Payment systems interlinking and trade flows

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Introduction & data

Cross-border payments in the spotlight

Putin's plan to dethrone the dollar

He hopes this week's BRICS summit will spark a sanctions-busting big bang

ILLUSTRATION: GUILLEM CASASÚS

Opinion **Global Economy**

The west must outdo rival efforts to build an alternative financial system

Technological and geopolitical competition between democracies and autocracies are two sides of the same coin

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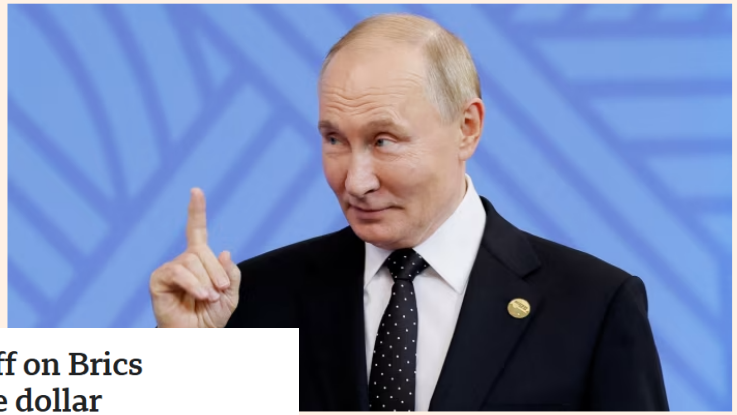

ussian banks were kicked out of Swift © Maxim Shemetov/Reuters

Trump threatens 100% tariff on Brics nations if they try to replace dollar

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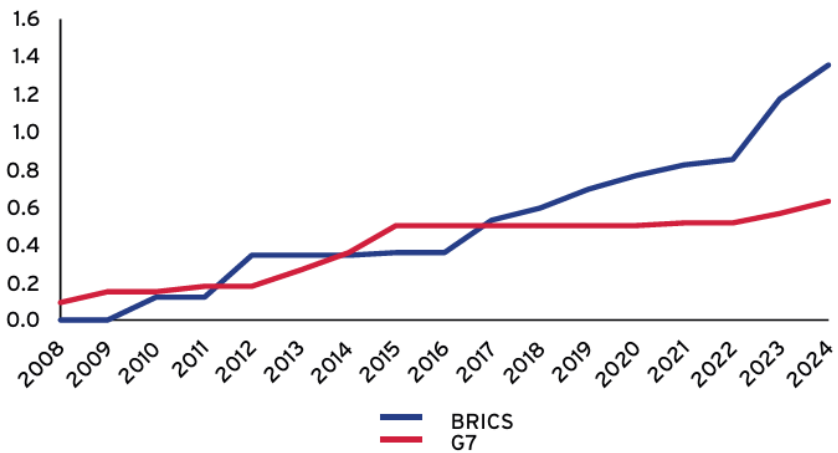
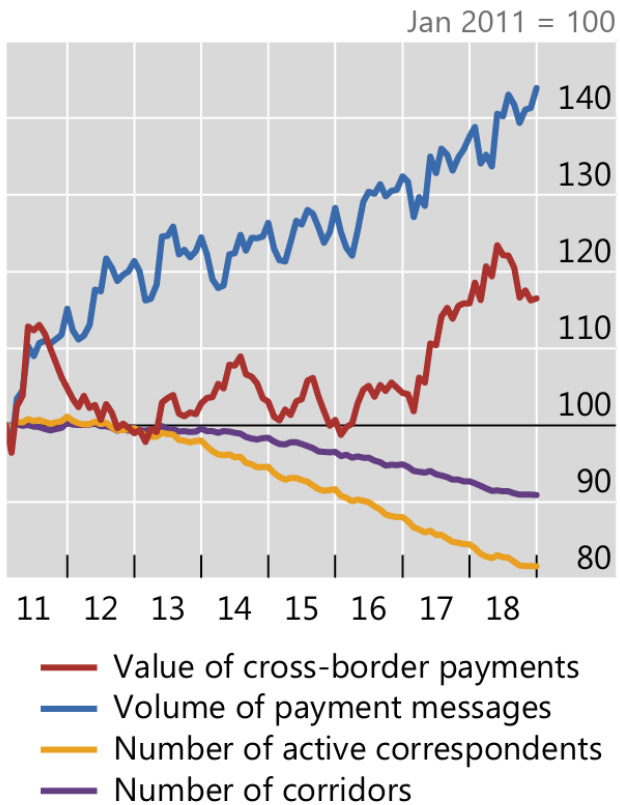
Cross-border payments in the spotlight

Mentions of cross-border payments in G7 and G20 leaders' summits



Source: Chari et al. (2025).

Correspondent banking is retreating



Rice et al. (2020).

