

# International Risk-Sharing in a Fragmented World

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The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of  
Minneapolis or the Federal Reserve System.

# Motivation

- The world economy is increasingly fractured along geopolitical lines
  - ▶ Economic relations are shaped not only by economic fundamentals, but also by political alliances and strategic rivalries
- **Key questions:**
  - ▶ How does geopolitical risk shape the international allocation of capital?
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  - ▶ What are the welfare implications?

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  - ▶ What are the welfare implications?
- This paper: **fragmentation in official bilateral lending** — facts and theory.

# What we do

Fragmentation of official government-to-government lending

- Long-run dyadic dataset (Horn, Reinhart & Trebesch, 2024)
- **Financial fragmentation index**

Findings:

1. When geopolitical tensions rise, bilateral lending **follows geopolitical alignment**
2. Geopolitically aligned countries have **more synchronized business cycles**
3. Fragmentation weakens risk-sharing

Theory of fragmentation:

- Geopolitical risk  $\Rightarrow$  **creditor identity matters** for repayment incentives
- Rising geopolitical risk  $\Rightarrow$  **endogenous fragmentation**

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## Related Literature

- **Geoeconomics:** Aiyar, Malacrino, and Presbitero (2024); Aiyar, Presbitero, and Ruta (2023); An and Huber (2026); Sturm Becko and O'Connor (2024); Bianchi and Sosa-Padilla (2024, 2025); Broner, Martin, Meyer, and Trebesch (2024); Caldara and Iacoviello (2022); Catalán, Fendoglu, and Tsuruga (2024); Clayton, Coppola, Maggiori, and Schreger (2024, 2025); Clayton, Maggiori, and Schreger (2024, 2025); De Souza, Hu, Li, and Mei (2024); Fernandez-Villaverde, Mineyama, and Song (2024); Gopinath, Gourinchas, Presbitero, and Topalova (2024); Kempf, Luo, Schäfer, and Tsoutsoura (2023); Kleinman, Liu, and Redding (2024); Pflueger and Yared (2024); Sturm Becko (2024)

### Fragmentation of official lending: facts and theory

- **Sovereign debt and limited commitment:** Aguiar & Amador (2011); Aguiar & Gopinath (2006); Arellano (2008); Broner, Martin & Ventura (2010); Eaton & Gersovitz (1981)

### Geopolitical risk and implications for capital flows and risk-sharing

# Data

Bilateral govt.-to-govt. lending data from Horn, Reinhart & Trebesch (2024)

- Loans, grants, and guarantees by governments and state-controlled agencies
- Lending flows between 120 creditor and 190 debtor countries, 1910–2024

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Official lending is an ideal laboratory for studying geoeconomic fragmentation

- Dyadic: creditor identity is directly observed
- Long-run coverage spans major geopolitical episodes
- State control makes geopolitics first-order

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**Goal:** measure whether official lending follows geopolitical alignment

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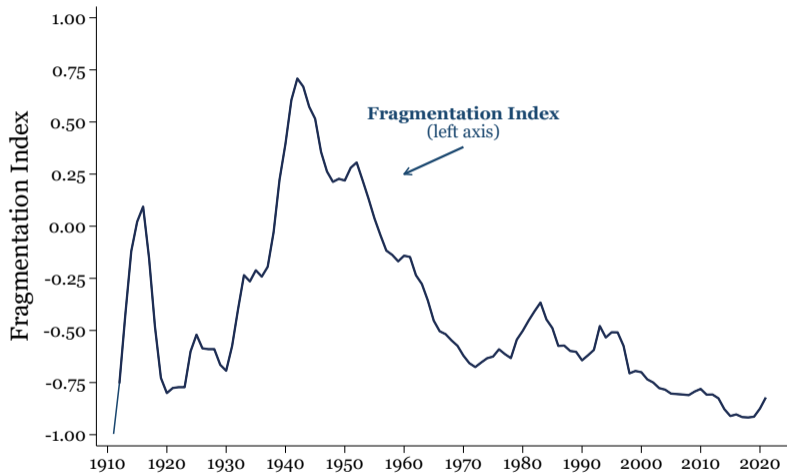
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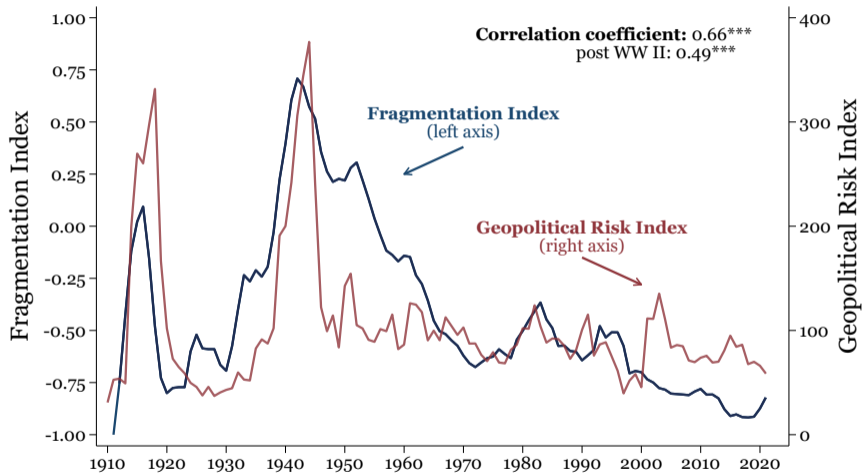
## Identifying Allies and Non-Allies:

- Military alliances as coded by the Correlates of War Project (Gibler & Sarkees 2004)
- Robustness: UN General Assembly voting similarity (Bailey et al. 2017)

