A Network Approach to Geopolitics

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Geopolitics in an interconnected world

- Geopolitics: a nascent literature in economics
  - existing research focuses on unilateral strategic decisions (e.g., single strategic hegemon) or bilateral strategic interactions (e.g., between hegemon and a rising power)
- In an interconnected world, geopolitical actions are rarely bilateral; almost always trigger a multilateral or global reaction
  - Cold War: the west and the Soviets fought for influence over African and South-East Asian countries
  - Russian invasion of Ukraine: Zelensky's diplomatic blitz to coordinate foreign policy and military aid
  - Trump & Greenland: a coalition of eight European partners issued a unified response

In each of these events, nations influence third parties to coordinate and shape foreign policy

This paper: a framework for geopolitics as a network game

Model

- Countries choose policies that trade off domestic interests against incentives to align with neighbors in an interaction network
- Prior to policy choice, countries can make costly investments to influence other countries' policies
- Influence propagates through the network; bilateral influence has cascading effects
- Equilibrium policies and foreign influence admit a spectral decomposition
  - identifies which latent disagreements (eigenvectors) drive large action divergence

Empirics

- Use data on countries' political preferences (V-DEM) and actions (UNGA voting) to recover the geopolitical network
- Geopolitical counterfactuals

Model setup

- N countries connected by graph $\boldsymbol{G}$ of international relations
  - matrix $\boldsymbol{G} \in \mathbb{R}_{\geq 0}^{N \times N}$ is symmetric and regular with row sums $1 - \alpha$
- Each country i has domestic interest $\theta_i \in \mathbb{R}$ and can choose a political action $a_i \in \mathbb{R}$
- Interpret $\boldsymbol{G}$ as long-standing relations, economic dependence, or even rivalries
  - eg: a network of alliances between countries
- Interpret $\boldsymbol{\theta}$ as domestic interests over specific issues
  - eg: each country's interest in restricting China from accessing advanced semi-conductors
- Each country i can exert costly influence over any other country k to change incentive over actions
  - eg: US pressuring to halt Dutch lithography and Japanese semi-conductor technology sales to China

Model without foreign influence

- Without foreign influence, countries play a game of geopolitical beauty contest:

$$U_i = \max_{a_i} -\left[\alpha\left(a_i - \theta_i\right)^2 + \sum_j G_{ij}\left(a_i - a_j\right)^2\right]$$

- Equilibrium:

$$a_i = \alpha\theta_i + \sum_j G_{ij} a_j,$$

or, in matrix form,

$$\begin{aligned} \boldsymbol{a} &= \alpha\left(\boldsymbol{I} + \boldsymbol{G} + \boldsymbol{G}^2 + \cdots\right)\boldsymbol{\theta} \\ &= \alpha\left(\boldsymbol{I} - \boldsymbol{G}\right)^{-1}\boldsymbol{\theta} \end{aligned}$$

Model with foreign influence

- Model with foreign influence ω_{im} (first index is the receiver of influence, second index the sender):

$$U_i = -\left[\alpha\left(a_i-\theta_i\right)^2+\sum_j G_{ij}\left(a_i-a_j\right)^2\right] \underbrace{+2\sum_m \omega_{im}\left(a_i-\theta_i\right)}_{\equiv\text{change in incentive due to foreign influence}} \underbrace{-\kappa\sum_k \omega_{ki}^2}_{\text{cost of exerting influence}}$$

- Ex-ante: each country i chooses $\{\omega_{ki}\}_k$
- Ex-post: each country i chooses a_i, taking $\mathbf{\Omega}$ and the other countries actions as given

Model with foreign influence: ex-post equilibrium

- Ex-post equilibrium:

$$a_i = \alpha\theta_i + \sum_j G_{ij} a_j + \sum_m \omega_{im} \iff \boldsymbol{a} = \alpha \left(\boldsymbol{I} - \boldsymbol{G}\right)^{-1} \left(\boldsymbol{\theta} + \boldsymbol{\Omega}\mathbf{1}/\alpha\right)$$

  - net influence: as if it modifies domestic interests in the beauty contest game

- Influencing country k has global effect:

$$\frac{\partial a_j}{\partial \omega_{ki}} = \left[\left(\boldsymbol{I} - \boldsymbol{G}\right)^{-1}\right]_{jk}$$

  - ω_{ki} directly affects the action of country k, which, through geopolitical coordination, affects all other connected countries

Model with foreign influence: ex-ante equilibrium

Lemma. The payoff of country i given $\boldsymbol{\Omega}$ and the ex-post equilibrium action profile $\boldsymbol{a}(\boldsymbol{\Omega})$ is,

$$U_i(\boldsymbol{\Omega}) = -\left[\alpha\left(a_i - \theta_i - \sum_i \omega_{im}/\alpha\right)^2 + \sum_i G_{ij}(a_i - a_j)^2\right] + \left(\sum_m \omega_{im}\right)^2 - \kappa \sum_k \omega_{ki}^2$$

- Interpretation: a country has higher payoff if
  1. neighbors' actions align with modified domestic interest $\theta_i + \sum_i \omega_{im}/\alpha$
  2. it's a target of high net foreign influence
  3. it exert little costly influence
- An ex-ante equilibrium $\boldsymbol{\Omega}$ solves $\frac{\mathrm{d}U_i(\boldsymbol{\Omega})}{\mathrm{d}\omega_{ki}} = \cancel{\frac{\partial U_i}{\partial a_i}\frac{\mathrm{d}a_i}{\mathrm{d}\omega_{ki}}} + \sum_{j\neq i}\frac{\partial U_i}{\partial a_j}\frac{\mathrm{d}a_j}{\mathrm{d}\omega_{ki}} + \frac{\partial U_i}{\partial \omega_{ki}} = 0$. Note

$$\sum_{j\neq i}\frac{\partial U_i}{\partial a_j}\frac{\mathrm{d}a_j}{\mathrm{d}\omega_{ki}} = \sum_j G_{ij}(a_i - a_j)(\boldsymbol{I} - \boldsymbol{G})^{-1}_{jk}$$

- Country i has greater incentive to influence k if
  - country i's action is misaligned with its neighbors (j's) (via $\boldsymbol{G}_{ij}(a_i - a_j)$)
  - those neighbors actions are strongly influenced by country k's action (via $(\boldsymbol{I} - \boldsymbol{G})^{-1}_{jk}$)

- Equilibrium solves the fixed point:

$$\text{(ex-ante)} \quad \kappa \boldsymbol{\Omega} \mathbf{1} = \alpha \left(\boldsymbol{I} - \boldsymbol{G} \right)^{-1} \boldsymbol{a} - \boldsymbol{\theta}$$

$$\text{(ex-post)} \quad \boldsymbol{a} = \left(\boldsymbol{I} - \boldsymbol{G} \right)^{-1} \left(\alpha \boldsymbol{\theta} + \boldsymbol{\Omega} \mathbf{1} \right)$$

Proposition. The equilibrium actions and net influence follow

$$\boldsymbol{a} = (\kappa\alpha - 1) \left(\kappa \left(\boldsymbol{I} - \boldsymbol{G} \right)^2 - \alpha \boldsymbol{I} \right)^{-1} \left(\boldsymbol{I} - \boldsymbol{G} \right) \boldsymbol{\theta},$$

$$\boldsymbol{\Omega} \mathbf{1} = - \left(\kappa \left(\boldsymbol{I} - \boldsymbol{G} \right)^2 - \alpha \boldsymbol{I} \right)^{-1} \left(\left(\boldsymbol{I} - \boldsymbol{G} \right)^2 - \alpha^2 \boldsymbol{I} \right) \boldsymbol{\theta}.$$

