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The legacy of nineteenth century treaties on the current trade of Chinese cities

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We examine the effect of treaty linkages established between Chinese cities and foreign countries during the nineteenth century on China's trade today. We hypothesize that these historical arrangements created relationship-specific capital that continues to facilitate trade. In the full sample of bilateral trade between 335 cities and 212 countries, there are significant linkage effects. However, ensuing analysis indicates that greater trade among cities and countries who are linked by treaties largely reflects the propensity of higher income partners to trade more with each other. These findings underscore the importance of controlling for trade complementarity related to the level of development of trading partners in cases where lack of time-series variation in the key explanatory variable prevents inclusion of bilateral fixed effects.

Keywords: trade; China; treaty ports

1. Introduction

Historical conditions can exert enduring influences on current economic relationships. A well-known example is the Acemoglu, Johnson, and Robinson (2001) finding that settler mortality in the colonial era led to different institutional arrangements that explain current differences in prosperity.[1] Head and Mayer (2014) report that on average, the existence of a colonial relationship (past or present) between two countries increases bilateral trade by 150%.[2] We contribute to the study of persistent effects of colonization by taking advantage of two somewhat unique features of China. First, unlike most of the rest of Asia, the country as a whole was not colonized, but specific cities were converted into colonies by Western powers and Japan. Second, Chinese customs data records the city from which exported goods originate. We use the Chinese experience to investigate whether treaty ports, forcibly established in the nineteenth century, influence contemporary international trading patterns of Chinese cities.

Starting with Britain's Treaty of Nanjing in 1842, a total of 14 foreign powers signed treaties with 58 different Chinese cities over the span of 70 years. These arrangements include treaty ports, port concessions and leased territories. Foreigners established schools and churches and introduced foreign laws and customs in settlements within the treaty cities. There was a large amount of foreign investment during

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the treaty port era. All these features of the period may have had enduring impact on bilateral relationships between treaty countries and the host cities. That said, the treaty port era and current times are separated by seven decades, two devastating wars (with Japan from 1937 to 1945, followed by civil war until 1950) and the economic isolation imposed by the communist government. It is far from obvious how bilateral linkages established a century ago might have survived such disruptions to facilitate trade today. Nevertheless, very long-run historical influences have been found in the literature – Alesina, Giuliano, and Nunn (2013) report that "societies that traditionally practiced plough agriculture today have less equal gender norms" – so we regard the existence of persistent treaty effects as an open question.

We use data on the trade of 335 Chinese cities with 212 trading partners for the 2000–2006 period to test the hypothesis that treaty linkages exert long-lasting impacts on trade. Using a gravity framework including fixed effects for each city and country, we estimate that a past treaty raises a city's imports by 76% and exports by 40% with the specific signatory country. However, when we consider restricted samples of cities and countries and control for economic complementarity related to the propensity to be a host or recipient of treaty arrangements, we find that the bilateral treaty effects lose their significance. There remains some evidence of a general increase in trade between cities and countries that were involved in *any* treaty arrangements in the period.

The only paper of which we are aware that considers the legacy of the treaty port era in promoting current trade is Keller, Li, and Shiue (2013) who focus on Shanghai, a treaty port established under the Treaty of Nanjing. In part of their analysis, they fit a gravity model to trade between Shanghai and 11 countries for the 1986–2009 period. They include current and historical FDI as covariates (along with distance, GDP, and, in some specifications, bilateral linkage variables such as common language). They interpret the result that both FDI variables are positive and significantly effective as evidence that the treaty port era generated a legacy promoting modern trade.

Recent papers investigate the economic development of treaty port cities in China over an extended period of time. Jia (2014) constructs a longitudinal data set of Chinese prefectures for 10 different years over the 1776–2000 time period to examine population and GDP growth. She identifies treaty port effects by comparing them to similar prefectures that did not include a treaty port and finds treaty ports enjoyed faster economic growth after the Open Door policy was enacted. Keller, Li, and Shiue (2011) use data from Chinese Maritime Customs service to examine treaty port trade over a similar long period of time. They chronicle many aspects of Chinese trade including a rapid increase in the number of goods traded after the establishment of treaty ports and the important but steadily declining role of Hong Kong in entrepôt trade. Unlike our study, neither paper considers the relationship between current bilateral trade and historical bilateral treaties.

Treaty ports in China can be considered a type of colonial expansion as they involved colonial powers such as Britain, France and Japan and occurred during the colonial period. A number of studies document persistent economic effects of colonization. Engerman and Sokoloff (2002) and Feyrer and Sacerdote (2009) document the influence of European colonization on the economic performance of the colonies. Head, Mayer, and Ries (2010) find that once colonial ties are severed, trade erodes steadily over the course of 30–40 years (a generation) but continues to be higher than trade between countries without a colonial history. The persistent effects of colonial histories may be related to common institutions. For example, ′L'opez de Silanes et al. (1998) emphasize that countries with different legal systems, i.e. based on British common law

or Roman civil law, offer different investor protections which affect their financial development. Colonialism created common legal systems, a feature that the gravity literature has established as a source of greater bilateral trade. Our analysis extends research on the effects of colonialization.

Our paper also relates to the literature showing effects of history-based trust and distrust on economic relations. In their study of 17 European countries, Guiso, Sapienza, and Zingales (2009) find that lower bilateral trust lead to less trade as well as less direct investment between two countries. Glick and Taylor (2010) study the effects of war on bilateral trade with data extending back to 1870 and provide evidence for large and persistent impacts of war on trade and global economic welfare. Che et al. (2015) investigate the long-run effect of Japanese invasion on China's contemporary trade with Japan. Using the civilian casualty rate across 28 Chinese provinces as the key explanatory variable, they find that a higher casualty rate is associated with lower Japanese trade and foreign direct investment. In our study, the treaties signed by Chinese under foreign pressure might have generated trade-reducing resentment or trade-enhancing familiarity.