# Fragmentation and geopolitical risk, 1910–2020

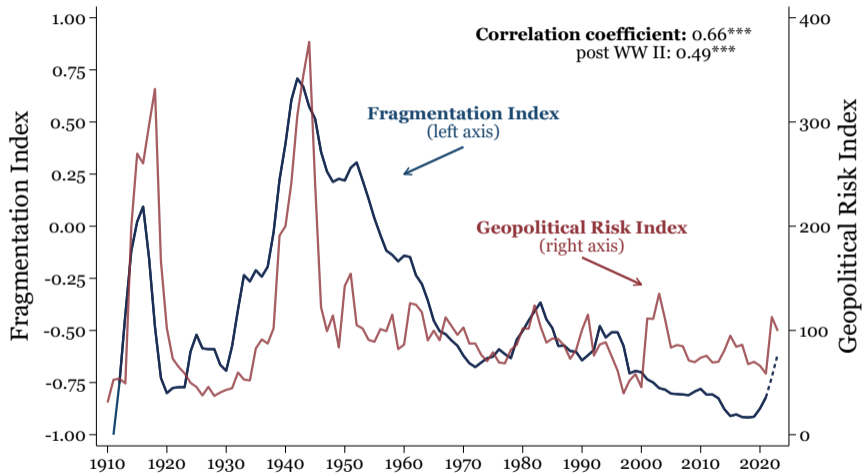


# Fragmentation and geopolitical risk, 1910–2020



Geopolitical risk: measured as in Caldara and Iacoviello (2022)

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FINDING 1: When geopolitical risk is high, lending follows political alignment

## Panel evidence: impact of GPR on Fragmentation

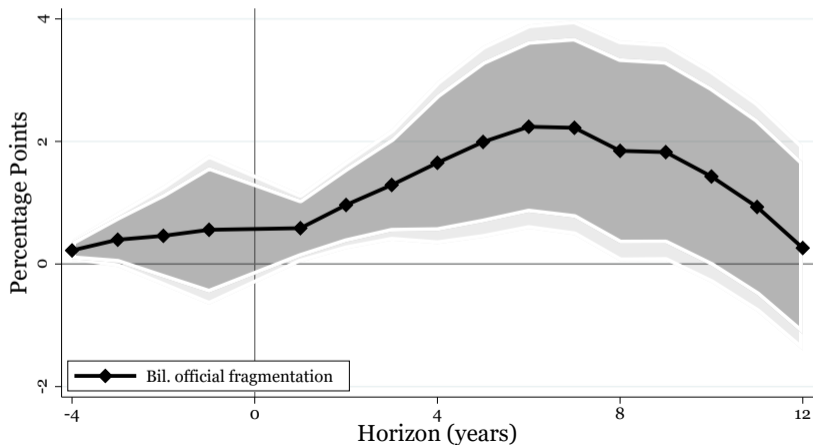
Panel Local Projections:

$$Fragm_{i,t+h} - Fragn_{i,t-1} = \alpha^h + \beta^h \log GPR_{i,t} + controls_{i,t} + \eta_i^h + \psi_t^h + \epsilon_{i,t}^h$$

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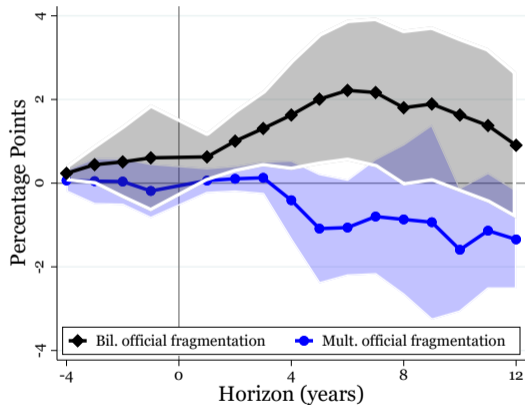
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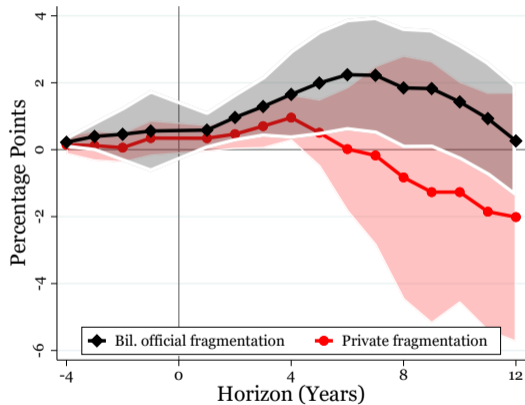
# Comparison with other forms of lending types

▶ Data

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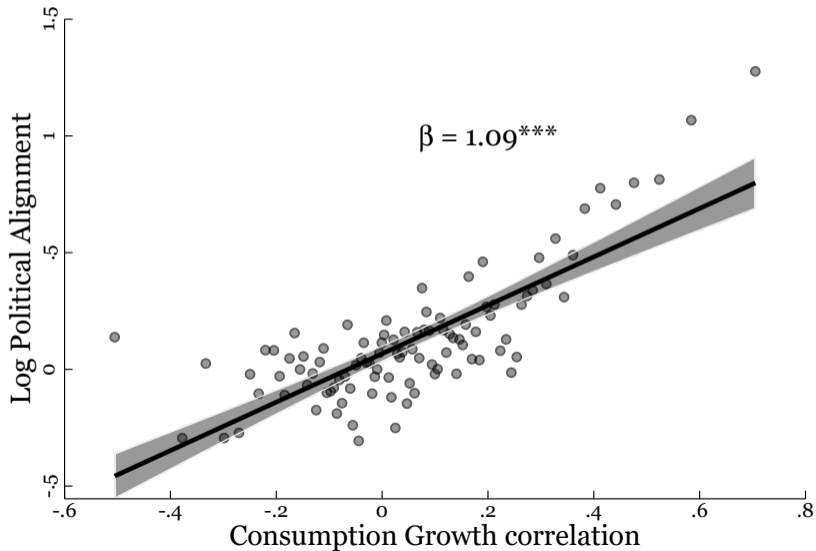
Bilateral vs. **multilateral** lending



