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The Economic Consequences of the Opium War

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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 document a turnaround during the 19th century in the nature of China's capital markets. Whereas before the Opium War, coastal cities were of relatively minor importance, the treaty port system of the West transformed China into an economy focused on coastal areas and on international trade that aligned with the trading interests of the West. We show, first, that the West had a positive impact on China's economy during the 19th century. It brought down local interest rates, and regions under Western influence exhibited both higher rates of industry growth and technology adoption. Second, the geographic scope of influence went far beyond the ports, impacting most of China. Interest rates fell by more than a quarter in the immediate vicinity of the ports and still by almost ten percent at distances of 450 kilometers from treaty ports. The development of China was not simply propelled by its own pre-1800 history, or by post-1978 reforms. The nearly 100 years of semi-colonization have shaped China's economy today as one focused on the coastal areas.

JEL Classification: N/A

Keywords: Treaty ports, extraterritoriality, Capital Markets, Legal origins

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October 2021

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1 Introduction

"[Eighty years after the Opium War,] China managed a great historical transformation from the most miserable circumstances to a situation that promises a bright future." Jiang Zemin (2001)

For nearly one hundred years, from 1842 until 1943, China was semi-colonized by Western countries. The Treaty of Nanjing in 1842 forced 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 from these claimed areas that Western countries abolished Chinese practices in trade and re-organized them under their management. Moreover, Western style courts and legal practices were introduced in China. The impact of the treaty port era has been deeply controversial. Since the late 1990s, the Opium War has been increasingly presented as part of a narrative of the pitfalls of Western capitalism in China, which had led to 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. At the same time, many 19th century treaty port areas are among the most advanced regions of China today.[1] This paper revisits the question of the Western impact and the economic consequences of the Opium War. A better understanding of this period is important, not least because of the need 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 estimation framework to assess the impact of Western influence on the Chinese economy 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, we are able to obtain comprehensive interest rate data through an asset pricing approach. We postulate that the trade policy and the legal interventions not only increased trade, but they reduced risk in the treaty ports and surrounding locations. This is reflected in reduced interest rates, and we perform a geographic spillover analysis to study how far-reaching the effect was.

Setting the stage, our paper documents that Western imperialism was accompanied by a deep change in

[1] Today's R&D projects, e.g., are in the same regions as were industrial firms in the 19th century (correlation of 0.85, see Appendix section C). The quote from Jiang Zemin above refers to the year 1921, when the Chinese Communist Party was founded. A longer excerpt of Jiang Zemin's speech can be found in section C. Kaufman (2011) explores the role of this dominant narrative in China today.

the structure of China's capital markets. Whereas before the Opium War northern inland areas were of key importance, the arrival of Western traders shifted the focus to China's coast, especially in the south. We show that Western influence caused an improvement in local capital markets, bringing down interest rates, and it also increased the pace of industrialization in China.

If the Western impact was small, any reduction in the interest rate would have been confined to the treaty ports. The larger the impact, the greater would be the reduction in interest rates, and the further this reduction would be felt, permeating not only the areas near the treaty ports, but also the surrounding geographic areas. We find that interest rates fell by more than a quarter in the immediate vicinity of the ports and by almost ten percent even at distances of up to 450 kilometers from treaty ports. Western influence reached far beyond the ports to impact the majority of China. One important channel was technological learning, industrial and organizational; another channel consisted of legal and security spillovers that manifested themselves in lower risk and interest rates. We discuss these forces of change and show evidence that the so-called Self-Strengthening Movement (1861-1894) internalized benefits from Western influence, in particular in terms of military and industrial technology.

The results on the lowering of interest rates in areas of Western influence 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 picked, and that regions that were directly exposed to Western influence had already distinct development paths before that exposure. We also employ recent difference-in-differences methods to address concerns that the staggered way in which Western influence in China grew during the 19th century might affect our results. Finally, the findings are robust to accounting for important historical factors such as mass violence (including the Taiping Rebellion) which might also have led to regional differences in the sample period.

As far as we know, this is the first paper to provide quantitative evidence on how the so-called century of humiliation had large and consequential positive impacts on China's economy as early as the 19th century. This revises earlier work from economic historians of China (see Murphey 1974, Dernberger 1975, Fairbank 1978, and Feuerwerker 1983). This debate 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 development path. We demonstrate that far from being impervious to change, there was a significant impact of the West on China through capital markets and investment, and that the changes were felt throughout China.

We are not arguing that Western influence is all what matters to China's current day economic performance. The impacts are geographically pervasive enough, however, that it is not far fetched to hypothesize that the turning point that seeded the conditions conducive to modern growth–and which initiated the trajectory we observe today, where China is one of the leading trading nation of the world–originated with the Opium War. Offering the year 1842 as the turning point that explains the Chinese economy we see today pre-dates 1921 (foundation of the Communist Party of China), 1949 (foundation of People's Republic of China), and 1978 (beginning of market reforms). Of course, the development path of the Chinese economy was neither uninterrupted nor steep after the Opium War, but the evidence suggests the origins can be located in 1842.[2]

Some readers might be skeptical of the idea that 1842 was the turning point to a better China. And yet, evidence pointing in this direction does already exist. For example, it is well-known that some ports were "self-opened" by China, which presumably would not have occurred had there not been benefits in the ports that were forced to open. 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 China (Bai and Kung 2015). Former treaty port regions 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 could serve as collateral (Horowitz 2006). And the Chinese government 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 the practice by which foreigners in China would be tried according to their home countries' laws, known as extraterritoriality (Commission on Extraterritoriality in China 1926). What has been missing is a quantitative assessment of Western colonization showing significant gains early on across much of China, and our paper fills this gap.

By studying Western colonialism in China, this paper provides new evidence of how colonialist trade inter-

[2]The notion that initial seeding events take long to take root is perhaps seen most prominently in the British Industrial Revolution (c. 1770) when it took also decades until the new paradigm showed up in per-capita income growth figures.

ests affected globalization in the past (Findlay and O'Rourke 2007, O'Rourke 2019) and also contributes to research on the cause of the West's divergence from Asia (Broadberry 2021, Broadberry and Gupta 2006). We know that Western colonialism had a substantial effect on the structure of China's economy; for example, part of Shandong province was turned from core to peripheral importance 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 possible positive implications of Western influence across China. That one of the consequences of Western colonialism in China was a shift in primacy from northern-inland to southern-coastal regions, which we show using interest rate data, is consistent with what we know about changes in the regional standards of living from the 18th to the 20th century based on wage data (Allen et al. 2011). Finally, 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 an overview of the historical setting and lays out what some of the main channels of Western influence in China might have been. Section 3 describes our estimation approach and performs a number of identification checks. The section also reviews major patterns of interest rates during the sample period, and how they have changed during the treaty port era. Our main estimation results are presented in section 4. We begin with the impact of Western influence on Chinese capital markets in the immediate vicinity of treaty ports, followed by its effect on several indicators of industrialization. Next, we provide more information on channels by studying Western influence in the context of China's Self-Strengthening Movement, and section 4 concludes with an analysis of the scope of Western influence beyond the immediate vicinity of the ports by allowing for geographic spillovers. Section 5 summarizes our results and provides a number of concluding thoughts. Supplemental material on the construction and characteristics of data is presented in the Appendix.

2 Historical Background and Channels of Western Influence[3]

In the decades before the First Opium War (1839-42), 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,

[3]See Keller and Shiue (2022) for additional information.

at Guangzhou (Canton). Given the far greater trade interests of Britain, British traders gained increased access to China after provoking a war over the destruction of British opium, which had been brought to China without the consent of the Qing Emperor.[4] After China's defeat in the First Opium War, the Treaty of Nanjing (1842) liberalized trade and opened four additional ports (Xiamen (Amoy), Fuzhou, Ningbo, and Shanghai). Later, treaties signed over the 19th century specified the open dates for numerous additional ports, which came to be known as treaty ports because they were opened by treaty.

The immediate purpose of the treaties, in addition, was to allow British, and more broadly international 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 trade, as well as more specifically the foreign-run customs house, while legal jurisdiction was centered on consulates, where extraterritorial dispute resolution was administered through consular courts. Both had implications also for improving the fiscal situation in Qing China. Over time, trade and legal dimensions evolved to become more distinct, in particular with the foundation of the Western-led Chinese Maritime Customs (CMC) Service in 1854 that took over the assessment and collection of customs duties.

Trade Policy–The immediate implication of the treaty port designation was that Western countries could legally trade at the port. Initially it meant trade contacts between Westerners and Chinese, and over time also the right to establish firms. 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 people and their families established organizations such as foreign municipalities, clubs, and schools.

Customs System–After the foundation in 1854 the first CMC customs house was opened in 1859 in Shanghai, under British direction. The CMC's task was to assess tariffs and record the quantity and value of shipped goods of both foreign and domestic origin. The organization transferred the tariff revenue to the Qing court after deducting its own costs for tariff collection, improving the fiscal stance of Qing China. The CMC supervised the locations where foreign trade actually took place, and where Western trade interests were concentrated. Only the more important treaty ports had CMC customs stations.

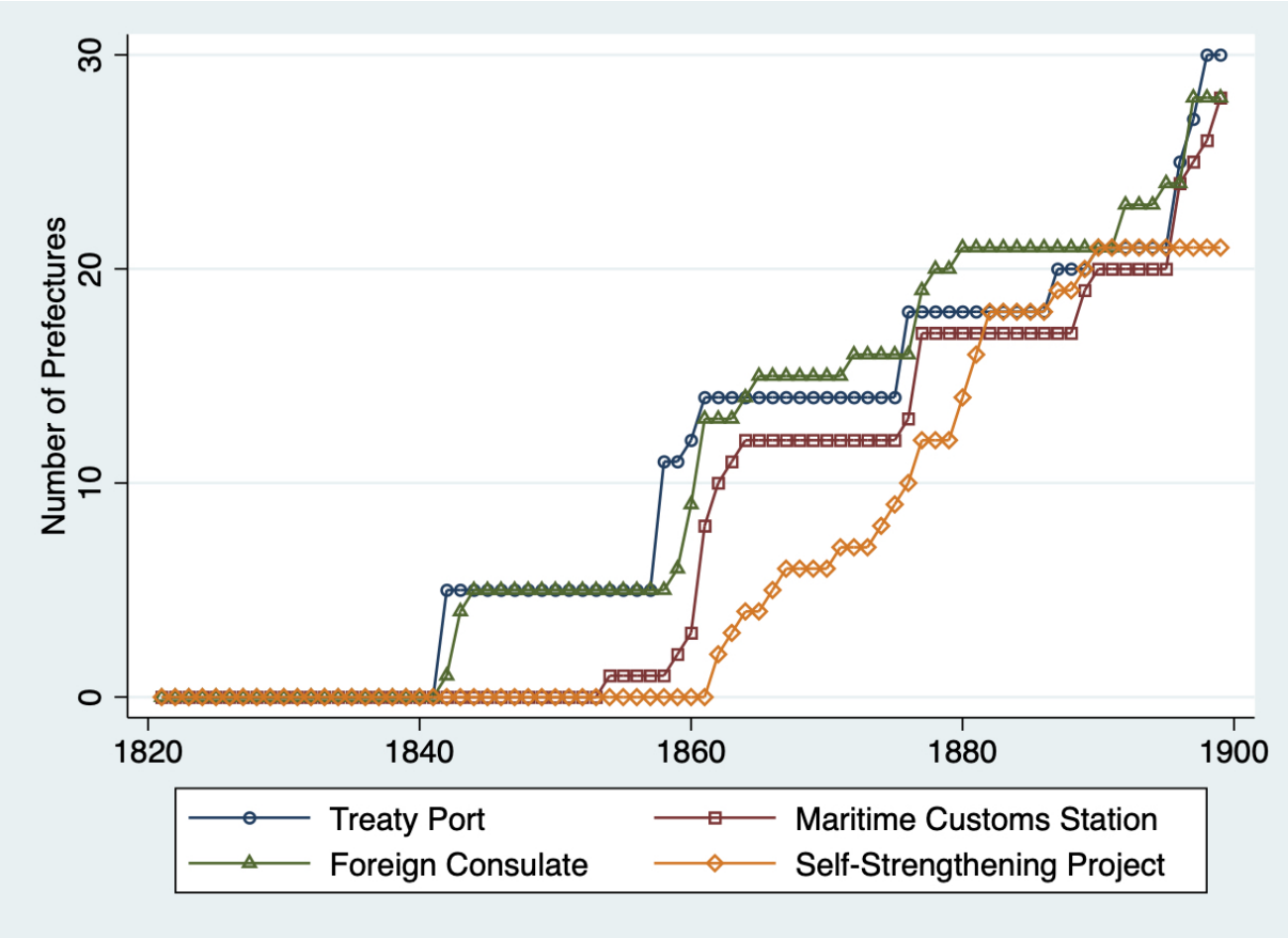
Legal Jurisdiction–The treaties stipulated that foreigners were subject to the legal jurisdiction of their own country rather than to Chinese laws (extraterritoriality). The consulate was key to the enforcement

[4]China was ruled by the Qing dynasty from 1644 to 1911.

of foreign laws in legal disputes, because the court of first instance was typically the consular court, and the foreign consul was the judge. By 1847, 19 nations had extraterritoriality provisions with China.