- Equilibrium properties:
  - unique
  - each a_i is a convex combination of $\boldsymbol{\theta}$
  - translation invariant to $\boldsymbol{\theta}$
  - conservative: average action = average national interest $(\mathbf{1}'\boldsymbol{a} = \mathbf{1}'\boldsymbol{\theta})$
  - geopolitical influence nets out to zero $(\mathbf{1}'\boldsymbol{\Omega}\mathbf{1} = 0)$

- Equilibrium action is weighted average of domestic interests of neighbors (and their neighbors, etc):

$$\begin{aligned} \boldsymbol{a} &= \left(\kappa\left(\boldsymbol{I}-\boldsymbol{G}\right)^{2}-\alpha\boldsymbol{I}\right)^{-1}\left(\boldsymbol{I}-\boldsymbol{G}\right)\boldsymbol{\theta} \\ &= \left(\kappa\alpha-1\right)\sum_{n=0}^{\infty}c_{n}\left(\frac{\boldsymbol{G}}{1-\alpha}\right)^{n}\boldsymbol{\theta}, \end{aligned}$$

  where c_n is a strictly decreasing sequence defined by the recursion

$$c_0=\frac{1}{\kappa-\alpha},\quad c_1=\frac{\left(\kappa+\alpha\right)\left(1-\alpha\right)}{\left(\kappa-\alpha\right)^{2}},\quad c_n=\frac{2\kappa\left(1-\alpha\right)}{\kappa-\alpha}c_{n-1}-\frac{\kappa\left(1-\alpha\right)^{2}}{\kappa-\alpha}c_{n-2}\quad\forall n\geq 2$$

- As $\kappa\to\infty$ (prohibitive cost), $\boldsymbol{\Omega 1}\to\boldsymbol{0}$, and $\boldsymbol{a}\to\alpha\left(\boldsymbol{I}-\boldsymbol{G}\right)^{-1}\boldsymbol{\theta}$

- As $\kappa\to 1/\alpha$, $\boldsymbol{\Omega 1}\to\alpha\boldsymbol{\theta}$, and all actions converge to $\boldsymbol{\theta}'\boldsymbol{1}$ (i.e., the global average $\boldsymbol{\theta}$)

Spectral decomposition: latent geopolitical cleavages

- Spectral composition: $\boldsymbol{G} = \boldsymbol{U}\boldsymbol{\Lambda}\boldsymbol{U}^{'}$ with orthonormal basis $\boldsymbol{U}$.
- We can write the domestic interest $\boldsymbol{\theta}$ as a linear combination of the eigenvectors

$$\boldsymbol{\theta} = \sum_{\ell=1}^{N} \widetilde{\theta}_{\ell} \boldsymbol{u}_{\ell}, \qquad \widetilde{\boldsymbol{\theta}} = \boldsymbol{U}'\boldsymbol{\theta}.$$

- Each eigenvector $\boldsymbol{u}_{\ell}$ corresponds to a distinct latent geopolitical cleavage on the network
  - countries with $\boldsymbol{u}_{\ell}(i) \gg 0$ and those with $\boldsymbol{u}_{\ell}(i) \ll 0$ strongly oppose each other; $\boldsymbol{u}_{\ell}(i) \approx 0$ not aligned

Eigenmode analysis: latent geopolitical cleavages

Lemma. Consider the network disagreement measure $\mathcal{S}(\boldsymbol{\theta}) \equiv \frac{1}{2}\sum_{i,j} G_{ij}(\theta_i - \theta_j)^2$, which captures how dissimilar are domestic interests averaged across network neighbors. The network disagreement of an eigenvector $\boldsymbol{u}_k$ is $\mathcal{S}(\boldsymbol{u}_k) = 1 - \alpha - \lambda_k$. Moreover,

$$\boldsymbol{u}_1 = \arg\min_{\|\boldsymbol{\theta}\|=1} \mathcal{S}(\boldsymbol{\theta}) \propto \mathbf{1}, \qquad \lambda_1 = 1 - \alpha.$$

$$\boldsymbol{u}_k = \arg\min_{\boldsymbol{\theta}\perp\{\boldsymbol{u}_j\}_{j<k}, \|\boldsymbol{\theta}\|=1} \mathcal{S}(\boldsymbol{\theta}) \text{ for all } k > 1.$$

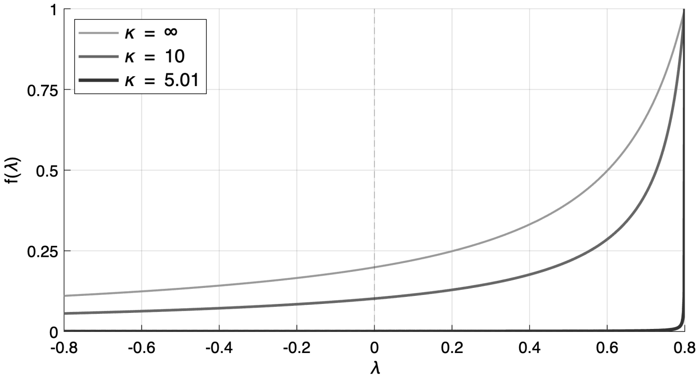
- Interpretation: eigenvalue λ_ℓ encodes how cohesive that cleavage is across the network
  - largest $\lambda_{max} = 1 - \alpha$, $u_{max} = \mathbf{1}$ (global agreement)
  - other cleavages: larger eigenvalues capture smooth, bloc-like modes (neighbors have similar ideal points)
  - $|\lambda_\ell| \approx 0$: weak net alignment, edges connect a mix of same-sign and opposite sign entries
  - negative λ_ℓ: polarized, oscillatory modes across neighbors

Spectral decoupling of policy actions

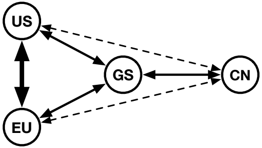
- Equilibrium policy can be written as linear combination of actions across cleavages:

$$\boldsymbol{a} = \sum_{\ell=1}^{N} \widetilde{\theta}_\ell \times f(\lambda_\ell)\, \boldsymbol{u}_\ell, \qquad f(\lambda) = \frac{(1-\lambda)(\kappa\alpha - 1)}{\kappa(1-\lambda)^2 - \alpha}$$

- $f(\lambda_\ell) \in (0,1)$: the factor that translates cleavage ℓ in ideal points into policy actions
- $f'(\lambda_\ell) > 0$: eigenmodes with larger $\lambda_\ell > 0$ translate into bigger differences in policy



Example: disagreement across blocs (US-EU vs China) and a swing state (Global South)



$$G = \begin{bmatrix} 0 & .5 & .3 & .1 \\ .5 & 0 & .3 & .1 \\ .3 & .3 & 0 & .3 \\ .1 & .1 & .3 & .4 \end{bmatrix}$$

$$\boldsymbol{u}_\ell \propto \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \\ -2 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ -3 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \\ 0 \\ 0 \end{bmatrix}$$

$$\lambda_\ell = \quad 0.9, \quad 0.3, \quad -0.3, \quad -0.5$$

- Disagreements across eigenmodes:
  - US-EU vs China ($\boldsymbol{u}_2$), Global South vs RoW ($\boldsymbol{u}_3$), and within-bloc split inside US-EU ($\boldsymbol{u}_4$)
- Contestability index:

$$\chi_i(\boldsymbol{\theta}) \equiv 1 - \sqrt{\frac{\left(\sum_{m\neq i} \omega_{im}\right)^2}{(N-1) \times \sum_{m \neq i} \omega_{im}^2}}.$$

  - one minus the cosine similarity between $\omega_{i\cdot}$ and $\mathbf{1}$; how misaligned are the foreign influence towards i
- Global South strongly contestable along eigenmodes 2 and 4; not contestable ($\chi_3 = 0$) along eigenmode 3

Stochastic ideal points and graph stationarity

- So far the analysis assumes fixed $\boldsymbol{\theta}$, but countries act on many international issues; $\boldsymbol{\theta} \sim N(0, \boldsymbol{\Sigma}_\theta)$
  - realized before influence is chosen; $\boldsymbol{\theta}$ remains perfect information
- Reasonable to assume connected countries have systematically similar (or dissimilar) ideal points
  - allies, shared media, ideology, and history-induced correlated preferences

Assumption. *(Graph Stationarity)* $\boldsymbol{\Sigma}_\theta$ is a spectral function of $\boldsymbol{G}$ (i.e., they share eigenvectors).

