

International Friends and Enemies

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Motivation

- Changes in the relative economic size of countries are often accompanied by shifts in the balance of political power
 - “Throughout history, anxiety about decline and shifting balances of power has been accompanied by tension and miscalculation ... Traditionally the test of a great power was its strength in war. Today, however, the definition of power is losing its emphasis on military force ... The factors of technology ... and economic growth are becoming more significant in international power.” (*Nye 1990*, pp. 153-4)

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- Combine with a variety of measures of political alignment
 - United Nations voting, strategic rivalries, formal alliances

This Paper

- Countries can undertake political actions that raises the productivity of their trade partners but incur utility costs
 - More sensitive a country's real income to a partner's productivity, greater incentive to undertake these political actions
- Key empirical challenge is that economic exposure depends on trade flows which could be endogenous to political alignment
- Address this empirical challenge using two sources of quasi-experimental variation
 - China's emergence into the global economy following its domestic supply-side reforms in 1978 (Autor et al. 2013)
 - Reduction in cost of air travel, which affects trade partners with different air distances relative to sea distances unevenly (Feyrer 2019)
- Increases in economic dependence on a trade partner predicted by our instruments lead to political realignment towards that partner
- Our theory-based economic exposure measure dominates simpler measures of trading relationships between countries

Related Literature

- **International political economy**
 - Scott (1955), Cohen (1960), Nye (1990), Signorino & Ritter (1999), Thompson (2001), Kuziemko & Werker (2006), Meyersson et al. (2008), Guiso, Sapienza & Zingales (2009), Colaresi et al. (2010), Head et al. (2010), Häge (2011), Head & Mayer (2013), Nunn & Qian (2014), Bailey et al. (2017), Aghion et al. (2018), Dicaprio & Sokolova (2018), Bao, Liu, Qiu & Zhu (2019)
- **Empirical literature on war and trade**
 - Polachek (1980), Polachek and McDonald (1992), Mansfield (1995), Barbieri (2002), Blomberg & Hess (2006), Martin et al. (2008), Glick & Taylor (2010)
- **Empirical literature on China's emergence and IVs for trade**
 - Frankel & Romer (1999), Rodriguez & Rodrik (2001), Autor, Dorn & Hanson (2013, 2016), Brunnermeier et al. (2018), Feyrer (2019)
- **Quantitative trade models and sufficient statistics for welfare**
 - Armington (1969), Jones & Scheinkman (1977), Wilson (1980), Eaton and Kortum (2002), Arkolakis, Costinot & Rodriguez-Clare (2012), Caliendo & Parro (2015), Adão, Costinot & Donaldson (2017), Adão, Arkolakis and Esposito (2019), Baqaee & Farhi (2019), Huo, Levchenko & Pandalai-Nayar (2019)

Outline

- Economic Friends and Enemies
- Extensions
- Data
- Descriptive Evidence
- Economic and Political Friends and Enemies
- Conclusions

Economic Friends and Enemies

- Consider a world of a set of countries indexed by $n, i \in \{1, \dots, N\}$
- Indirect utility of the representative agent in each country n

$$\mathcal{U}_n = u_n - v_n(\xi_n), \quad \xi_n = (\xi_{n1}, \dots, \xi_{nN})$$

- Productivity of each trade partner i (z_i) depends on fundamentals (\bar{z}_i) and political actions (ξ_{ni})

$$z_i = \bar{z}_i f_i(\xi_{1i}, \dots, \xi_{Ni})$$

- Reaction function in Nash non-cooperative equilibrium

$$\underbrace{\left(\frac{\partial \ln u_n}{\partial \ln z_i} \right)}_{U_{ni}} \left(\frac{\partial \ln z_i}{\partial \ln \xi_{ni}} \right) \frac{u_n}{v_n} - \left(\frac{\partial \ln v_n}{\partial \ln \xi_{ni}} \right) = 0$$

- All else equal, the greater real income exposure (the larger U_{ni}), the greater the incentive to undertake political actions (the larger ξ_{ni})

Real Income Exposure

- Consider single-sector constant elasticity Armington model
- Each country has an endowment of labor (ℓ_n)
- Goods produced using labor with productivity (z_i)
- Goods traded subject to iceberg trade costs (τ_{ni})
- Real income exposure is the matrix (U) in this vector equation

$$d \ln \mathbf{u} = \mathbf{U} d \ln \mathbf{z},$$

- $d \ln \mathbf{z}$ is the $N \times 1$ vector of log changes in productivity
- $d \ln \mathbf{u}$ is the $N \times 1$ vector of log changes in real income per capita ($d \ln u_n$) induced by these log changes in productivity ($d \ln z_n$)
- U is a $N \times N$ matrix, where element U_{ni} captures the elasticity of real income in country n with respect to productivity growth in country i
- **Positive** elements **friends**, **negative** elements **enemies**