Figure 1 provides an overview of the evolution of foreign influence in China. We note that the timing of the opening of treaty ports and the establishment of consulates is similar while the establishment of the customs stations comes somewhat later, especially in the early years.

Figure 1: Foreign Influence and "Self-Strengthening" in 19th Century China



Notes: Figure shows the cumulative number of regions that have their first Treaty Port, Maritime Customs Station, Foreign Consulate, or Self-Strenghening Project by year. For sources, see text.

While channels of Western trade and legal influence in China cannot be fully traced out, the literature has described some of the major forces. First, there is technological learning through demonstration effects. The spread of industrial technology in China was facilitated by the presence of Western firms in the treaty ports that could be observed and imitated. For example, Western steam ships could be seen not only on China's coast but increasingly also at inland ports (such as on the Yangzi River), and China's rate of

steamship adoption owed much to Western presence in China. Further, during the Qing, the lack of a medium of exchange and credit instruments was a serious weakness of the financial system (Rawski 1989). Chinese banks in Shanghai encountered Western banks and borrowed ideas for financial instruments, which created a convenient medium of exchange and increased security in the banking system. 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 et al. 2007).

Second, Western influence in China increased the supply of public goods that are normally provided by a functioning government. 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. Third, Western presence in China increased security and reduced risk. In particular, 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 manifested themselves as lower risk premia for capital market transactions and hence interest rates.

The introduction of Western law in China may have had additional effects. Extraterritorial provisions might have increased the incentives of Western traders to do business in China, thereby increasing the supply of foreign capital in China, and all else equal lowering interest rates. 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 possible to enforce contracts in ways familiar to British banking firms. There may have been additional spillovers to the domestic economy. For example, 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). 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.

In sum, the main channels of how Western countries might have positively impacted the Chinese econ-

omy include broadly defined technology spillovers and the improved efficiency through legal innovation providing security spillovers and reduced risk for economic transactions. The analysis below will also consider domestic reform efforts that were initiated partly as a response to the West's influence in China. In addition, Russia and Japan were present in China during our sample period, and we will quantify their importance for our results. Furthermore, China's economy during the 19th century was subject to domestic influences as well, including civil war (Taiping Rebellion). The next section explains how they are addressed.

3 Estimation Approach

We employ a difference-in-differences estimation approach in which an outcome Y_{it} in region (prefecture) i and period (year) t is related to Western influence in China using a linear regression:

$$Y_{igt} = \beta_1 TP_{it}^q + \beta_2 CON_{it}^q + \beta_3 CUS_{it}^q + \beta' \Gamma + \mu_t + \theta_{ig} + \varepsilon_{igt}. \quad (1)$$

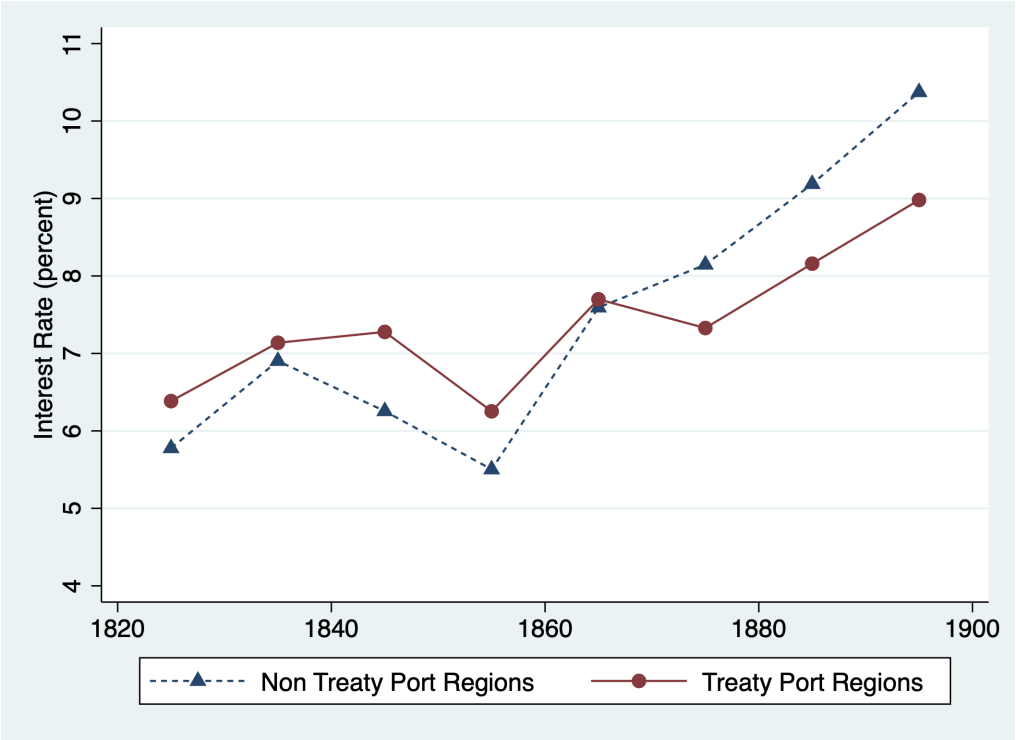
Our first outcome is interest rates, denoted by r_{igt}, where g indexes the particular grain on which the interest rate is based. On the right hand side of equation (1), TP_{it}^q is a measure q of treaty ports in region i and period t, with $q = \{I(x), x, ln(x+1)\}$, where x is the number of treaty ports; CON_{it}^q and CUS_{it}^q are analogous measures for foreign consulates and customs stations, respectively. The coefficient β_1, for example, estimates the difference in terms of Y_{igt} when there is a treaty port in a particular region and year, versus when there is not. Regional interest rates are obtained employing a commodity storage model together with monthly grain price data; the interested reader is referred to Appendix A to further details.

Since colonization was not the only factor influencing Chinese regional performance during the sample period, equation (1) addresses other influences as follows. First, our two-way fixed effects specification controls both for global shocks that affect all regions (μ_t) and for time-invariant heterogeneity, observed and unobserved, across regions and interest rate type (θ_{ig}). Second, the vector of control variables Γ includes geo-trends and other variables.[5] In particular, we account for the activity of Protestant missionaries, as well as incidents of mass violence, which might have affected performance in some regions of China.

[5] Geo-trends are defined as decade fixed effects for three areas based on latitude and longitude each (8 decades x 9 areas).

Furthermore, in the case of interest rates as the dependent variable, the vector Γ includes a set of weather indicator variables, as this is a major influence of grain storage costs, thereby affecting our interest rate calculation. Finally, ε_{igt} is a mean-zero error term; we allow for arbitrary correlation of observations belonging to the same cross-sectional unit by clustering at the prefecture-grain level. More information on these variables is given in the Appendix, with summary statistics presented in Table A.2.

Figure 2: Chinese Interest Rates by Foreign Influence



Notes: Shown are average interest rates by decade for regions that ever had a treaty port or a foreign consulate, versus regions that did not. Authors' calculations, see text.

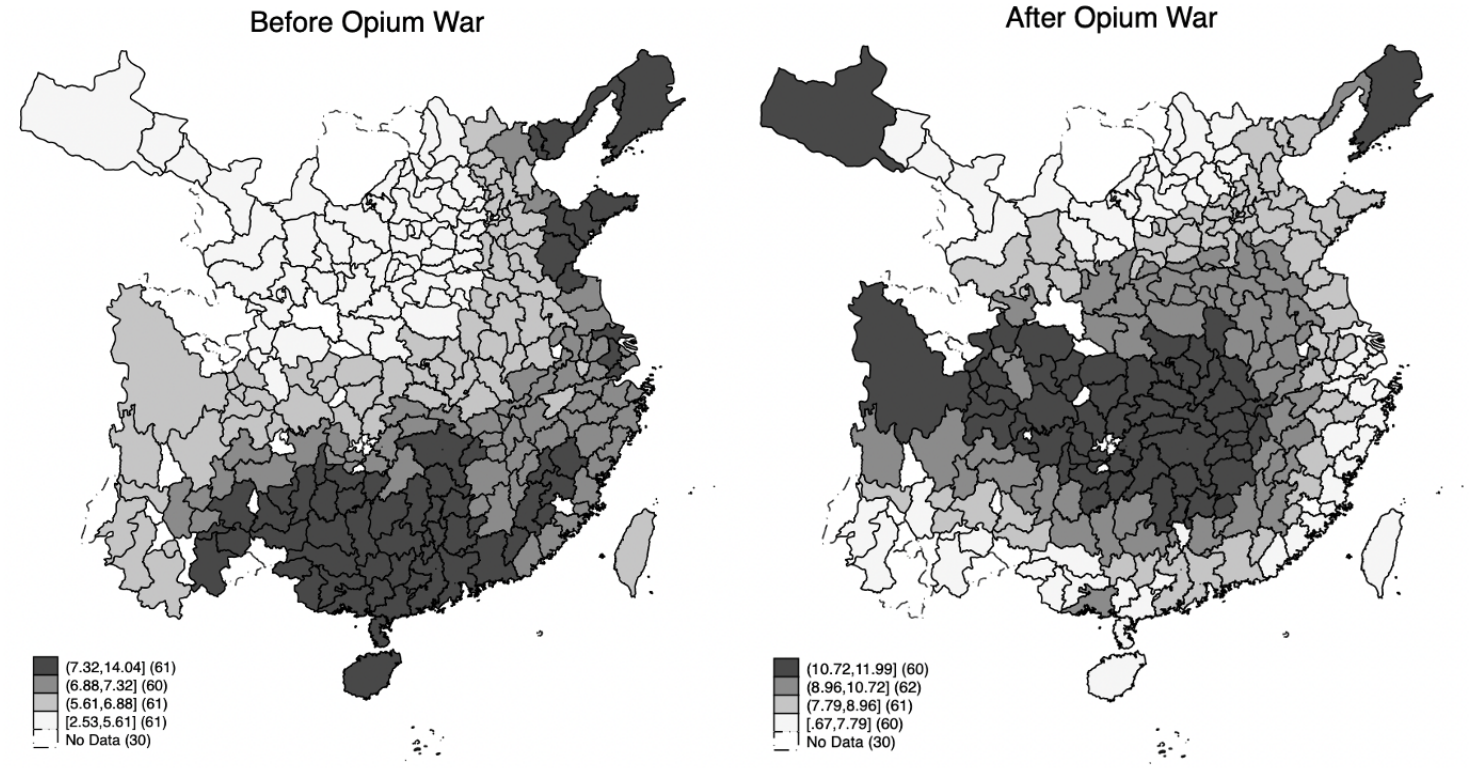
Figure 2 shows interest rates during our sample period. The overall mean is about 7.5 percent per year, with an increasing trend over time. Given that this occurred as Western influence was increasing in China (see Figure 1), one might –erroneously– conclude that Western influence has caused the rise in interest rates. Figure 2 shows interest rates for two sets of regions, those that at some point had at least one treaty port, versus those that did not. Notice that interest rates in regions with treaty ports tend to be lower than in other regions during the post-1842 era. If Western influence indeed was the cause of the overall rise in Chinese interest rates, it should be the case that interest rates in regions with treaty ports actually would rise faster than in Chinese regions without treaty ports. Given that this is not the case in Figure 2, we have some initial evidence that the impact of Western influence on Chinese capital markets

was positive (lower interest rates, and hence capital costs).

Furthermore, Figure 2 shows evidence for a turnaround during the 19th century. Before 1860, regions that would become treaty port locations had higher interest rates than regions that would not become treaty port locations. In contrast, after 1860, although there is a general rise in interest rates for all regions, eventual treaty port regions saw lower interest rates compared to what was experienced elsewhere in China. This suggests that the arrival of the West changed the underlying structure of the Chinese economy.

