Geoeconomic Competition and Capital Reallocation in Global FX Funding*

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Abstract

We study geoeconomic competition and capital reallocation in global financial markets, using the foreign exchange (FX) funding market as our empirical setting. FX funding, obtained by borrowing one currency while pledging another through FX swaps, is instrumental to cross-border investment and provides high-frequency measures of capital reallocation. Countries compete for FX funding through policy actions that shift investment returns or funding costs, thereby inducing global portfolio rebalancing by private investors. We quantify this competition by measuring how one country's inflow responds to another country's actions, which we call "reallocation exposure." Because observed funding flows reflect common shocks and strategic interactions across countries, bilateral influence is difficult to identify. We resolve this challenge by identifying "funding fronts," the independent margins of portfolio adjustment that enable systematic estimation of reallocation exposure. Applying our framework to a proprietary dataset, we find that FX funding competition is concentrated in a small number of funding fronts, with a dominant U.S. dollar front accounting for most capital reallocation. Consequently, changes in U.S. conditions generate disproportionately large reallocations elsewhere. We use reallocation exposure to construct time-varying measures of geoeconomic power and show that variations systematically track major monetary, fiscal, and geopolitical events. Finally, we characterize the network of financial competition and cooperation and show that strategic responses implied by reallocation exposure align with cross-country movements in policy rates.

JEL Classifications: F31, G12, G15, G28
Keywords: geoeconomic competition; capital reallocation; global FX funding; U.S. dollar dominance; monetary policy independence.

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1 Introduction

International economic competition increasingly plays out through finance (e.g., He, Krishnamurthy, and Milbradt, 2016; Clayton, Maggiori, and Schreger, 2025). Beyond trade and technology, countries engage in geoeconomic competition for global capital, as its allocation shapes domestic investment and economic activity. In normal times, capital flows reflect private investors' global portfolio optimization, which need not align with countries' political alliances. Governments may seek to influence capital flows either indirectly, by affecting the returns and costs that enter investors' investment decisions, or directly, through capital controls and sanctions. Because capital is mobile, however, such policies operate in a competitive environment: efforts to attract capital to one country often divert it from others. Understanding the effectiveness of any policy action, and the resulting dynamics of international financial competition, therefore crucially depends on how capital flows in equilibrium respond to a country's own actions and to those of others.

This paper studies geoeconomic competition and capital reallocation in the global foreign exchange (FX) funding market. In this market, institutions obtain funding in one currency by collateralizing another through FX derivatives such as swaps, generating cross-border funding flows that are instrumental to real economic activity (Powell, 2025). FX funding provides a natural setting to study capital reallocation because funding flows capture high-frequency portfolio rebalancing across countries and currencies. These flows also respond to a wide range of policy actions, including regulations that affect the cost of obtaining funding in a given currency, and monetary or fiscal policies that alter returns on investment financed with that funding. Moreover, because FX funding flows are organized by currency, reallocations can be measured at the level of monetary jurisdictions, bypassing the ambiguities inherent in residency-based classifications (Coppola, Maggiori, Neiman, and Schreger, 2021).

A central challenge in analyzing international capital flows is that observed reallocations reflect equilibrium responses to common shocks and simultaneous actions by multiple countries, making the impact of any one party difficult to isolate (Manski, 1993). Identifying bilateral influence therefore requires understanding the relevant margins of adjustment. In markets for physical goods, consumer preferences and production technology govern substitution across goods. By contrast, investors in financial markets optimize over portfolio payoffs; because individual assets are often close substitutes, rebalancing tends to occur across baskets of assets rather than asset by asset (Markowitz, 1952). Building on this insight, we exploit joint information from FX funding flows and funding prices to recover the long-short currency baskets that form investors' independent margins of adjustment, which we call *funding fronts*. Using funding fronts, we construct measures of *reallocation exposure* that capture how a marginal change in one country's actions reallocate FX funding across others through portfolio adjustments along each front.

Our analysis yields four main results. First, we find that FX funding reallocations are organized around a small number of funding fronts. The dominant front, and thus the most important margin of adjustment, corresponds to demand for U.S. dollar funding from non-U.S. countries. This is followed by a front associated with funding in the euro and the British pound, and a broader core-periphery front involving funding in the dollar, euro, and yen. Second, because the key funding fronts represent demand for a small number of currencies, reallocation exposures are highly asymmetric. In particular, the United States accounts for most equilibrium capital reallocation, reflecting its central positions on the leading funding front. The same intuition that gives rise to trade exposure also drives reallocation exposure: countries that rely on U.S.-centered fronts have limited scope for substitute and are therefore especially sensitive to U.S. shocks and policy changes. Third, we use reallocation exposure to construct time-varying measures of geoeconomic power in FX funding and find that variations systematically track major monetary, fiscal, and geopolitical events. Finally, we characterize the network of financial competition and cooperation across countries and show that strategic responses implied by reallocation exposure align closely with cross-country impulse responses of policy rates. This relationship remains robust after controlling for bilateral ties, as captured by geographic distance, trade intensity, and diplomatic proximity, thereby providing new evidence that international monetary policy independence is constrained by competition for global capital.

We start by constructing a novel dataset of global FX funding quantities. Quantity data in FX funding are scarce, and even when available, often lack the information needed to infer funding that is relevant for a specific horizon. We overcome these limitations using a proprietary dataset on outstanding FX forward and swap positions of banks and non-bank investors, observed across eight major currencies and eight geographic areas from 2012 to 2024. Crucially, the dataset reports the precise remaining maturity of all outstanding contracts, which allows us to construct, for any horizon, the amount of FX funding that is actually in place over that horizon rather than just the outstanding notional of contracts with matching tenor. For example, our measure of three-month funding quantity encompasses contracts with exactly three months remaining maturity, the full contribution of longer-dated contracts spanning the three-month window, and the proportional share of shorter-dated contracts that overlap it. This horizon-specific construction delivers the total funding quantity relevant for assessing funding conditions at a given horizon.

Our new quantity measure reveals three stylized facts about the global FX funding market. First, in the $18.5 trillion global FX funding market, FX forwards account for less than one sixth of outstanding notional. Because FX swaps largely neutralize exchange-rate risk and primarily facilitate borrowing across currencies, their prevalence underscores that this market is used predominantly for funding rather than for directional currency speculation. Second, nearly three quarters of funding quantities at a given horizon arise from contracts with non-matching maturities, highlighting the importance of accounting for the maturity structure. Third, while individual investors tend to specialize in providing or seeking funding in only a few currency pairs, aggregate funding quantities demanded by investors exhibit strong comovement across currencies, suggesting integrated forces that drive global funding reallocation.

We proceed to measure reallocation exposure as the change in one country's equilibrium funding flow induced by a marginal change in another country's policy action, holding all other countries' actions fixed. In practice, such unilateral changes are rarely observed because countries face correlated shocks and respond strategically to one another. To make progress, we re-map the web of funding interactions into a set of mutually independent funding fronts, each representing a distinct margin along which global capital is allocated.

Countries can redirect capital by shifting investors' demand for FX funding (e.g., by changing the return on assets financed in that currency) or by shifting banks' supply of funding (e.g., by changing balance-sheet or regulatory costs).[1] These demand and supply forces show up in two equilibrium objects we observe for each currency over time: funding quantities and the corresponding price of FX funding, measured as the spread between the FX swap-implied borrowing cost of a currency and its risk-free rate (i.e., deviations from covered interest-rate parity). We use the joint movements in quantities and prices to construct funding fronts, which are zero-sum long-short baskets of currencies that split the market into two sides, so that funding drawn to one side is financed by funding supplied by the other. The front weights are chosen so that innovations in front-level quantities and prices are mutually uncorrelated across fronts, allowing each front to be interpreted as an independent direction of equilibrium funding reallocation. In this representation, banks' and investors' constraints operate at the level of funding fronts: adjusting positions along one front does not systematically alter the marginal cost of adjustment along others. This structure permits a tractable analysis of reallocation through a small number of independent margins, which can then be translated back into country-level funding flows.

We identify three major funding fronts that explain most of the variation in the global competition for capital. The leading front is a U.S. dollar front (USD versus the rest). The

[1]While our framework focuses on policies that reallocate funding by shifting investment returns and intermediation costs and takes market participation as given, the baseline environment we characterize provides a benchmark for assessing more restrictive interventions, such as capital controls or sanctions, that also affect participation.

second is a pan-European front that reflects demand for euro (EUR) and pound sterling (GBP) funding primarily against the yen (JPY), with a smaller USD component. The third is a core-periphery front that pits core currencies (USD, EUR, JPY) against the remaining currencies. The explanatory power of additional fronts declines rapidly and remains small. The nature of the top three fronts are stable over the sample period, even as their compositions shift slightly over time. The prominence of the second and third fronts shows that FX funding is not driven by a single dollar funding cycle (Miranda-Agrippino and Rey, 2020); rather, the dynamics of global FX funding are shaped by several independent fronts, with European currencies playing an important role in their own right.

As funding fronts are independent, we measure bilateral reallocation exposures as a sum across fronts. Within each front, reallocation exposure between two countries is given by the product of two components: the responsiveness of funding flows in that front to countries' actions, and the extent to which the two countries participate on that front. Participation corresponds to a country's weight, while a front's responsiveness is proxied by the volatility of funding flows within that front. The intuition is that fronts with greater turnover and rebalancing activity have a larger pool of marginal investors, so a given policy action induces larger reallocations of funding along that front. The funding fronts we estimate from the data show that countries compete along some fronts (weights being of opposite signs) while being aligned along others.[2] By summing across funding fronts, our measure of bilateral reallocation exposure thus captures the net effect across multiple independent margins of portfolio adjustment, underscoring the multidimensional nature of geoeconomic competition.

The estimated reallocation exposure reveals strong asymmetries in geoeconomic competition, with a small set of countries capable of inducing large reallocation of global capital. The United States accounts for the largest reallocation exposure, in the sense that other countries' FX funding is most sensitive to U.S. actions. Quantitatively, aggregate exposure to the U.S. is about 80% larger than that to the euro area and more than twice that to the United Kingdom. Together, the dollar, euro, and pound account for roughly three quarters of our sample countries' reallocation exposures. This concentration reflects these countries' prominent participation in the leading funding fronts, particularly the central role of the U.S. in the dollar front. Because funding fronts define the margins along which global funding reallocates, just as preferences and technology define margins of substitution in trade, our reallocation exposure can be viewed as as a financial analogue of trade exposure. Countries that rely heavily on funding fronts centered on the U.S. are limited in their ability to substitute away from the U.S. and are therefore more vulnerable to U.S. shocks and policy

[2] Our funding fronts summarize what the equilibrium data say and do not take a stand on why countries are aligned, whether because they are hit by similar shocks or because they choose to coordinate their actions.

changes, much as countries highly dependent on a trade partner for key imports or exports are exposed to that partner's actions.

Bilateral reallocation exposures also reveal a network of financial competition and cooperation. The United States and the euro area emerge as universal competitors, in the sense that improvements in either reallocate funding away from others. This pattern arises because, along the major funding fronts, the U.S. and the euro area hold weights that are opposite to each other and to those of most other countries. In contrast, some countries' actions can draw capital toward one another. These positive bilateral effects arise when countries lie on the same side of the major funding fronts. Taken together, these patterns highlight scope for strategic cooperation among some countries, even as others may find it optimal to compete.

Having estimated reallocation exposures, we use them in two applications. First, we map reallocation exposure into time-varying measures of geoeconomic power in FX funding. We define the geoeconomic power of country A over country B as the marginal effect of A's action on B's payoff from FX funding. This definition is the continuous analogue of Clayton, Maggiori, and Schreger (2025), who measure power as the change in B's payoff when A moves between two extreme actions. We focus on the local slope because extreme shifts are typically off the equilibrium path and are not directly observed in the data. To operationalize power empirically, we translate funding reallocation into payoff units by scaling flows by the inverse of B's GDP, reflecting that a given dollar of funding is more consequential for smaller economies.

We find that the strength of a country's power waxes and wanes with major monetary, fiscal, and geopolitical events. Three patterns stand out. First, strong economic fundamentals appear to bolster geoeconomic power: U.S. power rises after the Federal Reserve first signals liftoff from the zero lower bound and again around the announcement of large-scale stimulus programs such as the CHIPS Act and the Inflation Reduction Act. Second, episodes that raise concerns about fiscal soundness are associated with noticeable declines in U.S. power, particularly in the period following the 2017 Tax Cuts and Jobs Act and after the Congressional Budget Office (CBO)'s large upward revision to projected deficits in 2024. Finally, political and policy uncertainty tends to be accompanied by softer geoeconomic power. U.S. power edges down during the prolonged government shutdown, and then stabilizes once the shutdown ends. Similarly, the United Kingdom's power declines sharply around the Brexit referendum and then partially recovers as the Withdrawal Agreement is finalized.

We also quantify each country's cost of wielding its geoeconomic power. As each country's action maximizes its own payoff in equilibrium, exercising power over another country requires deviating from this optimum, which entails a loss that increases with the curvature of its payoff function. Empirically, we find that the United States and the euro area face the lowest costs of using their power, making their substantial geoeconomic power especially usable as a tool for influencing other countries. In contrast, although the United Kingdom possesses significant geoeconomic power, it also bears the highest cost of using that power among our sample countries, rendering it a less effective instrument for influencing others.

As a second application, we use the estimated network of financial competition and cooperation to derive and test model-implied strategic responses across countries. Actions taken to attract foreign funding can be costly. When two countries are aligned, an action by one also raises funding for the other, reducing the latter's incentive to exert costly effort. When two countries are competitors, by contrast, an improvement by one reallocates funding away from the other, increasing the latter's incentive to respond in kind. The strength of these responses thus depends on the responding country's reallocation exposure to the initiating country, as well as on how capital responds to the responding country's own actions.

Using central bank policy rates as an observable form of action, we test our model-implied best response. We find that cross-country policy-rate responses, estimated using a monthly vector autoregression (VAR), are stronger between competitors and weaker between aligned countries. The relationship between model-implied and estimated policy-rate responses is statistically significant and remains robust after controlling for standard proxies for bilateral ties, including geographic distance, trade intensity, and diplomatic proximity. Our results provide new evidence of limits to international monetary policy independence, as monetary policies co-move in part in response to competition for global capital.

This paper contributes to three strands of the literature: (i) international economic competition and cross-border spillovers, (ii) geoeconomic power and strategic policy interactions, and (iii) global currency flows and FX funding markets.

First, we contribute to the literature on how international economic competition is organized and measured. A central challenge, common to both trade and finance, is that observable outcomes reflect the interaction of bilateral linkages and common shocks, giving rise to identification problems closely related to the reflection problem (Manski, 1993). In international trade, this challenge is addressed by imposing structure through consumer preferences and production technology, which discipline substitution patterns and allow competitive pressure to be summarized by elasticities under constant-elasticity-of-substitution (CES) demand or related frameworks (e.g., Krugman, 1980, Anderson and van Wincoop, 2003, Ossa, 2014). Financial markets differ fundamentally. Because agents optimize over portfolio payoffs, the relevant margins of adjustment are typically baskets of assets rather than individual, highly substitutable assets. Building on the insights that correlated assets can be represented by orthogonal portfolios (Markowitz, 1952), we identify *funding fronts*, the baskets of currencies that reflect margins of portfolio adjustment in FX funding markets. In settings where portfolio adjustment governs equilibrium outcomes, this representation allows bilateral reallocation effects to be disentangled from equilibrium co-movement and enables reallocation exposure to be quantified using observed market data. The FX funding market is an increasingly important segment of global capital markets since the Global Financial Crisis (e.g., Du and Huber, 2025). By quantifying how one country's actions reallocate FX funding away from others, our analysis complements the international finance literature on capital allocation and the global transmission of shocks (e.g., Maggiori, Neiman, and Schreger, 2020; Miranda-Agrippino and Rey, 2020; An and Huber, 2025), as well as theoretical work on currency competition and the emergence of dominant international currencies (e.g., Matsuyama, Kiyotaki, and Matsui, 1993; Zhang, 2014; Abadi, Fernàndez-Villaverde, and Sanches, 2025).