Hub and Authority Scores

- Generalizations of centrality measures for symmetric networks
- **Authority score**: captures the importance of a country as a source of real income shocks for other countries
- **Hub score**: summarizes the sensitivity of a country's real income to shocks in other countries

$$a_i = \lambda \sum_{n=1}^N U_{ni} h_n, \quad h_n = \mu \sum_{i=1}^N U_{ni} a_i$$

- where λ and μ are scaling constants equal to inverse norms of vectors $\mathbf{a} \equiv [a_i]$ and $\mathbf{h} \equiv [h_n]$
- Substituting the definition of \mathbf{h} into the definition of \mathbf{a} , these hub and authority scores are the dominant eigenvector of UU' and $U'U$, respectively, such that $\mathbf{a} \propto U'U\mathbf{a}$ and $\mathbf{h} \propto UU'\mathbf{h}$
- A country is an authority if it has a strong connection with hubs, and it is a hub if it has a strong connection with authorities

Exact-hat Algebra

- Real income exposure can be measured using exact-hat algebra
- Start at the observed equilibrium in the data and undertake a counterfactual for a productivity shock in one country

$$\ln \hat{w}_i = \left(\frac{\theta}{\theta + 1} \right) \ln \hat{z}_i + \frac{1}{\theta + 1} \ln \left[\sum_{n=1}^N t_{in} \frac{\hat{w}_n}{\sum_{m=1}^N s_{nm} \hat{w}_m^{-\theta} \hat{z}_m^{\theta}} \right]$$
$$\ln \hat{u}_i = \ln \hat{w}_i + \frac{1}{\theta} \ln \left[\sum_{n=1}^N s_{in} \hat{w}_n^{-\theta} \hat{z}_n^{\theta} \right]$$

- s_{ni} : share of expenditure of importer n on exporter i
- $t_{in} = s_{ni} w_n \ell_n / w_i \ell_i$: share of income of exporter i from importer n
- Repeat for a productivity shock in each country and populate matrix $U_{ik} = \ln \hat{u}_i / \ln \hat{z}_k$, where $\ln \hat{x}_i \simeq d \ln x_i$ for small x_i
- Corresponds to an arc elasticity for a given assumed magnitude of the productivity shock (\hat{z}_k)

Linearization

- Real income exposure also can be measured with a linearization

$$d \ln w_i = \sum_{n=1}^N t_{in} \left(d \ln w_n + \theta \left(\sum_{h=1}^N s_{nh} [d \ln w_h - d \ln z_h] - [d \ln w_i - d \ln z_i] \right) \right)$$

$$d \ln u_n = d \ln w_n - \sum_{i=1}^N s_{ni} [d \ln w_i - d \ln z_i]$$

- Stacking these comparative statics for each exposed country i (rows) and each shocked country k (columns)

$$d \ln \mathbf{w} = \mathbf{T} d \ln \mathbf{w} + \theta \cdot \mathbf{M} \times (d \ln \mathbf{w} - d \ln \mathbf{z})$$

$$d \ln \mathbf{u} = d \ln \mathbf{w} - \mathbf{S} (d \ln \mathbf{w} - d \ln \mathbf{z})$$

- Taking matrix inverse in wage equation and plugging into utility

$$\mathbf{U} \equiv -\frac{\theta}{\theta + 1} (\mathbf{I} - \mathbf{S}) (\mathbf{I} - \mathbf{V})^{-1} \mathbf{M} + \mathbf{S}, \quad \mathbf{V} \equiv \frac{\mathbf{T} + \theta \mathbf{T} \mathbf{S}}{\theta + 1} - \mathbf{Q}$$

- Corresponds to a point elasticity, where we used $\sum_{i=1}^N q_i d \ln w_i = 0$