Before the treaty port era, the key cities in China were administrative centers such as the current capital, Beijing, or the cities of Xi'an or Nanjing, and those cities tend to be located in the North of China. Most capital cities in China's history were located north of the Yangzi river.

Figure 3: Interest Rate Patterns in the Chinese Economy



Notes: Shown are fitted values of OLS regressions of regional interest rates on a third-order polynomial in latitude and longitude; on the left, for years 1821-42, on the right, for years 1859-99. Weather fixed effects included.

That importance of China's North is reflected in the broad geographic pattern of interest rates: before the Opium War, interest rates are relatively low in the North and Central provinces, but higher in the South, see the left panel of Figure 3. The primacy of the North as evidenced by lower capital costs is in line with the higher standard of living in the North as evidenced by 18th century wage data (Allen et al. 2011).

Further, before the treaty port era, inland areas were more important than coastal areas. Both Suzhou and Hangzhou, for example, were larger and more important than Shanghai and Hong Kong, and while those cities were not far from the coast, neither were they located with direct coastal access. The treaty port system of the West put more emphasis on coastal locations and on the international trade that aided the interests of the Western countries (see Pomeranz 1993). In the panel on the right of Figure 3, we see that during the post-Opium War era, low interest rates are predominantly to be found in the coastal areas, while inland areas often exhibit relatively high interest rates. In short, the North Inland-South pattern of interest rates before the Opium War has given way to a coastal-inland pattern after the Opium War, and the coastal-inland distinction remains important for China's economy to this day.

A central identification assumption of equation (1) 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 using equation (1) would have treaty port and consulate locations randomly determined. The historical record shows, however, that actual choices were not random, not least because the West's interest in trade with China meant that locations with good waterway access were preferred. Does this lead to the failure of the parallel trends in the absence of treatment condition? A standard approach is to compare trends of treatment and control regions in the pre-treatment period. Figure 2 does not show major differential pre-trends. To confirm this, we extend the analysis by generalizing equation (1) to an event-study framework estimating one coefficient for each period relative to treatment time:

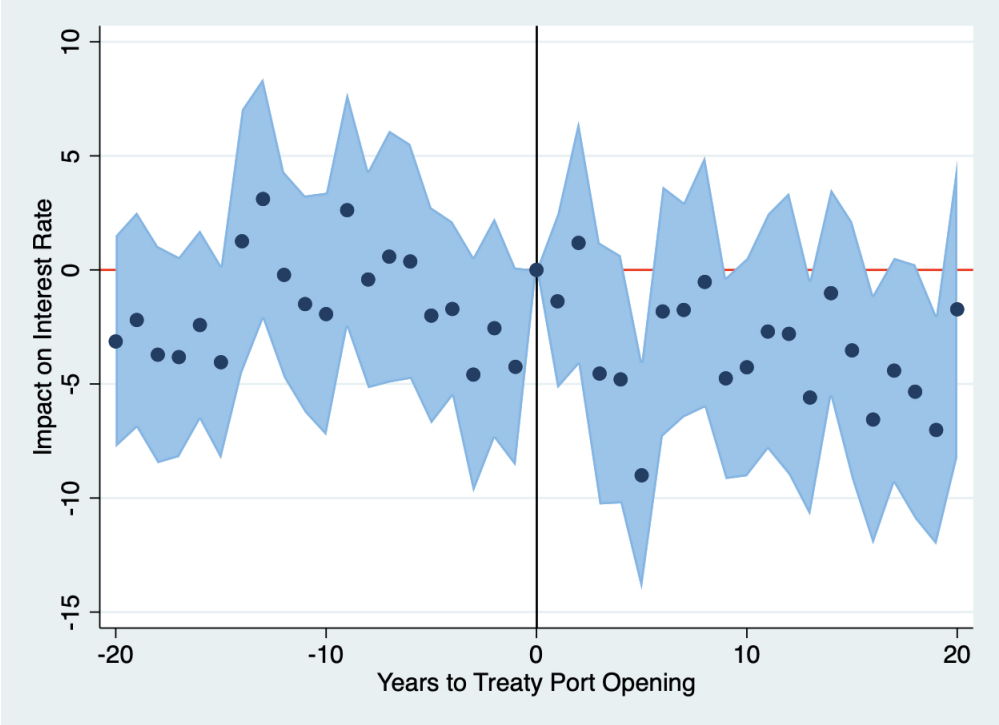
$$r_{igt} = \sum_{l} \beta_l \, 1\{t - E_i = l\} + \beta' \Gamma + \mu_t + \theta_{ig} + \varepsilon_{igt}, \tag{2}$$

where E_i is the time when region i receives the binary treatment, $l = t - E_i$ is timing relative to treatment, and estimation is by OLS. In this setting, no difference in pre-trends amounts to insignificant coefficients in years before the event.

Figure 4 reports OLS coefficients from estimating equation (2) for forty years, split equally into periods before and after the opening of treaty ports. While the annual coefficients vary from year to year, there is no evidence for major differential pre-trends in the sense that none of the coefficients on the left side of Figure 4 is significantly different from zero. For positive values of $l = t - E_i$, notice that all point estimates except one are negative, and significantly so at certain time horizons. Indeed, we will confirm below that

local interest rates are significantly lowered through treaty port openings. Figure 4 is also consistent with an increasingly strong impact lasting five years after opening, before the effect plateaus.

Figure 4: Treaty Port Opening and Interest Rates



Notes: Shown are coefficients and confidence intervals (99%) of the period fixed effects of equation (2) for an indicator variable that in prefecture i there is at least one treaty port.

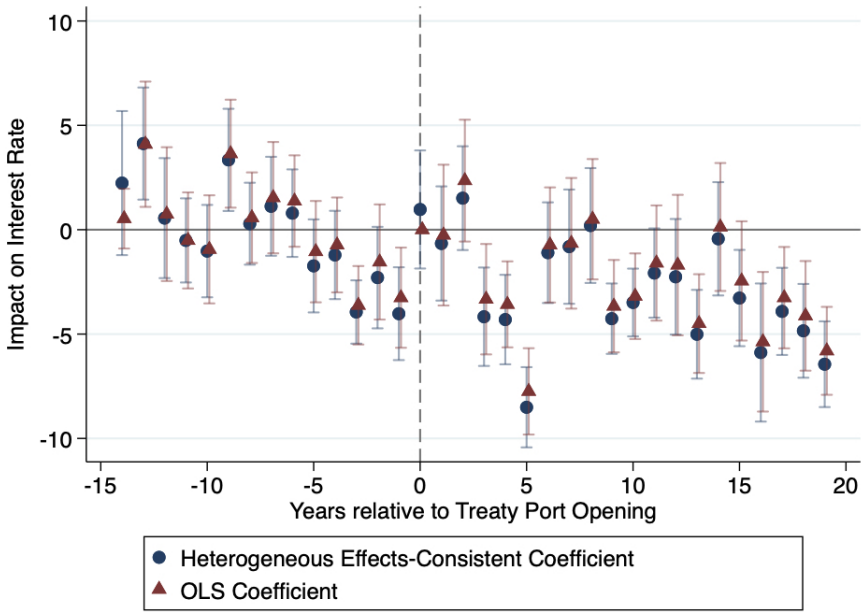
Recently, the literature has addressed some limitations of the OLS difference-in-differences estimator.[6] One is that the OLS estimator assumes homogeneous effects. In our context, two sources of heterogeneity might be especially important. First, some treaty ports might have triggered stronger effects than others, for example because the former commanded more foreign trade than the latter. Second, the dynamics of Western influence in China grew over time in waves (recall Figure 1). Such staggered treatment might imply heterogeneous effects, which creates biases under the maintained assumption of homogeneity. One way of addressing this in the estimation is to appropriately weigh all possible bilateral treatment-and-control comparisons. Figure 5 shows such estimates side by side with OLS estimates.

In our setting, the OLS and heterogeneity-consistent estimates turn out to be similar, and the correlation between the two sets of coefficients in Figure 5 is 0.99. In the following analysis, we will largely rely on OLS

[6]This work includes Borusyak, Jaraval, and Spiess (2021), Callaway and Sant'Anna (2020), de Chaisemartin and D'Haultfoeuille (2020), and Sun and Abraham (2020).

estimation, because for the non-indicator and multiple-treatment settings considered below heterogeneous effects-consistent estimators are not yet established. However, Figure 5 suggests that in the present case the difference to the results with OLS estimation would likely be small.

Figure 5: OLS versus Heterogeneous Effects-Consistent Difference-in-Differences Estimation



Notes: Shown are coefficients and 95% confidence intervals of the period fixed effects from estimating equation (2) with OLS and the heterogeneous-effects consistent approach of Borusyak, Jaraval, and Spiess (2021).

Other dependent variables considered in equation (1) are the number of Chinese banks, the number of industrial firms, their capital investment, as well as their adoption of steam engines and industrial machinery. The estimation equation is then given by

$$Y_{it} = \beta_1 TP_{it}^q + \beta_2 CON_{it}^q + \beta_3 CUS_{it}^q + \beta' \Gamma + \mu_t + \theta_i + \varepsilon_{it}, \tag{3}$$

and we employ robust standard errors clustered at the prefecture level. Analyses analogous to Figure 4 do not provide evidence for major differential pre-trends in terms of these outcome variables either (see Figure A.4 for the number of industrial firms). Equations (1) and (3) will be extended below with spillover terms to estimate the geographic scope of Western influence in China.

To address concerns that had the West not arrived in China, treaty port regions would have developed anyway because, for example, they were more advanced already in the traditional Qing economy, we

perform a series of balance checks going back to the year 1776. The results show that prior to the Opium War, regions that eventually had treaty ports or consulates were not systematically higher performing or more promising than regions that never had such points of Western influence (see Table A.3). Neither were the cities that would be chosen as treaty ports on a different trajectory, as estimated by population growth or interest rate growth. Thus, our analysis below does not overestimate the Western impact because of positive selection. Finally, we address non-random Western location choice by inverse-probability weighted regression adjustment (IPWRA). Based on the propensity that a region is selected as a treaty port or consulate location in terms of exogenous and pre-sample characteristics, this method is well-known to sharpen treatment-and-control comparisons. Consistent with the historical record, southern and Yangzi river locations, as well as high (past) population levels were important characteristics to be selected as locations (see Table A.4).

4 Regression Analysis

4.1 Impact in Locations of Immediate Foreign Influence

Table 1 reports the first set of our results in Panel A. A higher number of treaty ports or customs stations reduces interest rates (columns (1), (2)). The results are similar in part because customs stations are a subset of all treaty ports. We obtain an interest rate-lowering effect also for the number of consulates, our third measure of foreign influence (column (3)).[7] Including all three measures of foreign influence simultaneously, we see that consulates enter significantly while the customs and treaty port variables–which are positively correlated–do not (column (4)). If we focus on treaty ports (larger coefficient in column (4)) together with consulates, we estimate a significant interest-rate lowering effect for both variables (column (5)). This is evidence that foreign influence in China during the sample period operated both through trade and legal channels.

[7]The difference in the point estimate compared to treaty ports and customs stations is due to the larger number of consulates (see Table A.2).

Table 1: Foreign Influence and Chinese Interest Rates, 1821-1899

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
# Treaty Ports	-1.978^{**}			-1.326	-1.784^{**}				
	(0.645)			(1.108)	(0.665)				
# Customs Stations		-1.964^{**}		-0.538					
		(0.703)		(1.258)					
# Consulates			-0.115^{**}	-0.087^{*}	-0.090^{*}				
			(0.038)	(0.042)	(0.040)				
# TPs + Consulates						-0.124^{**}			
						(0.038)			
TP or Consulates							-2.195^{**}	-2.219^{**}	
							(0.467)	(0.471)	
Missionaries								0.353	
								(0.979)	
Mass Violence								0.086^{*}	
								(0.042)	
R-squared	0.163	0.163	0.162	0.163	0.163	0.162	0.163	0.163	

Panel B	(9)	(10) Hetero-geneous	(11) Spatial s.e.	(12) Capital Supply	(13) West vs Foreign	(14) South	(15) North	(16) West	(17) East	(18) Aggre-gate
TP or Consulates	-2.219^{**}	-2.117^{**}	-1.549^{**}	-2.786^{**}	-2.440^{**}					-2.261^{**}
	(0.515)	(0.413)	(0.418)	(0.515)	(0.512)					(0.889)
# TPs + Consulates						-0.112^{*}	-0.145^{*}	-0.994^{**}	-0.158^{**}	
						(0.049)	(0.066)	(0.364)	(0.034)	
N	64,627	64,642	64,627	64,627	63,337	32,212	32,415	32,312	32,315	15,327

Notes: Dependent variable is interest rate; estimation of equation (1) by OLS. Panel A: N = 64,627; all specifications include prefecture-grain, year, and weather fixed effects, as well as geo-trends; IPWRA applied. Panel B: All specifications include prefecture-grain, year, and weather fixed effects, as well as geo-trends, Missionaries, and Mass Violence, except (18) which employs prefecture fixed effects; IPWRA applied, except in specification (11). Specification (10) employs the method of Borusyak, Jaraval, and Spiess (2021); specification (12) adds Foreign Bank and FDI variables; specification (13) drops observations with Russian or Japanese consulates; specifications (14) to (17) split the sample in half by geography, and specification (18) aggregates to the prefecture level. Panels A and B report robust standard errors clustered at the prefecture-grain level, except specification (11) which employs standard errors consistent with spatial dependence up to a cutoff of 450 kilometers, and specification (18) which shows standard errors clustered at the prefecture level. Significance at the 1/5/10% indicated by **/*/+.