Bilateral vs. **private** lending

FINDING 2: Aligned countries have synchronized business cycles

# Polit. alignment and cross-country cons. correl.



FINDING 3: Fragmentation weakens risk-sharing

## Fragmentation and Risk-Sharing

$$\text{Flow}_{ijt} = \alpha + \beta \left( \text{TailRisk}_{i,t}^{\text{debtor}} - \text{TailRisk}_{j,t}^{\text{creditor}} \right) + \gamma \text{Alliance}_{ijt} \\ + \psi \text{Alliance}_{ijt} \times \left( \text{TailRisk}_{i,t}^{\text{debtor}} - \text{TailRisk}_{j,t}^{\text{creditor}} \right) + \theta_{ij} + \delta_t + \epsilon_{ijt}.$$

- $\beta > 0$ : official credit flows from lower-risk creditors to higher-risk borrowers  
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- $\beta > 0$ : official credit flows from lower-risk creditors to higher-risk borrowers  
 $\Rightarrow$  official lending provides insurance
- $\gamma > 0$ : allied countries lend more to each other
- $\psi < 0$ : the response to tail-risk differences is weaker inside alliances  
 $\Rightarrow$  within-bloc lending provides weaker insurance

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Tail-risk difference	2.32*** (0.54)	2.47*** (0.54)	3.12*** (0.63)
Alliance		0.38*** (0.14)	0.41*** (0.14)
Tail-risk difference × Alliance			-2.13* (1.26)
Observations	45,461	45,461	45,461
Sample	1910–2020	1910–2020	1910–2020
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*Implied response to tail-risk differences in column (3): non-allies = 3.12; allies = 3.12 – 2.13 ≈ 0.99.*

# Taking Stock

1. During episodes of high geopolitical risk, official flows follow geopolitical alignment
2. Aligned countries have synchronized business cycles
3. Fragmentation weakens flows from lower-risk creditors to higher-risk borrowers

Geopolitical risk leads to a reallocation of capital within geopolitical blocs and this fragmentation hinders risk-sharing

Model

# Model Environment

- Two periods, two aggregate shocks, three countries (home, allied, and rival)

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- **Period 1:** Home signs bilateral state-contingent contracts
  - ▶ Home: risk-averse. Allied and Rival: risk-neutral
- **Period 2:** Aggregate shock  $s \in \{s_g, s_b\}$  with  $y(s_b) < y(s_g)$ 
  - ▶ Home **repays or defaults** on all creditors

# Geopolitical Externality

Home country's objective at  $t = 1$ :

$$\sum_s \pi(s)u(c(s)) - \eta V^*$$

Geopolitical  
externality



where  $V^*$  is the Rival's expected payoff.

- $\eta > 0$  captures the desire to gain strategic advantage over geopolitical rivals

# Repayment and Default

Repayment,  $d(s) = 0$ :

$$c(s) = y(s) - \tilde{a}(s) - a^*(s)$$

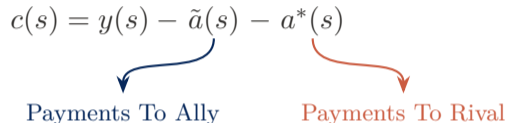
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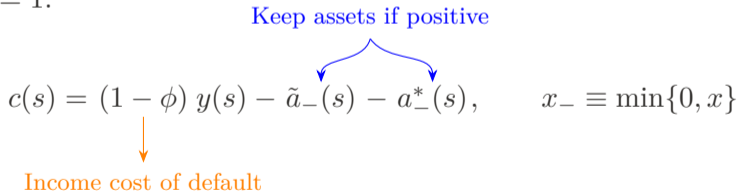


Payments To Ally      Payments To Rival

Default,  $d(s) = 1$ :

Keep assets if positive

$$c(s) = (1 - \phi) y(s) - \tilde{a}_-(s) - a_-^*(s), \quad x_- \equiv \min\{0, x\}$$



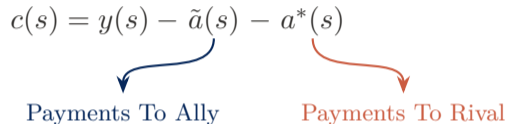
Income cost of default

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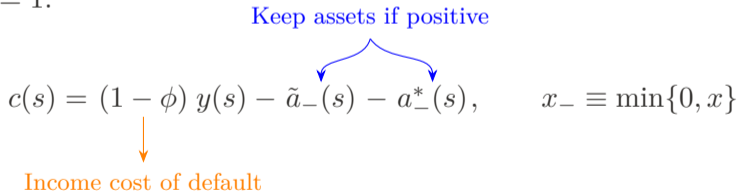


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Income cost of default

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  - ▶ Empirical support ▶ Arrears

# Ally and Rival Countries

- Period-1 utility values is given by expected consumption

$$\tilde{V}(\tilde{a}, s) = \sum_{s \in S} \pi(s) [\tilde{y}(s) + (1 - d(s))\tilde{a}(s) + d(s)\tilde{a}_-(s)]$$

$$V^*(a^*, s) = \sum_{s \in S} \pi(s) [y^*(s) + (1 - d(s))a^*(s) + d(s)a^*_-(s)]$$

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- Consumption must be positive in each state

$$\tilde{y}(s) + (1 - d(s))\tilde{a}(s) + d(s)\tilde{a}_-(s) \geq 0$$

$$y^*(s) + (1 - d(s))a^*(s) + d(s)a^*_-(s) \geq 0$$

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Geopolitical cost  
of repaying Rival

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When  $\eta = 0$ : IC depends only on total repayment  $\tilde{a} + a^*$

When  $\eta > 0$ : defaulting becomes more tempting the larger is the share of debt owed to rival