Finally, our analysis contributes to studies examining the multilateral effects of bilateral linkages. An obvious type of multilateral effect of a bilateral linkage is trade diversion. A number of studies (e.g. Krishna 1998; Ornelas 2005) provide evidence on trade divergence for countries outside FTAs. On a more positive note, Saggi and Yildiz (2011) develop a theoretical model predicting that bilateral agreements can be stepping stones to multilateral liberalization. Multilateral effects of dollarization are identified in Lin and Ye (2010) who find that dollarization encourages bilateral trade between dollar-using countries and the US as well as multilateral trade among dollar-zone countries. Recent work by Morales, Sheu, and Zahler (2014) models interdependence of export markets via a concept they refer to as "extended gravity." The idea is that "export entry requires a costly adaptation process: some firms are better prepared than others to export to certain countries because these firms have previously served similar markets and have therefore already completed part of the costly adaptation process." If the cities that signed trade agreements are similar to each other, then it seems likely that the incremental sunk costs of entering the first such city will be higher than for subsequent entry. This will lead to patterns in which a given country tends to have high exports to all the formerly treated cities. Our study investigates multilateral effects of bilateral treaties by considering whether treaty port experience increases trade between countries and host cities even if they are not directly linked by a bilateral treaty.

The next section provides details on the timing and characteristics of the treaties we evaluate. Section 3 describes the trade data and explains how we specify the treaty indicator variables. In Section 4, we describe the empirical framework and report and interpret the results. The final section summarizes and discusses the implications of our analysis for research on the effects of historical variables.

2. Treaty ports, concessions and leased territories

We consider three types of agreements that provided specific foreign countries with special access to China: treaty ports, concessions and leased territories. The most common arrangement was the establishment of a treaty port. 77 treaty ports were opened in 58 cities with six foreign countries. Inside some of the treaty ports, areas of land called concessions were created where foreign merchants could reside and establish businesses. This provided access to China for countries other than the six that established

treaty ports. Finally, four cities (including Hong Kong) were occupied by five foreign countries as leased territories. We provide further detail on each arrangement below.

Before the nineteenth century, foreigners who came to China had to do business on Chinese terms. The Qing government was willing to grant favours to the foreign merchants and let them trade, but only under strict regulations.[3] As early as 1757, foreign merchants were restricted to the port of Guangzhou and found themselves bound by imperial decrees. Doing business through merchant syndicates called Hong is an example.[4] Foreign merchants were not allowed to deal directly with local people nor hire Chinese servants by themselves. Even their stay in Guangzhou were limited to the trading periods and restricted to a small area along the shoreline. Foreign merchants facing high prices and administration fees began to fight against this so-called Canton System and thus triggered the opium war and opening of treaty ports.

Starting from the 1842 Treaty of Nanjing, Western powers imposed a number of asymmetric treaties on China. As a result, China was forced to pay large amounts of reparations, open up ports for foreign merchants to conduct business, make concessions for foreign residency and lease territories to foreign countries (e.g. Hong Kong was leased to Great Britain). In the following 60 years, treaty ports were opened in more than 50 cities. Note that several treaty ports may locate in different areas within the same city. Some of the treaty ports, such as Ulan Bator (the capital of Mongolia), are no longer territories of China now. Though called "ports," many of them were not located along the coast or rivers but along the border with the Soviet Union.

Concessions (or settlements) are areas of land inside treaty cities designated for homes and businesses of foreign residents. The British concession in Shanghai opened in 1845 was the first foreign concession in modern China. In the following 60 years, 14 countries established almost 30 concessions in 12 treaty cities in China. Most of them were owned by one foreign country which had administrative power over both economic and political issues within its territory. Therefore, concessions are also referred to as a "state within a state." Public concessions in Shanghai and Xiamen were jointly held by several countries.

After the 1895 Sino-Japanese War, foreign powers competed to divide up China by means of leased territories. The UK, France, Germany, Russia and Japan held territories in four cities in China. In contrast to treaty ports where China retained territorial control, leased territories usually allowed foreign powers complete sovereignty. The leased territories were "rented" by foreign countries mainly for strategic and military purposes. They were much larger than concessions and more likely to include adjacent water areas. Governor Generals were assigned to practice foreign legislations in their "colonies."

In Appendix 1, Table A1 identifies the salient features of the different types of treaty arrangements, and Table A2 matches the 14 treaty countries to 55 host cities.[5] The primary arrangement was a treaty port, but more countries (14 vs. 6) were involved in concessions. All arrangements allowed foreigners to live and work. Broadly speaking, the extent of political and economic autonomy was greatest in leased territories and most limited in a treaty port arrangement.

The proposition that treaty port linkages influence current trade requires that (1) there exists trade-promoting and relationship-specific capital and that (2) this capital has been maintained over many generations. We discuss possible forms this capital could take below.

One obvious avenue for trade promotion is the creation of port infrastructure. Facilities to assist loading and warehousing were introduced. Railways or roads connecting treaty ports and scattered production areas were developed. With the establishment of the

Imperial Maritime Customs Administration in 1854, lighthouse and beacons were set up along the coast and larger rivers. However, this infrastructure, to the extent it persists today, is available to all trading partners and unlikely the source of *bilateral* trade promotion. In the empirical work, we will use city fixed effects and thereby capture general trade promotion associated with port infrastructure. Direct investment between recipient country j and host city i would be another source of trade-promoting capital. Being the only locations foreign businesses were permitted in China, host cities attracted many foreign firms, especially in banking and transportation industries. In 1844, 11 firms from Britain and the US established headquarters in Shanghai. The number of foreign companies increased to more than 120 in the following 10 years (Zhang 1993). Li, Xia, and Gu (1981) reports that the number of foreign firms grew from 343 to 579 from 1872 to 1892. Meanwhile, the number of foreign merchants expanded from 3673 to 9945.

Some of these trade-facilitating institutions managed to retain their business in China such as the success of Hong kong and Shanghai Banking Corporation (HSBC), originally a British company. Established in 1865 in the treaty port of Shanghai, HSBC remained business in China except for 1941–1945 period when all foreign invested banks were forced to leave Chinese market by Japan. In April 1955, HSBC handed over this office to the communist government and its activities were continued in rented premises. Today, HSBC has the largest service network among foreign banks in China.[6] In spite of all the disruptions to the economy of China, many foreign firms such as HSBC continued to operate. The development of trade-facilitating foreign service industries potentially provides a legacy that still benefits the bilateral trade today between treaty partners. One piece of supporting evidence for an FDI legacy affecting trade today is the finding in Keller, Li, and Shiue (2013) that countries with more FDI in Shanghai in 1921 have more trade with the city today.