Second, we contribute to the growing literature on geoeconomic power and strategic policy interaction. A growing theoretical literature studies how countries compete to accumulate and deploy geopolitical power (e.g., Clayton, Maggiori, and Schreger, 2025; Broner, Martin, Meyer, and Trebesch, 2025), and recent work has begun to construct empirical measures of geopolitical pressure (e.g., Clayton, Maggiori, and Schreger, 2024; Clayton, Coppola, Maggiori, and Schreger, 2025; Bianchi, Horn, Rosso, and Sosa-Padilla, 2025; Liu and Yang, 2025). We provide a market-based and time-varying quantification of geoeconomic power in a highly interconnected financial market by mapping reallocation exposure into payoff units, yielding bilateral measures of power. We further use reallocation exposure to characterize optimal strategic responses across countries, derived from equilibrium adjustments in a network of financial competition and cooperation. Using policy rates as an observable form of action, we show that cross-country monetary policy reactions are systematically stronger between rivals and weaker between aligned countries, providing novel evidence on the trade-off between global capital flow and monetary policy independence (Rey, 2015).

Lastly, we provide a unified framework for understanding both the prices and quantities of global FX funding. Much of the existing work has focused on the price of FX funding, particularly following the post-2008 breakdown of covered interest-rate parity (CIP), which has been linked to balance-sheet constraints faced by intermediaries (e.g., Du, Tepper, and Verdelhan, 2018; Cenedese, Della Corte, and Wang, 2021; Du, Hébert, and Huber, 2023). More recent studies have emphasized quantity-based evidence, exploring the roles of safe-asset scarcity and bank market power, demand for repo financing, and speculative positions in FX forwards (e.g., Moskowitz, Ross, Ross, and Vasudevan, 2024, Kloks, Mattille, and Ranaldo, 2024; Du, Strasser, and Verdelhan, 2025, Dao, Gourinchas, and Itskhoki, 2025; De Leo, Keller, and Zou, 2025). Our conceptual contribution is to show that prices and quantities in FX funding markets must be understood jointly: even without frictions, CIP deviations arise when the marginal funding provider faces a limited balance sheet. This perspective calls for a clean measure of funding quantities relevant for the marginal agent's balance sheet and a framework that incorporates both demand and supply forces. To this end, we make two empirical contributions. First, we construct an improved measure of FX funding quantities at a given horizon by aggregating forward and swap positions across maturities, including non-maturity-matched positions. Second, we study the joint behavior of funding prices and quantities through mutually independent funding fronts, within which prices and quantities interact but remain orthogonal across fronts. These fronts capture distinct dimensions of variation in global FX funding and provide a coherent structure for understanding CIP deviations.

The next section introduces key FX funding concepts, outlines their measurement, and presents three new facts using our proprietary data. Section 3 develops our theoretical framework for geoeconomic competition and capital reallocation. Section 4 presents our empirical measure of reallocation exposure by identifying independent funding fronts in global FX. Section 5 reports our findings on geoeconomic power and strategic competition. Section 6 concludes.

2 FX Funding: Concepts, Data, and New Facts

In this section, we define the price and quantity of FX funding and explain how we measure them in the data. Using our proprietary dataset, we then document three new facts about the FX funding market. Throughout, the U.S. dollar (USD) is the numeraire: exchange rates are expressed as number of foreign currencies per USD, and quantities are measured in USD.

2.1 Price of FX Funding

Consider an investor who needs funding in currency n at date t for τ months and uses USD as collateral. At t, she enters an FX swap: sell USD for n at the spot rate $S_{n,t}$ and agree to buy back USD by delivering n at $t+\tau$ at the forward rate $F_{n,t,t+\tau}$. Let $R_{\$,t,\tau}$ and $R_{n,t,\tau}$ denote gross risk-free rates in USD and n from time t to $t+\tau$. The annualized rate to synthetically borrow 1 unit of currency n using USD is

$$R^{\text{syn}}_{n,t,\tau} \;:=\; R_{\$,t,\tau}\left(\frac{F_{n,t,t+\tau}}{S_{n,t}}\right)^{12/\tau}, \tag{1}$$

where $12/\tau$ annualizes forward points. Covered interest-rate parity (CIP) deviations measure the price of synthetic funding $R^{\text{syn}}_{n,t,\tau}$ relative to borrowing currency n directly at the risk-free rate $R_{n,t,\tau}$, expressed in log differences:

$$P_{n,t,\tau} \;:=\; \ln R^{\text{syn}}_{n,t,\tau} - \ln R_{n,t,\tau}. \tag{2}$$

In a frictionless market satisfying CIP, $P_{n,t,\tau} = 0$, i.e., there is no markup of synthetic funding relative to direct funding. In the data, a negative $P_{n,t,\tau}$ means synthetically funding a foreign currency using USD is cheaper than directly borrowing that foreign currency, which reflects a "USD premium," as documented in post-crisis episodes (Du, Tepper, and Verdelhan, 2018).

Similarly, for any two non-USD currencies n and n', the price of demanding currency n funding and supplying currency n' funding is defined by the triangular arbitrage:

$$P_{n,n',t,\tau} = P_{n,t,\tau} - P_{n',t,\tau}. \tag{3}$$

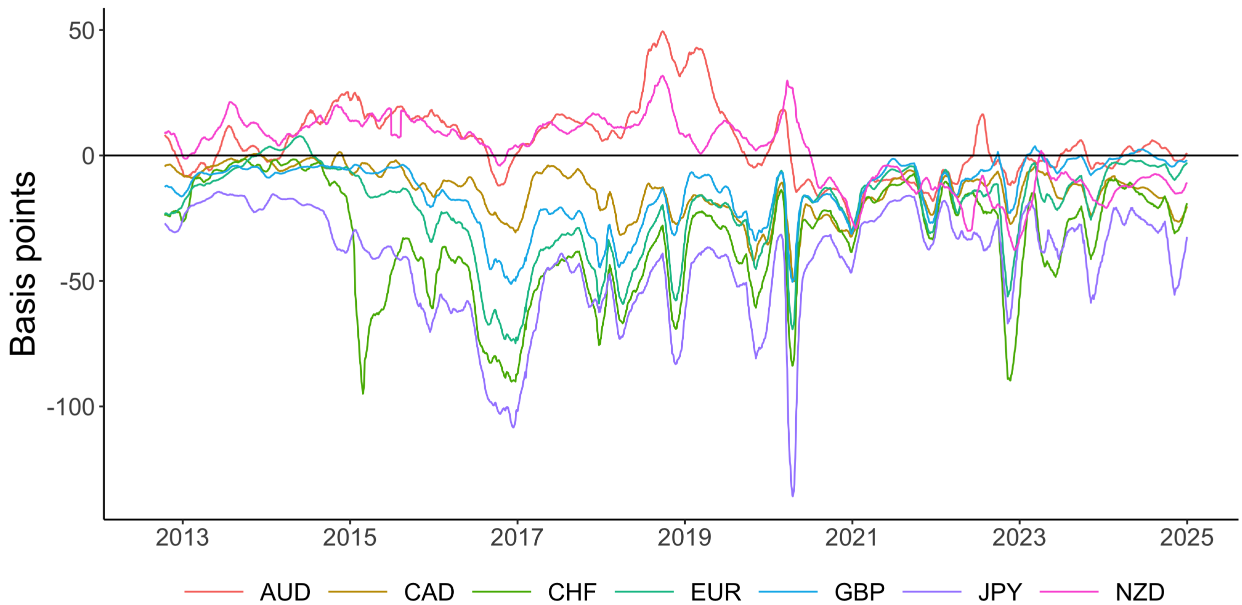
Data Source and Measurement

We obtain spot and forward FX rates from Bloomberg. To measure risk-free discount rates we use Overnight Indexed Swap (OIS) rates, following Du, Hébert, and Huber (2023). OIS is the appropriate benchmark for CIP because it reflects collateralized overnight funding with minimal bank-credit and scarcity premia; the alternative measure using LIBOR embeds bank credit/liquidity risk (also discontinued around 2021), and measures using Treasury yields can be distorted by specialness and regulatory demand. OIS quotes are available for the USD and seven non-USD currencies: Australian dollar (AUD), Canadian dollar (CAD), Swiss franc (CHF), euro (EUR), British pound (GBP), Japanese yen (JPY), and New Zealand dollar (NZD).

A contribution of this paper is to construct a continuous OIS-based series of CIP deviations that spans the CHF and EUR reference-rate transitions. Because these transitions induce level shifts, many studies restrict CHF and EUR samples to single-reference subperiods. We instead splice the pre- and post-transition segments using the overlap window to align levels at each tenor, yielding a single continuous series.

Our sample runs from September 2012 through December 2024, with the start date dictated by the availability of the quantity data described below. We study the most liquid tenors, including 1-month (1M), 3-month (3M), 6-month (6M), and 1-year (1Y). Figure 1 plots $P_{n,t,3\text{M}}$, the 3M price of demand funding in currency n by supplying USD funding for each non-USD currency n, as defined in (2). We observe pronounced comovement across

Figure 1: Price of FX funding across currencies at 3-month tenor



Notes: This figure plots $P_{n,t,3\text{M}}$, the 3M price of obtaining funding in currency n by supplying USD funding for each non-USD currency n. Positive values indicate that borrowing USD synthetically via currency n is cheaper than direct USD funding; negative values indicate the reverse. The series show 30-day moving averages.

currencies, consistent with tightly connected FX funding markets exposed to common supply- and demand-side shocks. Results for other tenors are similar and omitted for brevity.

2.2 Quantity of FX Funding

Our objective is to recover the total quantity relevant for pricing at a given funding horizon. Positions at longer maturities continue to occupy balance-sheet capacity within shorter horizons as they roll down. For example, even if an investor has no outstanding 1-month position today, his balance sheet can be occupied for the next 1-month horizon from a recently entered 3-month USD borrowing. Accordingly, our quantity measure over funding horizon τ aggregates outstanding contracts across all remaining maturities, weighting each position by the share of its life that overlaps $[t, t+\tau]$. This roll-down mapping aligns quantities with the horizon-specific price $P_{n,t,\tau}$ and avoids undercounting by looking only at contracts with tenor τ.

For investor group i demanding funding in currency n on date t, the horizon-τ quantity measure is

$$Q^D_{i,n,t,\tau} := \sum_{m\in\{1W,1M,3M,6M,1Y,\text{Longer}\}} O^D_{i,n,t,m}\, \mu^D_{i,n,t,m}(\tau), \quad \mu^D_{i,n,t,m}(\tau) := \frac{\min\{\tau,\, M^D_{i,n,t,m}\}}{\tau} \in [0,1], \tag{4}$$

where m indexes the maturity buckets, $O^D_{i,n,t,m}$ is the end-of-day outstanding total notional of currency n demanded by investor i on day t in bucket m, and $M^D_{i,n,t,m}$ is the corresponding outstanding-amount-weighted remaining maturity. The weight $\mu^D_{i,n,t,m}(\tau)$ equals 1 when the remaining maturity exceeds τ and scales linearly otherwise. Intuitively, a 1-month contract contributes 1/12 to the 1-year quantity, whereas a 1-year contract contributes fully (weight 1) to the 1-month quantity. We construct the supply-side quantity analogously, $Q^S_{i,n,t,\tau} = \sum_m O^S_{i,n,t,m}\, \mu^S_{i,n,t,m}(\tau)$; the net funding quantity demanded by investor i is $Q_{i,n,t,\tau} = Q^D_{i,n,t,\tau} - Q^S_{i,n,t,\tau}$.

Data Source and Measurement

Our quantity data come from the CLS Group (CLS), which settles FX trades for 72 settlement members, primarily large multinational banks.[3] As the largest single source of FX execution data, CLS covers over 50% of global FX volumes.

We obtain from CLS daily aggregates of outstanding FX swap and forward positions. On each trading day, for each agent-location × currency pair × maturity bucket, we observe (i) the total outstanding notional on the buy and sell sides against all counterparties (including those of the same agent type) and (ii) the outstanding-amount-weighted average remaining maturity within that bucket, which as discussed above, is essential for mapping outstanding notional into relevant FX funding quantity for a given horizon.[4] CLS classifies participating agents into Banks and non-bank Investors (henceforth Investors). We further classify agents into eight locations: United States (US), Euro Zone (EZ), United Kingdom (UK), Japan (JP), Australia (AU), Switzerland (CH), Canada (CA), and Rest of World (ROW).

The raw CLS panel spans 17 currencies from September 2012 to December 2024; for consistency with our price benchmarks, we restrict the analysis to the eight currencies with OIS curves.[5] We convert pair-level positions into currency-level funding demand and sup-

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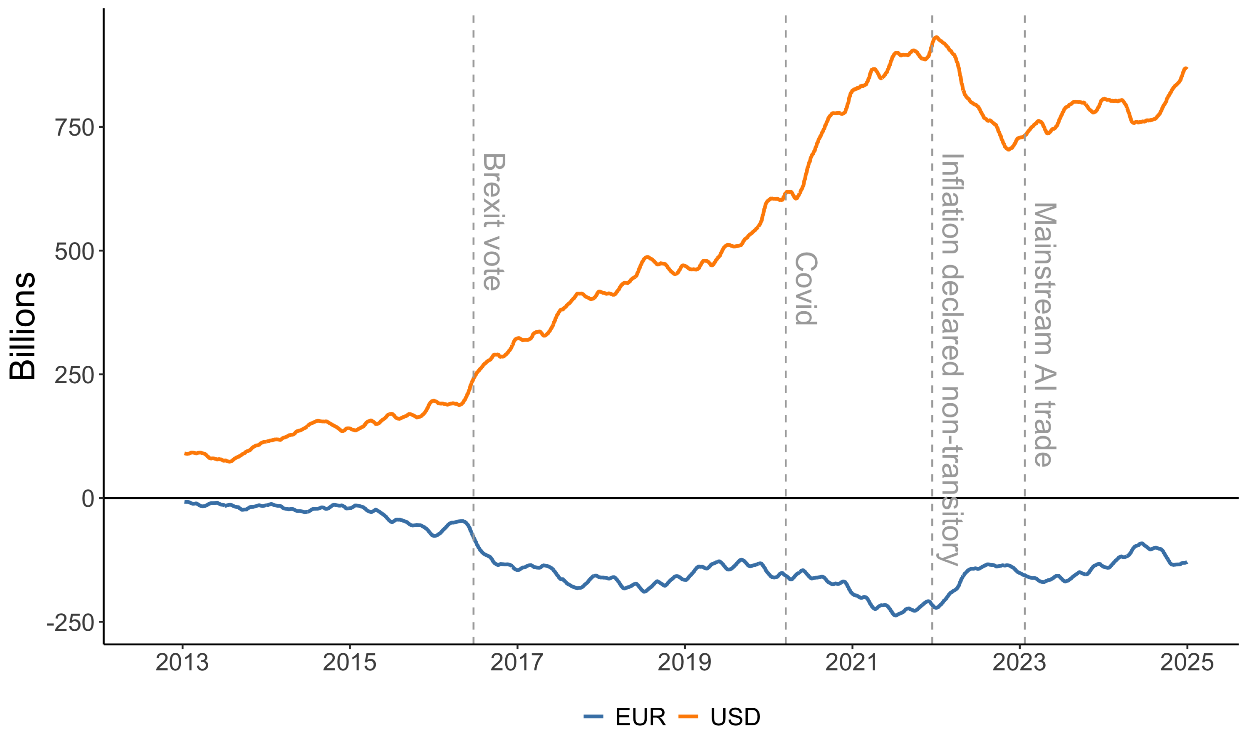
[3] A list of settlement members is available at https://www.cls-group.com/communities/settlement-members/.