# Optimal Bilateral Contracts

$$\max_{c(s), \tilde{a}(s), a^*(s)} \sum_s \pi(s) u(c(s)) - \eta V^*$$

subject to

**Participation:**  $\sum_s \pi(s) \tilde{a}(s) \geq 0, \quad \sum_s \pi(s) a^*(s) \geq 0$

**(IC) No-default:**  $u(c(s)) - \eta(y^*(s) + a^*(s)) \geq u((1 - \phi)y(s) - a_-^*(s) - \tilde{a}_-(s)) - \eta(y^*(s) + a_-^*(s)) \quad \forall s$

**Feasibility:**  $c(s) = y(s) - \tilde{a}(s) - a^*(s), \quad \tilde{a}(s) \geq -\tilde{y}(s), \quad a^*(s) \geq -y^*(s) \quad \forall s$

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Incentive constraint binds in the good state because govt. repays in good state

# Simplifying Assumptions

- **Equal state probabilities:**

$$\pi(s_g) = \pi(s_b) = 0.5$$

$$\Rightarrow \tilde{a}(s_g) = -\tilde{a}(s_b) \quad \text{and} \quad a^*(s_g) = -a^*(s_b)$$

- ▶ Good-state repayment equals the bad-state insurance transfer.

- **Same good-state endowment across countries:**

$$y(s_g) = \tilde{y}(s_g) = y^*(s_g)$$

- ▶ Insurance capacity determined by bad state output.

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- **Log utility:**

$$u(c) = \log(c)$$

## Proposition, part i: Full Insurance

If  $\phi \geq \hat{\phi}$ , we have **full insurance**:

$$c(s_g) = c(s_b) = \frac{y(s_g) + y(s_b)}{2}$$

$$\tilde{a}(s_g) + a^*(s_g) = \frac{y(s_g) - y(s_b)}{2}$$

**Threshold :**  $\hat{\phi} \equiv 1 - \frac{y(s_g) + y(s_b)}{2y(s_g)} \exp\left(-\eta \left[\frac{y(s_g) - y(s_b)}{2} - \tilde{y}(s_b)\right]\right)$

## Proposition, part ii: Imperfect Insurance

If  $\phi < \hat{\phi}$ , we have **imperfect insurance**:

$$c(s_g) > c(s_b)$$

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**Imperfect insurance takes two forms:**

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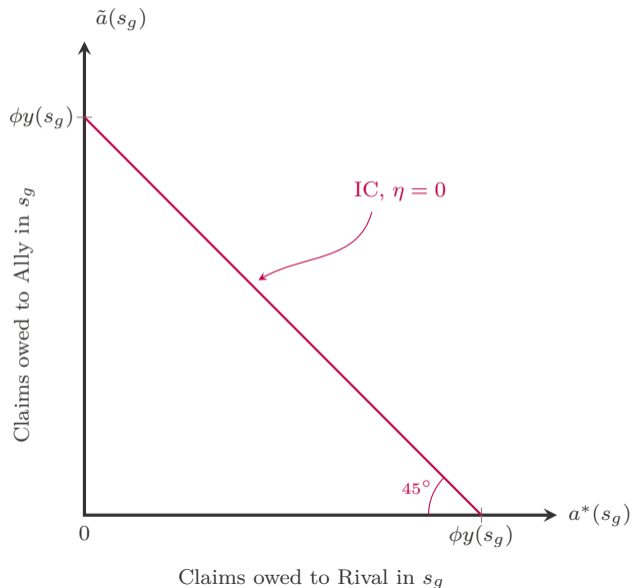
- **Complete fragmentation**,  $\phi \leq \underline{\phi}$  : *No borrowing from rival*

$$\tilde{a}(s_g) = \phi y(s_g) \leq \tilde{y}(s_b), \quad a^*(s_g) = 0$$

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# Graphical Illustration

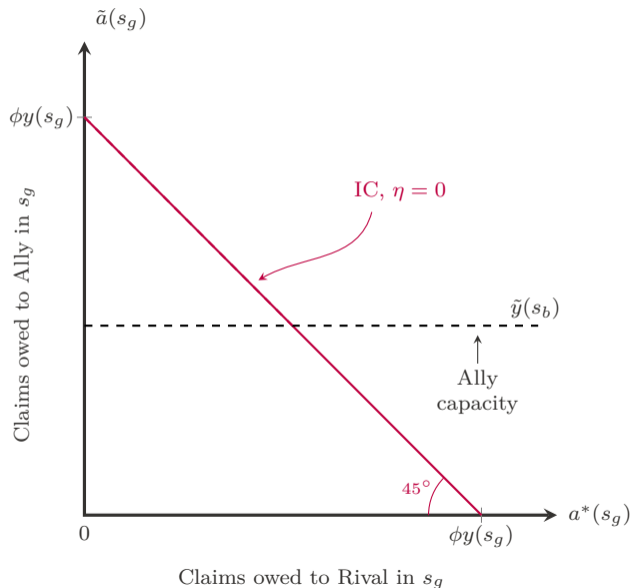


**Benchmark:**  $\eta = 0$

Only **total repayment** matters.

The split between Ally and Rival is irrelevant for repayment incentives.

