Export-Led Decay: The Trade Channel in the Gold Standard Era

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[1]The views expressed here are solely those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Cleveland or the Board of Governors of the Federal Reserve System

Motivation

- This paper tries to contribute to two important topics in international macroeconomics and economic history
  1. Costs of fixed exchange rate (FEX) and role of exchange rate changes in the short-run
  2. Explain depth and recovery of the Great Depression
- During the Great Depression the US and others in gold standard, which produced a fixed exchange regime (Eichengreen (1995))
- Evidence of cost of FEX and Great Depression mostly relies on low-frequency aggregate data
- In the Great Depression, many things happening at the same time, hard to assign effect to one shock
- Importance of cross-sectional estimates, within US, cities with different exposure
- Results have important implications for debate on current monetary unions (Euro, US)

This paper

- Combines rich micro-level data:
  - Economic activity at the city level with monthly frequency
  - Sectoral employment at the city level
  - Exports by destination and sector
  - Bilateral exchange rates by destination with monthly frequency
  - Prices of goods in local currency with monthly frequency
- Creates a measure of exposure at the city level to exchange rate variation depending on the sectoral employment of the city and the destination specific sectoral exposure
- Uses relatively exogenous changes of exchange rate to measure:
  - Effects on economic activity
  - Prices pass-through (not today)
- Informs aggregate effects from cross sectional evidence using GE model

Exchange Rate Measure

- We start by showing variation on the exchange rate between 1928 and 1935
- We build a measure of exchange rate with trade partners for the US
- Obtain bilateral exchange rate for 33 countries (87% of exports in 1928)
- Use exports by destination in 1928
- Normalize exchange rate to 1 in July 1931

$$Exchange\_Rate_t = \sum_{d=1}^{N_d} \frac{Exchange\_Rate_{d,t}}{Exchange\_Rate_{d,1931m7}} \times Share\_Exports_{d,1928}$$

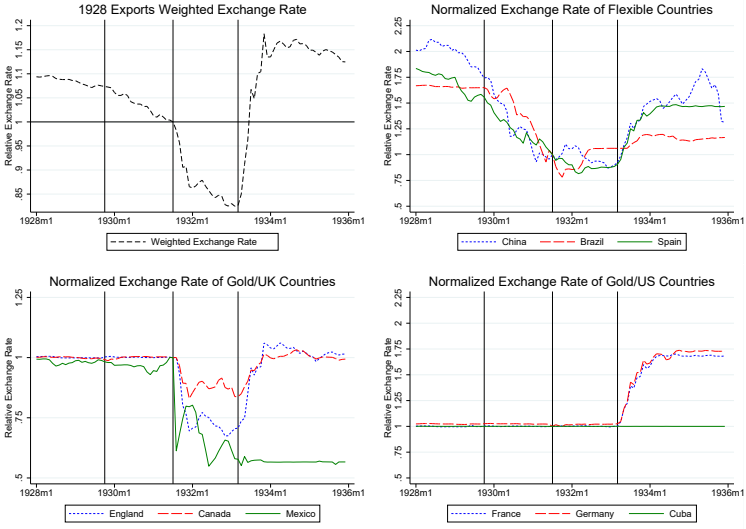
$\uparrow$ is a depreciation of the US dollar relative to the other currency

Exchange Rate Sources of Variation

Three groups of countries that generate exchange rate variation:

- **Never in the gold standard**: China, Spain, Brazil, etc
- **Left before the US**: Mexico, UK and "Pound countries", Japan, etc
- **Stayed in the gold standard after the US**: France

The Gold Standard and Exchange Rate



Vertical lines: October 1929, July 1931, April 1933. ↑ is a depreciation of the US dollar relative to the other currency

Mechanism

- Big changes in exchange rate related with recession and drop in exports Graphs
- After local shock, FEX limits capacity of economy to adjust prices relative the rest of the world
- Flexible exchange rate can reduce price of domestic goods abroad
- In that context, FEX depresses the external sector, as external demand is lower

Test: see how economic activity in more exposed cities changes after shocks

Trade Exposure Measure

- We build a measure of exposure of a city to bilateral exchange rate shocks
- We three sources of data:
  - Share of sectoral employment in 1930 (Census): 45 exporting sectors
  - Share of exports by country-destination (DoC): 45 exporting sectors and 33 destinations
  - Monthly bilateral exchange rate (Fed): 33 countries
- Create a measure that contains information on:
  - How export oriented a city is
  - Exposure of a city to individual bilateral exchange rate change

