Bound by Ancestors:
Immigration, Credit Frictions, and Global Supply Chain Formation

Jaerim Choi[a] Jay Hyun[b] Ziho Park[c]

[a]University of Hawai'i

[b]HEC Montréal - U Montreal Business School

[c]National Taiwan University

NBER Conference:
International Fragmentation, Supply Chains, and Financial Frictions

March 1, 2023

Global Supply Chains at the Center of Economic Debates

Disruption and reorganization of global supply chain (GSC) networks

- Trump's protectionist policies, Covid-19 pandemic, & Russo-Ukrainian war brought reorganization of the global supply chains to attention.

$\Rightarrow$ **(e.g,)** Covid-19 pandemic ignited a movement toward "renationalization" of global supply chains.

Importantly, recent events also led to a disturbance in immigration

$\Rightarrow$ **(e.g,)** Trump's H-1B suspension; Border restrictions following Covid-19, etc.

Global Supply Chains at the Center of Economic Debates

Disruption and reorganization of global supply chain (GSC) networks

Importantly, recent events also led to a disturbance in immigration

$\Rightarrow$ **Recent events then raise the following questions:**

- What determines global supply chain network structure?
- Among its potential determinants, does immigration affect the formation of global supply chains across countries?
- If so, through what mechanism does immigration shape global supply chain structure?

$\Rightarrow$ Answers to these questions will deepen our understandings on the long term determinants of GSC structure.

This Paper

Unique dataset (firm-to-firm GSC + US establishment location + historical immigration) + IV strategy (leave-out push-pull approach, Burchardi et al. 2019)

- We establish a causal linkage b/w immigration and GSC formation.
  - Immigration from a given country to a given US county has a positive causal impact on firm-to-firm GSC relationships between these regions.
  - The positive impact extends beyond conventional supplier-customer relationships: (i) *strategic partnerships* and (ii) *trade in services*.
- In terms of underlying economic mechanisms
  - Such positive impact is stronger for US counties where more credit-constrained firms are located;
  - and such a stronger interaction becomes even more pronounced for foreign firms located in countries with weak contract enforcement.

⇒ **Co-ethnic networks serve as social collateral to overcome credit constraints and facilitate global supply chain formation.**

American Dream: History of Koreatown, Los Angeles (LA)

Los Angeles: US city with the largest Korean-American population

Started by the Independent Movement Generations in early 20th century.

Huge inflow of Korean immigrants following 1965 Immigration Act.

Note: Olympic Market, which opened in 1971.
Source: KORELimited (Image courtesy of Pyong Yong Min).

American Dream: History of Koreatown, Los Angeles (LA)

Los Angeles: US city with the largest Korean-American population

- Koreans who settled in LA mostly engaged in trading activities (e.g., fashion items, garments) with vendors in South Korea.
  — A survey of Korean immigrants in LA (Min, 1993)
- Through the *"advantages associated with their language and ethnic background"* (Min, 1993), Korean immigrants established import businesses dealing in Korean-imported goods (e.g., textiles, wigs).
  - Korean importers in LA processed and distributed Korean-made products mainly to Korean wholesalers, who in turn distributed to other Korean retailers.
- Importantly, Korean immigrants were able to overcome financial obstacles by forming *trust-based* **Rotating Credit Associations (RCAs)** known as *"kye"*.
  - (c.f.) Other examples of RCAs: "Tandas" in Latin America; "Hui" in China
- "Kye" was widely used among 400,000 Korean immigrants, and supported a rapid expansion of LA apparel industry in K-town & business relationships with Korea.

Related Literature

1. Relationship between immigration and trade/FDI
   - Trade: Gould 1994; Head and Ries 1998; Rauch and Trinade 2002; Cohen et al. 2017; Parsons and Vezina 2018; Cardoso and Ramanaryanan 2019.
   - FDI: Javorcik et al. 2011; Burchardi et al. 2019.

   ⇒ We establish a causal link and focus on global supply chains.

2. Social networks and credit constraints under incomplete contracting
   - Fafchamps 2000; Fisman and Raturi 2004; Karlan et al 2009; Wu et al. 2014; Levine et al. 2018.

   ⇒ Consistent with the literature, we uncover that social (co-ethnic) network help mitigate credit constraints in GSCs.