# Graphical Illustration

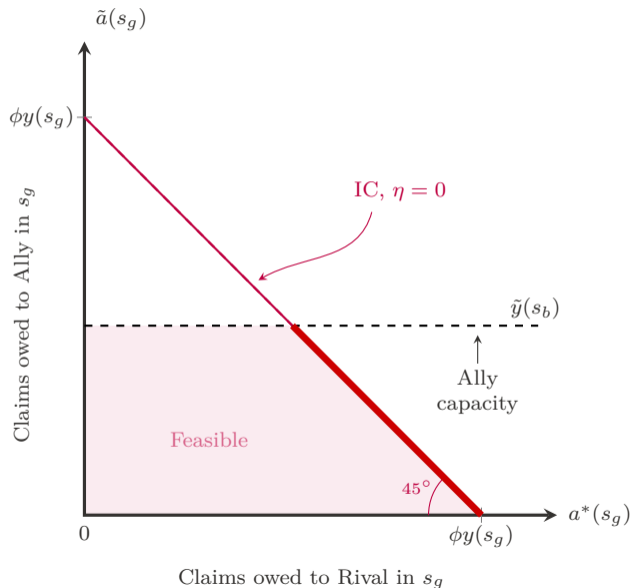


## Ally capacity

The Ally cannot fully insure Home on its own.

So full insurance requires some lending from the Rival.

# Graphical Illustration

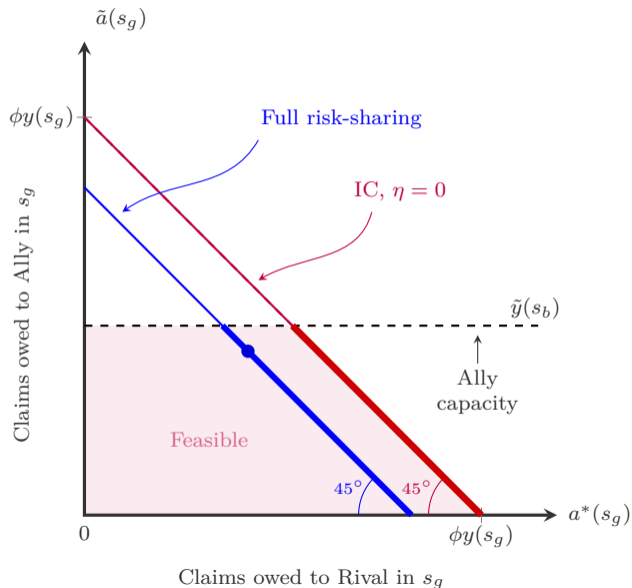


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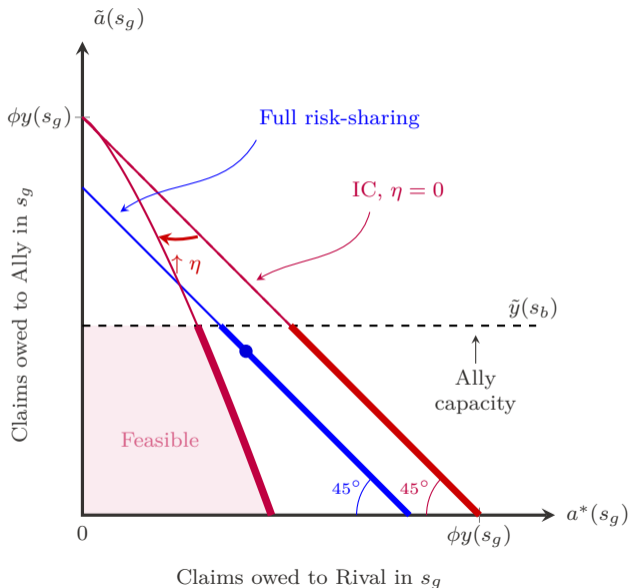


## Full insurance is feasible

Home uses both creditors.

Consumption can be fully smoothed across states.

# Graphical Illustration

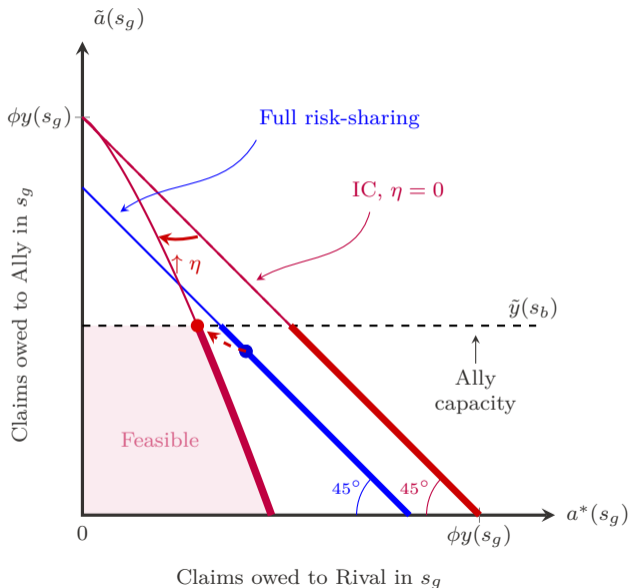


## Increase in $\eta$

Repaying the Rival becomes more costly.

The incentive constraint tightens away from Rival claims.

# Graphical Illustration

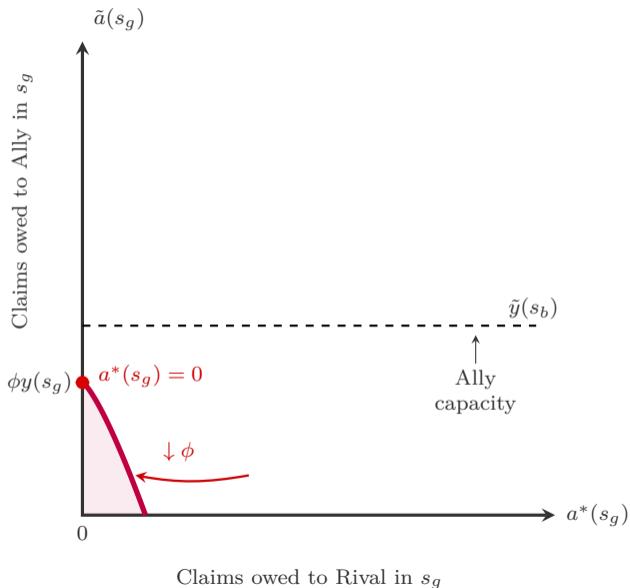


## Full insurance breaks down

The Ally maxes out.