Trade Exposure Measure: Details

$$Exposure\_Trade_{c,t} = \sum_{s} Sh\_Workers_{s,c,1930} \sum_{d} Sh\_Exports_{s,d,1928} \times Exchange\_Rate_{d,t}$$

Two main components that depend on time (t), city (c), sector (s) and destination (d):

$\sum_d Sh\_Exports_{s,d,1928} \times Exchange\_Rate_{d,t}$ = Sectoral export-weighted exchange rate

$\sum_s Sh\_Workers_{s,c,1930}$ = Sectoral exposure a la Autor, Dorn and Hanson (2013) (non-tradable sectors not included)

$\rightarrow$ The result is a time varying measure of exposure that combines trade composition of the city, with specific destination time-varying shocks

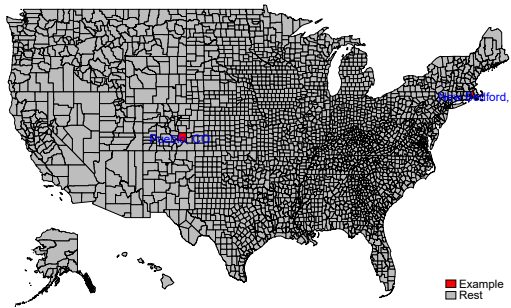
Trade Exposure Measure: Example with two cities

Pueblo, CO

- Inland, trade costly
- Home of Colorado Fuel and Iron Company: 18% of workers in steel
- Steel to Canada (44%) and Japan (18%)

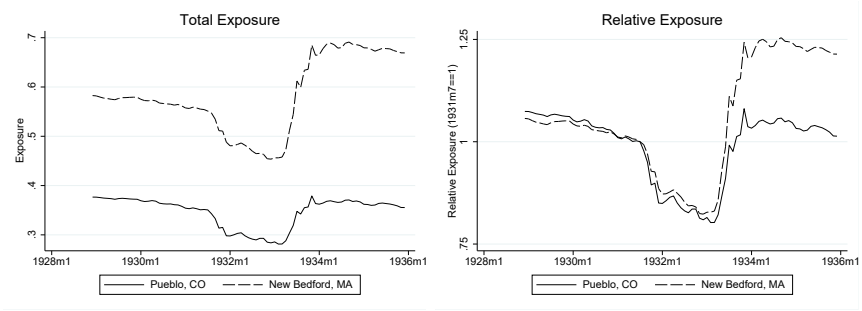
New Bedford, MA

- Coastal, open to trade
- Many cotton mills: 42 % of workers in semi-manufacturing cotton
- Cotton to Germany (25%) and UK (24%)



Trade Exposure Measure: Example

Figure: Exposure Measure for Selected cities



Measure of Economic Activity

- Bank debits at the city level with monthly variation
- Bank debits are withdrawals from bank accounts (including checks)
- High correlation with many measures of economic activity Tables
- Importance of high time and cross-sectional variation for this exercise:
  - Cross-sectional variation: Importance to have good variation in the measure of exposure (270 cities)
  - Time variation: Importance to identify in high frequency, specially in 1933

Effects on Economic Activity

$$\ln D_{c,t} = \gamma_c + \gamma_t + \beta \times Exposure\_Trade_{c,t} + \varepsilon_{c,t},$$

Effects on Economic Activity

$$\ln D_{c,t} = \gamma_c + \gamma_t + \beta \times Exposure\_Trade_{c,t} + \varepsilon_{c,t},$$

	(1)	(2)	(3)	(4)	(5)	(6)
Exposure Trade	1.193***	0.836***	0.758***	2.176***	1.965***	1.564***
	(0.253)	(0.260)	(0.216)	(0.449)	(0.453)	(0.529)
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	-	-	Yes	-	-
Fed-Time FE	No	Yes	No	No	Yes	No
State-Time FE	No	No	Yes	No	No	Yes
Sample	All	All	All	$\leq$1933m3	$\leq$1933m3	$\leq$1933m3
Observations	21,807	21,807	21,164	13,269	13,269	12,899
R-squared	0.990	0.992	0.993	0.994	0.994	0.995

Other Results

- Estimate exchange rate pass-through Prices
  - Use tradable prices in local currency for 4 countries
  - Show incomplete pass-through
  - Event study 1931 and 1933 show reaction of prices in local currency
- Use time fixed effect to evaluate empirically contribution of exchange rate: Time FE
  - Trade explains 16% of drop in economic activity by end of 1932
  - Trade explains 50% of increase in economic activity by end of 1934
- Robustness using Autor, Dorn and Hanson (2013) style measure: Robustness
  - Rely only on fixed shares and time FE
  - Show no pre-trend and similar results in 1931 and 1933