   ⇒ Furthermore, consistent with Antras and Foley 2015, such effect is more pronounced for foreign countries with weak contract enforcement.

3. The role of financial frictions/credit shocks on international transactions
   - Financial development as comparative advantage: Ju and Wei 2010, 2011.
   - Credit shocks and trade activities: Amiti and Weinstein 2011; Niepmann and Schmidt-Eisenlohr 2017.
   - Multinationals and credit constraints: Antras et al. 2009; Manova et al. 2015.

   ⇒ We complement the literature by showing that co-ethnic networks could potentially alleviate credit frictions and facilitate GSC formation.

Outline

Data

A unique dataset that combines

Sum.Stats

- Firm-to-firm Global Supply Chain Relationships (FactSet)

FactSet

⇒ Covers about 200,000 firms (>30,000 public firms) around the world, comprising over 725,000 unique business relationships.

⇒ Can identify HQ country of foreign firms connected to US firms

- Establishment-level Information of US firms (NETS)

NETS

⇒ Panel of a near universe of US establishments with precise information on location, trade activity, & credit ratings.

⇒ Can identify US firms' *trade-engaging* establishment location & credit ratings

- Century-long US Immigration Data (IPUMS)

IPUMS

⇒ Individuals files of the IPUMS samples covering 1880, 1900, 1910, ... 2000 waves of the US census + 2006-2010 ACS sample from Burchardi et al. 2019.

⇒ Can measure immigration history & ancestry composition of a given US county

Descriptive Analysis - Origin Country Level

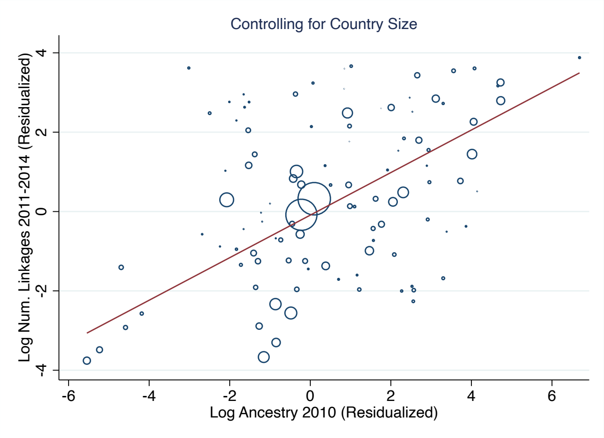
Relationship b/w #Ancestry and # GSC Linkages at the Origin Country Level
⇒ A country from which more immigrants originated and moved to US tends to have more GSC linkages with US

Top 30 lists County-level

Descriptive Analysis - Origin Country Level

Relationship b/w #Ancestry and # GSC Linkages at the Origin Country Level
⇒ A country from which more immigrants originated and moved to US tends to have more GSC linkages with US even after controlling for country size

◂ Top 30 lists ◂ County-level



Overview of the Identification Strategy

Co-ethnic Networks $\Rightarrow$ GSC Formation

- Need to overcome endogeneity problems
  1. (Reverse causality): Past supply chain networks $\Rightarrow$ more immigration.
  2. (Omitted variable bias): Unobserved characteristics that drive both immigration and current supply chain networks.

$\Rightarrow$ **IV strategy: Leave-out push-pull approach (Burchardi et al. 2019):**

- Exploits quasi-random variation in the allocation of immigrants to US counties across time and space.

$\Rightarrow$ During the past century, the major foreign countries of origination and preferred US counties of destination changed over time.

Empirical Specification

- Our aim is to estimate the causal impact of the ancestry composition in 2010 ($A_{o,d}^{2010}$) on GSC structure in 2011-2014.
  ($\Rightarrow$ Robust to using $A_{o,d}^{1980}$ & restricting to newly formed GSC b/w 2011-14.)
- We set up the following regression equation:

$$Y_{o,d} = \beta A_{o,d}^{2010} + X_{o,d}'\gamma + \delta_o + \delta_d + \varepsilon_{o,d}$$

  - $Y_{o,d}$: Linkage dummy between 2011-2014: I(N.Supp> 0), I(N.Cust> 0)
    $\Rightarrow$ Also considers the intensive margin (i.e., the number of linkages)
  - $A_{o,d}^{2010}$: Log of one plus the number of residents in US county d that report having ancestors in origin country o in 2010
  - $X_{o,d}'$: A set of control variables (e.g., geographic distance)
  - δ_o: Origin country FEs; δ_d: Destination county FEs

$\Rightarrow$ Need IV for $A_{o,d}^{2010}$.

