Geopolitics and global interlinking of fast payment systems *

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Abstract

This paper, for the first time, analyzes the role of economic, technical, and geopolitical factors in interlinking of payment systems across 117 countries, using new data on fast payment links from 2016 to 2023. We test whether links are governed by standard gravity variables influencing international trade patterns, technical features or by instead—or in addition—geopolitical factors. While we find support for the role of economic factors and technical features, the most striking finding is the strength of geopolitical effects. Our estimates suggests that the reduction in the probability of payment links between geopolitically distant countries is as much as thrice stronger than for geographically distant ones. Instrumental variable estimates suggest that the effect is causal. The results are in line with the hypothesis that alignment in country-preferences on sensitive features of contractual agreements along with incentives associated with higher opportunity costs of war emphasized in recent theoretical models play key roles in the establishment of interlinking arrangements.

Keywords: Geopolitics, interlinking, fast payment systems

JEL Codes: E42, F15, F30

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1 Introduction

Payment systems are often likened to the plumbing of the economy—a network of essential and ubiquitous conduits that typically go unnoticed until something goes wrong (Kahn and Roberds (2009)). Economists studying payment systems, such as Freeman (1996), Kocherlakota and Wallace (1998), Kahn and Roberds (1998), Furfine (2000), Kahn and Roberds (2001), Bech and Garratt (2003), Kahn and Roberds (2007), Mills and Nesmith (2008), and Kahn and Roberds (2009) have long grappled with the unflattering nature of this metaphor. But the field of payments economics—the study of transfers of value from one agent to another agent for the purpose of discharging debt— has gained greater recognition in recent years. That interest is spurred by the growing volume of global payments, advancements in payment technologies and infrastructure, and other reasons.[1]

One such reason is "the race to remake the world's financial plumbing"— notably what is seen as some emerging markets' bet that payments technology will reduce the dominance of the US dollar in the international monetary system and the role of US banks, clearing and payment infrastructures as hubs for global payments.[2] "Weaponization" of payment infrastructures to impose economic sanctions, such as SWIFT—the main financial messaging network through which international payments are initiated— has encouraged some countries to look for alternatives. At the summit of BRICS nations held by Russia in Kazan in October 2024, the Leaders of Brazil, Russia, India, China, South Africa, and other countries welcomed higher use of local currencies in global financial transactions and discussed whether to establish a new cross-border settlement and depositary infrastructure, BRICS Clear.[3]

These developments may have material economic implications. First, they matter for geoeconomic power. Recent theoretical models, such as Clayton et al. (2023), suggest that the dollar-based financial infrastructure for payment and clearing systems is a strategic asset that can be leveraged to achieve geopolitical objectives, as increasing returns to scale

[1] Growing payments activity is driven by both wholesale payment systems used for settling interbank obligations and retail payment systems used by households and non-banks. Advancements in payment technologies and infrastructure include the emergence of mobile payments and digital wallets, potential uses of blockchain and cryptocurrencies, interest in exploring central bank digital currencies in multiple countries, and the rise of fast payment systems—on which we come back below.

[2] See e.g., The Economist (2024) and Farrell and Newman (2023).

[3] On 30 November 2024, US President-elect Donald Trump warned the BRICS nations that he would require commitments that they would not move to create a new currency as an alternative to using the US dollar, and repeated threats to levy a 100% tariff otherwise.

naturally make them monopolistic. The infrastructure is strategic, in the sense that it supplies widely used inputs, with high value added for targets of economic sanctions, and there are poor available substitutes. Second, potential changes to global payment infrastructures matter for the international role of currencies. They affect the ease-of-settlement benefits of asset market liquidity (Coppola et al. (2023)), transaction costs in financial markets (Rey (2001), Devereux and Shi (2013)) and strategic complementarities between trade and finance (Gopinath and Stein (2021))—which are key economic forces in the current dollar-dominated financial system. In turn, this may have broader macroeconomic implications for e.g., the elasticity of global trade to exchange rate movements, the exchange rate pass-through or the international propagation of shocks (Gopinath et al. (2020)). Third, connecting payment systems have material implications for trade flows. While there is no empirical evidence on the effects of connecting payment systems on bilateral trade, insights can be drawn from studies on correspondent banking.[4] Finally, it has long been recognized that the high volume of transactions and the substantial value of underlying payments processed highlight the significant impact of payment systems on financial stability (see e.g., White (1998)).

This paper, for the first time, analyzes the role of economic, technical, and geopolitical factors in the interlinking of payment systems worldwide—i.e., the establishment of connections between payment systems in different countries. We focus on the rapidly growing global network of fast payment systems, which enable (near-) real-time transfer of funds between end-users. Households and businesses in over 100 jurisdictions now have access to fast payments, with more to be launched in the coming years (Frost et al. (2024)).[5] And these transactions represented 19% of all electronic payments globally, a figure expected to rise to 27% by 2028.[6]

[4]Borchert et al. (2024) estimate that the termination of cross-border correspondent banking services decreases the likelihood that a firm continues to export by almost 20 percentage points and revenues by almost 60% after four years.

[5]Globally, fast payments are addressing key challenges in finance and commerce by offering speed, affordability, accessibility, and convenience. These systems reduce costs, improve liquidity for businesses, and enable more efficient banking operations. They are seen as a catalyst for digital finance (Cornelli et al. (2024)). Governments and regulators in both developed and emerging markets are increasingly championing fast payments, recognizing their potential to drive economic growth, enhance financial inclusion, and promote transparency. In 2023, fast payments facilitated 266 billion transactions worldwide, marking a year-over-year growth of over 40% (ACI Worldwide and GlobalData (2024)).

[6]This rapid adoption is driven by the demand for low-cost, user-friendly payment options, the push for modernized infrastructure, and a shared commitment to improving economic performance. Innovations like mobile wallets and QR codes are accelerating adoption, offering consumers seamless access to real-time payment systems, both domestically and internationally. Fostering fast payment interlinking across borders is a preeminent avenue to enhance cross-border payments—for instance, it is one of the priority actions identified to reach the G20 cross-border payment targets (Committee on Payments and Market

We build a new annual dyadic database to analyze 527 fast payment links among 117 countries in the period 2016-2023. We measure economic factors using gravity-model covariates familiar to the literature, which we interpret as proxies for trade frictions. Technical features are measured using new data on the underlying payment technology—which capture how easy it is to link up the systems technically. Geopolitical motives are measured using overall voting patterns in the United Nations (UN), as per Bailey et al. (2017).

Geopolitics can influence the probability of establishing a payment link between two countries through two main channels. One is that geopolitically close countries are more likely to be aligned on sensitive matters that are part of contractual agreements of interlinking arrangements, such as governance. Participants must agree on dispute resolution mechanisms, privacy standards, cybersecurity, anti-money-laundering rules, set criteria for the inclusion of central banks over time, and ownership and voting shares (Eichengreen (2024)). The other channel is that geopolitically close countries have an incentive to establish payment links to increase the opportunity cost of a war between them, associated with the loss of trade gains enabled by the links in question—a channel stressed in recent theoretical models of international trade agreements (e.g. Martin et al. (2008), Martin et al. (2012), Thoenig (2023)).

To address endogeneity concerns between payment links and geopolitics, we propose an instrumental variable (IV) strategy where genetic distance—i.e., the difference in gene distributions between two populations—is used as an instrument. Our instrument is motivated by empirical evidence that states whose populations are more closely related genetically are significantly more likely to engage in international conflict with each other. Importantly, the effect of genetic distance on conflicts remains robust even after accounting for various measures of geographic proximity and other factors influencing conflict (Spolaore and Wacziarg (2016)). This suggests that the relationship does not simply stem from the tendency of nearby populations to intermarry, leading to genetic similarities, while geographic closeness itself contributes to border conflicts and associated hostilities.

Our results lend support to the significance of all posited factors—economic, technical and geopolitical. But the most striking finding is the strength of geopolitical effects. Our estimates suggest that the reduction in the probability of payment links between geopolitically distant countries is as much as thrice stronger than that for geographically distant

Infrastructure (2024)).

ones. The results are robust to alternative definitions of geopolitical distance, such as military alliances or the specific voting on UN resolution of 2 March 2022, deploring Russia's invasion of Ukraine. Instrumental variable estimates suggest that the effect is causal. The results are in line with the hypotheses that alignment in country-preferences on sensitive features of contractual agreements, along with incentives associated with higher opportunity costs of war emphasized in recent theoretical models, play key roles in the establishment of interlinking arrangements.

Related literature. Our paper is related to the literature on payment economics, which has explored a wide array of issues, such as payment system design, implications for monetary policy, functioning of money markets, and financial stability risks. Some studies have proposed models of the payments system (Freeman (1996), Mills and Nesmith (2008)) and optimal arrangements in the presence of incomplete record-keeping (Kocherlakota and Wallace (1998)) and limited enforcement powers (Kahn and Roberds (2007)). Other papers have focused on real-time gross settlement (RTGS) systems—the systems used for high-value or time-critical transactions that aim to eliminate settlement risk by ensuring that payments are final—focusing on topics such as costs stemming from credit constraints inherent in such systems (Kahn and Roberds (2001)). Others have zoomed in on payment activity and volatility in short-term interest rates (e.g., Furfine (2000)), including the intraday behavior of banks with respect to settlement of interbank claims in RTGS systems (Bech and Garratt (2003)), and how payment system settlement affects bank incentives (Kahn and Roberds (1998)). The scholarly literature on cross-border payment systems is sparse, however, and nearly nonexistent for fast payment systems. This paper seeks to address this gap.

Our work is also related to the literature on the roles of hegemony and dominance in the global economy. Much of this research has focused on global reserve currencies, particularly the dominant role of the US dollar in trade and financial markets (e.g., Rey (2001), Devereux and Shi (2013), Farhi and Maggiori (2018), Gourinchas et al. (2019), Ilzetzki et al. (2019), Gopinath et al. (2020), Gopinath and Stein (2021), Mukhin (2022), Coppola et al. (2023)). More recent studies have shifted towards examining "geoeconomics", i.e., how economic tools and strategies influence global power and geopolitics (e.g., Clayton et al. (2024), Itskhoki and Mukhin (2022), Itskhoki and Mukhin (2023), Broner et al. (2024)), and explored conceptually how major powers act as enforcers to secure payment systems in international markets (e.g., Clayton et al. (2023)). Our related contribution is to test

theories of the effects of geopolitics on fast payment systems across borders, using new and unique data.

Finally, this paper extends existing studies of the impact of geopolitical considerations on trade agreements, such as Martin et al. (2012), Baldwin and Jaimovich (2012), Vicard (2012), Eichengreen et al. (2021), with a distinctive focus on interlinking of payment systems.

Section 2 presents our data and methodology. Section 3 reports the basic results, while Section 4 considers robustness checks. Endogeneity between interlinking of payment systems and geopolitics is examined in Section 5. Section 6 concludes by drawing out policy implications.

2 Data and methodology

2.1 Data construction

Our analysis is based on a newly constructed dataset on payment systems deployed across the globe. For the purposes of this paper, payment systems refer to the rails that allow for the clearing and/or settlement of transactions across different Payment Service Providers (PSPs), be those banks—authorized to maintain customer accounts—or non-banks—which provide payment processing services while relying on customer bank accounts, e.g., digital wallet providers such as Google Pay and Apple Pay, or card network providers such as Mastercard and Visa, among others.[7]

Payment systems can be fully owned and operated by central banks, fully owned and operated by private entities—typically a consortium of banks—, or be positioned somewhere in between. In fact, these models tend to coexist within the same jurisdiction, as each country usually has multiple payment systems: a PSP will choose to participate in one or another (or a multiplicity of them) depending on the product proposition of each, the reachability offered and the pricing scheme. Taking the example of Europe, EBA Clearing—a company owned by 48 of the major European banks—owns and operates RT1 and STEP2, for the processing of instant and non-instant credit transfers in euro. These systems exist together with the Eurosystem's TIPS and T2, among other clearing and settlement mechanisms such

[7]Card networks are not payment systems in themselves. They do provide for a framework and technology that connects consumers, banks, and merchants, ensuring that the necessary information is securely transmitted between the involved parties in a card transaction. However, they do not handle the transfer of funds: it is the involved banks that clear and settle payments via the established payment systems.

as those of DIAS or EquensWorldline. Instead, in India, retail payment systems are owned and operated by the National Payments Corporation of India (NPCI), i.e., an Indian public sector company that was created by initiative of the Reserve Bank of India and the Indian Banks' Association.

Within the remits of their mandate, central banks act as *overseers* of all systemically important payment systems, ensuring the resilience and smooth functioning of financial systems. By also participating in the *offering* of payment systems though, central banks (i) help promote financial inclusion, ensuring that all market participants have access to secure, reliable, and affordable payment mechanisms; and more importantly (ii) provide the infrastructure for settlement in central bank reserves, which helps reduce systemic risk and increases trust between counterparts.[8]

Traditional payment systems operate exclusively domestically, being connected across jurisdictions—for the purpose of clearing and settling cross-border transactions—only through contractual relations between banks. These are the so-called correspondent banking relations, i.e., banks that are connected to different domestic infrastructures agree to provide clearing and settlement services to each other, thus unlocking cross-border payment corridors. In turn, communication and clearing across the involved banks takes place via financial messaging networks such as SWIFT.[9] However, correspondent banking arrangements lead to long chains of intermediaries that result in slow, expensive, and opaque payment transactions for the end-user (Financial Stability Board (2024)). It is in this context that the interlinking of payment systems across borders is being explored: a link between payment systems of two jurisdictions establishes clearing and settlement rails between participants of the respective domestic systems, overall streamlining the payment processing chain end-to-end.[10] And this is especially true if the payment systems involved are fast payment systems,

[8]Clearing and settlement are highly sensitive issues, as they directly affect fund flows, and consequently risk exposure of the parties involved. Specifically, payment clearing refers to the process of reconciling a payment between two parties, while payment settlement refers to the actual debit and credit of funds. At the core of clearing and settlement is the finality of a transaction: participants need to trust that once a payment is cleared and settled, it is irreversible, meaning that no party can back out or reverse the transfer. Central Banks play a key role in increasing the level of trust in the payments ecosystem.

[9]SWIFT (Society for Worldwide Interbank Financial Telecommunication) provides a financial messaging network that enables communication between banks across borders, taking part in the clearing of transactions, but it is not a platform for settlement of funds. Financial institutions need to rely on separate systems to that end.

[10]Depending on the interlinking model used, i.e., on the technical infrastructure behind the link, these rails can be more or less direct, and allow for wider or narrower reachability of the participants on the other end. On top of clearing and settlement services, the interlinking infrastructure may offer added value services such as mechanisms to assist its participants with exchange rate conversion.

which are the focus of this paper.

Specifically, our data collection process is as follows. For each domestic payment system, we gather its name, year of launch, messaging standard used, and payment use cases supported. We also compile data on the total value of domestic real-time transactions, as well as on the share of domestic spending attributable to real-time, paper-based and electronic payments, respectively. Importantly, we collect data on existing cross-border payment links. Based on the BIS CPMI's stylised models for interlinking cross-border payments, we differentiate between bilateral connections—i.e., the existence of a link between two domestic systems, be that through a "single access point" or a fully-fledged "bilateral link"—and multilateral connections—where multiple countries are connected to the same system, in the form of either a "hub and spoke" or a "common platform" model (Committee on Payments and Market Infrastructure (2022)).[11] For each link, the dataset includes information on the go-live year, platforms involved, currencies available to originate payments, and the presence—or absence—of an end-to-end cross-currency settlement capability.[12] Additionally, for each "leg" of the payment link (i.e., for the debtor and creditor platforms involved), we record whether settlement takes place in central bank money and, if so, the specific settlement model used. This allows us to infer details on the end-to-end settlement asset and model indirectly.

We use data from a wide array of sources. We rely to a large extent on announcements by central banks as well as on technical documents published by payment service providers and payment system operators. Dedicated projects, reports and working papers of international organizations such as the World Bank, the Bank for International Settlements, or the International Monetary Fund provide additional sources of information, especially for emerging markets and developing economies. Data on the split of domestic spending across payment types and on the value of domestic real-time transactions is incorporated directly from the latest issue of the *Prime Time for Real-Time* report (ACI Worldwide and GlobalData (2024)). Finally, we extract data from news issued by specialized agencies (e.g., *FinTech Futures*, *PYMNTS*, *The Paypers*, *Fintech News Network*), which have become significantly more detailed and informative in recent years, in line with the rise of interlinking

[11] As of 2024, there exist no links in the model of a "hub and spoke", thus the multilateral connections in our sample refer only to "common platforms".

[12] In what regards to the go-live year of multilateral connections, a country is considered to be linked to the infrastructure in question from the year at which any of its PSPs starts to use it, i.e., irrespective of whether a critical mass of PSPs do.

activity across payment systems. Table C.23 lists all the data sources.

The resulting dataset contains annual dyadic observations at the country-pair level between 2000 and 2024. We have data for 92 domestic fast payment systems and seven regional fast payment systems (used by an additional 61 countries). In terms of cross-border connections, the dataset includes 30 bilateral links and 501 multilateral links. Figure 1 shows the connections in question on a map. Moreover, we have data on other types of payment links, which we use for robustness tests. These include cross-border connections between payment messaging systems, and cross-border clearing and/or settlement arrangements, summing up to 523 connections, which are shown in Figure B.3.

2.2 Stylized facts

Figure 1 puts cross-border fast payment systems connections in 2024 on a map. The figure shows bilateral connections, split between unidirectional and bidirectional (depending on the originating currencies enabled). Moreover, the figure shows multilateral connections, represented as dyads and colored by regional platforms. Figure B.1 provides more detail on multilateral links, specifying the number of countries connected to each regional platform, and depicting their geographical coverage on a map. Europe shares similarities with Africa: both continents saw the creation of regional fast payment platforms that tend to leverage on the existence of economic and/or monetary unions. In contrast, bilateral links are more common in Asia and South America, and they show the projection of well-established domestic fast payment systems such as UPI in India, PIX in Brazil, or PayNow in Singapore.