Aggregate Effect

- Simple open economy NK model:
  - 1 home country with 2 symmetric regions
  - 2 foreign countries
  - Each region trades with one of those countries
  - Home country and foreign region 2 in FEX regime
- Generate series of output, prices and shock exchange rate with foreign country 1, while in gold standard with country 2
- Find parameters that match empirical findings Parameters
- 1% depreciation in foreign country 1 increases aggregate output by 0.33% (compared to 0.76% in cross-section) Aggregate
- Suggests an important role of appreciation in 1931 ($\Delta y = -9\%$) and of depreciation in 1933 ($\Delta y = 26\%$)

Conclusions

- Exploiting cross sectional variation at the city level in the US, we show that changes in exchange rate affect economic activity
- We estimate prices pass-through using novel natural experiment
- We use economic theory to inform aggregate effect from cross-sectional estimate
- We show that this mechanism was key to understand the decay in economic activity between 1931 and 1932 in the US and important for the recovery of 1933
- Important for today's context with more global shocks and big currency unions

Thank you!

A little heavy in the stern!

Cleveland Plain Dealer. September 22, 1931. Page 6.

Measure of Economic Activity: Correlation with other measures

Table: Relationship of Debits with Regional Measures of Economic Activity

	Log Car Registration (State)				% Change in Department Store Sales (Fed)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Debits	0.610***	1.032***	0.588***	0.349***	0.376***	0.375***	0.248***	0.226***
	(0.008)	(0.037)	(0.006)	(0.053)	(0.023)	(0.023)	(0.037)	(0.037)
Region FE	No	Yes	No	Yes	No	Yes	No	Yes
Time FE	No	No	Yes	Yes	No	No	Yes	Yes
Obs	3,480	3,480	3,480	3,480	792	792	792	792
R-squared	0.681	0.786	0.839	0.929	0.438	0.441	0.896	0.900

Table: Relationship of Debits with National Measures of Economic Activity

	Industrial Production			Business Activity		
	(1)	(2)	(3)	(4)	(5)	(6)
Log Debits	0.346***	0.514***	0.592***	0.496***	0.613***	0.470***
	(0.032)	(0.029)	(0.066)	(0.026)	(0.035)	(0.051)
Sample	All	$< 1933m3$	$\geq 1933m3$	All	$< 1933m3$	$\geq 1933m3$
Observations	117	51	66	117	51	66
R-squared	0.359	0.823	0.492	0.668	0.817	0.457

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Data: Prices

- We estimate the effect of changes in exchange rate on prices to account for terms of trade change $ToT_t = \frac{p_{FF,t}}{p_{HH,t}}\mathcal{E}_t$
- Incomplete pass-through implies gain in competitiveness:
  - 1 % increase in exchange rate that translate to only 0.5 % decrease in foreign currency prices implies that local producer receives 0.5% higher price
- We obtain monthly prices for the US, UK, France and Germany for 14 goods (commodities and food) in local currency
- We run regression over between 1929-1935, and run event studies in 1931 and 1933 to estimate effect of exchange rate variation

Effect on Prices: Measuring Competitiveness

$$\Delta Prices_{c,j,t} = \beta \Delta Exchange\_Rate_{c,t} + \gamma_{j,c} + \theta_{j,t} + \varepsilon_{c,j,t},$$

Effect on Prices: Measuring Competitiveness

$$\Delta Prices_{c,j,t} = \beta \Delta Exchange\_Rate_{c,t} + \gamma_{j,c} + \theta_{j,t} + \varepsilon_{c,j,t},$$

Table: Effect of Exchange Rate Changes on Prices

	(1)	(2)	(3)	(4)
Exchange Rate (log changes)	-0.500***	-0.522***	-0.507***	-0.232**
	(0.104)	(0.119)	(0.127)	(0.105)
Exchange Rate*Tradable		0.044		-0.543**
		(0.116)		(0.236)
Country-Product FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	-	-
Product-Time FE	No	No	Yes	Yes
Observations	2,719	2,719	2,719	2,719
R-squared	0.071	0.071	0.590	0.592