[4] CLS defines remaining maturity as the number of calendar days from the current date to the settlement date of the far leg, which is typically two business days after the contractual far date. The maturity buckets are: tomorrow-next and spot-next (overnight variants with remaining maturity $\leq$ 3 days), 1 week (4-9 days), 1 month (10-33 days), 3 months (34-94 days), 6 months (95-185 days), 1 year (186-368 days), and longer ($\geq$ 369 days).

[5] The full CLS currency list comprises the eight OIS currencies plus Danish krone (DKK), Hong Kong dollar (HKD), Israeli new shekel (ILS), Korean won (KRW), Mexican peso (MXN), Norwegian krone (NOK),

Figure 2: FX funding quantity in USD and EUR



Notes: This figure plots the time series of aggregate FX funding quantities in USD and EUR at the 3-month horizon, measured as net customer demand for funding from banks in each currency and expressed in billions of USD. Positive values indicate that customers are net borrowers of the currency (net funding demand), while negative values indicate that they are net lenders (net funding supply).

ply. Specifically, any position that borrows currency n against currency n' is classified as demand for funding in n; the opposite direction is supply of n'. For example, positions in EUR/JPY or EUR/USD that borrow EUR are counted as demand for EUR funding; the offsetting legs supply JPY or USD, respectively. All quantities are expressed in USD using contemporaneous spot exchange rates, consistent with our USD-numeraire convention.

Figure 2 shows the evolution of aggregate FX funding quantities in USD and EUR. Over 2013-2024, net investor demand for USD funding rises almost monotonically from about $100 billion to more than $750 billion, with noticeable accelerations around the Brexit vote and the COVID-19 shock. The series dips temporarily after the U.S. inflation was declared non-transitory before increasing again alongside the recent AI-related rally. By contrast, investors are net suppliers of EUR funding throughout the sample: EUR quantities are negative, becoming more negative after COVID-19 and then partly reversing after the inflation was declared non-transitory. The event markers line up with several turning points

Swedish krona (SEK), Singapore dollar (SGD), and South African rand (ZAR).

in both series, suggesting that major political and macroeconomic developments reshape the demand for dollar and euro funding.

2.3 Three facts about the FX Funding market

Fact 1: In the $18.5T-notional market, forwards account for less than 1/6

An FX swap consists of a near-date exchange of two currencies at the spot rate, together with a reverse exchange at $t+\tau$ using a forward rate fixed today. An outright forward has only the exchange at $t+\tau$. Hence, a forward can be written as an FX swap plus an offsetting spot trade, where the offsetting spot leg carries no funding over the horizon, while the swap leg embodies the borrowing or lending between the two currencies. This equivalence makes clear that a forward contributes to FX funding one-for-one with an otherwise identical swap of the same direction and horizon.[6]

According to our data, the global FX funding market is large. The time-series average of gross outstanding FX swap and forward notional across all currencies is about $18.5 trillion. Of this, FX swaps account for 84% while forwards account for 16%. We illustrate the quantitative importance of swaps versus forwards in Figure 3. For each of our sample currencies, we plot the time-series average of gross notional across swaps and forwards on the x-axis and the ratio of FX forwards to overall notional on the y-axis. Two patterns stand out. First, FX forwards amount to about 16% the total funding. Second, this ratio is even lower for currencies with large overall funding such as the USD and EUR. Because swaps largely neutralize exchange-rate risk and primarily facilitate cross-currency borrowing and lending, the fact that most outstanding notional is in swaps indicates that this market is used predominantly for funding rather than for taking directional currency risk.

Fact 2: Nearly 3/4 of FX funding at a given horizon comes from contracts with non-matching tenors

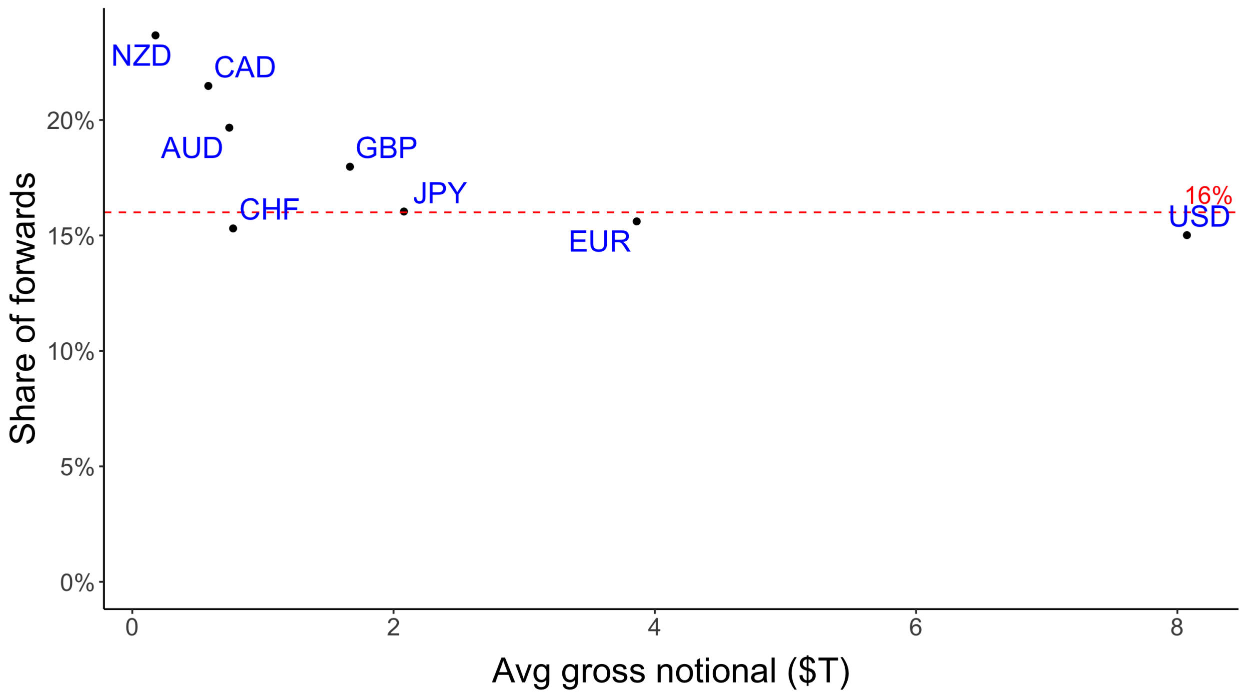
Table 1 quantifies how maturity bucket m contributes to horizon-τ funding quantity. We define the market-weighted share as:[7]

$$\text{Share}_m(\tau) := \frac{\sum_{i,n,t} O^D_{i,n,t,m}\, \mu^D_{i,n,t,m}(\tau)}{\sum_{i,n,t} Q^D_{i,n,t,\tau}}. \tag{5}$$

[6] One may argue that end-users may transact forwards to speculate rather than to obtain funding per se. However, the counterparty that intermediates the forward typically hedges FX risk with a spot trade, turning the forward into a swap with the same implied FX funding quantity.

[7] We compute shares using demand-side quantities. By market clearing, the corresponding supply-side shares are identical, so we report demand-based shares only.

Figure 3: Swaps versus forwards



Notes: This figure plots, for each currency, the time-series average of gross outstanding FX swap and forward positions on the x-axis (in trillions of USD) and the ratio of FX forward notional to overall notional on the y-axis.

The numerator aggregates, across investors i, currencies n, and dates t, the portion of horizon-τ funding quantity attributable to contracts in maturity bucket m; the denominator is total horizon-τ funding quantity. By construction, $\sum_m \text{Share}_m(\tau) = 1$.

Two facts stand out. First, diagonal entries ($m = \tau$) are small—26% (1M), 44% (3M), 24% (6M), and 26% (1Y). Second, off-diagonal contributions are large; for example, the 3M bucket accounts for 45% of the 1M funding quantities. Thus, using only same-tenor contracts (e.g., 1M positions for 1M funding) misses more than half of the relevant quantity. Correct measurement requires the roll-down mapping in (4), which translates outstanding positions into horizon-τ funding quantities.

Fact 3: Individual trading is specialized, but aggregate trading is integrated

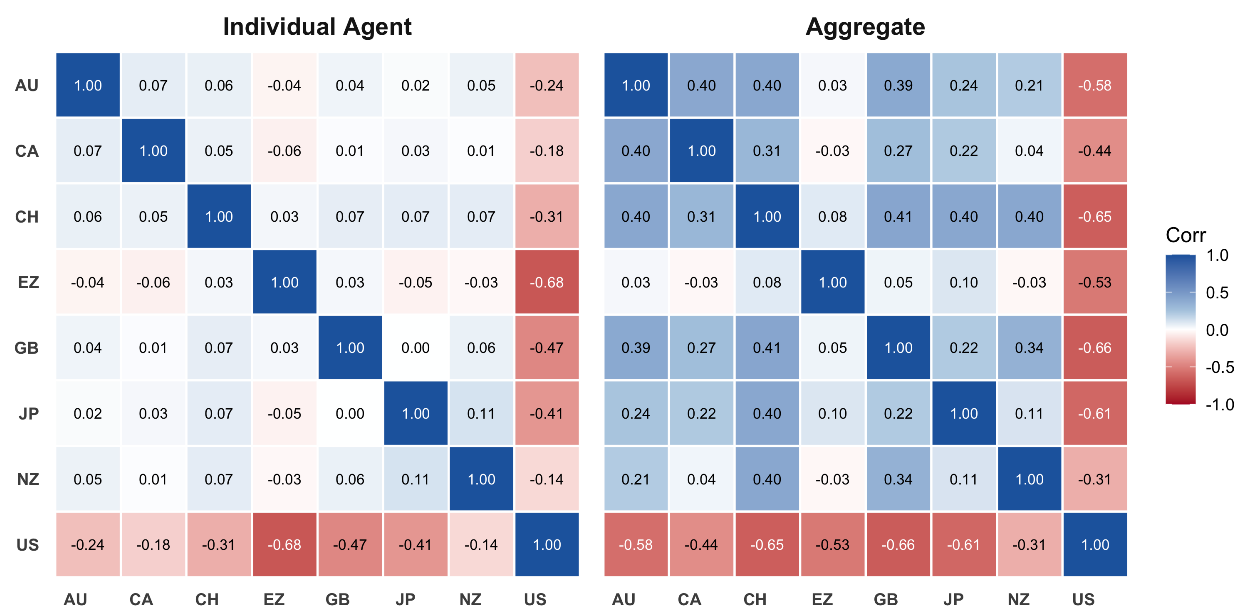
Figure 4 compares cross-currency correlations in FX funding quantity changes at the individual and aggregate level. In the left panel, we first compute, for each agent group, the time-series correlation of its funding quantity changes for each currency pair, and then average these correlations across agents. These agent-level correlations are close to zero for most

Table 1: Contribution of maturity buckets m to horizon-τ funding quantities

Maturity bracket	1M Funding	3M Funding	6M Funding	1Y Funding
1W	2%	1%	1%	1%
1M	26%	14%	11%	9%
3M	45%	44%	35%	29%
6M	14%	22%	24%	21%
1Y	9%	14%	21%	26%
longer	3%	5%	8%	14%

Notes: Rows are CLS maturity buckets $\{1W, 1M, 3M, 6M, 1Y, \text{Longer}\}$; columns are funding horizon $\{1M, 3M, 6M, 1Y\}$. Each cell is the market-weighted share (percent) of horizon-τ funding quantities accounted for by bucket m, aggregated over all investor groups i, currencies n, and dates t.

Figure 4: Correlation in individual vs. aggregate trading



Notes: This figure reports correlations of FX funding quantity changes across currencies. The left panel shows, for each pair of currencies, the average correlation of FX funding quantity changes computed at the agent level and then averaged across agents. The right panel shows the corresponding correlations after first aggregating funding quantity changes across all investors by currency.

non-USD currency pairs, while correlations involving the U.S. dollar are negative. This pattern is consistent with individual agents specializing in providing or seeking funding in only a small set of currency pairs. In the right panel, once we aggregate funding quantity changes across all investors, funding quantities in non-US currencies move together strongly and are jointly negatively correlated with U.S. dollar funding. Thus, even though individual trading is specialized, aggregate funding demand is highly integrated across currencies, suggesting common forces that tilt global FX funding toward or away from the dollar.

3 Theoretical Foundation

This section provides a theoretical foundation for funding fronts and for the bilateral reallocation exposures that are the key empirical objects in the paper. We model a stylized FX funding market in which investors demand FX funding to acquire foreign assets and banks intermediate these flows by supplying funding across currencies. Countries can take costly actions that shift expected returns on domestic investment opportunities and/or the marginal costs banks face when providing funding in their currencies. Taking countries' actions as given, Section 3.1 characterizes the equilibrium that jointly determines funding prices and funding quantities; the equilibrium mapping is governed by high-dimensional capacity matrices that summarize how costly it is for banks and investors to scale multi-currency funding positions. Section 3.2 introduces funding fronts, a portfolio rotation that orthogonalizes changes in funding prices and funding quantities, and allows for capacity matrices to be simplified. Building on this representation, Section 3.3 defines reallocation exposure and shows how it decomposes across fronts into a product of front overlap and front responsiveness, motivating an empirically implementable proxy. Finally, Sections 3.4 and 3.5 apply these exposure measures to quantify geoeconomic power in global FX funding markets and to derive testable implications for strategic policy responses across countries.

3.1 Market Equilibrium

We begin by characterizing the market equilibrium, taking countries' actions as given. There are $N + 1$ countries indexed by $n = 0, \ldots, N$, with country 0's currency (USD) as the numeraire. Let $P_{n,t}$ denote the equilibrium price of obtaining funding in currency n against USD at time t. By triangular arbitrage, the price of obtaining funding in currency n against currency m at time t is $P_{n,t} - P_{m,t}$.

