

The WWI Trade Shock and the Boom of Textile Industry in China

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Introduction

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 - ▶ The Civil War in the US changed the relative prices of the US cotton and the Indian cotton, thus the direction of innovation (Hanlon, 2014)
 - ▶ The Napoleonic Wars facilitated the development of the cotton industry (Juhász, 2014)

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 - ▶ ...or limited effect? In his work about industrial development in pre-WWII China, Rawski (1989) didn't even mention the importance of WWI.
 - ▶ Did the war really affect the industrial sector? Which industries were mostly affected by the war? Was the effect persistent over time?

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 - ▶ Supported by detailed records on trade flows
- Use a well-documented data source of newly established firms to measure the impact on textile industry
 - ▶ I conduct a difference-in-differences analysis, where the control group is other light industries.
 - ▶ The number and investment of new textile firms increased relative to other industries.
 - ▶ The effect was persistent even after the war

Introduction

This paper

- Micro-level evidence
 - ▶ Use detailed firm-level production information on textile firms to estimate production function
 - ▶ Find evidence on increased TFP in 1919. The TFP remained after the war.

Outline

- Background
- Data
- Empirical analysis: a difference-in-difference analysis on light industries
- Mechanism
- Production function estimation on textile firms
- Conclusion

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China's international trade

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 - ▶ Gradually opened up due to treaties signed with foreign countries.
 - ▶ By 1900, 43 ports were opened. Shanghai was the biggest one.
 - ▶ A small open economy; the tariff was relatively low (5%).

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 - ▶ By 1900, 43 ports were opened. Shanghai was the biggest one.
 - ▶ A small open economy; the tariff was relatively low (5%).
 - ▶ International trade was likely to affect Chinese industries
 - ★ The value of international trade is 8.5% of China's total GDP.
 - ★ Yet, most of the industries were in ports as well. And they relied on connections with foreign traders and firms (Broggi, 2015).

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 - ★ Yet, most of the industries were in ports as well. And they relied on connections with foreign traders and firms (Broggi, 2015).
- Imports and Exports
 - ▶ China mainly imported manufactured products, such as cotton textile, cigarettes, and sugar
 - ▶ It exported tea, silk, and other agricultural products

Background

The impact of WWI

- The impact of WWI on China's trade
 - ▶ Most parts of China were not involved in the fights
 - ▶ The war mainly affected China through international trade
 - ▶ The total value of imports dropped by more than 20% from 1913 to 1915; exports barely changed.
 - ▶ A drop in the import of cotton products

Background

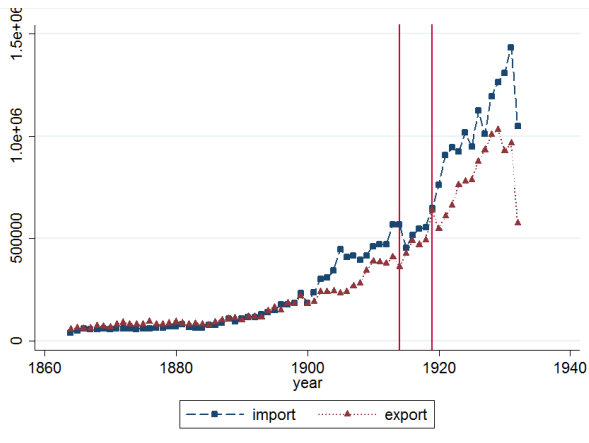


Figure 1: Trade Expansion of China (in *Haikwan Tael*), 1864 to 1932

Source: Hsiao (1974), pages 22-24, 117-119

Background

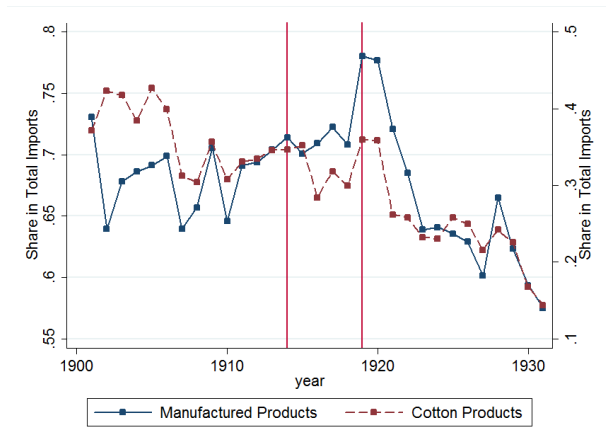


Figure 2: Share of Manufactured Products in Total Import, 1901 to 1932

Source: Hamashita (1989).