Figure B.4 provides details on the evolution of cross-border fast payment systems connections over time. This figure points to substantial heterogeneity between countries and across time. Regional fast payment systems took off first in Europe, with EBA Clearing's platform RT1 and Eurosystem's platform TIPS going live in 2017 and 2018, respectively; followed by African regional platforms, including GIMACPAY (of the of the Central African Economic and Monetary Community, launched in 2020), TCIB (of the of the Southern African Development Community, launched in 2021), PAPSS (of the African Union, launched in 2022), and more recently, BUNA (of the Arab Monetary Fund), which went live in 2023. These platforms jointly account for the bulk of the multilateral links in our dataset.[13] In contrast,

[13]Although it only accounts for one dyadic multilateral link in our dataset, we also consider Iberpay's BIZUM as a regional fast payments platform. BIZUM went live in Spain in 2016, and in Andorra in 2023.

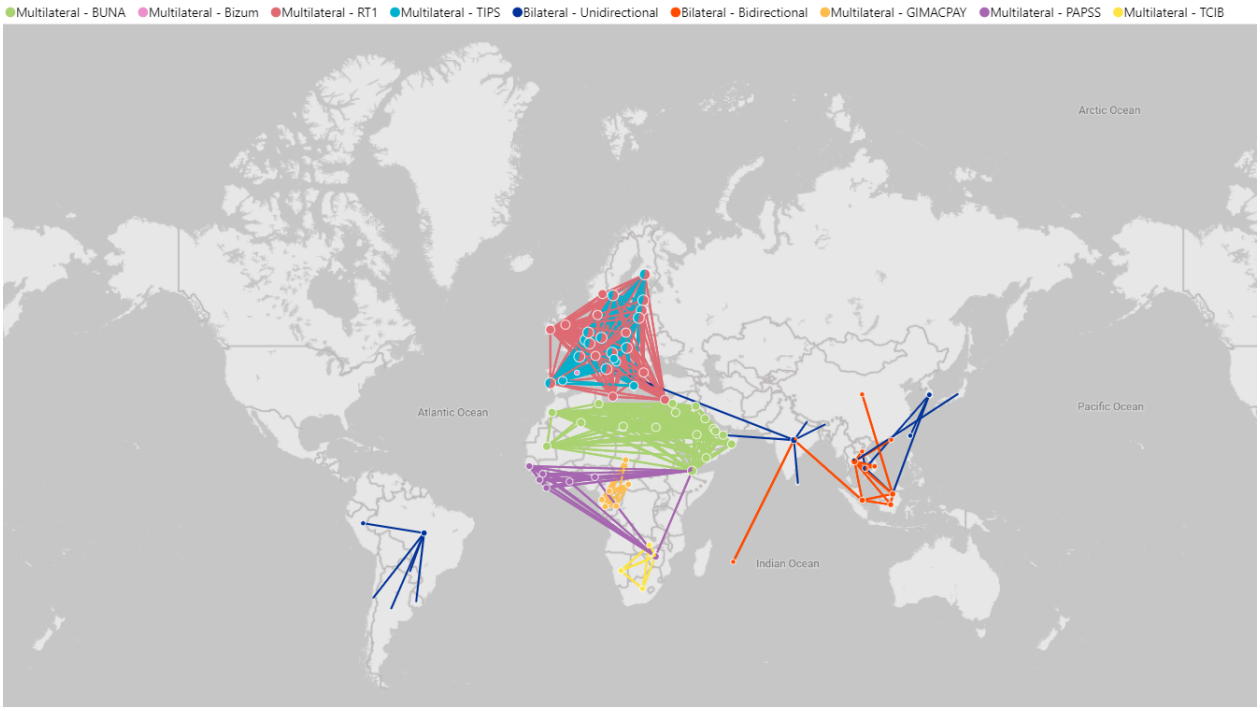


Figure 1: Map of cross-border connections of fast payment systems

Notes: The figure shows cross-border fast payment systems connections as of 2024. It represents dyadic bilateral connections, split between unidirectional and bidirectional (depending on the currencies enabled to originate a payment through the link); as well as multilateral connections, represented as dyads and colored by regional platform.

bilateral interlinking initiatives started to materialize later, in 2018, and they evolve slower than multilateral links. Currently they involve less than 20 countries—mainly in Asia. This disparity is consistent with the different scalability features of each type of link: one technical connection is sufficient for an additional country to become linked to all jurisdictions using a common regional payment system, while bilateral links are instead tailored to each jurisdiction counterpart. Whether this means that it is harder to interlink domestic payment systems bilaterally rather than within a common regional payment platform is one question which this paper provides insight on.

In any case, Figure B.2 shows that central-bank owned/operated fast payment platforms lie at the core of bilateral interlinking. In most cases central banks are directly involved and promote the establishment of such links themselves—either in collaboration with private payment service providers or with other central banks at the other end of the payment corridor. However, in some instances, the wide adoption of a central-bank owned/operated fast payment system domestically provides incentives for private payment service providers to create their own solutions, which extend the use of the system across borders. The surge of such initiatives for Brazil's Pix explains all bilateral links in South America.

Finally, Figure 2 shows that the global fast payment systems space comprises several main clusters. For instance, one cluster is around Europe's regional platforms; another around Africa's regional platforms; a third one around the Arab regional platform BUNA; bilateral links in Asia and Latin America are an additional two clusters, etc. What comes out as a striking feature is that although the links may be dense *within* clusters, there's hardly any links *across* clusters. The global fast payment systems landscape looks therefore fragmented: whether this is for economic, technical or geopolitical reasons is the main question which we will try to answer below.

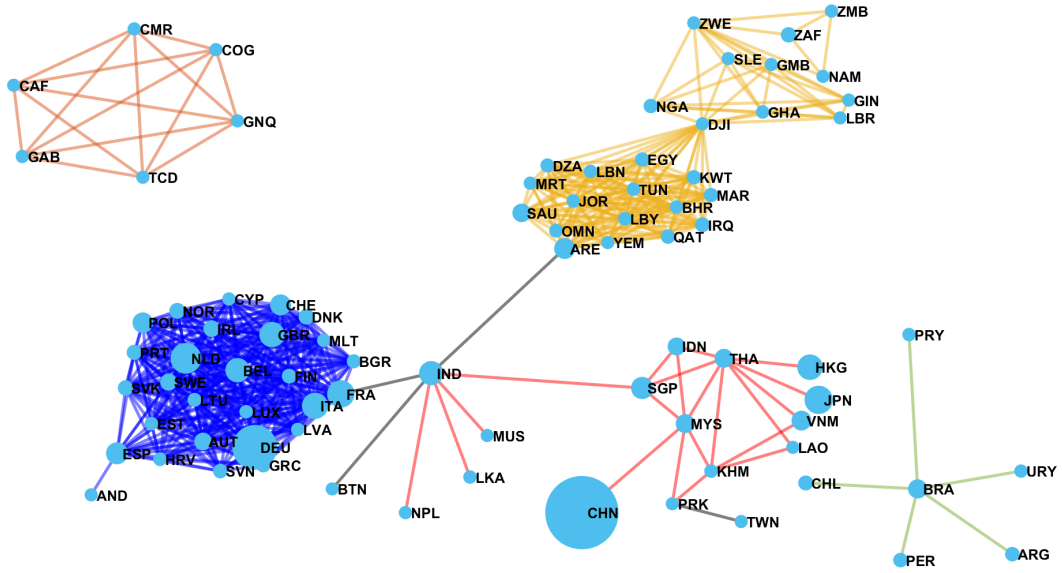


Figure 2: Clustering in cross-border connections of fast payment systems

Notes: The figure shows the network of cross-border fast payment connections as of 2024, which appears fragmented. It includes both bilateral and multilateral links, represented as dyads. Nodes are labeled with ISO 3166-1 alpha-3 country codes, and each cluster of connections is shown with a different color. The size of each node is proportional to the value of trade (imports plus exports) in 2023.

2.3 Empirical framework

Our basic specification follows Baier and Bergstrand (2004), Baldwin and Jaimovich (2012), Vicard (2012) and Eichengreen et al. (2021), and it consists in estimating the probability of existence of a payment link in a particular dyad as:

$$P(y_{i,j,t}|\mathbf{X}) = \frac{1}{1 + e^{-(\beta'\mathbf{X} + \alpha_i + \alpha_j + \lambda_t)}} \tag{1}$$

where i, j, and t are the source-country, destination-country and time dimensions, respectively ($i = j = 1$ ... up to 115k; $t = 2016...2023$); y is a dummy variable which equals

1 if fast payment systems of dyad (i, j) are connected in year t and 0 otherwise; α_i, α_j; and λ_t are vectors of source-country fixed effects, destination-country fixed effects and time fixed effects; and β is the vector of parameters of interest. $\mathbf{X}$ is the vector of controls, which includes dyadic variables from standard gravity models (Head and Mayer (2014)), such as output, trade, and geographical distance, posited to affect the probability of existence of a payment link to the extent that cross-border payments mirror closely patterns in international trade and finance; as well as geopolitics.

One can think of two channels through which geopolitics influences the probability of establishing a payment link. One channel is alignment in preferences on sensitive contractual agreements around payment interlinking arrangements—particularly governance (Committee on Payments and Market Infrastructure (2024), Eichengreen (2024)). Participants must reach contractual agreements on several key aspects surrounding the technical set-up. Among others, these can include selecting licensed foreign-exchange dealers, determining the exchange rates for algorithmic trades, or assigning responsibility for providing liquidity under specified conditions. Counterparts also need to establish a mechanism for dispute resolution and ensure compliance with their respective privacy and data protection laws, as well as designing measures to guard the infrastructure against cyber threats. Furthermore, they must agree on the enforcement of anti-money-laundering regulations and set criteria for the inclusion of central banks over time. Ownership and voting shares, akin to those in SWIFT, also need to be defined. Countries geopolitically close will have similar preferences over such sensitive issues, which increases the odds of successful conclusion of a payment link.

The other channel through which geopolitics influences the probability of establishing a payment link operates via the relationship between trade and international relations (e.g., Martin et al. (2008), Martin et al. (2012), Thoenig (2023)). Insofar as interlinking arrangements make cross-border payment cheaper, faster and safer, they reduce transaction costs and increase bilateral trade volumes and economic welfare. Dyads geopolitically close have therefore an incentive to establish payment links—and, in turn, solidify their security links—to increase the opportunity cost of a war between them, which is directly associated with the loss of trade gains. We proxy geopolitical distance using the ideal point distance measure of Bailey et al. (2017) which is constructed from voting patterns in the United Nations General Assembly—a metric of states preferences over foreign policy used in recent studies (see e.g.,

Gopinath et al. (2024), Aiyar et al. (2024)).

Theory and logic suggest that the net gains from a link between two countries increase as the distance between them declines, which should favorably influence the probability of existence of a link. The closer two nations are, the lower transportation costs are, and the higher trade and payment volumes are. We measure geographical distance as the natural logarithm of the physical distance (in kilometers) between the most populous cities of countries i and j, taken from CEPII's GeoDist data base (Conte et al., 2022).

Economic size and heterogeneity in factor endowments will further affect the probability of observing a link. For instance, Baier and Bergstrand posit that net gains from a bilateral trade agreement increase with the economic size of the two nations in question (i.e., their average real GDPs) because the agreement increases the volume of trade of more varieties of goods. To the extent that payment volumes increase with trade volumes, economic size should also increase the probability of observing a payment link. We measure it as the natural logarithm of the sum of GDP of the two countries within a dyad, taking data on them from the CEPII's GeoDist data base.

3 Basic results

The basic estimates of Equation (1) are reported in Table 1. Standard gravity variables (GDP, trade, geographical distance) and geopolitical distance are entered jointly in column (1), while each variable is considered individually in columns (2) to (5). The estimates control for source-country, destination-country and time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. All variables are standardized to facilitate comparison of the estimated coefficients.

The results are consistent with theory in that the probability of interlinking fast payment systems between two countries increases with their economic size and bilateral trade volume. Also consistent with theoretical priors, interlinking is less likely between countries that are geographically distant—because transportation costs are larger for distant nations, which reduces their trade and payment volumes. Importantly, geopolitical distance significantly decreases the probability of interlinking, even after controlling for standard gravity covariates and various fixed effects (see columns 1 and 5). More remarkable still is the fact that the effect of geopolitical distance is more than four times stronger than that of geographical

distance. Specifically, a one-standard deviation increase in geopolitical distance from the sample average reduces the probability of observing a payment link by about 2.8%, against about 0.5% for the same increase in geographical distance. In our sample, only about 1% of dyads have a connection between their payment systems, while the predicted *conditional* probability of the model is around 12%. A one-standard-deviation increase in geopolitical distance would reduce this probability by approximately one-fourth.

Table 1: Baseline estimates - All connections

	(1) All	(2) GDP	(3) Trade	(4) Geographical distance	(5) Geopolitical distance
GDP	36.844***	29.325***			
	(2.818)	(2.441)			
Trade	0.854***		3.338***		
	(0.166)		(0.222)		
Geographical distance	-0.631***			-1.612***	
	(0.102)			(0.072)	
Geopolitical distance	-2.763***				-2.637***
	(0.172)				(0.110)
Year FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Observations	18,939	25,875	24,301	27,189	20,568
Log-likelihood	-1505	-3986	-4101	-3934	-2445
Avg. probability	12.26	11.07	11.70	10.54	11.35
ROC	0.978	0.909	0.920	0.939	0.957

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023. Standard gravity variables (GDP, trade, geographical distance) and geopolitical distance are entered jointly in column (1), while each variable is considered individually in columns (2) to (5). The estimates control for source country, destination country, and time fixed effects. We report in parentheses standard errors clustered at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.2 shows that our results are robust to splitting the sample between bilateral links (in columns 1 to 5) and multilateral links (in columns 6 to 10). That is, the model comes to predict the probability of observing a *multilateral* or a *bilateral* payment link in a given dyad, respectively, instead of the probability of observing *any* payment link. Controlling for the standard gravity covariates, the effect of geopolitical distance is as much as seven times stronger than that of geographical distance when only multilateral links are considered (see column 6). Despite preserving its role, the estimator becomes less efficient when only bilateral connections are considered, as the sample size decreases from almost 19,000 observations to only about 480.

Figure 3 provides more details on the economic magnitude of the effects identified. The figure shows marginal effects of a one-standard deviation increase in geopolitical and geo-

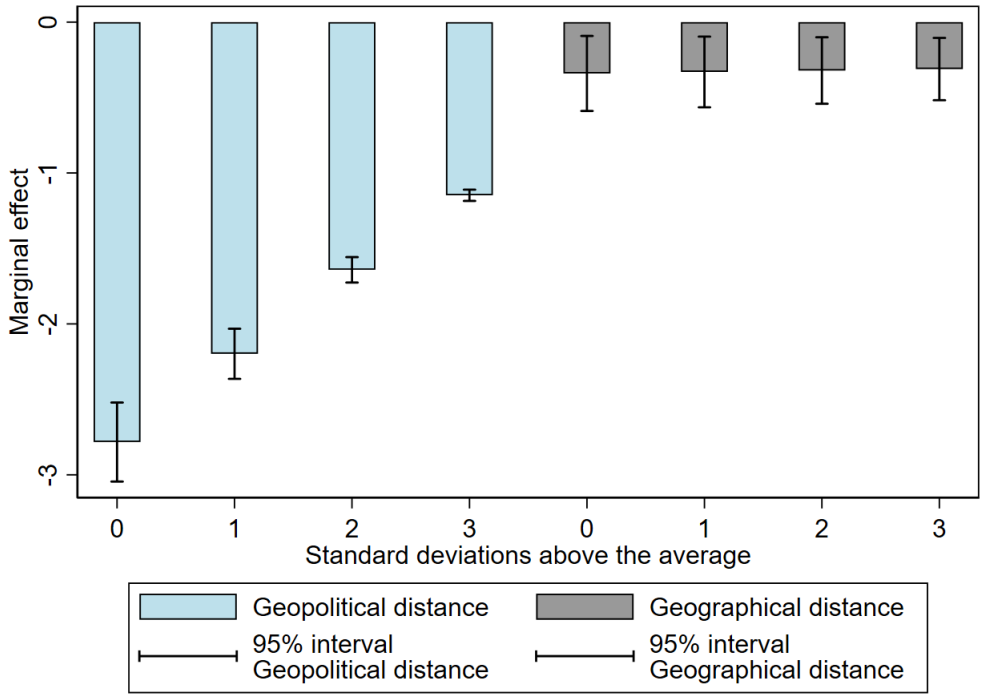


Figure 3: Marginal effect of geopolitical and geographical distance

Notes: The figure shows marginal effects of a one-standard deviation increase in geopolitical and geographical distance, respectively. Changes are computed using the basic estimates of column (1) in Equation (1). The marginal effects are computed for different initial levels, i.e. from the sample average (0) up to 3 standard deviations above it. All the other variables are kept at their respective sample means. Black whiskers show 95% confidence intervals.

graphical distance, respectively. Changes are computed using the basic estimates of column (1) of Equation (1), and for different initial levels of the variables, i.e. from their sample average (0) up to 3 standard deviations above it. All the other variables are kept at their respective sample means. Black whiskers show 95% confidence intervals. The figure makes clear that the effect of geopolitical distance is much (2-3 times) stronger than that of geographical distance. But it also shows that geopolitical distance has marginally decreasing effects. A unit increase in geopolitical distance reduces the probability of establishing an interlinking arrangement much more for two countries that are geopolitically close, like France and Italy, than for two other countries that are geopolitically more distant, like Israel and Iran. Results are similar if we use estimates with year fixed effects only, as Figure B.5 shows.[14]

We can assess the predictive power of our model using the Receiver Operating Characteristic (ROC) Analysis. In doing so, we consider a range of alternative probability cut-offs;

[14]The model with year fixed effects only controls for multilateral resistance with an additional gravity covariate, i.e., remoteness. See Section 4.

dyads for which our basic probability estimate is above the cut-off in question are classified as having a link, while dyads for which the estimate is below the respective cut-off are classified as having no link. For every possible cut-off, there are dyads with a link correctly classified as having one (true positives); dyads with a link incorrectly classified as having none (false negatives); dyads without a link correctly classified as having none (true negatives); and dyads without a link incorrectly classified as having one (false positives). Figure 4 shows the ROC curve of our basic model estimates (reported in column (1) of Table 1) on post-2020 data: it plots the true positive rate (the fraction of observed positive outcomes correctly classified) against the false positive rate (the fraction of observed positive outcomes incorrectly classified) corresponding to each cut-off. Models with no predictive power lie along the 45-degree line, where true positives and false positives are equally likely. Instead, models with perfect predictive power have a ROC curve that passes through the upper left corner of the figure. That our basic model's ROC curve is close to the upper left corner testifies to its predictive accuracy.