"Leave-out Push-pull" Approach - Illustration

To address endogeneity, we adopt IV strategy developed by Burchardi et al. 2019.

- Many **Italian** migrants in 1900-30 skilled at growing wine settled in U.S. regions favourable to **wine growing** (e.g. **Napa county**).
- The same unobserved factor may well explain why there are both residents with Italian ancestry in Napa (descendants of wine makers), and GSC linkages between Napa and Italy (wine-related-equipment trade with Italian firms)

Note. This illustration is based on the example in Burchardi et al. (2019), where we modify the context from FDI to GSC.

Detail

"Leave-out Push-pull" Approach - Illustration

To address endogeneity, we adopt IV strategy developed by Burchardi et al. 2019.

- The IVs remove this spurious correlation by ...

⇒ Predicting **# of Italians migrating to Napa** in 1900-30 using only the interaction of the share of **non-European immigrants** who settled in **Napa** with the number of **Italians** who settled **outside the West Coast**.

(i.e.) Predict $I^t_{Italy \to Napa} \approx I^t_{Italy \to US} \times \frac{I^t_{World \to Napa}}{I^t_{World \to US}}$

using $\Rightarrow I^t_{Italy \to NonWest} \times \frac{I^t_{NonEuro \to Napa}}{I^t_{NonEuro \to US}}$

⇒ Thus, if **wine growing** ability were the only true driver of migrations from **Italy** (or other European countries) to **Napa** (or other counties on the West Coast), the IVs would predict zero Napa residents with Italian ancestry today.

In a nutshell, $A^{2010}_{o,d}$ is likely to be positively associated with "predicted" immigration flow from o to d at t=1880, 1900, 1910, ..., 2000.

Outline

IV Regression Results: Supplier Linkages

Panel A	I(N.Supp>0)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log Ancestry 2010	0.242***	0.194***	0.224***	0.218***	0.224***	0.233***	0.234***
	(0.019)	(0.023)	(0.020)	(0.020)	(0.020)	(0.023)	(0.020)
Log Distance	0.016	0.012	0.055	0.053	0.033	0.067	-0.002
	(0.015)	(0.014)	(0.037)	(0.037)	(0.044)	(0.058)	(0.051)
First-stage F stat	11.0	2448.0	162.2	195.4	158.1	102.8	186.2
Destination FE	✓	✓	-	-	-	-	-
Origin FE	✓	✓	-	-	-	-	-
Principal Components	-	✓	✓	✓	✓	✓	✓
Destination x Continent FE	-	-	✓	✓	✓	✓	✓
Origin x Census Division FE	-	-	✓	✓	✓	✓	-
$I^{2010}_{o,-r(d)}(I^{2010}_{-c(o),d}/I^{2010}_{-c(o)})$	-	-	-	✓	-	-	-
3rd order poly in dist and lat	-	-	-	-	✓	✓	-
Agricultural Similarity	-	-	-	-	-	✓	-
Origin x State FE	-	-	-	-	-	-	✓
Observations	612495	612495	612495	612495	612495	459150	612300

Note. I(N.Supp>0) is a dummy variable that equals to one if any firm whose trade-engaging establishments located in destination d has supplier firms headquartered in origin o between 2011 and 2014, and zero otherwise. IVs constructed using IPUMS sample 1880-2000. Column (1) includes destination fixed effects and origin fixed effects. In column (2), we additionally include the first five principal components of the higher-order interactions of push and pull factors as instruments. Column (3) includes "destination county"-by-continent fixed effects and "origin country"-by-"census division" fixed effects. Column (4) includes the interaction of the push and pull factor constructed using data from the 2006-2010 American Community Survey. Columns (5)-(6) add the 3rd order polynomials in distance and latitude, and the measure of agricultural similarity. Column (7) includes "origin country"-by-state fixed effects instead of "origin country"-by-"census division" fixed effects. All regressions control for log distance and latitude difference; standard errors are clustered at the origin country-level; * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