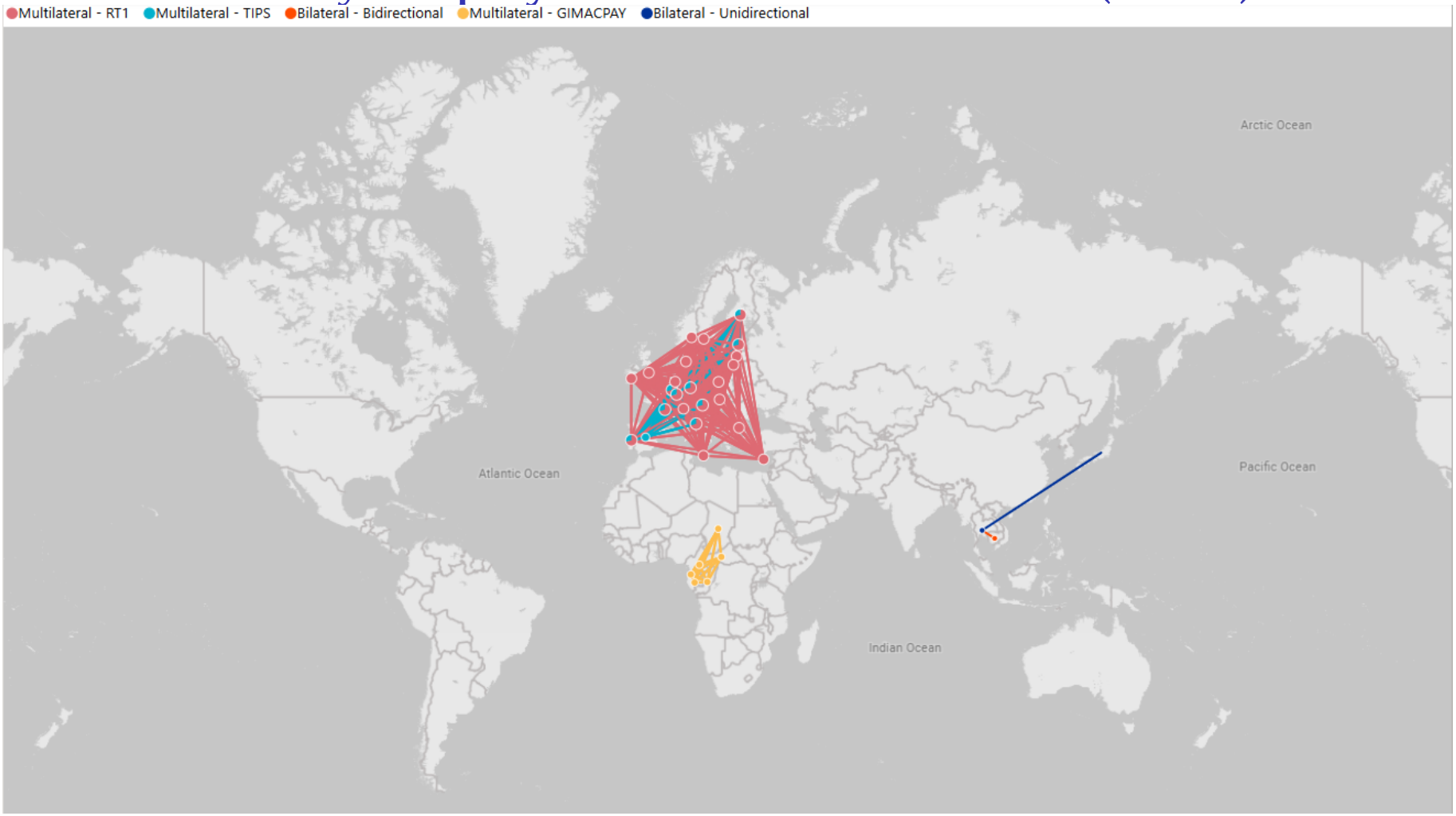
Cross-border payments in the spotlight

The current cross-border payments network relies on:

- Correspondent banking relations
  - → Inefficient (slow, expensive, not transparent, not equally accessible)
  - → Retrenching (20-30% decrease from 2011 to 2022)
  - → G20 Roadmap to enhance cross-border payments (2020)
- Western infrastructure (e.g., SWIFT) and currencies (USD & EUR)
  - → Used to impose financial sanctions
  - → Non-Western economies incentivised to develop alternatives and reduce dependence
- Global initiatives including by the Eurosystem
  - → Project Nexus by the BIS Innovation Hub.
  - → Eurosystem interlinking with UPI and Switzerland.
  - → Onboarding of currencies in TIPS: Sweden (2024), Denmark (2025), Norway (planned), Iceland (interested).