Effect on Prices: Measuring Competitiveness

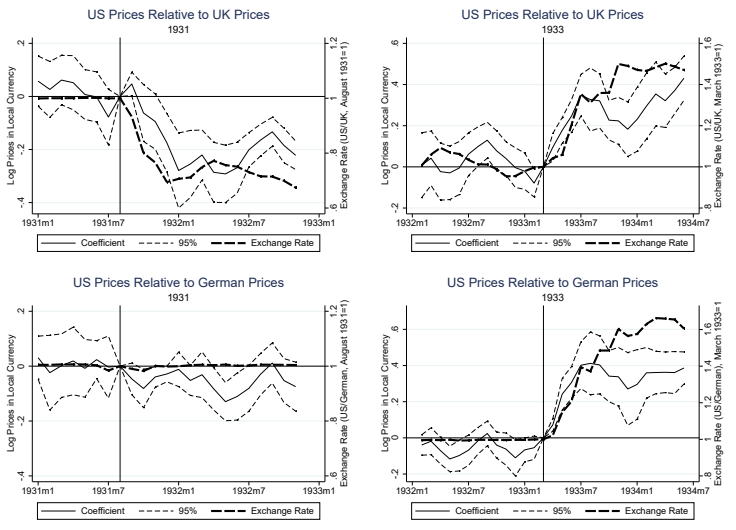
- We find incomplete pass-through
- Values similar to early works in the field (Goldberg and Knetter (1997))
- Also, evidence that more tradable goods have a higher pass-through as in Burstein, Eichenbaum and Rebelo (2005)
- Smaller than numbers found in the dominant currency paradigm literature (Gopinath et al (2020))
- No clear dominant currency at the time, UK a little more dominant than the US according to Eichengreen and Flandreau (2009) and Nurkse (1944)
- Big part of the period with no change, so we estimate effect around main events

Effect on Prices: Event study

$$Prices_{c,j,t} = \beta^t US_c \times \gamma_t + \gamma_{j,c} + \varepsilon_{c,j,t}$$ Back

Effect on Prices: Event study

$$Prices_{c,j,t} = \beta^t US_c \times \gamma_t + \gamma_{j,c} + \varepsilon_{c,j,t}$$ Back



Robustness: Income fixed variable

We add another variable to evaluate the effect a la Autor, Dorn and Hanson (2013)

$$Trade\_Exposure_{c,33-32} = \sum_{s} \frac{L_{c,s,1930}}{L_{c,1930}} \times \frac{Exports_{s,1933} - Exports_{s,1932}}{Exports_{s,1932}}$$

- This measure don't varies across time, so we rely on interactions with time fixed effects
- We can test for pre-trends around main events
- The measure indicates how much income received each reason in 1933

What Happened when the UK Abandoned?

$$D_{c,t} = \alpha_c + \gamma_{s(c),t} + \beta^t \times Trade\_Exposure_{c,33-32} \times \gamma_t + \varepsilon_{i,t}$$

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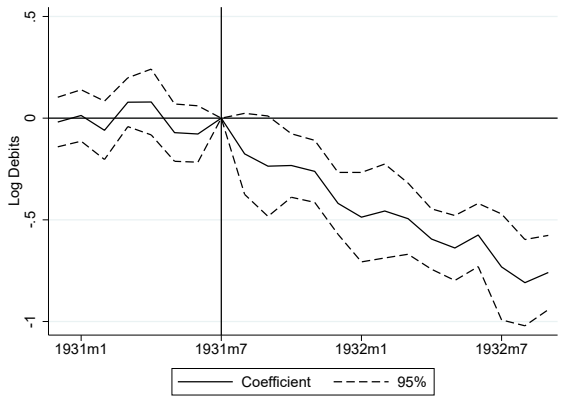

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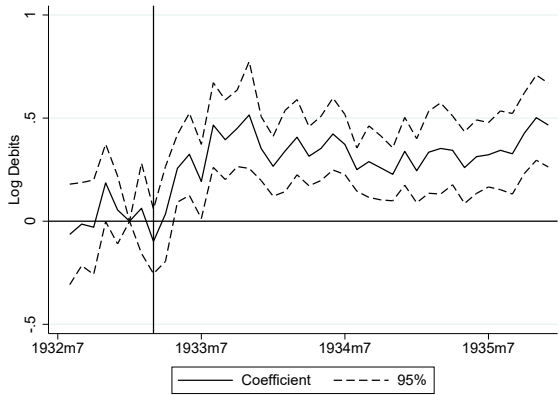

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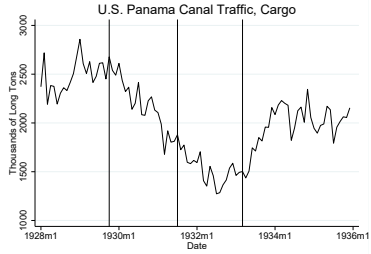
The Gold Standard, Trade and Economic Activity



