Real Iceberg Transport Costs

The Effects of the North Atlantic Iceberg Drift on Trade and Inequality

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Motivation

- How do naturally variant transport costs shape trade and inequality?
- Overcome the endogeneity of man-made transport infrastructure through naturally variant barriers
- Exploit influence of Atlantic iceberg drift on cotton trade using millions of ship locations and 92 years of cotton trade data
- Observe exogenous variation in maritime transport routes between North America and Europe
- Investigate the spatial diffusion of trade costs across the cotton supply chain and its spillovers on local economic conditions

Related Literature

- Market access and trade: Donaldson & Hornbeck (2016), Donaldson (2018), Jedwab & Storeygard (2020)
- First wave of globalization and cotton trade: Hanlon (2015), Pascali (2017), Steinwender (2018)
- Regional inequality and trade: Rodríguez-Pose (2012), Autor et al. (2013)

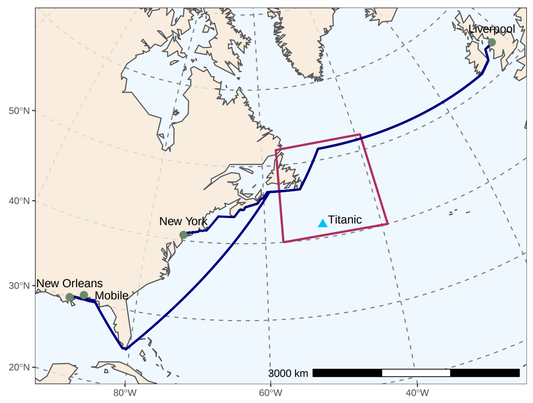
The Transatlantic Cotton Trade

- The cotton industry was a driving force of industrialization and the first wave of globalization ("King Cotton")
- One-way supply chain:
  - US: largest cotton producer until today
  - UK: important cotton manufacturing sector up to the first half of the 20th century
- New York most important cotton exporting US port, followed by New Orleans and Mobile
- Nearly all cotton destined for the UK was imported via Liverpool: Liverpool essentially set the world price (Steinwender 2018)

North Atlantic Iceberg Drift

- "Iceberg Season": February to September
- Icebergs break free ("calve") from Greenland glaciers
- The Labrador current pushes the icebergs into the major shipping route between North America and Europe south of Newfoundland ("Iceberg Ally")
- Icebergs are extremely dangerous as they consist of fresh water
- In sea water only 13% of an iceberg's mass float above sea level (Bigg & Billings 2014)
- Since 1913, the International Ice Patrol (IIP) patrols this area throughout the year to prevent another disaster like the sinking of the RMS Titanic on April 15, 1912
- On average, around 475 icebergs reach the area controlled by the IIP each year (see red rectangle in Figure 1)

Figure 1: Shortest Path US-Cotton Ports to Liverpool



Notes: Shortest sea route between US cotton exporting ports and Liverpool. The red rectangle highlights the area patrolled by the International Ice Patrol (IIP). The blue triangle denotes the point at which the RMS Titanic sank on April 15, 1912.

Data

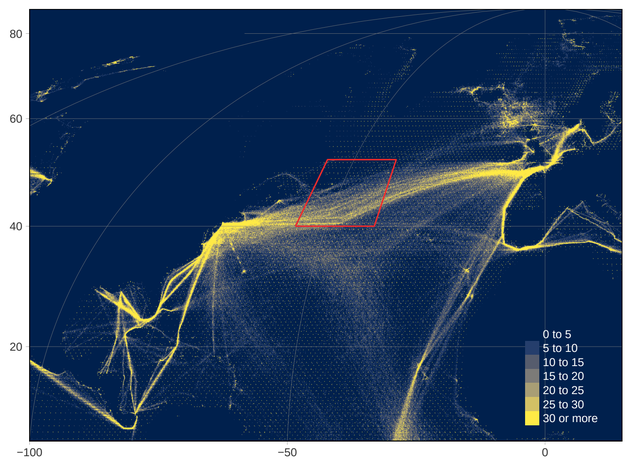
Cotton

- Monthly cotton prices from Liverpool Cotton Exchange January 1850 to December 1931, available from "The Economist"
- Monthly US cotton prices and quantities from 1850 to 1941 based on Bureau of Agricultural Economics (1951)

Ships

- Global ship data based on ICOADS database from 1662 to 2014 with more than 450 million marine reports
- Reassembled ship routes from Carella et al. (2017) to identify ship routes between Europe and the US
- Figure 2 shows that the icebergs intersect directly with the major shipping route between North America and Europe

Figure 2: Ships observed in ICOADS-data, 1850-1925

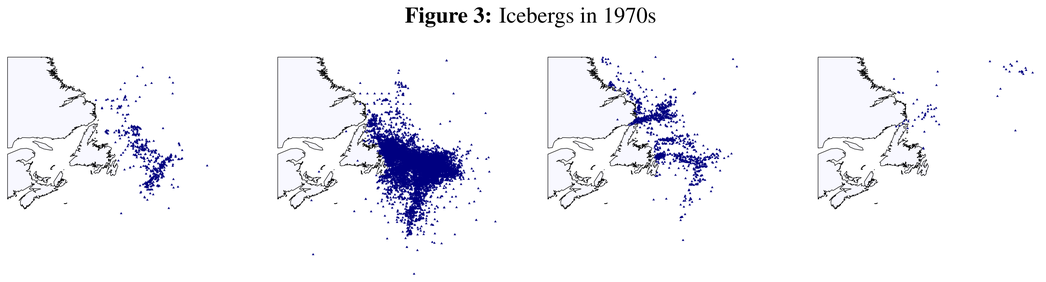


Notes: The figure illustrates shipping patterns from 1850 to 1925. Pixel values correspond to number of observations within a 10 x 10 km grid cell in a decade. The red box highlights the area that is patrolled by the IIP. It directly intersects with the main shipping route between North America and Europe.