Finally, the opening of treaty ports allowed host cities to get access to new technologies and products that could exert permanent influence on their trade structure. In particular, treaty cites might have developed manufacturing industries to suit the needs of their treaty partner. For example, Nield (2010) documented that a group of French engineers came to Fuzhou (one of the first five treaty ports opened due to the Treaty of Nanjing) in 1866 to launch shipyards, arsenals and special navy schools. These activities were supported by scholar generals in Qing government under the "Westernization Movement" which mainly took place in treaty ports. Although the movement failed at last due to the rigid feudal system, these attempts to learn foreign technologies broaden the eyes of Chinese businessmen and laid industrial foundations for further trade to be built on. After 1895, some industries appeared in treaty ports which were meant to bring in machinery, petroleum and transport equipment that China lacked. By improving the match between foreign demand and local supply, trade structure evolved to encourage trade between host cities and their industrialized treaty partners.[7]

Relationship-specific human capital also plays an important role in promoting bilateral trade.[8] Transactions require the matching of buyers and sellers, and familiarity with the business practices of each party is essential. From the point of view of a host city, there may be country-specific knowledge needed to conduct business effectively with a foreign country. This knowledge may be about culture and business practices or related to knowledge of particular legal institutions. French and the US treaties allowed foreigners in China to be governed by the law of their own country instead of Chinese law, thereby exposing the treaty cities to foreign business practices and institutions. Likewise, there may be specific knowledge required to conduct business in a particular host city, and treaty countries gained access to this knowledge.

Trust and reputation are also important. Foreign powers established municipal authorities and schools and provided public services such as street cleaning and police in treaty ports. The treaty port era brought a large number of foreign missionaries who built schools to teach maths, modern science and languages. By 1860, there were 90 Catholic and 50 Christian primary schools established in the first five port cities (Gu 1981).[9] Moreover, Chinese and foreigners were not separated since many Chinese compradors (or middlemen), rich merchants or even refugees also lived in foreign concessions (Murphey 1975). While the individuals in the treaty era are no longer around, the positive "reputation" could persist and still influence trade today. As pointed out by Jia (2014), human capital and social norms seem to be more important than geography and tangible institutions. On the other hand, with its vast area and insular nature, China was too self-contained to be strongly affected by Western traders outside treaty ports. The spread of Western ideas and techniques were deterred by both long distance and psychological resistance of Chinese people. Therefore, trade-facilitating human capital established during the treaty port era may have been confined to the cities with treaty linkages and did not extend to non-treaty cities.

Persistent relationship-specific capital provides a mechanism for historical treaty linkages to exert influence on current bilateral trade. However, whether this capital still persists is uncertain given the interlude of war and economic isolation between the treaty port era and today. In the years after the establishment of treaty linkages, China suffered from constant war and social turmoil.[10] Foreign investments were either evacuated from China or handed over to the communist party. Foreign trade was carried out under the planned economy. In the remainder of the paper, we confront the hypothesis of persistent treaty linkage effects with the data.

3. Data description

We combine two datasets. First, China's current trade data are drawn from the database constructed by China's General Administration of Customs. Disaggregated monthly transaction level data are collected for each HS-8 digit product from 2000 to 2006. The number of observations each month ranges from about 78,000 in January 2000 to over 230,000 in December 2006. The data set provides detailed information on trade status (import or export), quantity, trade value, origin and destination of each transaction, transportation mode, firm associated with each transaction, firm location, ownership (domestic, state owned or foreign). Since our variable of interest – treaty ports – does not vary over time over our period of study, we simply aggregate the monthly flows over the 2000–2006 period to produce a cross-sectional data set.[11] We observe a higher incidence of positive export flows than import flows: 37,045 city–country pairs are linked by exports and 18,055 pairs take part in importing.

The top five trading partners in terms of Chinese cities' export and import value are presented in Table 1.[12] Exports from Shenzhen to the US and imports from Japan to Shanghai lead the bilateral trade activities in China. While Shanghai was home to concessions to the US, UK and France, Shenzhen was a small city in the treaty era.[13]These examples point to the importance of city and country fixed effects to capture size differences.

Data and references used to construct treaty linkages are primarily collected from the history book "Treaty Ports and Concessions in Modern China" (in Chinese) by Zhang (1993). The source identifies 77 treaty ports with the partner country(ies), the year established and the location. Another source is Zhang (1993) who documents

Table 1. Top trading partners.

City	Country	Value (billion USD)
Export from China		
Shenzhen	US	25.56
Shanghai	US	23.47
Dongguan	US	14.96
Shanghai	Japan	14.02
Suzhou	US	12.99
Import to China		
Shanghai	Japan	19.36
Shanghai	US	12.61
Shenzhen	Japan	11.62
Shenzhen	Korea	9.89
Suzhou	Korea	9.11

concessions and leased territories.[14] Treaty linkages used in this paper were reorganized based on Zhang (1993) by adjusting cities more than a hundred years ago to their current locations and municipal cities.[15]

As previously discussed, recipient countries established links to Chinese cities via treaty ports, concessions and leases. In some cases, a recipient country had established multiple arrangements over time (e.g. Great Britain had a treaty port in Hong Kong as well as a subsequent lease). Table 2 displays the number of city links for each of the 14 recipient countries. A full accounting of the arrangements appears in Appendix 1. Great Britain was linked to 24 cities. It established treaty ports (only) in 16 cities, had a treaty port as well as a concession in 7 cities, along with its port treaty and lease in Hong Kong. Japan had arrangements with 22 cities, followed by France and Russia who were linked to 13 and 10 cities, respectively. Seven countries – Austria, Belgium,

Table 2. Number of city linkages, by type and recipient country.