Background

The Impact of WWI

Imports before WWI

In 1913, the total value of import is 645,067,211 Haikwan taels. The import with its value greater than 15,000,000 Haikwan taels includes rice (22,778,143, 3.53%), sugar (36,355,288, 5.63%), “oils, mineral and their derivatives” (26,443,041, 4.10%), “colours, dyes, and paints” (17,426,030, 2.7%), **cotton thread (72,946,905, 11.3%), cotton piece goods (113,369,801, 17.57%)**, all other manufactured products (81,423,107, 12.62%), silver (46,608,824, 7.23%)

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Imports during WWI

In 1918, the total value of import is 614,996,374 Haikwan taels. The import with its value greater than 15,000,000 Haikwan taels includes rice (18,386,905, 2.85%), sugar (60,381,794, 9.82%), “oils, mineral and their derivatives” (32,147,072, 5.23%), cigars and cigarettes (25,025,894, 4.07%), **cotton piece goods (100,178,307, 16.3%)**, iron and steel other manufactured products (21,772,757, 3.54%), all other manufactured products (25,061,351, 4.08%), silver (22,629,175, 3.68%)

Background

China's industrial development

- The rise of manufacturing industry in the early twentieth century
 - ▶ The number of foreign firms increases from 1102 in 1901 to 2863 in 1911 and 9511 in 1921.
 - ▶ The number of domestic firms has a similar trend (see figure)

Background

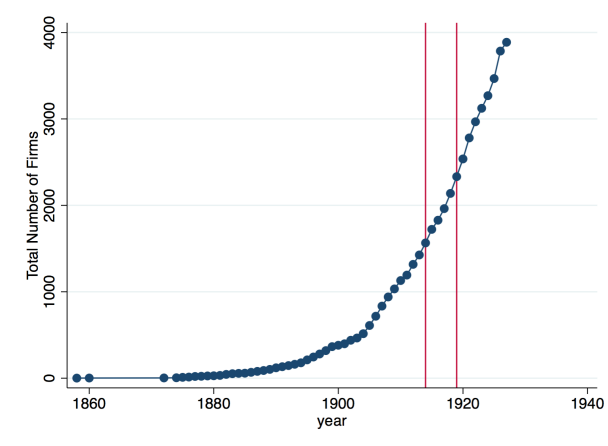


Figure 3: Total Number of Domestic Industrial Firms

Source: Du (1991)

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 - ▶ The number of domestic firms has a similar trend (see figure)
- Changes in textile industry
 - ▶ Cotton products were one of China's most important imports from Europe
 - ▶ Narratives suggest expansion of these firms during WWI
 - ★ In 1913, 97.31% of cotton yarn was consumed by craftsmen, only 2.69% was by modern factories; After WWI the numbers changed to 78.46% and 21.54%.
 - ★ Firms earned extra profits during WWI.

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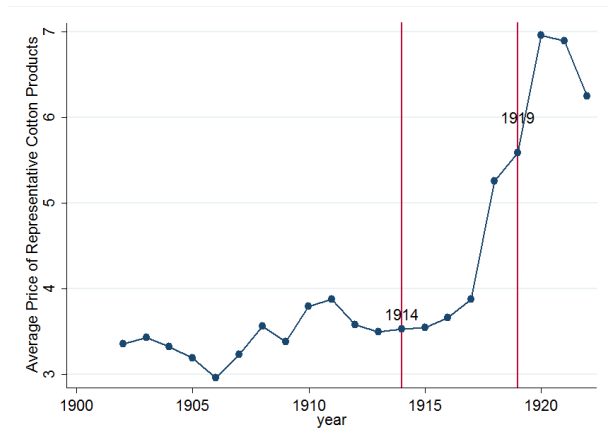


Figure 4: Import Price of Shirtings and Sheetings, 1901 to 1921

Source: Hamashita (1989).