Icebergs

- Iceberg location reports from 1880 to 2019 from the IIP archive

Figure 3: Icebergs in 1970s



(a) February **(b)** May **(c)** August **(d)** November

Estimation Strategy

- Dependent variables: monthly cotton prices, quantity, trade volume 1850 to 1941
- Independent variable: trade costs proxied by the average monthly latitude of ships passing the IIP-controlled sector from 1850 to October 1941

Figure 4: Average latitude of ships passing through the area controlled by the IIP, 1850 – 1925

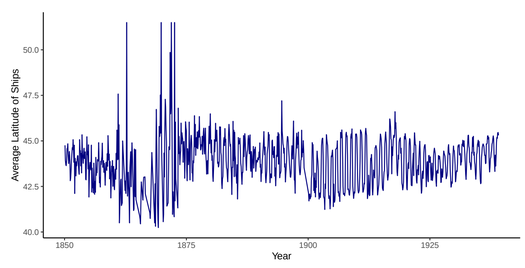
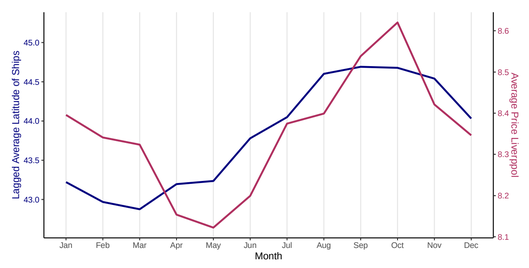


Figure 5: Average lagged latitude of ships and average Liverpool cotton price by month



Notes: Iceberg season from February to September

Estimation equation

$$\ln Trade_{mqt} = \beta Latitude_{m-1qt} + \delta_{qt} + \varepsilon_{mqt}$$

- $Trade_{mqt}$ is a set of trade variables, incl. prices, quantities and trade volume
- $Latitude_{mqt}$ is the average latitude at which ships pass the iceberg region in year t, quarter t and month m
- δ_{qt} denotes quarter-year fixed effects

Results

Table 1: Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)
	UK Price		US Cotton Exports		US Trade Volume	
Average Latitude	-0.062***	0.005	0.059*	0.100***	0.034	0.100***
	(0.014)	(0.004)	(0.035)	(0.030)	(0.030)	(0.029)
Observations	1046	1038	853	853	850	849
Year-Quarter FE		YES		YES		YES

Notes: Liverpool cotton price is forwarded by one month. All specifications include a constant. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

- A one degree southward shift in maritime trade due to the iceberg drift decreases US cotton trade by 10 percent on average
- The trade costs are largely borne by US cotton producers

Conclusion

Our preliminary findings report a significant effect of exogenous changes in distance on trade caused by the iceberg drift

Outlook

- Analyze spillovers of exogenous barriers to trade on US inequality using data on sectoral wages and employment
- Estimate the marginal value of the elasticity of trade volume with respect to distance for historical US data

References

Autor, David, H., Dorn, D. & Hanson, G. H. (2013), 'The China Syndrome: Local Labor Market Effects of Import Competition in the United States', *American Economic Review* **103**(6), 2121–68.

Bigg, G. & Billings, S. (2014), 'The Iceberg Risk in the Titanic Year of 1912: Was it Exceptional?', *Significance* **11**(3), 6–10.

Bureau of Agricultural Economics (1951), *Statistics on Cotton and Related Data*, number 99 *in* 'Statistical Bulletin', United States Department of Agriculture, Washington D.C.

Carella, G., Kent, E. C. & Berry, D. I. (2017), 'A probabilistic Approach to Ship Voyage Reconstruction in ICOADS', *International Journal of Climatology* **37**(5), 2233–2247.

Donaldson, D. (2018), 'Railroads of the Raj: Estimating the Impact of Transportation Infrastructure', *American Economic Review* **108**(4-5), 899–934.

Donaldson, D. & Hornbeck, R. (2016), 'Railroads and American Economic Growth: A "Market Access" Approach', *Quarterly Journal of Economics* **131**(2), 799–858.

Hanlon, W. W. (2015), 'Necessity is the mother of invention: Input supplies and directed technical change', *Econometrica* **83**(1), 67–100.

Jedwab, R. & Storeygard, A. (2020), The average and heterogeneous Effects of Transportation Investments: Evidence from Sub-Saharan Africa 1960-2010, Technical report, National Bureau of Economic Research.

Pascali, L. (2017), 'The Wind of Change: Maritime Technology, Trade, and Economic Development', *American Economic Review* **107**(9), 2821–54.

Rodríguez-Pose, A. (2012), 'Trade and Regional Inequality', *Economic Geography* **88**(2), 109–136.

Steinwender, C. (2018), 'Real Effects of Information Frictions: When the States and the Kingdom Became United', *American Economic Review* **108**(3), 657–696.