Capital Markets and Colonial Institutions in China

Wolfgang Keller and Carol H. Shiue
Stanford and Colorado
China’s Treaty Port Era (1842-1943)

- A political turning point in China’s history after her ports of trade were opened (by “treaty”) after the Opium War (1840-42)

- New foreign presence in terms of
  - Military occupation
  - Legal system: foreign courts
  - Customs system

- Diverging views on impact of foreign presence
  - China’s view (official textbook): Destructive; postponed China’s development
  - Other views more nuanced: Learning (Feuerwerker 1983), increased population growth (Jia 2013)
    - Overall, foreign presence had no substantial effect on China as a whole (Fairbanks; Feuerwerker; Rawski)
Question of the paper

- Did the new foreign presence affect capital markets?
  - As evidenced by the price for capital

- Present evidence on changes in price of capital in China caused by the new foreign presence
  - Mechanism?

- Motivation: Low price of capital as indicator of secure contractual institutions, spurring investment
  - North and Weingast (1989); also DeLong and Shleifer 1993, Acemoglu, Johnson, and Robinson (2001)
Foreign presence reduced price of capital by about 5-10%.
- In areas of up to 400 kilometers away from ports

Legal system contributed to it, but customs more important.
Households own all factors, capital (K), labor (L), and land (T), which they rent out to firms.

Price at which hh rent out K with competitive markets, depreciation rate $\delta$, and a $\theta$ percent chance of losing property of K due to theft is

$$p^K = \frac{r}{MP \text{ of Capital}} + \delta + \theta $$

Lower $\theta$ translates into lower costs of capital to firms.
Cost of capital, investment, and growth

- Closed economy, savings in terms of K; hh solves

\[
\max \int_0^\infty e^{-\rho t} \ln(C) dt \quad \text{s.t.} \quad \dot{K} = Y - (\delta + \theta) K - C
\]

with \( Y = AK, \ A \equiv \bar{T}^\alpha \bar{L}^\beta, \ \alpha, \beta > 0 \)

- \( \theta \downarrow \iff p^K \downarrow \iff \text{higher economic growth:} \)
  \[
g = (A - \delta - \theta) - \rho
\]

- If \( Y \) is produced from Manufacturing (M) and F (F), \( \theta \downarrow \) lowers cost of capital in either sector depending on
  - Sectoral capital usage & capital mobility between M and F
  - The degree to which other assets substitute for capital to transfer current into future consumption
Evidence on capital costs from grain storage

\[ FO(t, t + ds) = [p^K(t) + q(t)]S(t) \]

With:

- \( FO(t, t+ds) \): forward grain price at \( t \) for delivery at \( t + ds \)
- \( S(t) \): spot price at time \( t \)
- \( q(t) \): Grain-specific factors: spoilage, convenience yield

- Using future spot price instead of unobserved \( FO(t,t+ds) \), no-arbitrage with storage gives (Kaldor, Working):

\[ \frac{\dot{S}(t)}{S(t)} = Carrying Cost = \frac{p^K(t) + q(t)}{Dep.Variab le} \]

- Earlier work includes McCloskey/Nash, Shiue, Clark, Brunt/Cannon
Grain prices over time
Prefecture in Guangxi province, First-grade rice
Period 1820 to 1911
- 324 Prefectures
- Grains: Rice (different types), wheat, millet, sorghum
## Capital cost estimates

- **Summary statistics of our sample:**

<table>
<thead>
<tr>
<th></th>
<th>All grains</th>
<th>Rice</th>
<th>First- and second grade rice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>0.076</td>
<td>0.074</td>
<td>0.077</td>
</tr>
<tr>
<td><strong>10th percentile</strong></td>
<td>0.017</td>
<td>0.017</td>
<td>0.017</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>0.060</td>
<td>0.055</td>
<td>0.061</td>
</tr>
<tr>
<td><strong>90th percentile</strong></td>
<td>0.159</td>
<td>0.157</td>
<td>0.160</td>
</tr>
<tr>
<td><strong># of prefectures</strong></td>
<td>324</td>
<td>154</td>
<td>142</td>
</tr>
<tr>
<td><strong># of provinces</strong></td>
<td>21</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td><strong>N (prefecture x year x grain)</strong></td>
<td>54,979</td>
<td>41,281</td>
<td>30,941</td>
</tr>
</tbody>
</table>
Foreign presence and carrying cost of capital