- Concept in graph signal processing and random fields on graphs
- Intuition: the same eigenmodes $\boldsymbol{u}_\ell$ that describe the geometry of $\boldsymbol{G}$ (geopolitical cleavages) also describe the directions along which national interests co-vary
- Implies $\widetilde{\boldsymbol{\Sigma}}_\theta \equiv \boldsymbol{U}'\boldsymbol{\Sigma}_\theta \boldsymbol{U} = \text{Diag}\left(\sigma_\ell^2\right)$ is a diagonal matrix. Interpretation:

$$\boldsymbol{\theta} = \widetilde{\theta}_1 \boldsymbol{u}_1 + \widetilde{\theta}_2 \boldsymbol{u}_2 + \cdots + \widetilde{\theta}_N \boldsymbol{u}_N$$

  where $\widetilde{\theta}_k$ are independently drawn with variance σ_ℓ^2.

Recovering the network $\boldsymbol{G}$

- Suppose we observe covariances in preferences and actions $\boldsymbol{\Sigma}_\theta$ and $\boldsymbol{\Sigma}_a$
- Graph stationarity ($\boldsymbol{G}$, $\boldsymbol{\Sigma}_\theta$ share eigenbasis)$\Rightarrow$ $\boldsymbol{\Sigma}_a$ also share the same eigenbasis $\boldsymbol{U}$

$$\boldsymbol{G} = \boldsymbol{U}\,\text{Diag}\,(\lambda_\ell)\,\boldsymbol{U}'$$

- Can recover $\boldsymbol{G}$ from the eigenvalues of $\boldsymbol{\Sigma}_\theta$ and $\boldsymbol{\Sigma}_a$:

$$\widetilde{\boldsymbol{\Sigma}}_\theta := \boldsymbol{U}'\boldsymbol{\Sigma}_\theta\boldsymbol{U} = \text{Diag}\left(\sigma_\ell^2\right), \qquad \widetilde{\boldsymbol{\Sigma}}_a := \boldsymbol{U}'\boldsymbol{\Sigma}_a\boldsymbol{U} = \text{Diag}\left(f\left(\lambda_\ell\right)^2\sigma_\ell^2\right)$$

Proposition. *(Recoverability)* Let $\sigma_\ell^2 \equiv \left(\widetilde{\boldsymbol{\Sigma}}_\theta\right)_{\ell\ell} > 0$, then the eigenvalue λ_ℓ of $\boldsymbol{G}$ is identified: $\lambda_\ell = f^{-1}\left(\sqrt{\left(\widetilde{\boldsymbol{\Sigma}}_a\right)_{\ell\ell} / \left(\widetilde{\boldsymbol{\Sigma}}_\theta\right)_{\ell\ell}}\right)$. Collecting all identified modes, $\boldsymbol{G} = \boldsymbol{U}\,\text{Diag}\,(\lambda_\ell)\,\boldsymbol{U}'$.

- We can identify the *geopolitical spectrum* of the network—which cleavages exist (eigenvectors $\boldsymbol{u}_\ell$) and how cohesive they are (eigenvalues λ_ℓ)—wherever θ has variation.
- If $\sigma_\ell^2 = 0$ for some mode ℓ, then $\left(\widetilde{\boldsymbol{\Sigma}}_a\right)_{\ell\ell} = 0$ for any λ_ℓ. There is never any shock in that cleavage, so data carry no information about how the network behaves in that direction
- Thus, we can only identify $\boldsymbol{G}$ on the subspace spanned by the eigenmodes where $\boldsymbol{\theta}$ varies; on the orthogonal complement, λ_ℓ is unrestricted by $(\boldsymbol{\Sigma}_\theta, \boldsymbol{\Sigma}_a)$

Asymmetric network $\boldsymbol{G}$

- Let $\boldsymbol{H}$ be a symmetric network with dominant eigenvector $\boldsymbol{\pi}$. π_i is country i's "mass"
- Let $G_{ij} = (\pi_j/\pi_i)\, H_{ij}$. With preferences

$$U_i(\boldsymbol{a}, \boldsymbol{\Omega}) = -\left[\alpha (a_i - \theta_i)^2 + \sum_j G_{ij} (a_i - a_j)^2\right] - \kappa \sum_k \left(\frac{\pi_k \omega_{ki}}{\pi_i}\right)^2 + 2 \sum_m \omega_{im} (a_i - \theta_i),$$

  - higher mass countries have disproportionate impacts on neighbors & less sensitive to neighbors' actions
  - more costly for countries with lower mass to influence those with higher mass

Proposition. Equilibrium mappings from domestic interest to net influence and geopolitical actions stay the same as in the symmetric model. The equilibrium inherits uniqueness, the convex combination property, π^2-weighted conservativeness ($\sum_i \pi_i^2 a_i = \sum_i \pi_i^2 \theta_i$ and $\sum_i \pi_i^2 \sum_m \omega_{im} = 0$), and the two limiting benchmarks ($\kappa \to \infty$ and $\kappa \downarrow 1/\alpha$) from the symmetric baseline. The equilibrium continues to admit a spectral representation: $a_i = \sum_m L(\lambda_m) \left[\boldsymbol{u}_m^R\right]_i \left(\boldsymbol{u}_m^L\right)^\top \boldsymbol{\theta}$,where the scaling function $L(\cdot)$ is identical to that under a symmetric network.

Identification. Assume the π^2-weighted covariance matrix $\widetilde{\boldsymbol{\Sigma}}_\theta \equiv Diag(\boldsymbol{\pi}) \boldsymbol{\Sigma}_\theta Diag(\boldsymbol{\pi})$ shares the eigenbasis of $\boldsymbol{H}$. Then for given κ and $\boldsymbol{\pi}$, $\boldsymbol{G}$ can be recovered from the cross-country covariance in domestic interests $\boldsymbol{\Sigma}_\theta$ and covariance in policy actions $\boldsymbol{\Sigma}_a$.