Rival lending falls.

# Graphical Illustration



## Complete fragmentation

If the default cost is sufficiently low, Home borrows only from the Ally.

No borrowing from the Rival:

$$a^*(s_g) = 0.$$

# Conclusions

- We use a long-run dyadic dataset on government-to-government lending to examine financial fragmentation
- We document that increases in geopolitical risk lead to fragmentation in official lending and lower risk-sharing
- We build a sovereign debt model with limited commitment that links geopolitical risk to fragmentation in official lending and limits to risk-sharing

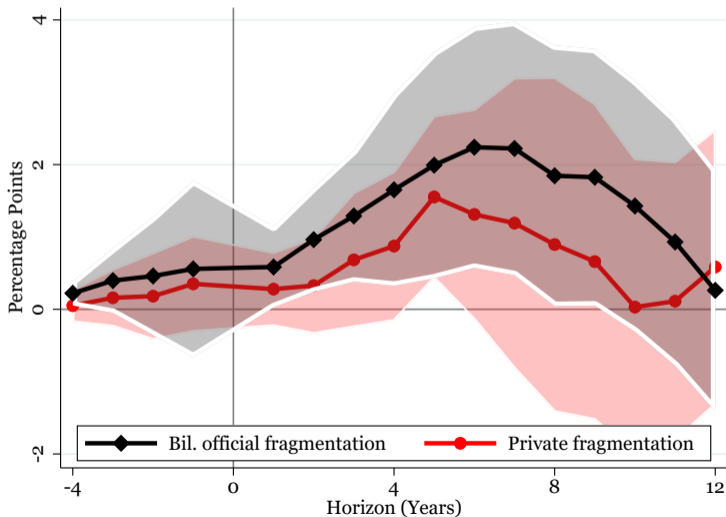
# Appendix

- Measuring private international lending at the dyadic (creditor-debtor country) level is complicated by:
  - ▶ active trading in secondary markets
  - ▶ intermediation through offshore financial centers (e.g. Coppola et al. 2021)

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  - ▶ USD 1.7 trillion by private creditors from 116 countries to 120 recipients

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- Robustness in 1970–1990 syndicated bank lending sample

# Fragmentation in syndicated bank lending, 1970-1990



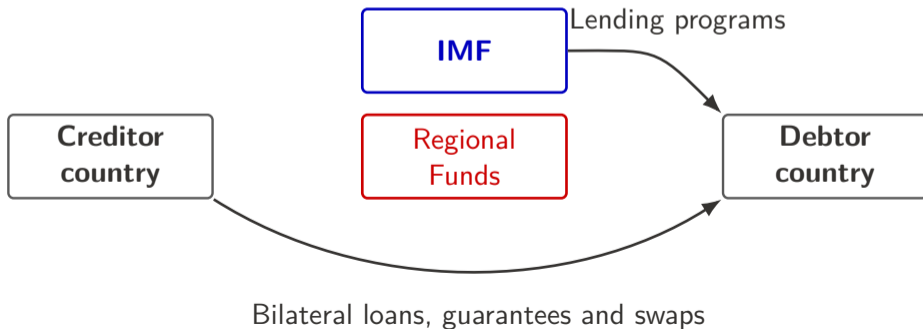
# Data on multilateral lending flows

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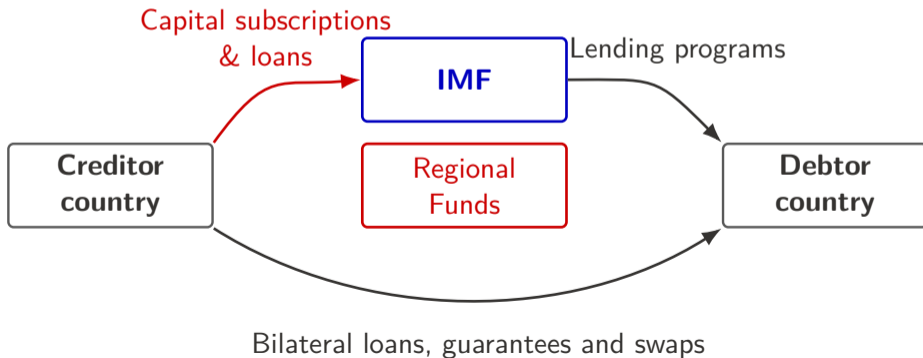
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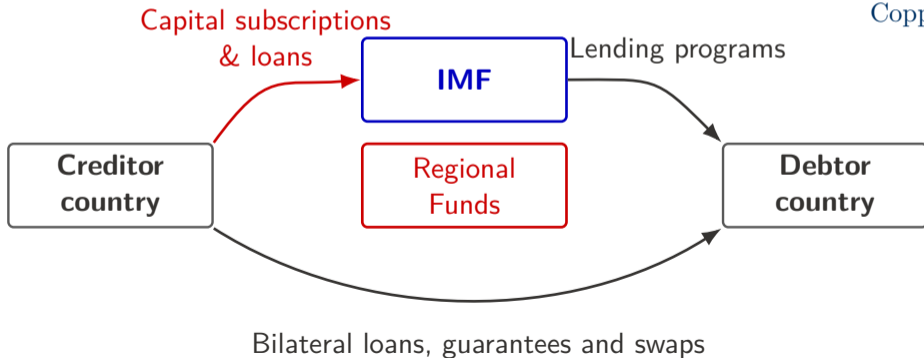
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Related approach:  
Coppola et al. (2021)



# Imputing lending through multilateral institutions

- We compute the funding share of creditor country  $j$  in organization  $o$  in period  $t$

$$\omega_{jot} = \frac{PAID.IN_{jot} + CREDIT_{jot}}{\sum_{k=1}^N (PAID.IN_{kot} + CREDIT_{kot})}$$