Background

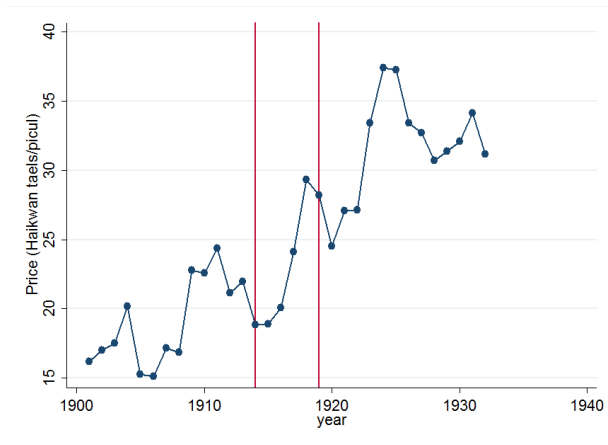


Figure 5: Export Price of Cotton (in *Haikwan Tael*), 1901-1932

Source: Hsiao (1974)

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 - ★ In 1913, 97.31% of cotton yarn was consumed by craftsmen, only 2.69% was by modern factories; After WWI the numbers changed to 78.46% and 21.54%.
 - ★ Firms earned extra profits during WWI.
- Questions raised
 - ▶ What was the impact of WWI on the textile industry?
 - ▶ Why was the impact persistent over time?

Data

- Trade records from the Annual Reports of China Maritime Customs
 - ▶ Product-level information of exports and imports in each year
 - ▶ Aggregate data compiled by Hsiao (1974) and Hamashita (1989)
- Information on newly established firms
 - ▶ Compiled by Du (1991) from official reports
 - ▶ Can identify industry, scale, year of opening, and names of the owners
- Firm-level information of cotton textile firms
 - ▶ The years 1916 to 1919: Report of Statistics on Agriculture and Commerce
 - ▶ After 1919: Annual statistics collected by the Chinese Cotton Mill Owners Associations

Impact on industrial development

Empirical Strategy

$$y_{it} = \beta_0 + \beta_1 \text{Textile}_i + \beta_2 \text{WWI}_t + \beta_3 \text{PostWWI}_t + \beta_4 \text{WWI}_t \text{Textile}_i + \beta_5 \text{PostWWI}_t \text{Textile}_i + \epsilon_{it} \quad (1)$$

for industry i at year t .

- y_{it} : Number of new firms or the total investments on new firms
- Textile_i : Indicator on textile firms
- WWI_t and PostWWI_t : Dummies. $\text{WWI} = 1$ if $1913 < \text{year} < 1920$; $\text{PostWWI} = 1$ if $\text{year} \geq 1919$.
- Add industry-level fixed effects.
- Also replace the war dummies with year dummies.

Impact on industrial development

Descriptive evidence using a representative control group

- I use match industry as a representative control group because more than 70% of China's imported match was from Japan.
- Of course the war reduced international trade overall. Changes in match industry represents this effect.
- Difference between match industry and textile industry was due to extra shocks on cotton textile industry.