Data

- UN General Assembly data on voting ideal points (Bailey et al. 2017)
  - reflects state actor's international actions in UN voting choice
  - denote s_{ikt} country i 's UNGA ideal point distance with country k in year t
  - calculate Σ_a as covariance of i and j 's scores with all other countries k:

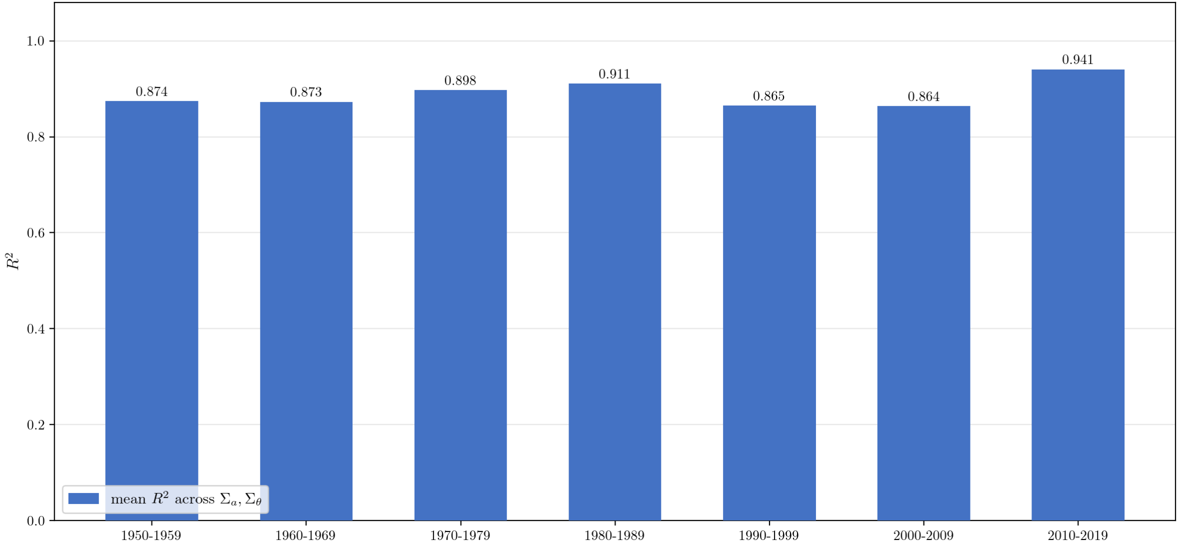
$$(\Sigma_a)_{ij} = \sum_{t=1}^{10} \sum_{k=1}^{N} \left(s_{ikt} - \bar{s}_{it}\right)\left(s_{jkt} - \bar{s}_{jt}\right)$$

- V-Dem dataset on various domestic political dimensions (eg freedom of press, gender equality)
  - reflects state actor's policy preferences
  - denote x_{imt} country i's preference on issue m in year t
  - calculate Σ_θ as covariance of countries i and j 's preferences across issues m:

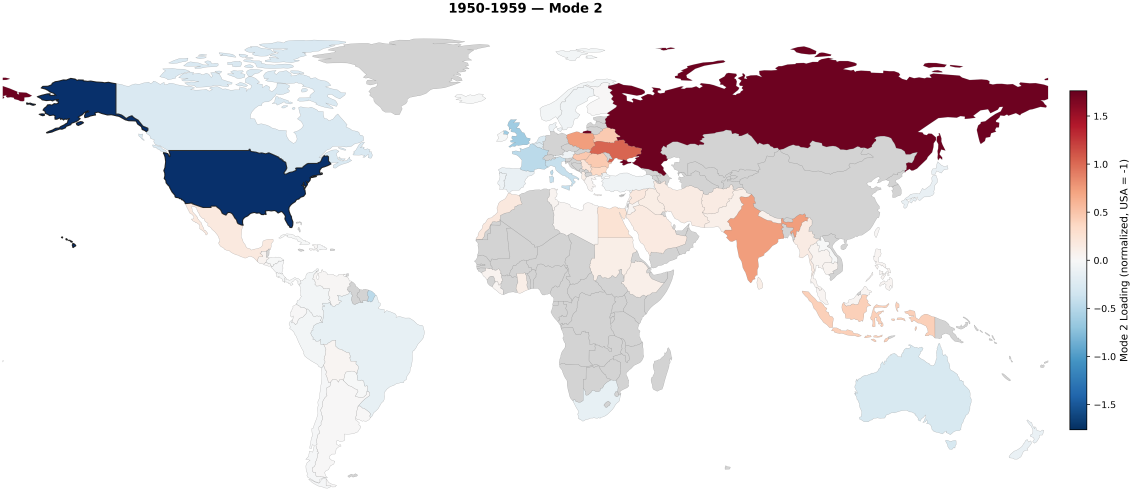
$$(\Sigma_\theta)_{ij} = \sum_{t=1}^{10} \sum_{m=1}^{35} \left(x_{imt} - \bar{x}_{it}\right)\left(x_{jmt} - \bar{x}_{jt}\right)$$

- Use $\pi_i \equiv \sqrt{GDP_i}$; GDP-weighted global influence nets out to zero

Joint diagonalization approximates Σ_θ and Σ_a well



The dominant eigenmode, over time



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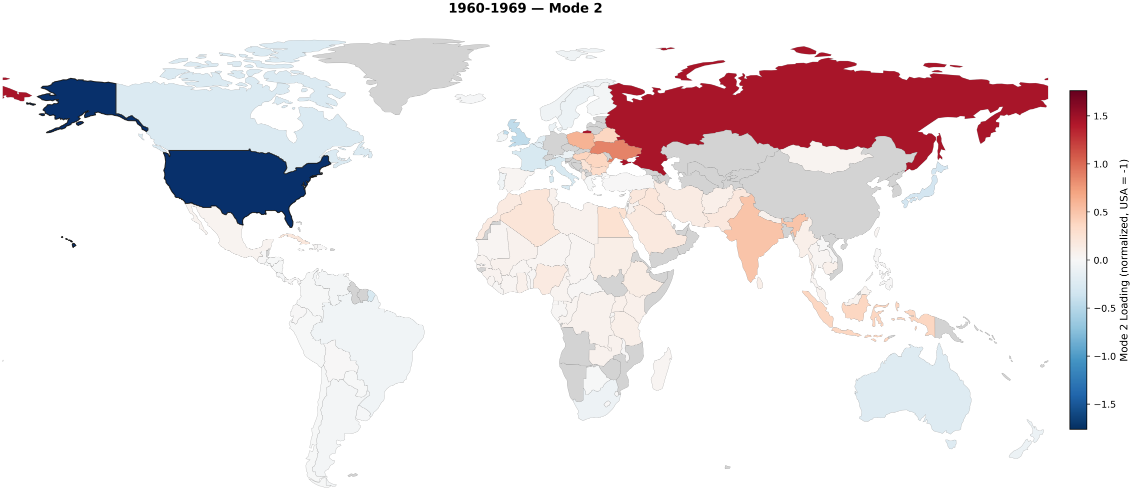

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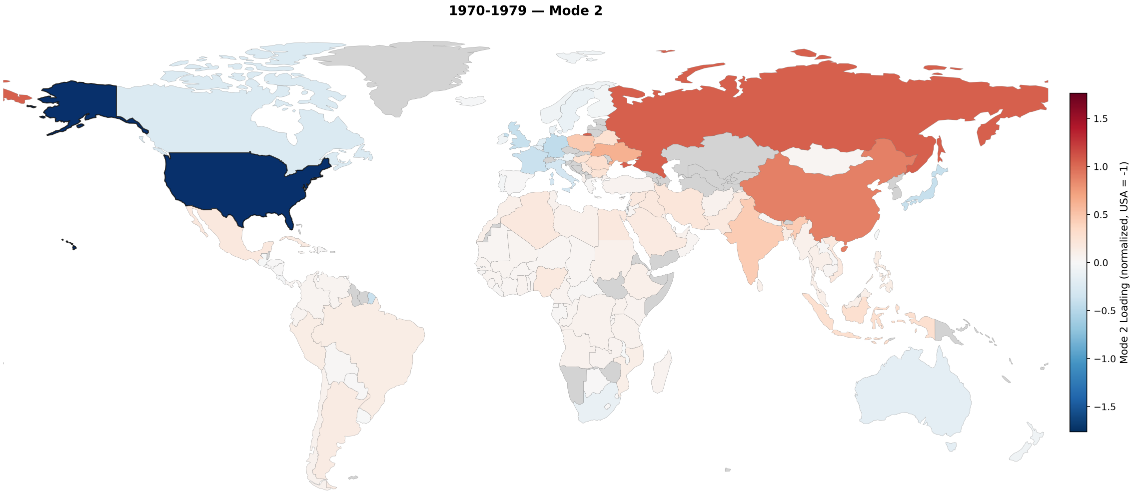