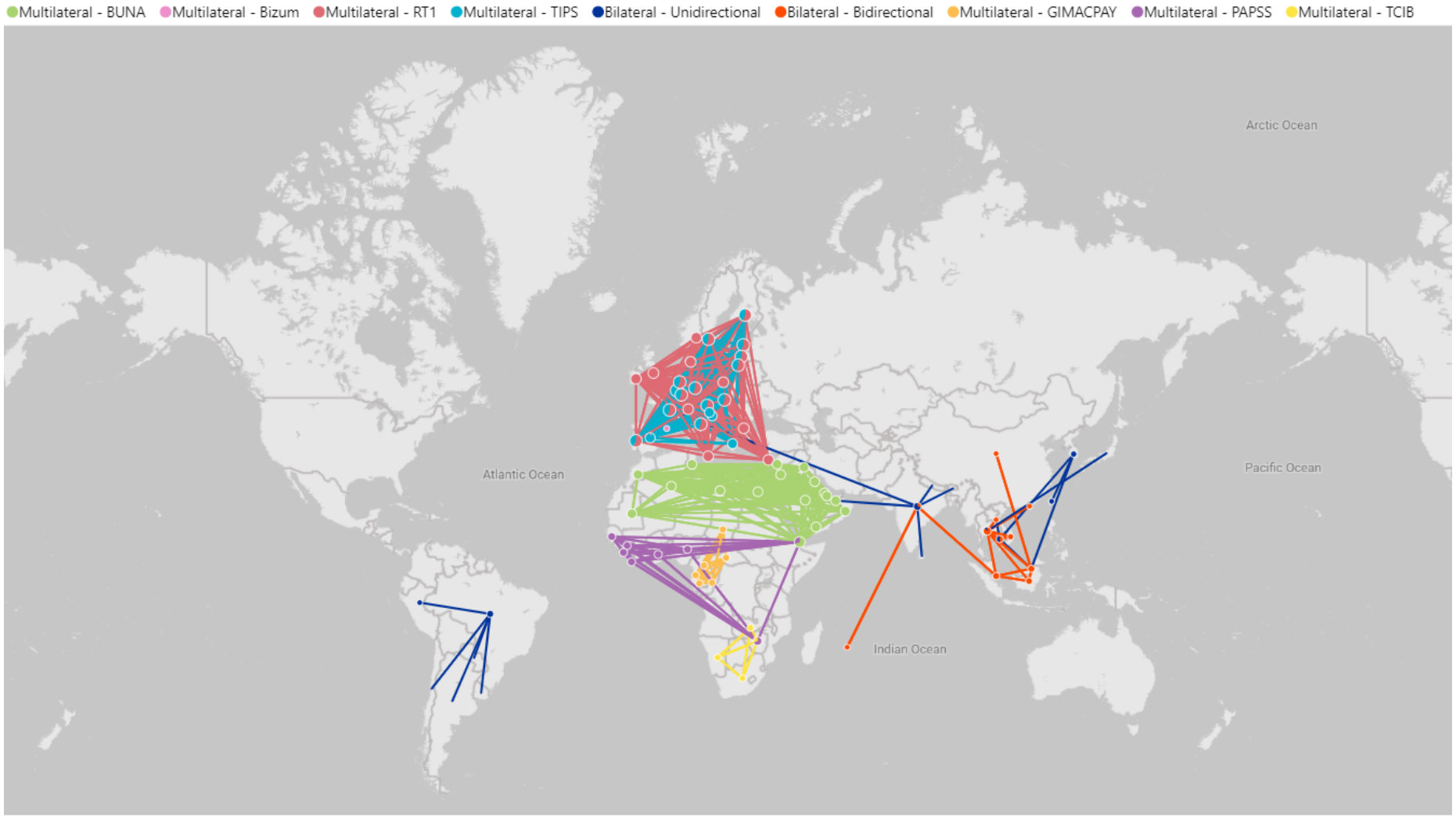
Does the connection of payment systems enhance trade?

Cross-border *fast* payments connections (2020)



Notes: The figure shows cross-border fast payment connections in 2020. The figure shows bilateral connections (split between unidirectional and bidirectional depending on the originating currencies enabled), and multilateral connections (represented as dyads and colored by regional platform).

Cross-border *fast* payments connections (2024)



Notes: The figure shows cross-border fast payment connections in 2024. The figure shows bilateral connections (split between unidirectional and bidirectional depending on the originating currencies enabled), and multilateral connections (represented as dyads and colored by regional platform).

Our contribution

- Extension of standard gravity framework to identify the **determinants of international trade**:
  - → Connection of payment systems enhances trade
  - → The effect is robust to the inclusion of geopolitical links
- Usage of an instrument to prove **causality** in a correction model:
  - → Common coding language as an instrument to determine connection
  - → Result are causal
- Understanding the **channels**:
  - → Wholesale vs retail
  - → Small vs big flows
  - → Type of goods traded

Literature review

- Determinant of international trade using the **gravity model**:
  - → Rose (2000), Rose (2004), Martin et al. (2008, 2012), Eichengreen et al. (2021), Gopinath et al. (2025)

- Few papers on the effect of **payment systems** on trade flows :
  - → Effect of connection creation: Rice et al. (2020), Borchert et al. (2024), Mariani et al. (2024)
  - → Effect of sanctions (restrictions on payment systems): Berthou (2023), Crozet and Hinz (2020), Imbs and Pauwels (2024)
  - → Reverse causality: Ferrari Minesso et al. (2025)

Gravity model

Empirical framework

Extension of the standard gravity framework to the interlinking of payment systems:

$$y_{i,j,t} = \exp\left[\gamma S_{i,j,t} + \beta' X_{i,j,t} + \alpha^1_{i,j} + \alpha^2_{j,t} + \alpha^3_{i,t}\right]\varepsilon_{i,j,t} \tag{1}$$

where:

- $y_{i,j,t}$ denotes exports from country i to country j at time t;
- $S_{i,j,t} = 1$ if the fast payment systems of country i and j are connected in year t;
- $X_{i,j,t}$ includes dummies for a currency union and for a free trade agreement, and an index of geopolitical distance;
- $\alpha^1_{i,j}$, $\alpha^2_{j,t}$ and $\alpha^3_{i,t}$ are country-pair, origin-time and destination-time fixed effects.