A representative bank can supply funding across any currency pair. As in the preceding data construction, for each currency n we aggregate across all pairs that borrow or lend in n and denote the bank's net supply of funding in currency n by $Q_{B,n,t}$ (subscript B for bank). Because synthetic FX funding raises funding in one currency while pledging another as collateral, $\sum_{n=0}^{N} Q_{B,n,t} = 0$ at any time t. Equivalently, the bank's net USD funding position is determined as the residual,

$$Q_{B,0,t} = -\sum_{n=1}^{N} Q_{B,n,t}. \tag{6}$$

Let $c_{n,t}$ denote the bank's marginal cost of supplying funding in currency n at time t. Only relative costs matter: the per-unit cost of supplying currency n funding against the USD numeraire is $c_{n,t} - c_{0,t}$, so a higher $c_{n,t}$ makes supplying that currency more expensive for banks. Denote the vectors

$$\mathbf{Q}_{B,t} := (Q_{B,1,t}, \ldots, Q_{B,N,t})^\top, \qquad \mathbf{P}_t := (P_{1,t}, \ldots, P_{N,t})^\top, \qquad \mathbf{c}_t^{\text{rel}} := \big(c_{1,t} - c_{0,t}, \ldots, c_{N,t} - c_{0,t}\big)^\top.$$

Given equilibrium funding prices, banks choose $\mathbf{Q}_{B,t}$ to maximize a quadratic objective,

$$\max_{\mathbf{Q}_{B,t}} \ \mathbf{Q}_{B,t}^\top\big(\mathbf{P}_t - \mathbf{c}_t^{\text{rel}}\big) - \frac{1}{2}\mathbf{Q}_{B,t}^\top \boldsymbol{\Gamma}_B \mathbf{Q}_{B,t}, \tag{7}$$

where $\boldsymbol{\Gamma}_B$ is the capacity matrix that summarizes how costly it is for banks to expand a vector of funding positions across currencies in a multi-asset setting. The diagonal elements of this $N \times N$ symmetric positive definite matrix govern the marginal cost of scaling positions in each currency, while the off-diagonal elements capture cross-currency interactions, that is, how positions in one currency affect the marginal cost of taking positions in another. Together, the quadratic term captures capacity limits that could result from risk aversion or balance sheet costs. The first-order condition implies the bank supply schedule,

$$\boldsymbol{\Gamma}_B \mathbf{Q}_{B,t}^* = \mathbf{P}_t - \mathbf{c}_t^{\text{rel}}. \tag{8}$$

Similarly, a representative investor may demand funding across any currency pair. As with banks, let $Q_{I,n,t}$ denote the net quantity of funding demanded in currency n at time t. Let $r_{n,t}$ denote the per-unit return from investing in country n. Only relative returns matter: the investor's per-unit payoff from demanding funding in currency n against the USD numeraire is $r_{n,t} - r_{0,t}$. Denote the vectors

$$\mathbf{Q}_{I,t} := (Q_{I,1,t}, \ldots, Q_{I,N,t})^\top, \qquad \mathbf{r}_t^{\text{rel}} := \big(r_{1,t} - r_{0,t}, \ldots, r_{N,t} - r_{0,t}\big)^\top.$$

Given equilibrium funding prices, the investor chooses $\mathbf{Q}_{I,t}$ to maximize a quadratic objective,

$$\max_{\mathbf{Q}_{I,t}} \ \mathbf{Q}_{I,t}^\top\big(\mathbf{r}_t^{\text{rel}} - \mathbf{P}_t\big) - \frac{1}{2}\mathbf{Q}_{I,t}^\top \boldsymbol{\Gamma}_I \mathbf{Q}_{I,t}, \tag{9}$$

where $\boldsymbol{\Gamma}_I$ is the capacity matrix that summarizes investors' capacity constraints for expanding a vector of funding positions across currencies in a multi-asset setting. Also $N \times N$, symmetric, and positive definite, $\boldsymbol{\Gamma}_I$ could reflect rollover risk, portfolio risk limits, or leverage/margin requirements that make it increasingly costly for investors to scale cross-currency positions. The first-order condition implies the investor demand schedule,

$$\boldsymbol{\Gamma}_I \mathbf{Q}^*_{I,t} = \mathbf{r}^{\text{rel}}_t - \mathbf{P}_t. \tag{10}$$

Market clearing requires $\mathbf{Q}^*_{B,t} = \mathbf{Q}^*_{I,t} \equiv \mathbf{Q}_t$. Combining (8) and (10) yields the equilibrium funding quantity and price:

$$\mathbf{Q}_t = (\boldsymbol{\Gamma}_B + \boldsymbol{\Gamma}_I)^{-1}\Big(\mathbf{r}^{\text{rel}}_t - \mathbf{c}^{\text{rel}}_t\Big), \tag{11}$$

$$\mathbf{P}_t = \boldsymbol{\Gamma}_B(\boldsymbol{\Gamma}_B + \boldsymbol{\Gamma}_I)^{-1}\mathbf{r}^{\text{rel}}_t + \boldsymbol{\Gamma}_I(\boldsymbol{\Gamma}_B + \boldsymbol{\Gamma}_I)^{-1}\mathbf{c}^{\text{rel}}_t. \tag{12}$$

These expressions formalize two basic intuitions. First, funding quantities increase when a currency becomes more attractive to investors (higher $\mathbf{r}^{\text{rel}}_t$) or less costly for banks to supply (lower $\mathbf{c}^{\text{rel}}_t$). Second, funding prices rise when either investors are willing to pay more to obtain the funding (higher $\mathbf{r}^{\text{rel}}_t$) or banks require higher compensation to supply it (higher $\mathbf{c}^{\text{rel}}_t$).

At the same time, (11) and (12) highlight the importance of the capacity matrices $\boldsymbol{\Gamma}_B$ and $\boldsymbol{\Gamma}_I$, which governs the mapping from demand and supply shifters $\mathbf{r}^{\text{rel}}_t$ and $\mathbf{c}^{\text{rel}}_t$ to equilibrium outcomes $\mathbf{Q}_t$ and $\mathbf{P}_t$. These matrices capture cross-currency interactions in banks' supply and investors' demand; high-dimensional in nature, they are difficult to observe directly. To make progress, we use funding fronts in the next subsection to study these matrices under a flexible structure that yields a transparent decomposition of how shocks and policy actions reallocate global funding.

3.2 Funding Fronts

This section introduces structure on the capacity matrices $\boldsymbol{\Gamma}_B$ and $\boldsymbol{\Gamma}_I$ to yield economically rich yet empirically measurable objects. We proceed in two steps. First, we perform a novel change of basis that rotates the data into *funding fronts*: long-short portfolios of currencies where innovations in funding prices and funding quantities are mutually uncorrelated across fronts. This rotation simply reorganizes the observed variation in the data and imposes no economic restrictions. Second, working in this funding-front representation, we model banks' and investors' capacities to scale FX funding positions at the level of funding fronts: the marginal cost of expanding bank supply and the marginal willingness of investors to expand demand along a given front depend on conditions specific to that front and not on conditions in other fronts. Under this structure, the market can be analyzed front by front as a collection of independent margins of adjustment.

Let $\Delta\mathbf{P}_t := \mathbf{P}_t - \mathbf{P}_{t-1}$ and $\Delta\mathbf{Q}_t := \mathbf{Q}_t - \mathbf{Q}_{t-1}$, and write

$$\boldsymbol{\Sigma}_P := \mathrm{var}(\Delta\mathbf{P}_t), \qquad \boldsymbol{\Sigma}_Q := \mathrm{var}(\Delta\mathbf{Q}_t).$$

Consider a special case in which changes in funding prices and funding quantities are uncorrelated across currencies (formally, $\boldsymbol{\Sigma}_P$ and $\boldsymbol{\Sigma}_Q$ are diagonal). In this case, shocks that move the equilibrium in one currency do not, in a systematic way, spill over into the equilibrium of other currencies. In other words, each currency's funding market behaves as a largely self-contained margin. It is then natural to assume that an agent's capacity to scale funding positions is also currency specific. For example, because there is no spillover across currencies, bank's marginal cost of expanding supply in currency n depends primarily on the bank's position in currency n, not on its positions in other currencies. This currency-specific capacity can be captured by diagonal capacity matrices, reducing the number of unknown parameters from N^2 to N:

$$\boldsymbol{\Gamma}_B = \mathrm{diag}(\gamma_{B,1}, \ldots, \gamma_{B,N}), \qquad \boldsymbol{\Gamma}_I = \mathrm{diag}(\gamma_{I,1}, \ldots, \gamma_{I,N}).$$

In the data, funding prices and quantities are not mutually uncorrelated across currencies. We therefore construct funding fronts that rotate the system by jointly orthogonalizing front-level price changes and front-level quantity changes. This rotation recovers a set of independent margins of adjustment, allowing the intuition developed in the currency-by-currency special case to extend naturally to the empirical setting.

Specifically, we construct K funding fronts, where $K \leq N$ allows for dimension reduction. A funding front is a long-short portfolio of currencies that satisfies market clearing within the portfolio. Formally, front k is defined by a participation weight vector $\mathbf{w}_k = (w_{0,k}, w_{1,k}, \ldots, w_{N,k})^\top$ such that $\sum_{n=0}^{N} w_{n,k} = 0$. Currencies with $w_{n,k} > 0$ lie on the positive side of the front and currencies with $w_{n,k} < 0$ lie on the negative side. The zero-sum restriction ensures that net funding absorbed by the positive side is financed by net funding supplied by the negative side.

With USD as the numeraire, $P_{0,t} \equiv 0$. The funding price of any front k is the corresponding portfolio of currency funding prices,

$$P_{k,t}^{\mathrm{front}} = \sum_{n=1}^{N} w_{n,k} P_{n,t}. \tag{13}$$

To define front quantities, let $Q^{\text{front}}_{k,t}$ denote the net amount of funding directed toward the positive-weight side of front k at time t. A one-unit increase in $Q^{\text{front}}_{k,t}$ is allocated across currencies in proportion to the weights, such that currency n receives $w_{n,k}$, which is an inflow if $w_{n,k} > 0$ and an outflow if $w_{n,k} < 0$. Consequently, the funding quantity of any country n is the weighted sum of quantities across fronts:

$$Q_{n,t} = \sum_{k=1}^{K} w_{n,k} Q^{\text{front}}_{k,t}. \tag{14}$$

The next proposition shows that the participation weights can be chosen so that changes in funding prices and funding quantities are mutually uncorrelated across fronts. Appendix A.1 provides an explicit construction of these weights from the currency-level covariance matrices $\mathbf{\Sigma}_P$ and $\mathbf{\Sigma}_Q$.

PROPOSITION 1. *There exists a collection of participation weights $\{w_{n,k}\}$ such that the resulting funding fronts satisfy*

$$\operatorname{cov}\big(\Delta P^{\text{front}}_{k,t+1}, \Delta P^{\text{front}}_{j,t+1}\big) = 0 \quad (k \neq j), \qquad \operatorname{var}\big(\Delta P^{\text{front}}_{k,t+1}\big) = 1, \tag{15}$$

and

$$\operatorname{cov}\big(\Delta Q^{\text{front}}_{k,t+1}, \Delta Q^{\text{front}}_{j,t+1}\big) = 0 \quad (k \neq j). \tag{16}$$

The set of weights satisfying (15) and (16) is identified up to column permutation, sign, and orthonormal rotations within any group of equal eigenvalues.

Let $\mathbf{W} \in \mathbb{R}^{N \times K}$ collect the non-numeraire participation weights, with (n, k) element $w_{n,k}$ for $n = 1, \ldots, N$. The bank and investor capacity matrices expressed in the funding-front basis are

$$\mathbf{\Gamma}^{\text{front}}_B := \mathbf{W}^\top \mathbf{\Gamma}_B \mathbf{W}, \qquad \mathbf{\Gamma}^{\text{front}}_I := \mathbf{W}^\top \mathbf{\Gamma}_I \mathbf{W}.$$

Similar to the special case, once positions are expressed in funding fronts, the marginal cost of expanding bank supply and the marginal willingness of investors to expand demand along a given front depend only on conditions in that front, and not others. Specifically, the front-level capacity matrices are diagonal:[8]

$$\mathbf{\Gamma}^{\text{front}}_B = \operatorname{diag}(\gamma^{\text{front}}_{B,1}, \ldots, \gamma^{\text{front}}_{B,K}), \qquad \mathbf{\Gamma}^{\text{front}}_I = \operatorname{diag}(\gamma^{\text{front}}_{I,1}, \ldots, \gamma^{\text{front}}_{I,K}), \tag{17}$$

[8] Appendix A.2 gives necessary and sufficient conditions under which (17) holds. The conditions are stated in terms of the primitive currency-space capacity matrices $\mathbf{\Gamma}_B$ and $\mathbf{\Gamma}_I$ and the covariance structure of $\Delta\mathbf{P}_t$ and $\Delta\mathbf{Q}_t$.

where the diagonal elements $\gamma_{B,k}^{\text{front}} > 0$ and $\gamma_{I,k}^{\text{front}} > 0$ summarize the tightness of bank and investor capacity along front k.

To express supply and demand shifters in the same front basis, define the return and funding-cost shifters of front k as the corresponding long-short portfolios:

$$r_{k,t}^{\text{front}} := \sum_{n=0}^{N} w_{n,k} r_{n,t}, \qquad c_{k,t}^{\text{front}} := \sum_{n=0}^{N} w_{n,k} c_{n,t}. \tag{18}$$

Under (17), each funding front clears independently. Using the equilibrium conditions (11) and (12), for each front k, bank supply and investor demand satisfy

$$P_{k,t}^{\text{front}} - c_{k,t}^{\text{front}} = \gamma_{B,k}^{\text{front}} Q_{k,t}^{\text{front}}, \qquad r_{k,t}^{\text{front}} - P_{k,t}^{\text{front}} = \gamma_{I,k}^{\text{front}} Q_{k,t}^{\text{front}}. \tag{19}$$

Solving the two equations yields

$$Q_{k,t}^{\text{front}} = \frac{r_{k,t}^{\text{front}} - c_{k,t}^{\text{front}}}{\gamma_{B,k}^{\text{front}} + \gamma_{I,k}^{\text{front}}}, \qquad P_{k,t}^{\text{front}} = \frac{\gamma_{B,k}^{\text{front}} r_{k,t}^{\text{front}} + \gamma_{I,k}^{\text{front}} c_{k,t}^{\text{front}}}{\gamma_{B,k}^{\text{front}} + \gamma_{I,k}^{\text{front}}}. \tag{20}$$

This shows that in equilibrium, each funding front behaves like an independent funding market with its own supply and demand shifters.

3.3 Reallocation Exposure

Using funding fronts, we quantify how policy actions in one country redirect global FX funding across destinations. We model each country n as taking a costly action $a_{n,t}$ that affects both the country's return to foreign capital, $r_{n,t}$, and banks' marginal cost of supplying funding in that currency, $c_{n,t}$:

$$r_{n,t}(a_{n,t}) = \bar{r}_{n,t} + \varphi_r a_{n,t} \qquad c_{n,t}(a_{n,t}) = \bar{c}_{n,t} + \varphi_c a_{n,t}, \tag{21}$$

where $\varphi_r \geq 0$ and $\varphi_c \leq 0$ determine whether the action operates through returns, funding costs, or both. For example, regulatory actions that relax intermediaries' balance-sheet constraints primarily lower funding costs ($\varphi_r = 0$, $\varphi_c < 0$), industrial policies that raise domestic investment opportunities primarily raise returns ($\varphi_r > 0$, $\varphi_c = 0$), and monetary policy can affect both channels ($\varphi_r \neq 0$, $\varphi_c \neq 0$).

Our central object is the *reallocation exposure* from country n to country m,

$$\frac{\partial Q_{m,t}}{\partial a_{n,t}}, \tag{22}$$

the partial effect of n's action on the equilibrium funding received by m, holding all other countries' actions fixed.

Using the front representation of country-level quantities in (14), reallocation exposure can be computed by tracking how $a_{n,t}$ shifts each front and then how changes in each front map back to country m. First, $a_{n,t}$ affects front-level shifters through the participation weights. By (18) and (21),

$$\frac{\partial r_{k,t}^{\text{front}}}{\partial a_{n,t}} = w_{n,k}\varphi_r, \qquad \frac{\partial c_{k,t}^{\text{front}}}{\partial a_{n,t}} = w_{n,k}\varphi_c. \tag{23}$$

Second, because the equilibrium is separable across fronts, front k's equilibrium quantity depends only on its own shifters $r_{k,t}^{\text{front}}$ and $c_{k,t}^{\text{front}}$. Combining this separability with the mapping (14) and the chain rule yields

$$\begin{aligned}\frac{\partial Q_{m,t}}{\partial a_{n,t}} &= \sum_{k=1}^{K} \frac{\partial Q_{m,t}}{\partial Q_{k,t}^{\text{front}}} \left(\frac{\partial Q_{k,t}^{\text{front}}}{\partial r_{k,t}^{\text{front}}} \frac{\partial r_{k,t}^{\text{front}}}{\partial a_{n,t}} + \frac{\partial Q_{k,t}^{\text{front}}}{\partial c_{k,t}^{\text{front}}} \frac{\partial c_{k,t}^{\text{front}}}{\partial a_{n,t}} \right) \\ &= \sum_{k=1}^{K} \underbrace{w_{n,k} w_{m,k}}_{\text{front overlap}} \underbrace{\frac{\varphi_r - \varphi_c}{\gamma_{B,k}^{\text{front}} + \gamma_{I,k}^{\text{front}}}}_{\text{front responsiveness}} .\end{aligned} \tag{24}$$

The overlap term $w_{n,k} w_{m,k}$ captures how strongly countries n and m participate in the same front and on which side. If $w_{n,k}$ and $w_{m,k}$ have the same sign, an action that improves country n shifts funding toward the side of the front that includes m. If they have opposite signs, it shifts funding away from m along that front. The responsiveness term captures how sensitively front-level quantities respond to policy actions. The factor $\varphi_r - \varphi_c$ is common across fronts and summarizes the nature of the action, while $1/(\gamma_{B,k}^{\text{front}} + \gamma_{I,k}^{\text{front}})$ measures how elastic funding is along front k.