Treating treaty ports and consulates as perfect substitutes, the simple sum of all treaty ports and consulates as our measure of foreign influence yields also a significant interest-rate lowering effect (column (6)). An alternative definition that abstracts from the count of foreign locations is an indicator variable, one for a region that has at least one treaty port or consulate, and zero otherwise. This yields a coefficient of -2.2, see column (7). These results indicate that our findings are robust to different definitions of foreign influence. Quantitatively, column (7) indicates that foreign influence lowers local interest rates on average by 2.2 percentage points. Given that the interest rate average in our sample is 7.5%, a back-of-the-envelope calculation indicates a sizable reduction of more than one quarter. As we will see below, accounting for geographic spillovers increases the impact further.

In the final specification of Panel A, we include other variables that might affect capital markets. Events of mass violence, such as the Taiping Rebellion, may lead to higher interest rates either because they raise risk premia or because they restrict the supply of capital. Column (8) shows that mass violence indeed raises local interest rates. At the same time, the foreign influence estimate remains virtually unchanged. Further, we include a measure of Protestant missionary activity. Interest rates reflect to some extent the riskiness of a certain location, and relatively low risk might encourage missionaries to go to those locations. Alternatively, missionary activity might have a modernizing effect on the local economy, including lower interest rates. Our estimation does not find evidence for a significant effect from missionary activity (column (8)).

Robustness Checks Panel B of Table 1 shows a number of robustness checks, with column (9) repeating the final specification of Panel A. First, recall that Western influence in China during the 19th century evolved over time in waves. To gauge the extent to which this staggered implementation and other heterogeneity affects our results, we employ Borusyak, Jaraval, and Spiess's (2021) approach. This yields a coefficient similar to the OLS coefficient, suggesting heterogeneous effects do not much change our estimates (coefficient of -2.1, versus -2.2, see columns (10) and (9), respectively).

Inferences so far have been based on robust standard errors that cluster at the cross-sectional level, so that annual observations can have arbitrary correlation in the time series. Another concern is spatial correlation, which we address by computing GMM standard errors that allow for spatial dependence (based on Conley 1999 and Fetzer 2020). As seen from Table 1, employing spatial-dependence robust

standard errors also leads to the finding that foreign influence lowered local interest rates (column (11)).

We are also interested in whether foreign influence leads to lower local interest rates simply because it triggered an inflow of capital. While we do not have information on domestic capital flows, there are two measures of foreign capital, namely foreign banks and foreign direct investment. If the impact of lower interest rates primarily reflects an increase in the local capital supply, the direct inclusion of capital supply measures should shrink the foreign influence coefficient towards zero. As column (12) shows, this is not what we find. Instead, our results suggest that foreign influence lowered interest rates because it reduced the wedge between capital supply and capital demand by lowering risk by raising security levels.

Next, to determine if our result is due to a foreign or more narrowly a Western effect, we examine the extent to which dropping Russia and Japan changes our results. Notably, none of the treaty ports were opened by these countries, even if Russia and Japan did have consulates in China. It turns out that dropping observations with Japanese or Russian consulates does not qualitatively change our results (compare columns (13) and (9)); thus, we conclude that the impact of foreign countries in China was primarily a Western effect, and in what follows we will refer to 'Western' influence.[8]

The following four columns in Panel B show that Western influence lowered interest rates in every region of China, South, North, West, and East (columns (14) to (17)). Finally, recall that our analysis so far employs all available interest rates for a given prefecture-year combination, which yields a larger sample. Alternatively, we aggregate the data and employ the average of interest rates in a given prefecture. Then, observations are indexed by prefecture and year, and clustering is at the level of the prefecture. Comparing columns (18) and (9) shows that results are similar. This indicates that the level of aggregation is not crucial for our results.[9]

4.2 Western Influence and Chinese Industrialization

Table 2 presents evidence on the impact of Western influence on other outcomes. The estimation equation is given by equation (3).

[8] Japan's influence in China was larger in the 20th century, which is outside the sample period.

[9] It also provides evidence that different interest rates capture broadly similar patterns in the local capital market.

Table 2: The Impact of Western Influence on Chinese Banks and Firms

	(1) Industrial Firms	(2) Banks	(3) Capital Investment	(4) Steam Engines	(5 Industrial Machinery	(6) Industrial Firms	(7)
						West vs Foreign	
# of Treaty Ports	0.177^{+}	0.245^{+}	0.114	0.061	0.049	0.168*	0.154*
	(0.099)	(0.133)	(0.117)	(0.063)	(0.094)	(0.059)	(0.063)
# of Consulates	0.039**	0.021^{+}	0.046**	0.022**	0.043**	0.015*	0.014*
	(0.012)	(0.011)	(0.017)	(0.007)	(0.013)	(0.006)	(0.006)
FDI							0.002
							(0.019)
Foreign Banks							−0.006
							(0.063)
Missionaries							0.124
							(0.076)
Mass Violence							0.001
							(0.001)
N	15,442	15,442	15,442	15,442	15,442	15,165	15,108
R-squared	0.498	0.797	0.191	0.505	0.571	0.403	0.409

Notes: Dependent variable x is given on top of column, employed as ln(x+1); estimation of equation (3) by OLS. All specifications include prefecture and year fixed effects, as well as geo-trends; IPWRA applied. FDI is the number of foreign-owned firms; Foreign banks is the number of foreign-owned bank headquarters. Missionaries is the fraction of counties of the prefecture that has one or more Protestant missionary; Mass Violence is a measure of incidents of rebellion or war activity (domestic and international). Columns (6) and (7) drop observations with consulates from Japan or Russia from the sample. Robust standard errors clustered at the prefecture level reported in parentheses. Significance at the 1/5/10% indicated by **/*/+.

We see that both treaty ports and consulates affect the number of firms and their investments, with the consulate effect being stronger for investment and technology adoption (columns (1) to (5)). This indicates that Western influence had positive impacts not only through lowering interest rates but also by increasing the pace of industrialization. Specification (6) drops observations with consulates from Japan or Russia, which leads to the same qualitative result (compare (1) and (6)). We conclude that also the impact on banks and firms in China is primarily a Western, not foreign impact. Finally, specification (7) adds capital supply, missionary, and mass violence variables. None of the additional variables turns out to be significant. Overall, these results are in line with the positive impact of the West on Chinese capital markets that we have estimated above.

4.3 Western Impact and the Self-Strengthening Movement

Technological learning and security spillovers are plausible channels through which Western influence benefited China's economy, as noted above. One area for which more systematic evidence can be provided is the so-called Self-Strengthening Movement (SSM for short), a set of reforms initiated following the military defeats in the Opium Wars. It is widely accepted that the SSM sought to implement Western ideas in the area of technology (military and industrial) but also organizational and institutional reform (see Kuo and Liu 1978). As such, the SSM is *prima facie* evidence for the influence of Western ideas, and the evolution of SSM between 1862 and 1895 suggests it was a reaction to Western influence (see Figure 1). In the following, we employ regional variation in SSM projects to provide additional evidence on the nature of Western influence.[10] Table 3 shows results from estimating equations (1), (3) that add a measure of self-strengthening projects. These results should be viewed as correlations as opposed to causal effects, since we do not specify the precise way that Western influence has impacted the Self-Strengthening Movement.

Controlling for the location of self-strengthening projects tends to shrink the Western influence coefficient towards zero, consistent with the hypothesis that the SSM captures part of how Western influence impacted China's economy (see Table 3). The signs of the SSM coefficients–negative in column (2) and positive in the other columns– provide additional evidence that Western influence had a positive impact on China. Note that including the SSM variable changes the results in different ways according to Table 3. The SSM mechanism appears to be quite important for the number of industrial firms, investment, and technology adoption, whereas it matters less for the number of Chinese banks and capital markets. This reflects that the SSM often involved military and industrial technology. Also note that the Western influence variable in Table 3 remains significantly different from zero, which is evidence that mechanisms other than SSM projects were important as well.

[10] Although it was not a stated goal of the SSM to match the regional distribution of Western influence, among regions that hosted SSM projects, more than half also had treaty ports or consulates.

Table 3: Western Influence and Self-Strengthening

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Interest Rate		Industrial Firms		Banks		Investment		Steam Engines		Industrial Machinery	
Treaty Ports & Consulates	-2.219^{**}	-2.204^{**}	0.042^{**}	0.027^{**}	0.022^{+}	0.021	0.049^{**}	0.031^{**}	0.022^{**}	0.014^{**}	0.043^{**}	0.031^{**}
	(0.471)	(0.474)	(0.011)	(0.007)	(0.013)	(0.014)	(0.016)	(0.010)	(0.007)	(0.005)	(0.012)	(0.009)
Self-Strengthening Projects		-0.947^{+}		0.818^{**}		0.052		0.999^{**}		0.444^{**}		0.675^{**}
		(0.569)		(0.179)		(0.151)		(0.312)		(0.128)		(0.184)
N	64,627	64,627	15,385	15,385	15,385	15,385	15,385	15,385	15,385	15,385	15,385	15,385
R-squared	0.163	0.164	0.494	0.607	0.794	0.794	0.194	0.240	0.503	0.615	0.571	0.678

Notes: Dependent variable x given on top of column, in columns (3) to (12) entered as ln(x+1); estimation of equation (1) by OLS (columns (1) and (2)), otherwise equation (3). Self-Strengthening Projects is the number of self-strengthening projects in the prefecture, defined as ln(x+1). Information on self-strengtening projects from Qian and Tan (1995). Treaty Ports or Consulates variable in columns (1) and (2) is indicator for at least one treaty port or consulate, in columns (3) to (12) the sum of treaty ports and consulates. All specifications include geo-trends, Missionaries, and Mass Violence variables as well as year fixed effects. Columns (1) and (2) include also weather fixed effects and prefecture-by-grain fixed effects; columns (3) to (12) include prefecture fixed effects. Robust standard errors clustered at prefecture-by-grain (columns (1) and (2)) or prefecture (columns (3) to (12) in parentheses. Significance at the 1/5/10% indicated by **/*/+.

4.4 The Geographic Scope of Western Influence

We now examine the geographic scope of Western influence in China. Our approach is to generalize equation (1) by forming circular bands (or, donuts) at certain distances around locations of Western influence in China. We estimate variants of the following extension of equation (1):

$$r_{igt} = \beta_1 TP_{it}^q + \beta_2 CON_{it}^q + \sum_d \beta_{3l}\, 1\{l = d\} \times TP_{it}^q + \sum_d \beta_{4l}\, 1\{l = d\} \times CON_{it}^q + \beta' \Gamma + \theta_{ig} + \mu_t + \varepsilon_{igt}, \quad (4)$$

where d indicates a certain distance bracket in kilometers; in the following we show results for distance bands of 150 kilometers width up to 600 kilometers: $d = \{(0, 150], (150, 300], (300, 450], (450, 600]\}$. The vector Γ includes weather fixed effects, geographic trends, as well as mass violence and missionary variables; θ_{ig} and μ_t are prefecture by grain and year fixed effects, respectively, and ε_{igt} is a mean-zero regression error. Similar approaches to estimating geographic spillovers in other contexts have recently been taken for example in Feyrer, Mansur, and Sacerdote (2020, 2017) and James and Smith (2020).[11]

Table 4 shows the results. The first specification includes an indicator variable equal to one if at a distance of up to 150 kilometers from the capital of a given prefecture i in period t there is at least one treaty port, and zero otherwise; the analogous consulate indicator is also included. We see that both the treaty port and the consulate variables enter with a negative coefficient, indicating that if there is Western influence at a distance of up to 150 kilometers from region k, the local interest rate is significantly lower than in regions that are not within 150 kilometers from Western influence (irrespective of Western influence in region k itself; see column (1)).