Mechanism

Evidence from trade values

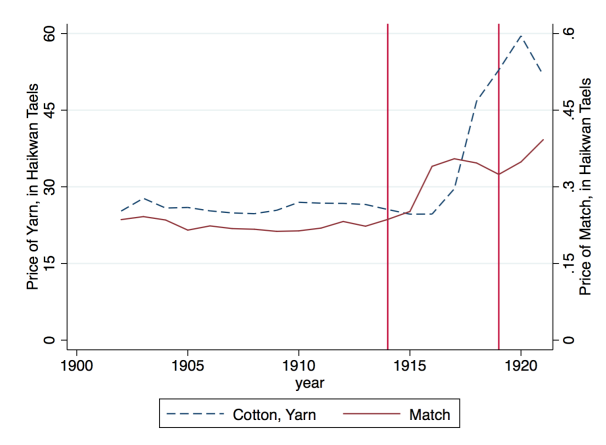


Figure 6: Import Prices of Yarn and Matches

Source: The Annual Report of China Maritime Customs

Impact on industrial development

Descriptive evidence

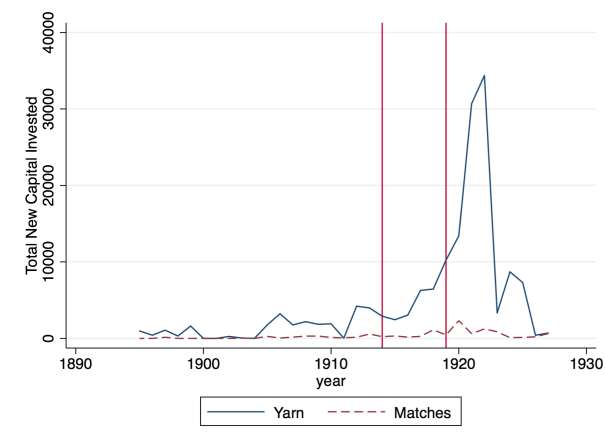


Figure 7: The Amount of Newly Invested Capital in Textile and Match Industries

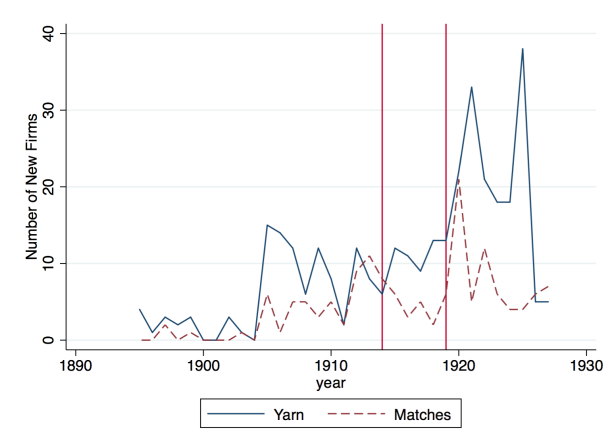


Figure 8: The Number of New Firms in Textile and Match Industries

Source: Hsiao (1974)

Mechanism

Evidence from trade values

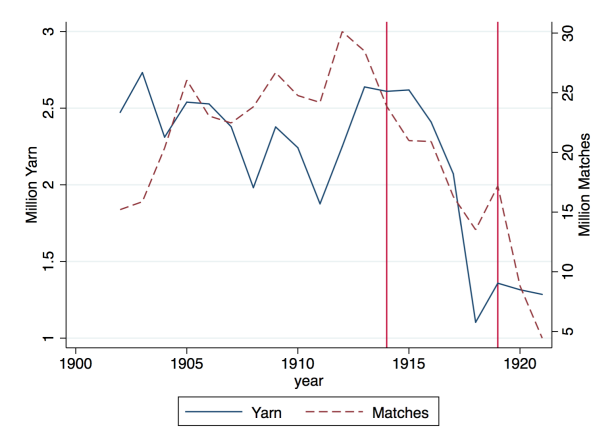


Figure 9: Import Values of Yarn and Matches

Source: The Annual Report of China Maritime Customs

Impact on industrial development

Results

Table 1: Change in the Number of New Textile Firms During the War

VARIABLES	(1) Number of New Firms	(2) Number of New Firms
WWI	0.882*** (0.240)	0.577 (0.396)
PostWWI	0.261** (0.131)	0.841*** (0.307)
yarn	4.761*** (1.157)	4.172*** (1.219)
yarn × WWI	4.205*** (1.559)	3.465** (1.631)
yarn × PostWWI	3.572 (3.250)	12.53*** (4.083)
Constant	0.818*** (0.0761)	2.453*** (0.177)
Observations	1,302	488
R-squared	0.184	0.344

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.
The dependent variable is the number of new firms. The variable *yarn*,
WWI, and *PostWWI* are dummy variables.