	Port	Concession	Lease	Port and concession	Port and lease	Total
United Kingdom	16	0	0	7	1	24
Japan	12	5	2	3	0	22
France	7	4	0	1	1	13
Russia	7	2	0	0	1	10
United States	2	3	0	0	0	5
Germany	0	3	0	0	1	4
Austria	0	1	0	0	0	1
Belgium	0	1	0	0	0	1
Denmark	0	1	0	0	0	1
Italy	0	1	0	0	0	1
Netherlands	0	1	0	0	0	1
Norway	0	1	0	0	0	1
Spain	0	1	0	0	0	1
Sweden	0	1	0	0	0	1
Total	44	25	2	11	4	86

Denmark, Italy, Netherlands and Norway – only had a concession in the public concession in Xiamen.

Figure 1 provides a map of the cities that host treaty ports, concessions and leases. We identify treaty ports with black dots, concessions with blue squares and leased territories with red triangles. All the other cities included in our sample are represented with grey dots. We observe that, compared with the distribution of all the cities in China, treaty ports were concentrated in coastal cities and along the Yangzi River. Some located along the "Silk Road" as well as near the northern and western border of China. Aside from Tianjin in the North, concession cities appear along the Yangzi River or the Southeast coast. Leased territories were chosen in four coastal cities. Three of them were close to the capital city Beijing, while the fourth (Hong Kong) guards the South China Sea.

4.   Specification and results

A straightforward way to test the effect of treaty linkages on current trade is to estimate a gravity type, bilateral trade equation using year, country and city fixed effects:

$$\ln(X_{ij}) = \beta \mathrm{BTL}_{ij} + \delta \ln(\mathrm{Dist}_{ij}) + \mathrm{EX}_i + \mathrm{IM}_j + \epsilon_{ij} \qquad (1)$$

where X_{ij} represents trade between city i and country j. We aggregate trade over the 2000–2006 period and consider exports (from cities) and imports (to cities) separately. The bilateral treaty linkage dummy BTL_{ij} equals 1 if city i and country j are linked by a treaty. Dist_{ij} is the geodesic distance between city i and country j. EX_i and IM_j are city and country fixed effects, while E_{ij} is the idiosyncratic error. We cluster standard errors at the city level. All observations correspond to city–country dyads.

There is considerable heterogeneity in the types of linkages between host cities and recipient countries. As shown in Table 2, linkages can be in the form of treaty ports, concessions or leased territories and there are many cases of multiple links. We
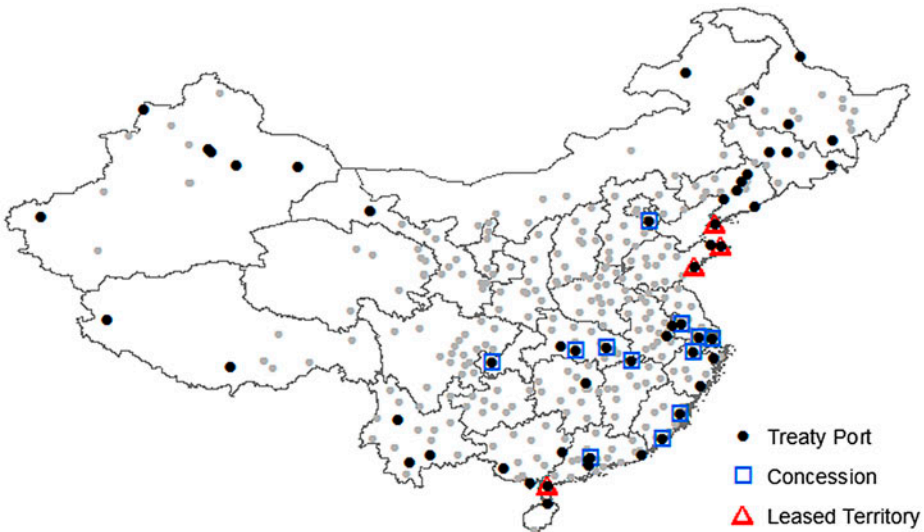

Figure 1.   Geographic distribution of host cities.

experiment with different ways of defining BTL_{ij}. First, we define five variables that correspond to the five different arrangements displayed in Table 2: port only (P); concession only (C); lease only (L); port and concession (PC); and port and lease (PL). Estimating different effects for each of the five arrangements provides flexibility but poses a challenge for identification due to limited variation. We also define two aggregate forms of BTL. The first is $T_{\max ij}$, a binary variable, equal to the maximum value across P, C, L, PC, and PL. That is, $T_{\max ij}$ turns on so long as there is any type of BTL between city i and country j. We also calculate $T_{\text{sum}ij}$ as the sum of the P + PC, C + PC and L + PL dummies. It therefore can take the values of 0 (no linkage), 1 (for P, C and L cities) or 2 (for PC and PL cities) .

The results of the different linkage specifications appear in Table 3. The first three columns show results for city imports and the second three exports. Columns (1), (2), (4) and (5) show that $T_{\max}$ and T_{sum} enter significantly. However, the significance of the linkage variables is higher for imports (1% significance) than for exports (10% significance). Based on R^2 and root-mean squared error, we observe both specifications fit the data equally. Columns (3) and (6) reveal generally positive effects of each of the five types of arrangements. Significant effects are exhibited for ports (10%), concessions (1%) and ports and concessions (1%) in the case of imports, whereas in the export regressions, concessions (10%) and port and lease (5%) are significant.

Table 3 indicates that historic treaty linkages are associated with more current trade. Since the specifications include country and city fixed effects, a linkage leads to more trade than what is observed on average for that country and for that city. Specifying linkages as either $T_{\max}$ or T_{sum} provide equivalent fit to the data. We use $T_{\max}$ hereafter because it is slightly easier to interpret. Exponentiating gives the trade multiplier for having had some type of BTL. Columns (1) and (4) suggest that a BTL of any kind raises imports and exports of a city by 76 and 40%, respectively. These magnitudes are in line with coefficients estimated for *current* regional trade agreements. Averaging 108 estimates that use origin and destination fixed effects Head and Mayer (2014) find an average RTA effect of $\exp(0.36) - 1 = 43\%$. The remarkable aspect of our results is that the agreements considered here have been inoperative since World War 2.