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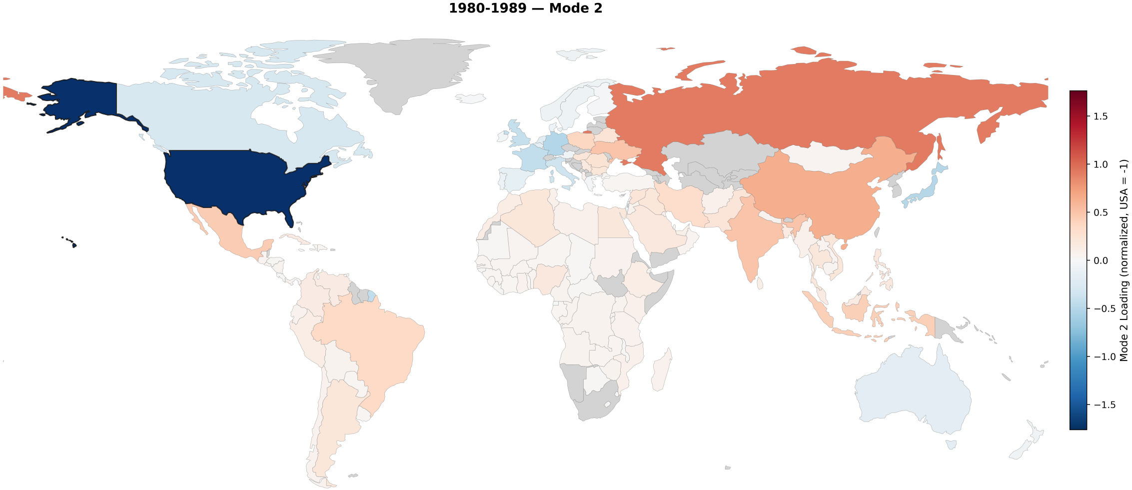

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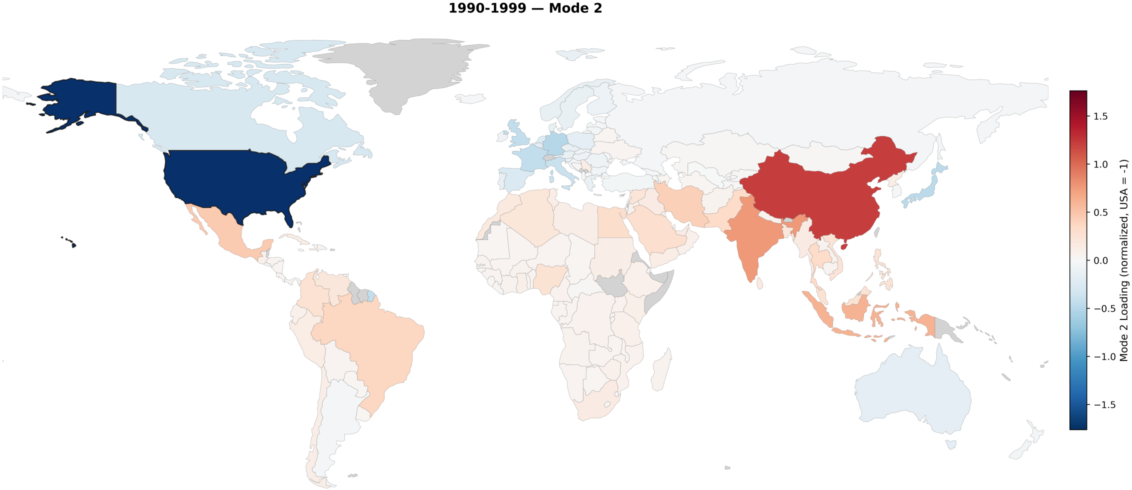

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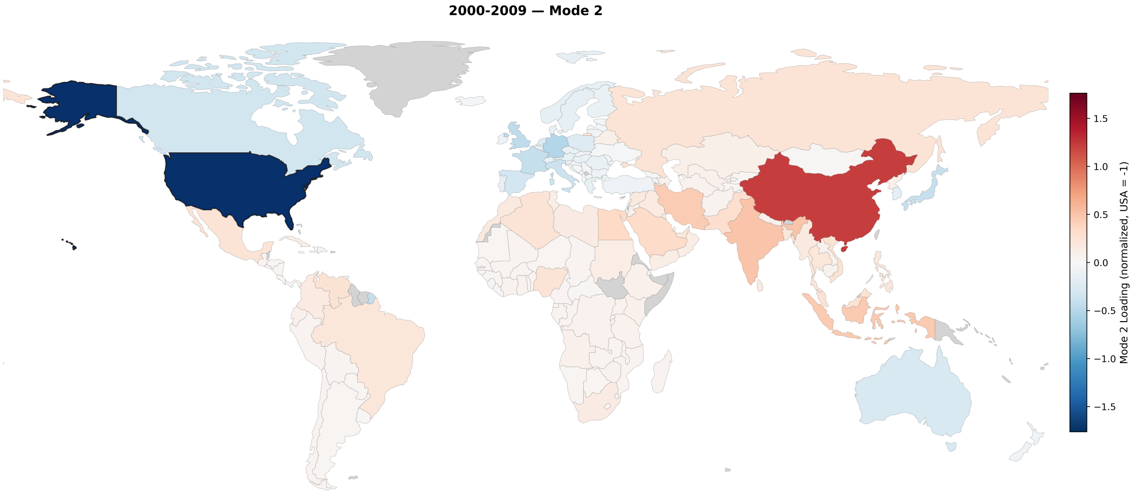