The overlap component $w_{n,k} w_{m,k}$ is directly observed from the estimated funding fronts. The remaining object is the front responsiveness, which depends on the policy loadings (φ_r, φ_c) and the unobserved capacity parameters $(\gamma_{B,k}^{\text{front}}, \gamma_{I,k}^{\text{front}})$. To obtain an empirically implementable proxy, we assume that the front-level elasticity is proportional to the observed volatility of within-front reallocations. For some scaling constant $L > 0$,

$$\frac{1}{\gamma_{B,k}^{\text{front}} + \gamma_{I,k}^{\text{front}}} = L\,\sigma(\Delta Q_{k,t}^{\text{front}}). \tag{25}$$

Because funding fronts are constructed so that $\Delta Q_{k,t}^{\text{front}}$ is orthogonal across k, $\sigma(\Delta Q_{k,t}^{\text{front}})$ captures reallocation intensity within front k rather than reflecting spillovers from other fronts. Consequently, since $\varphi_r - \varphi_c$ is common across fronts, reallocation exposure is identified up to a scale constant common across all countries. In particular, we obtain the proxy

$$\frac{\partial Q_{m,t}}{\partial a_{n,t}} \propto \sum_{k=1}^{K} w_{n,k} w_{m,k}\, \sigma(\Delta Q_{k,t}^{\text{front}}), \tag{26}$$

This proxy summarizes how actions in one country reallocate global funding toward or away from other countries through the independent margins defined by funding fronts.

3.4 Geoeconomic Power

We now apply the concept of reallocation exposure to construct a proxy for geoeconomic power in the global FX funding market.

We start by defining the value function of country n at time t as

$$V_{n,t}(a_{0,t}, a_{1,t}, \ldots, a_{N,t}) := g(Q_{n,t}(a_{0,t}, a_{1,t}, \ldots, a_{N,t})) - \frac{\theta}{2} a_{n,t}^2, \tag{27}$$

where g is increasing and concave ($g'(\cdot) > 0$ and $g''(\cdot) < 0$), so foreign funding is valuable but delivers diminishing marginal benefits. The term $Q_{n,t}$ is the equilibrium foreign funding attracted by country n, which depends on all countries' actions. The parameter $\theta > 0$ captures the quadratic cost of taking action $a_{n,t}$.

In equilibrium, country n's action satisfies

$$\frac{\partial V_{n,t}}{\partial a_{n,t}} = g'(Q_{n,t}) \frac{\partial Q_{n,t}}{\partial a_{n,t}} - \theta a_{n,t} = 0. \tag{28}$$

An infinitesimal change around a country's equilibrium $a_{n,t}$ does not change its value function $V_{n,t}$, but it can affect another country's value function $V_{m,t}$. We therefore define the geoeconomic power of country n over another country m as

$$\frac{\partial V_{m,t}}{\partial a_{n,t}} = g'(Q_{m,t}) \frac{\partial Q_{m,t}}{\partial a_{n,t}}. \tag{29}$$

This measures the first-order sensitivity of country m's payoff to country n's action. If country n moves its action from the equilibrium $a_{n,t}$ to $a_{n,t} + \Delta a$, the resulting change in $V_{m,t}$ is approximately

$$\frac{\partial V_{m,t}}{\partial a_{n,t}} \Delta a. \tag{30}$$

Our definition can be viewed as the continuous analogue of Clayton, Maggiori, and Schreger (2025), who define power as the change in $V_{m,t}$ induced by moving n's action between two extreme choices.

To take (29) to the data, we need the reallocation exposure $\partial Q_{m,t}/\partial a_{n,t}$ from (24), and we need $g'(Q_{m,t})$, the marginal value of one additional unit of foreign funding for country m. To capture diminishing marginal benefits with scale and to make power comparable across countries, we assume $g(Q) = \ln Q$. We evaluate this marginal value at a reference level proportional to average GDP, capturing that a one-dollar reallocation in FX funding has a larger payoff impact for smaller economies.

Our empirical proxy for the geoeconomic power of country n over country m is:

$$\frac{\sum_{k=1}^{K} w_{n,k} w_{m,k}\, \sigma\big(\Delta Q_{k,t}^{\text{front}}\big)}{\text{GDP}_m}. \tag{31}$$

Aggregating across all other countries, we define total geoeconomic power of country n as[9]

$$\frac{\sum_{m\neq n} \left|\sum_{k=1}^{K} w_{n,k} w_{m,k}\, \sigma\big(\Delta Q_{k,t}^{\text{front}}\big)\right|}{\sum_{m\neq n} \text{GDP}_m}. \tag{32}$$

This measure reflects the average magnitude of n's influence on a GDP-weighted rest of the world.

We also study the cost of exercising geoeconomic power for country n. Let Δa be a small deviation from the equilibrium action, holding other countries' actions fixed. A second-order expansion around the optimum implies that the associated change in country n's payoff is approximately

$$V_{n,t}(a_{n,t} + \Delta a, a_{-n,t}) - V_{n,t}(a_{n,t}, a_{-n,t}) \approx \frac{1}{2}\frac{\partial^2 V_{n,t}}{\partial a_{n,t}^2}(\Delta a)^2. \tag{33}$$

Since the country's problem is concave, any deviation reduces $V_{n,t}$ and the loss grows quadratically in Δa. This motivates defining the cost of exercising power as the local capacity

$$-\frac{\partial^2 V_{n,t}}{\partial a_{n,t}^2} = -g''(Q_{n,t})\left(\frac{\partial Q_{n,t}}{\partial a_{n,t}}\right)^2 - g'(Q_{n,t})\frac{\partial^2 Q_{n,t}}{\partial a_{n,t}^2} + \theta. \tag{34}$$

A higher value of $-\partial^2 V_{n,t}/\partial a_{n,t}^2$ means that country n's payoff falls more steeply as it moves away from its equilibrium action, so its power is more costly to deploy.

Using the same empirical proxies as above and dropping the common term θ, we estimate

[9] We sum the absolute reallocation effect across counterparties because market clearing implies that an action that redirects capital toward some destinations must redirect it away from others, so signed effects can mechanically cancel in the aggregate.

the cost of exercising power as

$$\left(\frac{\sum_{k=1}^{K} w_{n,k}^2\, \sigma\left(\Delta Q_{k,t}^{\text{front}}\right)}{\text{GDP}_n}\right)^2. \tag{35}$$

3.5 Strategic Response

We now use reallocation exposure to characterize how countries strategically respond to one another. In equilibrium, country m's first-order condition is

$$\frac{\partial V_m(a_{0,t}, a_{1,t}, \ldots, a_{N,t})}{\partial a_m} = g'(Q_{m,t}(a_{0,t}, a_{1,t}, \ldots, a_{N,t}))\, \frac{\partial Q_{m,t}(a_{0,t}, a_{1,t}, \ldots, a_{N,t})}{\partial a_{m,t}} - \theta a_{m,t} = 0. \tag{36}$$

By the implicit function theorem, for $m \neq n$ the equilibrium response of m's action to n's action is

$$\frac{\partial a_{m,t}}{\partial a_{n,t}} = -\frac{\partial^2 V_m / \partial a_{m,t} \partial a_{n,t}}{\partial^2 V_m / \partial a_{m,t}^2} = -\frac{\partial Q_{m,t}}{\partial a_{n,t}}\, \frac{g''(Q_{m,t})\, \frac{\partial Q_{m,t}}{\partial a_{m,t}}}{g''(Q_{m,t}) \left(\frac{\partial Q_{m,t}}{\partial a_{m,t}}\right)^2 - \theta}, \tag{37}$$

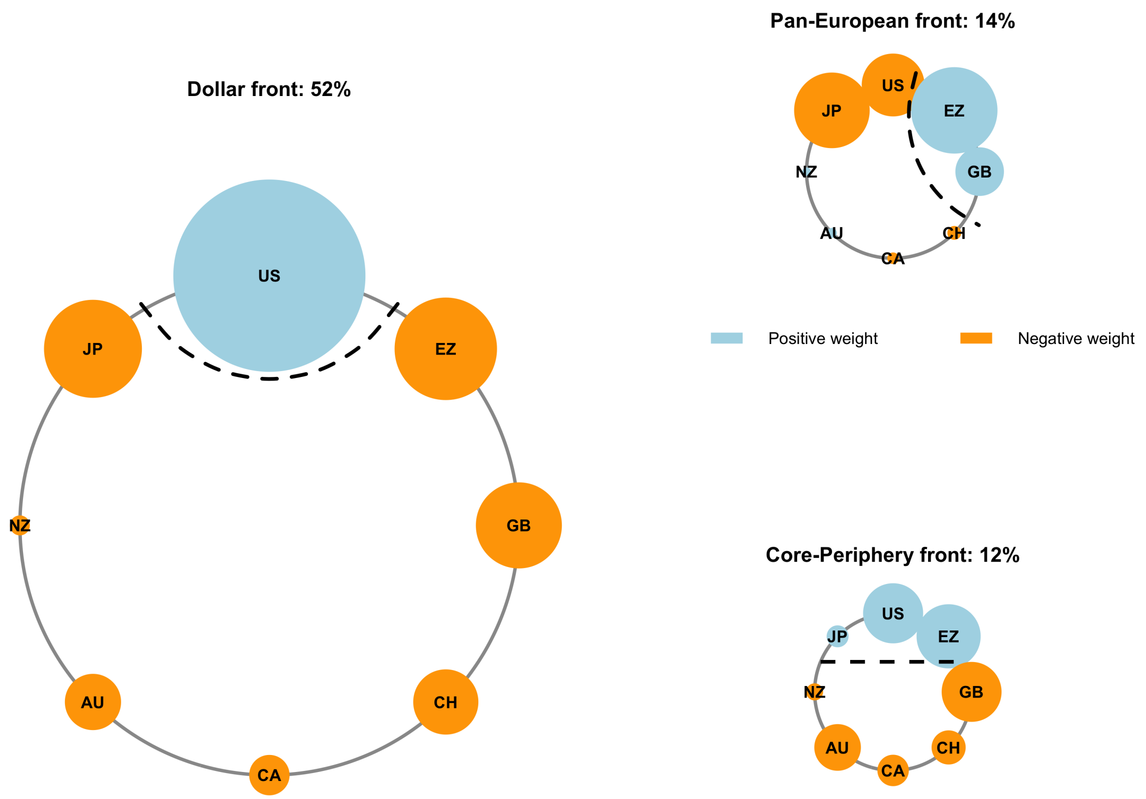
where the second equality uses that the equilibrium mapping from actions to funding quantity is linear, so $\partial^2 Q_{m,t} / \partial a_{m,t}^2 = \partial^2 Q_{m,t} / \partial a_{m,t} \partial a_{n,t} = 0$.

Towards an empirically tractable measure of the right-hand side of (37), we set $\theta = 0$, as we did when measuring the cost of using power. With this approximation we obtain

$$\frac{\partial a_{m,t}}{\partial a_{n,t}} = -\left. \frac{\partial Q_{m,t}}{\partial a_{n,t}} \middle/ \frac{\partial Q_{m,t}}{\partial a_{m,t}} \right. . \tag{38}$$

Because $\partial Q_{m,t} / \partial a_{m,t} > 0$, the sign of country m's strategic response $\partial a_{m,t} / \partial a_{n,t}$ is the opposite of the sign of reallocation exposure $\partial Q_{m,t} / \partial a_{n,t}$, which describes how m's capital inflows respond to n's action. Intuitively, when two countries are aligned (i.e., $\partial Q_{m,t} / \partial a_{n,t} > 0$), an improvement in country n's policy increases country m's inflows, which lowers m's marginal benefit of further action; the best response is to scale back costly effort. When they are competitors (i.e., $\partial Q_{m,t} / \partial a_{n,t} < 0$), an improvement by n reallocates capital away from m, which raises m's marginal benefit of action; the best response is to move in the same direction. Empirically, we test the prediction in (38) by estimating VARs of policy rates and relating the resulting cross-country impulse responses to our bilateral reallocation exposure measures.

Figure 5: Top 3 FX Funding Fronts



Notes: This figure depicts the top 3 funding fronts for the three-month horizon. Each panel shows one funding front with nodes corresponding to countries. Blue (orange) nodes have positive (negative) participation weights in that front, and node area is proportional to the absolute value of the weight. The percentage printed above each panel reports the front's share of aggregate capital pull, measured by the volatility of front-level funding quantities, $\sigma(\Delta Q^{\text{front}}_{k,t})$.

4 Capital Reallocation in FX

In this section we measure countries' reallocation exposure to each other. We first identify the independent funding fronts that organize global FX funding. We then use funding fronts to construct reallocation exposure.

4.1 Funding Fronts in FX

Figure 5 reports the currency weights $w_{n,k}$ in the top three funding fronts. We focus on the 3M horizon; results at other horizons are similar and omitted for brevity. These three fronts are dominant, jointly accounting for 80% of total capital pull, as measured by the volatility of front-level funding quantities, $\sigma(\Delta Q^{\text{front}}_{k,t})$. The currency weights and the capital full of the remaining four fronts are shown in Appendix Figure A1.

The leading front (left panel) is a Dollar front, where the U.S. dollar carries a large positive weight while all other currencies enter negatively. This front accounts for 52% of aggregate capital pull. The second front (upper right) is a Pan-European front: the euro and pound sterling have large positive weights, while the yen and, to a lesser extent, the dollar and other currencies load negatively. It explains 14% of capital pull. The third front (bottom right) loads positively on the core currencies (USD, EUR, and JPY) and negatively on the peripheral currencies, and accounts for 12% of capital pull. The time-series average of funding price $P_{k,t}^{\text{front}}$ is positive for each of these three fronts, showing that agents are willing to pay extra premium to obtain the positive-weight currencies by collateralizing the negative-weight currencies.

These funding fronts are stable. The results in Figure 5 draw on the entire sample of 12 years of daily observations, and reflect the average co-movements in price and quantity over this period. Figure 6 illustrates that the nature of funding fronts does not change in sub-samples. Specifically, we plot the currency weights in the Dollar front when estimated using five-year rolling-windows that are updated annually. Throughout, the front is clearly about using other currencies to obtain USD FX funding. At the same time, the currency weights are not fixed, as seen in the steady decline of EUR's absolute weight. This time-variation implies that reallocation exposure can change due to both changing funding flows into a front and changing compositions of a front. More systematically, funding fronts obtained in the Pre-COVID (2012-2019) vs. Post-COVID (2020-2024) sub-samples have a cosine similarity of 0.96, 0.73, and 0.90 for the Dollar, Pan-European, and Core-Periphery fronts, respectively.