Another diagnostic computes the area under the ROC curve, also known as AUROC. This area can be interpreted as the probability that our model ranks a random positive observation (i.e., a dyad with a payment link) more highly—in terms of probability of observing a link— than a random negative observation (i.e., a dyad without a payment link). Models with no predictive power have an AUROC equal to 0.5, against 1 for models with perfect predictive power. The AUROC of our model is 0.98, thus we easily reject the null hypothesis that the AUROC equals 0.5.[15] Similar results apply if we use model estimates with year effects only, as Figure B.7 shows.

The baseline model can be extended to estimate the effect of an increase in geopolitical distance between two countries over time, following Jordà (2023) and Ferrari Minesso et al. (2022).[16] Figure B.8 shows that the resulting effects are persistent and stronger over time. A one standard deviation increase in geopolitical distance between two countries reduces the probability of establishment of a payment link by 3.5 percentage points three years after the shock, i.e., 25% larger than the contemporaneous effect. Results are robust when excluding

[15]The AUROC is computed on post-2020 data, when fast payment system began to interconnect outside the euro area. Admittedly, the presence of a large number of "true negatives" helps the model correctly predict the outcomes for different thresholds and increases the AUROC statistic.

[16]The methodology is the same as that used to estimate recession probability models: the left-hand side variable is forwarded k periods to project control variables today to future probabilities, i.e., the estimated equation becomes $P(y_{i,j,t+k}|\mathbf{X}) = \frac{1}{1+e^{-(\beta'\mathbf{X}+\alpha_i+\alpha_j+\lambda_t)}}$. Marginal effects define the impact of a unitary increase in variable x in period t on the probability of a connection existing in period $t+k$.

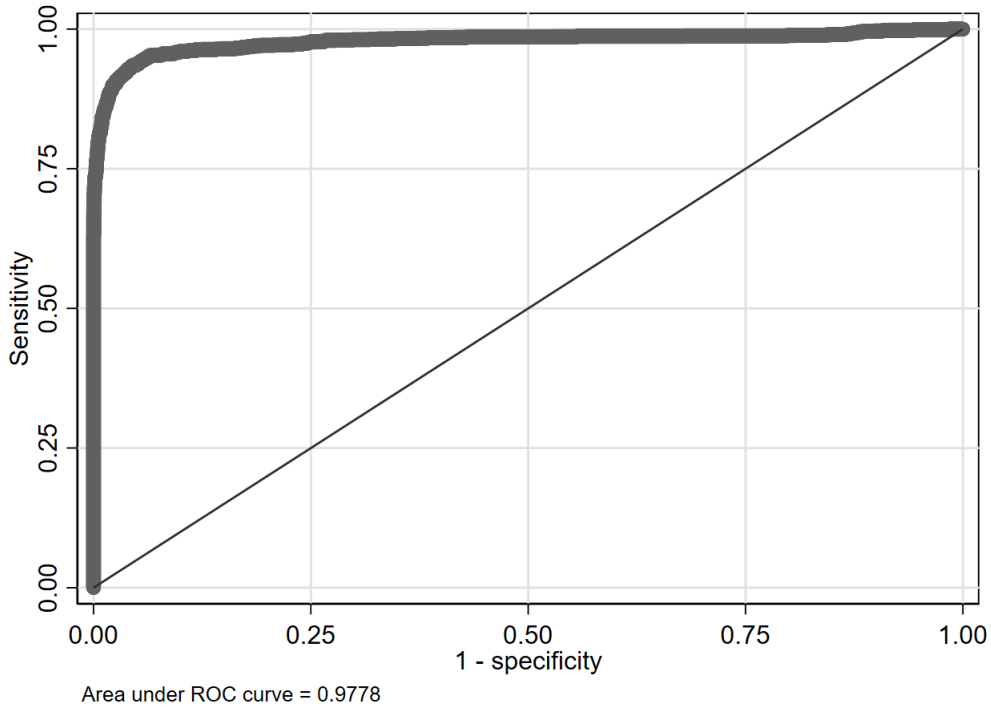


Figure 4: Receiver Operating Characteristic (ROC) analysis

Notes: The figure shows the ROC curve of our basic model estimates (reported in column (1) of Table 1) on post-2020 data; it plots the true positive rate (sensitivity) against the false positive rate (1 minus specificity) corresponding to each probability cut-off. Models with no predictive power lay along the 45-degree line, while models with perfect predictive power have a ROC curve that passes through the upper left corner. The figure also reports the area under the ROC curve (AUROC), which can be interpreted as the probability that our model ranks a random positive observation (i.e., a dyad with a link) more highly than a random negative observation (i.e., a dyad without a link).

origin and destination fixed effects, as shown in Figure B.9.

4 Robustness

We subject our findings to a range of robustness tests and extensions. Source and destination fixed effects are beneficial for absorbing substantial unobserved heterogeneity. They pick up "multilateral resistance", the prediction from theory that bilateral trade and payments depend on relative barriers, i.e., bilateral barriers relative to average barriers (or multilateral resistance) faced by both source and destination countries (see e.g., Anderson and Van Wincoop (2003) and Okawa and Van Wincoop (2012)).[17] However, in panels with sparse observations—where many dyads are never connected—source and destination fixed effects often perfectly predict the outcome variable, resulting in the exclusion of many ob-

[17]Intuitively, the more resistant to trade with all others a region is, the more it is pushed to trade with a given bilateral partner.

servations from the estimation. An alternative way to control for multilateral resistance is to include remoteness—a variable related to distance from all *alternative* bilateral partners (see the discussion in Anderson and Van Wincoop (2003), Martin et al. (2012)). For a given dyad (i, j) we compute remoteness as the average of distance between (i) country i and countries other than country j and (ii) country j and countries other than country i. As Baier and Bergstrand (2004) put it, the net gains from a bilateral link between two countries should increase when they are more remote from the rest of the world. Countries that are remote from the rest of the world face higher transport costs, lowering trade and payment volumes, other things equal. Table C.3 presents estimates for the full sample, controlling for year fixed effects and remoteness instead of source and destination fixed effects. Sample size increases considerably (from almost 19,000 to over 115,000 observations). The magnitude of the estimated coefficients changes relative to the basic estimates of Table 1, but not their sign nor their level of statistical significance. Importantly, the effect of geopolitical distance remains larger than that of geographical distance (see column 1). And splitting bilateral links from multilateral links, as in Table C.4, yields similar results—the effect of geopolitical distance still appears larger than that of geographical distance (see columns 1 and 7).

Standard errors in our basic estimates might be underestimated if the residuals are correlated across two dimensions, such as source and destination countries. To capture such multi-dimensional dependencies, we obtain estimates on the full sample with standard errors robust to two-way clustering. Cameron et al. (2011) show that controlling for multi-way clustering is important when using dyadic data, since failure to do so can lead to underestimated standard errors and over-rejection of the null of statistical insignificance. We cluster standard errors by both source and destination country. The results, reported in Table C.5 and Table C.6, are robust.

We also check for outliers that could be driving full sample estimates: Figure B.10 shows the estimated coefficients from the basic estimates of column (1) of Table C.3 when we exclude one connected dyad at a time. Each estimate is shown as a black dot, 95% confidence intervals are shown as shaded areas and the full sample estimates are shown as black lines. The estimated coefficients are robust whichever dyad we exclude. Results with year only fixed effects are also robust to this test (see Figure B.11).

Skeptics could further argue that the high density of fast payments system links in Europe is driving our results. European countries are connected via TIPS more or less since

the end of 2018, and they have relatively high UN voting cohesion. Table C.10 show the estimates of the baseline model excluding euro area countries from the sample. The role of geopolitical distance appears, if anything, even stronger.

Previous studies have found that other dyadic covariates typically used in gravity models such as having a common legal system, a colonial relationship or a common language influence both bilateral trade patterns and the probability of trade agreements. These variables capture transaction costs or information asymmetries that affect trade and financial relations; they are sometimes described as capturing "familiarity" or "connectivity" and conceivably can influence also the probability of establishment of a payment link. In Table 2 we report baseline model estimates controlling for these additional covariates (in columns 1 and 2).[18] We also report estimates controlling for remittances (in column 3) and measures of the underlying payment technology—which capture the technical ease with which a payment link can be established. Such measures include whether the countries use the same financial messaging standard, whether they use the specific ISO 20022 standard, and the volume of real-time domestic settlements in 2023 (jointly introduced in column 4).[19] Results stress the need to adopt international standards as a prerequisite for cross-border payments integration: using the same messaging system as a counterpart country has a positive impact on interlinking your fast payment systems, but the effect of ISO 20022 adoption by at least one of the countries involved is around 4 times larger in magnitude. Across all tests,

[18] We take data on them from CEPII's GeoDist data base.

[19] Fast payment systems can differ in a number of features, e.g., transaction limits, pricing scheme, use cases enabled for end-users, participation criteria, etc. However, only *one of these factors* supposes a real showstopper when it comes to technically setting up an interoperability or interlinking arrangement: the two systems must be able to exchange payment messages, i.e., they must either use the same messaging system or set up a translation mechanism that enables one system to process the messages sent by the other, and vice versa. It is precisely for this reason that the design and adhesion to international standards such as ISO 20022 plays a crucial role to ease interlinking. This shows in Table 2. *Another set of factors* includes features that might impose minor technical adaptations to the systems involved, but without necessarily preventing the technical establishment of a link when not harmonised. An example within this category are transaction limits. These usually stem from AML/CFT requirements in each jurisdiction, which are an essential consideration when deciding how to and whether to interlink, but from a legal—rather than a purely technical—perspective. Technically, that two payment systems have different transaction limits may simply entail the introduction of a check on the amount to be transferred before initiating a transaction, which is not a major change in the infrastructure. Finally, there is a *last set of factors* which do not force even minor technical changes to the systems involved. This is the case, for example, of differences in participation criteria, or pricing schemes, which entail changes only in the respective contracts between participants and payment system providers. Another example are differences in the offered payment initiation mechanisms, use cases, or additional services. The counterparts can always agree to not offer these in the context of the link, as such features are essentially independent from—or do not strictly interact with—settlement functionalities. In any case, to account for delays and small hurdles that the *last two sets of factors* may introduce in the negotiations, we control for differences in legal systems, as well as for the domestic take-up of Real-Time payments in Table 2.

our main finding that geopolitical distance influences the probability of conclusion of a link significantly more than geographical distance remains robust. This is also the case if we control for year fixed effects only, as in Table C.7.

Table 2: Estimates with additional controls - All connections

	(1) Legal system	(2) Colonial & language	(3) Remittances	(4) Technical features
GDP	36.844***	36.677***	88.207***	39.222***
	(2.818)	(2.826)	(21.984)	(3.073)
Trade	0.854***	0.744***	7.205***	0.970***
	(0.166)	(0.171)	(1.891)	(0.174)
Geographical distance	-0.631***	-0.584***	0.390	-0.404***
	(0.102)	(0.103)	(0.464)	(0.096)
Geopolitical distance	-2.763***	-2.762***	-4.297***	-2.422***
	(0.172)	(0.179)	(1.048)	(0.188))
Legal system (o)	-5.350***			
	(0.795)			
Legal system (d)	-1.629***			
	(0.544)			
Former colony		0.586+		
		(0.423)		
Common language		0.793***		
		(0.304)		
Remittances			0.826*	
			(0.493)	
Common messaging system				1.173***
				(0.328)
ISO20022 standard				5.055***
				(0.534)
RTS volumes (2023)				-0.186***
				(0.068)
Year FE	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y
Observations	18,939	18,939	961	18,939
Log-likelihood	-1505	-1496	-89.16	-1255
Avg. probability	12.26	12.26	42.25	12.26
ROC	0.978	0.979	0.992	0.986

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023, using standard gravity variables, geopolitical distance, additional controls and technical features. The estimates control for source country, destination country and time fixed effects. Equation (1) is augmented by controlling for legal systems, historical linkages, remittances, payment systems technical features and excluding the euro area. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

Our findings could also hinge on the fact that we focus on *fast* payment systems, and results could be different when considering other types of payment systems. In Table C.9 we obtain estimates on an extended sample, including both fast and slow payment systems connections and controlling (i) for the full set of fixed effects in the upper panel, and (ii) only year fixed effects in the lower panel. The negative, significant and strong effect of

geopolitical distance remains robust on this extended sample.

Finally, it could also be argued that our findings depend on one particular definition of geopolitical distance—i.e., the ideal point distance measure of Bailey et al. (2017). In Table C.11 we use military alliances as an alternative measure of geopolitical proximity (the opposite of geopolitical distance), defined here as the weighted *pi*-score computed with data from the Alliance Treaty Obligations and Provisions (ATOP) project (see Chiba et al. (2015)). Countries more geopolitically distant have a lower *pi*-score. The effect of geopolitical proximity remains stronger than that of geographical distance, including if we split the estimates into bilateral and multilateral links only, as in Table C.12. The same holds if we use *kappa*-scores instead (see Table C.14 and Table C.15, respectively). We also find similar results if we use another measure of geopolitical proximity, namely a dummy variable which equals 1 if two countries in a dyad voted similarly on the UN's Resolution ES-11/1 of 2 March 2022, which deplored Russia's invasion of Ukraine, demanded full withdrawal of Russian forces and reversal of its decision to recognize the self-declared People's Republics of Donetsk and Luhansk (see Table C.17 and Table C.18).[20]

5 Endogeneity

Interlinking and geopolitics are endogenous since existing interlinking arrangements can be weaponized to support foreign policy goals.[21] We address endogeneity using an instrumental variable for geopolitical distance: genetic distance, i.e., the difference in gene distributions between two populations, where the genes under consideration change randomly and independently of selection pressure. Genetic distance reflects the time since two populations shared a common ancestor, meaning they were a single population.[22]

[20] In additional robustness checks, we considered the count of weapon trade- contracts within a dyad as yet another measure of geopolitical proximity, taking data from the Stockholm International Peace Research Institute's Arms Transfers Database. The corresponding estimated coefficient was not statistically significant. But whether this was due to the fact that the effect is insignificant is unclear, as we lost 80% of the sample owing to limited availability of data on the number of weapon trade-contracts.

[21] For instance, in the model of Clayton et al. (2023), a hegemon maximizes global enforcement by coordinating punishments across strategic sectors—i.e., those that supply valuable inputs which are not easily substitutable because of (i) physical scarcity, like rare earths or oil and gas, or (ii) economies of scale and natural monopolies, such as dollar-based payment systems (e.g., SWIFT)—allowing the hegemon to use them as tools in geoeconomic threats.

[22] Divergence in neutral genes offers insights into lineage, making genetic distance a valuable measure of overall relatedness between populations. For example, the genetic distance between Pakistan and India is 0.036, while between Argentina and Sweden it is 0.097, reflecting the greater genetic differences between the two populations.

Since genetic distance is random and predetermined, it satisfies the exclusion restriction for a valid instrument. It is also a relevant one: Spolaore and Wacziarg (2016) provide evidence that states whose populations are more closely related genetically are significantly more likely to engage in international conflict with each other. They point to two connected mechanisms that operate through the effects of relatedness on preferences over rival goods and government policies, respectively. The first mechanism is that more closely related populations tend to have more similar preferences over rival goods, such as natural endowments or historic sites, and are thus more likely to fight over them. This increases the likelihood of international conflict between related populations over the control of territories and resources. The other mechanism is that more closely related populations tend to have similar preferences. As a result, governments have stronger incentives to engage in conflicts over territories inhabited by similar populations as that of their homeland, because ex-post they bear lower political costs and face a lower probability of internal conflict and rebellion. Importantly, Spolaore and Wacziarg show that the effect of genetic distance on conflicts remains robust even after accounting for various measures of geographic proximity and other factors influencing conflict. This suggests that the relationship does not simply stem from the tendency of nearby populations to intermarry, leading to genetic similarities, while geographic closeness itself contributes to border conflicts and associated hostilities.

We take data on genetic distance from Spolaore and Wacziarg (2016) who provide a summary measure at the dyadic level of differences in allele frequencies across a range of neutral genes. As above-mentioned, this measure captures the length of time since two populations became separated from each other. When two populations diverge, random genetic mutations lead to genetic differentiation over time so that the longer the separation, the greater the genetic distance observed in a set of neutral genes.

Second-stage regression results are shown in Table C.16, which provides cross-sectional logit estimates of Equation (1) on the full sample (column 1), a sample restricted to bilateral links (column 2) and to multilateral links (column 3) over the period 2016-2023. Standard gravity variables are included together in the regression, along with geopolitical distance, which is instrumented using genetic distance and the other exogenous covariates. The estimates suggest that causality flows from geopolitics to the probability of interlinking, and *not* in the other direction. The estimated coefficient on geopolitical distance remains negative, statistically significant and larger in absolute value than that obtained with the

basic estimates. The F-statistic of the first-stage regression reported in the bottom row of Table C.16 is a whopping 480, which testifies to the significantly strong power of genetic distance as an instrument.

Skeptics could argue that some of the covariates included in the first-stage regression along with genetic distance are endogenous to geopolitical distance. For instance Martin et al. (2008) discuss endogeneity of war and trade, while Spolaore and Wacziarg (2016) show that geographical distance is correlated with conflicts. We also run the IV analysis excluding those covariates from the first-stage regression (see Table C.8). Results remain robust.