Impact on industrial development

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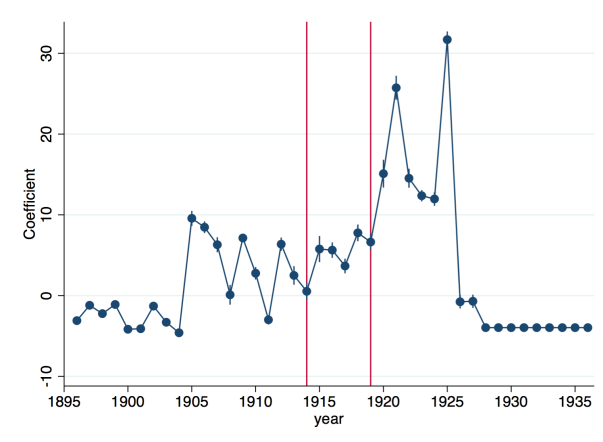


Figure 10: Coefficient of yarn \times year dummies

Impact on industrial development

Results

Table 2: Change in Investments on New Firms During the War

VARIABLES	(1) Total Investments	(2) Total Investments
WWI	178.3*** (54.59)	194.4** (96.31)
PostWWI	72.60** (33.11)	227.2** (93.60)
yarn	1,245*** (301.2)	1,295*** (323.4)
yarn × WWI	3,696*** (1,169)	3,427*** (1,181)
yarn × PostWWI	4,398* (2,566)	10,536** (4,407)
Constant	101.3*** (14.03)	303.9*** (38.18)
Observations	1,302	488
R-squared	0.234	0.437

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is the scale of investments on new firms. The variable *yarn*, *WWI*, and *PostWWI* are dummy variables.

Impact on industrial development

Spillover effect on other industries

Table 3: Machinery

VARIABLES	(1) Number of New Firms
WWI	0.882*** (0.240)
PostWWI	0.261** (0.131)
Machinery	0.761** (0.345)
Machinery × WWI	0.205 (1.049)
Machinery × PostWWI	0.513 (0.776)
Constant	0.818*** (0.0761)
Observations	1,302
R-squared	0.023

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is the number of new firms. The variable *Machinery*, *WWI*, and *PostWWI* are dummy variables.

Impact on industrial development

Spillover effect

Table 4: Finance

VARIABLES	(1) Number of New Firms
WWI	0.882*** (0.240)
PostWWI	0.261** (0.131)
Finance	1.288* (0.715)
Finance × WWI	6.262*** (2.061)
Finance × PostWWI	3.340 (2.121)
Constant	0.818*** (0.0761)
Observations	1,344
R-squared	0.117

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is the number of new firms. The variable *Finance*, *WWI*, and *PostWWI* are dummy variables.

Impact on industrial development

Spillover effect

Table 5: Construction

VARIABLES	(1) Number of New Firms
WWI	0.882*** (0.240)
PostWWI	0.261** (0.131)
Building	-0.581*** (0.116)
Building \times WWI	-0.869*** (0.308)
Building \times PostWWI	-0.233 (0.184)
Constant	0.818*** (0.0761)
Observations	1,344
R-squared	0.024

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is the number of new firms. The variable *Building*, *WWI*, and *PostWWI* are dummy variables.