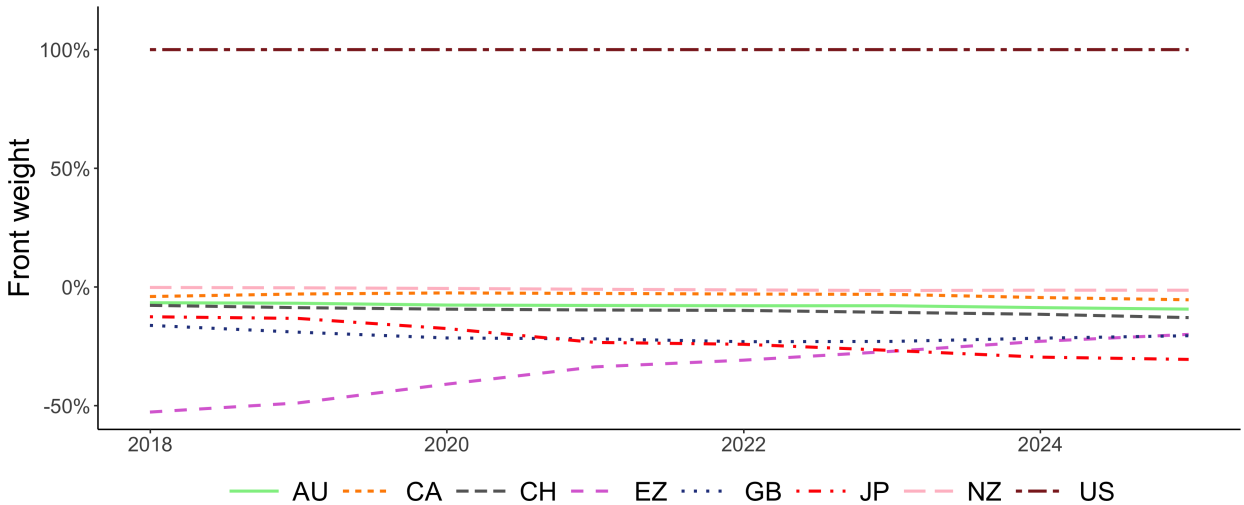
As funding fronts capture the independent margins of adjustments in FX funding, portfolios that are more spread out across funding fronts deliver better diversification. In Appendix Figure A2, we show that banks tend to have better diversified portfolios than non-bank investors, and banks in US and UK are better diversified than banks in Japan and the euro zone.

4.2 Reallocation Exposure

This subsection presents our central empirical object, reallocation exposure, which measures how a marginal change in a country's action reallocates equilibrium FX funding across other countries, holding all other countries' actions fixed. Estimating this object for the eight major currencies in our sample yields a transparent measure of who is exposed to whom in global capital reallocation.

Reallocation exposures are constructed using the funding-front decomposition introduced in Section 3.2. Specifically, the bilateral exposure from country A to B can be written as a

Figure 6: Stability of the Dollar funding front



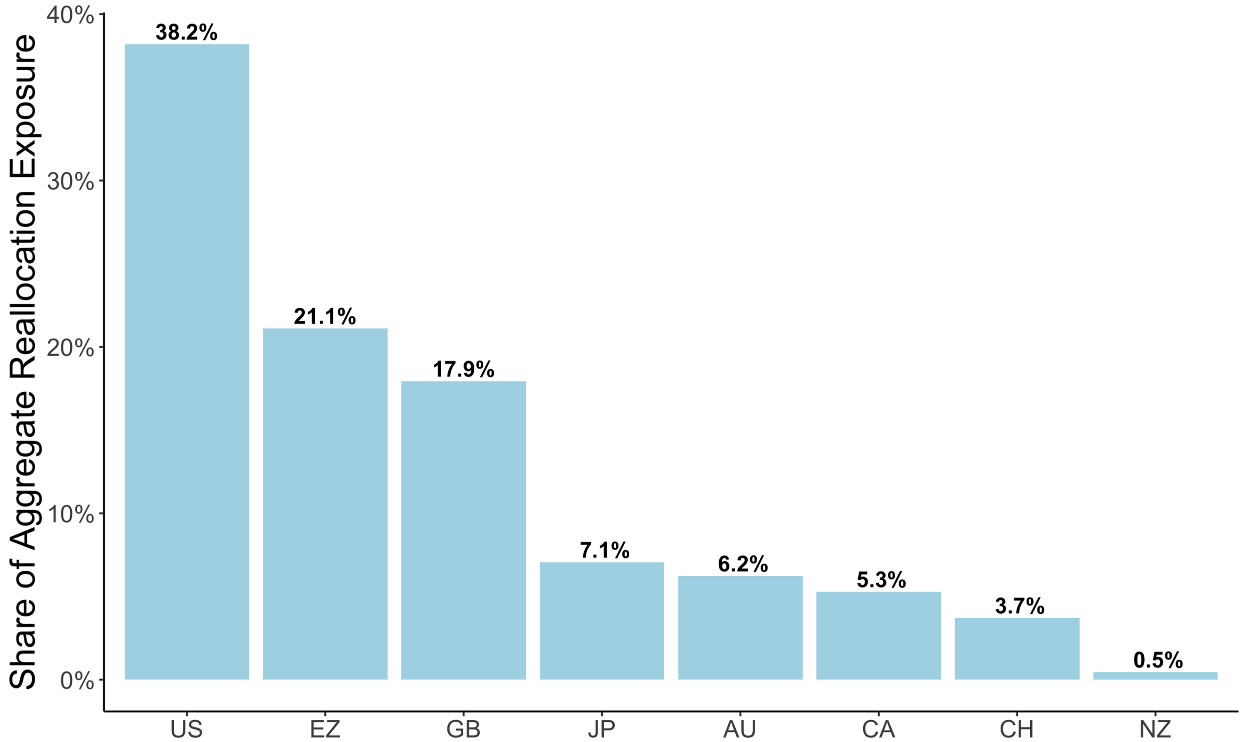
Notes: This figure reports the time-series evolution of countries' weights in the Dollar funding factor, based on five-year rolling-window estimations with annual step size.

sum across funding fronts of two ingredients: countries' overlap in front participation and each front's responsiveness to actions (see equation (24), together with the responsiveness proxy in equation (25)). Market clearing implies that aggregate FX funding sums to zero at each date, so differentiating the market-clearing condition yields an adding-up restriction for exposures. Specifically, for each country A, the bilateral exposures satisfy $\sum_B \partial Q_B/\partial a_A = 0$, where the sum is taken over all countries including A itself. As such, A's reallocation exposure to its own action must equal to the negative sum of its reallocation exposure to all other countries: $\partial Q_A/\partial a_A = -\sum_{B\neq A} \partial Q_B/\partial a_A$. Hence, $\partial Q_A/\partial a_A$ captures the total amount of funding that a marginal improvement in A reallocates away from other countries in equilibrium. Note that by construction in (26), $\partial Q_A/\partial a_A$ is always positive.

Figure 7 plots $\partial Q_A/\partial a_A$ for each of the sample countries. Since only relative magnitudes matter, we normalize and report each country's share of the aggregate reallocation exposure. The estimated exposures reveal strong asymmetries in reallocation exposures. The United States commands the largest overall exposure in our sample at 38.2%, about 80% larger than the euro area (21.1%) and a bit more than twice that of the United Kingdom (17.9%). Together, the U.S., euro zone, and the U.K. account for roughly three quarters of total exposure in the sample. This concentration reflects these countries' prominent participation in the leading funding fronts, which makes it difficult for others to substitute away from their currencies.

Whereas $\partial Q_A/\partial a_A$ is a summary measure, $\partial Q_B/\partial a_A$ reveals bilateral competition in capital reallocation. A negative exposure $\partial Q_B/\partial a_A < 0$ indicates rivalry, in the sense that

Figure 7: Countries' Reallocation Exposure



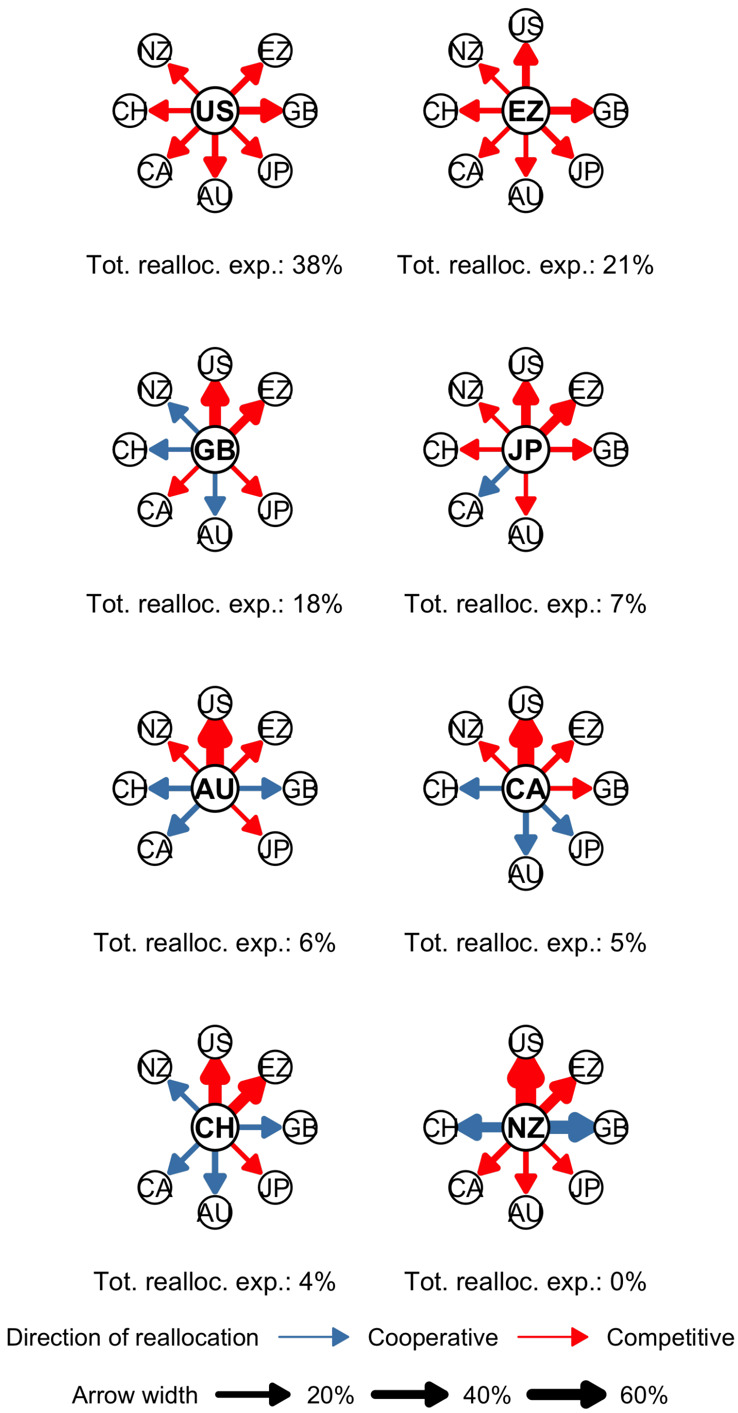
Notes: The figure plots, for each country, its aggregate reallocation exposure vis-á-vis the other countries.

a marginal improvement in A reallocates funding away from B, while a positive exposure indicates alignment, in the sense that A's action raises B's funding. We illustrate the pairwise $\partial Q_B/\partial a_A$ in Figure 8, using red arrows to indicate competition and blue arrows to indicate cooperation; we normalize such that the arrow widths reflect share of bilateral reallocation in the focal country's total exposure, i.e., $(\partial Q_B/\partial a_A)/(\partial Q_A/\partial a_A)$. The United States and the euro area emerge as universal competitors in our sample. All other countries have allies that would benefit from joint actions. Although reallocation exposure is symmetric within a pair $\partial Q_B/\partial a_A = \partial Q_A/\partial a_B$, the importance of a pair's reallocation to the focal country's total reallocation can differ across the two countries. For example, the reallocation exposure between Canada and the U.S. is of paramount importance to Canada but not to the U.S.

5 Geoeconomic Power and Strategic Competition

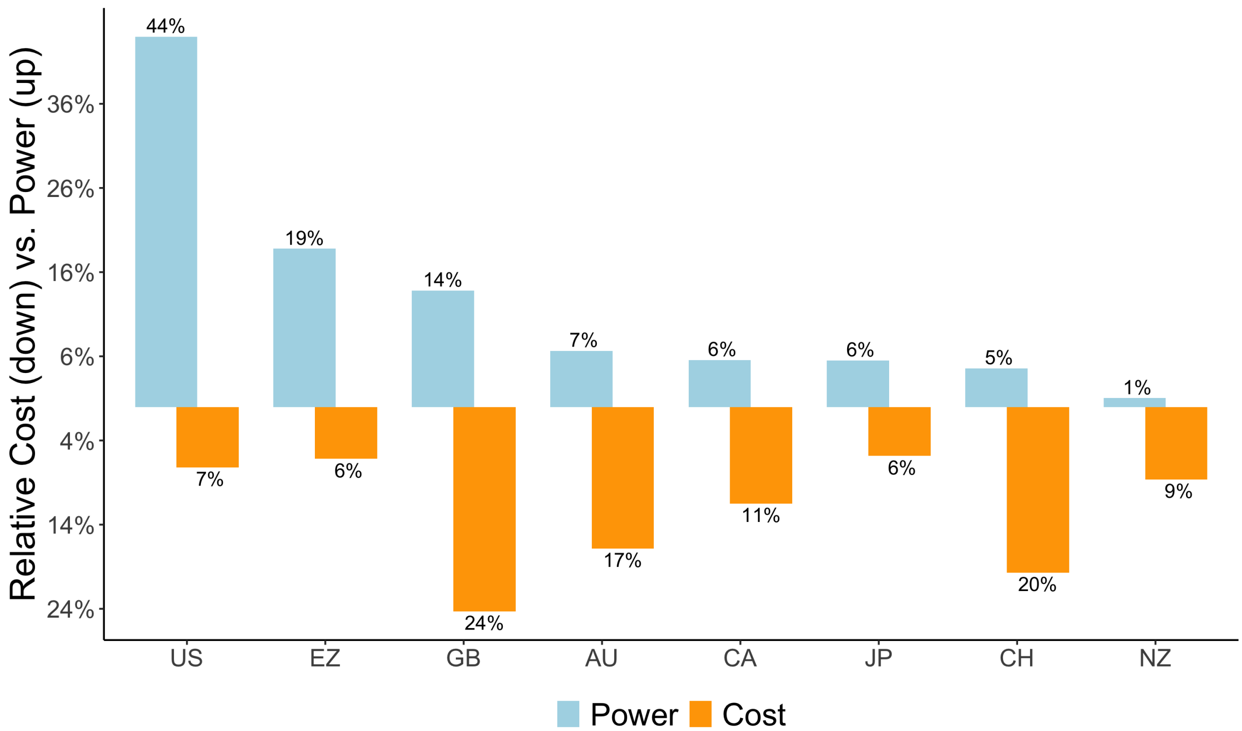
In this section, we use countries' reallocation exposure to each other in two applications of geoeconomic competition. First, we quantify and trace the time-series variation in geoeconomic power. Second, we derive countries optimal strategic response to each other given the

Figure 8: Bilateral Reallocation Exposure



Notes: Each panel displays the focal country's reallocation exposure vis-á-vis other countries. Arrow width is proportional to the strength of bilateral reallocation exposure and is normalized to sum to 100% across all recipients for each focal country. Blue (red) arrows indicate positive (negative) effects between the pair. "Tot. realloc. exp." below each panel reports that country's share of aggregate reallocation exposure across all countries, as illustrated in Figure 7.