In the initial specification, we include trade between all countries and cities. To explore robustness of the results to different samples, we consider two sub-samples: (1) all cities and only the 14 countries that had some type of treaty linkage (which we refer to as "recipient" countries) and (2) all countries and only the 55 cities with some linkage ("host" cities). As before, we report results separately for imports (columns 1 and 2) and exports (3 and 4). Table 4 shows that the results change dramatically: the coefficients on $T_{\max}$ shrink and become statistically insignificant in both sub-samples. History's shadow has all but disappeared.

The contrasting results in Tables 3 and 4 can be reconciled via a data generating process in which recipient countries trade more with *any* host city, regardless of whether they had a linkage with the host city. To see this, let H_i be a dummy variable indicating that city i has been host to one or more treaties and R_j indicates that country j has received treaty privileges from at least one Chinese city. Neither dummy can be identified, of course, in a model with i and j fixed effects. However, we can estimate their interaction, $H_i R_j$. The interacted variable is a binary variable identifying a pairing of any host city and any recipient country, not just those who were bilaterally linked by an actual treaty. The augmented specification is

$$\ln(X_{ij}) = \beta BTL_{ij} + \gamma H_i R_j + \ln(\text{Dist}_{ij}) + EX_i + IM_j + \epsilon_{ij} \qquad (2)$$

Table 3. Bilateral treaty linkage effects.

	(1)	(2) City imports	(3)	(4)	(5) City exports	(6)
T_{max}	0.564*** (0.174)			0.334* (0.181)		
T_{sum}		0.423*** (0.135)			0.255* (0.131)	
Port (P)			0.431* (0.244)			0.141 (0.197)
Concession (C)			0.832*** (0.294)			0.664* (0.363)
Lease (L)			0.264 (0.584)			0.367 (0.578)
P&C			0.771*** (0.291)			0.320 (0.221)
P&L			−0.164 (0.603)			0.344** (0.142)
ln Dist	−1.614*** (0.099)	−1.614*** (0.099)	−1.615*** (0.099)	−1.204*** (0.085)	−1.205*** (0.085)	−1.205*** (0.085)
Number of obs.	18,055	18,055	18,055	37,045	37,045	37,045
R^2	0.490	0.490	0.490	0.672	0.672	0.672
RMSE	2.490	2.490	2.490	1.588	1.588	1.588

Note: Standard errors in parentheses.
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Table 4.   Restricted sample.

	(1)	(2)	(3)	(4)
	Imports		Exports	
	Recipients	Hosts	Recipients	Hosts
Bilateral treaty linkage ($T_{\max ij}$)	0.135	−0.086	0.025	0.114
	(0.161)	(0.202)	(0.126)	(0.176)
ln Dist_{ij}	−0.941***	−2.077***	−0.069	−1.371***
	(0.263)	(0.175)	(0.258)	(0.185)
Number of obs.	3903	4686	4072	7668
R^2	0.454	0.648	0.636	0.764
RMSE	1.543	2.335	1.244	1.472

Note: Standard errors in parentheses.
*** $p < 0.01$.

The parameter γ (where the Greek g is a mnemonic for "group" or "generalized" effect) represents the additional trade between any host city when exporting to any recipient country. Meanwhile, β is the incremental effect of a bilateral treaty link. For a country with a bilateral treaty link, the total trade effect is $\gamma + \beta$. In Equation (1), the estimate $\hat{\beta}$ captures both the bilateral and the group effects. When we confine the sample to recipient countries only, the $R_j = 1$ so $H_i R_j$ becomes an i-specific term that is absorbed by the city fixed effect. Similarly, when we confine the sample to host cities only, the $H_i = 1$ for all observations so the $H_i R_j$ term becomes j-specific and is fully captured by the country fixed effect.

If the $H_i R_j$ term belongs in the specification, the estimates of β listed in Table 4 are unbiased, whereas estimates shown in Table 3 are upwardly biased because the fixed effects fail to absorb the $H_i R_j$ term. The results in Table 4 indicate that β is small and not significantly different from zero. Receiving favourable treatment is associated with higher trade with all host cities and having a direct link has a negligible additional effect. The lesson we take from these results is that the sample matters even if importer and exporter fixed effects are included in the specification. Unobserved bilateral linkages lead to bias. Unfortunately, in cases such as this where the variable of interest is historical does not vary over the time frame of the estimation, it is impossible to include bilateral fixed effects.

What is the source of these group effects that appear to expand trade between recipient countries and host cities even in the absence of a direct treaty link? Port infrastructure can be ruled out because, if it expanded trade generally, it would be absorbed in the city fixed effect. A possible explanation is that host city industrial structure changed in a manner that is conducive to trade with recipient countries but not non-recipient countries. This may be explained by the former being higher income than the latter. Alternatively, the experience gained through participation in a treaty arrangement might have created knowledge useful for trade between host cities and recipient countries (group benefits). Figure 2 illustrates the coexistence of bilateral treaty linkages (red solid lines) and their 3rd party effects on countries and cities involved in port arrangements (blue dash lines). In the diagram, country F has a treaty with city C that enables trade with host cities A and B (but not non-host city D).

One important source of group benefits is the Unilateral Most Favored Nation clause. As stated in the treaty with UK in 1843, "additional privileges" granted to
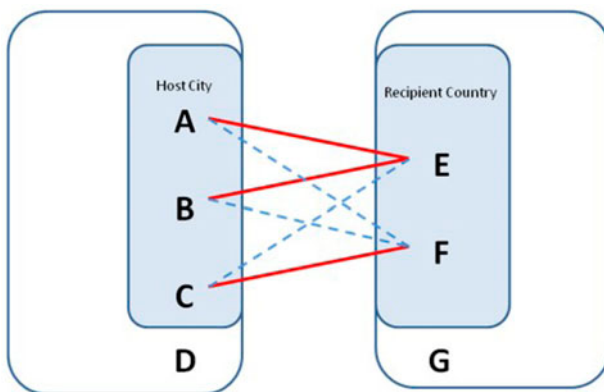
Figure 2.   Bilateral and group linkages.
Notes: Bilateral linkages between pairs of host cities and recipient countries determined in treaties are denoted by red solid lines, while group linkages are represented by blue dash lines. Note that city D and country G are non-host city and non-recipient country, respectively.

foreign countries were to be "extended to and enjoyed by British subjects." Under this condition, treaty ports opened by one country was not a private property but shared with any other country who obtained the privilege of UMFN. From 1843 to 1896, at least six countries seized UMFN with the Qing government.[16] Even for countries without UMFN, business activities were largely welcomed in foreign concessions owned by other countries. Zhang (1993) provides evidence of British concessions where merchants from other foreign countries were allowed and welcomed to operate. While preferential access under UMFN is not relevant for trade today, the knowledge and experience developed during trade under UMFN may persist.