Economic Interpretation

- Real income exposure has a direct economic interpretation

$$\underbrace{d \ln \mathbf{w}}_{\text{income effect}} = \underbrace{T d \ln \mathbf{w}}_{\text{market-size effect}} + \underbrace{\theta \mathbf{M} \times (d \ln \mathbf{w} - d \ln \mathbf{z})}_{\text{cross-substitution effect}}$$

$$\underbrace{d \ln \mathbf{u}}_{\text{welfare effect}} = \underbrace{d \ln \mathbf{w}}_{\text{income effect}} - \underbrace{\mathbf{S} (d \ln \mathbf{w} - d \ln \mathbf{z})}_{\text{price index effect}}$$

$$T_{in} = t_{in} \equiv \frac{s_{ni} w_n \ell_n}{w_i \ell_i}, \quad M_{in} = [TS - I]_{in} = \sum_{h=1}^N t_{ih} s_{hn} - 1_{n=i}, \quad S_{ni} = s_{ni}$$

- Cross-substitution (M_{in}) away from an exposed country i in response to a productivity shock in country n
 - Expenditure share of each market h on the shocked country n (s_{hn})
 - Income share of exposed country i from each market h (t_{ih})
 - Sum across all markets h

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Extensions

- Analysis holds in class of trade models with a constant trade elasticity
 - Armington model (Armington 1969)
 - Ricardian model (Eaton and Kortum 2002)
 - Love of variety model (Krugman 1980)
 - Heterogeneous firm model with Pareto distribution (Melitz 2003)
- Trade imbalance
- Productivity and trade cost shocks
- Departures from constant trade elasticity
- Multi-sector versions of constant elasticity trade models
 - Costinot, Donaldson and Komunjer (2012)
 - Cross-substitution occurs within each market-sector combination
- Multi-sector models with input-output linkages
 - Caliendo and Parro (2015)
 - Cross-substitution occurs within each market-sector combination
 - Gross trade includes indirect value added from previous stages
 - Impact of a productivity shock depends on whether it reduces intermediate input or final goods prices at each stage

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Economic Data

- International trade data
 - United Nations COMTRADE data
 - NBER World Trade Database 1970-2012
- Income, population and distance data
 - CEPII Gravity Database 1970-2012
- Preferential Trade Agreements (PTAs)
 - World Bank's Content of Deep Agreements database 1958-2012
- Input-output matrix
 - Caliendo and Parro (2015)
- Robustness test using EORA database

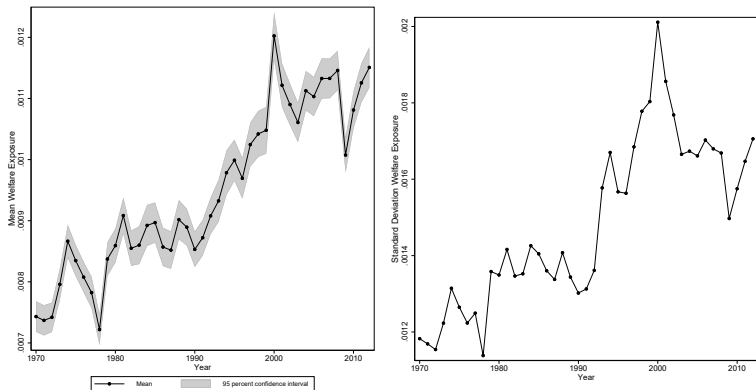
Political Alignment Data

- Voting in the United Nations General Assembly (UNGA)
 - S -score : sum of squared deviations between countries' votes
 - π -score : adjusts for empirical frequency with which each pair of countries votes yes, no and abstain
 - κ -score : adjusts for empirical frequency with which each country votes yes, no and abstain
 - Ideal distance : use observed votes to estimate each country's time-varying political preferences vis-a-vis US-led liberal order
- Strategic rivalries
 - Risk of conflict with a country of significant relative size and military strength, based on perceptions by political decision makers
 - Includes positional, spatial and ideological strategic rivalries
- Formal Alliances
 - Includes mutual defense pacts, neutrality pacts, non-aggression treaties, and ententes

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Global Welfare Exposure

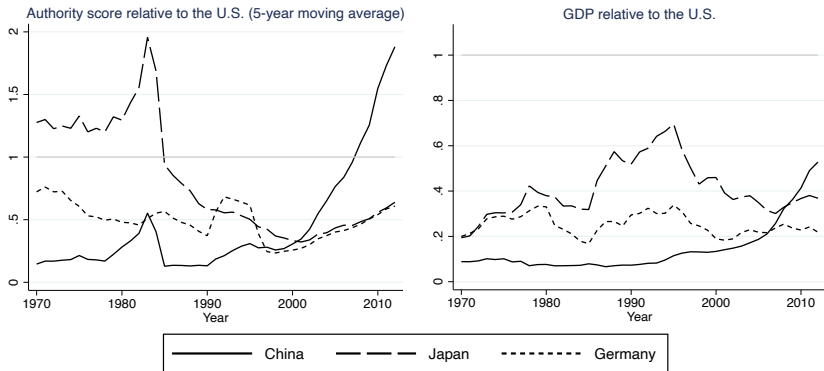


- Growing mean and dispersion of welfare exposure, consistent with increasing globalization over our sample period