Table 3: IV estimates of second-stage regression - cross-sectional, year fixed effects only

	All connections	Bilateral connections	Multilateral connections
GDP	7.492***	2.556+	7.671***
	(0.644)	(1.689)	(0.735)
Trade	0.858***	4.016***	0.768***
	(0.159)	(0.807)	(0.164)
Remoteness	-9.656***	-2.914+	-10.497***
	(0.760)	(2.203)	(0.863)
Geographical distance	5.305***	2.324+	5.587***
	(0.521)	(1.606)	(0.589)
Geopolitical distance	-23.263***	-10.767*	-23.984***
	(1.945)	(5.713)	(2.204)
Year FE	Y	Y	Y
Origin FE	N	N	N
Destination FE	N	N	N
Observations	11,923	11,923	11,923
Log-likelihood	-1150	-83.20	-1079
Avg. probability	4.126	0.193	3.934
ROC	0.947	0.835	0.946
F-stat (first-stage reg.)	486.6	486.6	486.6

Notes: The table reports cross-sectional logit estimates of Equation (1) on the full sample (column 1), a sample restricted to bilateral links (column 2) and to multilateral links (column 3). Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical distance are entered jointly. Geopolitical distance is instrumented with the genetic distance measure of Spolaore and Wacziarg (2016), which is available for the cross-section of the dyadic sample. The F-statistic of the first-stage regression is reported in the bottom row of the table. ***p<0.01, **p<0.05, *p<0.1.

One could further argue that there might be an issue of reverse causality from payment links to geopolitics following the establishment of the payment link in question. This can lead to underestimate the corresponding coefficient: establishing payment links could boost

future trade, which is likely to reduce the probability of future conflicts. Under this light, we compare geopolitical distance across country pairs or time before the payment links are actually established, using the methodology proposed by Martin et al. (2012). Specifically, in the cross-section dimension, we estimate equation Equation (1) in year $t = 2023$ for dyads where a payment link does not exist in 2023. For dyads where a payment link exists in 2023, the right-hand-side variables are set to their values one year before the link was established. For instance, in the case of France and Italy, which connected in 2019, these variables reflect their 2018 values. The results, reported in Table C.19, confirm that causality flows from geopolitics to interlinking. The estimated coefficient on geopolitical distance remains negative, statistically significant and larger than that on geographical distance. We obtain similar results when we distinguish bilateral links from multilateral links (see Table C.20). All in all, the results are in line with the hypothesis that alignment in country-preferences on sensitive features of contractual agreements, along with incentives associated with higher opportunity costs of war emphasized in recent theoretical models, play key roles in the establishment of payment interlinking arrangements.

6 Conclusion

This paper has investigated the global influence of economic, technical, and geopolitical factors on fast payment system links, showing that geopolitical factors more significantly affect interlinking probability than geographic distance, with causal evidence. Our estimates indicate that the reduction in the probability of establishing payment links between geopolitically distant countries is up to three times greater than between geographically distant ones. These results support the hypotheses that alignment in country preferences on sensitive contractual features, alongside incentives related to higher opportunity costs of war emphasized in recent models, play crucial roles in forming interlinking arrangements.

These findings have policy implications, emphasizing the importance of multilateral initiatives like the *G20 Roadmap for Enhancing Cross-Board Payments* adopted in 2020. They stress the importance of not only reducing technical barriers that cause costly, slow, and opaque cross-border payments but also addressing potential geopolitical frictions through international cooperation to prevent division along geopolitical lines.

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Appendix

A Data limitations and sources

One challenge confronting collection of data on the cross-border interlinking of payment systems lies in spelling out the concrete definitions used, for both "payment systems" and "cross-border links". As referred to in Section 2, this paper defines payment systems as the rails that allow for the *clearing* and/or *settlement* of payments across *any* two *different* Payment Service Providers (PSPs). Additionally, the BIS CPMI's stylised models for interlinking cross-border payments serve as our basis to differentiate between bilateral and multilateral connections (refer to Section 2 and Committee on Payments and Market Infrastructure (2022)). Aside from fast payment systems, we also gather data on non-fast clearing and/or settlement systems, albeit the following are worth stressing:

i. We do not include connections to SWIFT because country-level participation cannot be tracked over time based on publicly available sources. Only the latest list of connected countries is published, namely 204 countries as of 2024. SWIFT was founded in 1973 and, in 1999 (just before the start of our data set), it already included 189 (undisclosed) participating countries. Limited information can be inferred from news on sanctioned countries—namely Iran, Russia, and Belarus—as shown in Table C.21.

ii. We include partial data on the Russian System for Transfer of Financial Messages (SPFS), as the full list of participants is not public. The Head of the Department of the National Payment System at the Bank of Russia announced on 15 March 2024 that "more than 160 foreign participants from 20 countries are connected to this system". However, these countries are undisclosed: our dataset records only 9 countries connected via SPFS, relying on the last official record from the 2020 National Payment System Oversight Results published by the Bank of Russia. Namely, these are Belarus, Germany, Switzerland, Armenia, Kazakhstan, Cuba, Moldova, Kyrgyzstan, and Tajikistan, all considered to be connected as of 2020.

iii. We do not include data for the Chinese Cross-border Interbank Payment System (CIPS), given that—similar to SWIFT—the evolution of participation cannot be tracked at the country level over time. It is worth mentioning that, unlike SWIFT or

SPFS, CIPS not only participates in the clearing of payments across borders but it also provides settlement services. Table C.22 reports the list of countries with at least one direct participant in CIPS as of the end of 2024.

iv. Bilateral cross-border payments connections include any kind of interoperability arrangement between domestic payment infrastructures. These range from fully-fledged technical links—such as the one between Singapore's PayNow and India's UPI—to QR code interoperability mechanisms. The presence of clearing banks abroad is also included in the dataset, as a non-fast bilateral payment connection. There are only two cases in which a bilateral payment connection is not recorded as such: correspondent banking arrangements, and connections for which the country of origin and/or destination of the transactions are not directly observable.[23]

Table C.23 provides detailed information on the sources of the data used.

[23]Because we have country-level observations, we only record connections where origin and destination are observable. This implies, for example, that arrangements such as that in Australia are disregarded. Namely, the New Payments Platform—the national fast payment system of Australia—started processing incoming cross-currency one-leg-out transactions in 2024, through the partnership of the Commonwealth Bank of Australia with the Bank of New York, and that of the Australia and New Zealand Bank with BNP Paribas. However, the origin of the transactions processed via this link is not disclosed, and could be any of the multiple markets that the Bank of New York and BNP Paribas operate.

B Additional figures

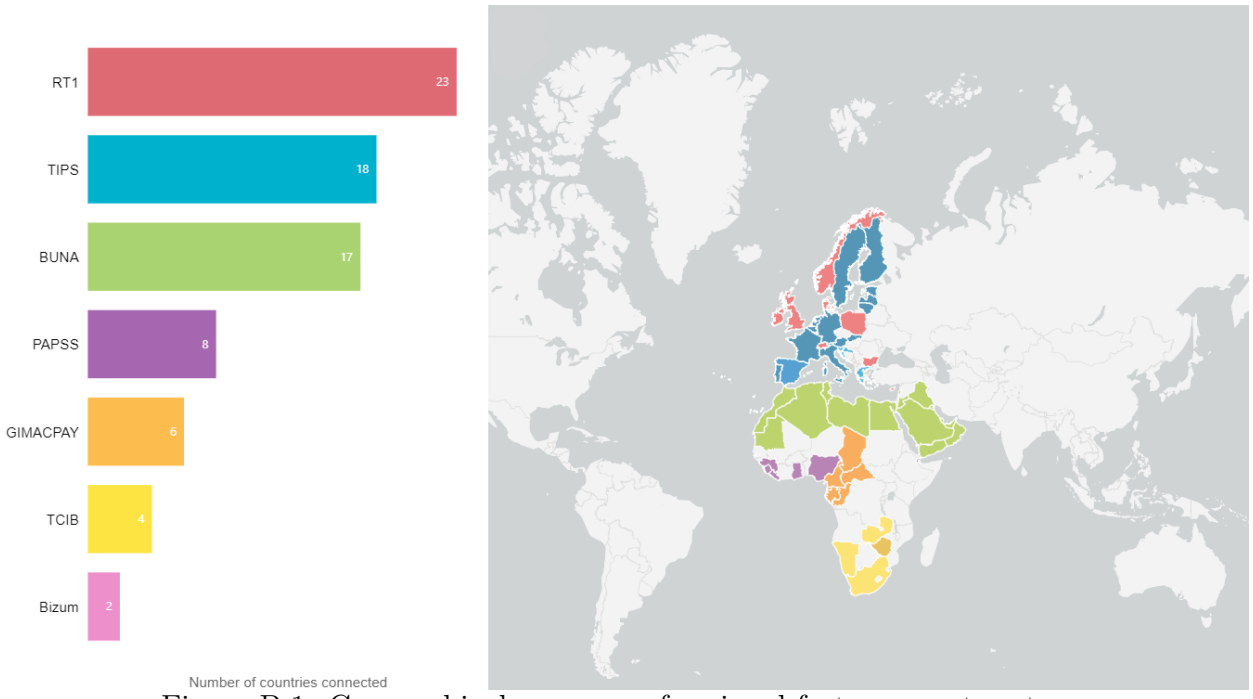


Figure B.1: Geographical coverage of regional fast payment systems

Notes: The figure provides detail on the geographical coverage of regional fast payment systems as of 2024. The left chart specifies the number of countries connected to each platform, while the right chart maps their geographical coverage. Throughout our analysis, country dyads that are connected to the same regional system are considered to have a multilateral link.

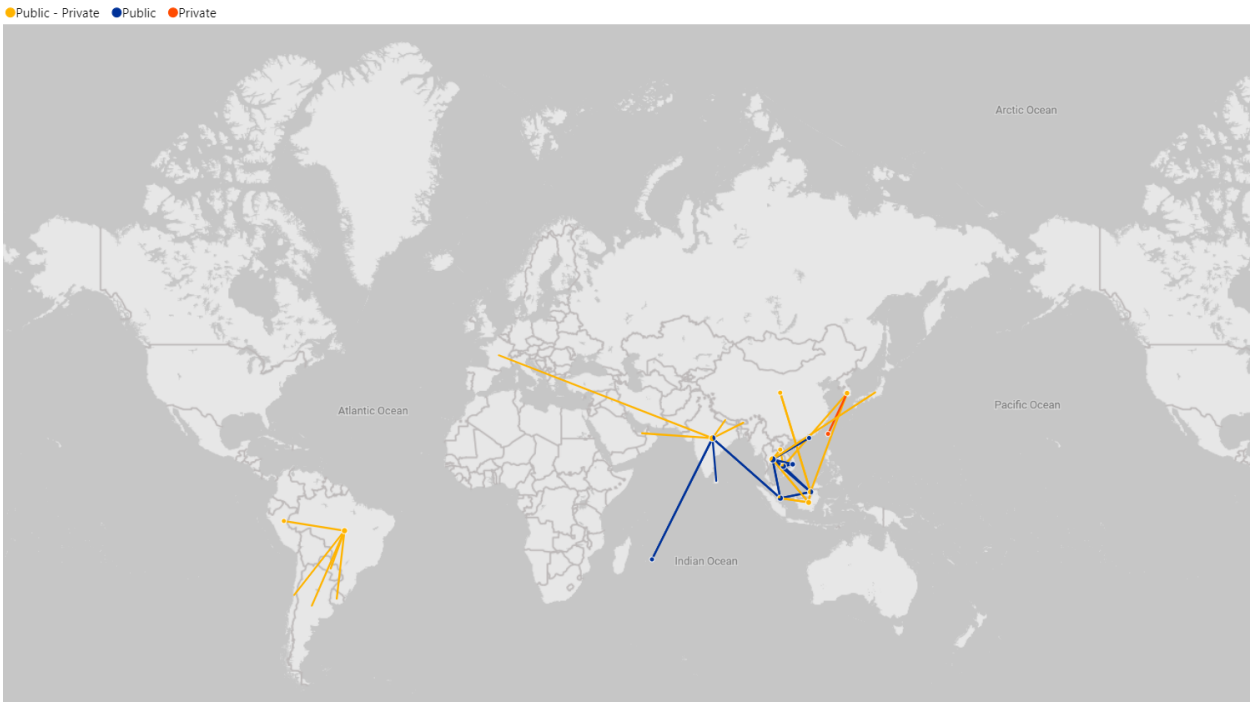


Figure B.2: Map of bilateral cross-border fast payment connections, by actor

Notes: The figure shows existing bilateral cross-border fast payment connections as of 2024. They are colored by the type of actor that orchestrates the end-to-end payment flow, so that those links involving central-bank owned/operated platforms on both ends are referred to as "Public" and colored in blue; those that involve a private Payment Service Provider on one end, and a central-bank owned/operated platform on the other are referred to as "Public - Private" and colored in yellow; and those that involve only private Payment Service Providers are referred to as "Private" and colored in orange.

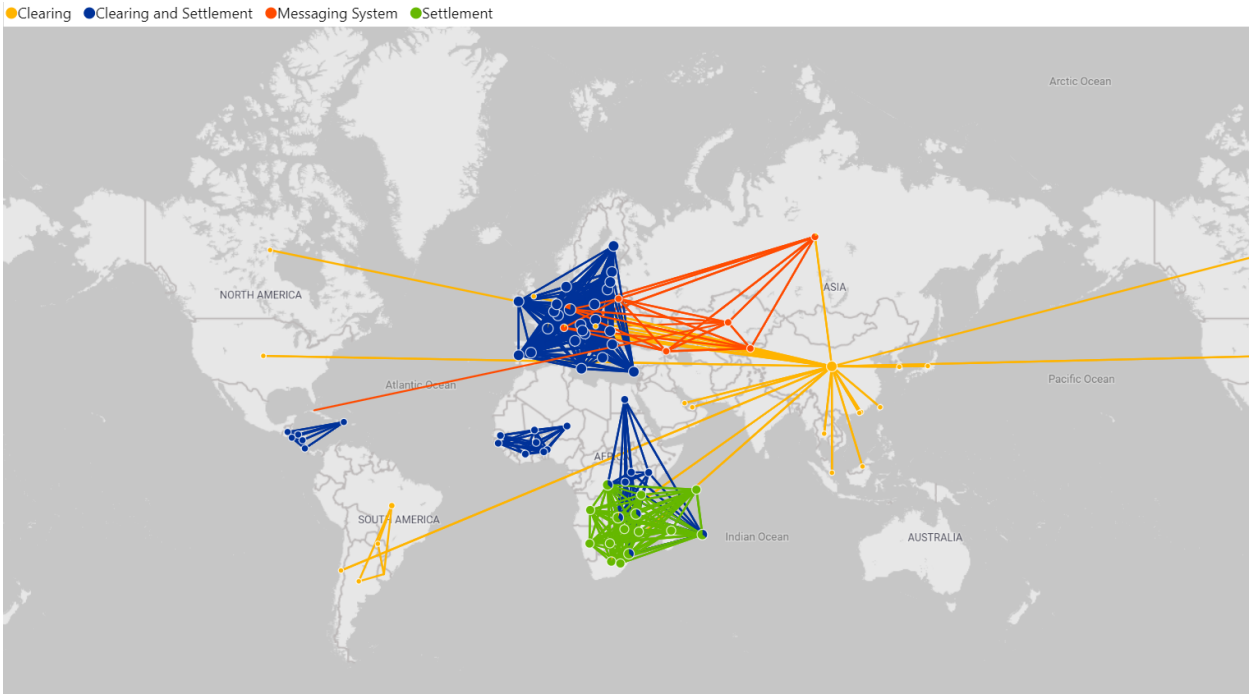


Figure B.3: Map of other cross-border payment connections

Notes: The figure represents payment connections other than fast payment connections as of 2024. It includes both bilateral links—i.e., links between two domestic payment infrastructures—and multilateral links—where multiple countries use the same regional payment infrastructure. All connections are represented as dyads and colored by type, namely differentiating across connections between payment messaging systems, and cross-border clearing and/or settlement arrangements.

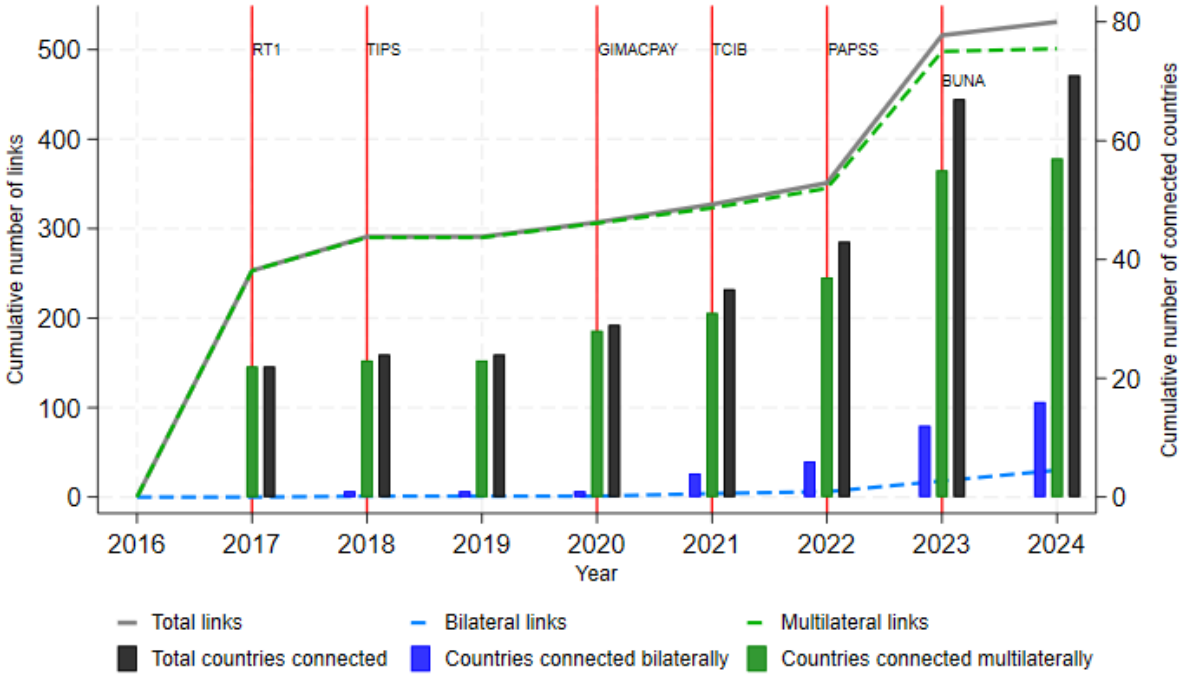


Figure B.4: Evolution of cross-border fast payment connections

Notes: The figure shows the cumulative number of cross-border fast payment connections from 2016 to 2024. The line graph (depicted on the primary y-axis) represents the yearly evolution of the cumulative number of dyadic links across countries, while the barplots (on the secondary y-axis) illustrate the number of countries connected each year. Both data series depict total values—in gray and black, respectively—as well as a split by connection type: bilateral links are represented in blue, and multilateral links in green. Finally, the vertical red lines show the go-live years of different regional fast payment systems, under which multilateral links are established.