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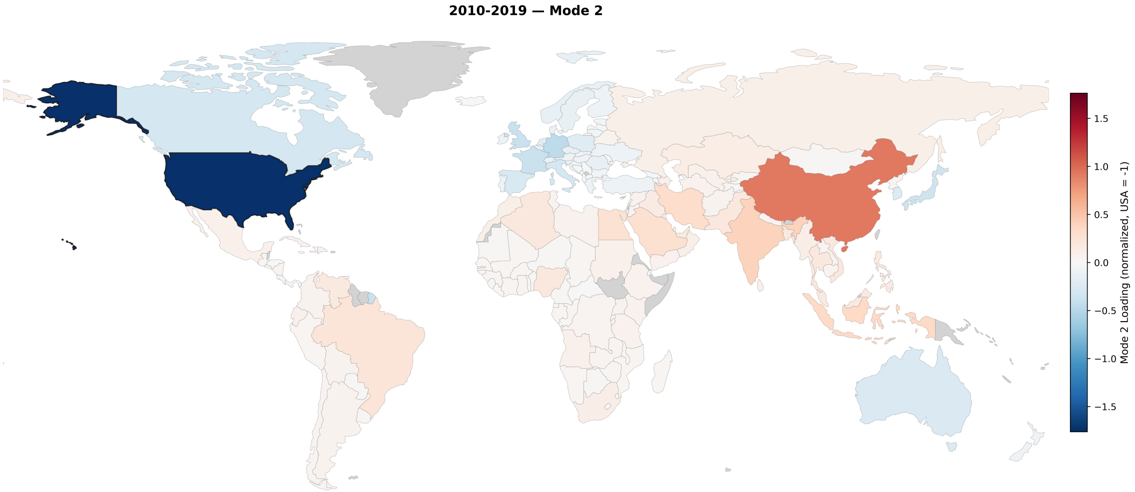
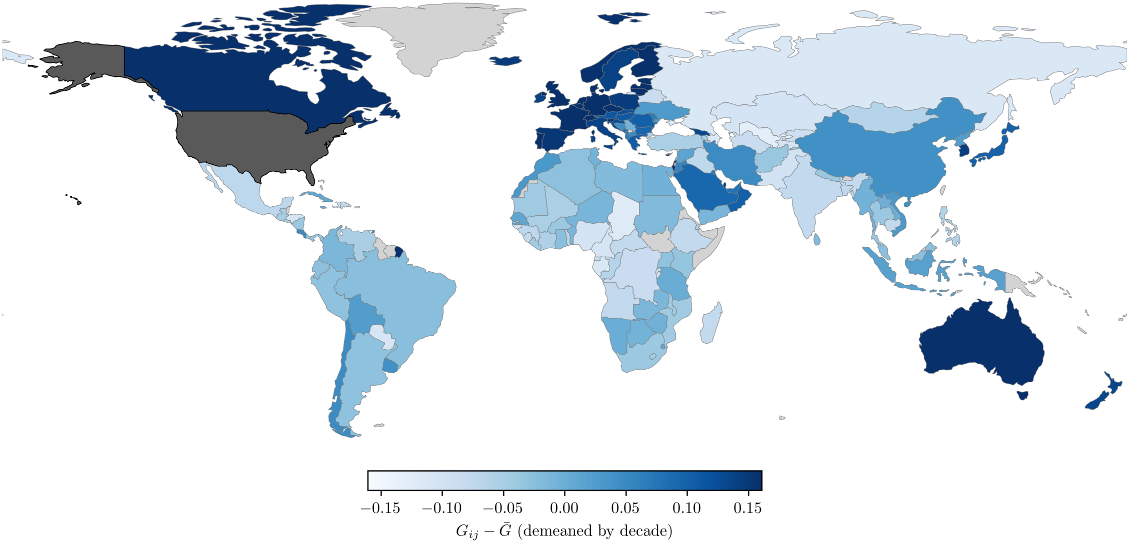
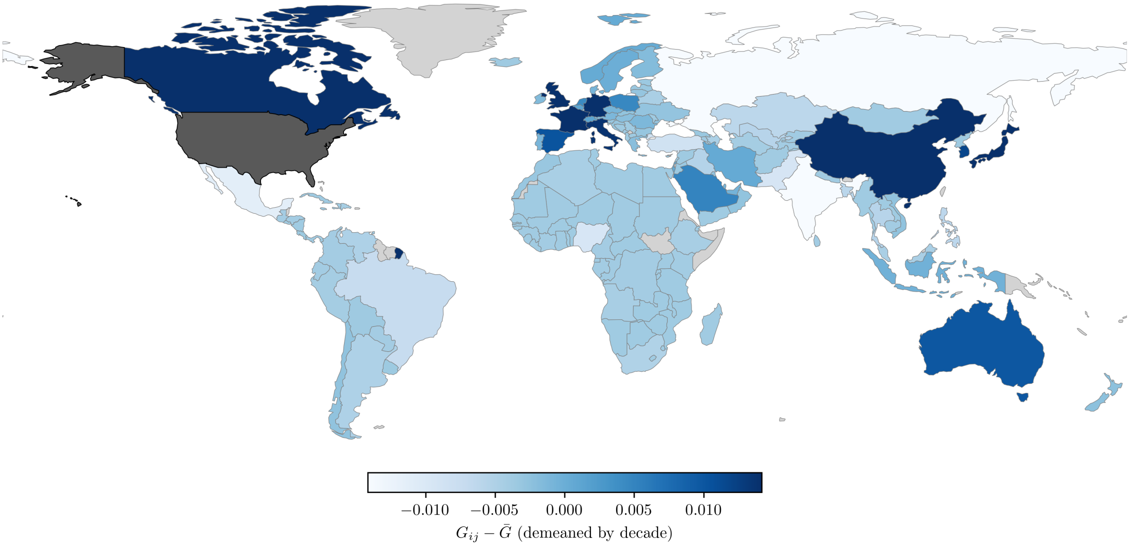