IV Regression Results: Supplier Linkages

Panel A	I(N.Supp>0)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log Ancestry 2010	0.242***	0.194***	0.224***	0.218***	0.224***	0.233***	0.234***
	(0.019)	(0.023)	(0.020)	(0.020)	(0.020)	(0.023)	(0.020)
Log Distance	0.016	0.012	0.055	0.053	0.033	0.067	-0.002
	(0.015)	(0.014)	(0.037)	(0.037)	(0.044)	(0.058)	(0.051)
First-stage F stat	11.0	2448.0	162.2	195.4	158.1	102.8	186.2
Destination FE	✓	✓	-	-	-	-	-
Origin FE	✓	✓	-	-	-	-	-
Principal Components	-	✓	✓	✓	✓	✓	✓
Destination x Continent FE	-	-	✓	✓	✓	✓	✓
Origin x Census Division FE	-	-	✓	✓	✓	✓	-
$I^{2010}_{o,-r(d)}(I^{2010}_{-c(o),d}/I^{2010}_{-c(o)})$	-	-	-	✓	-	-	-
3rd order poly in dist and lat	-	-	-	-	✓	✓	-
Agricultural Similarity	-	-	-	-	-	✓	-
Origin x State FE	-	-	-	-	-	-	✓
Observations	612495	612495	612495	612495	612495	459150	612300

$\Rightarrow$ Doubling the number of residents with ancestry from a given origin relative to the sample mean (from 320 to 640) increases by 4.9 percentage points the probability that at least one firm engages in global supply chain relationship with a supplier company headquartered in that origin.
Note: Mean of I(N.Supp>0)=3.2%.

IV Regression Results: Supplier Linkages

Panel A	I(N.Supp>0)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log Ancestry 2010	0.242***	0.194***	0.224***	0.218***	0.224***	0.233***	0.234***
	(0.019)	(0.023)	(0.020)	(0.020)	(0.020)	(0.023)	(0.020)
Log Distance	0.016	0.012	0.055	0.053	0.033	0.067	-0.002
	(0.015)	(0.014)	(0.037)	(0.037)	(0.044)	(0.058)	(0.051)
First-stage F stat	11.0	2448.0	162.2	195.4	158.1	102.8	186.2
Destination FE	✓	✓	-	-	-	-	-
Origin FE	✓	✓	-	-	-	-	-
Principal Components	-	✓	✓	✓	✓	✓	✓
Destination x Continent FE	-	-	✓	✓	✓	✓	✓
Origin x Census Division FE	-	-	✓	✓	✓	✓	-
$I^{2010}_{o,-r(d)}(I^{2010}_{-c(o),d}/I^{2010}_{-c(o)})$	-	-	-	✓	-	-	-
3rd order poly in dist and lat	-	-	-	-	✓	✓	-
Agricultural Similarity	-	-	-	-	-	✓	-
Origin x State FE	-	-	-	-	-	-	✓
Observations	612495	612495	612495	612495	612495	459150	612300

$\Rightarrow$ Robust to adding various controls (e.g., 3rd order polynomial in distance and latitude difference; agricultural similarity) and more demanding fixed effects.

IV Regression Results: Customer Linkages

Panel B	I(N.Cust>0)						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Log Ancestry 2010	0.232***	0.196***	0.207***	0.208***	0.208***	0.209***	0.213***
	(0.018)	(0.022)	(0.019)	(0.019)	(0.019)	(0.023)	(0.021)
Log Distance	0.017	0.014	0.041	0.041	0.029	0.050	-0.022
	(0.018)	(0.017)	(0.040)	(0.041)	(0.045)	(0.060)	(0.070)
First-stage F stat	11.0	2448.0	162.2	195.4	158.1	102.8	186.2
Destination FE	✓	✓	-	-	-	-	-
Origin FE	✓	✓	-	-	-	-	-
Principal Components	-	✓	✓	✓	✓	✓	✓
Destination x Continent FE	-	-	✓	✓	✓	✓	✓
Origin x Census Division FE	-	-	✓	✓	✓	✓	-
$I^{2010}_{o,-r(d)}(I^{2010}_{-c(o),d}/I^{2010}_{-c(o)})$	-	-	-	✓	-	-	-
3rd order poly in dist and lat	-	-	-	-	✓	✓	-
Agricultural Similarity	-	-	-	-	-	✓	-
Origin x State FE	-	-	-	-	-	-	✓
Observations	612495	612495	612495	612495	612495	459150	612300