Hub and Authority Scores

| Countries with the highest authority scores | | Countries with the highest hub scores | |
|---|------------------|---------------------------------------|--------------|
| 1980 | 2010 | 1980 | 2010 |
| 1. Japan | 1. China | 1. Vietnam | 1. Syria |
| 2. United States | 2. United States | 2. Cambodia | 2. Singapore |
| 3. France | 3. France | 3. Singapore | 3. Djibouti |
| 4. Saudi Arabia | 4. Germany | 4. Belize | 4. Vietnam |
| 5. Singapore | 5. Japan | 5. Lebanon | 5. Malaysia |

Welfare Authority and GDP

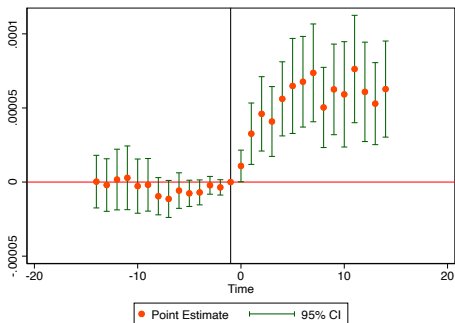


Validation Check

- Use event-study specification to check that our real income exposure measure successfully detects increases in economic interdependence following the formation of Preferential Trade Agreements (PTAs)

$$U_{nit}^{IO} = \sum_{s \in \{S_-, S_+\}} \beta_s (\mathbb{I}_{ni}^{PTA} \times \mathbb{I}_s) + \xi_{ni} + d_{ct} + h_{nit},$$

- Demonstrate robustness to alternative event-study estimators



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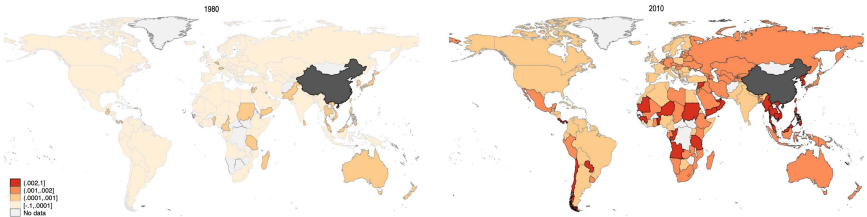
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 - A large empirical literature argues that China's rapid growth driven by its domestic supply-side reforms in 1978
 - Exogenous shock to other countries real income exposure

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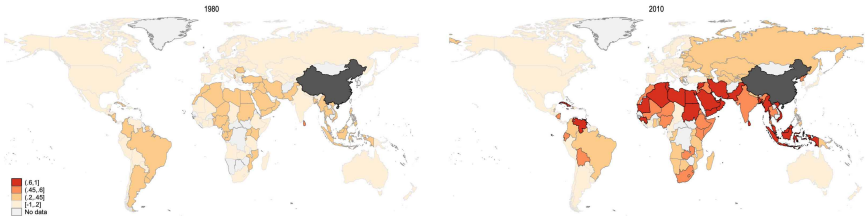
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 - Exogenous shock to other countries real income exposure
- Secular reduction in the cost of air travel (Feyrer 2019)
 - From 1955-2004, cost of moving goods by air fell by a factor of 10
 - Position of land masses generates large differences in bilateral distances by sea versus great circle distances by air
 - Countries with large sea distances relative to air distances benefit more from reduction in cost of air travel

China Shock

Top panel: welfare exposure to China's productivity growth by country, 1980 and 2010



Bottom panel: voting similarity (κ) to China in the United Nation's General Assembly, 1980 and 2010