Thus far, we have only compiled indirect evidence that trade is higher between any recipient country and any host city ($\gamma > 0$). We can explicitly measure γ by estimating Equation (2) using the full sample. The estimation results are shown in Table 5. Columns (2) and (4) present results for imports and exports for the group linkage variable H_iR_j. It is large and statistically significant (1% level). Host city imports from

Table 5.   Bilateral and multilateral effects.

	(1)	(2)	(3)	(4)
	Imports		Exports	
Treaty link ($T_{\max}$)	0.564***	0.167	0.334*	0.020
	(0.174)	(0.167)	(0.181)	(0.173)
Host w/recipient (HR)		0.546***		0.390***
		(0.144)		(0.103)
ln Dist	−1.614***	−1.612***	−1.204***	−1.204***
	(0.099)	(0.099)	(0.085)	(0.086)
Number of obs.	18,055	18,055	37,045	37,045
R^2	0.490	0.490	0.672	0.672
RMSE	2.490	2.488	1.588	1.588

Note: Standard errors in parentheses.
*$p < 0.1$; ***$p < 0.01$.

recipient countries are 73% higher, and their exports to recipient countries 48% higher than city–country pairs without group linkages. Bilateral treaty linkages lose their significance.

We have observed that treaty linkages confer group benefits between recipient countries and host cities. The presence of a direct bilateral link appears to have no significant impact on bilateral trade. In the discussion above, we offer complementary industrial structure and knowledge as explanations. These sources of group benefits may or may not be "caused" by historical treaty arrangements. To further push on the results, we conduct falsification exercises. Our idea is to match 14 placebo recipients to the 14 true ones and 55 placebo cities to the 55 true ones.

In order to identify the placebo entities, we estimate two probit regressions, one for countries and the other for hosts, where the dependent binary variable is coded as one for real recipients and hosts and zero otherwise. For both regressions, we use GDP and per capital GDP (both logged) as size and income variables. In the country regression, we add (log) distance from China and we add a binary variable indicating coastal for in the city regressions. We have data for 185 countries and 332 cities. Table 6 displays the results. Column (1) reveals that both GDP and per capita GDP are significant, but distance is not. The latter result is likely because recipient countries Russia and Japan are close to China, whereas the remaining 12 recipients are distant. Per capita GDP and a location on the coast matter determine the likelihood of being a host city.

We identify the placebo countries and cities by generating predicted probabilities based on the probit regressions and choosing countries and cities with the highest probabilities among those that did not have actual treaties. The probits do well in predicting the real recipients and links: 13 of the 14 recipients are among the 17 countries with the highest predicted probability (the 14th country is Russia and ranks 23rd). Among the 50 cities with highest predicted probabilities, 21 are actual host cities. The top four placebo countries (in terms of predicted probabilities) are Canada, Australia, Switzerland and Korea. A complete list of the ranking of placebo and true countries according the probit predictions appears in Appendix 1.

We construct two sets of group variables incorporating our placebos and add them to the specification. $H_i R_j^p$ equals one when trade is between a true host and a placebo recipient. $H_i^p R_j$ equals one when trade is between a true recipient and a placebo host. Table 7 reports results for imports and exports. The first set of results repeats the

Table 6. Probit prediction of treaty recipients and hosts.

	(1) Countries	(2) Cities
ln GDP	1.023***	0.120
	(0.224)	(0.109)
ln GDP per capita	0.808**	0.264**
	(0.380)	(0.128)
ln Dist	−0.002	
	(0.515)	
Coastal		0.619***
		(0.223)
Number of obs.	185	332

Note: Standard errors in parentheses.
**$p < 0.05$; ***$p < 0.01$.

Table 7. Placebos and propensities.

	City imports			City exports		
	(1) True	(2) Placebos	(3) Propensities	(4) True	(5) Placebos	(6) Propensities
Treaty (T_{max})	0.167	0.144	−0.031	0.020	0.015	−0.099
	(0.167)	(0.167)	(0.209)	(0.173)	(0.173)	(0.194)
True HR	0.546***	0.942***	0.334**	0.390***	0.531***	0.237**
	(0.144)	(0.170)	(0.152)	(0.103)	(0.114)	(0.110)
HR^p		0.720***			0.324***	
		(0.178)			(0.098)	
H^pR		0.812***			0.426***	
		(0.136)			(0.118)	
$\mathbf{P}(H) \times \mathbf{P}(R)$			3.682***			2.309***
			(0.582)			(0.552)
ln Dist	−1.612***	−1.604***	−1.596***	−1.204***	−1.202***	−1.195***
	(0.099)	(0.098)	(0.096)	(0.086)	(0.086)	(0.084)
Number of obs.	18,055	18,055	18,055	37,045	37,045	37,045
R^2	0.490	0.493	0.492	0.672	0.672	0.672
RMSE	2.488	2.483	2.484	1.588	1.587	1.586

Note: Standard errors in parentheses.
**$p < 0.05$; ***$p < 0.01$.

specification without placebo variables for comparison and columns (2) and (5) show results with the placebos included. We observe that the placebo group effects are positive and significant in all cases. Their magnitude is somewhat smaller than the "true" group effects. The difference between the true and placebo effects is borderline significant in some cases. In columns (3) and (6), we add a variable measuring the "propensity" for having a group effect. $\mathbf{P}(H_i) \times \mathbf{P}(R_j)$ is the product of the probit propensities for city i and country j.[17] Columns (3) and (6) show the results when we replace the placebo group variables with the propensity variable. The results reveal that this propensity has a significant positive effect on trade. Also, once we control for propensity, the true group effect, $H_i R_j$, is now significant at the 5% level for both imports and exports.