Note. I(N.Cust>0) is a dummy variable that equals to one if any firm whose trade-engaging establishments located in destination d has customer firms headquartered in origin o between 2011 and 2014, and zero otherwise. All regressions control for log distance and latitude difference; standard errors are clustered at the origin country-level; * p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01.

◂ OLS ◂ Link Dummy

Intensive Margin: Log Number of Supp/Cust Linkages

Panel A	Log N.Supp						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log Ancestry 2010	0.309***	0.213***	0.253***	0.318***	0.254***	0.248***	0.262***
	(0.110)	(0.067)	(0.074)	(0.062)	(0.074)	(0.091)	(0.075)
First-stage F stat	10.2	84.3	26.8	26.1	26.3	21.4	22.7
Observations	20385	20385	20385	20385	20385	18949	20340
Panel B	Log N.Cust						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Log Ancestry 2010	0.341***	0.204***	0.255***	0.279***	0.254***	0.279***	0.265***
	(0.094)	(0.054)	(0.069)	(0.055)	(0.068)	(0.085)	(0.072)
First-stage F stat	14.9	67.7	16.2	31.3	17.0	21.5	18.4
Observations	22968	22968	22968	22968	22968	20551	22931
Destination FE	✓	✓	-	-	-	-	-
Origin FE	✓	✓	-	-	-	-	-
Principal Components	-	✓	✓	✓	✓	✓	✓
Destination x Continent FE	-	-	✓	✓	✓	✓	✓
Origin x Census Division FE	-	-	✓	✓	✓	✓	-
$I^{2010}_{o,-r(d)}(I^{2010}_{-c(o),d}/I^{2010}_{-c(o)})$	-	-	-	✓	-	-	-
3rd order poly in dist and lat	-	-	-	-	✓	✓	-
Agricultural Similarity	-	-	-	-	-	✓	-
Origin x State FE	-	-	-	-	-	-	✓

Note. We use log of the number of supplier linkages (Log N.Supp) and customer linkages (Log N.Cust), respectively, as dependent variables. All regressions control for log distance and latitude difference; standard errors are clustered at the origin country-level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Placebo Test: Non-trade-engaging Establishments

- In our baseline analyses, we restricted establishments to those who engage in international trade (i.e., trade-engaging establishments).

(e.g,) Suppose a firm who has a supplier in Italy has establishments in Sacramento county (California) and San Augustine county (Texas).

$\Rightarrow$ If the establishment in Sacramento engages in international trade while the one in San Augustine does not,

$\Rightarrow$ It is likely that the establishment in Sacramento is connected with the firm's supplier in Italy.

- Perform a placebo test by using non-trade-engaging establishments

Placebo Test: Non-trade-engaging Establishments

	I(N.Supp>0)				I(N.Cust>0)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Ancestry 2010	0.014	0.014	0.022	0.011	0.039*	0.039*	0.021	0.031
	(0.022)	(0.022)	(0.026)	(0.022)	(0.023)	(0.023)	(0.025)	(0.023)
First-stage F stat	69.4	69.2	56.2	77.4	69.4	69.2	56.2	77.4
Principal Components	✓	✓	✓	✓	✓	✓	✓	✓
Destination x Continent FE	✓	✓	✓	✓	✓	✓	✓	✓
Origin x Census Division FE	✓	✓	✓	-	✓	✓	✓	-
3rd order poly in dist and lat	-	✓	✓	-	-	✓	✓	-
Agricultural Similarity	-	-	✓	-	-	-	✓	-
Origin x State FE	-	-	-	✓	-	-	-	✓
Observations	612495	612495	459150	612300	612495	612495	459150	612300

Note. This table presents regression results of the Placebo test. Specifically, we measure firms' US county location solely based on non-trade-engaging establishments. All regressions control for log distance, latitude difference, and FDI dummy; standard errors are clustered at the origin country-level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Additional Robustness