**Foreign** \( \equiv \) 1 if either Occupation or Customs or Court in prefecture at time t, 0 otherwise

\[
\ln Carry_{igt} = \beta_1 \text{Foreign}_{it} + \beta_t + \beta_{ig} + \beta' X + e_{igt}
\]

\( i = \text{prefecture}; \ g = \text{grain}; \ t = \text{year}; \ X : \text{trend controls} \)

<table>
<thead>
<tr>
<th></th>
<th>All Grains</th>
<th>All Rice</th>
<th>1\textsuperscript{st} and 2\textsuperscript{nd} Grade Rice</th>
<th>1\textsuperscript{st} and 2\textsuperscript{nd} Grade Rice No Shanghai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign</td>
<td>-0.093**</td>
<td>-0.054**</td>
<td>-0.064**</td>
<td>-0.067**</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.021)</td>
<td>(0.019)</td>
<td>(0.024)</td>
</tr>
<tr>
<td>N</td>
<td>54,979</td>
<td>41,201</td>
<td>30,941</td>
<td>30,790</td>
</tr>
<tr>
<td>Clusters</td>
<td>1,778</td>
<td>982</td>
<td>731</td>
<td>725</td>
</tr>
</tbody>
</table>

s.e. clustered by prefecture x grain; **(*) p<1% (p<5%)
## Estimation issues

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Pre-Trend</th>
<th>Prop. Score</th>
<th>PS Weights HIR</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foreign</strong></td>
<td>-0.093**</td>
<td>-0.112**</td>
<td>-0.109**</td>
<td>-0.085**</td>
<td></td>
</tr>
<tr>
<td>(0.010)</td>
<td>(0.025)</td>
<td>(0.025)</td>
<td>(0.028)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Foreign x capital cost growth 1821-42</strong></td>
<td></td>
<td>0.089**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.027)</td>
<td></td>
<td>(0.025)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Foreign x Propensity Score</strong></td>
<td></td>
<td></td>
<td>0.049</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.083)</td>
<td></td>
<td></td>
<td>(0.083)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After treaty date, before arrival of foreigners</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.001</td>
</tr>
<tr>
<td>(0.052)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.052)</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>54,979</td>
<td>53,420</td>
<td>54,979</td>
<td>54,979</td>
<td>30,941</td>
</tr>
</tbody>
</table>

- Propensity score (PS) = $f(\text{latitude, longitude, pop 1776, pop growth 1776-1820, Coastal, Yangzi, Pearl})$
Carry cost = capital cost + storage cost

- Grain storage costs vary with weather

- Weather is classified from Very Wet to Very Dry (5 categories) in 120 stations

- Findings: Storage costs ~ 25% of total, consistent w/ other estimates
  - No change w/ foreign presence
How does foreign presence affect capital costs?

1. Military occupation

2. Customs system
   - Tariff revenue ↑
   - Trade: International and domestic, w/ steamships
   - Infrastructure: Lighthouses, harbor development, warehousing, removal of wrecked ships
   - Information & communication: Postal system, statistics, storm warning
   - Security: Campaigns against piracy, protection from domestic warlords through foreign troops/ships
Customs operations in treaty ports

First opening in 1854 (Shanghai)

Last opening in 1907

Total of 46 locations
3. Foreign law presence in China

- Extraterritoriality secured by 19 countries*
  - Foreigners accused of wrongdoing were exempted from Chinese courts
  - Dealt with by foreign consuls of own nationality
    - Effect, if any, is in part external to Chinese