Does accounting for spillovers also alter the aggregate size of Western influence? Comparing the previous results with a specification in which spillovers are absent–column (5) of Table 1–we see that treaty port and consulate coefficients are larger (in absolute value) in the specification with spillover terms (Table 4, column (1)). Given that treaty ports and consulates have additional interest-rate lowering spillover effects at distances up to 150 km, the estimation of spillovers leads not only to a larger geographic scope but also to a larger aggregate Western effect. In some sense, the spillover terms remove a misspecification that allow the own-region effects to increase in absolute value.[12]

[11] Our focus on treaty ports and consulates in equation (4) drops the customs variable to keep the number of spillover terms relatively low; for the same reason we abstract from spillover versions of Mass Violence and other variables.

[12] Without the spillover terms, the entire Western influence effect is captured by the own-region variables, and given that

Table 4: Western Influence in China: Geographic Spillovers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
# Treaty Ports	−2.056**	−2.401**	−2.451**	−2.458**	−2.732**		
	(0.684)	(0.692)	(0.697)	(0.700)	(0.681)		
# Consulates	−0.100**	−0.104**	−0.102**	−0.101*	−0.135**		
	(0.038)	(0.039)	(0.040)	(0.040)	(0.038)		
# TPs + Consulates						−0.178**	−0.252**
						(0.040)	(0.079)
TP Indicator (0, 150 km]	−1.565**	−1.590**	−1.671**	−1.669**			
	(0.464)	(0.467)	(0.476)	(0.477)			
Consulate Indicator (0, 150 km]	−2.086**	−2.094**	−2.042**	−2.047**			
	(0.460)	(0.452)	(0.449)	(0.454)			
TP Indicator (150, 300 km]		−1.914**	−1.917**	−1.907**			
		(0.444)	(0.446)	(0.444)			
Consulate Indicator (150, 300 km]		−0.018	−0.084	−0.105			
		(0.453)	(0.457)	(0.458)			
TP Indicator (300, 450 km]			−0.720+	−0.747+			
			(0.385)	(0.387)			
Consulate Indicator (300, 450 km]			0.403	0.415			
			(0.380)	(0.378)			
TP Indicator (450, 600 km]				0.208			
				(0.462)			
Consulate Indicator (450, 600 km]				−0.393			
				(0.431)			
# TPs (0, 150km]					−0.414		
					(0.369)		
# Consulates (0, 150km]					−2.024**		
					(0.403)		
# TPs + Consulates (0, 150 km]						−1.109**	−1.559**
						(0.167)	(0.273)
# TPs + Consulates (150, 300 km]					−0.626**	−0.531**	−1.212**
					(0.099)	(0.107)	(0.191)
# TPs + Consulates (300, 450 km]					−0.330**	−0.290**	−0.832**
					(0.083)	(0.084)	(0.152)
Mass Violence	0.090*	0.099*	0.099*	0.101*	0.089*	0.090*	0.274**
	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)	(0.060)
N	64,627	64,627	64,627	64,627	64,627	64,627	19,209
R-squared	0.168	0.170	0.170	0.170	0.169	0.167	0.207

Notes: Dependent variable is interest rate; estimation of equation (4) by OLS. All specifications include prefecture-grain, year, and weather fixed effects, as well as geo-trends and Missionaries; IPWRA applied. Specification (7) limits the sample to regions that are in the top third of propensity score for both having at least one treaty port and having at least one consulate, and it drops observations including a Russian or Japanese consulate. Robust standard errors clustered at prefecture-grain in parentheses. Significance at the 1/5/10% indicated by **/*/+.

Next, we examine spillover effects at distances between 150 and 300 kilometers. The treaty port indicator at that distance enters with a coefficient of about -1.9, while the consulate indicator coefficient is close to zero (Table 4, column (2)). This indicates Western influence has an impact on local capital markets at distances of up to 300 kilometers (and mostly through the treaty port channel). Moving further away,

spillovers generally decline in geographic distance, this reduces the own-region estimate.

we estimate that at distances between 300 and 450 kilometers there is an additional interest-rate lowering effect through treaty ports (column (3)). Beyond 450 kilometers, there is no evidence for Western influence (column (4)). That Western impact could reach beyond the ports is natural since there were no borders preventing its spread. Neither the diffusion of ideas, nor the higher-efficiency of better capital markets, are likely to stop at an interior prefectural border.

Overall, these results indicate that Western influence in China was felt at distances of up to 450 kilometers away from the locations of treaty ports and consulates. Moreover, the results of Table 4 provide evidence that the impact of Western trade influence–captured by the treaty port variable–is geographically more diffuse than the Western legal effect which is more concentrated near the consulates. Quantitatively, a back-of-the-envelope calculation shows that in the port itself Western influence reduces interest rates by more than 25 percent, and even at distances of up to 450 kilometers the presence of a treaty port lowers interest rates by almost ten percent.[13]

The spillovers implied by our estimates are generally lower, the larger is the geographic distance. This decay of the effect with geographic distance is plausible not only because capital market transactions become less frequent with geographic distance since distance is a barrier to the mobility of people, but also because the diffusion of new ideas exhibits spatial decay since knowledge is not perfectly codifiable and thus facilitated by in-person demonstration (Jaffe, Trajtenberg, and Henderson 1993, Keller 2004).

While our approach is generally able to distinguish between the influence through trade versus legal channels, results depend to some degree on variable definition. For example, the treaty port indicator enters significantly at distances (0, 150 km] while the number of treaty ports does not (column (3) compared to column (5), respectively). To gauge the geographic scope of Western influence irrespective of channel, consider simply the sum of all treaty ports and consulates in a particular distance bracket. This yields coefficients of about -0.6 and -0.3 at (150, 300] and (300, 450] kilometers (Table 4, column (5)). Employing analogous variables for the region itself and the (0, 150 km] distance bin yields the results shown in column (6). They confirm the earlier finding that Western influence lowered interest rates at a distance of up to 450 kilometers.

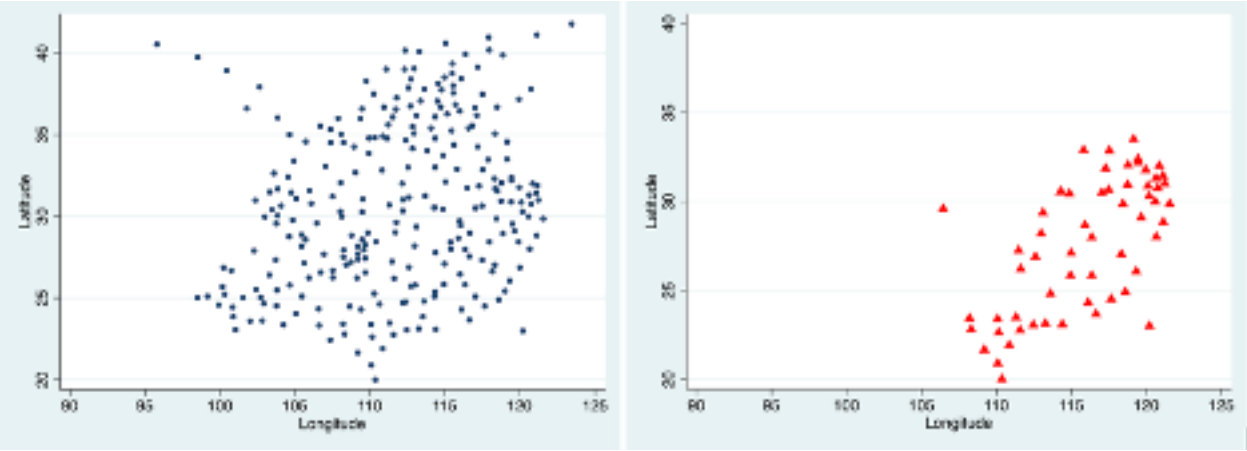
Finally, we present spillover results for a subsample of regions, namely those that score in the top third in

[13]The coefficient on the treaty port indicator variable at distances between 300 and 450 kilometers in column (3) is -0.72, which is almost ten percent of the average interest rate (7.45 percent, see Table A.2).

terms of the probability of attracting both a treaty port and one or more foreign consulates.[14] This can be thought of as a matched-sample approach. It reduces the possibility that our results are due to the presence of regions that were largely unattractive to foreigners, perhaps because they are fundamentally different than the locations eventually chosen. Figure 6 shows the full sample of 245 prefectures on the left, while the 59 prefectures most likely to have Western influence are on the right.

We see that the regions with the highest probability of being semi-colonized by the West are concentrated in the south-central coastal area of China. By contrast, the historically central cities of Qing China were located inland since the empire was not focused on foreign trade. In the restricted sample, about one in three regions had a treaty port or consulate, compared to about one in eight in the full sample, so that control regions are relatively similar to treatment regions in the restricted sample. In addition, we drop observations with consulates from Russia and Japan to focus on Western as opposed to foreign influence. Our results show that at any distance, Western influence in the restricted sample is larger (in absolute value) than in the full sample (see columns (6), (7)). This shows that our finding of a sizable and far-reaching Western influence on Chinese capital markets is not driven by regions that did not matter to Westerners.

Figure 6: All Regions versus Likely Western-Selected Regions



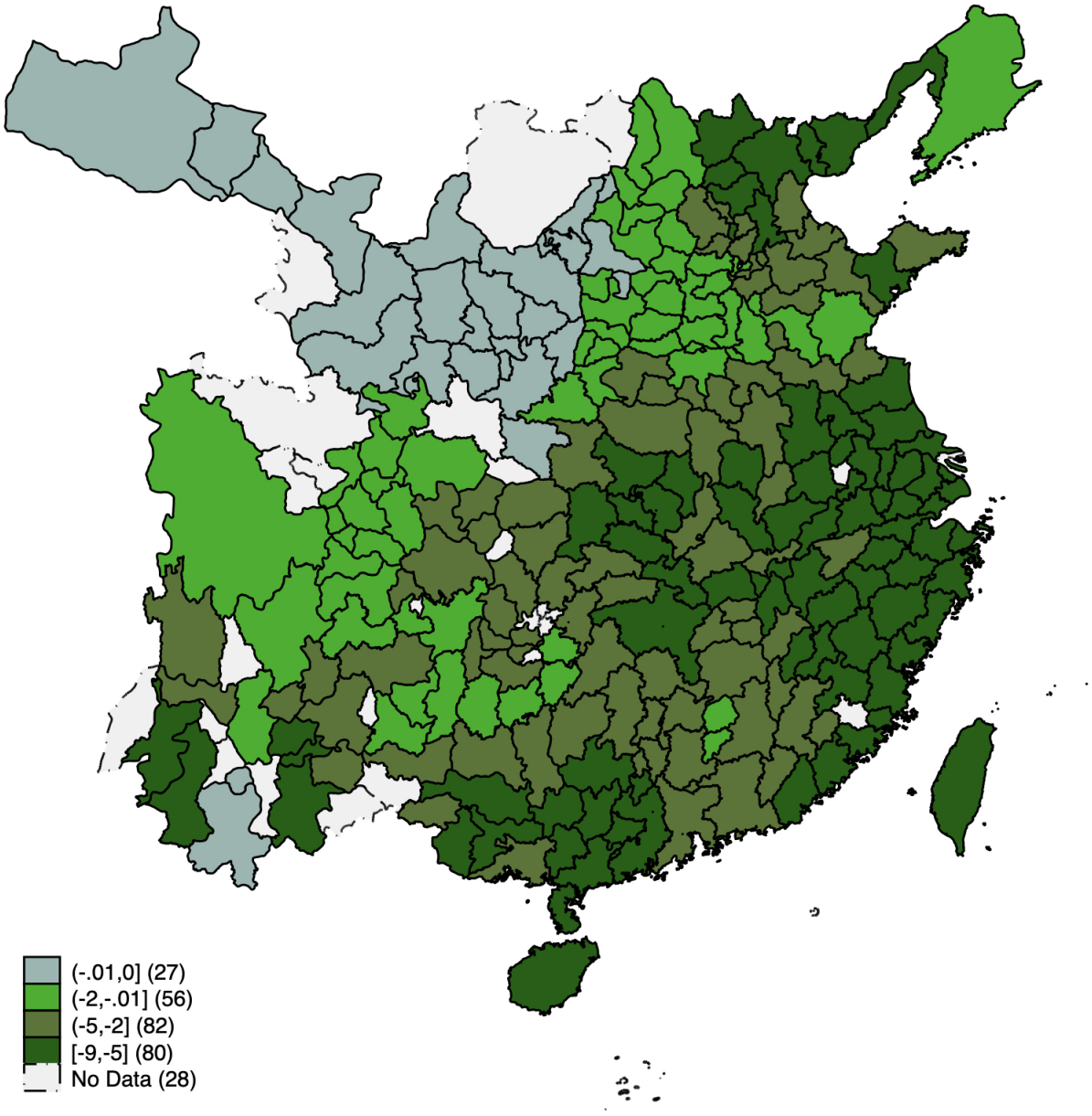
Notes: Shown are on the left all sample prefectures (N = 245) and on the right prefectures that are in the highest third of the predicted probability of having both one or more treaty ports and consulates based on a probit regression analogous to that underlying Table A.4(N = 59).