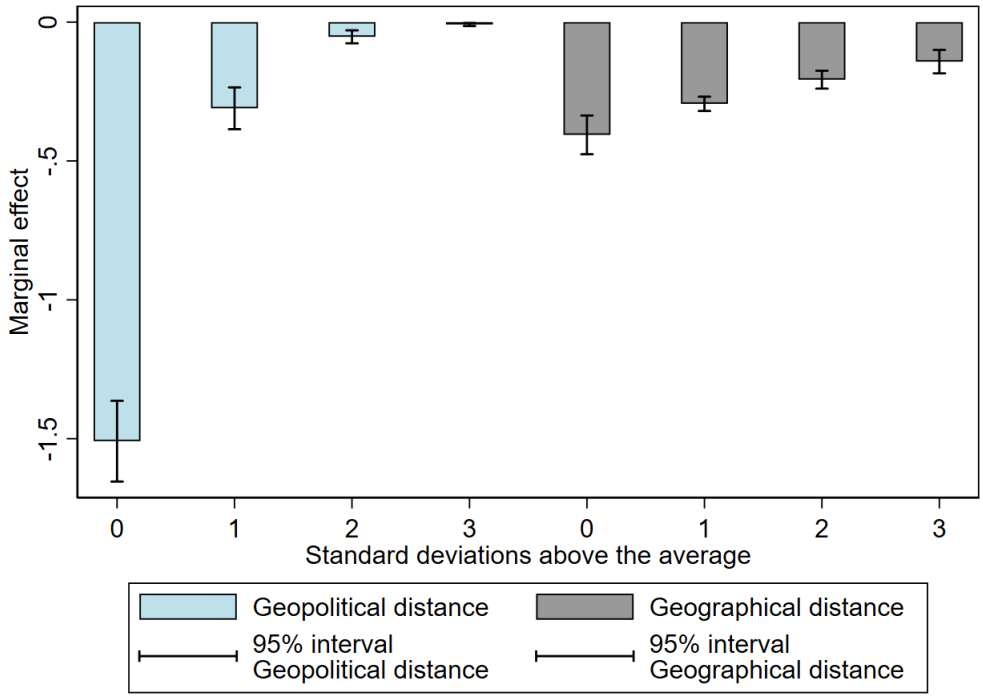


Figure B.5: Marginal effects of geopolitical and geographical distance - year fixed effects only

Notes: The figure shows marginal effects of a one standard deviation increase in geopolitical and geographical distance, respectively, conditional on the initial level of the variable. The estimates control for time fixed effects only (i.e., no origin and destination fixed effects). Changes are computed using the basic estimates of column (1) of Table C.3. The marginal effects are computed considering as starting point levels of the respective variables ranging from the sample average (0) to 3 standard deviations above. All other variables are kept at their respective sample means. Black whiskers show 95% confidence intervals.

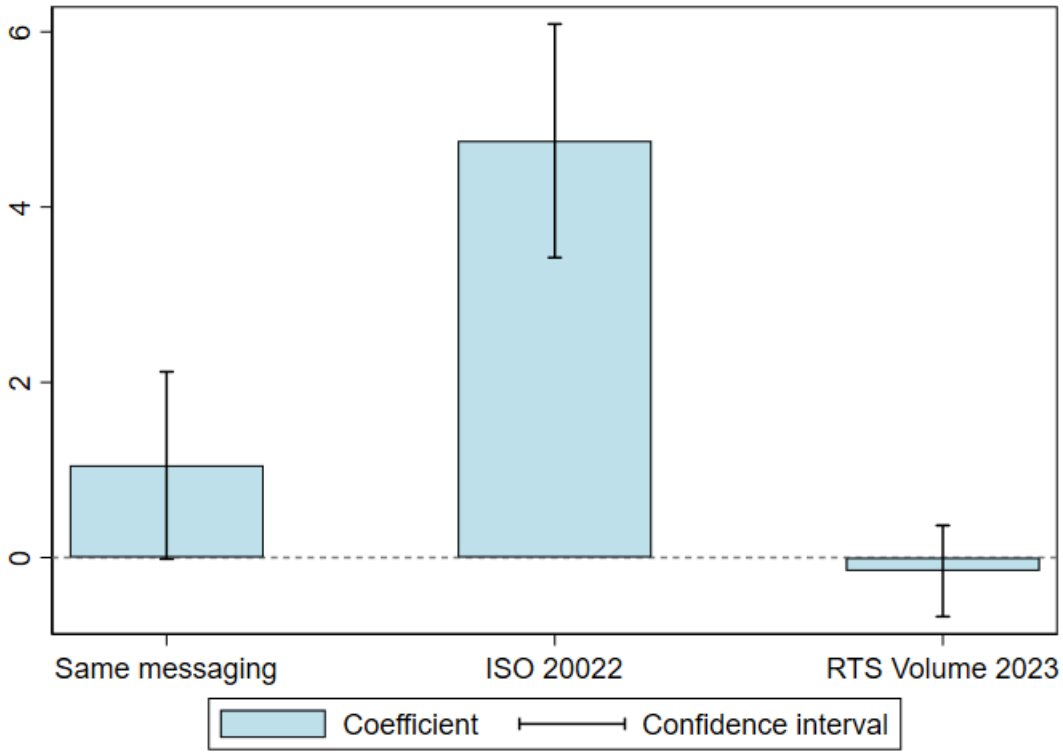


Figure B.6: Effect of technical variables

Notes: The figure shows the coefficients associated to different technical characteristics of the payment systems of the countries in a dyad, obtained by augmenting the model in Table 1. Black whiskers show 95% confidence intervals. Full regression results are also depicted on Table 2.

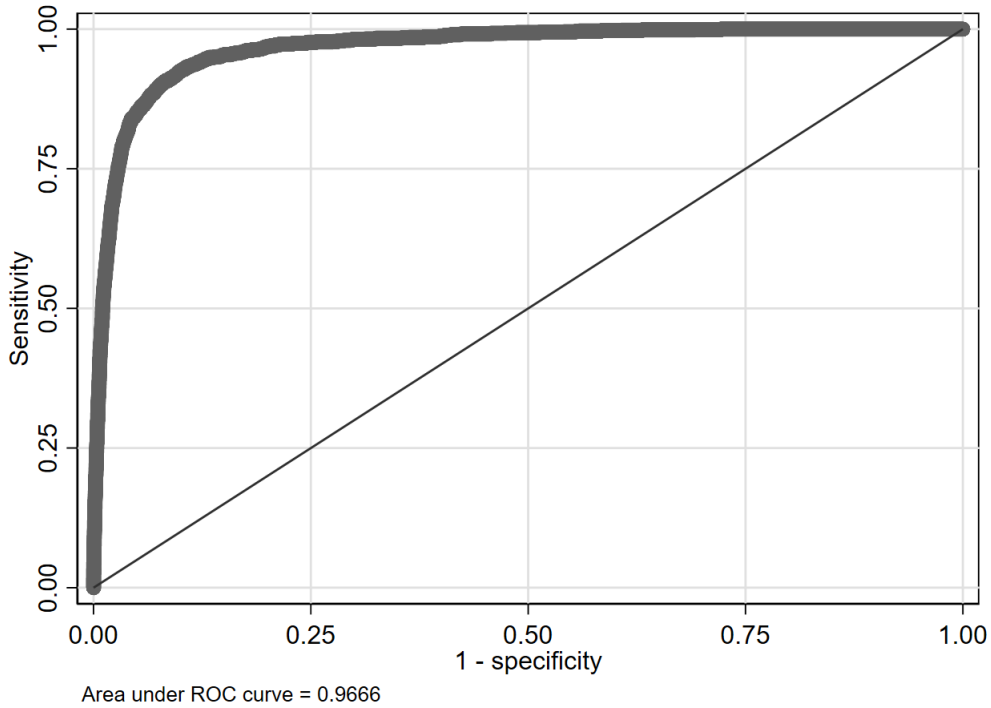


Figure B.7: Receiver Operating Characteristic (ROC) analysis - year fixed effects only

Notes: The figure shows the ROC curve of our basic model estimates (reported in column (1) of Table C.3) on post-2020 data; it plots the true positive rate (sensitivity) against the false positive rate (1 minus specificity) corresponding to each probability cut-off. Models with no predictive power lay along the 45-degree line, while models with perfect predictive power have a ROC curve that passes through the upper left corner. The figure also reports the area under the ROC curve (AUROC), which can be interpreted as the probability that our model ranks a random positive observation (i.e., a dyad with a link) more highly than a random negative observation (i.e., a dyad without a link).

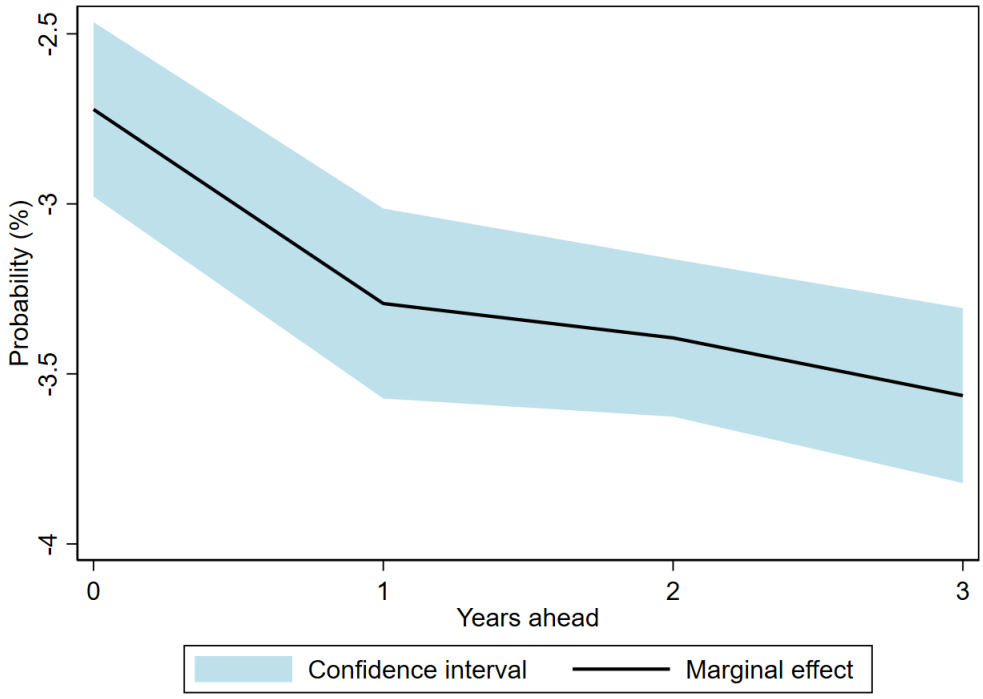


Figure B.8: Dynamic effects of changes in geopolitical distance

Notes: The figure reports the marginal effect of a one standard deviation increase in geopolitical distance on the probability of observing a connection between between the fast payment systems of a particular country dyad. It reports the contemporaneous effect (0), as well as the effect at 1, 2, and 3 years ahead of the shock. The marginal effect is computed regressing the baseline model of Table 1 with controls in period t on forwards of the dependent variable in the manner of Jordà (2023) and Ferrari Minesso et al. (2022).

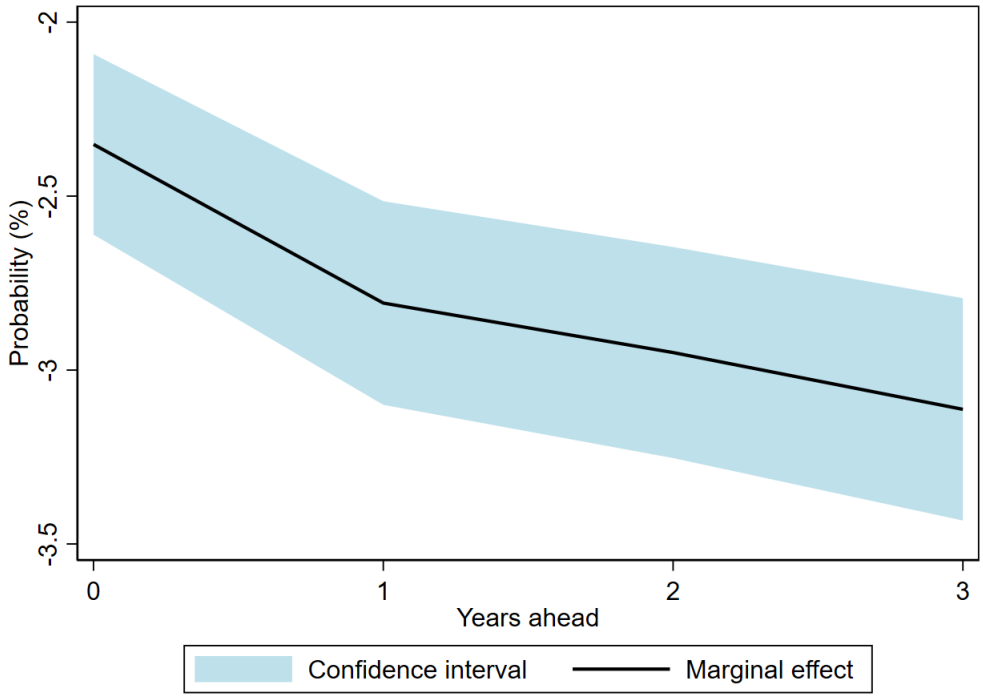


Figure B.9: Dynamic effects of changes in geopolitical distance - year fixed effects only

Notes: The figure reports the marginal effect of a one standard deviation increase in geopolitical distance on the probability of observing a connection between between the fast payment systems of a particular country dyad. It reports the contemporaneous effect (0), as well as the effect at 1, 2, and 3 years ahead of the shock. The marginal effect is computed regressing the model of Table C.3, with year-only fixed effects, with controls in period t on forwards of the dependent variable in the manner of Jordà (2023) and Ferrari Minesso et al. (2022).

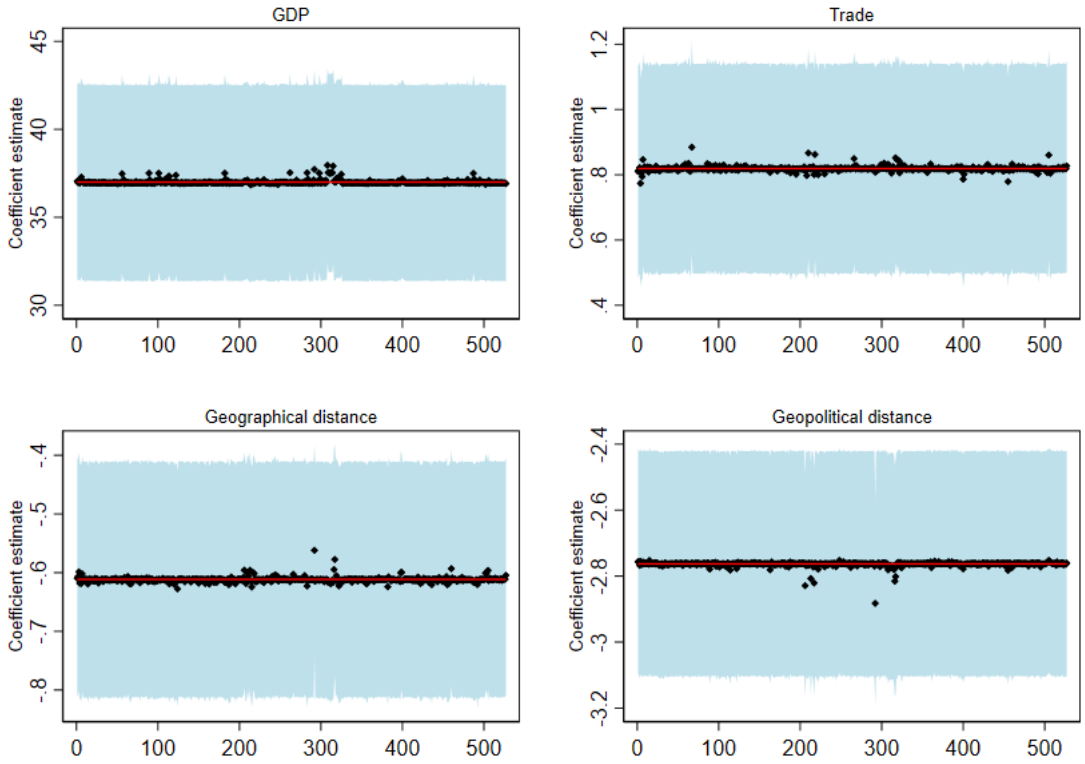


Figure B.10: Estimates excluding one connected dyad at a time

Notes: The figure shows the estimated coefficients from the baseline model, of column (1) in Table 1, when we exclude one connected dyad at a time. Each estimate is shown as a black dot. 95% confidence intervals are shown as shaded areas. The full sample estimates are shown as red lines.