Mechanism: Experience of the textile industry

Suggestive Evidence from Firm-level Information

- In this section, I use textile surveys from 1916 to 1919 and the ones from 1919 to 1927 to quantify firms' response during the war.
- I run a simple production function estimation.
 - ▶ Capital: number of spindles (“spindles opened” for firms after 1919)
 - ▶ Quantity of Input and Output; does not consider changes in quality (number of count)
 - ▶ Labor: didn't report hours from 1919 to 1927; try different specifications
- Preliminary results suggest an spike of TFP in 1919

Table 6: Productivity increase: 1917 to 1919

VARIABLES	(1) 1916-1919	(2) 1916-1919	(3) 1916-1919	(4) 1916-1919	(5) 1916-1919
log_input	0.359** (0.148)	0.458 (0.401)	0.422 (0.911)	0.517 (0.887)	0.539 (0.882)
log_spindle	0.150 (0.305)	-0.575 (0.409)	0.290 (2.691)	-0.155 (2.853)	0.416 (2.465)
log_worker	0.714** (0.302)	1.336** (0.526)	0.396 (1.173)		
log_workhour				1.022 (0.842)	
year=1917	2.067** (1.013)	2.467** (0.963)	2.138 (1.296)	2.084 (1.303)	1.913* (1.087)
year=1918	1.451 (1.023)	1.837* (0.947)	1.122 (1.306)	1.482 (1.230)	0.957 (1.091)
year=1919	2.792*** (0.917)	2.676*** (0.855)	2.355** (1.128)	2.448** (1.084)	2.208** (1.021)
Constant	0.260 (1.236)	-3.724 (4.948)	0.234 (15.14)	-9.353 (17.28)	-3.989 (28.38)
Observations	78	78	77	77	81
R-squared	0.629	0.770	0.829	0.836	0.831
County FE		Y	Y	Y	Y
Firm FE			Y	Y	Y

Robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The dependent variable is the quantity of yarn produced in natural log form.

Table 7: Productivity Increase: 1919 to 1927

VARIABLES	(1) 1919-1927	(2) 1919-1927	(3) 1919-1927	(4) 1919-1927
log_input	0.815*** (0.133)	0.728*** (0.185)	0.630*** (0.207)	0.704*** (0.164)
log_spindle	0.158 (0.125)	0.118 (0.0955)	0.112 (0.0817)	0.203* (0.120)
log_worker	0.0347 (0.0726)	0.0457 (0.0814)	0.237 (0.152)	
year=1920				0.188** (0.0880)
year=1921	0.151 (0.105)	0.195 (0.119)	0.191 (0.155)	0.169* (0.101)
year=1922	0.100 (0.0808)	0.165* (0.0995)	0.172 (0.154)	0.153* (0.0913)
year=1924	0.121 (0.0838)	0.192* (0.0987)	0.184 (0.153)	0.175* (0.0921)
year=1925	0.146* (0.0823)	0.208** (0.0959)	0.183 (0.151)	0.182** (0.0918)
year=1927	0.0870 (0.0855)	0.156 (0.0987)	0.130 (0.154)	0.123 (0.0957)
Constant	-1.223*** (0.334)	-0.353 (0.743)	-0.720 (0.983)	-0.642 (1.134)
Observations	262	259	259	301
R-squared	0.938	0.953	0.973	0.967
County FE		Y	Y	Y
Firm FE			Y	Y

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Mechanism

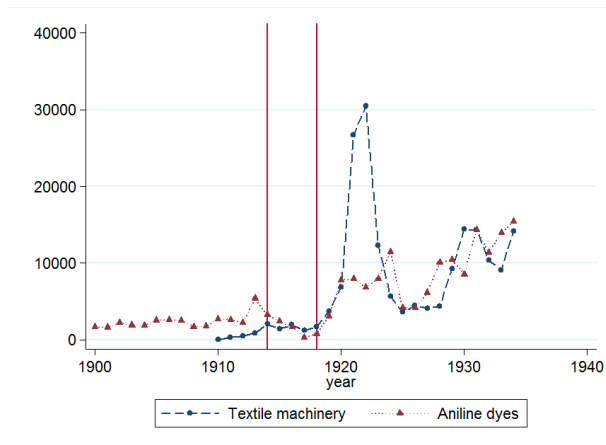


Figure 11: Imports of Inputs for Cotton Industries

Conclusion

- This paper examines the impact of the First World War on the Chinese economy.
- The war benefited the manufacturing sectors in China, especially the cotton textile industry.
- The impact was persistent over time
- Plan to explore productivity changes using firm-level information