Figure 9: Countries' Geoeconomic Power and Cost



Notes: The figure plots, for each country, its geoeconomic power as in (32) (blue bars, above zero) and the cost of exercising power as in (35) (orange bars, below zero). The percentages at the tips of each bar report the country's share of aggregate geoeconomic power or aggregate cost, respectively.

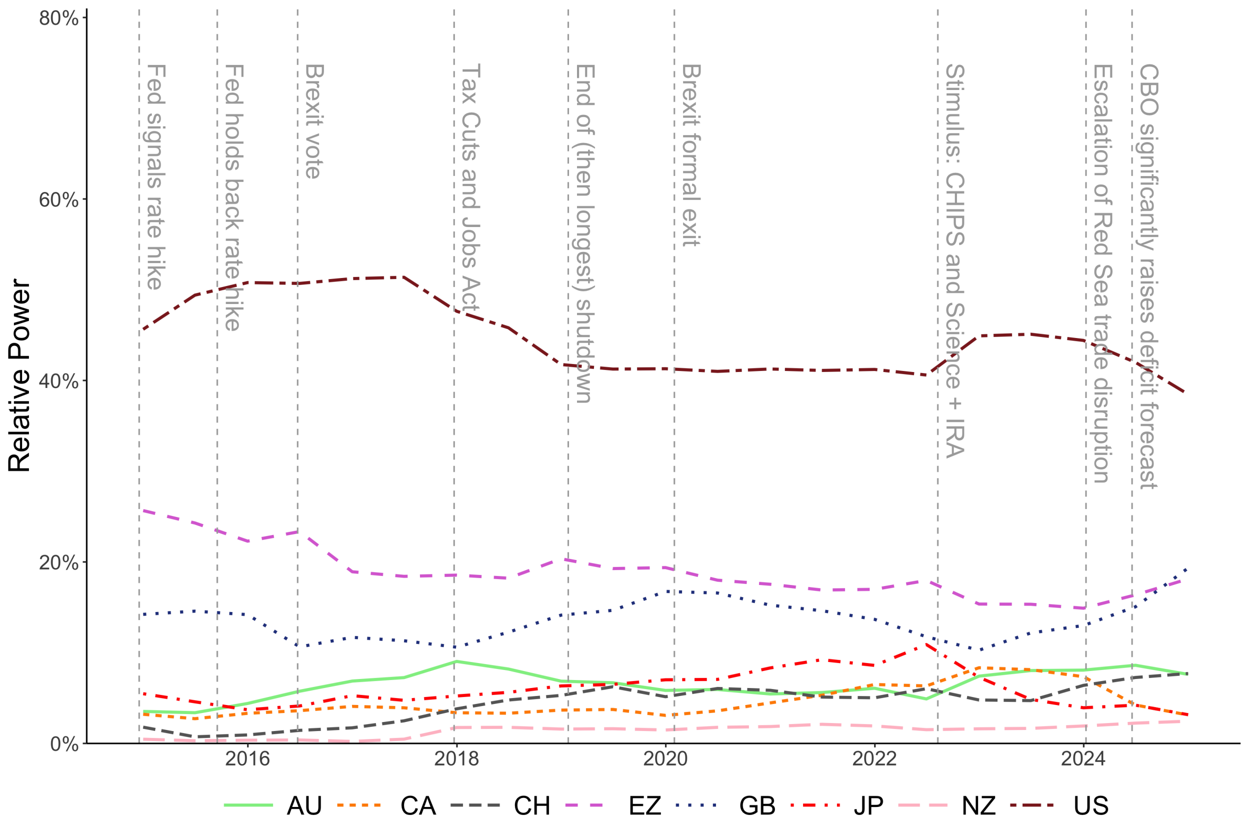
network of competition and cooperation and empirically test these predictions.

5.1 Country's Geoeconomic Power

We quantify each country's average geoeconomic power over our sample period following equation (32). Figure 9 illustrates our findings by showing each country's relative share of total power. Geoeconomic power is highly concentrated. The United States accounts for 44% of aggregate geoeconomic power, roughly equal to the combined share of all other countries. The euro area follows with 19% and the United Kingdom with 14%. Australia, Canada, Japan, Switzerland, and New Zealand together contribute the remaining 23%, each individually below 7%.

We further quantify the cost of exercising geoeconomic power in FX, following (35), and illustrate the findings in Figure 9. The United States and the euro area bear only 7% and 6% of aggregate costs, respectively, while the United Kingdom accounts for 24%. Thus, the hierarchy of geoeconomics is defined not simply by the power enjoyed but also by the cost inherent in exercising that power: the United States and the euro area can exercise

Figure 10: Time-series of Geoeconomic Power



Notes: This figure plots the time series of each country's geoeconomic power as a share of the global total. Estimates are computed using a two-year rolling window that advances every six months; for example, the value at the end of 2016 uses data from 2015-2016. Vertical dashed lines mark selected monetary, fiscal, and geopolitical events discussed in the text.

substantial influence at relatively low cost, whereas the United Kingdom sustains sizable geoeconomic power but bears enormous cost should the power be exercised.

Next, we examine how relative geoeconomic power evolves over time. As Figure 10 shows, although the cross-country ranking of geoeconomic power is relatively stable, the strength of a country's power waxes and wanes with major monetary, fiscal, and geopolitical events. Three patterns stand out. First, strong economic fundamentals appear to bolster geoeconomic power: U.S. power rises after the Federal Reserve first signals liftoff from the zero lower bound and again around the announcement of large-scale stimulus programs such as the CHIPS and Science Act and the Inflation Reduction Act (IRA). Second, episodes that raise concerns about fiscal soundness are associated with noticeable declines in U.S. power, particularly in the period following the 2017 Tax Cuts and Jobs Act and after the Congressional Budget Office (CBO)'s large upward revision to projected deficits in 2024. Finally, political and policy uncertainty tends to be accompanied by softer geoeconomic power. U.S. power levels off or edges down when the Federal Reserve unexpectedly holds back from its planned hiking path and during the prolonged government shutdown, and then stabilizes once the shutdown ends. Similarly, the United Kingdom's power declines sharply around the Brexit referendum and then partially recovers as the Withdrawal Agreement is finalized. Equation (29) elucidates that power changes arise from either changes in marginal utility (proxied by GDP) or changes in reallocation exposure. Empirically, 95% of changes in relative power owes to changes in reallocation exposure.

5.2 Strategic Competition and Cooperation

Bilateral reallocation exposures generate prediction for both the direction and the magnitude of strategic response. We test these predictions by examining policy rate movements. Raising the policy rate is costly as it increases borrowing costs and reduces present value of future profits. Our model implies that strategic competitors should move policy rates in the same direction, since an improvement in one country's funding attractiveness induces its rivals to respond in kind. In contrast, strategic cooperators should move in opposite directions as the costly action by one reduces the incentive for the other to incur the cost. We estimate, for each ordered pair (n, m) with n equal to the United States or the euro area, a monthly VAR in the eight countries' policy rates and obtain the impact response of $a_{m,t}$ to a one-standard-deviation shock to $a_{n,t}$.[10] We focus on the United States and the euro area as senders because of their position in the power hierarchy, whereby they have the most amount of influence and the least cost to wield their influence. We then regress the impact responses on the theory-implied best response $-(\partial Q_m/\partial a_n)/(\partial Q_m/\partial a_m)$ from equation (38). Table 2 reports the results.

The coefficients on the theory-implied response are uniformly positive and statistically significant, consistent with the model's prediction that strategic rivals escalate each other's action in the same direction, while aligned pairs move less in tandem. In the 2012-2024 sample, the theory-implied response enters with a coefficient of 0.27 (s.e. 0.11) when included on its own, and 0.55 (s.e. 0.13) after controlling for a host of gravity measures that could also affect bilateral responses. Specifically, we consider the physical distance between two countries, bilateral trade flow, and diplomatic proximity as measured through voting patterns in the United Nations.[11] In the longer 1999-2024 sample, the estimated coefficient remains positive and significant, at 0.14 (s.e. 0.04) without controls and 0.14 (s.e. 0.06) with controls.

[10]Impulse responses are identified using a recursive (Cholesky) ordering. In the baseline specification, we order countries by aggregate reallocation exposure: United States, euro area, United Kingdom, Japan, Australia, Canada, Switzerland, and New Zealand. The results are robust to alternative orderings of the response countries (m).

[11]Gravity measures are sourced from the CEPII Gravity Database (Conte, Cotterlaz, and Mayer, 2023).

Table 2: Monetary Policy Responses and Bilateral Reallocation Exposure

	Interest rate initial response					
	Sample (2012-2024)			All (1999-2024)		
	(1)	(2)	(3)	(4)	(5)	(6)
Theory-implied response	0.27**		0.55***	0.14***		0.14**
	(0.11)		(0.13)	(0.04)		(0.06)
Physical distance		-0.13	-2.2*		0.18	-0.35
		(1.4)	(0.96)		(0.44)	(0.43)
Diplomatic disagreement		0.004	-0.21**		0.05	-0.005
		(0.09)	(0.08)		(0.03)	(0.03)
GDP-normed trade flow		0.65	-2.4*		0.93*	0.19
		(1.6)	(1.2)		(0.49)	(0.51)
Observations	13	13	13	13	13	13
R^2	0.34	0.05	0.69	0.50	0.43	0.66

Notes: The table reports cross-sectional regressions of the impact response of country m's policy rate to a one-standard-deviation shock to country n's policy rate. The impact responses are estimated from a monthly VAR in the eight countries' policy rates and are expressed in units of the responding country m's own standard deviation of monthly policy-rate changes over the corresponding sample. Each observation is an ordered country pair (n, m) with $n \neq m$, where n is either the United States or the euro area. "Theory-implied response" is the model-predicted best-response slope $-(\partial Q_m/\partial a_n)/(\partial Q_m/\partial a_m)$ from equation (38); positive values correspond to strategic competition and negative values to strategic cooperation. Columns (1) and (4) include only the theory-implied response, columns (2) and (5) include only geographic, diplomatic, and trade controls, and columns (3) and (6) include both. "Physical distance" is the bilateral distance between the two countries, scaled by 10^{-5}. "Diplomatic disagreement" is based on UN voting, with larger values indicating greater disagreement. "GDP-normed trade flow" is bilateral trade flow normalized by the GDP of the responding country m, scaled by 10^3. GDP is measured as average GDP over 2012-2024 in columns (1)-(3) and over 1999-2024 in columns (4)-(6). Diplomatic disagreement and trade-flow data are available through 2020. Standard errors are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

Because there is no direct mapping from a unit change in the model's abstract action to a unit change in observed policy rates, we emphasize the sign and statistical significance rather than the level of the coefficients. Overall, these results indicate that cross-country monetary policy responses mirror countries' competitive positions in global FX funding, providing evidence that international monetary policy transmission partly reflects competition for capital.

6 Conclusion

This paper studies geoeconomic competition and capital reallocation in global financial markets through the lens of the FX funding market. We develop a framework to measure how a change in one country's action reallocates FX funding across other countries, holding the rest constant. The key empirical challenge is that observed funding quantities and funding prices are equilibrium objects that jointly reflect common shocks and strategic interaction across countries, so bilateral influence cannot be read off from equilibrium correlations. To address this, we recover a small set of *funding fronts*, mutually independent margins of portfolio adjustment constructed from the joint variation in funding quantities and funding prices.

Our results show that competition for FX funding is multidimensional but highly concentrated. A small number of funding fronts organize most of the variation in global FX funding, with a dominant U.S. dollar front, followed by fronts associated with demand for European currencies and demand for a broader set of core currencies. The resulting reallocation exposures display strong asymmetries: a small set of countries drives a disproportionate share of global FX funding reallocation. These asymmetries reflect countries' participation in the leading funding fronts and provides a financial analogue of trade exposure. Countries that rely heavily on U.S.-centered funding fronts have limited scope to substitute away and are thus vulnerable to U.S. shocks and policy changes, much as trade-dependent countries are exposed to actions by key partners.

We use reallocation exposure in two applications. First, we map reallocation exposure into time-varying measures of geoeconomic power in FX funding and the cost of exercising that power, and find that variations systematically track major monetary, fiscal, and geopolitical episodes. Second, using policy rates as an observable form of action, we find that cross-country policy-rate reactions are stronger between rivals and weaker between aligned countries, consistent with the model's best-response prediction. This evidence suggests that competition for capital is an important driver of global monetary policy co-movements.

As the world becomes increasingly interconnected, geoeconomic competition, particularly through financial markets, has become a defining feature of international economic interaction. Because financial markets are governed by global portfolio optimization, actions taken in one country reverberate through multilateral channels that are difficult to observe directly. By introducing funding fronts, this paper offers a way to organize and interpret these interactions, highlighting the margins along which capital reallocation and competition occur. We hope this perspective proves useful for future work seeking to understand economic interdependence in an era of globally integrated finance.

References

Abadi, J., J. Fernàndez-Villaverde, and D. Sanches. 2025. International currency dominance. Working paper.

An, Y., and A. W. Huber. 2025. Demand propagation through traded risk factors. Working Paper.

Anderson, J. E., and E. van Wincoop. 2003. Gravity with gravitas: A solution to the border puzzle. *The American Economic Review* 93:170–92.

Bianchi, J., S. Horn, G. Rosso, and C. Sosa-Padilla. 2025. Financial cooperation in a fragmented world. Presentation slides, presented at the IMF–Kiel Institute Conference on Geoeconomic Fragmentation, October 2025.

Broner, F., A. Martin, J. Meyer, and C. Trebesch. 2025. Hegemonic globalization. Working paper.

Cenedese, G., P. Della Corte, and T. Wang. 2021. Currency mispricing and dealer balance sheets. *The Journal of Finance* 76:2763–803.

Clayton, C., A. Coppola, M. Maggiori, and J. Schreger. 2025. Geoeconomic pressure. Working paper.

Clayton, C., M. Maggiori, and J. Schreger. 2024. A theory of economic coercion and fragmentation. *Available at SSRN 4767131* .

———. 2025. A framework for geoeconomics. *Econometrica* Forthcoming.

Conte, M., P. Cotterlaz, and T. Mayer. 2023. The cepii gravity database. Working papers, CEPII.

Coppola, A., M. Maggiori, B. Neiman, and J. Schreger. 2021. Redrawing the map of global capital flows: The role of cross-border financing and tax havens. *The Quarterly Journal of Economics* 136:1499–556.

Dao, M. C., P.-O. Gourinchas, and O. Itskhoki. 2025. Breaking parity: Equilibrium exchange rates and currency premia. Working Paper.

De Leo, P., L. Keller, and D. Zou. 2025. Speculation, forward exchange demand, and cip deviations in emerging economies. Working Paper.

Du, W., B. Hébert, and A. W. Huber. 2023. Are intermediary constraints priced? *Review of Financial Studies* 36:1464–507.

Du, W., and A. W. Huber. 2025. USD asset holding and hedging around the globe. Working Paper.

Du, W., G. Strasser, and A. Verdelhan. 2025. Repo and fx swap: A tale of two markets. Working paper.

Du, W., A. Tepper, and A. Verdelhan. 2018. Deviations from covered interest rate parity. *Journal of Finance* 73:915–57.

He, Z., A. Krishnamurthy, and K. Milbradt. 2016. What makes us government bonds safe assets? *American Economic Review* 106:519–23.

Kloks, P., E. Mattille, and A. Ranaldo. 2024. Hunting for dollars. Working Paper.

Krugman, P. 1980. Scale economies, product differentiation, and the pattern of trade. *American Economic Review* 70:950–9.

Liu, E., and D. Yang. 2025. International power. Working paper.

Maggiori, M., B. Neiman, and J. Schreger. 2020. International currencies and capital allocation. *Journal of Political Economy* 128:2019–66.