- Countries varied in how strongly they enforced their own laws in China
  - Number of courts: Britain had 43, Norway had 1
  - Extent of legal authority invested in their court in China

- Define *Legal* variable which measures differences in intensity of foreign law presence across China

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*Russia, Great Britain, the United States, France, Sweden & Norway, German Customs Union, Denmark, The Netherlands, Spain, Belgium, Italy, Austria-Hungary, Peru, Brazil, Portugal, Japan, Mexico and Switzerland*
Map 2. Treaty Ports

CMC Stations
(boundaries and place names of 1990)

Intensity of foreign legal presence in particular prefecture and year

1) Scope of jurisdiction ($J_{it}$)
   ▶ How many foreign courts are there that can hear civil and criminal cases **without limit**?

2) System of appeals ($A_{it}$)
   ▶ How many courts whose decision can be **appealed in China**, as opposed to abroad?

3) Sentencing ($S_{it}$)
   ▶ How many courts of countries **with prisons in China**?

4) Influence on Chinese courts ($IN_{it}$)
   ▶ How many courts of countries that **send foreign assessors to Chinese courts**?

\[
Legal_{it} \equiv (J_{it} + A_{it} + S_{it} + IN_{it})/(Pop1820_{it})
\]
Foreign assessors in Chinese courts

- Foreign assessors as a measure of foreign influence in cases where Chinese are the defendants:
  - U.S. and U.K.: Foreign assessor present in the mixed court or Chinese court cases where their nationals are plaintiffs to watch, cross-examine witness, and protest proceedings
  - Japan, Mexico, Brazil: Exclusive jurisdiction applies, no foreign assessors are present
  - All other countries: Many cases are dealt with by the foreign consul and the Chinese official jointly
    - The settlement is one by mediation or arbitration, a method most in line with Chinese practice
Which channel matters most?

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>All grains</th>
<th>1&lt;sup&gt;st&lt;/sup&gt;, 2&lt;sup&gt;nd&lt;/sup&gt; Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td>0.067 (0.044)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legal</td>
<td></td>
<td>-0.148** (0.022)</td>
<td></td>
<td>-0.163** (0.022)</td>
<td>-0.120* (0.037)</td>
</tr>
<tr>
<td>Customs</td>
<td></td>
<td></td>
<td>-0.108** (0.010)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customs without Legal</td>
<td></td>
<td></td>
<td></td>
<td>-0.374** (0.036)</td>
<td>-0.348** (0.055)</td>
</tr>
<tr>
<td>N</td>
<td>54,979</td>
<td>54,979</td>
<td>54,979</td>
<td>54,979</td>
<td>30,941</td>
</tr>
</tbody>
</table>

- $\text{Corr}(\text{Customs, Legal}) = 0.81$
- $\text{Customs beta coeff} \ -2.4\%, \ \text{Legal beta} \ -1.4\%$
Spillovers from foreign presence

- We estimated the effect of foreign presence in prefecture $i$ on capital costs in prefecture $i$:

$$ CarryCost_{igt} = \beta_1 Customs_{it} + \gamma' X + e_{igt} $$

- Spillovers: Do capital costs fall in prefectures that do not have customs operations themselves but that are **geographically nearby** customs stations?

$$ CarryCost_{igt} = \beta_1 Customs_{it} + \gamma' X + e_{igt} + \beta_2 \sum_j I_{ij} [0 < Dist_{ij} \leq 200] Customs_{jt} + \beta_3 \sum_j I_{ij} [200 < Dist_{ij} \leq 400] Customs_{jt} $$
Spillover estimates

- Includes Prefecture x Grain FE, Time FE, Trend Controls
- N = 54,979
- 95% CIs
  - Own: -0.14, -0.10
  - 1,200km: -0.07, -0.05
  - 201,400km: -0.02, -0.01
Summary