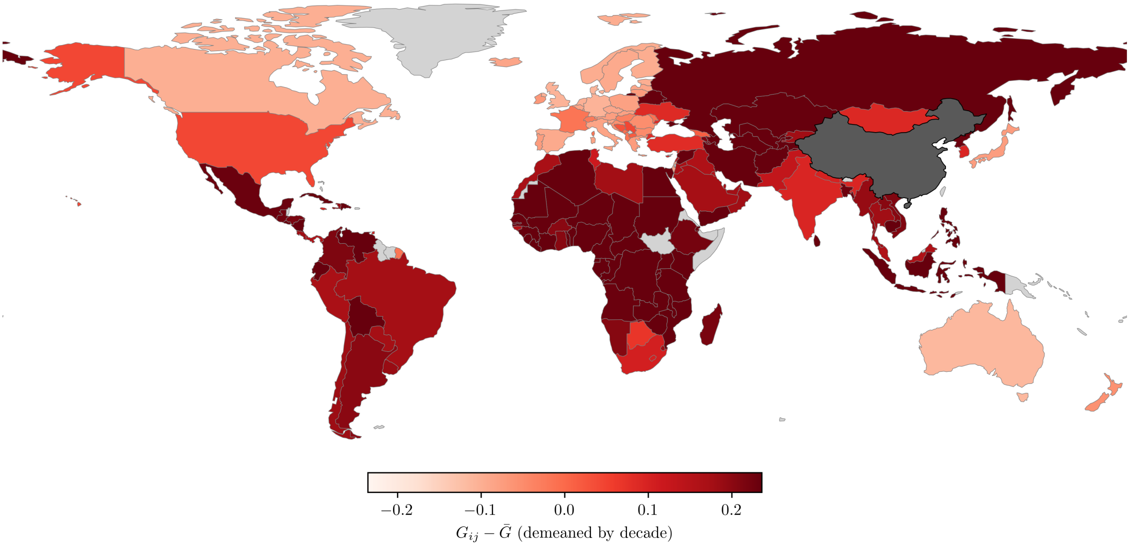
Countries that weigh US strongly, 2010s



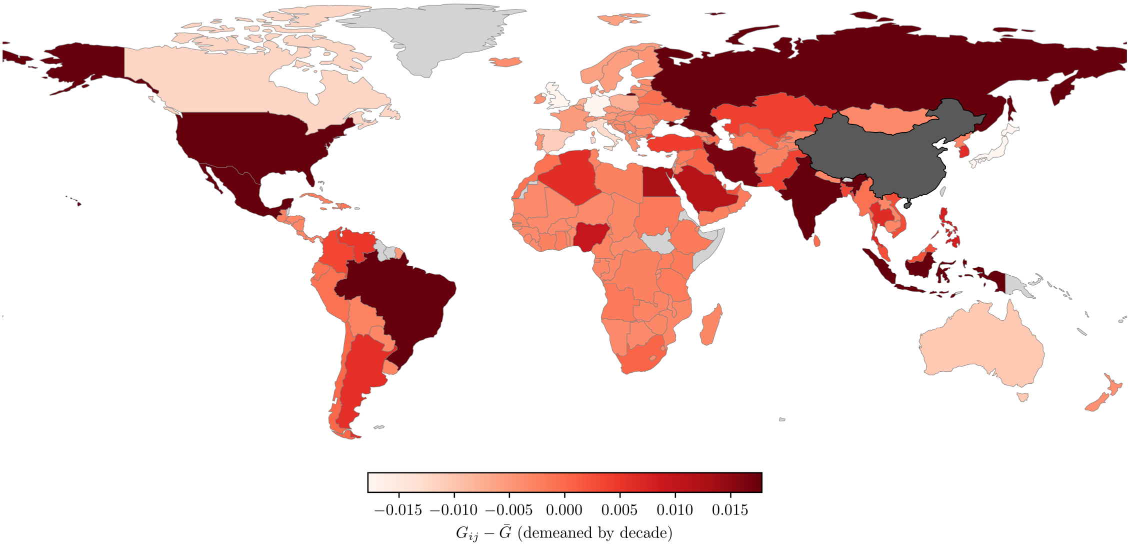
Countries that US weighs strongly, 2010s



Countries that weigh China strongly, 2010s



Countries that China weighs strongly, 2010s



G correlates with Polity score distance, gravity, and cultural variables

	Outcome: G_{ijt}					
	$\lvert\text{Polity}_{it} - \text{Polity}_{jt}\rvert$	Trade flow$_{ijt}$	Distance$_{ij}$	Common religion$_{ij}$	Common language$_{ij}$	Common colonizer$_{ij}$
	(1)	(2)	(3)	(4)	(5)	(6)
x_{ijt}	-0.127***	0.0893***	-0.0442***	0.176***	0.0513***	0.0901***
	(0.00584)	(0.0294)	(0.00629)	(0.0140)	(0.0161)	(0.0110)
Observations	120766	61147	119622	117486	119622	119622
Country i FE:	Yes	Yes	Yes	Yes	Yes	Yes
Country j FE:	Yes	Yes	Yes	Yes	Yes	Yes

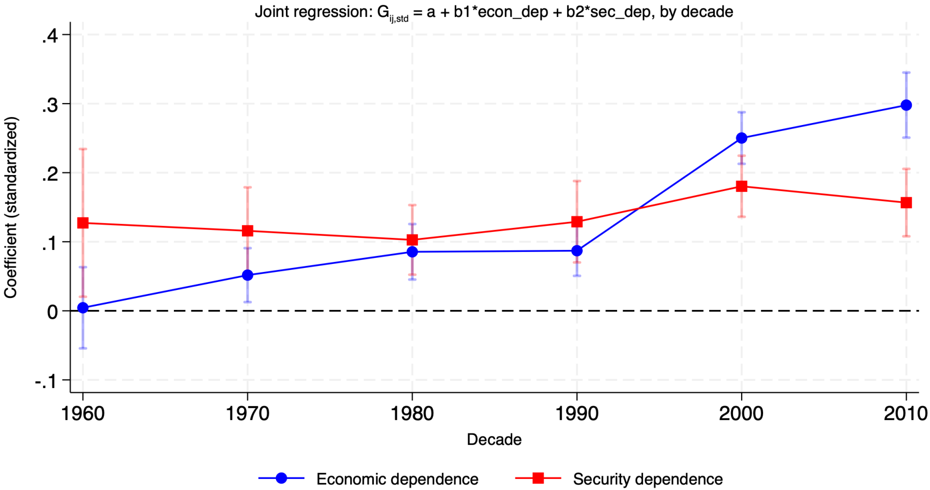
Note: This table regresses the ij-th entry of the G network for decade t on decade-level averages of dyadic variables. Column 1's outcome variable is the distance between country i and country j's average polity scores in each decade t. Column 2's outcome variable is the average trade flow between country country i and country j in decade t. Column 3 is the geographical distance between country i and country j. Columns 3-6 have binary outcomes denoting whether or not countries i and j share a common religion, common language, or common colonizer. CEPII trade flow data (Column 2) goes back to 1990, whereas polity data (Column 1) covers the entire panel. Standard errors are clustered on the unordered pair level, with significance levels denoted * $p < 0.1$, ** $p < .05$, *** $p < 0.01$.

G correlates with FBIC dependence

	Outcome: G_{ijt}		
	Dependence	Economic dependence	Security dependence
	(1)	(2)	(3)
x_{ijt}	0.106^{***}	0.0533^{***}	0.129^{***}
	(0.0171)	(0.0159)	(0.0166)
Observations	111333	111356	111415
Country i FE:	Yes	Yes	Yes
Country j FE:	Yes	Yes	Yes

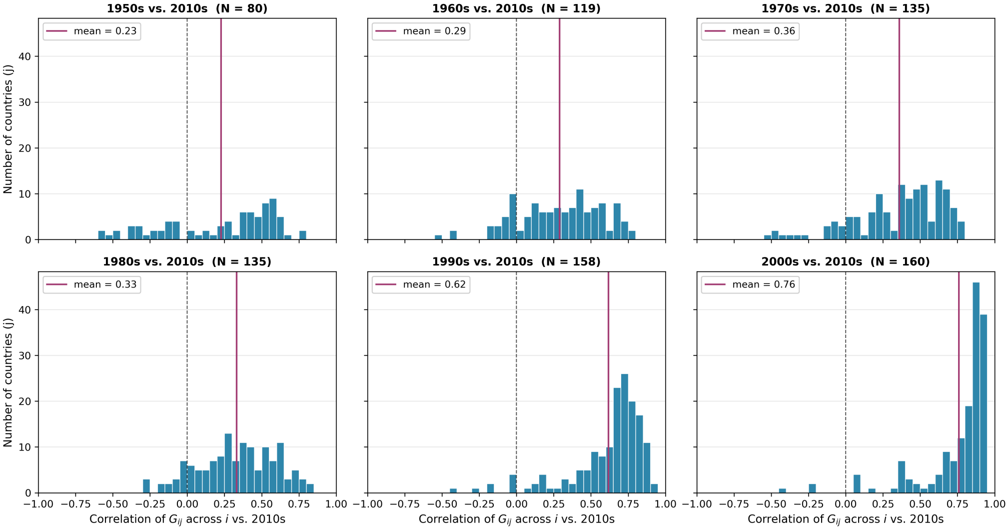
Note: This table regresses the ij-th entry of the $\boldsymbol{G}_t$ network for decade t on decade-level averages of ordered dyadic variables. These variables come from the Foreign Bilateral Influence Capacity (FBIC) dataset, which measures the degree of dependence of country i on country j along different dimensions. The first column is the composite/overall FBIC dependence, whereas the latter columns display coefficients for each dimension separately. FBIC data is available starting in 1960. Standard errors are clustered at the pair level, with significance levels denoted * $p < 0.1$, ** $p < .05$, *** $p < 0.01$.