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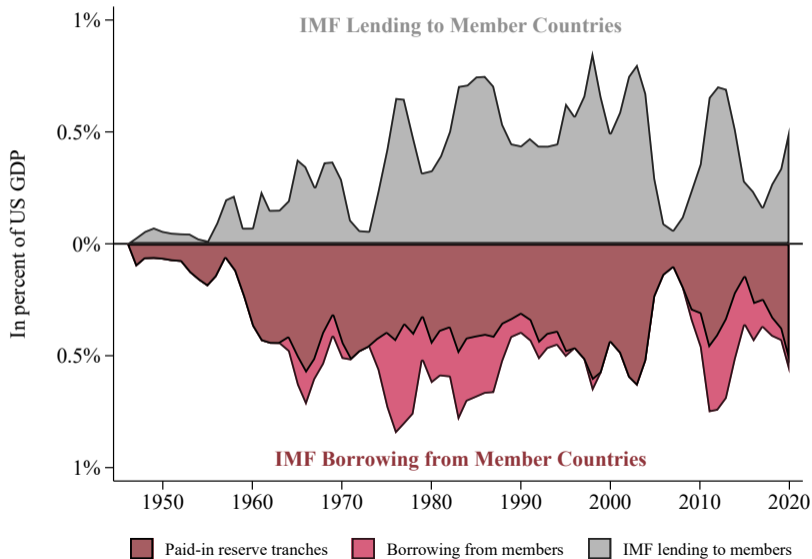
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- Finally, total multilateral lending from country  $j$  to country  $i$  in period  $t$  is:

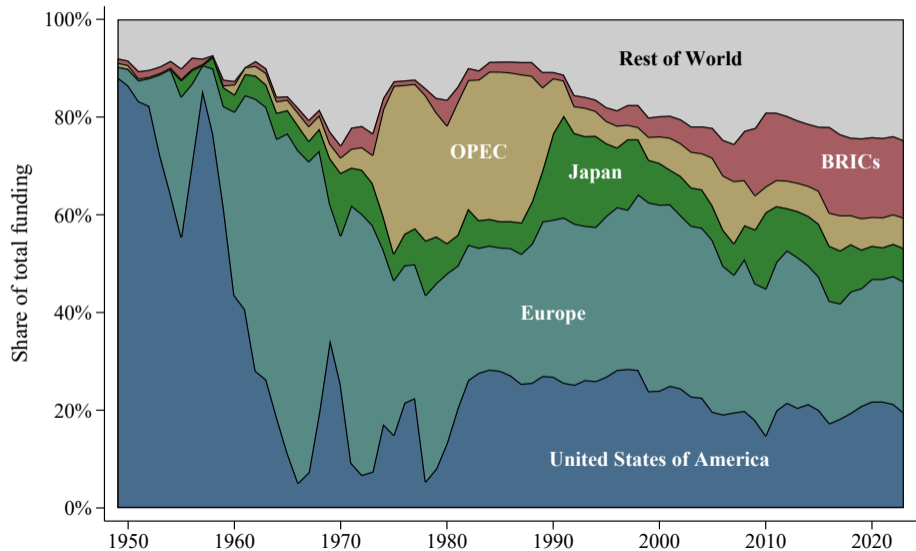
$$\sum_o LOAN_{ijot}$$

# IMF borrowing and lending



# Example: Who funds the IMF?

[▶ Back to LPs](#)



Agreement to establish Andean Reserve Fund, 1976

## Capital

**Article 5.** The initial capital of the Fund is five hundred million (\$500,000,000) dollars of the United States of America, subscribed as follows:

<b>Bolivia:</b>	sixty-two million five hundred thousand (\$62,500,000) dollars.
<b>Colombia:</b>	one hundred twenty-five million (\$125,000,000) dollars.
<b>Ecuador:</b>	sixty-two million five hundred thousand (\$62,500,000) dollars.
<b>Peru:</b>	one hundred twenty-five million (\$125,000,000) dollars.
<b>Venezuela:</b>	one hundred twenty-five million (\$125,000,000) dollars.

Agreement to establish European Monetary Fund, 1955

CONTRACTING PARTIES	AMOUNT OF CONTRIBUTIONS (in units of account)
Germany .....	42,000,000
Austria .....	5,000,000
B.L.E.U. ....	30,000,000
Denmark .....	15,000,000
France .....	42,000,000
Greece .....	2,850,000
Iceland .....	1,000,000
Italy .....	15,000,000
Norway .....	15,000,000
Netherlands .....	30,000,000
Portugal .....	5,000,000
United Kingdom .....	86,575,000
Sweden .....	15,000,000
Switzerland .....	21,000,000
Turkey .....	3,000,000
<b>TOTAL</b> .....	<b>328,425,000</b>

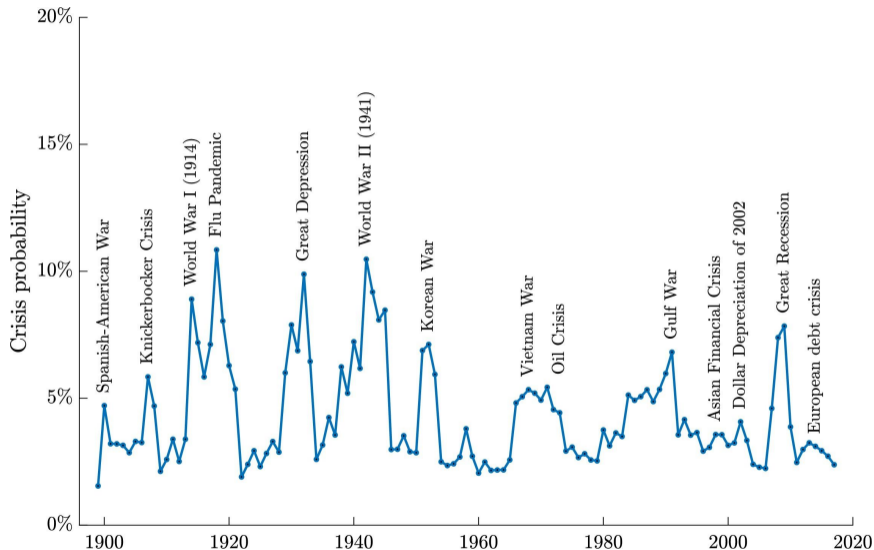
# Coverage - International Financial Institutions