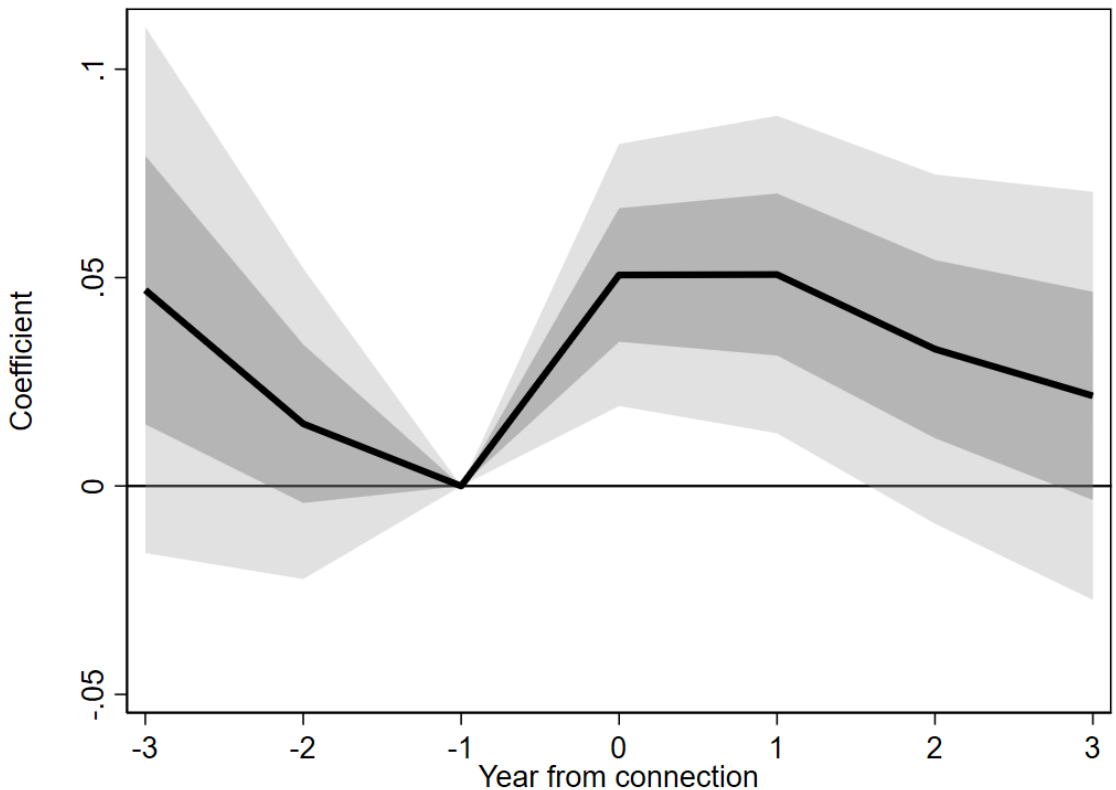
Gravity model (PPML)

	(1)	(2)	(3)	(4)
FPS connection	0.109***	0.085***	0.043***	0.032*
	(0.029)	(0.018)	(0.015)	(0.017)
Common currency				0.123**
				(0.059)
Trade agreement				0.052
				(0.052)
Geopolitical distance				-0.136***
				(0.023)
Observations	76,516	76,516	76,507	48,626
N. connections	2864	2864	2864	2053
Pseudo-R^2	0.995	0.997	0.998	0.998
Exporter-importer FE	Y	Y	Y	Y
Exporter-year FE	N	Y	Y	Y
Importer-year FE	N	N	Y	Y
Controls	N	N	N	Y

Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

Event study

$$y_{i,j,t} = \exp\left[\sum_{l=-3}^{3} \gamma_l \, S_{i,j,t} \times time_{l,t} + \alpha^1_{i,j} + \alpha^2_{j,t} + \alpha^3_{i,t}\right] \varepsilon_{i,j,t} \tag{2}$$



Notes: Shaded areas show 95 and 68% confidence intervals.

Correction model

Correction model

First-stage equation:

$$P(S_{i,j,t}|\mathbf{X_1}) = \Phi(\beta_1'\mathbf{X_1} + u_{1,i,t})$$
$$u_{1,i,j,t} \approx N(0, \sigma(\beta_2'\mathbf{X_2})) \tag{3}$$

where:

- $S_{i,j,t} = 1$ if the fast payment systems of country i and j are connected in year t;
- $\mathbf{X_1}$ and $\mathbf{X_2}$ are controls for the level and the volatility of the first-stage regression respectively;
- $\Phi(\bullet)$ is the normal distribution function.