Economic vs. Security Dependence

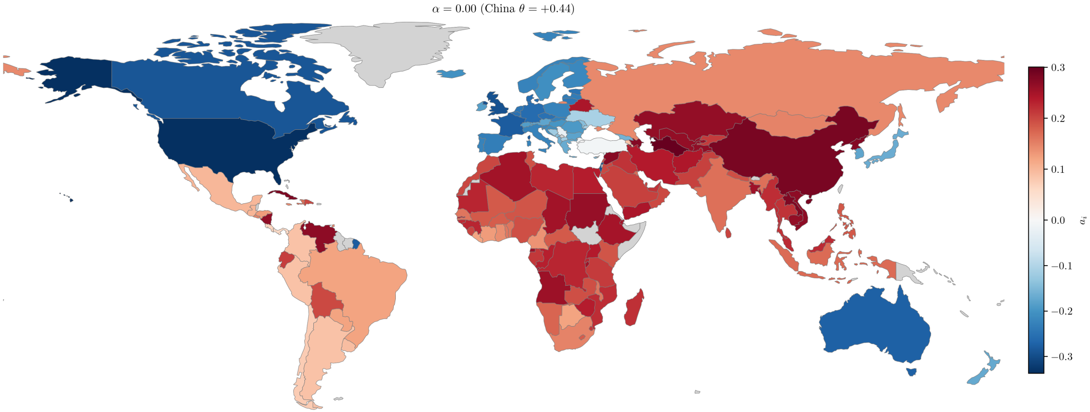


Each point: pooled regression across all (i,j) pairs within decade.
95% CIs shown. Robust standard errors.

Persistence of Geopolitical Network



Counterfactual: A China with American Preferences



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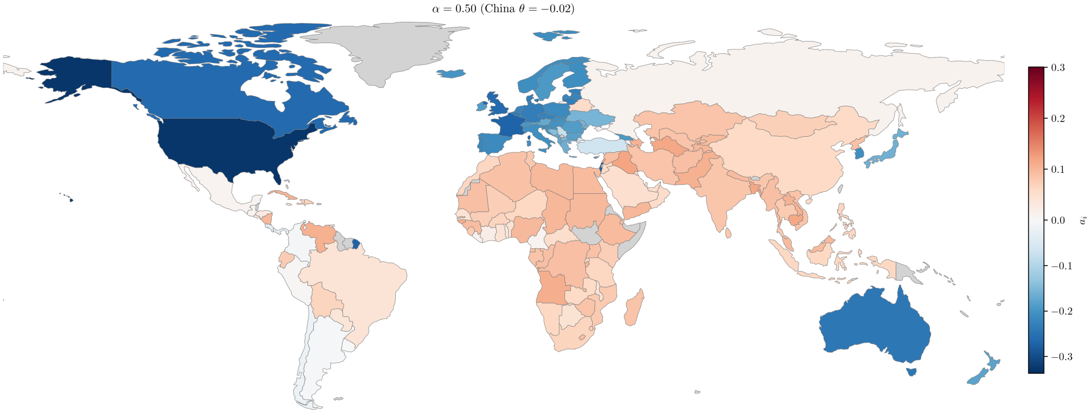

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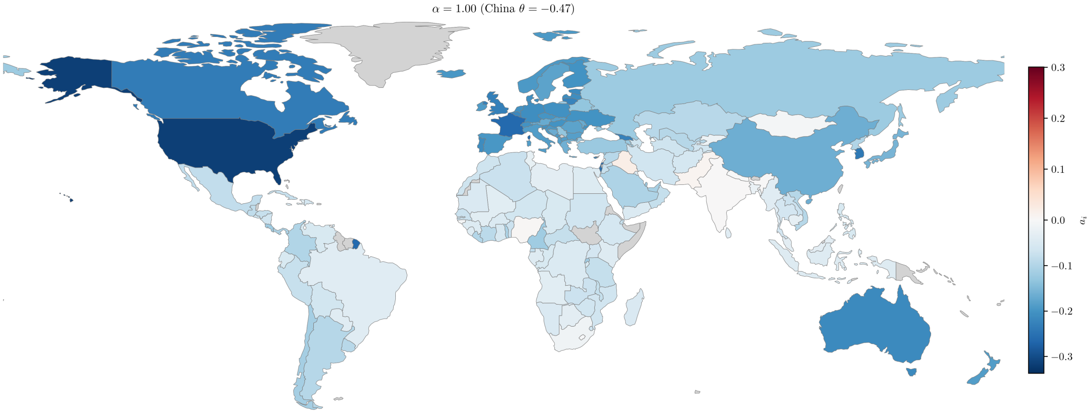
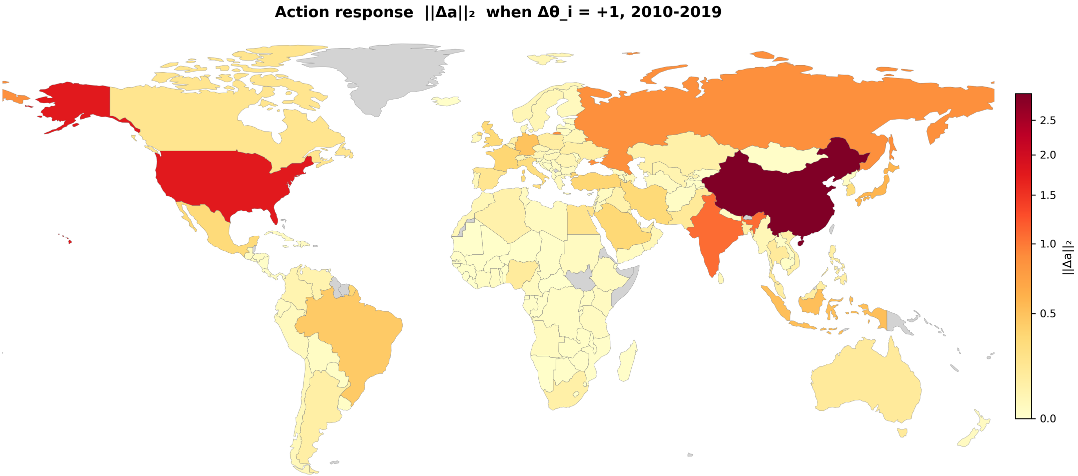


Counterfactual: Impact of Changing Each Country's Preferences



Additional exercises

Empirical:

- Cluster UNGA issues and recover country-specific $\boldsymbol{\theta}$ from countries' votes
- Recover foreign influence on specific issues & validate using data on diplomatic engagements
- Describe bottlenecks, key influencers, and swing prizes (small changes in $\boldsymbol{\theta}_k$ or $\boldsymbol{G}$ have large and opposite sign effects on blocs' welfare)
- Shocks to national interests $\boldsymbol{\theta}$ can have global effects; exploit close elections as instruments
- Contestability index
- Sensitivity of ex-ante welfare with respect to $\boldsymbol{\Sigma}_\theta$: who benefits from volatility in ideal points?
  - and respect to $\boldsymbol{G}$; who benefits from stronger connections with whom?

Theoretical:

- Alliances and coalitions: what does NATO/EU do to the geometry of influence?
- Institutional design / regulation of influence:
  - are there "good" forms of multilateral influence vs "bad" bilateral arms races?
  - what kinds of international agreements (restrictions on bilateral influence) improve welfare, and how does that depend on $\boldsymbol{G}$?

Conclusion

In an interconnected world, geopolitical actions are almost always multilateral in nature

This paper: a framework for geopolitics as a network game

- Countries choose policies that trade off national interests against incentives to align with neighbors in an interaction network
- Cascading effects of costly investments to influence other countries' policies
- Use data on countries' political preferences and actions to recover the geopolitical network
- Propose measurements of bottlenecks and key influencers; counterfactuals