[▶ Back to LPs](#)

<b>Institution</b>	Operating time	Authorized capital (in bn USD)	Number of member countries
League of Nations	1920 - 1946	n.a.	63
International Monetary Fund	1946 - 2020	1350	189
Andean Reserve Fund	1978 - 1991	2	5
Arab Monetary Fund	1977 - 2020	5	22
BRICS Contingent Reserve Arrangement	2014 - 2020	100	5
Chiang Mai Initiative	2000 - 2020	240	10
Eurasian Anti-Crisis Fund	2009 - 2020	9	6
European Monetary Fund	1958 - 1973	0.6	16
European Community Loan Mechanism	1975 - 1988	n.a.	12
European Financial Assistance Facility	1975 - 1988	n.a.	12
European BOP Facility	1988 - 2020	60	28
European Financial Stability Facility	2010 - 2013	1040	19
European Financial Stability Mechanism	2010 - 2013	75	28
European Stability Mechanism	2012 - 2020	780	19
Latin American Reserve Fund	1991 - 2020	4	8
NAFTA Swap Facility	1994 - 2020	7	3

# Macroeconomic tail risk, 1900 - 2020, Aggregate

▶ back



Source: Marfe & Penasse (JFE, 2024)

# Macroeconomic tail risk, 1900 - 2020

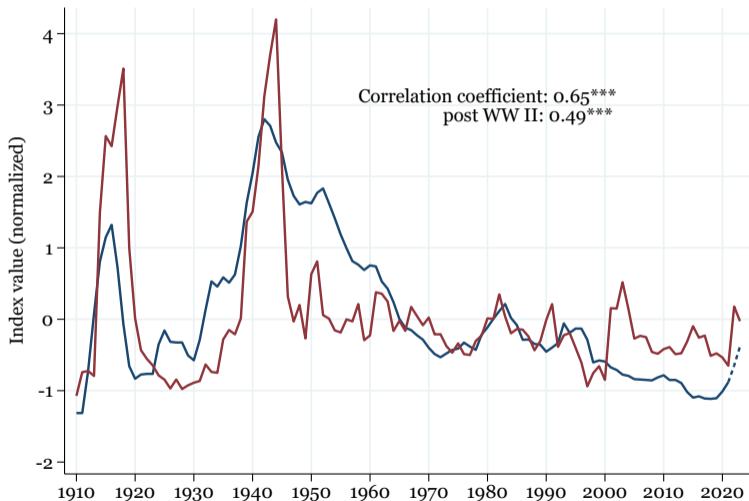
▶ back



Source: Marfe & Penasse (JFE, 2024)

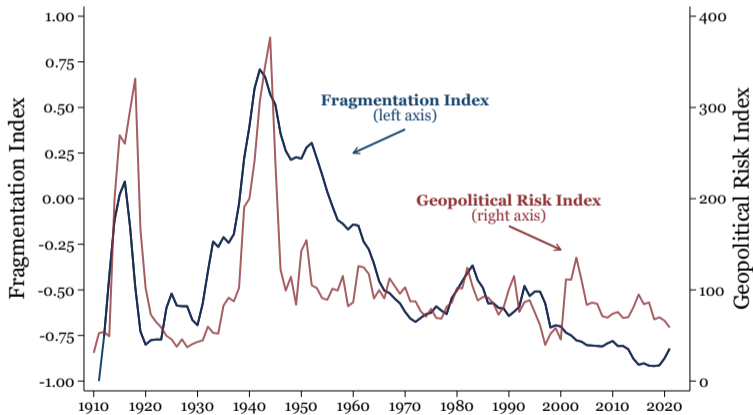
# Fragmentation and geopolitical risk – Normalized

▶ back



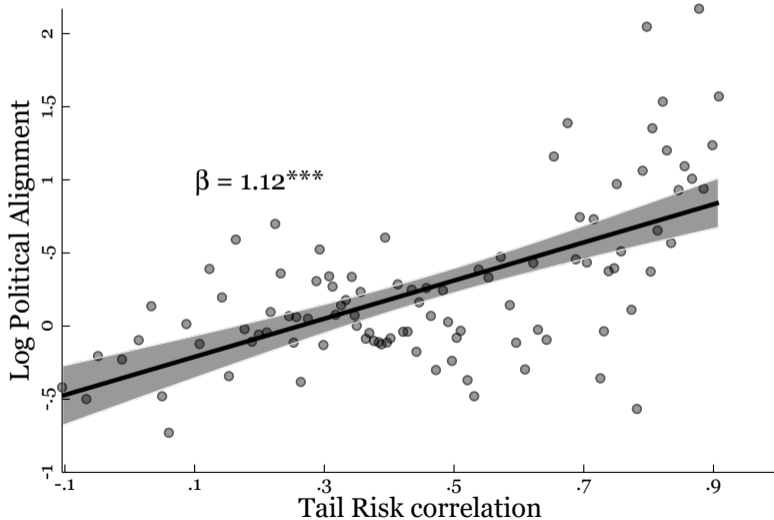
# Fragmentation and geopolitical risk – bilateral + multilateral

▶ back



## ... and more synchronized macro tail risk

▶ back



# Accum. of payment arrears on allies and rivals

▶ back