Plotting the regression-predicted interest rate effects on a map of China illustrates the geographic scope of Western influence. In Figure 7 we indicate the strength of Western influence on China's regional interest

[14]This probability is obtained by a probit using geographic and pre-sample characteristics as predictors (Table A.4).

rates using different colors, with darker shades indicating stronger influence.

Figure 7: Western Influence and Chinese Capital Markets in the Treaty Port Era



Notes: Figure gives predicted effects of the analysis of equation (4), Table A.5, column (4) for the latest possible 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.

The results 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, Western influence has gone well beyond these areas. In fact, only 12% of all Chinese regions in our analysis–27 out of 217 prefectures, mostly in China's

North and West–was not been significantly affected. Furthermore, in about three quarters of affected regions Western influence brought interest rates down by a quarter or more.[15] Thus, Western influence substantially affected most of China. Accounting for regional population differences would not weaken this finding because China's Northwest is not particularly highly populated. Central to our finding of a larger effect is that we extend the typical point-based analysis with the estimation of spatial spillovers. Employing a point-based analysis, one might indeed conclude that Western influence in China was small because in that analysis 88% of our Chinese regions is not subject to Western influence.

The exact rendition of the Western influence map given in Figure 7 depends on particulars such as the distance bands, the size of regions, and the definition of Western influence variables. Additional analyses presented Tables A.5 and A.6) indicate, however, that the main message of Figure 7 is robust. Moreover, we also present evidence that Western influence affected firm and investment growth in China outside of the immediate vicinity of the ports (see Table A.6). In sum, once the geographic scope of Western influence is taken into account, it is hard not to conclude that the West had a major effect on China's economy during the treaty port era.

5 Conclusions

This paper is a study of the economic consequences of the West's foray into China after the Opium War (1839-42), when Western influence was introduced in dozens of cities by way of treaty ports. We show that Western countries had a positive impact on China's economy. Regions with Western influence exhibited a higher rate of growth of modern firms, and greater investment into advanced machinery as well as steam engines; and such regions also saw a disproportionate creation of Chinese banks. Furthermore, Western influence brought down local interest rates substantially, with evidence that much of this effect due to enhanced security and lower risk as opposed to additional capital. Both legal influence centered on consular courts and trade influence associated with the ports and Western-led customs system played a role in this.

Although the impact was strongest in treaty ports and the immediate geographic vicinity of Western

[15] In 162 out of 217 prefectures (a share of 75 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. These calculations do not account for regions not included in our analysis due to data limitations.

influence, where interest rates fell by more than 25 percent, we show that the geographic scope of influence went far beyond— even at distances 450 kilometers away, the opening of a treaty port reduced interest rates by almost 10 percent. Legal influence had a strong but more geographically limited impact, whereas trade influence reached further into Chinese areas away from the ports. Once the geographic spillovers of Western influence are taken into account, there is little doubt that the West's foray into China after the First Opium War influenced a large part of China. This provides evidence for our thesis that 1842 was a turning point that significantly increased the pace of economic progress in China.

Our analysis of the treaty port era yields new perspectives on China's economic performance since the country introduced elements of market reform in the year 1978. Oftentimes, there is considerable skepticism on whether Western-style reforms will work in the context of a different country. If there was any doubt at the time on whether Western-style reforms will work in the context of China, perhaps there should not have been. The fact that China managed per-capita growth rates upwards of 5% per year for several decades does not seem surprising given the strong positive impacts that resulted from the introduction of Western technology, ideas, and institutions after the Opium War.

Although China had in many ways a flourishing economy well into the 18th century, its capital market development had fallen substantially behind that of some Western countries by the early 19th century (Shiue and Keller 2007, and Keller, Shiue, and Wang 2021, respectively). The large impact of Western influence, which is here manifested 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. Moreover, just because the West was involved in China's development in ways that are no longer considered politically justifiable, that does not mean that the period when the West semi-colonized China was not important for understanding how China's economy gained as a result. We hope that the present paper contributes to clearing the path for future research on the examination of these and other elements of China's 19th century economy, and the way they relate to the country's development path over the next two centuries.

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A Data

A.1 The Storage Cost Approach and Interest Rates

In this approach, the interest rate in a given region and year is obtained from the gradient of the grain price movement over the harvest cycle. The gradient is informative because optimal storage behavior requires that the price compensates for the storage costs of holding grain, of which the interest rate is a part. This method goes back to Kaldor (1939), Working (1949), and others, and has been employed 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 there exists high-frequency data on stored commodities (including but not limited to grain), and grain price data tends to be available centuries before consistent interest rates are recorded.[16] Recently, the storage cost approach has been validated by showing that grain-price based interest rate variation is similar to that of bank interest rates, and that it yields similar results on the performance of capital markets in the 19th United States (Keller, Shiue, and Wang 2020). The storage cost approach has also been applied to document that superior capital market development in Britain versus China may be a reason why economic performance in Britain and China diverged in the 18th century (Keller, Shiue, and Wang 2021). The following gives an overview of the approach, with more details given in Keller, Shiue, and Wang (2020).

Consider a merchant living 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, she 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 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 related to the risk-free rate, which captures the fact that if the merchant does not buy grain from the farmer she has an income of no less than $(1 + \varrho_{it})\, P_{it}Q_{it}$ at time t+1, whereas if she stores the grain for one period, then no interest is earned.

[16] It can be possible to collect interest rate figures from archival records, however, the rates are rarely comparable because conditions of each individual transaction vary but remain unspecified.

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 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 as 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

$$F_{it+1}^{j} = P_{it}\left(1 + r_{it}^{j} + c_{it}\right) - b_{it}, \tag{5}$$

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 we make a number of assumptions. First, we do not observe the transaction-specific risk for each contract; consequently, the superscript j is dropped and it is assumed that we capture the average level of risk, r_{it} (with $r_{it} \geq \varrho_{it}$). Second, since we do not observe the price F_{it+1}^{j} in the contract 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 do not observe the convenience yield, and we assume that b_{it} is zero.

With these assumptions, equation (5) can be rewritten as

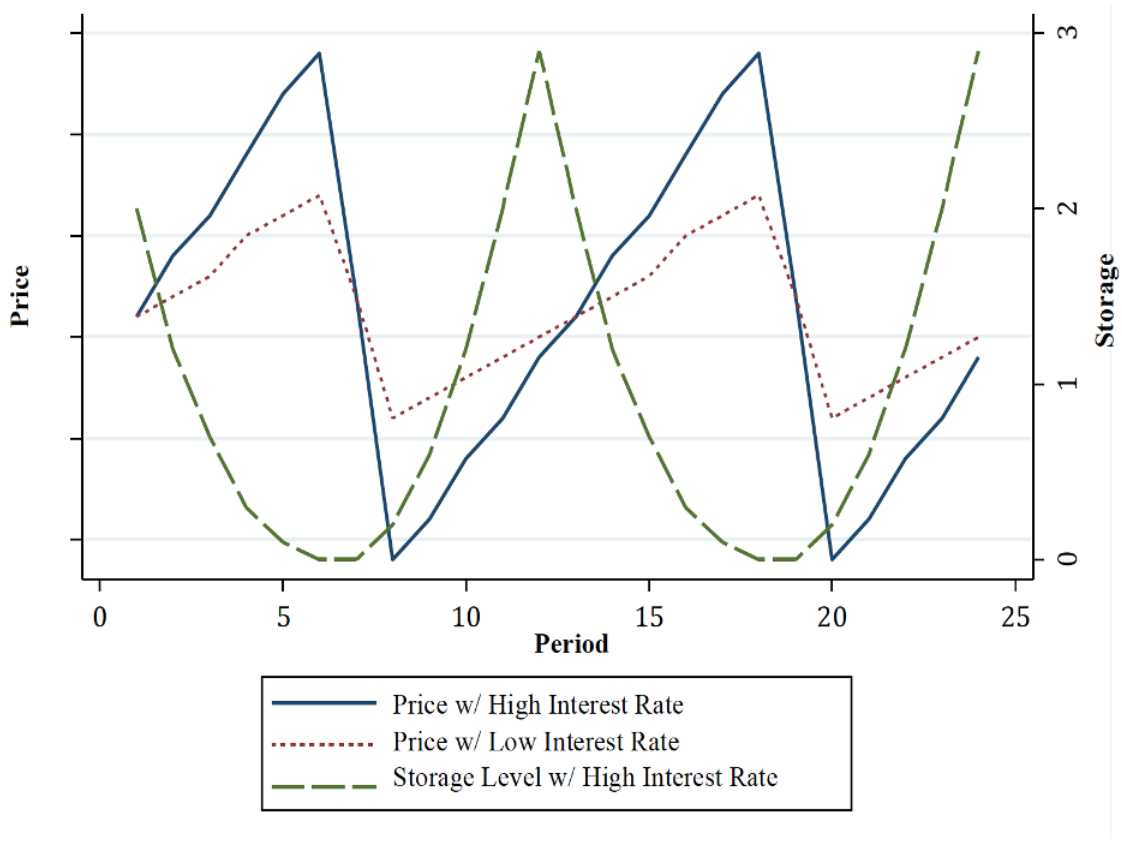
$$\hat{p}_{it} \equiv \frac{P_{it+1} - P_{it}}{P_{it}} = r_{it} + c_{it}. \tag{6}$$

Equation (6) shows that in a storage equilibrium the rate of grain price change is equal to the risk-inclusive interest rate r_{it} plus grain-specific storage costs, c_{it}. The term $\hat{p}_{it}$ in equation (6) is referred to as the carry cost of grain.

To illustrate the relationship between grain price behavior 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 period 18 when the maximum is reached, and the cycle repeats itself.

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

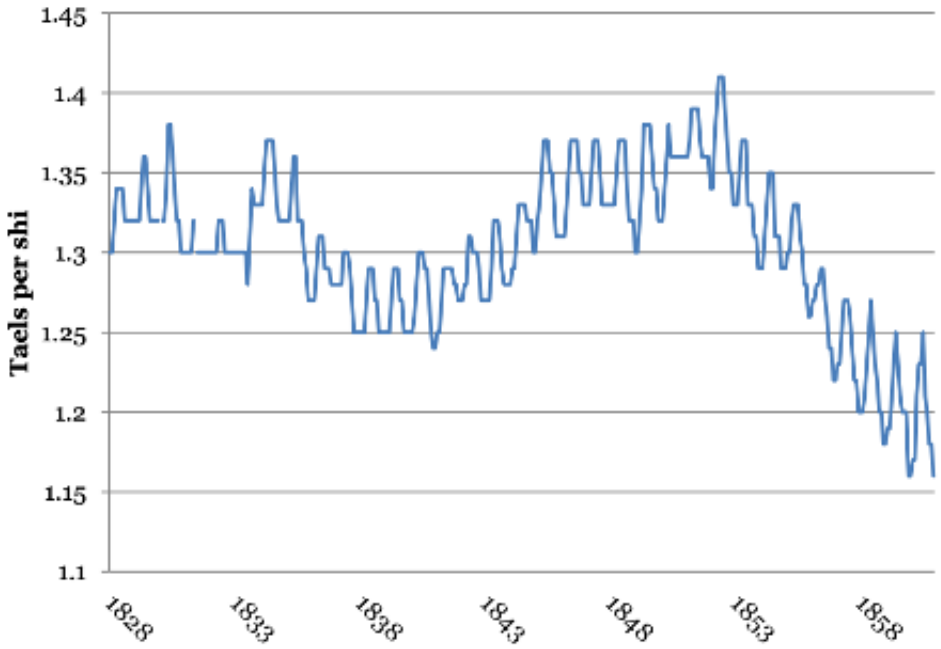


Between period 8 and period 12, storage level and price rise together, while after period 12 the price increase is accompanied by declining storage. The last unit of stored grain is withdrawn just before the new harvest arrives. The new grain supply causes a fall in price; in this way, storage has the consequence 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 equilibrium 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 the approach of computing interest rates from grain prices. In principle, the approach can be applied to other storable commodities. What makes grain particularly attractive in this context is that the cyclical price pattern of Figure A.1 is more discernible for grain than for other commodities given that grain is typically harvested

only once per year. An example of the cyclical price movements in the raw price data is given in Figure A.2.

