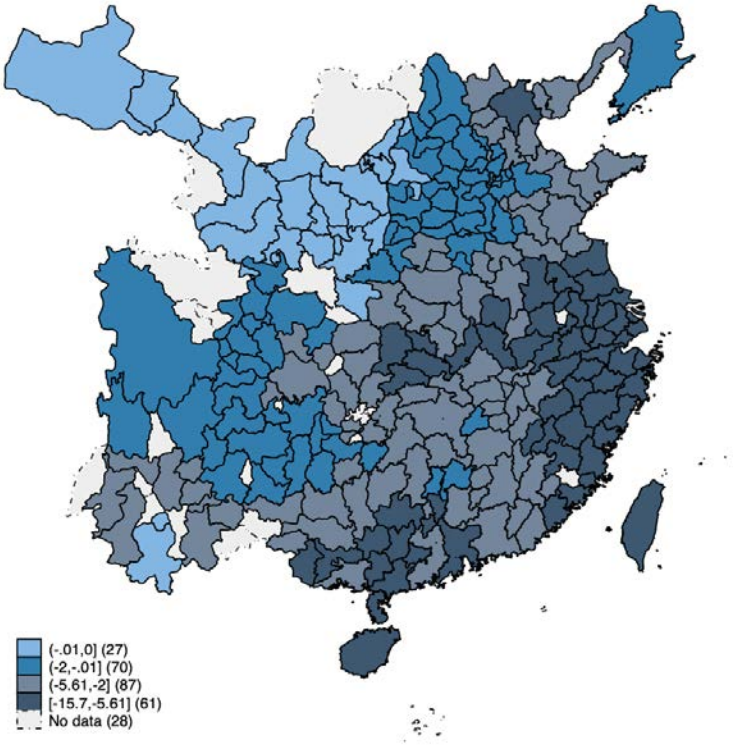
intervention among inland prefectures, defined as the complement set of the coastal prefectures shown in Figure 4, right panel. Also among inland prefectures, point estimates tend to be negative. Further, there is geographic decay with distance, although it is more rapid than for the entire sample, so that the coefficient for distances between 300 and 450 kilometers is not significant (see column (8), versus Table A.4, column (7) and Table 5, column (11), respectively). The larger geographic dispersion among coastal prefectures might be due to lower-cost transport options, in particular coastal shipping.

The next specification drops the region of Shanghai from the sample. It confirms that Shanghai does not have an unduly large influence on the results (column (9)). Spillover results with spatial-dependence consistent standard errors are shown in column (10); inferences do not change. These results also show that the prefecture-i effect is larger (in absolute value) than without geographic spillover terms (compare columns (10) and (6), respectively). This confirms that the effect of the West's interventions is underestimated without the spillover terms.

The final specification of Table A.4 adopts an alternative definition of distance bands, based on 100 kilometers instead of 150 kilometer brackets (see column (11)). Results turn out to be similar (compare with column (7)). First, the prefecture-i coefficient is now -3.51, compared to -3.48 before. Second, point estimates in the geographic vicinity of Western influence, between 0 and 200 kilometers, are negative, not a mix of negative and positive, which is consistent with the the hypothesis that reallocation plays a limited role. Third, coefficients for successive bands are declining in distance, as before. Finally, consistent with a geographic scope of the West's intervention of 450 kilometers, we estimate an interest-rate lowering effect for 400 but not for 500 kilometers (see column (11)).

Overall, the results of Table A.4 are in line with the interest rate results we have obtained earlier. In addition, as alternatives to the map with predicted interest rate effects above (Figure 5), we present two other maps in Figures A.11 and A.12. The first of these shows results for the specification underlying column (10) in Table 5. Results are broadly to those presented in the text. In particular, 89% of our sample prefectures are affected by the West's intervention, and 60% of the prefectures are estimated to experience lower interest rates of two percentage points or more, relative to areas without Western influence. Furthermore, the geography of the interest rate effects is similar to that in Figure 5 as well.

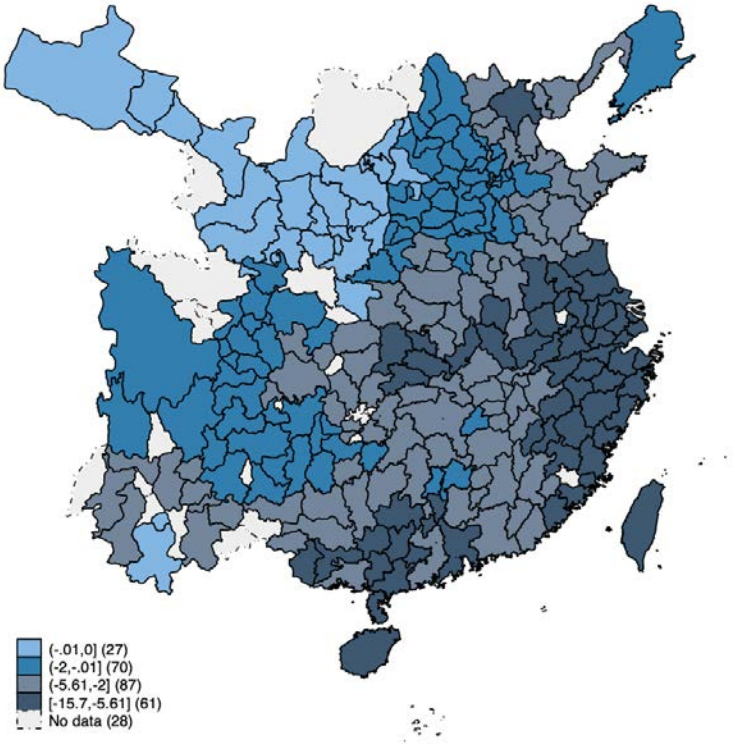
Figure A.11: Western Influence with Combined 150 Kilometer Bands



Notes: Figure gives predicted effects of the analysis of equation (3), Table 5, column (10) for the latest possible year in each prefecture (, typically in the 1890s). First parentheses gives the range of the interest rate reduction (in percentage points), second parentheses reports the number of prefectures in the particular bin.

In Figure A.12 we show the predicted effects employing 100 kilometer bands, see Table A.4, column (11).

Figure A.12: Western Influence with 100 Kilometer Bands



Notes: Figure gives predicted effects of the analysis of equation (3), Table A.4, column (11) for the latest possible year in each prefecture (typically in the 1890s). First parentheses gives the range of the interest rate reduction (in percentage points), second parentheses reports the number of prefectures in the particular bin.

Now, 83% of the sample prefectures are significantly affected, and the share of prefectures in which the West's intervention is estimated to have lowered interest rates by two percentage points or more, compared to other regions, is 47 percent. This analysis indicates that once we account for geographic dispersion, the analysis invariably indicates that Western influence in China during the Treaty Port Era went well beyond the immediate treaty port areas.