Long Differences

- Long differences: 30-year change in political alignment to China (ΔA_{nct}) on 30-year change in welfare exposure to China (ΔU_{nct}^{IO})

$$\Delta A_{nct} = \beta \Delta U_{nct}^{IO} + \varepsilon_{nct},$$

- Control for log changes in bilateral trade ($\Delta \ln X_{nct}$)
- Although most of China's growth plausibly driven by its domestic fundamentals (\bar{z}_i), our political economy model suggests a feedback from political alignment to productivity (through $f_i(\cdot)$)

$$z_i = \bar{z}_i f_i(\zeta_{1i}, \dots, \zeta_{Ni})$$

- **Model-based instrument:** Starting at the initial equilibrium in 1980 in the data undertake an exact-hat algebra counterfactual for an increase in China's domestic fundamentals (\bar{z}_i)
- Instrument log changes in bilateral trade ($\Delta \ln X_{nct}$) with initial level of bilateral trade (shift-share type instrument)

OLS Regressions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|--------------------------------|------------------------------------|-----------------------------|---------------------------------|------------------------------------|-----------------------------|---------------------------------|
| | $\Delta \mathbf{A}_{nct}^{\kappa}$ | $\Delta \mathbf{A}_{nct}^S$ | $\Delta \mathbf{A}_{nct}^{\pi}$ | $\Delta \mathbf{A}_{nct}^{\kappa}$ | $\Delta \mathbf{A}_{nct}^S$ | $\Delta \mathbf{A}_{nct}^{\pi}$ |
| $\Delta \mathbf{U}_{nct}^{IO}$ | 44.13*** (15.10) | 22.69*** (6.665) | 47.26*** (15.65) | 51.74*** (16.12) | 26.08*** (7.172) | 58.38*** (17.05) |
| $\Delta \ln \mathbf{X}_{nct}$ | | | | -0.0263* (0.0139) | -0.0117* (0.00597) | -0.0385*** (0.0139) |
| Estimation | OLS | OLS | OLS | OLS | OLS | OLS |
| Observations | 119 | 119 | 119 | 119 | 119 | 119 |
| R-squared | 0.0484 | 0.0491 | 0.0447 | 0.0776 | 0.0713 | 0.0950 |

- \mathbf{A}_{nct}^S (S-score) : sum of squared deviations between countries' votes
- \mathbf{A}_{nct}^{π} (π -score) : adjusts for empirical frequency with which each pair of countries votes yes, no and abstain
- $\mathbf{A}_{nct}^{\kappa}$ (κ -score) : adjusts for empirical frequency with which each country votes yes, no and abstain

IV Regressions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|--------------------------|---------------------------|---------------------|------------------------|---------------------------|-----------------------|------------------------|
| | ΔA_{nct}^{κ} | ΔA_{nct}^S | ΔA_{nct}^{π} | ΔA_{nct}^{κ} | ΔA_{nct}^S | ΔA_{nct}^{π} |
| ΔU_{nct}^{IO} | 101.3*** (27.66) | 29.42*** (11.24) | 105.5*** (30.08) | 81.21*** (22.67) | 25.92** (11.70) | 66.93*** (24.88) |
| $\Delta \ln X_{nct}$ | | | | -0.0173 (0.0157) | -0.00302 (0.00859) | -0.0333* (0.0171) |
| Estimation | IV | IV | IV | IV | IV | IV |
| Observations | 119 | 119 | 119 | 119 | 119 | 119 |
| First-stage F-statistics | 21.83 | 21.83 | 21.83 | 10.65 | 10.65 | 10.65 |

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Air and Sea Distance

- Quasi-experimental variation from reductions in the cost of air travel across bilateral country pairs
 - Countries with large sea distances relative to air distances benefit more from reduction in cost of air travel
 - Further evidence using a quite different source of variation
 - Control for exporter-year and importer-year fixed effects
 - Wider range of measures of political alignment
- Regress bilateral political alignment (A_{nit}) on bilateral real income exposure (U_{nit}^{IO}) for importer n and exporter i at time t :

$$A_{nit} = \beta^A U_{nit}^{IO} + \vartheta_{ni}^A + \eta_{nt}^A + \mu_{it}^A + \epsilon_{nit}^A$$

- Instrument actual real income exposure (U_{nit}^{IO}) with predicted value (U_{nit}^{IO*}) based on time-varying coefficients on air and sea distance

$$U_{nit}^{IO} = \beta^U U_{nit}^{IO*} + \vartheta_{ni}^U + \eta_{nt}^U + \mu_{it}^U + \epsilon_{nit}^U$$

Model-based Instrument

- Real income exposure instrument

- Step 1: Sectoral gravity with time-varying air/sea distance coefficients

$$\ln s_{nit}^k = \sum_{t=1}^T \sum_{k=1}^K \mathbb{I}_{tk} (\gamma_{tk}^a \ln (\text{airdist}_{ni}) + \gamma_{tk}^s \ln (\text{seadist}_{ni})) + \vartheta_{ni}^k + \eta_{nt}^k + \mu_{it}^k + \epsilon_{nit}^k$$