The results of our falsification exercise reveal trade complementarity between levels of development of trading partners. The complementarity is evident when we match the true host cities to high-income placebo countries and observe a high level of bilateral trade. Likewise, true recipients trade more with developed placebo hosts. This complementarity also appears when we introduce a variable calculated as the product of the predicted probabilities, probabilities mainly reflecting per capita GDP. This complementarity may be viewed as a type of Linder effect.

Controlling for the economic complementarity of trade partners is crucial in our analysis as relatively developed cities and foreign countries established nineteenth century treaty linkages. The complementarity could be captured and the bias avoided in a specification with bilateral fixed effects. However, in cases such as ours where there is no temporal variation in the key bilateral variable of interest, bilateral fixed effects are infeasible. Hence, researchers need to be especially careful about the choice of sample and specification. One option is to combine the treated pairs with a similar set of control pairs using some type of matching scheme. Another option is to introduce a bilateral variable such as the product of the partner country per capita GDPs. Interestingly, in standard gravity models, country incomes enter multiplicatively and are therefore absorbed by country fixed effects in the linear in logs transformation. Thus, the inclusion of a GDP product term requires a non-standard functional form such as the product of propensities that we have introduced in this paper.

5. Conclusion

This paper examines the effect of treaty linkages established between Chinese cities and foreign countries during the nineteenth century on China's current bilateral trade. We hypothesize that historical linkages may exert contemporary effects by some form of persistent capital that lowers trade costs. Using data on the trade of Chinese cities, we find initial evidence that treaties are associated with substantially higher trade today. However, once we add additional controls allowing for higher trade among groups of trading entities, the bilateral linkage effect disappears.

We believe these empirical results provide a useful lesson for gravity estimation of policy effects. The sample of "control" trading partners matters. We find strong results for bilateral linkage effects when we use all countries and cities in the data set, but these results disappear in restricted samples. Essentially, even though we employ country and city fixed effects in all specifications, they cannot capture unobserved bilateral effects that may be correlated with the variable of interest. In our case, we determine that the unobserved bilateral influence was related to a complementarity between the levels of development of trading partners resulting in higher trade.

While we do not find that a historical treaty link between a Chinese city and foreign country is associated with more trade today, there is some evidence of group effects: rade is higher among the group of countries and cities that were involved in treaty arrangements. We propose two possible explanations for the observed group effects. First, participation in a treaty arrangement changed the industrial structure of cities party to a treaty in a manner that continues to facilitate economic exchange today. Second, the experience gained through participation in a treaty arrangement created knowledge that has passed down through generations. Theoretical underpinnings of group effects are developed in recent research of Morales, Sheu, and Zahler (2014) modelling the interdependence of export markets. Our results are consistent with the proposition that bilateral linkages promote multilateral trade by generating group effects.

Disclosure statement

Notes

1. Nunn (2009) reviews a range of additional evidence for history effects on economic development.
2. The mean of 147 estimated coefficients from the literature is 0.92.
3. The Qing Dynasty (1644–1911) is the last imperial dynasty of China.
4. The term Hong derives from a Chinese word meaning company. A Hong was a union of authorized merchants with monopoly power over business with foreign traders. Firms belonging to Hong were licensed by the government and paid large sums of fees for their positions. They collected fees and duties from foreign merchants, transmitted government decrees and supervised foreign traders' business activities.
5. The 77 treaty ports map into a smaller number of modern Chinese cities.
6. See Guo (1992) "Main activities of HSBC in China" in "Concessions of foreign powers in China" (in Chinese) for a detailed description of business activities of the HSBC in modern China.
7. At the same time, the endowment of host cities also affect the selection of treaty ports. The British, for instance, aimed those places where large quantities of tea and silk could be obtained. Xiamen, Fuzhou and Ningbo were chosen as treaty ports by the British since they located nearer than Guangdong to the tea-producing areas (Murphey 1975). However, we need not worry about any selection effect on bilateral trade today since tea and silk no longer feature China's present trade structure.
8. Evidence of the influence of relationship-specific human capital is found in the trade and immigration literature initiated by Gould (1994) and Head and Ries (1998). Immigrants are associated with more trade with their countries of origin, perhaps because they lower transactions costs.
9. The first five treaty ports opened by Treaty of Nanking are Guangzhou, Xiamen, Fuzhou, Ningbo and Shanghai.
10. For example, during the Second Sino-Japanese war (1937–1945), China's foreign trade was primarily controlled by Japan. From 1946 to 1948, the two parties of China were engaged in a civil war and the US dominated China's foreign trade. The sovereignty of foreign trade was finally given back with the establishment of the People's Republic of China when trade was mainly centralized or strictly regulated within the planned economic regime.
11. Alternatively, we could have aggregated by year and clustered standard errors at the country–city level to account for correlated errors. Since trade between countries and cities might be volatile, we decided summing over the years was better to smooth the data.
12. Note that Hong Kong, Macao and Taiwan (HMT) are not included in the China's customs data and are therefore excluded from our ranking here.

13. After being designated as a Special Economic Zone in 1980, its population soared from about 300 thousand to over 10 million.
14. We also cross validated treaty linkages information documented in this book with other sources such as Li (2012) and Wikipedia.
15. Hong Kong and treaty ports in Taiwan are excluded from our sample since they're considered foreign in China's custom statistics. But they do deserve a careful examination. Some cities used to be a part of the Qing empire now belong to Mongolia or Russia and therefore dropped from our sample. Further, with the process of urbanization, different cities in the nineteenth century now consist of the same city are recorded only once in our list.
16. Please refer to Li (2012).
17. This product is coded as zero for the countries and cities for whom we do not have data for the probit regressions. They are very small entities.

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Appendix 1

Table A1. Description of treaty arrangements.