- Not Driven by FDI
  - Directly control for FDI dummy ◂ Controlling FDI
  - Eliminate any potential multinational linkages. ◂ Exclude Multinationals
- Not Driven by Reverse Causality
  - Ancestry Compositions Prior to 2010 ◂ Ancestry 1980
  - Newly Formed Linkages After 2010 ◂ New Connections
- Robust to alternative ways of defining US firms' location
  - Single-establishment firms ◂ Single-establishment Firms
  - HQ establishments ◂ HQ Establishments
- Additional Checks
  - Firm-Origin-Destination-Level ◂ Firm-Origin-Destination
  - Drop West Region and Asia ◂ Drop West/Asia
  - Alternative (Relative) Ancestry Measure ◂ Alternative Ancestry

Beyond Conventional Perspectives on Supply Chains

- We now present two novel results that go beyond conventional perspectives on supply chain network relationships.

  1. Strategic partnerships: (e.g.,) joint venture, research collaboration, marketing, integrated product offering, in- and out-licensing, etc.

     Strategic Partnership

  2. Non-manufacturing establishments: separate analyses by restricting establishments to manufacturing and non-manufacturing. Non-MFG
     - Results also hold for service-related sectors Service

Outline

What stories can explain our findings?

International Transactions are Different!

- International transactions usually involve various informal barriers.
  - (e.g.) Poor enforcement of contracts, incomplete information about foreign partners, cultural and language differences, etc.
- Co-ethnic networks that operate across national borders may help mitigate these informal barriers (Rauch, 2001).

What stories can explain our findings?

International Transactions are Different!

Firm-to-Firm Relationships, Social Networks, & Credit Frictions

- Arm's-length relationship; More severe contractual & financial problems
  ... compared to other types of transactions (e.g., those within a firm boundary)
- Also, firm-to-firm international transactions generally involve trade credit.
  - Social trust plays a major role in granting and receiving trade credit.
    ... especially under weak contractual enforcement in place.
    (Fafchamps, 2000; Karlan, 2005; Wu et al., 2014; Levine 2018).
- Social networks, in general, can relax financial frictions by facilitating trust-based informal finance, such as RCAs or "Kye" (Karlan et al., 2009).

What stories can explain our findings?

International Transactions are Different!

Firm-to-Firm Relationships, Social Networks, & Credit Frictions

- Arm's-length relationship; More severe contractual & financial problems
  ... compared to other types of transactions (e.g., those within a firm boundary)
- Also, firm-to-firm international transactions generally involve trade credit.
  - Social trust plays a major role in granting and receiving trade credit.
    ... especially under weak contractual enforcement in place.
    (Fafchamps, 2000; Karlan, 2005; Wu et al., 2014; Levine 2018).
- Social networks, in general, can relax financial frictions by facilitating trust-based informal finance, such as RCAs or "Kye" (Karlan et al., 2009).

In a nutshell...

Co-ethnic networks → create trust in international business → mitigate credit constraints and facilitate in firm-to-firm transactions.

Economic Mechanism

Co-ethnic networks $\rightarrow$ create trust in international business $\rightarrow$ mitigate credit constraints and facilitate in firm-to-firm transactions.

Hypothesis:

1. We would expect to observe that the positive impact is stronger for US counties in which more credit constrained firms are located.
2. This stronger interaction would be more amplified if US firms interact with foreign firms in countries with weak enforcement of contracts.

$\Rightarrow$ If so, the presence of co-ethnic networks can serve as social collateral to overcome credit constraints and facilitate global supply chain formation.