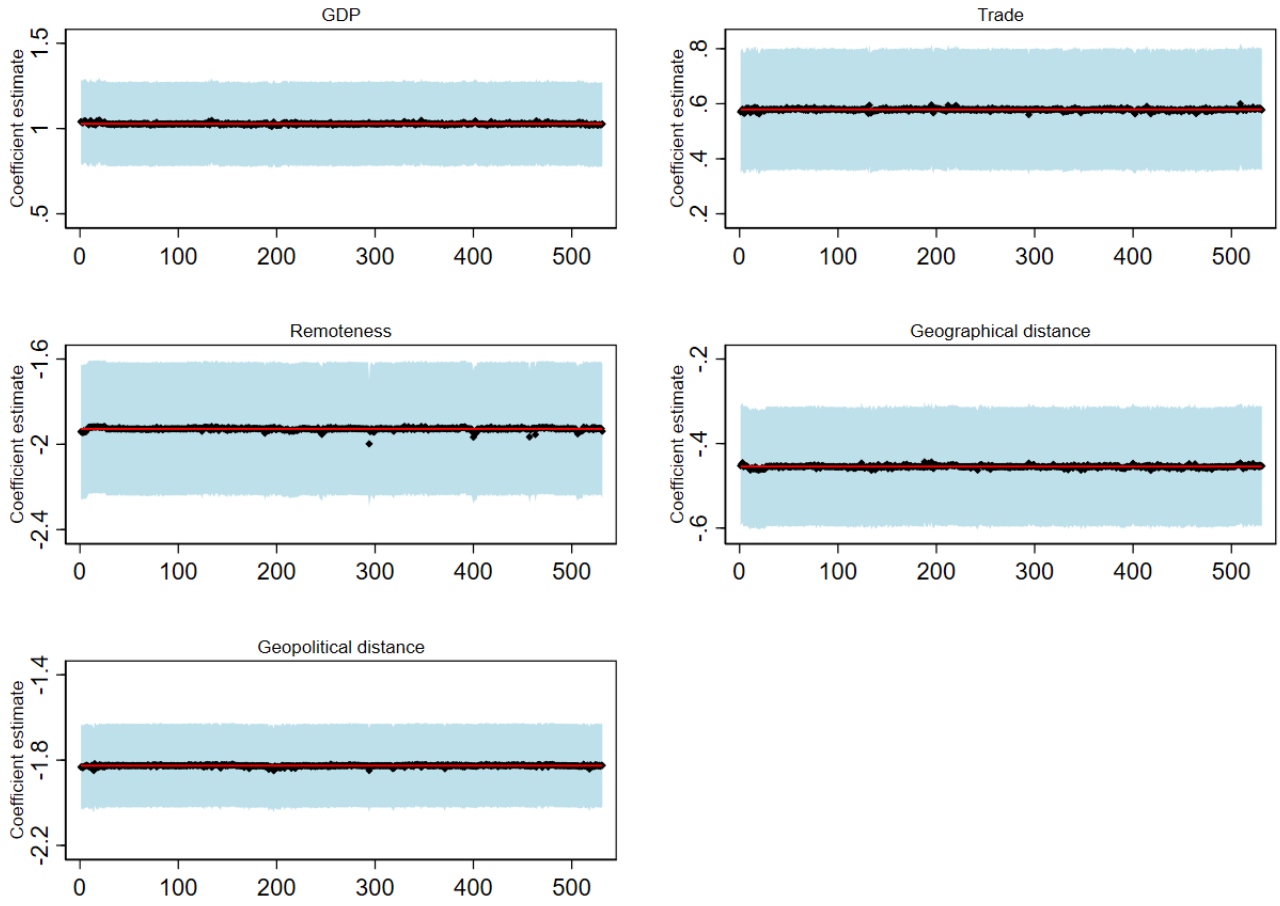


Figure B.11: Estimates excluding one connected dyad at a time - year fixed effects only

Notes: The figure shows the estimated coefficients from the baseline model, of column (1) in Table C.3, when we exclude one connected dyad at a time. Each estimate is shown as a black dot. 95% confidence intervals are shown as shaded areas. The full sample estimates are shown as red lines.

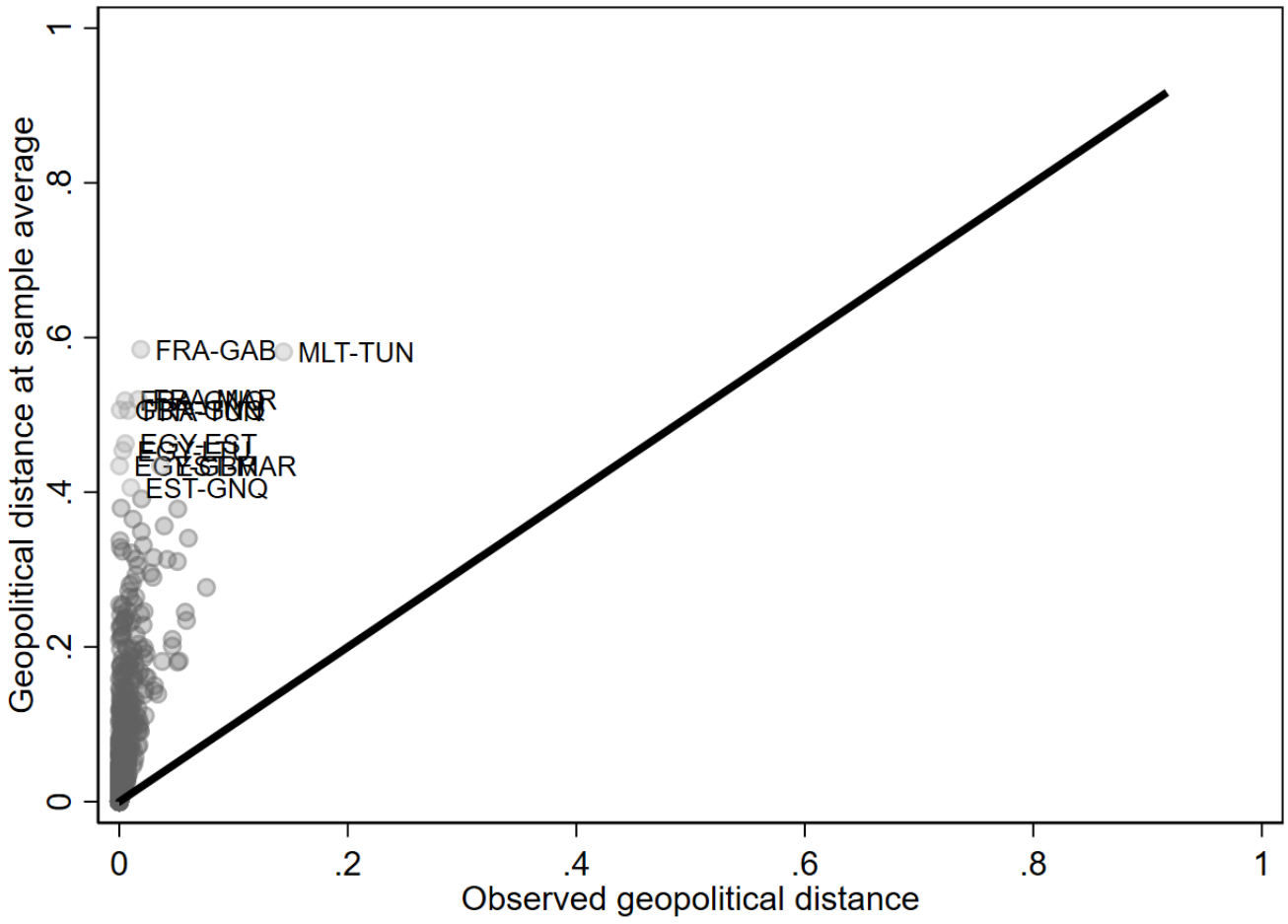


Figure B.12: Counterfactual probabilities with average geopolitical distance

Notes: The figure compares the fitted probabilities of interconnecting fast payment systems for non-connected dyads. The x-axis reports the fitted probability of connecting with the observed level of geopolitical distance in 2023. The y-axis plots instead the fitted probability if geopolitical distance is fixed at the sample average. All other variables are kept at their observed values.

C Additional tables

Table C.1: Summary statistics

	GDP	Trade	Remoteness	Geographical distance	Geopolitical distance
Mean	34.60	12.44	9.03	8.82	0.90
Standard deviation	3.34	9.25	0.14	0.80	0.73
Min	22.32	-13.82	8.78	0.00	0.00
Max	47.48	40.10	9.49	9.90	4.71
Unit	log	log	log	log	unit
	Remittances	RTS volumes	All connections	Bilateral connections	Multilateral connections
Mean	13.84	-0.02	0.01	0.00	0.01
Standard deviation	4.64	0.25	0.10	0.02	0.10
Min	0.00	-6.56	0.00	0.00	0.00
Max	27.92	0.00	1.00	1.00	1.00
Unit	log	log	dyadic	dyadic	dyadic

Notes: The table reports descriptive statistics on the variables used in the empirical estimates.

Table C.2: Baseline estimates - Bilateral and multilateral connections

	Bilateral connections					Multilateral connections				
	(1) All	(2) GDP	(3) Trade	(4) Geographical distance	(5) Geopolitical distance	(6) All	(7) GDP	(8) Trade	(9) Geographical distance	(10) Geopolitical distance
GDP	311.736**	221.377***				36.450***	28.493***			
	(133.226)	(84.273)				(2.843)	(2.440)			
Trade	13.978*		5.446***			0.905***		3.021***		
	(7.385)		(1.142)			(0.165)		(0.206)		
Geographical distance	6.235*			-1.530***		-0.380***			-1.496***	
	(3.432)			(0.366)		(0.103)			(0.074)	
Geopolitical distance	-12.634**				-2.509**	-2.908***				-2.667***
	(6.276)				(1.190)	(0.166)				(0.108)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	483	1,256	1,296	1,528	504	12,897	15,885	14,542	15,885	14,096
Log-likelihood	-10.90	-37.01	-125.4	-133.8	-71.38	-1379	-3568	-3728	-3683	-2221
Avg. probability	6.211	4.618	4.630	3.992	5.952	17.76	17.66	19.14	17.66	16.35
ROC	0.997	0.994	0.966	0.964	0.912	0.976	0.893	0.897	0.903	0.955

Notes: The table reports panel logit estimates of Equation (1) on a sample restricted to bilateral links (columns 1 to 5) and multilateral links (columns 6 to 10) over the period 2016-2023. Standard gravity variables (GDP, trade, geographical distance) and geopolitical distance are entered jointly in columns (1) and (6), while each variable is considered individually in columns (2) to (5) and (7) to (10), respectively. The estimates control for source country, destination country and time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.3: Baseline estimates - All connections, year fixed effects only

	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical distance
GDP	1.028***	1.116***				
	(0.126)	(0.050)				
Trade	0.579***		1.945***			
	(0.112)		(0.073)			
Remoteness	-1.927***			-3.869***		
	(0.159)			(0.182)		
Geographical distance	-0.454***				-1.200***	
	(0.072)				(0.038)	
Geopolitical distance	-1.826***					-1.887***
	(0.100)					(0.099)
Year FE	Y	Y	Y	Y	Y	Y
Origin FE	N	N	N	N	N	N
Destination FE	N	N	N	N	N	N
Observations	115,314	115,314	115,314	115,314	115,314	115,314
Log-likelihood	-5356	-10206	-8738	-8262	-8407	-9990
Avg. probability	2.013	2.013	2.013	2.013	2.013	2.013
ROC	0.967	0.760	0.863	0.898	0.928	0.770

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical distance are entered jointly in column (1), while each variable is considered individually in columns (2) to (6). The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.4: Baseline estimates - Bilateral and multilateral connections, year fixed effects only

	Bilateral connections						Multilateral connections					
	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical distance	(7) All	(8) GDP	(9) Trade	(10) Remoteness	(11) Geographical distance	(12) Geopolitical distance
GDP	0.101	1.619***					1.059***	1.107***				
	(0.653)	(0.251)					(0.132)	(0.050)				
Trade	3.056**		3.320***				0.521***		1.924***			
	(1.401)		(0.464)				(0.115)		(0.073)			
Remoteness	1.454***			1.211***			-2.358***			-4.363***		
	(0.189)			(0.084)			(0.153)			(0.146)		
Geographical distance	-0.726**				-0.857***		-0.374***				-1.200***	
	(0.283)				(0.105)		(0.077)				(0.038)	
Geopolitical distance	-0.954*					-1.013*	-1.858***					-1.905***
	(0.541)					(0.518)	(0.101)					(0.100)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Origin FE	N	N	N	N	N	N	N	N	N	N	N	N
Destination FE	N	N	N	N	N	N	N	N	N	N	N	N
Observations	101,070	101,070	101,070	101,070	101,070	101,070	115,314	115,314	115,314	115,314	115,314	115,314
Log-likelihood	-139.9	-232.1	-191.8	-237.6	-237.8	-255.5	-5173	-10119	-8687	-7877	-8322	-9879
Avg. probability	0.0297	0.0297	0.0297	0.0297	0.0297	0.0297	1.987	1.987	1.987	1.987	1.987	1.987
ROC	0.873	0.756	0.866	0.233	0.879	0.740	0.964	0.759	0.862	0.898	0.928	0.769

Notes: The table reports panel logit estimates of Equation (1) on a sample restricted to bilateral links (columns 1 to 6) and multilateral links (columns 7 to 12) over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical distance are entered jointly in columns (1) and (7), while each variable is considered individually in columns (2) to (6) and (8) to (12), respectively. The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.5: Baseline estimates, with two-way clustering of SE - All connections

	(1) All	(2) GDP	(3) Trade	(4) Geographical distance	(5) Geopolitical distance
GDP	36.844***	29.325***			
	(8.272)	(7.281)			
Trade	0.854***		3.338***		
	(0.196)		(0.461)		
Geographical distance	-0.631***			-1.612***	
	(0.171)			(0.133)	
Geopolitical distance	-2.763***				-2.637***
	(0.321)				(0.216)
Year FE	Y	Y	Y	Y	Y
Destination FE	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	Y	Y
Observations	18,939	25,875	24,301	27,189	20,568
Log-likelihood	-1505	-3986	-4101	-3934	-2445
Avg. probability	12.26	11.04	11.97	11.76	11.97
ROC	0.978	0.924	0.941	0.954	0.960

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023. Standard gravity variables (GDP, trade, geographical distance) and geopolitical distance are entered jointly in column (1), while each variable is considered individually in columns (2) to (5). The estimates control for source country, destination country and time fixed effects. We report in parentheses two-way cluster robust standard errors that control for two-way clustering between source and destination countries, as well as for heteroscedasticity in the manner of Cameron et al. (2011). ***p<0.01, **p<0.05, *p<0.1.

Table C.6: Baseline estimates, with two-way clustering of SE - All connections, year fixed effects only

	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical distance
GDP	1.028***	1.116***				
	(0.295)	(0.192)				
Trade	0.579**		1.945***			
	(0.249)		(0.258)			
Remoteness	-1.927***			-3.869***		
	(0.404)			(0.526)		
Geographical distance	-0.454**				-1.200***	
	(0.182)				(0.088)	
Geopolitical distance	-1.826***					-1.887***
	(0.215)					(0.272)
Year FE	Y	Y	Y	Y	Y	Y
Origin FE	N	N	N	N	N	N
Destination FE	N	N	N	N	N	N
Observations	115,314	115,314	115,314	115,314	115,314	115,314
Log-likelihood	-5356	-10206	-8738	-8262	-8407	-9990
Avg. probability	2.013	2.013	2.013	2.013	2.013	2.013
ROC	0.967	0.760	0.863	0.898	0.928	0.770

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical distance are entered jointly in column (1), while each variable is considered individually in columns (2) to (6). The estimates control for time fixed effects. We report in parentheses two-way cluster robust standard errors that control for two-way clustering between source and destination countries, as well as for heteroscedasticity in the manner of Cameron et al. (2011). ***p<0.01, **p<0.05, *p<0.1.

Table C.7: Estimates with additional controls - All connections, year fixed effects only

	(1) Legal system	(2) Colonial & language	(3) Remittances	(4) Technical standards
GDP	0.979***	1.031***	0.681**	0.703***
	(0.132)	(0.126)	(0.326)	(0.150)
Trade	0.546***	0.578***	0.600**	0.400***
	(0.122)	(0.112)	(0.250)	(0.133)
Remoteness	-1.910***	-1.942***	-1.727***	-1.709***
	(0.166)	(0.163)	(0.334)	(0.192)
Geographical distance	-0.420***	-0.449***	-0.302*	-0.379***
	(0.078)	(0.074)	(0.177)	(0.083)
Geopolitical distance	-1.765***	-1.829***	-1.844***	-1.103***
	(0.098)	(0.098)	(0.272)	(0.103)
Legal system (o)	0.086+			
	(0.059)			
Legal system (d)	0.335***			
	(0.056)			
Former colony		0.084		
		(0.458)		
Common language		0.053		
		(0.138)		
Remittances			0.139	
			(0.145)	
Common messaging system				-1.010***
				(0.205)
ISO20022 standard				2.770***
				(0.220)
RTS volumes (2023)				-0.103*
				(0.062)
Year FE	Y	Y	Y	Y
Origin FE	N	N	N	N
Destination FE	N	N	N	N
Observations	114,690	115,314	8,833	115,314
Log-likelihood	-5252	-5356	-735.8	-3682
Avg. probability	2.024	2.013	4.596	2.013
ROC	0.966	0.967	0.969	0.986

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023, using standard gravity variables, geopolitical distance, additional controls and technical features of the payment systems in the countries involved. The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1, +p<0.2.

Table C.8: IV estimates of second-stage regression, geopolitical distance instrumented with smaller set of instruments - cross-sectional, year fixed effects only

	All connections	Bilateral connections	Multilateral connections
GDP	11.722***	4.514*	12.032***
	(0.993)	(2.706)	(1.130)
Trade	0.667***	3.928***	0.572***
	(0.160)	(0.795)	(0.166)
Remoteness	-0.568***	1.292***	-1.127***
	(0.096)	(0.173)	(0.095)
Geographical distance	-0.619***	-0.418*	-0.521***
	(0.072)	(0.232)	(0.078)
Geopolitical distance	-34.547***	-15.989*	-35.618***
	(2.889)	(8.483)	(3.272)
Year FE	Y	Y	Y
Origin FE	N	N	N
Destination FE	N	N	N
Observations	11,923	11,923	11,923
Log-likelihood	-1150	-83.20	-1079
Avg. probability	4.126	0.193	3.934
ROC	0.947	0.835	0.946
F-stat (first-stage reg.)	571.2	571.2	571.2

Notes: The table reports cross-sectional logit estimates of Equation (1) on the full sample (column 1), a sample restricted to bilateral links (column 2) and to multilateral links (column 3). Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical distance are entered jointly. Geopolitical distance is instrumented with the genetic distance measure of Spolaore and Wacziarg (2016), which is available for the cross-section of the dyadic sample. Only GDP is included as additional control in the first-stage regression. The F-statistic of the first-stage regression is reported in the bottom row of the table. ***p<0.01, **p<0.05, *p<0.1.