Theory net exports Back

Model Equations

We derive a open economy NK model, this equations represents the how aggregate output (y_h) and net exports (nx_t) depends on changes of the terms of trade $q_t = p_t^* + e_t - p_t$, depending on the preference for local good ϕ_H, internal trade ϕ_C, foreign trade ϕ_F, elasticity of substitution between local and foreign varieties σ and intertemporal elasticity of substitution γ

$$y_t = y_t^* + \left[2\sigma(\phi_H + \phi_H)\phi_F + \frac{1}{2\gamma} \left(1 - 2(\phi_H + \phi_C)\right)^2 \right] q_t$$

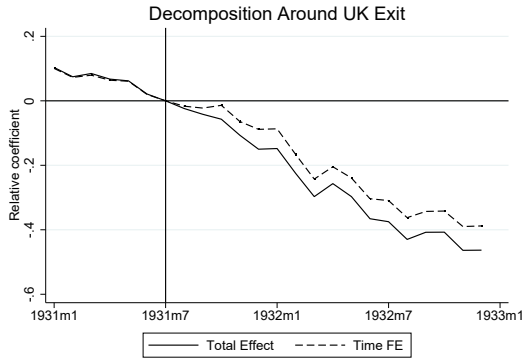
$$nx_t = \phi_F \left((\phi_H + \phi_C) \left(\sigma - \frac{1}{\gamma} \right) - \frac{\gamma - 1}{2\gamma} \right) q_t$$

Effects on Economic Activity: Results

- Significant and economically relevant results at the city level
- 1 % city specific depreciation increases economic activity by around 1 percent as well.
- Appreciation in 1931 was 15 percent and depreciation in 1933 was 35 percent
- To analyze effect, average exposure also relevant
- We then analyze around the main events comparing the average effect with the time fixed effect:
  - Time fixed effect: γ_t
  - Average exposure effect: $\beta \times \overline{Exposure\_Trade}_{.,t}$
  - Total average effect: $\gamma_t + \beta \times \overline{Exposure\_Trade}_{.,t}$

Decomposition around 1931 Event

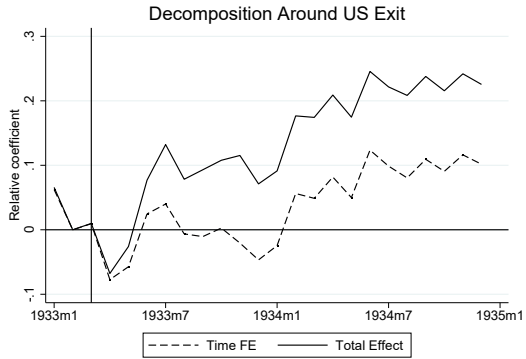
Figure: Effect of Exchange Rate Appreciation on Trade Exposed Cities



→ Economic activity ↓ 16 % by the end of 1931 → 40 % due to the trade channel
→ Economic activity ↓ 42 % by the end of 1932 → 16 % due to the trade channel

Decomposition around 1933 Event

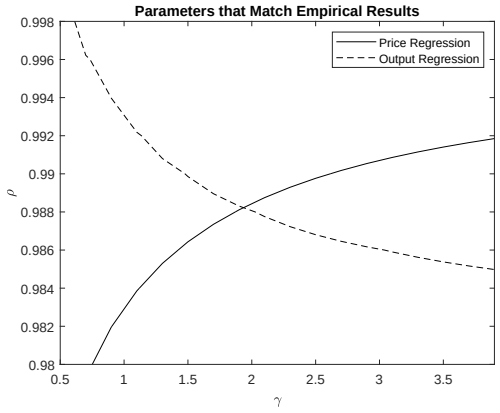
Figure: Effect of Exchange Rate Appreciation on Trade Exposed Cities



→ Economic activity ↑ 10 % by the end of 1933 → 100 % due to the trade channel
→ Economic activity ↑ 22 % by the end of 1934 → 50 % due to the trade channel Back

Parameters

Figure: Parameters that Match Empirical Results



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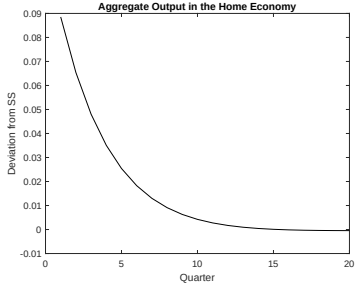
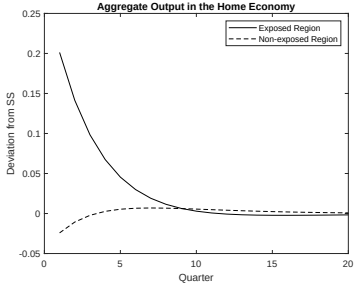
Aggregate Effect

Figure: Aggregate Output after Depreciation





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