Economic Mechanism

To Test Our Hypothesis:

- We set up the following regression:

$$Y_{o,d} = \delta_o + \delta_d + \beta A_{o,d}^{2010} + \gamma A_{o,d}^{2010} \times CC_d + X'_{o,d}\eta + \varepsilon_{o,d}$$

- CC_d: Destination-level credit constraints – higher value of CC, which stands for "credit constraint", indicates worse trade credit solvency.
    - We use firms' PayDex score information in NETS, which measures trade credit performance at the establishment level.
    - Robust to
      (i) using alternative CC measure from Rajan and Zingales (1998);
      (ii) running regressions at firm-origin-destination-level

Heterogeneous Treatment Effect: Credit Constraints

	100-PayDexMax		100-PayDexMin	
	I(N.Supp>0)	I(N.Cust>0)	I(N.Supp>0)	I(N.Cust>0)
	(1)	(2)	(3)	(4)
Log Ancestry 2010	0.054	0.084**	0.065*	0.098***
	(0.039)	(0.042)	(0.039)	(0.037)
Log Ancestry 2010 x CC	0.186***	0.131**	0.158***	0.099**
	(0.056)	(0.060)	(0.050)	(0.044)
First-stage F stat	567.7	567.7	468.9	468.9
Destination FE	✓	✓	✓	✓
Origin FE	✓	✓	✓	✓
Principal Components	✓	✓	✓	✓
Observations	592995	592995	592995	592995

Note. This table presents heterogeneous treatment effect results by including interaction of Log Ancestry 2010 with credit constraint measures. CC, which is defined at the destination-level, measures the average credit constraint of establishments within each destination county. Columns (1)-(2) define CC using 100-PayDexMax; columns (3)-(4) define CC using 100-PayDexMin. To facilitate the interpretation of coefficients, all credit constraint variables are standardized so that the sample mean equals to zero and the sample standard deviation equals to one. All regressions control for log distance, latitude difference, and FDI Dummy; standard errors are clustered at the origin country-level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

RZ Measure
Additional Control
Firm-Origin-Destination

What stories can explain our findings?

To Test Our Hypothesis:

- We set up the following regression:

$$Y_{o,d} = \beta_1 A_{o,d}^{2010} + \beta_2 A_{o,d}^{2010} \times CC_d + \beta_3 A_{o,d}^{2010} \times CC_d \times (-JQ_o) + \beta_4 A_{o,d}^{2010} \times (-JQ_o) + \beta_5 CC_d \times (-JQ_o) + \delta_o + \delta_d + X'_{o,d}\eta + \varepsilon_{o,d}$$

  - CC_d: Destination-level credit constraints
    - higher value of CC, which stands for "credit constraint", indicates worse trade credit solvency.
  - JQ_o: Origin-level judicial quality (Nunn 2007)
    - higher value of (-JQ) indicates "weaker" institutional quality.

Heterogeneous Treatment Effect: The Role of Judicial Quality Interacting with Credit Constraints

	100-PayDexMax		100-PayDexMin	
	I(N.Supp>0)	I(N.Cust>0)	I(N.Supp>0)	I(N.Cust>0)
	(1)	(2)	(3)	(4)
Log Ancestry 2010	-0.004	0.014	-0.069***	-0.034
	(0.023)	(0.030)	(0.026)	(0.035)
Log Ancestry 2010 x CC	0.285***	0.234***	0.397***	0.311***
	(0.035)	(0.053)	(0.046)	(0.056)
Log Ancestry 2010 x CC x (-JQ)	0.095***	0.113***	0.175***	0.165***
	(0.025)	(0.037)	(0.030)	(0.038)
Log Ancestry 2010 x (-JQ)	-0.057***	-0.071***	-0.104***	-0.103***
	(0.016)	(0.020)	(0.018)	(0.023)
CC x (-JQ)	-0.002	-0.007**	-0.005*	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)
First-stage F stat	22.4	22.4	145.7	145.7
Destination FE	✓	✓	✓	✓
Origin FE	✓	✓	✓	✓
Principal Components	✓	✓	✓	✓
Observations	437904	437904	437904	437904

The role of co-ethnic networks on alleviating credit constraints in destinations becomes more important if origin countries have weaker judicial quality
$\Rightarrow$ Consistent with Antras and Foley (2015, JPE).

Outline

Conclusion

- This project attempts to advance our understanding on the two determinants of the GSCs and their interactions:
  1. Co-ethnic networks shaped by centry-long immigration;
  2. Credit constraints under incomplete contracting.
- Our results demonstrate a complex interplay among social and supply chain networks, financial frictions, and institutions.
- Have implication on the on-going discussion on GSC organization.
  - History-changing events that alter patterns of immigration (e.g., Covid-19) can have prolonged impact on the future structure of GSCs;

Thank you!

Appendix