	Treaty port	Treaty concession	Leased territory
Number of cities	55	12	4
Number of recipients	6	14	5
Time frame	1842–1924	1845–1902	1898–1914
Expatriate presence and commercial freedom	Merchants were allowed to trade with anyone and rent residences from local people or build their own houses in "settlements" granted by the government. Nominal land rents paid to the government[a]	Concessions are usually several square kilometres large. Government from recipient countries rented the area from China and then sublet parts of the land to foreign merchants or missionaries. Merchants from countries other than the recipient of the concession were also welcomed to operate in the concession[b]	They could be several hundred square kilometres large and usually contained adjacent water areas. Military occupation without rent or duties
Governance			
Commercial law, taxes and duties	Tariffs were set together by the government and foreign recipients. Local Chinese officials owned the right to collect duties and execute law enforcement. Consuls from recipients could intervene if foreign residents were involved in criminal activities and disputes	Municipal councils and boards of directors consisting of consuls and elected merchants from the recipient country were in charge of local administration (fiscal regulation, taxation, policing, infrastructure, etc.)	Military occupation and full governance (civil law, taxation, police, etc.) Recipients of leased territory possess judicial authority over all cases no matter the citizenship of the defendant, whereas Chinese could be tried under Chinese law in concessions
Commercial and residential property development	Foreigners were allowed to rent or build residences, consulates, business offices, banks, churches, warehouses, schools and hospitals, renovate road, port and other infrastructure within the granted area	Same as treat ports	Recipients were allowed to build railways and extract natural resources in addition to those rights obtained by treaty ports

[a]Foreigners were not allowed to stay overnight in cities without treaty ports.
[b]For example, more than 1300 Japanese citizen (working for 20 Japanese firms) lived in the British concession in Hankou in 1905 (Zhang1993, 80).

Table A2. Treaty linkages.

RC	Port	Year	RC	Port	Year	RC	Concession	Year
UK	Shanghai	1842	Japan	Suzhou	1896	US	Xiamen^p	1902
	Guangzhou	1842		Hangzhou	1896	France	Shanghai	1849
	Ningbo	1843		Jingzhou	1896		Guangzhou	1861
	Fuzhou	1844		Dandong	1903		Tianjin	1861
	Xiamen	1844		Hulunbeier	1905		Hankou	1896
	Shantou	1860		Shenyang	1905		Xiamen	1902
	Tianjin	1861		Dandong	1905	Japan	Hangzhou	1896
	Yingkou	1861		Liaoyang	1905		Suzhou	1897
	Zhenjiang	1861		Tieling	1905		Tianjin	1898
	Jiujiang	1861		Changchun	1905		Hankou	1898
	Yantai	1861		Jilin	1905		Jingzhou	1898
	Wuhan	1861		Yanbian	1905		Xiamen	1899
	Wenzhou	1876		Haerbin	1905		Fuzhou	1899
	Wuhu	1876		Qiqihaer	1905		Chongqing	1901
	Yichang	1876		Mudanjiang	1905		Xiamen	1902
	Beihai	1876		Heihe	1905	Germany	Tianjin	1895
	Chongqing	1890		Yanbian	1909		Hankou	1895
	Rikaze	1893	Germany	Qingdao	1898		Xiamen	1902
	Foshan	1897	Russia	Tacheng	1851	Russia	Hankou	1896
	Wuzhou	1897		Kashi	1860		Tianjin	1900
	Baoshan	1897		Shizuishan	1881	Denmark	Xiamen^p	1902
	Weihai	1898		Wulumuqi	1881	Austria	Xiamen^p	1902
	Changsha	1902		Tulufan	1881	Italy	Xiamen^p	1902
	Jiangmen	1902		Hami	1881	Norway	Xiamen^p	1902
	Rikaze	1906		Changji	1881	Belgium	Xiamen^p	1902
	Ali	1906		Dalian	1898	Sweden	Xiamen^p	1902
US	Shenyang	1903				Netherland	Xiamen^p	1902
	Dandong	1903		Concession		Spain	Xiamen^p	1902
France	Shantou	1860	UK	Shanghai^p	1845			
	Tianjin	1861		Xiamen	1852		Leased Territory	
	Yantai	1861		Guangzhou	1861	UK	Weihai	1898
	Hainan	1876		Tianjin	1861		Hong Kong	1898
	Chongzuo	1887		Hankou	1861	France	Zhanjiang	1898
	Honghe	1887		Jiujiang	1861	Japan	Dalian	1905
	Qiannan	1895		Zhenjiang	1861		Qingdao	1914
	Hekou	1895		Xiamen^p	1902	Germany	Qingdao	1898
	Nanjing	1899	US	Shanghai^p	1848	Russia	Dalian	1898
	Zhanjiang	1899		Tianjin	1861			

Note: RC stands for recipient country. ^{p}indicates public concession jointly owned by several recipient countries. If one city appears many times in the table above, a different treaty port under that city was opened each time it shows up. All the city names displayed are their current names.

Table A3. Probit regression predictions for countries.

Country	Predicted Prob	True/Placebo
United States	0.9999	True
Japan	0.9965	True
Germany	0.9749	True
United Kingdom	0.9599	True
France	0.9516	True
Italy	0.9124	True
Canada	0.8308	Placebo
Spain	0.7491	True
Netherlands	0.6877	True
Australia	0.6728	Placebo
Switzerland	0.5803	Placebo
Norway	0.5056	True
Korea	0.5016	Placebo
Sweden	0.4835	True
Belgium	0.4505	True
Denmark	0.3953	True
Austria	0.3914	True
Mexico	0.3095	Placebo
Ireland	0.2756	Placebo
Finland	0.2270	Placebo
Brazil	0.1742	Placebo
Greece	0.1147	Placebo
Russia	0.1036	True
Saudi Arabia	0.0930	Placebo
Singapore	0.0797	Placebo
Portugal	0.0790	Placebo
Israel	0.0572	Placebo
United Arab Emirates	0.0540	Placebo

Note: The second column presents predicted probability of being a Recipient country. The last column indicates whether the country is truly recipient country or placebo one.