Figure A.2: Monthly Rice Price in Guilin Prefecture, 1828-1860



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

A.2 Grain Prices

By the beginning of the 18th century, an extensive network of grain price reports had become a routine aspect of the Qing (1644-1911) bureaucracy. The government did not set prices, but compiled voluminous price observations. All 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), which starts the series in the year 1821.

Historical analysis and empirical studies both suggest that the data on prices are generally of high quality. For one, 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 by contemporaries 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 as an early warning system of areas of potential food crises to Qing officials, 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 for various purposes 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 sample covers regions in 20 provinces and 245 prefectures 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 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 and 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, often consists of 3 types of 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 to compute interest rates. 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 data checks suggest there is 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. First, we drop months for which the one-month price change is typically negative; which could occur, for example, because the harvest comes in, since these months do not aid in the estimation of the storage price gradient (see Figure A.1). Second, we focus on the central 98 percent interval of one-month price changes to reduce the impact of outliers.[17] Taking the average of one-month price changes in a given

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

year yields N = 64,627 carry costs which vary by prefecture, year, and grain.

Using multiple interest rate observations for a given prefecture-year combination, one for each grain price series available, strengthens the analysis given that grain prices are affected by idiosyncratic shocks. The storage cost approach yields more precise information on interest rates as the sample size grows (Keller, Shiue, and Wang 2020). As an alternative, we form the mean of all available interest rates at the prefecture-year level, in which case there are more than 15,000 observations, and clustering is at the prefecture. This leads to similar results, see Table 1, column (18). Employing the average prefectural interest rate leads also to similar results when we estimate geographic spillovers (Table A.6, column (3)).

These carry costs can be seen as estimates of annual interest rates inclusive of risk and physical storage costs.

A.3 Weather Data

Grain storage is sensitive to climatic conditions, and we employ historical weather data to separate the carry cost data into the components of physical storage cost and risk-inclusive interest rates, see equation (6). We exploit the fact that extreme weather is associated with higher storage costs for grain. Weather data come from published data by the State Meteorological Society (1981). The original materials were based on more than 2,200 local histories and gazetteer writings. See Figure A.3 for the historical information on weather in form of a contour map.

Figure A.3: Historical Weather Information for 1860

The 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 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 weather condition:

Table A.1: Weather Conditions and Grain Storage Costs

Weather Condition	N	Mean	Standard Deviation
Very Wet	6,631	7.855	11.677
Wet	17,538	7.187	10.582
Normal	23,753	7.228	10.577
Dry	12,977	7.449	10.629
Very Dry	3,728	9.380	12.324
All	64,627	7.450	10.935

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. All regressions with interest rates as the dependent variable reported in the paper account for physical storage costs by including a fixed effect for each of the five weather conditions.

A.4 Other Data

In addition to interest rates, we consider the following outcome variables. First, for Chinese banks we employ Jiang (2014) who reports the headquarters of banks by prefecture and year. This gives information on the entry, exit, and location of 232 Chinese-owned banks.[18] Second, information on newly established and the total number of industrial firms by prefecture and year comes from Du (1991), which is also our source for their capital investment. In addition, we employ information from Chang (1989, 1988a,b) on the number of firms that adopted machinery as well as steam engines.

Our information on the timing of treaty port openings is based on CMC (1938). In this analysis 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).

Information on the projects of the Self-Strengthening movement comes from Qian and Tan (1995), as reported by Elleman and Paine (2019). Thirty-six of the thirty-eight self-strengthening projects listed

[18]For 55 of them we do not know the exact year of entry, and we employ the last year of the emperor's reign instead.

(95%) are in our sample area. For a single project in the year 1874 we only know the province, Yunnan, and code this to be located in the capital city. The definition of our missionary variable is the fraction of counties in a prefecture with at least one Protestant missionary, based on Stauffer (1922).

Data on mass violence comes from Chan (1983). This information is from the Veritable Records of the Qing Emperors. It is a standard reference for all the memorials that the imperial court received regarding civil and military affairs—in short, news of all the events that crossed the emperor's desk. Chan identifies 6,580 incidents over the period, which includes data on riots of more than 5 participants, the extent of government action, as well as property damage. We employ a composite measure to identify peaks in the mass disturbance by province and year. A large portion of the incidents occurred between 1861 and 1865, attributable to the well-known disturbances of the Taiping Rebellion and the Nian Rebellion, but other incidents such as the Boxer rebellion (1899-1901) led to peaks as well.

The first measure of foreign capital supply, foreign direct investment, is the total number of foreign-owned firms in each treaty port (and thus prefecture), from CMC (1933).[19] The second is a measure of foreign banks, defined as the number of foreign banks' offices in a prefecture, based on Jiang (2014). Table A.2 shows summary statistics.

[19]Foreign firm data before the year 1872 is partly estimated.

Table A.2: Summary Statistics

	Mean	Standard Deviation
Panel A: Interest Rate Sample (N = 64,627)		
Interest Rate	7.450	10.935
Treaty Port Indicator	0.053	0.224
Customs Station Indicator	0.041	0.199
Consulate Indicator	0.048	0.214
Number of Treaty Ports	0.173	0.463
Number of Consulates	0.480	3.095
Missionaries	0.069	0.179
Mass Violence	0.819	1.538
Foreign-owned Firms	0.135	0.646
Foreign-owned Banks	0.034	0.223
Treaty Port Indicator (0, 150 km]	0.164	0.370
Treaty Port Indicator (150, 300 km]	0.323	0.468
Treaty Port Indicator (300, 450 km]	0.360	0.480
Treaty Port Indicator (450, 600 km]	0.440	0.496
Consulate Indicator (0, 150 km]	0.164	0.370
Consulate Indicator (150, 300 km]	0.314	0.464
Consulate Indicator (300, 450 km]	0.380	0.485
Consulate Indicator (450, 600 km]	0.424	0.494
Panel B: Firms, Banks, Investment, and Self-Strengthening (N = 15,327)		
Industrial Firms	0.047	0.268
New Industrial Firms	0.010	0.110
Capital Investment	0.044	0.491
Steam Engines	0.017	0.137
Industrial Machinery	0.031	0.222
Banks	0.107	0.393
Self-Strengthening Project	0.025	0.152

Notes: Panel A: Unit of analysis is prefecture-grain by year; Mass Violence in units of 100s; Foreign Firms and Foreign Banks in logs after adding one. Panel B: Unit of analysis is prefecture by year; all variables in logs after adding one.

B Additional Empirical Results

B.1 Balance Checks

Table A.3 compares treatment and control regions in the pre-treatment period. 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 typically not statistically significant as the p-values

indicate. Panel B of Table A.3 extends the analysis to the pre-sample period by showing results for population growth between 1776 and 1820 in the two sets of prefectures. We see that for both definitions of treatment, population growth in the treatment regions tends to be lower than in the control regions. This lack of evidence for positive selection is consistent with Fairbank's (1978) point that Shanghai, which arguably became the most strongly Western-influenced Chinese city, had been a relatively small city since the Yuan (1279-1368) period, and that Shanghai's population hardly changed between 1813 and 1852. Finally, we compare the two set of regions in terms of interest rate growth during the pre-Opium War period (Panel C). It turns out that the differences in typical interest rate growth between treated and control regions are relatively small and not significant. 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. This makes it unlikely that our analysis overestimates the impact of Western influence due to positive selection.

Table A.3: Pre-Treatment Characteristics of Treated versus Control Regions

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

Notes: Table gives means (growth) for the period 1821 to 1842 in panel A (C), and growth from 1776 to 1820 in panel B. 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 level and growth data based on authors' computations.

B.2 Likelihood of Western Influence

Our results generally employ inverse-probability weighted regression adjustment (IPWRA) to account for differences in the likelihood that a particular region would be chosen by foreigners as a treaty port or consulate location. The IPWRA weights are based on the predicted probability that a region would be subject to foreign influence based on differences across prefectures in terms of geographic and pre-sample characteristics. Table A.4 shows these probabilities.

Table A.4: The Probability of Foreign Influence in a Region

	Coefficient	Standard Error
Latitude	−4.76**	0.95
Longitude	−1.50	3.06
Population in 1776	0.65**	0.18
Pop'n 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 region ever had one or more treaty ports or consulates, zero otherwise. N = 365. Estimation by probit. Latitude, Longitude, and Population in 1776 in logs. Coastal and waterway access variables are indicators. Standard errors are heteroskedasticity-consistent. Significance at the 1/5% indicated by **/*.

Among the important predictors is location in the North-South dimension, with the negative coefficient for latitude indicating that Western interest tended to be in the south. We also see that regions whose population was relatively large or fast growing in the pre-sample period were more likely to be selected by Westerners than other regions. Also, consistent with Western interest in foreign trade, locations on the coast in the North were more likely than inland regions in the North. Finally, conditional on latitude, longitude, and access to the coast, location on the Yangzi river significantly increased the probability that a region would be chosen as treaty port or consulate location. This is consistent with the historical importance of the Yangzi for low transport-cost access to China's central heartland.

We employ a similar probit approach to separately predict the likelihood that a region would have (1) at least one treaty port and (2) at least one consulate during the sample period. In the restricted sample shown in Figure 6 (right side), only regions are included that score in the top third of the predicted probabilities to have both one or more treaty ports and one or more consulates.

B.3 Time-Event Study for Number of Industrial Firms

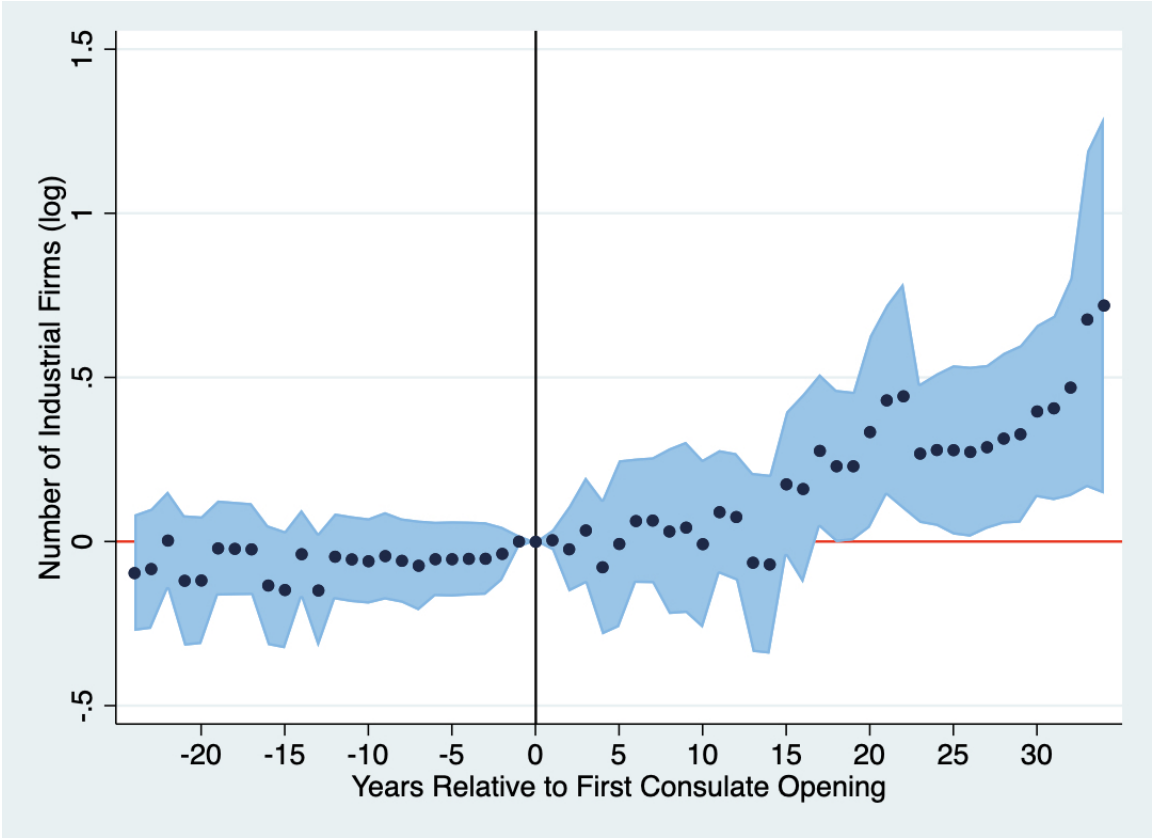
We employ a difference-in-differences approach to examine the impact of the West on the number of Chinese industrial firms and their investments. To examine possibly differential pre-trends we generalize

equation (3) to estimate a coefficient for every year relative to consulate openings

$$lfirm_{it} = \sum_{l} \beta_l \, 1\{t - E_i = l\} + \beta' \tilde{\Gamma} + \mu_t + \theta_i + \varepsilon_{it}, \tag{7}$$

where $lfirm_{it}$ is the log number of industrial firms in region i and year t plus 1, and the vector $\tilde{\Gamma}$ stands for geo-trends. Figure A.4 shows the estimates around the opening of the first foreign consulate.