Foreign presence lowered local capital costs
  Magnitude: by about 5-10%

Consistent with foreign presence generating positive externalities for Chinese capital markets
  C.f. higher tariff revenue that enabled China to borrow at lower rates internationally

Mechanism: Legal and customs system both played a role, with customs’ effect larger

Foreign presence lowered capital costs outside local area, up to about 400 km
  First econometric evidence of this kind
Foreign presence and trade

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customs</td>
<td>-0.108**</td>
<td>-0.059+</td>
<td>-0.112**</td>
<td>0.024</td>
</tr>
<tr>
<td>Customs x Coastal</td>
<td></td>
<td>-0.092+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customs x Yangzi River</td>
<td></td>
<td></td>
<td>0.034</td>
<td></td>
</tr>
<tr>
<td>Customs x Water Access</td>
<td></td>
<td></td>
<td></td>
<td>-0.158**</td>
</tr>
</tbody>
</table>

- With some variation, the Customs effect is closely related to water access and ports
## Estimating the role of storage costs

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign</td>
<td>-0.028**</td>
<td>-0.028**</td>
<td>-0.027**</td>
<td>-0.029**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Very Wet</td>
<td></td>
<td>0.013**</td>
<td>0.025**</td>
<td>0.011**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.004)</td>
<td>(0.007)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Very Wet x Post 1842</td>
<td></td>
<td></td>
<td>-0.018**</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.008)</td>
<td></td>
</tr>
<tr>
<td>Very Wet x Foreign</td>
<td></td>
<td></td>
<td></td>
<td>0.030</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.018)</td>
</tr>
<tr>
<td>R2</td>
<td>0.337</td>
<td>0.338</td>
<td>0.338</td>
<td>0.338</td>
</tr>
</tbody>
</table>

- Storage costs do not mimic the new foreign presence
Foreign presence and carrying costs

Foreign = 1 if either Occupation or Customs or Court in prefecture, 0 otherwise

\[ \ln \text{Carry Cost}_{igt} = \beta_1 \text{Foreign}_{it} + \mu_t + \mu_{ig} + \beta' X + \varepsilon_{igt} \]

<table>
<thead>
<tr>
<th></th>
<th>Robust</th>
<th>Clustered Prefecture x grain</th>
<th>Clustered Prefecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign</td>
<td>-0.093</td>
<td>-0.093</td>
<td>-0.093</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.010)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>N</td>
<td>54,979</td>
<td>54,979</td>
<td>54,979</td>
</tr>
<tr>
<td>Clusters</td>
<td></td>
<td>1,778</td>
<td>324</td>
</tr>
</tbody>
</table>
Foreign presence outside local prefecture

\[ Carry_{Cost_{it}} = \beta_1 Customs_{it} + \beta_2 \sum_{j} I_{ij} Customs_{jt} + X + \epsilon_{it} \]
Direct evidence on interest rates in China
Direct information on capital costs

- **Specific to**
  1. Borrower
  2. Lender
  3. Date
    - Year, month, day
  4. Location
  5. Maturity
  6. Risk
  7. Collateral
  8. Insurance

- Relatively **high** interest rates high in Lower Yangzi Delta (Yang 1952, Lieu 1937, Chao 1977)
- Rate on fixed dividends in 1920s Shanghai machine weaving was **9.6%** (Shiroyama 2004)
  - Rate on stocks in 1895 Dasheng cotton mill was **8%**; rates for long term contracts: **10.5%**; short-term contracts (3 mo.): **6%** to **14.5%** plus collateral
  - Maximum interest rate around **15%**
- Interest rates at pawnshops often **greater than 15%** (Li/van Zanden 2013)
- Qing Government loans from abroad **8-9%** in 1864-1886; **5.3-7%** in 1886-1894

- Given a relatively low number of contracts, it is hard to avoid comparing ‘apples with oranges’