- Step 2: Predict sectoral expenditure shares (s_{nit}^{k*})
- Step 3: Compute expenditure share (\mathbf{S}^{IO*}), income share (\mathbf{T}^{IO*}) and cross-substitution matrices (\mathbf{M}^{IO*}) in input-output model
- Step 4: Compute predicted welfare exposure (\mathbf{U}_{nit}^{IO*}) using linearization
- Step 5: Instrument actual (\mathbf{U}_{nit}^{IO}) with predicted (\mathbf{U}_{nit}^{IO*}) exposure

- Bilateral trade instrument

- Step 1: Aggregate gravity with time-varying air/sea distance coefficients

$$\ln \mathbf{X}_{nit} = \sum_{t=1}^T \mathbb{I}_t (\gamma_t^a \ln (\text{airdist}_{ni}) + \gamma_t^s \ln (\text{seadist}_{ni})) + \vartheta_{ni}^X + \eta_{nt}^X + \mu_{it}^X + \epsilon_{nit}^X$$

- Step 2: Instrument actual ($\ln \mathbf{X}_{nit}$) with predicted ($\ln \mathbf{X}_{nit}^*$) bilateral trade

- General equilibrium effects and industry heterogeneity

OLS Regressions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|----------------|--------------------|-------------|-----------------|--------------------|-------------|-----------------|
| | A_{nit}^{κ} | A_{nit}^S | A_{nit}^{π} | A_{nit}^{κ} | A_{nit}^S | A_{nit}^{π} |
| U_{nit}^{IO} | 24.20*** | 12.01*** | 25.77*** | 24.10*** | 11.85*** | 25.54*** |
| | (3.824) | (2.099) | (4.085) | (3.836) | (2.101) | (4.092) |
| $\ln X_{nit}$ | | | | 0.000119 | 0.000185 | 0.000280 |
| | | | | (0.000238) | (0.000131) | (0.000275) |
| Estimation | OLS | OLS | OLS | OLS | OLS | OLS |
| Observations | 653,214 | 653,214 | 653,214 | 653,214 | 653,214 | 653,214 |
| R-squared | 0.646 | 0.872 | 0.709 | 0.646 | 0.872 | 0.709 |

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| | A_{nit}^{κ} | A_{nit}^S | A_{nit}^{π} | A_{nit}^{κ} | A_{nit}^S | A_{nit}^{π} |
| U_{nit}^{IO} | 60.76*** (15.51) | 22.85*** (7.124) | 59.15*** (15.69) | 77.24*** (18.19) | 35.90*** (9.224) | 77.70*** (18.59) |
| $\ln X_{nit}$ | | | | 0.0255*** (0.00299) | 0.0202*** (0.00170) | 0.0287*** (0.00326) |
| Estimation | IV | IV | IV | IV | IV | IV |
| Observations | 480,452 | 480,452 | 480,452 | 480,452 | 480,452 | 480,452 |
| First-stage F-statistics | 33.62 | 33.62 | 33.62 | 271.9 | 271.9 | 271.9 |

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Robustness

- Strategic rivalries
 - Risk of conflict with a country of significant relative size and military strength, based on perceptions by political decision makers
- Formal alliances
 - Includes mutual defense pacts, neutrality pacts, non-aggression treaties, and ententes
- Exact-hat algebra versus linearization
 - Emergence of China in the global economy
 - Point versus arc elasticities

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- Find \uparrow economic friendship causes \uparrow political friendship

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- Provide evidence using two sources of quasi-experimental variation
 - China's emergence into the global economy
 - Reduction in the cost of air travel over time
- Find \uparrow economic friendship causes \uparrow political friendship
- Theory-based exposure measure dominates simpler measures

Conclusions

- As countries become more economically dependent on a trade partner, do they realign politically towards that trade partner?
- We use network measures of the elasticity of real income with respect to productivity growth in each trade partner
- We define a country as a **friend** (**enemy**) of a trade partner if this elasticity is **positive** (**negative**)
- Provide evidence using two sources of quasi-experimental variation
 - China's emergence into the global economy
 - Reduction in the cost of air travel over time
- Find \uparrow economic friendship causes \uparrow political friendship
- Theory-based exposure measure dominates simpler measures
- Major changes in the relative economic size of countries (e.g. China) lead to large-scale changes in the balance of political power

Thank You