Figure A.4: Consulate Opening and Industrial Firm Growth



Notes: Shown are coefficients and confidence intervals (95%) of the period fixed effects of equation (7) by OLS for an indicator variable that in a prefecture there is at least one foreign consulate.

We see that in the pre-treatment period the coefficients are typically close to zero, consistent with the absence of differential pre-trends. With the opening of consulates the coefficients start turning positive, although it takes over fifteen years until the effect becomes significant at standard levels. Figure A.4 provides evidence that foreign influence has increased the number of Chinese industrial firms. Note that the time-event coefficients in Figure A.4 are increasing relative to the first opening, in contrast to the coefficients in the interest rate event study (see Figure 4). This is in part due to the cumulative definition

of the dependent variable in Figure A.4, the total number of industrial firms.

B.4 Geographic Spillovers of Western Influence: Further Results

Table A.5 shows alternative specifications in the estimation of the geographic scope of Western influence. First, we employ a simple indicator for presence of treaty ports and consulates using distance bands of 200 kilometer width (see column (1)). The treaty port variable is negative at distances of up to 400 kilometers, while consulates exert a significant interest-lowering effect until 200 kilometers. At the same time, in the relative vicinity of the prefecture, up to 200 kilometers, consulates tend to reduce interest rates by more than treaty ports. There are no significant spillovers at a distance of 600 kilometers (column (2)). These findings are broadly similar to those with 150 kilometer distance bands in the text.

Table A.5: Geographic Spillovers from Western Influence: Robustness

	(1)	(2)	(3)	(4)
TP or Consulate Indicator	−2.458**	−2.458**		−3.111**
	(0.499)	(0.499)		(0.530)
TP Indicator (0, 200 km]	−1.033*	−1.037*		
	(0.437)	(0.447)		
Consulate Indicator (0, 200 km]	−2.227**	−2.225**		
	(0.442)	(0.442)		
TP Indicator (200, 400 km]	−0.828*	−0.823*		
	(0.336)	(0.333)		
Consulate Indicator (200, 400 km]	−0.263	−0.264		
	(0.294)	(0.295)		
TP or Consulate Indicator (400, 600 km]		−0.039		
		(0.335)		
No. of TP or Consulates, log			−1.650**	
			(0.235)	
# TPs (0, 150 km], log			−2.187**	
			(0.639)	
# Consulates (0, 150 km], log			−2.262**	
			(0.618)	
# TPs (150, 300 km], log			−3.339**	
			(0.542)	
# Consulates (150, 300 km], log			0.571	
			(0.554)	
# TPs (300, 450 km], log			−1.156*	
			(0.465)	
# Consulates (300, 450 km], log			0.510	
			(0.461)	
TP or Consulate Indicator (0, 150 km]				−3.431**
				(0.393)
TP or Consulate Indicator (150, 300 km]				−1.823**
				(0.383)
TP or Consulate Indicator (300, 450 km]				−0.204
				(0.293)
Mass Violence	0.091*	0.091*	0.089*	
	(0.043)	(0.043)	(0.042)	
N	64,627	64,627	64,627	63,337

Notes: Dependent variable is interest rate; estimation of equation (4) by OLS. Column (4) excludes observations with Japanese or Russian consulates. All specifications include prefecture-grain, year, and weather fixed effects, as well as geo-trends. Additional control variable in columns (1) to (3) is Missionaries; IPWRA applied. Robust standard errors clustered at prefecture-grain in parentheses. Significance at the 1/5/10% indicated by **/*/+.

Table A.5 shows also results based on log measures of Western influence (column (3)). They confirm that treaty ports exert their influence at distances of up to 450 kilometers, while consulates have a more geographically localized impact. Column (4) shows the specification underlying Figure 7.

Table A.6: Spillovers from Western Influence on Capital Markets and Chinese Firms

	(1)	(2)	(3)	(4)	(5)	(6)
	Interest Rate			Firms		New Firms
No. TP + Consulates	−0.187**	−0.148**	−0.228*	0.042**	0.044**	0.015**
	(0.044)	(0.025)	(0.112)	(0.011)	(0.011)	(0.005)
No. TP + Consulates (0, 100 km]	−1.681**					
	(0.276)					
No. TP + Consulates (100, 200 km]	−0.729**					
	(0.134)					
No. TP + Consulates (200, 300 km]	−0.439**					
	(0.117)					
No. TP + Consulates (300, 400 km]	−0.263+					
	(0.136)					
No. TP + Consulates (400, 500 km]	0.092					
	(0.106)					
No. TPs + Consulates (0, 150 km]		−1.082**	−1.052**	0.004	0.007	
		(0.182)	(0.378)	(0.012)	(0.013)	
No. TPs + Consulates (150, 300 km]		−0.641**	−0.658**		0.025*	
		(0.107)	(0.226)		(0.013)	
No. TPs + Consulates (300, 450 km]		−0.271**	−0.315+			
		(0.089)	(0.163)			
No. TPs (0, 200 km)						0.007
						(0.010)
No. Consulates (0, 200 km)						−0.004
						(0.011)
No. TPs + Consulates (200, 400 km]						
TP Indicator (150, 300 km]				0.073*		
				(0.012)		
Consulate Indicator (150, 300 km]				−0.036		
				(0.044)		
No. TPs (200, 400 km]						−0.007
						(0.009)
No. Consulates (200, 400 km]						0.015*
						(0.008)
Mass Violence	0.091*	0.094	0.758**	−0.002	−0.001	−0.001
	(0.042)	(0.102)	(0.284)	(0.002)	(0.002)	(0.001)
N	64,427	64,427	15,385	15,385	15,385	15,385

Notes: Dependent variable is given on top of column; estimation of equation (4) by OLS. All specifications include year fixed effects and geo-trends; weather fixed effects in specifications (1) to (3). Prefecture-grain fixed effects in specifications (1), (2), prefecture fixed effects in specifications (3) to (6). Additional control variable is Missionaries; IPWRA applied except in specification (2). Robust standard errors clustered at prefecture-grain (specification (1)) or prefecture (specifications (3) to (6) in parentheses. Specification (2) reports standard errors consistent with spatial dependence (cutoff 450 kilometers) in parentheses. Significance at the 1/5/10% indicated by **/*/+.

Results for distance bands of 100 kilometers are shown in Table A.6. We see that for distances up to 400 kilometers, treaty ports and consulates exert an interest-rate lowering impact (column (1)). Our main findings are robust to employing spatial-dependence consistent standard errors, see results in column (2). The impact of Western influence on regional capital markets has a scope of up to 450 kilometers also when

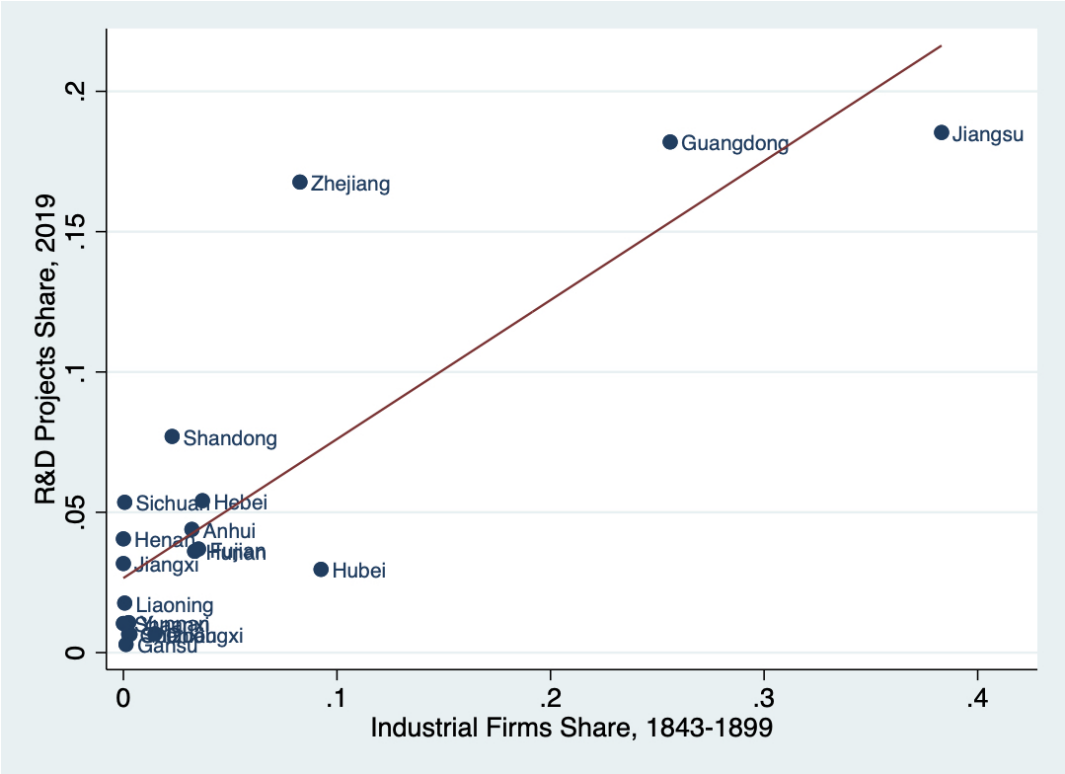
employing aggregate data at the prefecture level (column (3); note the lower number of observations). It is reassuring that our analysis is robust to employing the average interest rate of the prefecture.

The remaining three specifications of Table A.6 present spillover results on the number of Chinese industrial firms. We find evidence that Western influence has a positive spillover impact on the number of Chinese firms. For example, a higher number of treaty ports and consulates at distances between 150 and 300 kilometers increases the number of Chinese firms (column (5)), and consulates exert a positive influence at distances of up to 400 kilometers (column (6)). Overall, these spillover results are somewhat weaker than our spillover findings for interest rates. In part this appears to be due to the location of industrial firms being regionally concentrated compared to interest rate levels, which vary across regions more smoothly. A definitive answer to this question will likely have to await the availability of additional data.

Overall, the analysis summarized in Tables A.5 and A.6 shows that our finding of sizable geographic spillovers from Western influence in China is robust.

C Additional Material

Figure A.5: The Modern Economy, Then and Now



Notes: Shown are provincial shares of R&D projects and industrial firms for the periods given. Source for 19th century, see paper, and for 2019 R&D projects, China Provincial Statistical Yearbook.

Figure A.5 shows that the share of China's industrial firms during the 19th century treaty port era tended to be high in provinces that account for a relatively high share of China's R&D projects today. The correlation between the two variables is 0.85.

The following is a longer quote from Jiang Zemin's speech from which the quote at the beginning of the paper is taken. It marked the 80th anniversary of the founding of the Chinese Communist Party in 2001:

"From the Opium War (1840-42) to the founding of the Communist Party of China, and from the founding of the Party to the present, China has experienced two completely different periods of eighty years. In the first eighty-year period the feudal rulers surrendered the country's sovereign rights under humiliating terms, the whole [of] society was thrown into utter chaos caused by wars, the country became impoverished and weak, and the people lived in hunger and cold. In the second eighty-year period the Chinese people, under the leadership of the Communist Party of China, got united and unprecendently organized, overcame

numerous difficulties and won one victory after another in their revolutionary struggle...it is precisely the leadership of the Communist Party of China that has enabled the country to materialise the great historical transformation from the most miserable circumstances to a situation that promises a bright future."