Manski, C. F. 1993. Identification of endogenous social effects: The reflection problem. *The Review of Economic Studies* 60:531–42.

Markowitz, H. 1952. Portfolio selection. *Journal of Finance* 7:77–91.

Matsuyama, K., N. Kiyotaki, and A. Matsui. 1993. Toward a theory of international currency. *The Review of Economic Studies* 60:283–307.

Miranda-Agrippino, S., and H. Rey. 2020. U.S. Monetary Policy and the Global Financial Cycle. *The Review of Economic Studies* 87:2754–76.

Moskowitz, T. J., C. P. Ross, S. Y. Ross, and K. Vasudevan. 2024. Quantities and covered-interest parity. Working Paper.

Ossa, R. 2014. Trade wars and trade talks with data. *American Economic Review* 104:4104–46.

Powell, J. H. 2025. Converstaion following "economic outlook" at the economic club of chicago. Public conversation, Economic Club of Chicago. Comment at 51:02 on the importance of FX funding.

Rey, H. 2015. Dilemma not trilemma: the global financial cycle and monetary policy independence. Working Paper, National Bureau of Economic Research.

Zhang, C. 2014. An information-based theory of international currency. *Journal of International Economics* 93:286–301.

A Additional Theoretical Results and Proofs

This appendix provide additional theoretical results and proofs omitted in the main text.

A.1 Proof for Proposition 1

Let $\Delta\mathbf{P}_t^{\text{front}} \in \mathbb{R}^K$ and $\Delta\mathbf{Q}_t^{\text{front}} \in \mathbb{R}^K$ stack front-level price and quantity changes, respectively, where $K \leq N$ allows for dimension reduction. Denote by $\mathbf{W} \in \mathbb{R}^{N\times K}$ the weight matrix whose kth column contains the non-numeraire country weights $(w_{1,k}, \ldots, w_{N,k})^\top$. The weight on the numeraire is then $w_{0,k} = -\sum_{n=1}^{N} w_{n,k}$. By construction of front prices in (13) and front quantities in (14),

$$\Delta\mathbf{P}_t^{\text{front}} = \mathbf{W}^\top \Delta\mathbf{P}_t, \qquad \Delta\mathbf{Q}_t = \mathbf{W}\Delta\mathbf{Q}_t^{\text{front}}. \tag{A1}$$

Assume $\text{var}(\Delta\mathbf{P}_t)$ is nonsingular.[12] Take its Cholesky factorization

$$\text{var}(\Delta\mathbf{P}_t) = \mathbf{U}^\top\mathbf{U}, \tag{A2}$$

with $\mathbf{U}$ upper triangular and $\text{diag}(\mathbf{U}) > 0$. Consider the symmetric matrix

$$\mathbf{M} := \mathbf{U}\,\text{var}(\Delta\mathbf{Q}_t)\mathbf{U}^\top, \tag{A3}$$

and take its spectral decomposition

$$\mathbf{M}\mathbf{G} = \mathbf{G}\mathbf{\Pi}, \qquad \mathbf{G}^\top\mathbf{G} = \mathbf{I}_N, \quad \mathbf{\Pi} = \text{diag}(\pi_1, \ldots, \pi_N),\ \pi_k \geq 0. \tag{A4}$$

Let $\mathbf{G}_K \in \mathbb{R}^{N\times K}$ collect the K orthonormal eigenvectors of $\mathbf{M}$ that we retain (e.g., the K most informative directions). Define

$$\mathbf{W} := \mathbf{U}^{-1}\mathbf{G}_K. \tag{A5}$$

Using (A1), (A2), and (A5),

$$\text{var}(\Delta\mathbf{P}_t^{\text{front}}) = \mathbf{W}^\top\,\text{var}(\Delta\mathbf{P}_t)\mathbf{W} = \mathbf{G}_K^\top(\mathbf{U}^\top)^{-1}\mathbf{U}^\top\mathbf{U}\mathbf{U}^{-1}\mathbf{G}_K = \mathbf{I}_K, \tag{A6}$$

so the front price changes are mutually uncorrelated and normalized to unit variance, estab-

[12] The general case with singular $\text{var}(\Delta\mathbf{P}_t)$ can be handled by working on its support; see An and Huber (2025).

lishing (15). Moreover, from (A1),

$$\text{var}(\Delta \mathbf{Q}_t) = \mathbf{W}\, \text{var}(\Delta \mathbf{Q}_t^{\text{front}}) \mathbf{W}^\top. \tag{A7}$$

Left- and right-multiplying by $\mathbf{U}$ and using (A5),

$$\mathbf{U}\, \text{var}(\Delta \mathbf{Q}_t) \mathbf{U}^\top = (\mathbf{U}\mathbf{W})\, \text{var}(\Delta \mathbf{Q}_t^{\text{front}})(\mathbf{U}\mathbf{W})^\top = \mathbf{G}_K\, \text{var}(\Delta \mathbf{Q}_t^{\text{front}})\mathbf{G}_K^\top. \tag{A8}$$

Comparing (A8) with the restriction of (A4) to the span of $\mathbf{G}_K$ and using orthonormality,

$$\text{var}(\Delta \mathbf{Q}_t^{\text{front}}) \;=\; \mathbf{\Pi}_K, \tag{A9}$$

where $\mathbf{\Pi}_K = \text{diag}(\pi_1, \ldots, \pi_K)$ is diagonal. Hence front quantity changes are mutually uncorrelated across fronts, establishing (16).

The construction (A5) uniquely identifies $\mathbf{W}$ up to (i) the ordering of fronts, (ii) a sign for each column, and (iii) arbitrary orthonormal rotations within any group of equal eigenvalues in $\mathbf{\Pi}$.

A.2 Primitive Conditions for Front-Level Separability

Section 3.2 imposes front-level separability (17): once global FX funding is expressed in the funding-front basis, banks' and investors' capacity to scale positions is assumed to be front specific (i.e., diagonal in the front basis). This appendix provides primitive currency-space conditions—stated in terms of the capacity matrices $\mathbf{\Gamma}_B$ and $\mathbf{\Gamma}_I$ and the joint covariance structure of $\Delta \mathbf{P}_t$ and $\Delta \mathbf{Q}_t$—under which (17) holds for the orthogonal funding fronts constructed in Proposition 1.

Let $\mathbf{\Sigma}_P := \text{var}(\Delta \mathbf{P}_t)$ and $\mathbf{\Sigma}_Q := \text{var}(\Delta \mathbf{Q}_t)$ as in Section 3.2. Throughout this appendix, we specialize to the full-basis case $K = N$ and impose two regularity conditions: $\mathbf{\Sigma}_P$ is full rank and $\mathbf{\Sigma}_P \mathbf{\Sigma}_Q$ has distinct eigenvalues.[13] We now state and prove a primitive commutation condition that is equivalent to front-level separability (17).

ASSUMPTION. *Banks' and investors' capacity matrices satisfy*

$$\mathbf{\Sigma}_P \mathbf{\Sigma}_Q \mathbf{\Gamma}_B = \mathbf{\Gamma}_B \mathbf{\Sigma}_Q \mathbf{\Sigma}_P, \qquad \mathbf{\Sigma}_P \mathbf{\Sigma}_Q \mathbf{\Gamma}_I = \mathbf{\Gamma}_I \mathbf{\Sigma}_Q \mathbf{\Sigma}_P. \tag{A10}$$

This restriction holds mechanically in the no cross-currency comovement benchmark dis-

[13] These conditions ensure that the associated funding-front rotation is well defined and unique up to sign and ordering. More general cases, including rank deficiency and repeated eigenvalues, can be handled with the same logic but require additional notation; see An and Huber (2025).

cussed in Section 3.2: if $\mathbf{\Sigma}_P$ and $\mathbf{\Sigma}_Q$ are diagonal and capacity is currency specific (so $\mathbf{\Gamma}_B$ and $\mathbf{\Gamma}_I$ are diagonal), then all matrices commute.

PROPOSITION 2. *Assumption (A10) holds for both $\mathbf{\Gamma}_B$ and $\mathbf{\Gamma}_I$ if and only if $\mathbf{\Gamma}_B^{\text{front}}$ and $\mathbf{\Gamma}_I^{\text{front}}$ are diagonal as in equation (17).*

Proof. Let $\mathbf{\Sigma}_P = \mathbf{U}^\top \mathbf{U}$ be the Cholesky factorization used in Appendix A.1 and define

$$\mathbf{A} := \mathbf{U}\mathbf{\Sigma}_Q\mathbf{U}^\top.$$

By construction, $\mathbf{A}$ is symmetric. Under the stated regularity condition, $\mathbf{A}$ has distinct eigenvalues, so it admits an eigenvalue decomposition

$$\mathbf{A} = \mathbf{G}\mathbf{\Pi}\mathbf{G}^\top, \qquad \mathbf{G}^\top\mathbf{G} = \mathbf{I}_N, \qquad \mathbf{\Pi} = \text{diag}(\pi_1, \ldots, \pi_N) \text{ with } \pi_i \neq \pi_j \text{ for } i \neq j.$$

In the full-basis case $K = N$, the orthogonal-front construction in Appendix A.1 implies

$$\mathbf{W} = \mathbf{U}^{-1}\mathbf{G}.$$

First, define the transformed capacity matrices

$$\widetilde{\mathbf{\Gamma}}_B := \mathbf{U}^{-\top}\mathbf{\Gamma}_B\mathbf{U}^{-1}, \qquad \widetilde{\mathbf{\Gamma}}_I := \mathbf{U}^{-\top}\mathbf{\Gamma}_I\mathbf{U}^{-1}.$$

Premultiplying $\mathbf{\Sigma}_P\mathbf{\Sigma}_Q\mathbf{\Gamma}_B = \mathbf{\Gamma}_B\mathbf{\Sigma}_Q\mathbf{\Sigma}_P$ by $\mathbf{U}^{-\top}$ and postmultiplying by $\mathbf{U}^{-1}$ yields

$$\mathbf{U}\mathbf{\Sigma}_Q\mathbf{\Gamma}_B\mathbf{U}^{-1} = \mathbf{U}^{-\top}\mathbf{\Gamma}_B\mathbf{\Sigma}_Q\mathbf{U}^\top.$$

Using $\mathbf{A} = \mathbf{U}\mathbf{\Sigma}_Q\mathbf{U}^\top$ and $\widetilde{\mathbf{\Gamma}}_B = \mathbf{U}^{-\top}\mathbf{\Gamma}_B\mathbf{U}^{-1}$, the preceding display is equivalent to

$$\mathbf{A}\widetilde{\mathbf{\Gamma}}_B = \widetilde{\mathbf{\Gamma}}_B\mathbf{A}.$$

The same argument shows that the investor condition in (A10) is equivalent to

$$\mathbf{A}\widetilde{\mathbf{\Gamma}}_I = \widetilde{\mathbf{\Gamma}}_I\mathbf{A}.$$

Second, using $\mathbf{W} = \mathbf{U}^{-1}\mathbf{G}$, we can write the front-level capacity matrices as

$$\mathbf{\Gamma}_B^{\text{front}} = \mathbf{W}^\top\mathbf{\Gamma}_B\mathbf{W} = \mathbf{G}^\top\widetilde{\mathbf{\Gamma}}_B\mathbf{G}, \qquad \mathbf{\Gamma}_I^{\text{front}} = \mathbf{W}^\top\mathbf{\Gamma}_I\mathbf{W} = \mathbf{G}^\top\widetilde{\mathbf{\Gamma}}_I\mathbf{G}.$$

Moreover, since $\mathbf{A} = \mathbf{G}\mathbf{\Pi}\mathbf{G}^\top$, the commutation relation $\mathbf{A}\widetilde{\mathbf{\Gamma}}_B = \widetilde{\mathbf{\Gamma}}_B\mathbf{A}$ is equivalent to

$$\mathbf{\Pi}\big(\mathbf{G}^\top\widetilde{\mathbf{\Gamma}}_B\mathbf{G}\big) = \big(\mathbf{G}^\top\widetilde{\mathbf{\Gamma}}_B\mathbf{G}\big)\mathbf{\Pi}.$$

Because $\mathbf{\Pi}$ is diagonal with distinct diagonal entries, the only matrices that commute with $\mathbf{\Pi}$ are diagonal matrices. Hence,

$$\mathbf{A}\widetilde{\mathbf{\Gamma}}_B = \widetilde{\mathbf{\Gamma}}_B\mathbf{A} \quad\Longleftrightarrow\quad \mathbf{G}^\top\widetilde{\mathbf{\Gamma}}_B\mathbf{G} \text{ is diagonal} \quad\Longleftrightarrow\quad \mathbf{\Gamma}_B^{\text{front}} \text{ is diagonal.}$$

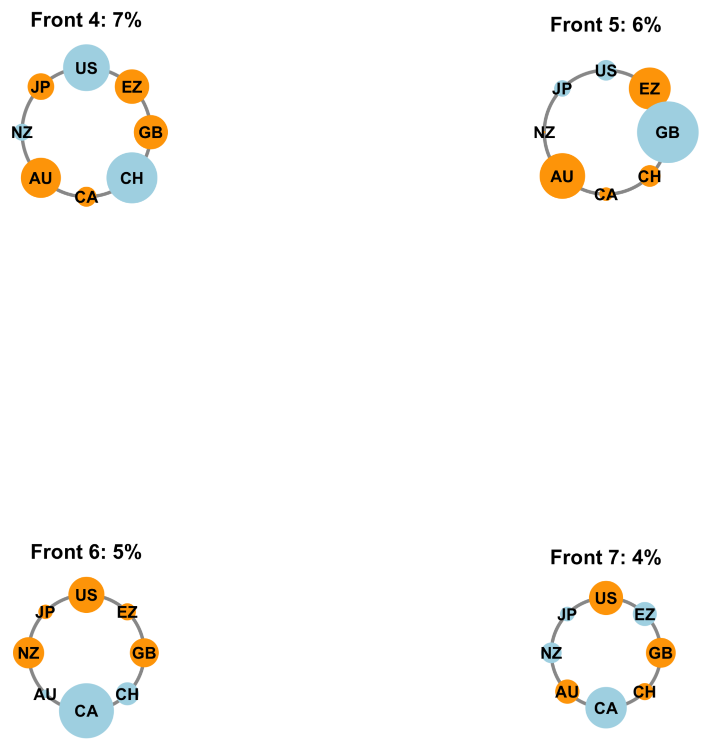
The same logic applies to $\widetilde{\mathbf{\Gamma}}_I$, giving

$$\mathbf{A}\widetilde{\mathbf{\Gamma}}_I = \widetilde{\mathbf{\Gamma}}_I\mathbf{A} \quad\Longleftrightarrow\quad \mathbf{\Gamma}_I^{\text{front}} \text{ is diagonal.}$$

Combining two steps proves the proposition. □

B Additional Empirical Results

Figure A1: 4th to 7th FX Funding Fronts



Notes: This figure depicts the 4th to 7th funding fronts for the three-month horizon. Each panel shows one funding front with nodes corresponding to countries. Blue (orange) nodes have positive (negative) participation weights in that front, and node area is proportional to the absolute value of the weight. The percentage printed above each panel reports the front's share of aggregate capital pull, measured by the volatility of front-level funding quantities, $\sigma(\Delta Q_{k,t}^{\text{front}})$.

Figure A2: Agents' concentration across funding fronts

Notes: This figure reports the Herfindahl–Hirschman Index (HHI) of each agent group's activity across funding fronts. For each country label on the x-axis, the blue circle shows the average HHI for banks and the orange triangle for investors. The dashed horizontal line gives the benchmark HHI under full diversification, in which an agent allocates the same share to each front.