Table C.9: Baseline estimates for fast *and* slow payment system links - All connections

	Origin, destination and year FE					
	(1) All	(2) GDP	(3) Trade	(4) Geographical distance	(5) Geopolitical distance	
GDP	6.354***	4.080***				
	(0.532)	(0.257)				
Trade	1.460***		4.260***			
	(0.162)		(0.196)			
Geographical distance	-1.710***			-2.555***		
	(0.112)			(0.102)		
Geopolitical distance	-1.853***				-2.340***	
	(0.135)				(0.101)	
Year FE	Y	Y	Y	Y	Y	
Origin FE	Y	Y	Y	Y	Y	
Destination FE	Y	Y	Y	Y	Y	
Observations	59,255	59,255	59,255	59,255	59,255	
Log-likelihood	-5478	-13541	-9398	-6926	-9380	
Avg. probability	9.257	9.257	9.257	9.257	9.257	
ROC	0.961	0.804	0.911	0.936	0.891	
	Year FE only					
	(1) All	(2) GDP	(3) Trade	(4) Geographical distance	(5) Geopolitical distance	(6) Remoteness
GDP	0.321***	0.633***				
	(0.086)	(0.043)				
Trade	0.814***		1.368***			
	(0.095)		(0.053)			
Geographical distance	-0.893***			-1.234***		
	(0.048)			(0.036)		
Geopolitical distance	-1.200***				-1.420***	
	(0.070)				(0.071)	
Remoteness	0.013					-0.707***
	(0.056)					(0.071)
Year FE	Y	Y	Y	Y	Y	Y
Origin FE	N	N	N	N	N	N
Destination FE	N	N	N	N	N	N
Observations	115,314	115,314	115,314	115,314	115,314	115,314
Log-likelihood	-13470	-21247	-18551	-21301	-16312	-19721
Avg. probability	4.777	4.777	4.777	4.777	4.777	4.777
ROC	0.929	0.658	0.804	0.682	0.902	0.751

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample, extended to also include slow payment systems connections over the period 2016-2023. The estimates of the upper panel control for source, destination and time fixed effects. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical distance are entered jointly in column (1), while each variable is considered individually in columns (2) to (6). The estimates of the lower panel control for time fixed effects only, and include remoteness as an additional covariate. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.10: Baseline estimates, excluding the euro area

	Origin, destination and year FE			Year FE only		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Bilateral	Multilateral	All	Bilateral	Multilateral
GDP	32.757***	311.736**	32.315***	1.028***	0.101	1.059***
	(3.377)	(133.226)	(3.463)	(0.126)	(0.653)	(0.132)
Trade	0.871***	13.978*	0.885***	0.579***	3.056**	0.521***
	(0.181)	(7.385)	(0.173)	(0.112)	(1.401)	(0.115)
Geographical distance	-0.896***	6.235*	-0.635***	-0.454***	-0.726**	-0.374***
	(0.107)	(3.432)	(0.100)	(0.072)	(0.283)	(0.077)
Geopolitical distance	-2.653***	-12.634**	-2.816***	-1.826***	-0.954*	-1.858***
	(0.211)	(6.276)	(0.193)	(0.100)	(0.541)	(0.101)
Remoteness				-1.927***	1.454***	-2.358***
				(0.159)	(0.189)	(0.153)
Year FE	Y	Y	Y	Y	Y	Y
Origin FE	Y	Y	Y	N	N	N
Destination FE	Y	Y	Y	N	N	N
Observations	16,645	483	10,787	115,314	101,070	115,314
Log-likelihood	-987.2	-10.90	-881.4	-5356	-139.9	-5173
Avg. probability	7.299	6.211	10.99	2.013	0.0297	1.987
ROC	0.974	0.997	0.971	0.967	0.873	0.964

Notes: The table reports panel logit estimates of Equation (1) obtained on the sample of dyadic observations over the period 2016-2023, excluding from the sample euro area dyads. Columns (1) to (3) report estimates for all, bilateral and multilateral connections—respectively—including origin, destination and time fixed effects. Columns (4) to (6) include only time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.11: Estimates using geopolitical proximity (military alliances, pi score) - All connections, year fixed effects only

	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical proximity
GDP	0.514*	0.505***				
	(0.270)	(0.096)				
Trade	0.168		1.191***			
	(0.241)		(0.129)			
Remoteness	-2.632***			-4.584***		
	(0.438)			(0.549)		
Geographical distance	0.028				-1.193***	
	(0.211)				(0.078)	
Geopolitical proximity	4.004***					2.662***
	(0.440)					(0.202)
Year FE	Y	Y	Y	Y	Y	Y
Destination FE	N	N	N	N	N	N
Origin FE	N	N	N	N	N	N
Observations	25,810	25,810	25,810	25,810	25,810	25,810
Log-likelihood	-781.8	-1942	-1780	-1445	-1557	-1247
Avg. probability	1.480	1.480	1.480	1.480	1.480	1.480
ROC	0.987	0.666	0.788	0.910	0.918	0.942

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical proximity are entered jointly in column (1), while each variable is considered individually in columns (2) to (6). Geopolitical proximity is defined as the weighted pi scores computed with data from the Alliance Treaty Obligations and Provisions (ATOP) project over the period 1816–2018 (see (Chiba et al., 2015)). The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.12: Estimates using geopolitical proximity (military alliances, pi score) - Bilateral and multilateral connections, year fixed effects only

	Bilateral connections						Multilateral connections					
	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical proximity	(7) All	(8) GDP	(9) Trade	(10) Remoteness	(11) Geographical distance	(12) Geopolitical proximity
GDP	10.728**	1.777***					0.483*	0.492***				
	(4.746)	(0.124)					(0.285)	(0.096)				
Trade	-0.841		2.850***				0.114		1.177***			
	(1.613)		(0.311)				(0.253)		(0.130)			
Remoteness	3.832***			1.308***			-3.161***			-5.309***		
	(1.304)			(0.061)			(0.459)			(0.480)		
Geographical distance	-2.857*				-0.813***		0.086				-1.195***	
	(1.466)				(0.117)		(0.237)				(0.078)	
Geopolitical proximity	18.711**					3.019***	4.047***					2.656***
	(7.394)					(0.626)	(0.451)					(0.203)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Destination FE	N	N	N	N	N	N	N	N	N	N	N	N
Origin FE	N	N	N	N	N	N	N	N	N	N	N	N
Observations	8,575	8,575	8,575	8,575	8,575	8,575	25,810	25,810	25,810	25,810	25,810	25,810
Log-likelihood	-8.444	-29.29	-26.55	-30.48	-32.39	-26.74	-752.1	-1929	-1770	-1382	-1543	-1240
Avg. probability	0.0466	0.0466	0.0466	0.0466	0.0466	0.0466	1.465	1.465	1.465	1.465	1.465	1.465
ROC	0.940	0.632	0.751	0.124	0.913	0.934	0.987	0.665	0.787	0.910	0.918	0.942

Notes: The table reports panel logit estimates of Equation (1) on a sample restricted to bilateral links (columns (1) to (6)) and multilateral links (columns (7) to (12)) over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical proximity are entered jointly in columns (1) and (7), while each variable is considered individually in columns (2) to (6) and (8) to (12), respectively. Geopolitical proximity is defined as the weighted pi scores computed with data from the Alliance Treaty Obligations and Provisions (ATOP) project over the period 1816–2018 (see (Chiba et al., 2015)). The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.13: IV estimates of second-stage regression, using geopolitical proximity (military alliances, pi score) - cross-sectional, year fixed effects only

	All connections	Bilateral connections	Multilateral connections
GDP	1.059***	-0.421	1.038***
	(0.165)	(0.436)	(0.183)
Trade	0.039	3.638***	-0.076
	(0.175)	(0.773)	(0.185)
Remoteness	-2.866***	0.229	-3.496***
	(0.210)	(0.555)	(0.235)
Geographical distance	2.101***	0.841	2.283***
	(0.258)	(0.829)	(0.291)
Geopolitical proximity	4.923***	2.278*	5.075***
	(0.412)	(1.209)	(0.466)
Observations	11,923	11,923	11,923
Log-likelihood	-1150	-83.20	-1079
Avg. probability	4.126	0.193	3.934
ROC	0.947	0.835	0.946
F-stat (first-stage reg.)	168.4	168.4	168.4

Notes: The table reports cross-sectional logit estimates of Equation (1) on the full sample (column 1), a sample restricted to bilateral links (column 2) and to multilateral links (column 3). Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical proximity are entered jointly. Geopolitical proximity is defined as the weighted pi scores computed with data from the Alliance Treaty Obligations and Provisions (ATOP) project over the period 1816–2018 (see (Chiba et al., 2015)). The estimates control for time fixed effects. Geopolitical proximity is instrumented with the genetic distance measure of Spolaore and Wacziarg (2016), which is available for the cross-section of the dyadic sample. The F-statistic of the first-stage regression is reported in the bottom row of the table. ***p<0.01, **p<0.05, *p<0.1.

Table C.14: Estimates using geopolitical proximity (military alliances, kappa score) - All connections, year fixed effects only

	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical proximity
GDP	0.514*	0.505***				
	(0.270)	(0.096)				
Trade	0.168		1.191***			
	(0.241)		(0.129)			
Remoteness	-2.636***			-4.584***		
	(0.439)			(0.549)		
Geographical distance	0.029				-1.193***	
	(0.211)				(0.078)	
Geopolitical proximity	3.985***					2.664***
	(0.438)					(0.199)
Year FE	Y	Y	Y	Y	Y	Y
Destination FE	N	N	N	N	N	N
Origin FE	N	N	N	N	N	N
Observations	25,810	25,810	25,810	25,810	25,810	25,810
Log-likelihood	-781.8	-1942	-1780	-1445	-1557	-1248
Avg. probability	1.480	1.480	1.480	1.480	1.480	1.480
ROC	0.987	0.666	0.788	0.910	0.918	0.942

Notes: The table reports panel logit estimates of Equation (1) obtained on the full sample of dyadic observations over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical distance are entered jointly in column (1), while each variable is considered individually in columns (2) to (6). Geopolitical proximity is defined as the weighted kappa scores computed with data from the Alliance Treaty Obligations and Provisions (ATOP) project over the period 1816–2018 (see (Chiba et al., 2015)). The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.15: Estimates using geopolitical proximity (military alliances, kappa score) - Bilateral and multilateral connections, year fixed effects only

	Bilateral connections						Multilateral connections					
	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical proximity	(7) All	(8) GDP	(9) Trade	(10) Remoteness	(11) Geographical distance	(12) Geopolitical proximity
GDP	10.688**	1.777***					0.482*	0.492***				
	(4.729)	(0.124)					(0.284)	(0.096)				
Trade	-0.820		2.850***				0.114		1.177***			
	(1.603)		(0.311)				(0.253)		(0.130)			
Remoteness	3.823***			1.308***			-3.166***			-5.309***		
	(1.298)			(0.061)			(0.460)			(0.480)		
Geographical distance	-2.854*				-0.813***		0.087				-1.195***	
	(1.471)				(0.117)		(0.238)				(0.078)	
Geopolitical proximity kappa	18.410**					3.008***	4.027***					2.659***
	(7.287)					(0.610)	(0.448)					(0.200)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Destination FE	N	N	N	N	N	N	N	N	N	N	N	N
Origin FE	N	N	N	N	N	N	N	N	N	N	N	N
Observations	8,575	8,575	8,575	8,575	8,575	8,575	25,810	25,810	25,810	25,810	25,810	25,810
Log-likelihood	-8.463	-29.29	-26.55	-30.48	-32.39	-26.75	-752.1	-1929	-1770	-1382	-1543	-1241
Avg. probability	0.0466	0.0466	0.0466	0.0466	0.0466	0.0466	1.465	1.465	1.465	1.465	1.465	1.465
ROC	0.939	0.632	0.751	0.124	0.913	0.934	0.987	0.665	0.787	0.910	0.918	0.942

Notes: The table reports panel logit estimates of Equation (1) on a sample restricted to bilateral links (columns 1 to 6) and multilateral links (columns 7 to 12) over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical proximity are entered jointly in columns (1) and (7), while each variable is considered individually in columns (2) to (6) and (8) to (12), respectively. Geopolitical proximity is defined as the weighted kappa scores computed with data from the Alliance Treaty Obligations and Provisions (ATOP) project over the period 1816–2018 (see (Chiba et al., 2015)). The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.16: IV estimates of second-stage regression, using geopolitical proximity (military alliances, kappa score) - cross-sectional, year fixed effects only

	All connections	Bilateral connections	Multilateral connections
GDP	0.920***	-0.485	0.895***
	(0.159)	(0.433)	(0.176)
Trade	0.103	3.667***	-0.010
	(0.173)	(0.774)	(0.182)
Remoteness	-2.884***	0.220	-3.515***
	(0.211)	(0.560)	(0.237)
Geographical distance	2.056***	0.820	2.236***
	(0.254)	(0.818)	(0.286)
Geopolitical proximity	4.784***	2.214*	4.933***
	(0.400)	(1.175)	(0.453)
Observations	11,923	11,923	11,923
Log-likelihood	-1150	-83.20	-1079
Avg. probability	4.126	0.193	3.934
ROC	0.947	0.835	0.946
F-stat (first-stage reg.)	174.7	174.7	174.7

Notes: The table reports cross-sectional logit estimates of Equation (1) on the full sample (column 1), a sample restricted to bilateral links (column 2) and to multilateral links (column 3). Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical proximity are entered jointly. Geopolitical proximity is defined as the weighted kappa scores computed with data from the Alliance Treaty Obligations and Provisions (ATOP) project over the period 1816–2018 (see (Chiba et al., 2015)). The estimates control for time fixed effects. Geopolitical proximity is instrumented with the genetic distance measure of Spolaore and Wacziarg (2016), which is available for the cross-section of the dyadic sample. The F-statistic of the first-stage regression is reported in the bottom row of the table. ***p<0.01, **p<0.05, *p<0.1.

Table C.17: Estimates using geopolitical proximity (United Nations General Assembly Resolution ES-11/1) - year fixed effects only

	All connections	Bilateral connections	Multilateral connections
GDP	0.770***	0.254	0.788***
	(0.121)	(0.461)	(0.127)
Trade	0.568***	2.390***	0.514***
	(0.123)	(0.873)	(0.125)
Remoteness	-1.195***	1.338***	-1.616***
	(0.105)	(0.143)	(0.110)
Geographical distance	-0.811***	-0.879***	-0.734***
	(0.060)	(0.203)	(0.063)
Geopolitical proximity	1.876***	-0.077	1.955***
	(0.140)	(0.525)	(0.148)
Year FE	Y	Y	Y
Origin FE	N	N	N
Destination FE	N	N	N
Observations	147,088	131,019	147,088
Log-likelihood	-7657	-265.2	-7375
Avg. probability	1.932	0.0443	1.893
ROC	0.958	0.832	0.956

Notes: The table reports panel logit estimates of Equation (1) on the full sample (column 1), a sample restricted to bilateral links (column 2) and to multilateral links (column 3) over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical proximity are entered jointly. Geopolitical proximity is defined as a dummy variable which equals 1 if two countries in a dyad voted the same on the United Nations General Assembly Resolution ES-11/1 adopted on 2 March 2022, which deplored Russia's invasion of Ukraine and demanded a full withdrawal of Russian forces. The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.18: Estimates using geopolitical proximity (United Nations General Assembly Resolution ES-11/1, "Abstain" = "Absent") - year fixed effects only

	All connections	Bilateral connections	Multilateral connections
GDP	0.781***	0.413	0.793***
	(0.121)	(0.540)	(0.127)
Trade	0.571***	2.325**	0.524***
	(0.122)	(1.071)	(0.124)
Remoteness	-1.246***	1.498***	-1.661***
	(0.109)	(0.141)	(0.112)
Geographical distance	-0.801***	-0.940***	-0.724***
	(0.060)	(0.241)	(0.064)
Geopolitical proximity	1.971***	0.279	2.038***
	(0.145)	(0.559)	(0.153)
Year FE	Y	Y	Y
Origin FE	N	N	N
Destination FE	N	N	N
Observations	147,088	131,019	147,088
Log-likelihood	-7622	-227.3	-7363
Avg. probability	1.928	0.0397	1.893
ROC	0.958	0.833	0.956

Notes: The table reports panel logit estimates of Equation (1) on the full sample (column 1), a sample restricted to bilateral links (column 2) and to multilateral links (column 3) over the period 2016-2023. Standard gravity variables (GDP, trade, remoteness, geographical distance) and geopolitical proximity are entered jointly. Geopolitical proximity is defined as a dummy variable which equals 1 if two countries in a dyad voted the same on the United Nations General Assembly Resolution ES-11/1 adopted on 2 March 2022. Countries that abstained are considered to have the same vote as those absent on the day of vote. The estimates control for time fixed effects. We report in parentheses clustered standard errors at the level of a dyad. ***p<0.01, **p<0.05, *p<0.1.

Table C.19: Reverse causality test - All connections, cross-sectional, year fixed effects only

	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical distance
GDP	0.441***	0.720***				
	(0.128)	(0.045)				
Trade	0.704***		1.422***			
	(0.134)		(0.067)			
Remoteness	-1.403***			-2.598***		
	(0.133)			(0.167)		
Geographical distance	-0.566***				-1.238***	
	(0.074)				(0.040)	
Geopolitical distance	-2.039***					-1.982***
	(0.110)					(0.097)
Year FE	Y	Y	Y	Y	Y	Y
Origin FE	N	N	N	N	N	N
Destination FE	N	N	N	N	N	N
Observations	14,462	14,462	14,462	14,462	14,462	14,462
Log-likelihood	-1109	-2090	-1838	-1736	-1608	-1888
Avg. probability	3.506	3.506	3.506	3.506	3.506	3.506
ROC	0.964	0.695	0.816	0.866	0.916	0.788

Notes: This table compares geopolitical distance across country pairs or time before the payment links actually takes place using the methodology proposed by Martin et al. (2012). In the cross-section dimension, we thus estimate equation Equation (1) in year $t = 2023$ for dyads where a payment link does not exist in 2023. For dyads where a payment link exists in 2023, the right-hand-side variables are set to their values one year before the link was established. . ***p<0.01, **p<0.05, *p<0.1.