Correction model

The inverse Mill's ratios (λ) are computed as:

$$\lambda_{i,j,t} = \frac{\phi(\hat{\beta}_1' \mathbf{X_1} / \exp \hat{\beta}_2' \mathbf{X_2})}{\Phi(\hat{\beta}_1' \mathbf{X_1} / \exp \hat{\beta}_2' \mathbf{X_2}) \exp \hat{\beta}_2' \mathbf{X_2}} \tag{4}$$

where:

- $\Phi(\bullet)$ is the normal probability function;
- $\phi(\bullet)$ is the cumulative distribution function.

Correction model

The second-stage equation is the standard gravity model equation augmented by the IMR:

$$y_{i,j,t} = \exp\left[\gamma S_{i,j,t} + \beta' \mathbf{X_3} + \alpha^1_{i,j} + \alpha^2_{j,t} + \alpha^3_{i,t} + \delta\lambda_{i,j,t} + \beta'_4 \lambda_{i,j,t} \times \mathbf{X_2}\right]\varepsilon_{i,j,t} \quad (5)$$

where:

- $\rightarrow$ $\mathbf{X_3}$ contains the same controls as in the gravity equation;
- $\rightarrow$ The correction terms ($\delta\lambda_{i,j,t} + \beta'_4 \lambda_{i,j,t} \times \mathbf{X_2}$) control for the endogeneity of $S_{i,j,t}$;
- $\rightarrow$ The regression is estimated with PPML.

Correction model

	(1)	(2)	(3)	(4)
FPS connection	0.053*	0.040**	0.046***	0.037**
	(0.031)	(0.016)	(0.016)	(0.017)
Common currency				0.121**
				(0.060)
Trade agreement				0.074
				(0.058)
Geopolitical distance				-0.082***
				(0.030)
Observations	48,733	48,733	48,733	48,733
N. connections	2053	2053	2053	2053
Pseudo-R^2	0.995	0.998	0.998	0.998
Exporter-importer FE	Y	Y	Y	Y
Exporter-year FE	N	Y	Y	Y
Importer-year FE	N	N	Y	Y
Controls	N	N	N	Y

Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

Synthetic difference-in-difference

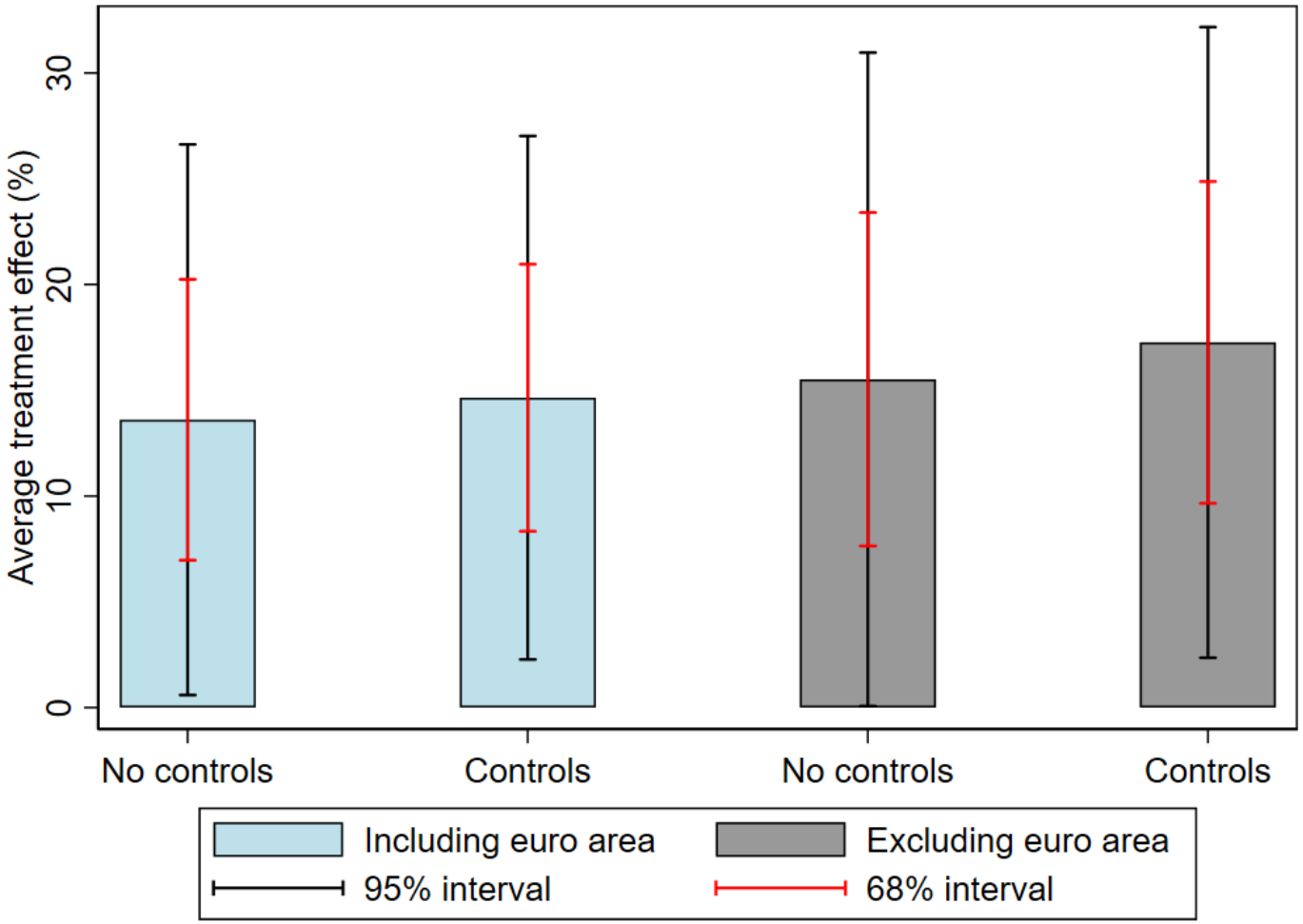
Synthetic difference-in-difference

$$(\hat{\tau}_{\text{sdid}}, \hat{\mu}, \hat{\alpha}, \hat{\beta}) = \arg\min_{\tau,\mu,\alpha,\beta} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\omega}_{i,j} \hat{\theta}_t \left(y_{i,j,t} - \mu - \alpha_{i,j} - \beta_t - \Gamma' X_{i,j,t} - S_{i,j,t}\tau \right)^2 \tag{6}$$

where:

- $\rightarrow$ $y_{i,j,t}$ is exports;
- $\rightarrow$ $S_{i,j,t}$ is the usual dummy;
- $\rightarrow$ β_t is a time fixed effect;
- $\rightarrow$ $X_{i,j,t}$ a set of controls including GDP, geographical distance, a common currency dummy and a dummy for the presence of a trade agreement.

Synthetic difference-in-difference



Notes: Standard errors are bootstrapped.

Channels

Wholesale vs retail transactions

$$y_{i,j,t} = \exp\left[\gamma_W SW_{i,j,t} + \gamma_R SR_{i,j,t} + \beta' X_{i,j,t} + \alpha^1_{i,j} + \alpha^2_{j,t} + \alpha^3_{i,t}\right]\varepsilon_{i,j,t} \quad (7)$$

	(1)	(2)	(3)	(4)
Wholesale & retail connection	0.171***	0.209***	0.136***	0.178***
	(0.040)	(0.038)	(0.027)	(0.031)
Only retail connection	0.095***	0.059***	0.020	-0.007
	(0.035)	(0.021)	(0.017)	(0.018)
Common currency				0.143**
				(0.059)
Trade agreement				0.056
				(0.052)
Geopolitical distance				-0.136***
				(0.023)
Observations	76,516	76,516	76,507	48,626
N. connections	2864	2864	2864	2053
Pseudo-R^2	0.995	0.997	0.998	0.998
Exporter-importer FE	Y	Y	Y	Y
Exporter-year FE	N	Y	Y	Y
Importer-year FE	N	N	Y	Y
Controls	N	N	N	Y

Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

Small vs big country pairs

$$y_{i,j,t} = \exp\left[\gamma_1 S_{i,j,t} \times small_{i,j} + \gamma_2 S_{i,j,t} \times big_{i,j} + \beta' X_{i,j,t} + \alpha^1_{i,j} + \alpha^2_{j,t} + \alpha^3_{i,t}\right]\varepsilon_{i,j,t} \tag{8}$$

	(1)	(2)
FPS connection × big	0.043***	0.032*
	(0.015)	(0.017)
FPS connection × small	0.584+	0.718**
	(0.455)	(0.308)
Common currency		0.123**
		(0.059)
Trade agreement		0.052
		(0.052)
Geopolitical distance		-0.136***
		(0.023)
Observations	76,507	48,626
N. connections	3028	2224
Pseudo-R^2	0.998	0.998
Exporter-importer FE	Y	Y
Exporter-year FE	Y	Y
Importer-year FE	Y	Y
Controls	N	Y

Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

High tech and low tech goods

	(1) High tech	(2) High tech	(3) Low tech	(4) Low tech
FPS connection	-0.024	-0.029	0.057***	0.054**
	(0.025)	(0.024)	(0.016)	(0.021)
Common currency		-0.147***		0.167**
		(0.050)		(0.067)
Trade agreement		-0.027		0.052
		(0.053)		(0.057)
Geopolitical distance		-0.107***		-0.142***
		(0.033)		(0.024)
Observations	54,942	35,088	74,735	47,574
N. connections	2799	2012	2855	2047
Pseudo-R^2	0.997	0.998	0.997	0.998
Exporter-importer FE	Y	Y	Y	Y
Exporter-year FE	Y	Y	Y	Y
Importer-year FE	Y	Y	Y	Y
Controls	N	Y	N	Y

Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

Conclusion and next steps

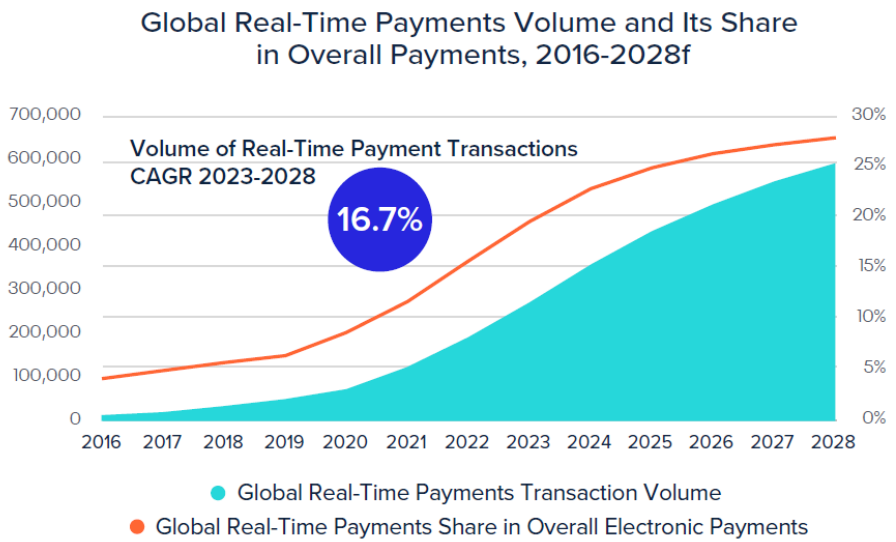
Conclusion

- Significant role of interlinking fast payment systems in fostering international trade
- Results are causal and robust to alternative specifications of the model
- Evidence suggest that it might be due to a reduction of cross-border payment costs
- Policy implications: need for continued international efforts to interconnect payment systems
- Next steps:
  - Comparing pair of countries depending on the transaction costs (database under construction)
  - Impact across types of trade flows (intermediate products, homogeneous products such as commodities, etc.)

Appendix

Why fast payment systems?

Fast payment systems enable (near-) real-time transfer of funds between end-users. Low-value retail payments, but increasingly representative:



Source: ACI Worldwide and GlobalData. "Prime time for real-time", 2024.

- Available in 100+ jurisdictions, more to come
- 266 billion transactions in 2023, 40% yoy growth
- Transaction volume expected increase of 17% by 2028
- Interlinking of fast payments is a G20 priority action

Gravity model – robustness

	(1) Exclude euro area	(2) Euro area as dummy	(3) Gravity controls	(4) Exclude small trade flows
FPS connection	0.037**	0.032*	0.353***	0.032*
	(0.017)	(0.017)	(0.068)	(0.017)
Common currency	0.096	0.123**	0.012	0.126**
	(0.094)	(0.059)	(0.074)	(0.059)
Trade agreement	0.052	0.052	0.863***	0.052
	(0.052)	(0.052)	(0.077)	(0.052)
Geopolitical distance	-0.142***	-0.136***	-0.174***	-0.136***
	(0.024)	(0.023)	(0.048)	(0.023)
Same legal system			0.225***	
			(0.054)	
Geographic distance			-0.770***	
			(0.025)	
Bilateral GDP			1.443***	
			(0.020)	
Observations	47,486	48,626	50,057	46,470
N. connections	1019	2053	2055	2050
Pseudo-R^2	0.998	0.998	0.691	0.998
Exporter-importer FE	Y	Y	N	Y
Exporter-year FE	Y	Y	N	Y
Importer-year FE	Y	Y	N	Y
Controls	Y	Y	Y	Y

Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2. Column (1) excludes the euro area, column (2) adds a dummy for countries in the euro area, column (3) adds other standard gravity controls excluding fixed-effects and column (4) excludes pairs in the bottom 5% of the distribution of trade flows.

Correction model – robustness

	(1) Exclude euro area	(2) Euro area as dummy	(3) Gravity controls	(4) Exclude low trade flows
FPS connection	0.042**	0.037**	0.172**	0.037**
	(0.018)	(0.017)	(0.069)	(0.017)
Common currency	0.149+	0.121**	-0.060	0.124**
	(0.097)	(0.060)	(0.085)	(0.059)
Trade agreement	0.077+	0.074	0.938***	0.074
	(0.058)	(0.058)	(0.084)	(0.058)
Geopolitical distance	-0.091***	-0.082***	-0.214***	-0.082***
	(0.032)	(0.030)	(0.069)	(0.030)
Same legal system			0.199***	
			(0.055)	
Geographic distance			-0.825***	
			(0.050)	
Bilateral GDP			1.303***	
			(0.064)	
Observations	47,593	48,733	50,254	46,594
N. connections	1019	2053	2055	2050
Pseudo-R^2	0.998	0.998	0.695	0.998
Exporter-importer FE	Y	Y	N	Y
Exporter-year FE	Y	Y	N	Y
Importer-year FE	Y	Y	N	Y
Controls	Y	Y	Y	Y

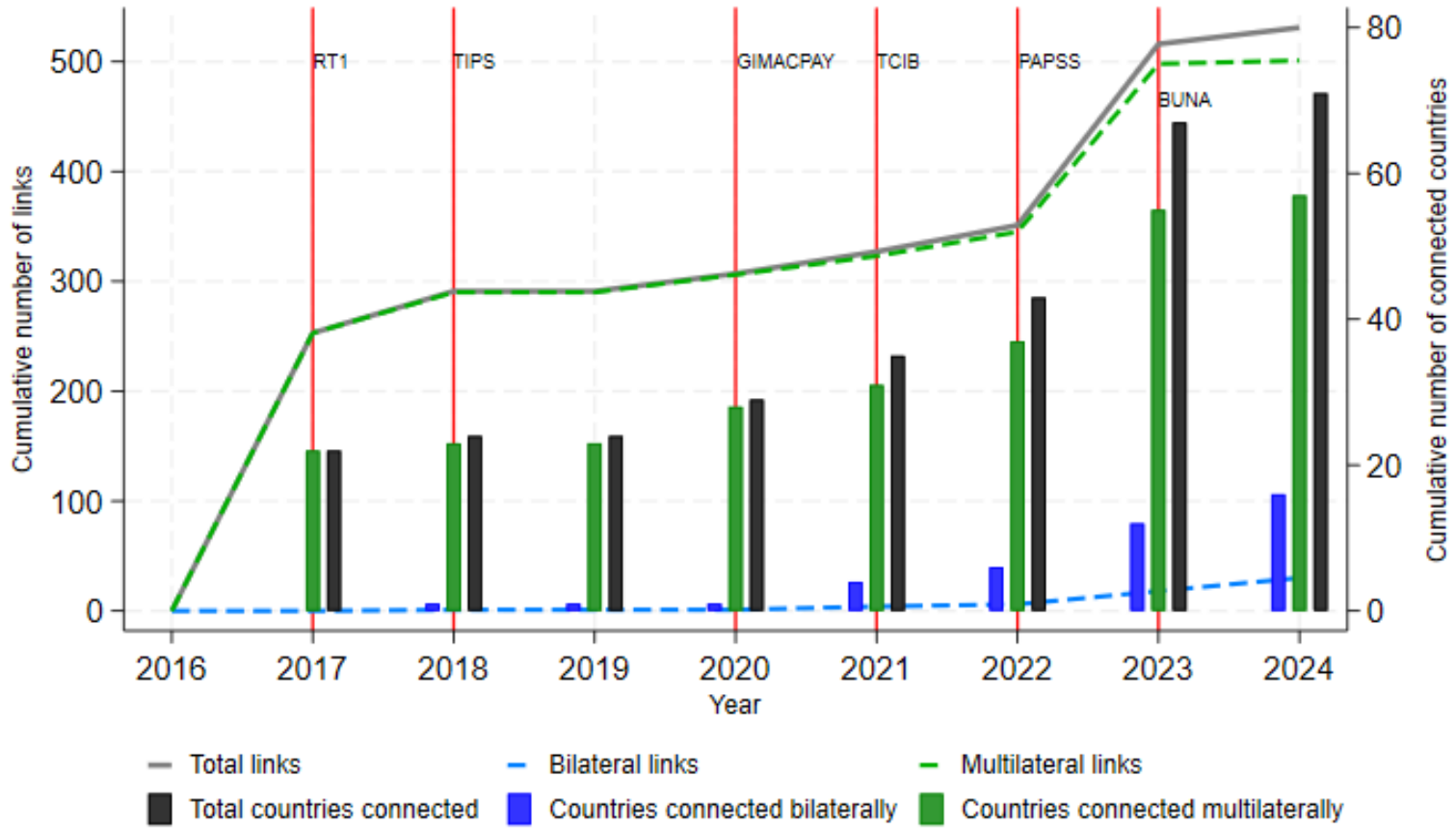
Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2. Column (1) excludes the euro area, column (2) adds a dummy for countries in the euro area, column (3) adds other standard gravity controls excluding fixed-effects and column (4) excludes pairs in the bottom 5% of the distribution of trade flows.

First stage regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP	0.093***						0.024***
	(0.004)						(0.002)
Geographic distance		-0.566***					-0.049***
		(0.009)					(0.005)
Common language			0.031***				0.011***
			(0.003)				(0.003)
Former colony				-0.017***			-0.020***
				(0.006)			(0.006)
Same payment standards					0.266***		0.011+
					(0.019)		(0.007)
FPS						0.393***	0.200***
						(0.026)	(0.022)
Observations	177216	177,216	167264	177192	177,216	177216	167,240
Log-likelihood	-11004	-11004	-10562	-10991	-9917	-8420	-7960

Notes: ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

Timeline of cross-border connections of fast payment systems



Notes: The figure shows the evolution of cross-border fast payment systems connections since 2017. Data are from Ferrari Minesso et al. (2025).