Table C.20: Reverse causality test - Bilateral and multilateral connections, cross-sectional, year fixed effects only

	Bilateral connections						Multilateral connections					
	(1) All	(2) GDP	(3) Trade	(4) Remoteness	(5) Geographical distance	(6) Geopolitical distance	(7) All	(8) GDP	(9) Trade	(10) Remoteness	(11) Geographical distance	(12) Geopolitical distance
GDP	0.803	1.455***					0.355**	0.690***				
	(0.675)	(0.206)					(0.139)	(0.045)				
Trade	1.986+		3.063***				0.673***		1.370***			
	(1.369)		(0.449)				(0.143)		(0.066)			
Remoteness	1.742***			1.222***			-2.023***			-3.324***		
	(0.231)			(0.077)			(0.118)			(0.133)		
Geographical distance	-1.182***				-0.967***		-0.401***				-1.221***	
	(0.274)				(0.104)		(0.078)				(0.040)	
Geopolitical distance	-1.287***					-1.327***	-2.108***					-2.009***
	(0.466)					(0.337)	(0.114)					(0.101)
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Origin FE	N	N	N	N	N	N	N	N	N	N	N	N
Destination FE	N	N	N	N	N	N	N	N	N	N	N	N
Observations	14,462	14,462	14,462	14,462	14,462	14,462	14,462	14,462	14,462	14,462	14,462	14,462
Log-likelihood	-56.29	-116.6	-94.42	-116.1	-111.5	-124.7	-1038	-2045	-1812	-1576	-1579	-1839
Avg. probability	0.118	0.118	0.118	0.118	0.118	0.118	3.388	3.388	3.388	3.388	3.388	3.388
ROC	0.848	0.695	0.816	0.134	0.916	0.788	0.961	0.695	0.816	0.866	0.916	0.788

Notes: This table compares geopolitical distance across country pairs or time before the payment links actually takes place using the methodology proposed by Martin et al. (2012) distinguishing bilateral links from multilateral links. In the cross-section dimension, we thus estimate equation Equation (1) in year $t = 2023$ for dyads where a payment link does not exist in 2023. For dyads where a payment link exists in 2023, the right-hand-side variables are set to their values one year before the link was established. ***p<0.01, **p<0.05, *p<0.1.

Table C.21: Evolution of SWIFT participation for sanctioned countries

Country	History of sanctions
Iran	EU Regulation 267/2012 forced SWIFT to disconnect EU-sanctioned Iranian banks in 2012. In 2016, many Iranian banks were de-listed by the EU, and subsequently reconnected to SWIFT. Sanctions were re-imposed in 2018.
Russia	In 2022, SWIFT was forced to disconnect all Russian entities and their Russia-based subsidiaries, as designated by EU Regulation 833/2014.
Belarus	In 2022, SWIFT was forced to disconnect all Belarusian entities and their Belarus-based subsidiaries, in compliance with EU Regulation 765/2006.

Notes: The table compiles the list of countries that have ever been subject to sanctions limiting their access to the SWIFT network. Source: https://www.swift.com/de/node/11306 (Accessed November 2024).

Table C.22: List of countries connected to Chinese CIPS (November 2024)

Angola	Djibouti	Luxembourg	Philippines	Switzerland
Australia	France	Macau	Qatar	Taiwan
Brazil	Germany	Malaysia	Republic of Korea	Thailand
Cambodia	Hong Kong	Mexico	Russia	Turkey
Canada	Indonesia	Myanmar	Serbia	United Arab Emirates
Chile	Japan	New Zealand	Singapore	United Kingdom
China	Kazakhstan	Panama	South Africa	Zambia
Czech Republic	Laos	Pakistan	Sri Lanka	

Notes: The table reports the list of countries which have at least one payment service provider using the Chinese Cross-border Interbank Payment System (CIPS). Source: https://www.cips.com.cn/cips/sy/index.html (Accessed November 2024).

Table C.23: Extended list of data sources

A. Dedicated Projects, Reports and Working Papers by International Organisations.
Project FASTT (Frictionless Affordable Safe Timely Transactions) Reports, Case Studies and Map, by the World Bank. Accessible at: https://fastpayments.worldbank.org/
Payment, Clearing and Settlement System Books, by the BIS Committee on Payments and Market Infrastructures. Accessible at: https://www.bis.org/cpmi/paysysinfo.htm?m=113
State of Inclusive Instant Payment Systems in Africa (SIIPS) Reports, Case Studies and Map, by Africa Nenda. Accessible at: https://www.africanenda.org/en/siips
IMF Working Paper: Cross-Border Payments Integration in Latin America and the Caribbean (Drakopoulos et al. (2024))
IMF Working Paper: Renminbi Usage in Cross-Border Payments: Regional Patterns and the Role of Swaps Lines and Offshore Clearing Banks (Perez-Saiz and Zhang (2023))
B. Technical Documents published by Payment Service Providers, Payment System Operators and Overseers.
Pan-African Payment and Settlement System (PAPSS): https://papss.com/
BankservAfrica's Transactions Cleared on an Immediate Basis (TCIB): https://www.tcib.africa/home
Iberpay's Bizum: https://bizum.es/; https://www.iberpay.com/en/
Arab Monetary Fund's BUNA: https://buna.co/
Eurosystem's T2 and TARGET Instant Payment Settlement (TIPS): https://www.ecb.europa.eu/paym/target/html/index.en.html
EBA Clearing's RT1: https://www.ebaclearing.eu/services/rt1/
Asian Clearing Union (ACU): https://www.asianclearingunion.org/
Bank of Russia's National Payment System Oversight Results. Accessible at: https://www.cbr.ru/eng/Psystem/
ALADI's "Convenio de Pagos y Créditos Recíprocos" (CPCR): https://www.aladi.org/sitioaladi/publicaciones/
"Sistema Unitario de Compensación Regional de Pagos" (SUCRE): https://www.bcv.org.ve/system/files/documentos/aspectos_conceptuales_del_sucre_2018.pdf
CMCA's "Sistema de Interconexión de Pagos" (SIPA): https://www.bancentral.gov.do/a/d/2549-sistema-de-interconexion-de-pagos-sipa
COMESA's Regional Payment and Settlement System (REPSS): https://www.comesa.int/comesa-clearing-house/
SADC's Regional Cross-border Real-Time Gross Settlement (SADC-RTGS): https://www.resbank.co.za/en/home/what-we-do/payments-and-settlements/SADC-RTGS

WAEMU's Automated Interbank Clearing System (SICA-UEMOA) and Regional Gross Settlement System in Real Time (STAR-UEMOA): https://www.bceao.int/en/content/sica-uemoa; https://www.bceao.int/en/content/star-uemoa
"Sistema de Pagos en Moneda Local" (SML): https://www.bcra.gob.ar/MediosPago/Sistema_de_Pagos_en_Moneda_Local-SML.asp
Payment and Settlement Systems in Korea: https://www.bok.or.kr/eng/main/contents.do?menuNo=400045
Thailand's Domestic Payment Systems and Cross-border Payment Linkages: https://www.bot.or.th/en/our-roles/payment-systems.html; https://www.bot.or.th/en/financial-innovation/digital-finance/digital-payment/cross-border-payment.html#connectivites-item-5121671a50
Payments Infrastructure in Denmark: https://www.nationalbanken.dk/en/what-we-do/safe-and-efficient-payments/the-payments-infrastructure-in-denmark
Singapore's Domestic Payment Systems and Cross-border Payment Linkages: https://www.mas.gov.sg/regulation/payments; https://www.nets.com.sg/group; https://www.mas.gov.sg/development/e-payments/cross-border-payment-linkages
Payment Systems in Japan: https://www.boj.or.jp/en/paym/outline/pay_boj/pss0305a.pdf
Malaysia's Domestic Payment Systems and Cross-border QR Payments: https://www.bnm.gov.my/types-of-payment-systems; https://www.duitnow.my/Cross-Border/index.html
Aruba's I-Pago: https://www.cbaruba.org/ipago/static/CBA_I_Pago_FAQ_PDF_2023_05_12_v4-56928bedfc1ec55438596ccbca58c739.pdf
Vietnam's NAPAS FastFund 247 and Inter-bank electronic payment system (IBPS): https://en.napas.com.vn/napas-fastfund-247-184230612211622214.htm ; https://www.sbv.gov.vn/webcenter/portal/en/home/sbv/paytreasury/paysystem/ibeps?centerWidth=80%25&leftWidth=20%25&rightWidth=0%25&showFooter=false&showHeader=false&_adf.ctrl-state=1c8dx7bpra_281&_afrLoop=7453785137034755
China's Internet Banking Payment System (IBPS): https://www.dbs.com.cn/sme/day-to-day/payments/ibps#:~:text=DBS%20Bank%20has%20launched%20IBPS,for%20more%20instant%20payment%20services.
Canada's Domestic Payment Systems: https://www.bankofcanada.ca/core-functions/financial-system/payment-systems-the-bank-of-canada-oversees/
Turkey's Instant and Continuous Transfer System of Funds (FAST): https://www.ziraatkatilim.com.tr/en/retail/payments/instant-transfer-fast#:~:text=Instant%20and%20Continuous%20Transfer%20System%20of%20Funds%20(FAST)%20is%20a,Number%20instead%20of%20an%20IBAN.
Nepal's ConnectIPS: https://connectips.com/
Mongolia's Domestic Payments Systems: https://www.mongolbank.mn/en/p/1301
Sri Lanka's Payment and Settlement Systems: https://www.cbsl.gov.lk/en/financial-system/financial-infrastructure/payments-and-settlements-systems; https://www.lankapay.net/public/en/for-financial/lankapay-slips

Lebanon's Domestic Payment Systems: https://www.bdl.gov.lb/paymentsystemoverview.php
Cambodia's BAKONG: https://bakong.nbc.gov.kh/download/NBC_BAKONG_White_Paper.pdf
Philippines' Domestic Payment Systems: https://www.bsp.gov.ph/SitePages/PaymentsAndSettlements/PaymentsAndSettlements.aspx
Hong Kong's Dollar Faster Payment System (FPS): https://fps.hkicl.com.hk/files/page_file/126/8041/HKD%20FPS%20Rules_redacted%20version_Aug%202023_dist%20ver..pdf
UAE's Aani: https://aletihadpayments.ae/en/aani; https://www.mashreq.com/en/uae/private/banking-solution/forex-transfer/aani/
Taiwan's Payment and Settlement Systems: https://www.cbc.gov.tw/en/np-446-2.html
Romania's PlatiInstant: https://www.platiinstant.ro/
Australia's Domestic Payment Systems: https://www.rba.gov.au/payments-and-infrastructure/payments-system.html
Maldives' Favara: https://www.mma.gov.mv/#/bankingandpayments/favara
Oman's Domestic Payment Systems: https://cbo.gov.om/Pages/PaymentSystemReforms.aspx
Kazakhstan's Instant Payments System (IPS): https://npck.kz/en/ips/
Qatar's Retail Payment Systems: https://www.qcb.gov.qa/en/Pages/Retail-payment-systems.aspx
Brazil's Pix: https://www.bcb.gov.br/en/financialstability/pix_en
Yemen's Instant Transfers Service (ITS): https://wenet-ye.com/index-en.html
Paraguay's Domestic Payment Systems: https://www.bnf.gov.py/sipap-sistemas-de-pagos-del-paraguay-
Switzerland's SIC5: https://www.six-group.com/de/products-services/banking-services/billing-and-payments/instant-payments.html
Bhutan's Domestic and Regional Payment Systems: https://www.rma.org.bt/dpSystem/#:~:text=Bhutan%20QR%20Code&text=Bhutan%20QR%20Code%20is%20a,the%20need%20of%20additional%20hardware.; https://www.rma.org.bt/rpSystem/
United States' FedNow Service: https://www.frbservices.org/financial-services/fednow
Indonesia's Domestic Payment Systems and QRIS: https://www.bi.go.id/en/fungsi-utama/sistem-pembayaran/default.aspx; https://qris.interactive.co.id/homepage/qris-faq?question=21/berapa-lama-dana-masuk-ke-rekening-setelah-proses-settlement/;https://developers.bri.co.id/en/product/qris
Saudi Arabia's sarie: https://sarie.sa/
Sweden's Domestic Payment Systems: https://www.riksbank.se/en-gb/payments--cash/the-payment-system---rix/

Mauritius' Domestic Payment Systems: https://www.bom.mu/sites/default/files/AR2021/5.payment_systems_and_currency_management.pdf
Moldova's MIA: https://mia.bnm.md/en
Bahrain's Domestic Payment Systems: https://www.cbb.gov.bh/payment-settlement/
Pakistan's Raast: https://www.sbp.org.pk/dfs/Raast.html
Serbia's Domestic Payment Systems: https://www.nbs.rs/en/ciljevi-i-funkcije/platni-sistem/
Jordan's Domestic Payment Systems: https://www.cbj.gov.jo/EN/Pages/Retail_Payment_Systems; https://www.jopacc.com/what-we-do/services-products/cliq-services
India's Unified Payments Interface (UPI): https://www.npci.org.in/what-we-do/upi/product-overview
UK's Faster Payment System: https://www.wearepay.uk/what-we-do/payment-systems/faster-payment-system/
CMA's Success Stories. Accessible at: https://www.cma.se/success-stories
Lyra: https://www.lyra.com/in/base/payment-settlement-guide/
Fonepay: https://fonepay.com/content/settlement-options-instant-settlement; https://www.globalimebank.com/services/qr-code-payment
Brazil's Pix abroad, Bancard and PVS: https://www.bancard.com.py/pix; https://pvs.com.ar/landing/pix/
FPS x PromptPay: https://fps.hkicl.com.hk/eng/fps/consumers/fps_x_promptpay_qr_payment.php
C. Central Bank Announcements, and Specialized Agency News and Reports.
2024 Prime-Time for Real Time Report, by ACI Worldwide and GlobalData. Accessible at: https://www.aciworldwide.com/real-time-payments-report
Real-Time Payments World Map Monthly Reports, by PYMNTS. Accessible at: https://www.pymnts.com/tracker/global-push-for-real-time-payments/
Real-time payments: A global view, by volt. Accessible at: https://www.volt.io/real-time-payments-world-map/
Payment Insights and Expertise, by Payments and Commerce Market Intelligence. Accessible at: https://paymentscmi.com/insights/; https://paymentscmi.com/our-expertise/payments-coffee-chats/
Iran and Russia link their banks in new deal. Source: https://thepaypers.com/online-mobile-banking/iran-and-russia-link-their-banks-in-new-deal--1260079
Official Launching Ceremony of Cross-Border Payment Project between the Republic of Korea and the Kingdom of Cambodia. Source: https://www.nbc.gov.kh/download_files/news_and_events/press_eng/6448PR-NBCPPCBENGVersion.pdf
Official Launching Ceremony of Cross-Border Payment Project between the Republic of Korea and the Kingdom of Cambodia. Source: https://www.nbc.gov.kh/download_files/news_and_events/press_eng/6448PR-NBCPPCBENGVersion.pdf

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Cambodia and Laos launch cross-border payments link. Source: https://www.centralbanking.com/central-banks/payments/7959573/cambodia-and-laos-launch-cross-border-payments-link

Malaysia and Cambodia Launch Cross-Border QR Payments Connectivity. Source: https://www.bnm.gov.my/-/khqr-pr

PhonePe launches cross-border UPI payments in Sri Lanka. Source: https://www.forbesindia.com/article/news/phonepe-launches-crossborder-upi-payments-in-sri-lanka/93103/1#:~:text=Indians%20travelling%20to%20Sri%20Lanka%20can%20now%20make%20payments%20using,showing%20the%20currency%20exchange%20rate.

Mauritius and India launch RuPay and Unified Payments Interface Linkage. Source: https://www.bom.mu/media/media-releases/media-release-mauritius-and-india-launch-rupay-and-unified-payments-interface-linkage

UPI-powered PhonePe App is Now Accepted at Mashreq's NEOPAY Terminals in UAE. Source: https://www.mashreq.com/en/uae/news/2024/march/upi-powered-phonepe-mashreq/

UPI is now accepted in France. Source: https://www.npci.org.in/PDF/npci/press-releases/2024/Press-Release-UPI-is-Now-Accepted-in-France.pdf

UPI is now accepted in Nepal. Source: https://kathmandupost.com/money/2024/03/13/india-launched-quick-response-code-two-weeks-ago-nepal-still-discussing-details

PayNet and BC Card Collaborate to Drive Seamless Digital Payments Between Malaysia and South Korea. Source: https://paynet.my/press-release/2024/PayNet-and-BC-Card-Collaborate-to-Drive-Seamless-Digital-Payments.pdf

"Bancard ahora acepta Pix, el medio de pago más popular de Brasil." Source: https://www.abc.com.py/brandlab/2024/02/07/bancard-ahora-acepta-pix-el-medio-de-pago-mas-popular-de-brasil/

South Korean Tourists Can Now Pay with QR Codes in Cambodia. Source: https://fintechnews.sg/100889/cambodia/south-korean-tourists-can-now-pay-with-qr-codes-in-cambodia/

TWQR mobile payment service launches in South Korea. Source: http://www.afsaworld.org/news/twqr-mobile-payment-service-launches-in-s-korea.aspx

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BI-Fast: Redefining Payment Systems in Indonesia. Source: https://www.finofo.com/blog/bi-fast-redefining-payment-systems-in-indonesia#:~:text=BI%2DFAST%20Processing%3A%20The%20BI,Bali%20Retailers%20holds%20its%20account.

Central Bank of Libya announces launch of LYPAY – an interbank instant payment service. Source: https://libyaherald.com/2024/08/central-bank-of-libya-announces-launch-of-lypay-an-interbank-instant-payment-service/

NBK launches the 'WAMD' Instant Payment service on its mobile banking app. Source: https://thepaypers.com/mobile-payments/nbk-launches-the-wamd-instant-payment-service-on-its-mobile-banking-app--1268899#:~:text=The%20Instant%20Payments%20System%20(WAMD,number%20of%20electronic%20financial%20transactions.